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## HIV-risk behaviors and social support among men and women attending alcohol-serving venues in South Africa: Implications for HIV prevention

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### Abstract

**Background**—Alcohol use is associated with increased HIV-risk behaviors, including unprotected sex and number of sex partners. Alcohol-serving venues can be places to engage in HIV-related sexual risk behaviors, but are also important sites of social support for patrons, which may mitigate risks. We sought to examine the relationship between alcohol-serving venue attendance, social support, and HIV-related sexual risk behavior, by gender, in South Africa.

**Methods**—Adult patrons (n=496) were recruited from six alcohol-serving venues and completed surveys assessing frequency of venue attendance, venue-based social support, and recent sexual behaviors. Generalized estimating equations tested associations between daily venue attendance, social support, and sexual behaviors, separately by gender. Interaction effects between daily attendance and social support were assessed. Models were adjusted for venue, age, education, and ethnicity.

**Results**—Daily attendance at venues was similar across genders and was associated with HIV-related risk behaviors, but the strength and direction of associations differed by gender. Among women, daily attendance was associated with greater number of partners and higher proportion of unprotected sex. Social support was a significant moderator, with more support decreasing the

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**Conflicts of Interest:** The authors declare that they have no conflicts of interest.

COMPLIANCE WITH ETHICAL STANDARDS

**Research involving human participants and/or animals:** All procedures performed were in accordance with the ethical standards of the University of Connecticut, Stellenbosch University, and Duke University institutional review boards, national research ethics committees for the study sites, and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed consent:** Informed consent was obtained from all individual participants included in the study.

strength of the relationship between attendance and risk. Among men, daily attendance was associated with a lower proportion of unprotected sex; no interaction effects were found for attendance and social support.

**Discussion**—Frequent venue attendance is associated with additional HIV-related risks for women, but this risk is mitigated by social support in venues. These results were not seen for men. Successful HIV interventions in alcohol-serving venues should address the gendered context of social support and sexual risk behavior.

### Keywords

HIV risk; Social support; Alcohol drinking; Gender; South Africa

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## INTRODUCTION

Household surveys in South Africa estimate that 18% of the adult population (6.7 million individuals) are infected with HIV, and an additional 370,000 people are diagnosed with new HIV infections annually (1,2). South Africa also has one of the highest levels of average alcohol consumption per adult when compared to other African countries (3). Among South Africans who report alcohol use, one-third meet criteria as hazardous or harmful alcohol users, a level of drinking significantly associated with increased HIV-risk behaviors and HIV transmission (4-6).

High rates of alcohol consumption in South Africa may be related to both the contentious history of alcohol use in the country and the types of venues where individuals typically drink (7). Historically, alcohol was exchanged for labor from local populations, which likely normalized a culture of heavy drinking (8-10). Government-regulated taverns can be found throughout Cape Town, in addition to informal alcohol outlets (“shebeens”), which sprang up in the 20<sup>th</sup> century in protest of apartheid policies (7-10). These alcohol-serving venues (both formal taverns and shebeens) have been gathering places for communal drinking and socialization (11), and today they remain popular places for individuals in low-income communities to drink, socialize, and meet sex partners (12,13).

Attendance at alcohol-serving venues has been associated with higher levels of HIV-related sexual risk behaviors. Not surprisingly, South African men and women who regularly frequent venues report greater quantity and frequency of alcohol use than those who do not patronize these venues (12,13). Heavy drinking at venues may increase risky sexual behaviors and HIV transmission due to cognitive impacts of heavy alcohol use (i.e. reduced inhibitions), patrons meeting new, high-risk sex partners in these venues, or engagement in transactional sex to support drinking behavior (14-19). Alcohol use has also been linked with use of other substances (i.e. cannabis, methamphetamine), which are additional risk factors for increased sexual risk behaviors among venue patrons (20,21). Individuals who meet sex partners at venues have a higher risk of HIV acquisition than patrons who meet sex partners elsewhere (22). Venue attendance has been associated with increased risk of perpetrating or experiencing physical and sexual violence, greater number of sex partners, and higher rates of unprotected vaginal intercourse (13,23,24).

While alcohol-serving venues have been studied as sites of HIV-related sexual risk behaviors, they are also important sites of social support among patrons, which may help to mitigate these risks. Although women are vulnerable to physical and sexual violence in alcohol-serving venues, some report feeling more empowered and safer in the venues than at home (24). Both men and women report visiting venues in order to bond with their peers and relax (18,25), and women may frequent the venues to escape stressors of their home lives (25-27). The potential for safety, support, and community among venue patrons could serve an important protective role for patrons (24). Social support and community cohesion have been linked to reduced alcohol use and victimization (28), and increased resilience and adaptive coping mechanisms among persons living with HIV (29). However, there is limited evidence on whether social support may reduce risky sexual behaviors (i.e., number of sex partners, frequency of unprotected sex) among a more general population. Furthermore, it is not known whether experiencing social support specifically within the alcohol-serving venue environment may reduce HIV-related risk behaviors in this otherwise high-risk context.

The purpose of this study was to: 1) describe the demographic characteristics of patrons who attend alcohol-serving venues almost daily (“venue regulars”); 2) test associations between frequency of venue attendance and sexual risk and substance use behaviors; 3) test the associations between venue-specific social support and sexual risk and substance use behaviors; and 4) examine the interaction between venue attendance and venue-specific social support on predicting both sexual risk and substance use behaviors. We hypothesized that frequent venue attendance would be associated with both increased sexual risk behaviors and social support, and that relationships between venue attendance and sexual risk behaviors would be mitigated by social support for men and women.

## METHODS

### Setting

This study was conducted in the peri-urban township of Delft, located 15 miles outside of Cape Town, South Africa. Delft, like other South African townships, was established to segregate non-white residents during the apartheid era and now consists of Coloured (a term originating from the apartheid era and referring to people of mixed African, European, and/or Asian ancestry) and Black Africans. According to the 2011 census, about 152,000 people live in Delft and the township has high levels of poverty and unemployment, with 70% of households reporting a monthly income equal to or less than 3,200 rand (approximately 300 USD) (30). A large proportion of adult residents (41%) are unemployed, and less than 30% have completed secondary school (the South African equivalent of US-based high school education) (30).

Study participants were recruited from six alcohol-serving venues in Delft. These venues were selected using the Priorities for Local AIDS Control Efforts (PLACE) methodology (31). The study team approached 210 community members at public places (e.g., bus stands, markets) and asked them to identify places where people drink alcohol. Venues were eligible if they had space for patrons to sit, offered in-house alcohol consumption (no take-away option), were willing to have the research team visit over the course of one year (based on brief interviews with venue staff), and reported >50 unique patrons per week, of whom at

least 10% were female to ensure adequate sample size and diverse patron representation for this study. A total of 88 venues were identified using the PLACE method and sites included both “shebeens” (small unlicensed venues) and “taverns” (larger licensed venues). Of these 88 venues, 24 were eligible and 6 were selected that had a mix of geographic locations throughout Delft, size, and patron ethnicity (approximately half served predominantly Coloured patrons and half served predominantly Black patrons).

## Procedures

Fieldwork teams (South Africans matched by language and ethnicity to the venues) conducted ethnographic and behavioral observations of the six venues prior to participant recruitment. They visited each site for at least four hours per day during a one-week period. These site visits also established familiarity between the study team and the venue settings.

After the observational period, the fieldwork teams returned to the sites to recruit patrons for cross-sectional surveys. Surveys were conducted during four different time periods over about one year. The data presented here represents data collected from the third time period (October 2011-February 2012) because measures of social support were only included in this period. All male and female venue patrons who were at least 18 years of age and not intoxicated during recruitment and survey administration were eligible for study participation. Interviewers assessed intoxication via informal conversations and participant observations. Patrons were approached immediately upon entering the venue and, after providing oral consent, were given the option of completing a survey in Xhosa, Afrikaans, or English. A total of 852 patrons were approached and 789 agreed to participate (93% response rate). Most surveys (94%) were self-administered (the remainder were interviewer-administered, as participants were given a choice between self-administering the survey or having it read to them). The survey included 127 questions and took 10-15 minutes to complete. Data collectors were matched by ethnicity and language to the venues. All procedures were approved by ethical review boards of the University of Connecticut, Stellenbosch University, and Duke University.

## Measures

The English version of the survey was translated and back-translated into Xhosa and Afrikaans.

**Demographics**—Participants were asked to report their age, gender, education, ethnicity, marital status, and socio-economic status (i.e., employment, electricity in their homes).

**Venue attendance**—Venue attendance was assessed with a single question: “About how often do you come to this bar?” Responses ranged from 1= “this is my first time” to 5= “almost daily”. This variable was dichotomized to “less than daily attendance” (which included responses 1-4 on the original question) and “almost daily attendance” (which included response 5 on the original question) for this analysis, which improved interpretability of our results.

**Venue-specific social support**—A 15-item social support scale was modified from the 40-item Social Support Behaviors Scale to include fewer items and specifically measure venue-based social support received from other venue patrons (32). All participants were asked to report the degree to which they could rely on other patrons for specific forms of support, including emotional support (i.e., “People in this bar would comfort me when I’m upset”) and instrumental support (i.e., “People in this bar would lend me money, say R50, for an indefinite period”). Response choices ranged from 1= “No one would do this” to 4= “Most would do this”. A mean score was calculated (higher scores indicated greater venue-specific social support) and was centered around the sample mean to reduce multicollinearity in the analyses testing interaction effects ( $\alpha=0.96$ ).

**Alcohol use**—Participants completed the AUDIT-C, the first three questions from the Alcohol Use Disorders Identification Test (AUDIT) (33). These questions assessed frequency of drinking, typical quantity of alcohol consumed, and frequency of binge drinking and have been previously used in this setting. Responses to each of these questions ranged from 0-4 and were summed to classify participants as either hazardous or non-hazardous drinkers. Consistent with the scoring instructions (33,34), men with a total score of 4 or more and women with a score of 3 or more were classified as hazardous drinkers, provided that their points were not all from the question assessing drinking frequency. Participants were also asked a separate dichotomous question of whether or not they were currently at the venue to drink.

**Drug use**—Participants reported how often in the past four months they had used marijuana (“dagga”), methamphetamine (“tik”), inhalants (e.g., glue, petrol), and injection drugs. Responses ranged from 1=“Never” to 4=“Daily”. Participants who reported yes on any of the items were categorized as using drugs.

**Sexual risk behavior**—Participants were asked about their sexual risk behavior specific to the venue, as well as behaviors not specific to the venue. Four separate dichotomous questions assessed whether they were currently at the venue to meet a sex partner, if they ever met a sex partner at this venue, if they ever had sex on the venue premises, and if they had ever bought or sold sex (i.e., engaged in transactional sex). Each of these questions was analyzed as a separate outcome describing venue-related sexual risk behaviors. Participants were also asked to report sexual risk behavior in the past four months, specifically: number of sex partners, number of protected sex acts (vaginal and anal), and number of unprotected sex acts (vaginal and anal). A new variable, “proportion of unprotected sex acts,” was created by dividing the number of unprotected sex acts by the total number of sex acts. The two variables, number of sex partners and proportion of unprotected sex acts, were considered separate outcomes in models describing broader HIV risk behaviors.

## Analyses

We first conducted descriptive analyses of demographics, venue-specific social support, substance use, and sexual risk behaviors. Chi-square analyses and two-sample t-tests with unequal variances were conducted to assess differences in the distribution of these variables

by gender and venue attendance (comparing almost daily attendance with less than daily attendance).

Generalized estimating equations were used to estimate regression coefficients for each of our different substance use and sexual risk behavior outcomes by two predictors, venue attendance and venue-specific social support. Models were specified in PROC GENMOD (SAS 9.4), with the repeated subject statement to adjust for venue-level clustering and estimate robust standard errors. Models to assess the risk of substance use, venue-related sexual risk behaviors, and the proportion of unprotected sex acts were fit using a logit link function and a binomial distribution, which approximates logistic regression. A Poisson distribution was used to model number of sex partners. We calculated Bonferroni corrected p-values to adjust for multiple comparisons in our models. We considered three separate families of tests for this adjustment: venue-related sexual risk behaviors (four variables), substance use behaviors (four variables), and broader HIV risk behaviors (two variables). Models were adjusted for covariates identified *a priori* to be related to our exposures and outcomes of interest, including ethnicity, education, and age. We also considered several additional variables for potential confounding, including relationship status and indicators of socio-economic status; however, none of these substantially (>10%) changed effect estimates and therefore they were not included in the adjusted models. Finally, we assessed the presence of effect modification between venue attendance and venue-specific social support, by fitting models for the proportion of unprotected sex acts and the number of sex partners with interaction terms.

## RESULTS

### Descriptive results

A total of 789 participants completed cross-sectional surveys at six different alcohol-serving venues from October 2011-February 2012. This analysis is restricted to the subset of 496 participants who had not previously completed the cross-sectional survey to reduce response bias related to repeated administration of sexual behavior and substance use questions from the two prior data collection periods. This restriction also ensures that participants did not complete the same survey multiple times in the third data collection period. Participants were between 18 and 76 years old (mean = 31.5, SD = 10.1), 57% were male, and almost two-thirds were unmarried. Half of the sample reported less than high school education (52%), no employment (50%), and Black ethnicity (50%). Almost a fifth of the sample (15%) reported daily attendance at the venue. There were no significant differences in demographic information, including gender distribution, age, education, ethnicity, employment, and relationship status, between daily and non-daily venue attenders (Table 1).

Overall, 24% of the sample reported meeting new sex partners at the venue and this was more commonly reported for men than women (31% of men versus 16% of women). A greater proportion of men also said that they were currently at the venue to find a sex partner compared with women (21% of men versus 8% of women). There were no significant gender differences in transactional sex engagement or ever having sex on the venue premises. Men had a mean of 3.3 sex partners in the past four months (SD = 11.8), while women had a mean of 1.2 partners (SD = 1.7). About half of all sex acts were unprotected

for both men and women (mean proportion of unprotected sex acts was 0.5 for men and 0.6 for women).

Reported levels of venue-specific social support differed by frequency of venue attendance among females but not among males. Among female participants, venue-specific social support was significantly greater for those who attended the venue daily (mean = 2.7, SD = 0.8) than for those who were less frequent attenders (mean = 2.2, SD = 0.9;  $t = -3.3$ ,  $p = 0.002$ ). Venue-specific social support was not related to frequency of venue attendance among men (mean for daily attenders = 2.4, mean for less frequent attenders = 2.2;  $t = -1.4$ ,  $p = 0.154$ ).

### Factors associated with substance use and venue-specific HIV risk behaviors

Venue attendance was significantly associated with venue-specific sexual risk and substance use behavior outcomes after adjusting for ethnicity, education, and age; however, the strengths of these associations differed by gender (Table 2). Both women and men who attended the venue daily were more likely to report meeting a new sex partner at the venue ( $aOR_{women} = 4.5$ , 95%  $CI_{women} = 2.7-7.6$ ;  $aOR_{men} = 2.1$ , 95%  $CI_{men} = 1.1, 4.1$ ) and engaging in transactional sex ( $aOR_{women} = 2.7$ , 95%  $CI_{women} = 1.2-5.9$ ;  $aOR_{men} = 2.2$ , 95%  $CI_{men} = 1.1-4.6$ ), compared with those who did not attend the venue daily. In addition, women who attended the venue daily were more likely to report weekly or more binge drinking ( $aOR_{women} = 2.7$ , 95%  $CI_{women} = 1.6-4.6$ ), being currently at the venue to drink ( $aOR_{women} = 5.0$ , 95%  $CI_{women} = 2.0-12.4$ ), and using any drugs in the last four months ( $aOR_{women} = 2.9$ , 95%  $CI_{women} = 1.6-5.0$ ), compared with those who attended less than daily. Men who attended the venue daily were also more likely to report weekly or more binge drinking ( $aOR_{men} = 1.6$ , 95%  $CI_{men} = 1.1, 2.5$ ) and being currently at the venue to drink ( $aOR_{men} = 3.1$ , 95%  $CI_{men} = 1.3, 7.5$ ), as well as hazardous alcohol use ( $aOR_{men} = 2.0$ , 95%  $CI_{men} = 1.3, 3.3$ ).

Venue-specific social support was related to several sexual risk behaviors at the venues only for women, after adjusting for ethnicity, education, and age (Table 3). Among women, higher venue-specific social support was associated with less likelihood of being at the venue to find a sex partner ( $aOR_{women} = 0.6$ , 95%  $CI_{women} = 0.4, 0.8$ ) and less likelihood of ever having had sex on the venue premises ( $aOR_{women} = 0.4$ , 95%  $CI_{women} = 0.2, 0.7$ ). Venue-specific social support was not associated with substance use behavior in this sample.

### Factors associated with broader HIV risk behaviors

Daily attendance at alcohol-serving venues and venue-specific social support also had significant effects on sexual risk behaviors outside of the venue context, but only for women (Table 4). For women, the main effect of daily venue attendance on number of sex partners was significant, with those who attend venues daily having a greater number of sex partners than those who did not attend daily ( $aRR_{women} = 1.1$ ,  $p = 0.04$ ). Daily attendance was not significantly associated with a higher proportion of unprotected sex acts in women. Venue-specific social support was significantly associated with a lower proportion of unprotected sex acts ( $aOR_{women} = 0.8$ ,  $p = 0.04$ ), but was not significantly associated with number of partners. Finally, we found significant interaction effects between daily venue attendance

and venue-specific social support for women. Venue-specific social support moderated associations between daily attendance and number of partners ( $aRR_{\text{women}} = 0.7$ ,  $p=0.02$ ) and proportion of unprotected sex acts ( $aOR_{\text{women}} = 0.5$ ,  $p=0.04$ ), such that higher levels of social support buffered the positive associations between daily attendance and these sex behavior outcomes.

For men, daily attendance was not significantly related to number of sex partners, and higher levels of venue-specific social support resulted in an increased number of partners ( $aRR_{\text{men}} = 1.4$ ,  $p < 0.001$ ). Daily attendance and venue-specific social support were each associated with a lower proportion of unprotected sex acts ( $aOR_{\text{men}} = 0.3$ ,  $p = 0.002$  for daily attendance and  $aOR_{\text{men}} = 0.7$ ,  $p = 0.002$  for social support). There were no significant interaction effects between daily attendance and venue-specific social support on either of the two HIV-related sexual risk behavior outcomes.

## Discussion

Women bear a disproportionate burden of HIV in South Africa (35), and those who regularly attend alcohol-serving venues may be particularly vulnerable to acquiring HIV. The findings presented in this study indicate that women's frequent attendance at alcohol-serving venues is associated with greater likelihood of HIV sexual risk behaviors, but that venue-specific social support may mitigate these risks for women. The associations between daily alcohol-serving venue attendance and sexual risk behaviors are consistent with other research conducted among women in South Africa (13). The data presented here also support prior qualitative work, which has illustrated that alcohol-serving venues are important sites for social support for women in this setting (24), and demonstrate that this venue-specific social support may be capable of counteracting HIV risk associated with venue attendance. For men, daily attendance at a venue was associated with mixed results for HIV risk behaviors, and we did not find evidence of an interaction between attendance and social support on HIV risk behavior outcomes. Importantly, these data suggest that women and men experience frequent attendance at alcohol-serving venues differently, which has implications for future HIV prevention interventions in these settings.

This analysis is unique in demonstrating the gendered effects of venue-specific social support in buffering the association between daily alcohol-serving venue attendance and HIV-related sexual risk behaviors for women. The hazardous drinking that occurs in alcohol-serving venues may increase women's vulnerability to sexual objectification, and female venue patrons may experience stigma because alcohol-serving venues are traditionally seen as "masculine establishments" (24,36,37). Women who choose to attend venues may be different from the broader population of women in South Africa with regard to their alcohol use, sexual risk behaviors, and their social support outside of the venues. For some women, alcohol-serving venues may be places to socialize with friends, escape the stressors of their homes, and feel empowered and protected by their community (24,25). In qualitative research, female venue patrons reported working together to procure alcohol and monetary support from male patrons while also trying to protect one another from sexual victimization (19), which could help to explain why venue-specific social support mitigated the associations between daily venue attendance and sexual risk behaviors among women in this



sample. It is also possible that women who had higher levels of venue-specific social support were attending venues closer to their homes, which provided both protection and accountability to social norms. Prior work has shown that women who attended venues farther from their homes had higher rates of sexual risk behaviors, which may have been driven by low social support and a sense of anonymity at these distant venues (38).

For men, daily venue attendance was associated with more sex partners, but higher rates of protected sex. Although on the surface paradoxical, these results are likely explained by a greater number of casual partners among men and higher likelihood of using condoms with casual, as opposed to regular, partners (39,40). Venue-specific social support was not shown to reduce HIV-related sexual risk behaviors among men in this setting. Because venues are traditionally male-dominated spaces, support from other venue patrons may instead promote traditional gender norms around masculinity (36,37). Prior research conducted in South Africa has demonstrated that inequitable gender attitudes are associated with risky sexual behaviors as a mechanism for men to exert dominance and control over women (41,42,43). Male venue patrons may encourage one another to have multiple sex partners and purchase alcohol for female patrons in exchange for sex (19,36,37). Masculinity and venue attendance is also more likely to be associated with hazardous and harmful alcohol use among men, which can lead to high-risk sexual behaviors; venue-specific social support may be insubstantial in mitigating this association between alcohol use and sexual risk (12). While this analysis provides interesting insights on potential associations between venue-specific social support and HIV risk among men, these results should be cautiously interpreted until future research is done to support and elucidate the mechanism by which venue-specific social support may promote risky sexual behaviors.

This paper has several limitations that should be considered when interpreting the findings. First, the cross-sectional design of this study limits conclusions about temporality or causality of the examined associations. Second, sexual risk behaviors and alcohol consumption information were self-reported, and may be influenced by social desirability bias in the participants' responses. Third, intoxication at survey administration was not formally assessed and the potential inclusion of intoxicated individuals in our sample could have also resulted in data misreporting. Fourth, although the study included a large sample from six different alcohol-serving venues, the data were collected from a single township in Cape Town, which could limit the generalizability of these findings to the larger South African population. Fifth, venue attendance was not measured on a continuous scale (e.g., number of days at the venue in the past month) for this study. We reduced the five-category venue attendance variable to a binary variable, which improved interpretability of the results but may have reduced power. Sixth, there were significant differences in gender composition by venue (about half of the venues had predominantly female patrons and half had predominantly male patrons) and we did not have enough power to detect effect modification by venue. Finally, social support outside of the venue context was not measured, and it is possible that this type of support may have influenced venue-specific social support as well as venue attendance and HIV-related risk behaviors. We also did not examine the specific influence of different types of social support (i.e. emotional, instrumental) on sexual risk behaviors. Despite these limitations, this analysis will help to inform longitudinal studies seeking to answer research questions regarding alcohol-serving

venue attendance, social support, and HIV risk. It also provides public health professionals with additional evidence of the gendered impact of social support in high-risk settings, assisting with HIV prevention intervention development in these contexts.

These findings highlight several key opportunities for future HIV prevention interventions within the context of alcohol-serving venues. At the individual level, interventions should focus on reducing harmful and hazardous alcohol use and risky sexual behaviors (including unprotected sex, number of sex partners, and sex partners met at the alcohol-serving venue) among frequent alcohol-serving venue patrons. These interventions have already demonstrated some success in South Africa, although structural-level interventions with community stakeholders and venue owners may be necessary for individuals with severe alcohol dependence, who may have difficulty changing their behaviors without a more integrated approach (44,45). Given the high levels of hazardous alcohol use in South Africa, multi-level interventions may be necessary to address social norms around alcohol use, gender equality, and sexual risk behaviors differently for men and women (45). Among female alcohol-serving venue patrons, such programs can harness social support networks through peer-led and group-based sessions; however, among men these interventions may need to have a greater emphasis on addressing cultural norms of masculinity and gender inequality in order to more effectively reduce risky sexual behaviors.

In conclusion, this study has demonstrated novel insights into the relationships between frequent alcohol-serving venue attendance and HIV-related sexual risk behaviors in South Africa. It has also demonstrated how these relationships are moderated by venue-specific social support, separately by gender. While both men and women who attend the venues regularly are more likely to engage in risky sexual behaviors, venue-specific social support may help to mitigate this risk for women in particular. Further research is needed to understand the mechanism by which venue-specific social support may influence risky sexual behavior in the context of alcohol-serving venues. HIV prevention interventions should capitalize on these findings to more effectively curb the HIV epidemic in South Africa.

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**Table I**

Description of the sample, by frequency of attendance (n=496)

	Less than daily attendance (n=421)	Daily attendance (n=75)	p-value
Age, years	31.3 (10.0)	32.2 (10.5)	0.46
Gender			0.55
Women	181 (43%)	35 (47%)	
Men	240 (57%)	40 (53%)	
Education			0.43
Grade 11 or less	215 (51%)	42 (56%)	
Grade 12 or more	206 (49%)	33 (44%)	
Ethnicity			0.66
Black	212 (51%)	36 (48%)	
Coloured	206 (49%)	39 (52%)	
Relationship status			0.49
Married/cohabitating	152 (36%)	24 (32%)	
Unmarried	269 (64%)	51 (68%)	
Employment			
Yes	212 (50%)	36 (48%)	0.71
No	209 (50%)	39 (52%)	
Electricity in home			
Yes	391 (93%)	69 (92%)	0.73
No	29 (7%)	6 (8%)	
Water source in home			
Yes	371 (89%)	65 (87%)	0.64
No	48 (12%)	10 (13%)	

Data are presented as mean (standard deviation) for age and as n(%) for all other variables

Daily venue attendance as a predictor of sexual behavior and substance use outcomes, by gender

**Table II**

Outcomes <sup>1</sup>	Women (n=216)			Men (n=280)		
	Daily Attendance n=35 n (%)	< Daily Attendance n=181 n (%)	AOR <sup>2</sup> [95% CI]	Daily Attendance n=40 n (%)	< Daily Attendance n=240 n (%)	AOR <sup>2</sup> [95% CI]
<i>Venue-related sexual behavior</i>						
Met new sex partner at venue	10 (29%)	24 (13%)	<b>2.7</b> [1.5, 4.8]	18 (45%)	69 (29%)	<b>2.1</b> [1.1, 4.1]
Currently at venue to find sex partner	3 (9%)	14 (8%)	1.4 [0.5, 4.3]	9 (23%)	50 (21%)	1.1 [0.7, 1.7]
Engaged in transactional sex (bought or sold)	7 (20%)	16 (9%)	<b>2.7</b> [1.3, 5.3]	10 (25%)	29 (12%)	<b>2.2</b> [1.1, 4.6]
Ever had sex on the premises	2 (6%)	10 (6%)	0.7 [0.2, 2.7]	5 (13%)	15 (6%)	2.1 [0.8, 5.8]
<i>Substance use behaviors</i>						
Weekly or more bingeing	19 (54%)	54 (30%)	<b>2.7</b> [1.5, 4.8]	22 (55%)	100 (42%)	<b>1.6</b> [1.1, 2.4]
Hazardous alcohol use	32 (91%)	149 (83%)	2.5 [0.9, 7.3]	36 (92%)	196 (83%)	<b>3.1</b> [1.4, 7.4]
Currently at venue to drink	31 (89%)	118 (65%)	<b>4.3</b> [2.0, 9.5]	36 (90%)	203 (85%)	<b>2.0</b> [1.3, 3.1]
Any drug use (last 4 months)	10 (29%)	26 (14%)	<b>2.2</b> [1.3, 3.9]	10 (25%)	82 (34%)	0.6 [0.3, 1.4]

Reference category for all models was less than daily venue attendance.

OR= Odds Ratio; AOR= Adjusted Odds Ratio; 95% CI= 95% Confidence Interval

<sup>1</sup>Each venue-related sexual behavior and substance use behavior variable was considered as an outcome in its own regression model. We estimated regression coefficients for each model using generalized estimating equations (PROC GENMOD), with the repeated subject statement to adjust for venue-level clustering and estimate robust standard errors.

<sup>2</sup>Each model adjusted for ethnicity, education, and age.

**Table III**

Associations between venue-specific social support and venue-related HIV risk behavior outcomes, by gender

Outcome <sup>1</sup>	Women (n=216)			Men (n=280)		
	Social support M (SD) <sup>2</sup>	OR [95% CI]	AOR <sup>3</sup> [95% CI]	Social support M (SD) <sup>2</sup>	OR [95% CI]	AOR <sup>3</sup> [95% CI]
<i>Venue-related sexual risk behavior</i>						
Met new sex partner at venue	2.3 (0.9)	1.0 [0.6, 1.8]	1.1 [0.7, 1.8]	2.0 (0.8)	0.8 [0.7, 1.0]	0.8 [0.7, 1.0]
Currently at venue to find sex partner	1.9 (0.7)	<b>0.6 [0.5, 0.7]</b>	<b>0.6 [0.4, 0.8]</b>	2.2 (0.8)	0.9 [0.8, 1.1]	0.9 [0.8, 1.1]
Engaged in transactional sex (bought or sold)	2.2 (0.6)	0.9 [0.7, 1.3]	1.0 [0.7, 1.2]	2.3 (0.7)	1.0 [0.8, 1.2]	1.0 [0.8, 1.2]
Ever had sex on the premises	1.9 (0.5)	<b>0.4 [0.3, 0.6]</b>	<b>0.4 [0.2, 0.7]</b>	2.3 (1.0)	1.1 [0.6, 2.1]	1.4 [0.6, 3.2]
<i>Substance use related risk behaviors</i>						
Weekly or more bingeing	2.3 (0.9)	1.0 [0.9, 1.2]	1.0 [0.8, 1.2]	2.3 (0.9)	1.1 [0.9, 1.2]	1.1 [0.8, 1.4]
Hazardous alcohol use	2.3 (0.9)	1.1 [0.9, 1.5]	1.1 [0.8, 1.5]	2.2 (0.9)	1.2 [0.9, 1.6]	1.2 [0.9, 1.7]
Currently at venue to drink	2.3 (0.9)	1.0 [0.6, 1.6]	1.0 [0.6, 1.7]	2.2 (0.9)	0.8 [0.6, 1.2]	0.9 [0.6, 1.3]
Drug use (last 4 months)	2.4 (0.9)	1.2 [0.9, 1.6]	1.2 [0.8, 1.9]	2.2 (0.8)	0.9 [0.7, 1.2]	0.7 [0.5, 1.1]

M= Mean; SD= Standard Deviation; OR= Odds Ratio; AOR= Adjusted Odds Ratio; 95% CI= 95% Confidence Interval

<sup>1</sup> Each venue-related sexual behavior and substance use behavior variable was considered as an outcome in its own regression model. We estimated regression coefficients for each model using generalized estimating equations (PROC GENMOD), with the repeated subject statement to adjust for venue-level clustering and estimate robust standard errors.

<sup>2</sup> This column shows the mean social support values (and their standard deviations) for groups defined by their given venue-related sexual risk or substance use behavior.

<sup>3</sup> Each model adjusted for ethnicity, education, and age.



**Table IV**

Daily venue attendance and social support as predictors of two sexual behavior outcomes, by gender

	<u>Women (n=216)</u>		<u>Men (n=280)</u>	
	Parameter (SE)	Bonferroni adjusted p-value	Parameter (SE)	Bonferroni adjusted p-value
<b>Outcome 1: Number of Partners<sup>1</sup></b>				
Daily Attendance	<b>1.1 (0.1)</b>	<b>.04</b>	0.8 (0.1)	0.10
Social Support	1.1 (0.1)	1.0	<b>1.4 (0.1)</b>	<b>&lt;0.001</b>
Daily Attendance * Social Support	<b>0.7 (0.1)</b>	<b>.02</b>	0.7 (0.2)	0.36
<b>Outcome 2: Proportion Unprotected Sex Acts<sup>2</sup></b>				
Daily Attendance	2.0 (0.9)	0.26	<b>0.3 (0.1)</b>	<b>0.002</b>
Social Support	<b>0.8 (0.1)</b>	<b>0.04</b>	<b>0.7 (0.1)</b>	<b>0.002</b>
Daily Attendance * Social Support	<b>0.5 (0.2)</b>	<b>0.04</b>	3.4 (2.4)	0.16

SE= Standard Error

<sup>1</sup>Poisson distribution, with exponentiated relative risk parameter estimates presented (all parameters are adjusted for ethnicity, education and age)<sup>2</sup>Binomial distribution, with exponentiated odds ratio parameter estimates presented (all parameters are adjusted for ethnicity, education, and age)