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Impact of alcohol use on sexual behavior among men who have sex with men and transgender women in Lima, Peru

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Abstract

Background—Alcohol use disorders (AUDs) may enhance the likelihood of risky sexual behaviors and the acquisition of sexually transmitted infections (STIs). Associations between AUDs with condomless anal intercourse (CAI) and STI/HIV prevalence were assessed among men who have sex with men (MSM) and transgender women (TW) in Lima, Peru.

Methods—MSM and TW were eligible to participate based on a set of inclusion criteria which characterized them as high-risk. Participants completed a bio-behavioral survey. An AUDIT score of 8 determined AUD presence. Recent STI diagnosis included rectal gonorrhea/chlamydia, syphilis, and/or new HIV infection within 6 months. Prevalence ratios (PR) were calculated using Poisson regression.

Results—Among 312 MSM and 89 TW, 45% (181/401) had an AUD. Among those with an AUD, 164 (91%) were hazardous/harmful drinkers, and 17 (9%) had alcohol dependence. Higher CAI was reported by participants with an AUD vs. without, (82% vs. 72% albeit not significant). Reporting anal sex in two or more risky venues was associated with screening AUD positive vs. not (24% vs. 15%, $p=0.001$). There was no difference in recent STI/HIV prevalence by AUD status (32% overall). In multivariable analysis, screening AUD positive was not associated with CAI or recent STI/HIV infection.

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Conclusions—In our sample AUDs were not associated with CAI or new HIV infection/recent STI. However higher prevalence of CAI, alcohol use at last sex, and anal sex in risky venues among those with AUDs suggests that interventions to reduce the harms of alcohol should be aimed toward specific contexts.

Keywords

Men who have sex with men; Transgender women; Alcohol use; AUDIT; HIV; STI; Sexual risk behavior; Peru

1 INTRODUCTION

Although the countries of Central and South America have a relatively low adult human immunodeficiency virus (HIV) infection prevalence among the general population, estimated to be 0.4% (UNAIDS, 2012), in Peru concentrated epidemics persist among gender and sexual minorities with the HIV prevalence among men who have sex with men (MSM) and transgender women (TW) estimated to be as high as 10% and 30%, respectively (Cáceres and Mendoza, 2009; Silva-Santisteban et al., 2012; Carcamo et al., 2003). HIV infection and other sexually transmitted infections (STIs) exist as “syndemics,” synergistically contributing to an excess disease burden in these key populations (CDC, 2002). Concurrent STIs such as syphilis, gonorrhea, and chlamydia have been proven to facilitate HIV transmission while HIV also complicates these infections (Fleming and Wasserheit, 1999). Myriad high-risk behaviors including condomless anal intercourse lead to HIV/STI acquisition. The predisposition to engage in sexual risk behaviors (Newcomb et al., 2010) is associated with psychosocial factors such as substance abuse (Koblin et al., 2006; Stall and Purcell, 2000), depression (Alvy et al., 2011), anxiety (Rosario et al., 2006), history of childhood sexual abuse (Paul et al., 2001), self-efficacy, prejudice, stigma and social inequality (Meyer et al., 2011).

A recent systematic review in Latin America, identified several studies in which alcohol consumption was significantly associated with high-risk sexual behavior across various populations (Vagenas et al., 2013). Yet regional prevention services neglect alcohol consumption as a modifiable risk factor meriting intervention. As a psychogenic substance, alcohol leads to disinhibition, decreased risk perception, impaired decision making, and diminished capacity to negotiate condom use (Rehm et al., 2012; Kalichman et al., 2007a; Gálvez-Buccollini et al., 2009). The need to address alcohol use to provide comprehensive HIV/STI preventive care is substantiated by the global literature, including support of an overall association between problematic alcohol consumption and both STIs and HIV incidence (Baliunas et al., 2010; Cook and Clark, 2005). A meta-analysis of African studies observed a significant relationship between alcohol and HIV wherein drinkers had a 70% greater chance of being HIV positive than non-drinkers (Fisher et al., 2007). However, there is a lack of prospective longitudinal studies that could demonstrate causality between alcohol use and HIV/STI incidence in Latin America. Project EXPLORE (Koblin et al., 2006), for example, longitudinally followed 4,000 HIV-negative MSM in the United States, and found that the use of alcohol or drugs before sex and heavy alcohol use in the last 6

months were independent predictors of seroconversion accounting for 29% and 6% of new HIV infections, respectively.

The relationship between problem alcohol use and HIV/STI prevalence needs further study. According to the 2010 World Health Organization Global Status Report on Alcohol and Health, the prevalence of alcohol use disorders among males over the age of 15 years in Peru was 12.2% (WHO, 2014). Yet among samples of MSM and TW in Peru the prevalence of alcohol use disorders is 55-63% (Ludford et al., 2013a; Vagenas et al., 2014). An event-level study in Peru found alcohol consumption prior to sex was associated with unprotected sex and at least one STI (Maguiña et al., 2013). While studies in Peru seem to agree that alcohol use is associated with condomless or risky sex, more global measures of problem alcohol use (such as the AUDIT and the CAGE questionnaire) have yielded inconsistent results with regard to the association between alcohol use and STI prevalence (Ludford et al., 2013b; Deiss et al., 2013a). Therefore further information is needed to clarify the relationship between alcohol use and HIV/STI prevalence in this context.

Based on the known psychoactive effects alcohol has on judgment and reasoning in conjunction with the positive associations previously reported in international and Peruvian studies, we hypothesized that alcohol use disorders (AUDs) would be associated with higher baseline prevalence of both condomless anal intercourse in the last 3 months and new HIV infection/recent STI diagnosis.

2 METHODS

2.1 Study Design

To test our hypothesis, we utilized data from an ongoing cohort study of sexual risk behaviors and HIV/STI prevalence among MSM and TW in Lima, Peru (Deiss et al., 2013b). The Picasso study is an NIH-funded study of 401 MSM and TW recruited in clinics located in the districts of Callao and Barranco. Although only 2 clinics were used for recruitment, participants hailed from 35 out of Lima's 49 districts. Baseline enrollment occurred from May, 2013 – May, 2014 and the projected end date is July 2016. Given the study inclusion criteria (Section 2.2), it is worth noting that this is a high-risk sample. The overall aim of this cohort study is to elucidate patterns of syphilis and HIV infection among populations at the greatest risk for these overlapping epidemics. At each visit the participants completed an interviewer-administered survey in Spanish that collected an array of socio-demographic and behavioral information. Biologic specimens were collected for syphilis, HIV, and rectal gonorrhea/chlamydia testing. We used cross-sectional, baseline data from this cohort for analysis.

2.2 Study Population

MSM and TW were recruited from specialized health clinics that provide enhanced STI prevention and treatment services to these key populations. Enrollment eligibility was limited to individuals assigned male sex at birth and 18 years of age. The inclusion criteria required that participants fulfill at least 3 of the following: (i) sexually active for more than 5 years, (ii) a positive syphilis test in the last 2 years, (iii) a positive HIV test, (iv) more than 5

sexual partners in last 3 months, (v) STI diagnosis in last 6 months, (vi) current STI symptoms, or (vii) more than 5 episodes of condomless anal intercourse in the last 6 months.

2.3 Exposure Variable

2.3.1 Alcohol Use Disorders—We used the Alcohol Use Disorder Identification Tool (AUDIT) which is a 10-item screening questionnaire intended to detect a broad spectrum of AUDs allowing for early intervention (Saunders et al., 1993). Validated by the World Health Organization, items in the AUDIT cover 3 conceptually distinct domains: intake/consumption, adverse consequences of alcohol use, and dependence behavior in the last year. An AUDIT score ≥ 8 determines the presence of an alcohol use disorder. A score of 8-15 denotes hazardous alcohol use (use that poses high-risk of future damage to physical or mental health) while a score of 16-19 denotes the harmful category (reflects alcohol use already resulting in damage). A score of 20 or more is indicative of dependence (a combination of behavioral, cognitive, and physiologic processes that can develop after repeated alcohol use). The AUDIT for our sample had an alpha of 0.78, showing good internal consistency.

2.4 Independent Variables

2.4.1 Demographic Information—Age was calculated based on participant response to a write-in birth date. Education was ascertained by asking participants to identify their level of education from “completed primary school or less,” to “postgraduate studies.” Information regarding participants’ socioeconomic status was based on how many months in the last year they ran out of money to cover water, food, or housing. Gender identity was obtained by asking participants if they identified themselves as transgender using locally appropriate terms. HIV infection status knowledge was assessed by asking “what was the result of your most recent HIV test?” Those who responded “HIV positive” were considered known positive for the analysis.

2.4.2 Risky Sexual Behavior—The interviewer-administered behavioral survey assessed self-reported high-risk sexual behaviors such as number of sex partners in the last 3 months (which was entered by the interviewer as a free text numerical response), types of sex partners (casual, friends with benefits, stable, anonymous, etc), types of sex (anal, oral), substance use at last sex (by either the participant or the participant’s partner), and types of condomless sex (insertive or receptive oral vs. anal sex). Participants were also asked if in the last 3 months they had anal sex in any of the following venue types: discos, saunas, hostels, hair salons, or public places. The specific venue types which comprised the answer choices were selected from an ethnographic mapping study with Peruvian MSM and TW populations (Clark et al., 2014). No assessment of frequency was obtained for this measure.

2.5 Outcome Variables

2.5.1 Behavioral Outcome—The behavioral outcome of interest was the report of condomless receptive or insertive anal sex in the last 3 months between participants and their male and/or trans partners. This variable was inclusive of all participants including those who did not have male sex partners.

2.5.2 Biologic Outcome—The biologic outcome of interest was a recent diagnosis of either HIV or an STI at baseline using a composite HIV/STI outcome (Hartwell et al., 2013). New HIV infection was defined as a participant reporting a negative HIV test result within 6 months of their baseline study visit. Positive HIV rapid tests (Determine HIV-1/2, Alere Medical Co, Japan) were followed with confirmatory testing by a 4th generation Ag/Ab HIV EIA serum test (Genscreen ULTRA HIV Ag-Ab, Bio-Rad, Redmond, WA) and Western Blot confirmation (Genetic Systems HIV-1 New Lav Blot I, Bio-Rad, Marnes-La-Coquette, France). Only participants diagnosed with HIV within 6 months of their study visit were then coded as positive. Participants who were known to be HIV positive for >6 months were not included in the outcome unless they were found to have acquired a new STI. Recent syphilis diagnosis was defined by an RPR (BD Macro-Vue RPR, Beckton-Dickinson, NJ) titer of 1:16 and confirmed with TPPA (Serodia TP-PA, Fujirebio Inc, Japan). Rectal *Neisseria gonorrhea* and *Chlamydia trachomatis* infections were diagnosed by nucleic acid amplification tests of self-collected rectal swabs (Aptima Combo2 CT/NG, Hologic, San Diego, CA).

2.6 Statistical Analysis

Descriptive analysis included univariate distributions of participant socio-demographic characteristics, AUD positivity/classification, HIV/STI-related sexual risk behavior, and HIV/STI prevalence. Chi-square tests were used to compare characteristics between those who did vs. did not screen positive for an AUD and between AUD severity categories.

Poisson regression was used to calculate prevalence ratios to estimate the association between screening AUD positive and two outcomes: 1. condomless anal intercourse in the last 3 months and 2. composite HIV/STI prevalence. Prevalence ratios were used as opposed to odds ratios to avoid overestimating associations given the high frequency of both outcomes in this sample (Barros and Hirakata, 2003). Bivariate analysis was used to explore the relationship of potential confounders with each outcome; these variables were selected for inclusion on the basis of significant findings reported in prior studies. Multivariable regression models were used to discern the independent effect of AUDs on each outcome condomless anal intercourse and HIV/STI prevalence. The adjusted models were reached using likelihood ratio testing to see if the overall model fit was improved by the inclusion of a given variable. A p-value threshold of 0.05 was used to determine significance. The exposure of interest, AUDIT score, remained in the final models regardless of significance. Sensitivity analyses were also performed separating the men and TW for both models as we recognize these are distinctly unique populations although they may share a common biological risk of anal intercourse. All analyses were conducted using STATA 12 (StataCorp, College Station, TX).

2.7 Human subjects and Ethical Review

The institutional review board of the Universidad Peruana Cayetano Heredia approved the study. Written informed consent was obtained from all enrolled participants.

3 RESULTS

3.1 Participant characteristics

A total of 401 participants (312 MSM and 89 TW) completed the survey and provided biologic specimens. Median age of participants was 30 years (IQR of 23-38 years, age range 18-70 years). Over half (52%) of the MSM and TW in the sample attended either university or other post-secondary education such as technical schooling. Yet 61% of the sample reported not being able to meet their basic needs (such as water, food, and housing) at least one month during the last year (see Table 1). Although temporal relationships cannot be surmised in a cross-sectional study, in an attempt to uncover any potential dose-response relationships between AUDs and our variables of interest, the descriptive statistics in Table 1 are stratified by the AUD severity categories (as outlined in section 2.3.1).

3.2 Alcohol use disorders

Among the total sample, 45% (181/401) had an AUD with the breakdown by gender identity at 44% and 47% by men and TW, respectively. Among participants with an AUD, 91% (164/181) were hazardous or harmful drinkers, and 9% (17/181) met criteria for alcohol dependence. Alcohol use prior to sex was reported by 31% (125/401) of participants and 44% (55/125) of this subgroup reported being inebriated in association with their last sexual encounter. At last sex, 34% of participants reported that their partners consumed alcohol and 49% of that group was inebriated. Of participants who were AUDIT positive, 25% (46/181) were reportedly inebriated at last sex, while 4% (9/220) of AUDIT negative participants reported being inebriated at last sex ($p < 0.001$).

3.3 Condomless anal intercourse and HIV/STIs

Among the sample, recent condomless anal intercourse with a male partner was reported by 74% (292/397). New HIV infection or a new STI was diagnosed in 32% (128/401). Breaking this composite variable down, 3% were newly diagnosed with HIV, 15% were diagnosed with recent syphilis, and 21% of the sample with rectal gonorrhea or chlamydia infection.

3.4 Associations with condomless anal intercourse and composite HIV/STI variable

In multivariable analysis, screening AUD positive was not independently associated with recent condomless anal intercourse (see Table 2). In bivariate comparisons of dependent drinkers vs. alcohol abstainers there was a greater prevalence of both condomless anal intercourse and HIV infection/STI diagnosis among dependent drinkers, although there were no significant associations. Condomless anal intercourse was independently associated with having 6 sex partners (aPR=1.30, 95% CI 1.07 – 1.57). In order to avoid the masking of important differences between men and TW, we conducted a separate sensitivity analysis removing the 89 TW, and the behavioral model did not differ significantly from what is displayed in Table 2. When we looked at a TW-only behavioral model with just 89 participants, there were no significant variables in the model.

In a separate multivariable analysis, AUDs remained unassociated with the composite biologic outcome (see Table 3). Recent STI/HIV infection was independently associated

with reporting being both receptive and insertive (aPR=2.06, 95% CI 1.18 – 3.59) during anal sex compared to being receptive or insertive only during anal sex. Increased age was associated with a significantly lower likelihood of having recent

HIV/STI at baseline (aPR=0.47, 95% CI 0.31-0.71 for participants aged 36 years or older). When we examined the composite STI variable without the 89 TW participants, only the effect of sex role was enhanced. In the TW-only biologic model only age remained significant. Although not significant, screening AUD positive in the TW-only model was a risk factor for recent HIV infection/STI diagnosis (aPR=1.55, 95% CI 0.76 – 3.18). This directionality is different when compared to the all-inclusive model in Table 3 which suggests AUDs have no effect, but again is not significant. We also performed a sensitivity analysis deconstructing the HIV/STI outcomes. We compared the 10 participants with a recent HIV diagnosis to only those who were HIV negative, thus excluding those diagnosed more than 6 months ago. With so few people there were no significant variables. When we ran the model looking at only gonorrhea, chlamydia, and syphilis infections in the outcome only 6 of the 10 participants who were newly diagnosed with HIV were lost since the other 4 had at least one concurrent STI diagnosis. Therefore the model was essentially identical to the one using the original composite variable.

4 DISCUSSION

We examined the relationship between alcohol use as a risk factor for sexual risk behavior and HIV/STI prevalence among MSM and TW in Lima, Peru. Our hypotheses were that participants screening AUD positive would also report a higher degree of recent condomless anal intercourse and have a higher prevalence of recent HIV/STIs. However in this analysis screening AUD positive was not independently associated with either outcome. Event level alcohol data, i.e. the use of alcohol at last sex, were significantly associated with screening AUD positive. This finding suggests that alcohol use at the time of sex may be more common among those with an AUD. Furthermore in our study, the use of alcohol at last sex was significantly correlated with screening AUD positive and increased with AUD severity. Given that the use of alcohol at sex may negatively impact condom negotiation/correct usage (Chersich et al., 2009), this result highlights the utility of screening for AUDs to identify those at risk of failing to practice safer sex. Perhaps by offering appropriate treatment for AUDs, as outlined by the World Health Organization guidelines for AUDIT use in primary care (Monteiro et al., 2001), healthcare professionals can indirectly impact the use of alcohol at sex.

Our results, wherein 45% of our sample had an AUD vs. 12% in the general population (WHO Country Profiles, 2014), would seem to support findings from a number of recent international studies that suggest a high burden of alcohol use among gender/sexual minority groups (Lu et al., 2013; Li and McDaid, 2014; Yadav et al., 2014; Kalichman et al., 2007b). However, our sample was distinctly high-risk due to the inclusion criteria, and therefore most likely any comparisons to the general population are more exaggerated than if the sample had not focused on high-risk MSM/TW. Our high AUD prevalence may be attributed to the eligibility criteria, and is not necessarily reflective of the broader MSM and TW populations. The prevalence of AUDs/STIs among heterosexual individuals might also

be higher than that of the general population if recruited from similar clinical settings using similar inclusion criteria. Especially since several studies have shown associations between alcohol use and the sexual risk behaviors that increase one's risk for HIV/STI acquisition among heterosexuals (Wray et al., 2015; Cook and Clark, 2005; Schneider et al., 2012; Fisher et al., 2007; Vagenas et al., 2013; Sen, 2002).

One potential life stress we identified that may be contributing to AUDs and sexual risk behaviors was the history of prior sexual coercion as this finding was significantly higher among those with more severe AUDs (hazardous and dependent drinkers). Similar findings have been consistently demonstrated among MSM in Peru (Deiss et al., 2013a) and abroad (Paul et al., 2001). Whereas prior studies of a community-based samples of Peruvian MSM and TW document an even higher prevalence of AUDs (Ludford et al., 2013b; Vagenas et al., 2014; Deiss et al., 2013b), the lower prevalence in our sample may suggest that AUDs are lower among MSM and TW who are engaged in clinical care. Additionally, similar to a study which used the CAGE questionnaire (Ewing, 1984) to diagnose alcoholism among Peruvian MSM and TW (Deiss et al., 2013b), we found no difference in HIV/STI prevalence among those with or without an AUD. Given the inclusion criteria for this study, future studies designed to include a comparison group from outside the STI clinic setting may allow for a detection of such differences.

Our study was the first to consider anal sex in high-risk venues as a potential risk factor for HIV/STI acquisition in Peru. The decision to use this variable was based on preliminary results revealing that the risk of incident HIV infection was increased among participants reporting anal sex in high-risk venues such as saunas and discos (adjusted hazard ratio 3.89, 95% CI 1.03-14.62) (Konda et al., 2015). Outside of Peru, sexual partner meeting venue can be important risk factor for HIV/STI acquisition (Michaud et al., 2004; Grov et al., 2013; Thiede et al., 2009). Interestingly, reports of anal sex in two or more distinct high-risk venues were significantly more frequent among participants with an AUD. Whether people drink more in these venue settings or people who a priori drink more attend these venues, becomes irrelevant when thinking about the potential for spread of HIV/STIs within these sexual networks (Doherty et al., 2006).

Given the high prevalence of AUDs identified in this cohort, a sub-analysis was conducted applying a higher AUDIT cut score of 10, which the original WHO validation study found to have a lower sensitivity (80%) but a higher specificity (98%). Under this more rigorous definition, there was a significant association between screening AUD positive and recent condomless anal intercourse (aPR= 1.18, 95%CI 1.07 – 1.31) but not for a new HIV/recent STI diagnosis. To further limit misclassification, we analyzed the extreme category of dependent drinkers because if an association existed it should be demonstrable when compared against alcohol abstainers. However, this comparison did not find that alcohol dependence significantly increased one's likelihood of recent condomless anal intercourse or new HIV infection/recent STI diagnosis.

4.1 Limitations

Our study has several important limitations to consider. First, the proportion of recent condomless anal intercourse reported in this sample is not necessarily reflective of that

among the larger population of MSM and TW in Peru since more than 5 episodes of condomless anal intercourse in the last 6 months was one of the seven possible eligibility criteria items and 74% of the participants reported this criterion at enrollment. However levels of condomless anal intercourse as high as 60-79% have commonly been reported in samples of Peruvian MSM and TW (Maguiña et al., 2013; Deiss et al., 2013b; Lee et al., 2015). Although this study's eligibility criteria limits generalizability of the results, these criteria were chosen to conscientiously target a population where public health interventions should be focused. Nevertheless for the purpose of this analysis it must be highlighted that both the behavioral and biologic outcomes were part of the inclusion criteria.

A second limitation of this study is the cross-sectional nature of the data. Moreover, regarding how the infections were measured we recognize that not all the diagnoses are necessarily due to *recent* unprotected sex. For example some of the rectal STIs deemed recent in this study may represent persistent infection from a remote sexual contact. The use of a composite STI variable is also a limitation since it conflates HIV with syphilis which does not require condomless anal intercourse for transmission. Regarding the CAI in high-risk venues variable, the structure of the questions may conflate individuals with different levels of risk. For example, we did not have data that revealed the frequency with which participants went to and had anal sex in these venues. Therefore we cannot distinguish someone who went to a single venue type and had anal sex in that venue one time only from someone who frequented and had anal intercourse in a single venue type multiple times. Nor was information on condom use collected for the venue encounters. Lastly the baseline survey did not include a depression screening which could act as a confounder for both alcohol use and high-risk sexual behavior (Alvy et al., 2011).

4.2 Conclusions

The prevalence of AUDs, condomless anal intercourse, and HIV/STI diagnoses is high among this clinic-based sample of MSM and TW in Peru. The lack of associations that would support a causal pathway between these factors highlights the need for longitudinal analyses targeting high-risk networks across populations. Given the relationships we uncovered between AUDs and both alcohol use at last sex and anal sex in high-risk venues, interventions that reduce the harms of alcohol use (Shoptaw et al., 2013) may need to be tailored to specific contexts since our work seems to suggest interventions addressing the intersectionality of alcohol use and HIV/STI acquisition may not be a priority for clinic-based populations. Additional work also needs to be done to better understand what is causing such a high proportion of AUDs among high-risk MSM and TW if these findings are in fact reproducible beyond our sample. Regardless of whether or not AUDs are associated with HIV infection or other STIs, excessive alcohol use poses substantial risk to an individual's health outcomes. Interventions that apply across high-risk populations should be pursued. However differing perceptions of alcohol abuse and cultural acceptability of social alcohol use in excess (Brown et al., 2015), may be hindering participation in alcohol abuse treatment programs. Therefore it is of critical importance that community engagement informs how interventions addressing unsafe alcohol use can be better accessed across high-risk populations.

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Highlights

- We describe alcohol use disorders (AUDs) among men who have sex with men and transgender women in Lima, Peru.
- We examine the association between AUDs and high risk sexual behaviors and sexually transmitted infections (STIs).
- AUDs were not associated with either condomless anal intercourse or recent STI.
- Interventions to reduce potential harms of alcohol should be context-specific.

Table 1

Stratification of AUDIT severity categories with demographic, behavioral, and biologic characteristics of high-risk men who have sex with men and transwomen in Lima, May 2013 – May 2014 *

Demographic, Behavioral & Biologic Characteristics	Total (N=401) n/N (%)	No AUD N=220 n/N (%)	Harmful Drinkers N=142 n/N (%)	Hazardous & Dependent Drinkers N=39 n/N (%)
Age (in years)				
18-25	123/401 (31)	66/220 (30)	43/142 (30)	14/39 (36)
26-30	84/401 (21)	44/220 (20)	30/142 (21)	10/39 (26)
31-35	65/401 (16)	39/220 (18)	21/142 (15)	5/39 (13)
36	129/401 (32)	71/220 (32)	48/142 (34)	10/39 (26)
University/Tech/Post-grad Education	210/401 (52)	127/220 (58)	60/142 (42)	23/39 (59)
Failure to meet basic needs, last 12 months	245/401 (61)	135/220 (61)	84/142 (59)	26/39 (67)
Gender Identity **				
Men	307/396 (77)	171/218 (79)	109/141 (78)	27/37 (73)
Transwomen	89/396 (23)	47/218 (21)	32/141 (22)	10/37 (27)
Role practiced during anal sex				
Insertive Only	89/401 (22)	50/220 (23)	33/142 (23)	6/39 (15)
Receptive Only	128/401 (32)	81/220 (37)	35/142 (45)	12/39 (31)
Both	184/401 (46)	89/220 (40)	74/142 (52)	21/39 (54)
ETOH before last sex	125/401 (31)	37/220 (17)	65/142 (46)	23/39 (59)
No. of male or transgender sex partners, last 3 months (quartiles)				
0 to 2	120/401 (31)	73/220 (33)	38/142 (27)	9/39 (23)
3 to 5	117/401 (29)	66/220 (30)	38/142 (27)	13/39 (33)
6 to 10	66/401 (16)	34/220 (16)	25/142 (18)	7/39 (18)
11 or more	98/401 (24)	47/220 (21)	41/142 (29)	10/39 (26)
Had condomless anal intercourse, last 3 months **	292/397 (74)	153/218 (70)	108/140 (77)	31/39 (79)
HIV testing history	333/401 (83)	187/220 (85)	109/142 (77)	37/39 (95)
Knowledge of HIV infection status				
Self-reported Negative	277/401 (69)	143/220 (65)	106/142 (75)	28/39 (72)
Self-reported Unknown	42/401 (11)	22/220 (10)	17/142 (12)	3/39 (8)
Self-reported Positive	82/401 (20)	55/220 (25)	19/142 (13)	8/39 (20)
History of sexual coercion	108/401 (22)	64/220 (29)	26/142 (18)	18/39 (46)
No. of unique high-risk venues where				

Demographic, Behavioral & Biologic Characteristics	Total (N=401) n/N (%)	No AUD N=220 n/N (%)	Harmful Drinkers N=142 n/N (%)	Hazardous & Dependent Drinkers N=39 n/N (%)
anal sex was reported, last 3 months ***				
0	90/401 (22)	55/220 (25)	24/142 (17)	11/39 (28)
1	196/401 (49)	119/220 (54)	63/142 (44)	14/39 (36)
2	78/401 (19)	34/220 (15)	35/142 (25)	9/39 (23)
3 or more	37/401 (9)	12/220 (5)	20/142 (14)	5/39 (13)
New HIV,Recent Syphilis, Rectal Gonorrhea, Chlamydia infection	128/401 (32)	70/220 (32)	45/142 (45)	13/39 (33)

* **Bold text indicates p-value < 0.05**

** Missing data was excluded.

*** Participants were asked in how many unique high-risk venues (such as saunas, public places, hostels, hair salons, and clubs) they had anal sex in the last 3 months.

Table 2

Factors associated with condomless anal intercourse in the last 3 months among high-risk men who have sex with men and transwomen in Lima, May 2013 – May 2014*

Variables	Prevalence of Condomless Anal Intercourse 292/397 (74%)	Crude Prevalence Ratio (95% Conf. Interval)	Adjusted Prevalence Ratio (95% Conf. Interval)
Age (in years)			
18-25	95/121 (79%)	ref	ref
26-30	64/84 (76%)	0.97 (0.83 – 1.13)	0.96 (0.83 – 1.11)
31-35	48/63 (76%)	0.97 (0.82 – 1.15)	0.92 (0.78 – 1.08)
36	86/129 (67%)	0.85 (0.73 – 0.99)	0.85 (0.73 – 0.98)
University/Tech/Post-grad Education			
No	139/188 (74%)	ref	
Yes	153/209 (73%)	0.99 (0.88 – 1.11)	
Failure to meet basic needs (food, water, housing), last 12 months			
No	109/156 (70%)	ref	
Yes	183/241 (76%)	1.09 (0.96 – 1.23)	
Gender and Sexual Identity			
Homosexual men	160/209 (77%)	ref	
Hetero/Bisexual men	65/80 (81%)	1.05 (0.91 – 1.22)	
Transgender women who have sex with men	64/87 (74%)	1.00 (0.86 – 1.17)	
Role practiced during anal sex			
Insertive Only	60/89 (67%)	ref	ref
Receptive Only	85/124 (69%)	1.01 (0.84 – 1.23)	0.97 (0.81 – 1.17)
Both	147/184 (80%)	1.18 (1.01 – 1.39)	1.11 (0.95 – 1.30)
AUDIT score			
7	154/218 (71%)	ref	ref
8	139/179 (78%)	1.11 (0.98 – 1.24)	1.05 (0.94 – 1.18)
No. of male or transgender sex partners, last 3 months (quartiles)			
0 to 2	73/120 (61%)	ref	ref
3 to 5	81/117 (69%)	1.14 (0.94 – 1.37)	1.07 (0.89 – 1.30)
6 to 10	57/66 (86%)	1.42 (1.19 – 1.69)	1.30 (1.07 –

Variables	Prevalence of Condomless Anal Intercourse 292/397 (74%)	Crude Prevalence Ratio (95% Conf. Interval)	Adjusted Prevalence Ratio (95% Conf. Interval)
			1.57)
11 or more	81/94 (86%)	1.42 (1.20 – 1.67)	1.33 (1.09 – 1.62)
Knowledge of HIV infection status			
Self-reported Negative	205/275 (75%)	ref	
Self-reported Unknown	34/42(81%)	1.09 (0.92 – 1.28)	
Self-reported Positive	54/80 (68%)	0.91 (0.77 – 1.07)	
Number of unique high-risk venues where anal sex was reported, last 3 months			
0	57/90 (63%)	ref	ref
1	139/192 (72%)	1.14 (0.95 – 1.37)	1.19 (1.00 – 1.40)
2	64/78 (82%)	1.30 (1.07 – 1.56)	1.10 (0.91 – 1.31)
3 or more	32/37 (86%)	1.37 (1.12 – 1.67)	1.21 (0.98 – 1.49)
Diagnosis of New HIV or Recent Syphilis or Rectal Gonorrhea or Chlamydia infection at baseline	98/127 (77%)	1.03 (0.92 – 1.15)	

* **Bold text indicates p-value < 0.05**

Table 3

Factors associated with prevalence of new sexually transmitted infections (STIs)* among high-risk men who have sex with men and transwomen in Lima, May 2013 – May 2014**

Variables	Prevalence of New STIs 128/401 (32%)	Crude Prevalence Ratio (95% Conf. Interval)	Adjusted Prevalence Ratio (95% Conf. Interval)
Age (in years)			
18-25	50/123 (41%)	ref	ref
26-30	28/84 (33%)	0.82 (0.57 – 1.19)	0.81 (0.56 – 1.16)
31-35	26/65 (40%)	0.98 (0.68 – 1.42)	0.96 (0.66 – 1.38)
36	24/129 (19%)	0.46 (0.30 – 0.70)	0.47 (0.31 – 0.71)
University/Tech/Post-grad Education			
No	55/191 (29%)	ref	
Yes	73/210 (35%)	1.21 (0.90- 1.61)	
Failure to meet basic needs (food, water, housing), last 12 months			
No	55/156 (35%)	ref	
Yes	73/245 (30%)	0.85 (0.63 – 1.13)	
Gender and Sexual Identity			
Homosexual men	83/219 (38%)	ref	ref
Hetero/Bisexual men	18/79 (23%)	0.54 (0.35-0.84)	0.73 (0.44 – 1.20)
Transgender women who have sex with men	25/89 (28%)	0.74 (0.51-1.08)	0.83 (0.56 - 1.24)
Role practiced during anal sex			
Insertive Only	15/89 (17%)	ref	ref
Receptive Only	39/128 (30%)	1.81 (1.06- 3.07)	1.61 (0.85 – 3.04)
Both	74/184 (40%)	2.39 (1.46 – 3.91)	2.06 (1.18 – 3.59)
AUDIT score			
7	70/220 (32%)	ref	ref
8	58/181 (32%)	1.00 (0.76 – 1.34)	1.00 (0.76 – 1.32)
No. of male or transgender sex partners, last 3 months (quartiles)			
0 to 2	42/120 (35%)	ref	
3 to 5	38/117 (32%)	0.93 (0.65 -1.33)	
6 to 10	21/66 (32%)	0.91 (0.59 -1.40)	

Variables	Prevalence of New STIs 128/401 (32%)	Crude Prevalence Ratio (95% Conf. Interval)	Adjusted Prevalence Ratio (95% Conf. Interval)
11 or more	27/98 (28%)	0.79 (0.53 – 1.18)	
Condomless anal intercourse, last 3 months			
No	29/105 (28%)	ref	
Yes	98/292 (34%)	1.22 (0.86 – 1.72)	
Number of unique high-risk venues where anal sex was reported, last 3 months			
0	27/90 (30%)	ref	
1	63/196 (32%)	1.07 (0.74 – 1.56)	
2	21/78 (27%)	0.90 (0.55-1.46)	
3 or more	17/37 (46%)	1.53 (0.96 – 2.45)	

* New STI variable included new HIV infection (participant reporting a negative HIV test result within the 6 months prior to the baseline visit), recent syphilis (an RPR titer of 1:16 confirmed with TPPA) and rectal *Neisseria gonorrhea* and *Chlamydia trachomatis* infections (diagnosed by nucleic acid amplification tests of self-collected rectal swabs).

**
Bold text indicates p-value < 0.05