

Relationship Between Alcohol Consumption Prior to Sex, Unprotected Sex and Prevalence of STI/HIV Among Socially Marginalized Men in Three Coastal Cities of Peru

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Published online: 28 September 2012
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Abstract This article presents data about the relationship between alcohol consumption prior to sex and unprotected sex and the prevalence of at least one sexually transmitted infection (STI) including HIV among socially marginalized men in three coastal Peruvian cities. During an epidemiological survey with 2,146 men, we assessed their STI prevalence, frequency of alcohol consumption prior to sex, unprotected sex and other sexual risk behaviors. The overall prevalence of at least one STI/HIV was 8.5 % (95 % CI 7.3–9.7), the prevalence of unprotected sex was 79.1 % (95 % CI 77.8–80.3) and alcohol consumption prior to sex with any of the last five sex partners in the

previous 6 months was 68.9 % (95 % CI 66.9–70.9). Bivariate and multivariate analysis showed that alcohol consumption of participants or their partners prior to sex were associated with the prevalence of at least one STI, adjusted Prevalence Ratio (aPR) = 1.3 (95 % CI 1.01–1.68). Unprotected sex was significantly associated with alcohol consumption prior to sex when both partners used alcohol, aPR = 1.15 (95 % CI 1.10–1.20) or when either one of them used alcohol aPR = 1.14 (95 % CI 1.09–1.18). These findings concur with previous literature suggesting a relationship between alcohol consumption prior to sex and STI and HIV. These data improve our understanding of this relationship in this context and could be used to enhance STI and HIV prevention strategies for socially marginalized men in Peru.

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Resumen Este artículo presenta datos de la relación entre el consumo de alcohol previo al sexo, el sexo no protegido y la prevalencia de al menos una infección de transmisión sexual (ITS) y VIH en hombres socialmente marginados de tres ciudades de la costa Peruana. En un estudio epidemiológico en 2,146 hombres, medimos las prevalencias de ITSs, la frecuencia de consumo de alcohol previo al sexo, frecuencia sexo no protegido y otras conductas sexuales de riesgo. La prevalencia total de al menos una ITS/VIH fue 8.5 % (IC 95 % 7.3–9.7), la prevalencia de sexo no protegido fue 79.1 % (CI 95 % 77.8–80.3) y el consumo de alcohol previo al sexo con al menos una de sus últimas cinco parejas en los últimos 6 meses fue 68.9 % (CI 95 % 66.9–70.9). El análisis bivariado y multivariado mostró que el consumo de alcohol de los participantes o sus parejas previo al sexo fue muy similar y asociado con la prevalencia de al menos una ITS/VIH, Razon de Prevalencia ajustado (RPa) = 1.3 (CI 95 % 1.01–1.68). El sexo no protegido estuvo asociado significativamente con el

consumo de alcohol previo al sexo cuando ambos consumieron alcohol, $RPa = 1.15$ (95 % CI 1.10–1.20) o cuando al menos uno de ellos consumió alcohol, $RPa = 1.14$ (CI 95 % 1.09–1.18). Estos hallazgos concuerdan con previas publicaciones que sugieren una relación entre el consumo de alcohol previo al sexo e ITSs y VIH. Estos datos mejoran nuestra comprensión de esta relación en este contexto y podría ser utilizada para mejorar las estrategias de prevención para ITSs y VIH en hombres socialmente marginados del Perú.

Keywords Alcohol consumption · Sexual risk behavior · Unprotected sex · Sexually transmitted diseases · Human immunodeficiency virus · Marginalized population

Introduction

Alcohol consumption and sexually transmitted infections (STIs), including HIV are important public health problems that affect low and middle income countries [1–5]. Alcohol consumption has been associated with increased instances of: sexual assault [6, 7], physical violence [8], sexual sensation seeking [9, 10] and risk sexual behavior [7, 11, 12] and most of these are also related to poverty and marginalization [13, 14].

According to the World Health Organization's last report on alcohol and health 2011, between 2003 and 2005 the adult per capita alcohol consumption in the American Region was 8.7 L per year and in Peru was 6.9 L per year [5]. In the American Region, alcohol consumption is the greatest risk factor for burden disease [2] and in Peru it is the third cause of disease burden [15]. The trend in global alcohol consumption has been relatively stable since 1990; however, in developing countries such as Peru it increased more than 10 % in 5 years (2001–2005) [5]. In 2007, a Peruvian national survey developed by a Peruvian Government Drug Control Agency (DEVIDA) showed that age of first alcohol consumption was 10 years-old, 2 year less than in 2002 [16]. The strong association between alcohol consumption and drug use leads to further public health problems like criminal involvement and addiction [17]. Since traffic accidents have become the leading risk factor for burden disease and accidents are principally associated with alcohol use, the Peruvian Government has implemented various measures to address alcohol consumption. These include “the designated driver”, where one person assumes the responsibility to driving and does not drink alcohol during a social event and public service announcements indicating that alcohol is harmful to health; however, their impact on alcohol consumption has not been evaluated [17, 18].

Research has shown a relationship between alcohol consumption prior to sex and an increased number of casual partners, unprotected sex and acquisition of STIs [12, 19–23]. A systematic review, with 11 observational studies showed significant association between alcohol consumption and having any STI [24] and a meta-analysis showed similar results from 11 studies with an overall adjusted odds ratio of 1.57 [25]. Alcohol consumption can decrease risk perception and increase risky sexual behavior [26]. Additionally, high and frequent alcohol consumption can affect the immunological response to infections such as tuberculosis and HIV [27, 28]. In vitro evidence has shown an increased rate of HIV viral replication and over-expression of CCR5 and CXCR4 in cell cultures exposed to alcohol, suggesting increased susceptibility to HIV among people consuming alcohol [29–32]. In Latin America little research has evaluated the relationship between alcohol consumption and the prevalence of STIs and HIV. Research on alcohol consumption has shown high consumption among young men and men who have sex with men [33–36]. In Peru, Sanchez et al. [37] found that casual sex was more common among men who consumed alcohol more frequently (83 %) than men with less frequent consumption (68 %).

The objective of this analysis is to explore the relationship between alcohol consumption prior to sex, unprotected sex and the prevalence of at least one STI, among socially marginalized men from low income populations in three cities of Peru.

Methods and Materials

Study Population and Data Collection

Our cross-sectional analysis uses data from the baseline assessment of the *NIMH Collaborative HIV/STD Prevention Trial* in Peru. A detailed description of this study can be found elsewhere [38]. Briefly, the study included three sub-populations recruited in 20 low income neighborhoods in three cities from the coast of Peru: Lima, Trujillo and Chiclayo. Previous ethnographic work that included informal interviews, participant observation and focus groups allowed us to identify the three sub-populations: (i) Socially marginalized, young men who spend time in on street corners or other locations such as soccer fields, were unemployed, had high rate of substances use/abuse, were involved in gang activities and were frequently involved in high-risk sexual activities (such as having multiple casual sex partners, sex in combination with use of substances, sex work and transactional sex) (ii) Socially marginalized women who spend time with socially marginalized men, (iii) Men who have sex with men, self-identified as gay or

male to female transgender. These populations have previously been described in more detail [39–41]. In this analysis, we focus only on the sub-population of socially marginalized men, who are called “*esquineros*” (corner men) in their own communities.

The study enrolled participants between 2003 and 2005. Inclusion criteria were being 18–40 years old, having had sex in the past 6 months, attending neighborhood venues with high social activity, and planning to stay in the area for at least 2 years. The surveys were conducted in private, temporary rented settings in or nearby the study neighborhoods; a staff ethnographer located people who were potentially eligible and took them to the temporary study office where a supervisor briefly explained the study procedures and invited them to participate. If they agreed, they entered a private room where trained personnel provided them with a copy of informed consent and read it to them. After signing the informed consent, participants answered a structured questionnaire using Computer Assisted Personal Interviewing (CAPI) [42], where the same personnel read the questions to the participants and entered the answers into the computer. Data collected included socio-demographics characteristics, health status, substance abuse, and sexual risk behavior with the last 5 partners in the last 6 months. Then, participants received HIV/STI pre-test counseling prior to providing samples of blood and urine. In the lead up to this multi-site study, the study team compared the performance of CAPI and ACASI in the trial and reported no differences in the information collected by both in Peru [43]. Possible misinformation or errors in data entry were monitored using data checks programmed into the CAPI system. Finally, study staff reviewed data for inconsistencies.

Ethical Approvals

The study was approved by the Committees of Human Research of the University of California, San Francisco; the University of California, Los Angeles; Cayetano Heredia Peruvian University, Peru, and the U.S. Naval Medical Research Unit N° 6 (NAMRU-6), Peru, in compliance with all federal regulations regarding the protection of human subjects.

Laboratory Methods

Laboratory testing was performed at US Naval Medical Research Unit 6, Lima Peru (NAMRU-6); following standardized protocols also including College of American Pathologists (CAP) proficiency testing. Blood samples were tested for Syphilis and HIV-1; urine samples were evaluated for Gonorrhea and Chlamydia. Syphilis (*Treponema pallidum*) testing was performed by Rapid Plasma

Reagin (Biomerieux, Boxtel; The Netherlands) with Treponema Pallidum Particle Agglutination (Fujirebio Diagnostics Inc, Tokyo, Japan) as a confirmatory test. HIV testing was performed using two different HIV EIA kits (Vironostika, Biomerieux, France and Genetic Systems, Biorad; CA) to increase sensitivity. The HIV testing algorithm also included Western Blot (Genetic Systems, Biorad; CA) as a confirmatory test if either EIA was positive. Urine samples were tested for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* DNA using Amplicor CT/NG PCR technology (Roche, Branchburg, NJ, USA). Samples were identified using barcodes and laboratory data was managed using an automated laboratory information management system [44].

Measures Used

Outcome Variables

Two outcomes were analyzed, one biological and the other behavioral, both were analyzed as binomial variables. The biological outcome was having a least one sexually transmitted infection (*Chlamydia trachomatis*, *Neisseria gonorrhoeae*, *Treponema Pallidum* and/or HIV). The behavioral outcome was having unprotected sex in the past 6 months with at least one of the last 5 sex partner.

Exposure of Interest

Our principal variable, alcohol consumption prior to sex in the last ten times with their five last partners, was analyzed three separate ways. As a binomial variable (yes/no) at the individual level, e.g., if alcohol consumption occurred was at least once prior to one of the last ten times they had sex with at least one sex partner; Additionally, we analyzed alcohol use as a continuous variable, e.g., the number of times a subject reported using alcohol with their last 5 partners. Finally, we analyzed it at the partner-level, categorizing alcohol consumption prior to sex into three levels: neither the participant nor their partner used alcohol prior to sex, either the participant or their partner used alcohol prior to sex; or both the participant and their partner used alcohol prior to sex.

Covariables of Interest

We analyzed socio-demographic variables and other potential confounding variables related to sexual risk behavior and drug use. Age and age at sexual debut were analyzed as continuous variables, while the number of sex partners in the last 6 months was categorized in tertiles. Marital status was re-categorized generating three new categories singles, widowed and separated or divorced and

married or living with partner; and graduated from high school as binomial variable. Time in relationship were categorized as binomial variable using 6 months as cut-off to approximate regular versus casual partners and partner type was categorized into occasional partner (casual partner or sex worker) or stable partner (spouse or girlfriend). Drug use prior to sex in the last ten times with their five last partners was analyzed as a binomial variable (yes/no).

Statistics Analysis

Bivariate analysis was performed with subject-level data ($N = 2069$) to evaluate the relationship between socio-demographic characteristics and sexual risk behavior with STI prevalence. For these comparisons, contingency tables and Chi-square test or Wilcoxon Mann–Whitney test were used as needed.

We conducted bivariate and multivariate regression analysis for two separate outcomes of interest. Model 1 analyzed unprotected sex as the outcome and model 2 analyzed the prevalence of at least one STI/HIV as the outcome of interest. Both models used information from 2,069 subjects who reported data for up to 5 sex partners, generating 4,040 observations at the partnership level. We evaluated 5 variables at the partner-level: (1) alcohol consumption prior to the past 10 sex acts, (2) time in the relationship, (3) partner type, (4) sex of partner, and (5) drug use prior to sex. We also evaluated 6 variables at the participant level (1) age, (2) age at sexual debut, and (3) number of partners in the past 6 months (4) marital status, (5) employment status, and (6) high school graduation.

Both multivariate models were conducted using Generalized Linear Models (GLM) *function (log) family (poisson)* to evaluate prevalence ratios (PR) [45]. All models used the cluster command to correct for the lack of independence between sex partners, yielding adjusted standard error estimates.

Correlation analysis between alcohol consumption of participants and alcohol consumption of their partners were analyzed as continuous variables by each partner using Spearman analysis. STATA 11.1 software was used for all analyses. (STATA Corp LP, College Station, TX, USA).

Results

A total of 2,146 socially marginalized men were recruited for the baseline assessment of this trial, of these, the 2,069 (94.6 %) who had complete data for our outcomes variables were used in our analyses. The prevalence of at least one sexually transmitted infection (STI) was 8.5 % (95 % CI 7.3–9.7) and the prevalence of unprotected sex was

79.1 %. (95 % CI 77.8–80.3). Our population were young (median age 22, IQR 20–26), almost half of the population did not finish high school, and most were single. Alcohol consumption prior to sex with any of the last five sex partners in the previous 6 months was 68.9 % (95 % CI 66.9–70.9).

Several factors were related to having a prevalent STI/HIV (see Table 1). Among men who used alcohol prior to sex the prevalence of any STI/HIV was 9.3 % compared with men who no used it (6.8 %), ($p = 0.066$). Employment status was associated with having a prevalent STI/HIV ($p = 0.016$), where occasional work (9.2 %) and permanent work (9.8 %) showed a higher frequency of STI/HIV in comparison with those who received financial support from family or friends (5.0 %).

In bivariate analysis with unprotected sex as outcome, alcohol consumption prior to sex when either partner used alcohol and when both partners used alcohol increased the likelihood of unprotected sex (18 and 9 %, respectively). Additionally, higher number of partners increased the likelihood of having had protected sex. The likelihood of having protected sex increased by 34 % with stable partners and having had a relationship for more than 6 months increased the likelihood to having had unprotected sex by 27 %. Finally, having had unprotected sex was more likely with a female partner than with a male partner (see Table 2).

In the multivariate model with unprotected sex as the outcome, both alcohol consumption prior to sex when both partners used alcohol (adjusted PR = 1.14; $p = 0.001$) and when either partner or participants used alcohol (adjusted PR = 1.13; $p = 0.001$) in comparison to when neither partner used alcohol prior to sex were associated with unprotected sex (see Table 2). Unprotected sex was less probable among single participants and participants with more than 2 partners in the last 6 months (adjusted PR = 0.93 and 0.94, respectively). Time in relationship for more than 6 months increased the likelihood to unprotected sex in 12 % and having a stable partner reduced the likelihood to unprotected sex in 19 %.

In bivariate analysis with a prevalent STI/HIV as the outcome, alcohol consumption prior to sex by any the participant or of their sex partners was associated with prevalence of at least one STI/HIV (PR = 1.30 CI 95 % 1.00–1.68) and this relationship remained significantly associated after adjusting for all relevant covariates (adjusted PR = 1.31 CI 95 % 1.02–1.69) (see Table 3). No other variables were associated with the outcome in model 2 in either bivariate or multivariate analysis.

We also evaluated the correlation of participants reporting alcohol consumption prior to sex with alcohol consumption prior to sex by their partners. Among participants who reported only one partner ($n = 1,000$), the

Table 1 Socio-demographics characteristics and sexual risk behavior among a group of socially marginalized men, Peru

	Men with at least one STI ^a		Men without an STI		<i>p</i> value ^b
	(N = 176)		(N = 1893)		
Demographic data					
Age (median, IQR) ^c	22.5	20–26	22	20–26	0.435
Graduated from high school (n, %)					0.081
Yes	75	7.4	937	92.6	
No	101	9.6	956	90.4	
Marital status (n, %)					0.142
Single	111	8.1	1,263	91.9	
Widowed, separated or divorced	14	13.7	88	86.3	
Married/living with spouse	51	8.6	542	91.4	
Employment status (n, %)					0.016^e
Permanent work	45	9.8	413	90.2	
Occasional work	111	9.2	1,096	90.8	
Support from family or friends	20	5.0	384	95.1	
Sexual Risk Behavior					
Alcohol use prior to sex (n, %) ^d					0.066
Yes	132	9.3	1293	90.7	
No	44	6.8	600	93.2	
Drug use prior to sex (n, %) ^d					0.745
Yes	38	8.1	429	91.9	
No	138	8.6	1464	91.4	
Age at sexual debut (median, IQR) ^c	15	14–17	15	14–17	0.090
# Partners, last 6 months (n, %)					0.569
1	81	8.0	929	92.0	
2	38	8.3	422	91.7	
3+	57	9.5	542	90.5	
A least one partner of the same sex (n,%)					0.246
Yes	27	10.4	233	89.6	
No	149	8.2	1660	91.8	

^a STI includes *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, Syphilis and HIV

^b *p* values were calculated from Chi-square tests except for age and age at sexual debut, which were calculated with Wilcoxon Mann–Whitney test

^c IQR Interquartile range

^d Alcohol use prior to sex in the last 10 times with a least one partner, drug use prior to sex in the last 10 times with a least one partner

^e The data in bold indicate statistical significance, *p* value < 0.05

correlation of both reporting alcohol use prior to sex was 0.384. Among participants with multiple partners, the correlation of both the participant and their first reported partner using alcohol was 0.549 ($n = 1,032$), with the second reported partner 0.578 ($n = 988$), with the third reported partner 0.617 ($n = 529$), with the fourth reported partner 0.700 ($n = 400$), and with the fifth reported partner 0.618 ($n = 187$), all *p* values for these correlations were $p < 0.001$. The order reported of the partners by participants does not indicate a hierarchy, because the first reported partner among participants with multiple partners is not necessarily the stable partner.

Discussion

Our analysis assessed the relationship between alcohol consumption prior to sex as a risk factor for the prevalence of at least one STI/HIV and for unprotected sex among socially marginalized men in three Peruvian coastal cities. These results suggest that alcohol consumption prior to sex could affect condom use and as a result facilitate the acquisition of STIs and potentially HIV [46]. These results concur with past studies of the relationship between alcohol use and sexual risk behavior and STI prevalence [19, 22, 24, 25], where use of alcohol prior to sex increased HIV

Table 2 Bivariate and multivariate analysis of factors associated with unprotected sex in the last 6 months among socially marginalized men, Peru. (N = 4040, subjects = 2053)

Risk factor	PR ^a	<i>p</i> value	95 % CI ^b	PR(a) ^a	<i>p</i> value	95 % CI ^b
Alcohol use prior to sex						
Neither partner nor participant used alcohol prior to sex	Ref.			Ref.		
Either partner or participant used alcohol prior to sex	1.18^c	0.001	1.13–1.23	1.13	0.001	1.09–1.17
Both partners used alcohol prior to sex	1.09	0.001	1.04–1.14	1.14	0.001	1.09–1.19
Drug use prior to sex						
No	Ref.			Ref.		
Yes	1.07	0.003	1.02–1.12	1.03	0.159	0.99–1.08
Age ^{c, d}	1.00	0.018	1.00–1.01	1.00	0.959	1.00–1.01
Age at sexual debut ^{c, d}	1.00	0.517	0.99–1.01	0.99	0.192	0.98–1.00
Graduated from high school ^d						
No	Ref.			Ref.		
Yes	0.97	0.111	0.93–1.01	0.99	0.713	0.95–1.03
Marital status						
Married/living with spouse	Ref.			Ref.		
Widowed, separated or divorced	0.88	0.010	0.79–0.97	0.95	0.245	0.86–1.04
Single	0.84	0.001	0.81–0.87	0.93	0.001	0.88–0.97
Employment status						
Permanent work	Ref.			Ref.		
Occasional work	1.02	0.572	0.96–1.08	1.03	0.291	0.98–1.08
Support from family or friends	1.00	0.900	0.93–1.06	1.06	0.085	0.99–1.13
# partners, last 6 months						
1	Ref.			Ref.		
2	0.93	0.001	0.89–0.96	1.00	0.937	0.96–1.04
3+	0.82	0.001	0.79–0.86	0.94	0.007	0.91–0.98
Time in relationship						
< 6 months	Ref.			Ref.		
> 6 months	1.27	0.001	1.22–1.31	1.12	0.001	1.08–1.16
Type of partner						
Stable partner (spouse/girlfriend)	Ref.			Ref.		
Occasional partner (casual partner/sexual work/another)	0.76	0.001	0.73–0.79	0.81	0.001	0.78–0.85
Sex of partner						
Woman	Ref.			Ref.		
Man	0.83	0.001	0.76–0.91	0.94	0.150	0.86–1.02

^a PR Prevalence ratio, PR(a) Adjusted prevalence ratio

^b CI Confidence Interval

^c Age and age at sexual debut are included as continuous variables

^d Age, age at sexual debut, graduated from high school, marital status and employment status are variables at the individual level

^e The data in bold indicate statistical significance, *p* value < 0.05

acquisition [46] and sexual risk behavior [11, 22, 47]. Given these results, drinking should be a focus of STI/HIV prevention interventions for this population.

In our study, alcohol consumption prior to sex and unprotected sex were associated, these results suggest that alcohol consumption may lead to disinhibition of the person and loss of the ability of risk perception, resulting in unprotected sex. However, the effect is not increased when both people consume alcohol, suggesting that alcohol use

in one person is enough to affect the condom use within the dyad. Kalichman et al. [19, 22], showed similar results among people at high risk for HIV, where alcohol prior to sex increased the likelihood of unprotected sex when alcohol consumption was present in both members of the couple or when alcohol was used only by men. Interestingly, alcohol consumption prior to sex was the only variable associated with the presence of at least one STI/HIV. Although in this model, only drinking by the participant or

Table 3 Bivariate and multivariate analysis of factors associated with at least one STI/HIV among socially marginalized men, Peru. (N = 4040, subjects = 2053)

Risk factor	PR ^a	<i>p</i> value	95 % CI ^b	PR(a) ^a	<i>p</i> value	95 % CI ^b
Alcohol use prior to sex						
Neither partner nor participant used alcohol prior to sex	Ref.			Ref.		
Either partner or participant used alcohol prior to sex	1.30^e	0.046	1.00–1.68	1.31	0.036	1.02–1.69
Both partners used alcohol prior to sex	1.03	0.844	0.77–1.38	1.00	0.974	0.74–1.34
Drug use prior to sex						
No	Ref.			Ref.		
Yes	0.88	0.548	0.57–1.34	0.80	0.316	0.52–1.23
Age ^{c, d}	1.01	0.763	0.97–1.04	1.00	0.808	0.97–1.04
Age at sexual debut ^{c, d}	0.94	0.075	0.88–1.01	0.94	0.088	0.88–1.01
Graduated from high school ^d						
No	Ref.			Ref.		
Yes	0.80	0.187	0.57–1.12	0.80	0.219	0.57–1.13
Marital status ^d						
Married/living with spouse	Ref.			Ref.		
Widowed, separated or divorced	1.55	0.202	0.79–3.02	1.51	0.230	0.77–2.98
Single	1.07	0.730	0.74–1.53	1.17	0.430	0.79–1.73
Employment status ^d						
Permanent work	Ref.			Ref.		
Occasional work	0.92	0.689	0.62–1.37	0.93	0.709	0.62–1.38
Support from family or friends	0.57	0.058	0.31–1.02	0.57	0.066	0.31–1.04
# Partners, last 6 months						
1	Ref.			Ref.		
2	1.01	0.943	0.70–1.47	1.01	0.980	0.68–1.48
3+	1.21	0.256	0.87–1.69	1.20	0.288	0.86–1.67
Time in relationship						
< 6 months	Ref.			Ref.		
> 6 months	0.97	0.804	0.75–1.25	0.97	0.842	0.75–1.27
Type of partner						
Stable partner (spouse/girlfriend)	Ref.			Ref.		
Occasional partner (casual partner/sexual work/another)	1.07	0.585	0.85–1.35	0.96	0.731	0.75–1.23
Sex of partner						
Woman	Ref.			Ref.		
Man	1.32	0.226	0.84–2.06	1.36	0.195	0.85–2.17

^a PR Prevalence ratio, PR(a) Adjusted prevalence ratio

^b CI Confidence Interval

^c Age and age at sexual debut are included as continuous variables

^d Age, age at sexual debut, graduated from high school, marital status and employment status are variables at the individual level

^e The data in bold indicate statistical significance, *p* value < 0.05

partner was associated with the presence of at least one STI/HIV, we found that drinking by both partners was not associated with increased STI/HIV prevalence. These results do indicate that looking more closely at drinking within sexual dyads would be important to understand unprotected sex and STI/HIV prevalence.

Socially marginalized men report more condom use with casual partners than with regular partners. Our bivariate

and multivariate analysis showed that socially marginalized men have unprotected sex with sex partners they define as stable, when they are in a relationship longer than 6 months, and when they report few sex partners. These findings are consistent with a recent study where condom use was also lower with steady partners than with casual partners [47]. Additionally, unprotected sex can change depending on the context based on factors such stigma,

social expectations and stereotypes [48] and these be increased by alcohol consumption [49]. According to our results, the probability of engaging in unprotected sex with occasional partners is lower than with stable partners; however, drinking alcohol before sex is more common with non-regular partners than with regular sex partners. These findings are supported by previous studies [47, 50] which also show that the use of condoms is more frequent with irregular partners than with regular partner. Some young people who use condoms in non-steady, short-term relationships, might also use them in long-term relationships [48]; however, condom use among young people is highest with partners they deem to be ‘risky’. In our study socially marginalized men reported a higher rate of condom use with casual partners than with regular partners, indicating a better confidence with their regular or stable partner [47].

In Peru as in the rest of the world, alcohol consumption is a common practice in different social contexts [13, 51, 52]. Although prevention strategies such as a purchase age limit and public service announcements exist, these strategies are not strict and non-formal commercialization of alcohol has increased in the last years [2]. Peru, also has very low alcohol prices and easy access to alcoholic beverages [14]. Like elsewhere in the world, alcohol can be purchased and consumed in bars, informal drinking establishments, neighborhood stores, discotheques and in the streets. Casual sex partners in these context are also easily found and many people are motivated to consume alcohol hoping to enhance their sexual expectancies within their social network [22, 53]. Kalichman et al. [9] showed a pattern of higher risk for STI and HIV infection in men who used alcohol in sexual contexts.

In Peru, previous studies that have evaluated the relationship between alcohol consumption and other substances with the prevalence of sexual transmitted infections or sexual risk behavior, and have shown a decrease in the use of condoms and a doubled probability of intercourse with a casual partner [54]. Among chronic alcohol abusers, HIV infection was associated with alcohol consumption; chronic abusers had almost three times the HIV infection prevalence as compared to non-users [35]. Another study found that alcohol consumption prior to sex was about 40 % more common among men than among women [37]. These previous findings along with our results indicate that the problem of alcohol consumption and unprotected sex continue and should be addressed in Peru through STI/HIV prevention interventions. This may be especially pertinent for the included population given their elevated prevalence of STI/HIV compared to the general population [40] their sexual contact with MSM and women [55], and their use of alcohol.

Although STI/HIV prevention interventions in Peru have not yet focused on alcohol use, research in this area

could help to guide the creation of effective interventions. Community clinical trials in Africa showed that a one-hour counseling based intervention focused on HIV and alcohol risk reduction, increased condom use by at least 25 % [56]. A theory-based behavioral HIV intervention including alcohol risk-reduction using a 3-h, small group counseling session found a reduction in sexual risk behavior compared with a control group that received a 1-h counseling session [57]. We believe that these sorts of interventions could have an effect in our population where a higher prevalence of STIs are present in comparison to the general population and where alcohol consumption varied by individual and contextual alcohol use factors and where alcohol consumption prior to sex of a member of the couple is associated to unprotected sex and the presence of STI/HIV. More research is needed to determine if such interventions would be efficacious in this context.

This observational study has limitations. The data included come from the baseline of the NIMH *Collaborative HIV/STD Prevention Trial*; therefore, we cannot establish if the prevalence of STIs in our population comes from a prior event or is a consequence alcohol consumption. Assessing alcohol consumption in Peru is difficult because alcohol consumption is not individual; it is a collective behavior with people sharing a communal glass and bottles of alcohol. The variable alcohol use is generated from questions to participants about their consumption of alcohol the last 10 times they had sex with each with each of their last 5 sex partners, participants were also asked about alcohol consumption of their sex partners. Some participants reported they had more than 5 sex partners; however, they only were asked about alcohol consumption with the last 5 sex partners. This form of measurement indicates the number of times that the participant and/or their sex partner consumed alcohol prior to sex, but does not describe the amount of alcohol volume and type of alcohol consumed. However, especially given the often communal nature of alcohol consumption in Peru and the lack of a conception of standard drink amounts, the focus on frequency of consumption prior to sex instead of volume consumed is beneficial. Establishing a direct association between amounts consumed with sexual risk behavior or the risk of acquiring an STI or HIV is a challenge that future research should address. Additionally, our study included a large sample of socially marginalized men and the data was collected as part of a rigorous, multisite international trial which employed standardized computer-based interview technology and yielded a high participation rate.

Conclusion

Alcohol consumption prior to sex and unprotected sex were both very common among socially marginalized men and

these behaviors were associated. This result occurred in a population with a high prevalence of STIs/HIV, alcohol consumption and a low prevalence of condom use. Our findings suggest the important role of alcohol as a facilitator of sexual risk behavior and as a risk factor for the prevalence of STIs/HIV. Future interventions and strategies in the combined reduction of alcohol consumption and sexual risk behavior should be implemented and evaluated to reduce the impact of the STIs and HIV in our population.

Acknowledgments This study was funded by NIH/NIMH grant number U10 MH61536 which is a 5-country Cooperative Agreement being conducted in China, India, Peru, Russia, and Zimbabwe. Each site has selected a different venue and population with which to implement the prevention program entitled Community Public Opinion Leader (C-POL) Intervention.

Disclaimer The views expressed in this article are those of the authors and do not necessarily the official policy or position of the Department of the Navy, Department of Defense, nor the US Government. This work was funded by the US National Institute of Mental Health (NIMH) and conducted following Institutional Review Board approval by NAMRU-6, UCLA, UCSF and UPCH in compliance with all applicable US and Peruvian regulations governing research with human subjects. The authors include military service members or employees of the US Government. This work was prepared as part of their official duties. Title 17 USC §105 provides that “Copyright protection under this title is not available for any work of the United States Government”. Title 17 USC §101 defines a US Government work as a work prepared by a military member or employee of the US Government as part of that person’s official duties. This article was partially prepared as part of the activities of the Masters in Clinical epidemiology with mention in quantitative methods offered jointly by the Universidad Peruana Cayetano Heredia (UPCH) and NAMRU-6, Peru. This program is part of the grant 2D43 TW007393 “Peru Infectious Diseases Epidemiology Research Training Consortium”, sponsored by the Fogarty International Center of the US National Institutes of Health (NIH/FIC). The author is thankful for the support and guidance received from the faculty and fellow students of the program.

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