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Alcohol Use Predicts Number of Sexual Partners for Female but not Male STI Clinic Patients

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Abstract

This study tested the hypothesis that greater alcohol involvement will predict number of sexual partners to a greater extent for women than for men, and that the hypothesized sex-specific, alcohol—sexual partner associations will hold when controlling for alternative sex-linked explanations (i.e., depression and drug use). We recruited 508 patients (46% female, 67% African American) from a public STI clinic. Participants reported number of sexual partners, drinks per week, maximum drinks per day, frequency of heavy drinking; they also completed the AUDIT-C and a measure of alcohol problems. As expected, men reported more drinking and sexual partners. Also as expected, the association between alcohol use and number of partners was significant for women but not for men, and these associations were not explained by drug use or depression. A comprehensive prevention strategy for women attending STI clinics might include alcohol use reduction.

Keywords

alcohol; sexual behavior; women; partner concurrency; HIV; AIDS

INTRODUCTION

Nearly 20 million new cases of sexually transmitted infections (STI) occur each year, incurring direct medical costs of $16 billion (1). Individuals seeking services at STI clinics are at elevated risk for HIV and other STIs (2). In addition, high rates of alcohol use are

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common among STI clinic patients (3), and may contribute to patients' risk for STIs. Several reviews document the relation between drinking alcohol and STIs, including HIV (4,5).

Although several mechanisms linking alcohol consumption with incident STIs have been hypothesized, one established mechanism is that alcohol use increases risky sexual behaviors that increase risk for STI acquisition (6). Many studies document the association between alcohol use and multiple sexual partners (3,7), an established risk factor for STIs (8,9).

Sex and/or gender role may influence the extent to which alcohol use increases sexual risk taking. On average, men consume more alcohol than do women (10) but women are more vulnerable to alcohol's effects due to smaller body mass, body fat composition, and other factors (11). Furthermore, gender-linked disparities in economic, social, and relationship power may affect the degree to which alcohol use will be associated with sexual risk taking (12). A small but growing literature reveals that the association between alcohol use and number of sexual partners is stronger for women than it is for men. In drug treatment samples, alcohol use is associated with multiple sexual partners for women only (13,14). In STI clinic samples, engaging in any heavy drinking doubled the likelihood of having multiple partners but only for women (15). Among patients at an HIV care clinic, frequent or heavy alcohol use (defined as drinking weekly or reporting any heavy drinking in the last 3 months) was associated with multiple partners for women and gay men, but not for heterosexual men (16). Collectively, these data suggest that alcohol use increases the risk of multiple partners to a greater extent for women than for men. However, the ability to draw clear conclusions from these studies has been hampered by use of relatively insensitive measures of alcohol involvement -- primarily binary indicators of alcohol consumption (13,17), status as a heavy episodic drinker (15,16), or substance use disorder (3).

The literature documenting sex effects on the alcohol use-multiple partner relationship is limited by lack of attention to an important potential confound, namely, depression. The associations between alcohol use and depression (18), and sex and depression (19) are well-documented. Longitudinal data from a representative community sample show that depressive symptoms predict the onset of heavy episodic drinking among women (20). Research also supports the association between depression and sexual risk behaviors. For example, in a nationally representative sample of youth (i.e., Add Health), depression measured in middle and high school predicted multiple partners 6 years later (21). Data collected from depressed patients in an STI clinic showed that they had more lifetime sexual partners than non-depressed patients (22). Thus, because depression is associated with both alcohol use and with multiple partners, and because depression is more common among women, the association between alcohol use and multiple partners among women could be explained by the higher rates of depression among females. This study addresses this potential explanation.

Also important is the co-occurrence of alcohol use and other drug use (23). Given high rates of comorbidity, concurrent drug use may also contribute to the differential association of alcohol use with number of partners. Drug use increases the likelihood of engaging in sexual

risk behaviors such as multiple partners, sex trading, and unprotected intercourse (24). In a sample of drug users, women reported more high-risk sexual partners than men (25). Thus, isolating the effect of alcohol use on number of partners for women also requires controlling for concurrent drug use, consistent with prior research on this topic (e.g., 13,15–16), as well as potential sex-linked effects of concurrent drug use.

The current research has two purposes. First, we test the hypothesis that greater alcohol involvement predicts number of sexual partners to a greater extent for women than for men. We extend prior research by employing a wider range of continuous alcohol use variables that include heavy episodic drinking frequency, maximum consumption, and average drinks per week. Because substance use disorder has been associated with number of partners for women (3), we also explore the moderating effect of sex on the relationship between number of alcohol problems and partners. Second, we test the hypothesis that the sex-specific, alcohol—sexual partner associations will hold even after controlling for alternative sex-linked explanations, namely, depression and drug use. Controlling for the influence of these factors allows us to determine whether alcohol use alone explains the association between alcohol use and multiple partners among women who drink.

METHODS

Participants

Participants were patients attending a publicly-funded STI clinic. All had completed a baseline assessment as part of a randomized controlled trial (RCT) (26, 27). The RCT recruited 1,010 participants; 508 of the participants were randomized to a survey that included in-depth questions about alcohol use. Of the 508 participants who completed the in-depth alcohol use questions, 54 reported that they had not had a drink in the past year and were excluded from analyses, leaving a final sample of 454 participants for the current analyses.

The final sample included 245 men (54%) and 209 women (46%). Participants were, on average, 28 years of age (*SD* = 9). The sample was primarily African-American (*n* = 301, 67%). Approximately one-half were unemployed (*n* = 221, 49%) and reported an income of less than $15,000 per year (*n* = 223, 51%); 61% (*n* = 278) had a high school education or less.

Procedure

The Institutional Review Boards at participating institutions approved this study. Patients attending the clinic were asked if they were willing to answer a few brief questions to determine whether they were eligible to participate in a study that was being conducted at the clinic. Patients who gave verbal consent were screened by a Research Assistant; to be eligible for the study, participants had to (a) be age 16 or older and (b) report recent sexual risk behavior (i.e., had vaginal or anal sex with more than one person in the past 3 months OR had vaginal or anal sex with a partner who had other partners in the past 3 months AND used condoms less than 100% of the time in the past 3 months). Patients who met eligibility criteria were invited to join the study and, if interested, to provide written informed consent.

Participants completed a baseline assessment in a private room prior to their clinic visit. All measures were administered on a laptop computer using audio computer-assisted self-interview (ACASI) software. Participants were reimbursed $20 for their time. Carey et al. (26, 27) provide an expanded report of the procedures for the RCT.

Measures

Covariates—Participants reported their age, sex, race/ethnicity, employment status, educational level, and income. They also completed the 10-item Drug Abuse Screening Test (DAST) (28), assessing risk for drug misuse in the past year; and the Patient Health Questionnaire (PHQ-2) (29), a brief screen for depression over the past 2 weeks, with good factorial and construct validity.

Number of partners—Participants were asked to report the (a) number of women and (b) number of men they had vaginal or anal sex with in the past 3 months. Responses were summed to create a variable indicating participants' total number of sexual partners in the past 3 months.

Alcohol use—Participants reviewed definitions of standard drinks (30) and then responded to several items used in the National Epidemiological Survey on Alcohol and Related Conditions (NESARC) (31), including the largest number of drinks they drank on one day in the past 3 months (max consumption); and their frequency of drinking 5 or more drinks per day (men) or 4 or more drinks per day (women) in the past 3 months (heavy drinking frequency), on a 9-point scale (never/1 or 2 times/once a month/2–3 times a month/once a week/2 times a week/3–4 times a week/nearly every day/every day). Participants also reported the number of drinks they consumed over a typical week in the last 3 months (drinks per week). They responded to the 3-item Alcohol Use Disorders Identification Test (AUDIT-C) (32); item 3 assessed frequency of 5 or more drinks, consistent with recommendations for adapting the AUDIT to national conventions for alcohol content in standard drinks (33). Higher scores on the AUDIT-C indicate greater likelihood of risky drinking in the past year. Finally, participants completed the 15-item Short Inventory of Problems (SIP-2R) (34,35). Higher scores on the SIP-2R indicate more drinking-related problems in the past 3 months.

Data Analyses

First, we trimmed outliers for count variables (i.e., number of sexual partners, maximum number of drinks in one day, number of drinks in a typical week) to 3 times the interquartile range from the 75^{th} percentile + 1. Second, we conducted analyses to determine whether there were sex differences in the number of sexual partners (regression with negative binomial distribution) and alcohol use (*t* tests for continuous variables, regression with negative binomial distribution for count variables). Third, we conducted bivariate correlations to determine the associations among hypothesized covariates (i.e., depression and drug use) and both the predictors (i.e., alcohol use and sex) and the criterion variable (i.e., number of sexual partners). Finally, we conducted regression analyses to determine (a) whether there was an association between the multiple measures of alcohol use and number of sexual partners in the past 3 months, and (b) whether sex moderated these associations.

We correlated the outcome variable (number of sexual partners) with other demographic variables (age, education, race, employment status); only race and employment were significantly associated with the outcome and so were included as covariates. The distribution of the outcome variable was over-dispersed, so we conducted analyses using a negative binomial distribution. In the first set of regression analyses, we conducted separate regressions with each alcohol use variable and sex as predictors controlling for race, employment status as well as drug use and depression. In the second set of regression analyses, we added interaction terms of interest (i.e., alcohol use x gender, drug use x gender, and depression x gender).

RESULTS

Sex Differences

Table I displays the summary statistics, by sex, for the sexual behavior, alcohol and drug use, and depression variables. Men reported more sexual partners than women (Ms = 2.9 and 2.5, respectively), Wald $\chi^2 = 7.49$, $p < .01$. Frequency of same sex partners was low, and men and women did not differ (7% and 8%, respectively). Also, relative to women, men reported (a) higher maximum number of drinks in one day (6.0 vs. 4.9), Wald $\chi^2 = 9.07$, $p < .01$; (b) more drinks consumed in a typical week (6.1 vs. 4.4), Wald $\chi^2 = 11.96$, $p < .001$; and (c) and higher AUDIT-C scores (4.6 vs. 3.9), $t(449) = -2.76$, $p < .01$. Men and women also differed in PHQ-2 scores, $t(451) = 2.27$, $p < .05$; as predicted, women had higher depression scores than men. Men and women did not differ on frequency of heavy drinking (using the gender-specific criteria described previously), on alcohol-related problem scores, or on the DAST-10.

Bivariate correlations among predictors and criterion are displayed in Table II. Consistent with expectations, the associations between all of the hypothesized predictors and number of partners were significantly positive for women (below the diagonal); for men, however, these associations were non-significant.

Alcohol Use and Number of Partners

Negative binomial regressions were conducted for each alcohol predictor variable, controlling for covariates (i.e., race, employment, DAST score, and depression; see Table III, Model 1a – Model 5a). Number of partners in the past 3 months was associated with male sex in each of the models, consistent with the bivariate analyses. In the multivariate models, number of sexual partners was positively associated with maximum number of drinks in one day, frequency of heavy drinking, average drinks in a typical week, and AUDIT-C scores, but not alcohol-related problems as assessed by the SIP-2R ($p < .09$). In all multivariate analyses, greater drug use was associated with more sexual partners (all ps < . 01), whereas depression was not associated with the number of sexual partners (all ps > . 05).

Sex moderated the association between all measures of alcohol use and number of sexual partners (see Table III, Model 1b – Model 5b). Significant interactions emerged between alcohol use and sex for maximum number of drinks in one day (Wald $\chi^2 = 19.02$, $p < .0001$);

frequency of heavy drinking (Wald $\chi^2 = 7.46$, $p < .01$); average drinks in a typical week (Wald $\chi^2 = 12.27$, $p < .001$); AUDIT-C scores (Wald $\chi^2 = 4.80$, $p < .05$); and alcohol-problems on the SIP-2R (Wald $\chi^2 = 6.35$, $p < .05$). In each case, alcohol involvement was positively related to number of sexual partners for women (all *p*s < .01), but not for men (all *p*s > .05). Drug use x sex and depression x sex interactions were not significant (all *p*s > .05) in any of these models.

DISCUSSION

In this sample of low income, largely minority adults from a community-based STI clinic, increasing alcohol use was associated with more sexual partners for female but not for male patients. Whereas previous observations from similar clinic settings focused on binary indicators of drinking (3,14–16), our findings extend the relation to a wider range of continuous measures of alcohol involvement and consequences. The hypothesized moderating effect of sex generalized across all the alcohol use measures. That is, for women only, the likelihood of having more sexual partners increased as they consumed more drinks per week and more frequently engaged in heavy drinking. Having more sexual partners was also associated with higher quantities consumed on a single occasion and more alcohol-related problems. Thus, greater alcohol involvement across all measured dimensions consistently increased risk behavior for women in this sample.

Stronger associations between alcohol use and risky sex were found for women despite the fact that men drank more than women and reported more sexual partners. However, for men, drinking quantity and frequency were unrelated to the number of partners they reported. In contrast, consuming more alcohol was significantly associated with more sexual partners for women. Thus, an important sex-specific distinction must be made with regard to the presence of a risk factor (alcohol use) and its association with the sexual risk behavior of interest (multiple partners). Thus, in this sample of STI clinic patients who reported drinking some alcohol in the last year, more drinking was associated with a greater number of sexual partners for women but not for men, corroborating similar observations by others (3,14–16). Our finding with number of sexual partners is also consistent with another sexual risk behavior, unprotected sex; for example, with a separate sample, we previously reported that female but not male STI clinic patients were less likely to use condoms when they were drinking before sex with non-primary partners (36). Taken together, such findings strongly suggest that alcohol use by women has a more direct association with sexual risk behavior relative to men.

The multivariate models revealed that both drug use and alcohol use were independent predictors of number of partners. Drug use increases the likelihood of engaging in sexual risk behavior such as multiple partners, sex trading, and unprotected intercourse (24). Given that alcohol and other drug use disorders are often comorbid (23), it is important to control for concurrent (non-alcohol) drug use; our analyses showed that sex moderated the effect of alcohol involvement on number of partners even when controlling for other drug use.

Consistent with prior research (21), depression was significantly correlated with number of partners but was not an independent predictor in the multivariate models after accounting for

substance use. Thus, we did not find evidence for depression as an alternate explanation of the differential effect of alcohol consumption on number of partners. Even though women are more vulnerable to experiencing depression, this vulnerability does not explain the alcohol—risky sex association. Alternative explanations are needed.

The cross-sectional nature of our data precludes causal inferences about the relation between alcohol use and number of sex partners. However, because alcohol use was associated with multiple partners only for women, we consider biological sex differences, cognitive factors, and gendered norms to understand this correlate of drinking. Biologically, women are more susceptible to the physically impairing effects of alcohol (11). Alcohol intoxication may be associated with women having more sex partners via disinhibited decision making. According to the alcohol myopia model, alcohol intoxication results in inattention to distal cues that might inhibit risk behaviors (37); for women, the risk inherent in having multiple partners may be more salient when sober but muted when they are intoxicated. Also, alcohol impairment or incapacitation may differentially affect women via an inability to resist sexual advances and/or aggression (38). Thus, alcohol intoxication may lead to greater skill impairment for women than for men, affecting women's sexual behavior to a greater extent than men's.

Cognitive factors such as expectancies about the effects of alcohol (e.g., that it enhances sexual pleasure) may also explain sex differences (39). Such alcohol-sex expectancies may facilitate disinhibition to a greater extent for women if, relative to men, they experience more conflict about sexuality (40). From a cultural perspective, the sexual "double standard" stigmatizes women for having multiple sexual partners, while commending men for this same practice (41). This double standard may explain why there was a relation between alcohol use and number of partners for women but not for men. That is, for those women who would like to have multiple partners, having an alternate explanation for their sexual behavior may prompt greater alcohol use; drinking allows them to attribute multiple partners to alcohol use rather than to personal desires. In contrast, men do not need an excuse to have multiple partners because this behavior is not stigmatized for them.

Because the number of sexual partners is positively associated with risk of STI infection (9), our findings have implications for HIV/STI prevention. Risk reduction interventions for women should address the role of alcohol and other drugs in contribution to sexual risk. Drawing connections between intoxication and the contexts in which substances are used may help women to reduce their risk, especially related to multiple partners. Our findings also suggest that targeting alcohol risk reduction for women in STI clinic settings has the potential to reduce number of sexual partners – an important determinant of STI transmission.

Strengths of this study include a large sample of men and women who are at high risk for both STIs and alcohol misuse. All assessments were conducted using ACASI, which optimizes accurate reporting of socially sensitive behavior (42,43). We also assessed multiple dimensions of alcohol use and consequences, with "cross validation" across the different measures. This pattern of findings provides evidence that there is not a threshold of alcohol involvement that serves as a predictor of risk (e.g., heavy episodic drinking or

alcohol use disorder); instead, the findings suggest that a harm reduction approach at all use levels warrants consideration.

Limitations of this study include, first, the use of a cross-sectional design. Future research might use event-level measurement and prospective designs to document differential effects of sex on sexual risk taking (44). Second, our data are subject to the limitations of self-report (45). Third, we used a brief measure of depression; this was practical given the public health context, and the measure used has strong predictive and construct validity (29) but replication with more robust measures of depression will enhance confidence in our findings. Fourth, the characteristics of our sample – predominantly African-Americans who reported alcohol use and risky sexual behavior – may limit the generalizability of our findings. Finally, we did not include measures of sex trading, which might moderate the alcohol-multiple partner association among women.

In summary, this study adds to a small but growing body of research that documents associations between alcohol use and problems, and number of sexual partners among women but not men. This relationship holds even when controlling for concurrent risk factors such as depression and drug use, thus justifying a focus on alcohol use reduction for women as one component of a comprehensive STI prevention strategy.

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Table I

Sexual behavior, alcohol use, drug use, and depression variables, past three months

	Males		Females		
Variable (range)	***M***	***SD***	***M***	***SD***	***P***
Number of sexual partners (count)	2.9	1.8	2.5	1.8	<.01
Maximum number of drinks in one day (count)	6.0	4.5	4.9	3.8	<.01
Heavy drinking frequency (count)	2.0	2.1	1.9	2.0	ns.
Drinks typical week (count)	6.1	6.7	4.4	4.7	<.001
AUDIT-C (0–12)	4.6	2.7	3.9	2.4	<.01
SIP-2R (0–45)	4.9	7.8	3.7	6.6	ns.
DAST-10 (0–10)	1.4	2.2	1.2	2.3	ns.
PHQ-2 (0–6)	0.8	0.8	0.9	0.9	<.05

Note. AUDIT-C = 3-item short form of the Alcohol Use Disorder Identification Test. SIP-2R = Short Inventory of Problems. DAST-10 = 10-item version of the Drug Abuse Screening Test. PHQ-2 = Patient Health Questionnaire 2-item depression screen.

Table II

Correlations between number of partners and alcohol use, drug use, depression, by sex

	Number of sexual partners	Maximum drinks/day	Heavy drinking frequency	Drinks per typical week	AUDIT-C	SIP-2R
Number of sexual partners	1.0	−.01	.06	.03	.05	.05
Maximum drinks/day	.41***	1.0	.57***	.60***	.66***	.37***
Heavy drinking frequency	.27***	.45***	1.0	.54***	.65***	.39***
Drinks per typical week	.33***	.40***	.54***	1.0	.63***	.38***
AUDIT-C	.24***	.53***	.61***	.62***	1.0	.46***
SIP-2R	.37***	.42***	.31***	.38***	.44***	1.0
DAST-10	.31***	.18*	.06	.20**	.17*	.46***
PHQ-2	.18**	.18*	.97	.05	.03	.31***

Note: Correlations for men are above the diagonal; correlations for women are below the diagonal. AUDIT-C = 3-item short form of the Alcohol Use Disorder Identification Test. SIP-2R = Short Inventory of Problems. DAST-10 = 10-item version of the Drug Abuse Screening Test. PHQ-2 = Patient Health Questionnaire 2-item depression screen.

* $p < .05$;

** $p < .01$;

*** $p < .001$

Table III

Negative binomial regression results predicting number of partners from alcohol use

	Wald χ^2	estimate (95% CI)
Predictor: Maximum drinks/day		
Model 1a		
Sex	5.49	−0.15* (−0.28, −0.02)
Maximum drinks/day	4.71	0.02* (0.002, 0.03)
Model 1b		
Sex	23.60	−0.56*** (−0.79, −0.33)
Maximum drinks/day	0.81	−0.01 (−0.03, 0.01)
Sex x Maximum drinks/day	19.02	0.06*** (0.03, 0.09)
Predictor: heavy drinking frequency		
Model 2a		
Sex	7.03	−0.17** (−0.29, −0.04)
Heavy drinking frequency	6.26	0.04* (0.01, 0.07)
Model 2b		
Sex	17.23	−0.46*** (−0.68, −0.25)
Heavy drinking frequency	0.11	0.01 (−0.03, 0.04)
Sex x Heavy drinking frequency	7.46	0.08** (0.02, 0.14)
Predictor: Drinks per typical week		
Model 3a		
Sex	7.06	−0.16** (−0.29, −0.04)
Drinks per typical week	5.57	0.01* (0.002, 0.02)
Model 3b		
Sex	19.21	−0.46*** (−0.67, −0.26)
Drinks per typical week	0.01	0.00 (−0.01, 0.01)
Sex x Drinks per typical week	12.27	0.04*** (0.02, 0.06)
Predictor: AUDIT-C		
Model 4a		
Sex	6.89	−0.16** (−0.28, −0.04)
AUDIT-C	4.80	0.03* (0.003, 0.05)
Model 4b		
Sex	13.70	−0.49*** (−0.76, −0.23)
AUDIT-C	0.19	0.01 (−0.02, 0.04)
Sex x AUDIT-C	4.80	0.05* (0.01, 0.10)
Predictor: SIP-2R		
Model 5a		
Sex	6.51	−0.16* (−0.28, −0.04)
SIP-2R	3.01	0.01 (−0.001, 0.02)

	Wald χ^2	estimate (95% CI)
Model 5b		
Sex	10.55	−0.31** (−0.50, −0.12)
SIP-2R	0.07	0.00 (−0.01, 0.01)
Sex x SIP-2R	6.35	0.02* (0.005, 0.04)

Note. AUDIT-C = 3-item short form of the Alcohol Use Disorder Identification Test. SIP-2R = Short Inventory of Problems. DAST-10 = 10-item version of the Drug Abuse Screening Test. All analyses controlled for race, employment status, sex, drug use, and depression; drug use x sex and depression x sex interaction terms were included in interaction models (Model 1b–Model 5b)

* $p < .05$;

** $p < .01$;

*** $p < .001$.