

RESEARCH ARTICLE

Correlates of condomless anal sex among men who have sex with men (MSM) in Tijuana, Mexico: The role of public sex venues

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Abstract

Condomless anal sex between male partners is the primary risk factor for HIV transmission among men who have sex with men (MSM). Correlates of condomless anal sex have been well-studied in developed countries, but they have received less attention in lower-to-middle income countries (LMIC), where MSM are often subject to stigma, discrimination, intolerance, and even the criminalization of same sex behavior. In Mexico, a LMIC where traditional views on homosexuality are common, HIV prevalence among MSM is high (16.9%), yet little research has been conducted on the correlates of condomless anal sex in this high-risk population. The present study examined correlates of condomless anal sex among 201 MSM recruited in Tijuana, Mexico, with a focus on the role of public sex venues in relation to sexual risk behavior. Eligibility requirements were: biologically male, 18 years of age or older, resident of Tijuana, and self-reported anal or oral sex with a male partner in the past year. Participants completed an interviewer-administered, demographic and psychosocial survey, and were tested for HIV and syphilis. A hierarchical multiple linear regression model was tested to identify correlates of condomless anal sex. Thirty-eight percent of participants ($N = 76$) reported condomless anal sex with a male partner in the past 2 months. Higher levels of condomless anal sex were associated with higher levels of depressive symptoms, greater sexual compulsivity, and more frequent seeking out of sex partners in a public venue in the past 2 months. In view of these findings, we recommend the development of multi-level, “combination” interventions, which in the Mexican context should include enhanced condom promotion and distribution, improved availability and access to mental health treatment and counseling services, and expanded HIV/STI testing in public venues.

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Introduction

Research into the correlates of sexual risk behavior among men who have sex with men (MSM) has a decades-long history, as researchers have sought to identify and understand changes in sexual risk behaviors associated with sociocultural and political change as well as with technological and medical advances [1]. The majority of studies have been conducted in developed countries and thus have limited application in low- to middle-income countries (LMIC), where stigma, discrimination, intolerance, and even criminalization of same sex behavior are often more severe [2, 3]; hence, the behavioral, psychological, and contextual correlates of sexual risk behavior are likely to differ.

Mexico ranks eleventh in population among world countries, with an estimated 124 million inhabitants [4]. Although in the past two decades it has undergone rapid social, cultural, economic, and technological change, Mexico continues to meet the criteria for a LMIC. Prevalent social mores in Mexico surrounding sexuality and masculinity tend to be highly traditional [5–7], and stigma associated with homosexuality continues to affect how gay men are treated, with experiences of homophobia and discrimination against MSM being common [8]. In addition, MSM in Mexico have disproportionately high rates of HIV infection (16.9% compared to 0.23% among reproductive age adults)[9], which has contributed to further stigma and discrimination [8, 10].

Research in developed countries and in LMIC has identified a range of psychosocial factors associated with sexual risk behavior among MSM, including psychological vulnerabilities (e.g., depressive symptoms, internalized homophobia, sexual compulsivity), substance use (drugs, alcohol), and impoverished personal and social characteristics, such as low educational attainment and high unemployment [11–15]. The venues where MSM meet their sexual partners have also been identified as a contextual factor that influences sexual risk behavior [16, 17].

Several studies of MSM in high-income countries, including the US and Western Europe, have documented links between depressive symptoms and risky sexual behavior [18–21], including receptive and insertive anal intercourse. In studies of MSM in LMIC, including India and China, clinically-significant depressive symptoms have been identified as a predictor of unprotected anal sex with male partners [12, 15, 22], and a greater number of male partners [23].

Internalized homophobia, which refers to dissatisfaction with being homosexual [24], has also been associated in the US and Europe with sexual risk behavior among MSM [25–28, 29]. In LMIC, including Uganda, Nigeria, and South Africa, internalized homophobia among MSM was associated with unprotected anal intercourse with male partners and HIV infection [3, 11, 30, 31].

Numerous studies have also documented the association between sexual compulsivity and sexual risktaking among MSM in the US and other developed countries [32–36]. In LMIC, at least two studies have reported a relationship between sexual compulsivity and sexual risk behavior among MSM [37, 38].

Studies that link substance use to high levels of risky sexual behavior among MSM in the US are plentiful [19, 36, 39–43]. In LMIC, a strong association between alcohol use and unprotected anal sex among MSM has been well documented [44–48]. In a study of MSM in Tijuana, Mexico, the use of illicit drugs before or during sex was associated with more unprotected anal sex [16].

The relationship between personal and social characteristics of MSM and condomless anal sex both in developed countries and in LMIC has yielded consistent findings; in short, the more impoverished the individual, the more sexual risk behavior [19, 36, 49, 50]. In studies of MSM in LMIC where same sex behavior is highly stigmatized, including Ghana, India,

Thailand, and China, condomless anal sex with men has been associated with younger age, less education, HIV-positive serostatus, and cohabitation with a partner of either sex [15, 48, 51, 52, 53].

Although the frequenting by MSM of public venues for sex with other men has received limited attention, studies in the US and China have documented an association between seeking sex partners in public venues and higher levels of unprotected anal sex [17, 46, 54–57, 58].

The present study examined correlates of condomless anal sex among MSM in Tijuana, Mexico. We focused on condomless anal sex with male partners since it is the primary mode of HIV transmission among MSM in Mexico [59]. Based on previous literature, including studies that report high levels of anti-gay stigma and discrimination in Mexico [6, 7], we hypothesized that greater experiences of condomless anal sex with male partners would be associated with psychological risk factors (e.g., internalized homophobia, depression), substance use, and impoverished personal and social characteristics. We also examined whether the propensity to seek out sex partners in public venues predicts greater experiences of condomless anal sex above and beyond the contribution made by the factors just mentioned. Because of the lack of information on the use of public sex venues by MSM in LMIC, we also examined descriptive data on the frequency and types of sexual activities and substance use that occurred in public settings. Identifying correlates of condomless anal sex among MSM in Tijuana has the potential to inform the development of sexual risk reduction programs for MSM in the border region and elsewhere in Mexico, as well as in other LMIC.

The current study differs from a previous study based on these data where we reported a relationship between number of syndemic factors (i.e., co-occurring psychosocial factors), and sexual risk behavior, as well as the attenuation effect of “outness” about having sex with men [60]. Although our definition of syndemic conditions included some of the same psychosocial variables that were used in the current analyses, our previous work did not address the relationship between public venues and sexual risk behavior, while taking into account the effects of psychosocial and substance use factors.

Methods

Participants

These analyses used data gathered from a sample of 201 MSM who were recruited for a study of HIV prevalence and related risk factors among MSM in Tijuana, Mexico during 2012–2013. To be eligible, participants had to: be biologically male, at least 18 years of age, and a resident of Tijuana; and report having anal or oral sex with a male partner in the past year. The recruitment method used was respondent-driven sampling (RDS). RDS uses peer referral, a dual incentive system, and a mathematical approach with probability weights to adjust for non-random sampling biases [61]. Six seeds were selected to initiate RDS recruitment, and four more were eventually added to bolster recruitment. Seeds were diverse with respect to age, ethnicity, socioeconomic status, and sexual orientation. Each received three numbered coupons to refer MSM in their social network to the study, and an incentive of \$5 US was paid for each referral that resulted in enrollment of an additional participant [62]. All but one seed were productive; the nine productive seeds resulted in an average of 19 referrals (SD = 34.9; Median = 6.5; range = 1 to 113).

In addition to receiving his own set of coupons to refer further potential participants, each peer recruit who enrolled was paid \$20 US for a two-hour, face-to-face interview using a standardized survey at the offices of the Agencia Familiar Binacional (AFABI), a community-based HIV services organization located in central Tijuana. A face-to-face interview was chosen over computer-assisted self-interviewing because the research team wanted direct feedback

from participants on the survey, which was to be used in a future, large-scale study of this risk population. Interview topics included socio-demographics, drug and alcohol use, mood, sexual risk behavior, STI history, and HIV/STI knowledge as well as childhood and adulthood experiences of stigma, homophobia, discrimination, and violence. After receiving pre-test counseling, participants also provided a finger-stick blood sample for rapid testing for HIV (Advanced Quality HIV Test Kits, Intec Products, Inc., Xiamen, China) and syphilis (Advanced Quality Anti-TP, Intec Products, Inc., Xiamen, China). Post-test counseling was then provided, as was antibiotic treatment for participants who received a positive syphilis result. Positive HIV results were confirmed through an additional (venous) blood sample that was sent to the San Diego County Public Health Laboratories (SDCPHL) for confirmation via immunofluorescence assay.

Measures

Number of condomless anal sex acts with male partners. MSM were asked to report the number of times during the past 2 months that they (a) engaged in anal sex with a male partner and (b) used a condom for anal sex with a male partner. A summary variable, total number of condomless anal sex acts with male partners in the past 2 months, was calculated by subtracting (b) from (a). This was defined as the dependent variable in the analyses.

Personal and social characteristics. Participants reported their age, number of years of formal education, marital status, sexual orientation, employment status, income, living situation, HIV serostatus, and whether they self-identify as a sex worker.

Substance use factors. For each item in a list of 13 illicit drugs (e.g., marijuana, cocaine, methamphetamine), participants were asked if they had used that drug in the past month. A dichotomous variable was calculated to represent use of at least one illicit drug in the past month (1 = yes, 0 = no). Severity of alcohol use during the last year was measured by the Alcohol Use Disorders Test (AUDIT-10) [63, 64].

Psychological risk factors. Depressed mood was measured using the 21-item Beck Depression Inventory (BDI), which has undergone extensive reliability and validation studies ($\alpha = 0.81$) [65, 66]. The 10-item Sexual Compulsivity Scale was used to measure “obsessive preoccupations with sexual acts and encounters” ($\alpha = 0.92$) [67, p.588]. The 9-item internalized homophobia (IHP) scale [24, 68, 69] measures “dissatisfaction with being homosexual and desire to become heterosexual” ($\alpha = 0.89$) [24, p. 2]. Mean scores were computed for sexual compulsivity and internalized homophobia, and a summary score was computed for Beck Depression.

Venues used by participants to seek out male sex partners. Participants were presented with a list of commercial and public venues where men can go to meet male sexual partners. Commercial venues included the following: bathhouse, sauna, adult movie theatre, dark room, bar, night club or disco, café. A public venue was defined as a park, public restroom, bus station, canyon, alley, or open space. For each venue, participants were asked, “In the past two months, did you go to a (venue) with the intention of meeting male sex partners?” (1 = yes, 0 = no). Two dichotomously-scored variables were created to represent the locations where MSM sought out male sex partners in the past 2 months: public venue (1 = yes, 0 = no); commercial venue (1 = yes, 0 = no).

Statistical analyses

We first examined frequency distributions for all variables. Two that had positively-skewed distributions (i.e., “total number of unprotected anal sex acts” and “total number of sex partners in the past 2 months”) were log-10 transformed. A hierarchical multiple linear regression

model predicting number of condomless anal sex acts with male partners was then tested. In a previous study using the same data, homophily and clustering by respondent, recruitment chain, geographic area and common-recruiter cluster levels were evaluated using one-way ANOVA [62]. We found no effect of sampling method (i.e., clustering) on these data; thus, unweighted data were used in the present analyses. The dependent variable (total number of condomless anal sex acts) was regressed on four blocks of variables: personal and social characteristics (Step 1), substance use factors (Step 2), psychological risk factors (Step 3), and venues used to meet male sex partners (Step 4).

Ethical statement

This protocol was reviewed and approved by the UCSD Human Research Protections Program and the Ethics Committee of Universidad Autónoma de Baja California. All participants provided written informed consent. All procedures were conducted in accordance with the Helsinki Declaration.

Results

Participant characteristics

Approximately 97% of participants self-identified as gay or bisexual (63.5% and 33.0%, respectively). The average age was 29.7 (SD = 8.7, median = 28, range 18–65), 49% had a high school education or greater, 82% were never married, 18% had a male spouse or steady partner, 60% were employed, and 54.5% reported an average monthly income of > 3500 pesos (> \$197 USD). The majority lived alone or with another person who was not a sex partner (33.7% and 39.2%, respectively). Twenty-four percent ($n = 48$) reported having a female sex partner in the past 2 months. Among those with a female partner, 58% ($n = 28$) reported having anal sex with their female partner in this time period. Two MSM were previously diagnosed HIV-positive and 33 were newly diagnosed in this study, resulting in a HIV prevalence of 17.4% (35/201) (see [Table 1](#)).

Use of public venues by MSM to meet male sex partners in Tijuana

Twenty-three percent ($N = 46$) reported going to a public venue in the past 2 months with the intention of meeting male sex partners. Eighty-five percent of MSM who sought out male sex partners in a public venue succeeded in meeting one there. The average number of sex partners that participants reported meeting in a public venue in the past 2 months was 7.6 (SD = 11.6, range 1 to 50). Approximately 60% of participants reported that they had not only met their sex partner in the public venue but also had sex with him there. Such men reported engaging in the following sex acts at the venue: insertive anal sex without a condom (57.9%), receptive anal sex without a condom (52.6%), received oral sex without a condom (73.7%), gave oral sex without a condom (52.6%), group sex with other men (35.3%). Twenty-eight percent of men who had sex in a public venue reported being drunk during their sexual encounter, and 33% reported being high on drugs. Among those who reported using drugs in connection with sex in a public venue, the most frequently used drug was methamphetamine.

Hierarchical linear regression predicting condomless anal sex with male partners

In Step 1, personal and social characteristics accounted for less than one percent of the variance in the dependent variable (DV) ($R^2 \Delta = .006$). No variables were statistically significant at this step. In Step 2, substance use factors contributed an additional 1% of variance

Table 1. Baseline characteristics of men who have sex with men (MSM) in Tijuana, Mexico (N = 201).

	N	Percent ^a
Personal and social characteristics		
Age (Mean, SD)	29.7	8.7
Sexual orientation		
Gay	127	63.5
Bisexual	66	33.0
Heterosexual	7	3.5
Living arrangement (lives with male spouse or steady vs. other)	35	17.6
Education (high school or more vs. less than high school)	97	48.3
Employment (employed vs. not employed)	120	60.0
Marital status (never married vs. other)	157	80.1
Average monthly income (> 3500 pesos vs. ≤3500 pesos)	105	54.5
Had a previous HIV-positive test result	2	1.0
HIV serostatus via rapid test result (HIV-positive vs. HIV-negative)	35	17.4
Self-identifies as a sex worker	28	14.6
Had female sexual partner ^b	48	24.0
Psychological risk factors		
Sexual compulsivity (Mean, SD)	1.74	0.62
Depressive symptoms (Mean,SD)	10.6	7.8
Internalized homophobia (Mean, SD)	2.1	0.72
Sexual risk behavior		
Number of steady or regular partners ^b (Mean, SD)	1.4	2.4
Number of casual sex partners ^b (Mean, SD)	3.0	5.8
Number of anonymous partners ^b (no money exchanged)(Mean, SD)	1.7	5.5
Number of exchange for sex partners ^b (Mean, SD)	2.4	8.0
Total number of sex partners ^b (Mean, SD)	7.1	13.7
Number of anal sex acts with male partners in past 2 months (Mean, SD)	18.8	22.4
Number of unprotected anal sex acts with male partners ^b (Mean, SD)	6.4	13.9
Number of vaginal sex acts with a woman ^b (Mean, SD) (n = 45)	14.8	21.3
Number of unprotected vaginal sex acts with a woman ^b (Mean, SD) (n = 45)	9.6	21.2
Number of anal sex acts with a women ^b (Mean, SD) (n = 46)	8.7	20.6
Number of unprotected anal sex acts with a woman ^b (Mean, SD) (n = 46)	6.0	19.5
Substance use		
Used illicit drugs ^c	83	41.3
AUDIT-10 ^d	7.9	8.1
Hazardous drinking (AUDIT-10 ≥ 8) ^d	90	45.0
Number of different drugs used (lifetime) (Mean, SD)	1.7	2.0
Injected drugs ^b	4	2.0
Used alcohol before or during sex ^b	83	41.3
Used drugs before or during sex ^b	24	12.6
Partner seeking venues		
Sought out sex partners in public venue ^b	46	22.9
Sought out sex partners in commercial venue ^b	93	46.3

^aBased on valid percent;

^bIn past 2 months;

^cIn the past month;

^dIn past year

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($R^2 \Delta = .007$). None of the substance use variables yielded statistical significance. In Step 3, psychological factors accounted for an additional 10% of the variance in condomless anal sex acts ($R^2 \Delta = .097$). MSM who scored higher on sexual compulsivity reported more acts of condomless anal sex with male partners in the past 2 months ($\beta = 0.197, p < .05$). Also, more condomless anal sex acts with male partners in the past 2 months was associated with higher scores on depressive symptoms ($\beta = .208, p < .01$). Internalized homophobia was not associated with number of condomless anal sex acts. In the fourth and final step, two venue types that participants reported using to meet male sex partners accounted for approximately 3% of the variance in condomless anal sex ($R^2 \Delta = .028$). As hypothesized, MSM who sought out male sex partners in public venues reported significantly more acts of condomless anal sex with male partners in the past 2 months ($\beta = .182, p < .05$). Thus, in the final model, more acts of condomless anal sex with male partners in the past 2 months were independently associated with greater sexual compulsivity, more depressive symptoms, and seeking out sex partners in public venues (see Table 2). Because almost one-quarter (24%) of our sample reported having sex with both men and women in the past two months (MSMW), we repeated our

Table 2. Number of condomless anal sex acts with male partners in the past 2 months regressed on personal and social characteristics (Step 1), substance use factors (Step 2), psychological risk factors (Step 3) and venues used to meet sex partners (Step 4) among men who have sex with men in Tijuana, Mexico (N = 197)^a.

	Step 1		Step 2		Step 3		Step 4	
	beta	sr ²	beta	sr ²	beta	sr ²	beta	sr ²
Sexual orientation (gay vs other)	.047	.002	.070	.004	.052	.002	.083	.005
Age (in years)	-.036	.001	-.035	.001	-.077	.005	-.058	.003
Living arrangement (living with male spouse/steady partner vs other)	-.050	.002	-.047	.002	-.032	.001	-.023	.001
AUDIT-10 ^b			.017	.000	-.062	.003	-.067	.004
Use of illicit drugs ^c (y/n)			.084	.006	.058	.003	.038	.001
Beck Depression					.208**	.033	.221**	.038
Sexual compulsivity					.197*	.029	.174*	.022
Internalized homophobia					-.077	.004	-.065	.003
Sought out sex partner(s) in public venue ^d (y/n)							.182*	.028
Sought out sex partner(s) in commercial venue (e.g., bathhouse/adult theater/ bar/nightclub ^d (y/n)							-.053	.002
Constant	.390**		.326*		.138		.073	
R ²	.006		.013		.110		.139	
R ² change	.006		.007		.097***		.028*	
F (df)	0.37 (3,193)		0.50 (5,191)		2.92** (8,188)		2.99** (10,186)	

beta = standardized regression coefficient;

† p < .10

*p < .05;

**p < .01;

***p < .001 (2-tailed tests)

^a Four cases missing data;

^bIn the past year;

^cIn past month;

^dIn the past 2 months

sr² = the proportion of variance explained in the dependent variable (DV) by a specific independent variable

R² = proportion of variance in the DV explained by the regression model

R² Δ = proportion of variance in the DV accounted for by the block of variables at that step in the regression

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hierarchical regression analysis with 48 MSMW cases excluded. The substantive findings did not change. In a separate sensitivity analysis, we examined the potentially confounding effects of HIV-positive (HIV+) serostatus on the outcome by excluding the 35 HIV+ MSM (33 newly diagnosed HIV+ and 2 previously identified HIV+) from the regression analyses. With HIV+ MSM excluded, depressive symptoms were no longer significant in relation to the outcome; however, the association between condomless anal sex and all of the other correlates remained unchanged. The loss of significance for depressive symptoms is most likely attributable to reduced statistical power associated with the smaller sample size.

Discussion

In our RDS-recruited sample of MSM in Tijuana, Mexico, 38% of participants reported condomless anal sex with a male partner in the past 2 months. Although direct comparisons are made difficult by varying time frames, this estimate falls within the range of estimates for condomless anal sex reported for MSM in other LMIC [44, 47, 48, 70, 71]. Higher levels of condomless anal sex were associated with more depressive symptoms, higher sexual compulsivity scores, and partner-seeking in public venues. As hypothesized, seeking partners in public venues was significantly associated with condomless anal sex, even after controlling for psychological risk factors, substance use, and personal and social characteristics.

Psychological risk factors accounted for the largest proportion of variance in sexual risk behavior. Within the psychological domain, depressive symptoms had the strongest association with condomless anal sex. The link between depressive symptoms and sexual risktaking has been documented in previous studies of MSM [19, 21, 22]; however, the causal pathways underlying this relationship are not fully understood. Potential pathways include substance use, escape or avoidant coping, low self-efficacy for condom negotiation, impaired decision-making, and impaired ability to plan for safer sex encounters [72–76]. Future studies of MSM in Mexico should examine these pathways as well as others that may be unique to the local culture and risk environments (e.g., social isolation, loneliness, fewer gay community attachments).

Based on clinical cutpoints for the BDI total score [77], 20% of our sample met criteria for moderate to severe depression (i.e., BDI score ≥ 17). The association between clinically-significant depressive symptoms and condomless anal sex puts depressed MSM at higher risk for HIV/STI infection [19]. MSM whose depressive symptoms tend to worsen in the aftermath of episodes of sexual risk behavior may also be at increased risk for suicidal thoughts and self-harm [78]. Local governments and federal agencies in Mexico would be well advised to scale up treatment services that are responsive to the mental health needs of MSM. Being MSM or gay in a culture that stigmatizes and discriminates against same-gender sexual behaviors may be at the root of depressive symptomatology. Future research should seek to identify social, psychological, economic, and cultural antecedents of depressive symptoms.

Higher sexual compulsivity scores were also associated with more condomless anal sex.

This finding has been documented with consistency in samples of gay and bisexual men as well as among male clients of female sex workers in Tijuana [33, 34, 79]. Previous studies have also found that sexual compulsivity co-occurs with other psychosocial and behavioral risk factors, including illicit drug use, substance use before or during sex, polydrug use, depressive symptoms, and childhood sexual abuse [34, 80–82]. In a study of MSM in a rural region of the US, Satinsky et al. [83] found a positive association between sexual compulsivity and partner-seeking in highly sexualized venues, including public cruising spots. As suggested by Parsons and Halkitis [57], seeking partners in public venues requires little planning and thus may be an ideal location for acting upon compulsive sexual urges. Overall, our data support the conclusion that sexual risk reduction interventions for MSM in Mexico should address sexual

compulsivity as a risk factor that may co-occur with other psychosocial risk factors [34]. Also, as others have noted, sexually compulsive behavior varies in intensity between individuals, ranging from mildly problematic to serious disorders meeting DSM criteria [84]. Our data indicate the need for health care providers in public and private clinics in Mexico to screen for sexually compulsive behaviors by routinely asking patients if they have experienced sexual thoughts, urges or behaviors that cause them personal distress or that negatively affect aspects of their life, such as job, health, relationships [85]. Psychological treatments, including behavioral and cognitive techniques, should be made available to individuals who report distress or exhibit clinically significant levels of sexually compulsive behavior [32, 84].

This study also found a strong relationship between seeking male partners in public venues and condomless anal sex in the past 2 months. Previous research conducted mostly in the US indicates that characteristics associated with partner-seeking in public venues include substance use, sexual compulsivity, psychological distress, sex trading, HIV-positive serostatus, and degree of “outness” [17, 54, 56, 57]. To date, little is known about the characteristics of MSM who seek partners in public venues in Tijuana, Mexico. Because many of these venues are in secluded outdoor areas and thus not easily accessed by outreach workers, it is questionable whether HIV prevention programs can be effectively implemented in them, whether in Tijuana or elsewhere in Mexico. Programs are thus needed to reach MSM in public areas that are unfamiliar and sometimes concerning to outreach workers. One possible approach would be to train peer outreach workers who are familiar with and frequent these public areas to distribute information on free HIV testing and other HIV/STI prevention services to persons they encounter. Moreover, since sex in public places has been associated with less condom use for anal sex and greater use of substances among MSM [16, 46], future studies should examine the acceptability of antiretroviral (ARV) pre-exposure prophylaxis (PrEP) products (oral pills or topic gels) as an alternative user-controlled HIV prevention method. Although PrEP is not currently available in Mexico, studies that examine acceptability and identify barriers to uptake and adherence in this high-risk population are warranted.

Future research should attempt to identify the characteristics of MSM who seek out sex partners in public venues and detail the frequency and types of sexual activities that occur in these settings. Findings from the present study indicate that most sexual behavior in public venues was high-risk (58% reported insertive anal sex without a condom; 53% reported receptive anal sex without a condom). A significant proportion of such behavior also involved stimulant use, alcohol intoxication, or both.

Overall, the findings from this study are potentially useful in terms of developing a screening tool to identify MSM who are at high risk for engaging in condomless anal sex (e.g., elevated depressive symptoms, sexually compulsive, seek partners in public venues) so that interventions, including sexual risk reduction counseling and regular HIV testing, can be recommended to them by health care providers. Despite the potential usefulness of these findings for HIV prevention and intervention, we call for future research to identify the full range of social, legal, political, and other factors that influence the decision to seek out partners in a public venue. For example, some researchers have called for wider investigation of the role of policing practices in relation to partner seeking and sexual risk behaviors in public venues [86, 87]. This study has several limitations. Because it was a single-site study, our findings cannot be generalized to MSM in the rest of Mexico or in other LMIC. Also, the cross-sectional design does not permit us to assess causality in the relationships between predictor variables and condomless anal sex. The retrospective and self-reported nature of our data also has the potential to bias this study’s findings. In particular, we believe that drug use may have been underreported, especially when compared with reports of drug use among Latino MSM in the adjacent county of San Diego, California [88]. Also, this study did not ask participants about their use of the

internet for meeting male sex partners. This is a notable shortcoming, since other studies have shown that MSM who meet partners over the internet are more likely to engage in sexual risk behavior than those who do not meet partners this way [89, 90]. Moreover, we did not ask whether participants used private venues to meet partners, such as invitation-only sex parties, which have been linked to high-risk sexual behavior [91], nor did we inquire about participants' sexual activities in other non-public venues such as homes or hotel rooms [17]. As previously mentioned, research has documented the association between a number of personal and social characteristics and condomless anal sex among MSM; however, only a limited number of these variables could be included in our regression model due to sample size. Future studies should aim for larger sample sizes so that a wider range of these variables (e.g., education, income, STI history) can be examined in relation to condomless anal sex. The smallness of our sample also prevented us from conducting separate analyses for MSM and MSMW that might otherwise have yielded interesting results, since previous research has shown significant differences between the two groups. For example, MSMW in LMIC have higher rates of inconsistent use of condoms with male partners, greater overall use of alcohol and illicit drugs, and higher likelihood of sex trading than men who have sex only with men (MSM) in the same countries [92, 93]. Future studies could examine the correlates of sexual risk behavior separately for MSM and MSMW, particularly in LMIC where gay stigma and discrimination are known to influence sexual identity and practices [94]. Moreover, the high rate of sex with women (24%) and the high levels of unprotected vaginal and anal sex with female partners among MSMW calls for more research and development of targeted interventions for this subpopulation of men in LMIC. Finally, this study did not include transgender persons, a group that is at high risk for HIV/STIs yet remains understudied around the globe [8, 95]. Enhanced understanding of the correlates of sexual risk behavior among transgender persons will help to inform the development of much needed, tailored prevention interventions and treatment services.

Conclusions

The finding that more than one-third of MSM in Tijuana reported condomless anal sex in the past 2 months should be a matter of serious concern to public health authorities, given the relationship between this high-risk behavior and increased risk for contracting HIV/STIs [96]. Clearly, evidence-based approaches are needed to target the behavioral and psychological processes that influence high-risk sexual behavior in MSM. Currently, few such approaches are available in Mexico or in other LMIC [97]. To maximize their effectiveness, prevention programs should be culturally sensitive and address multiple and often co-occurring psychosocial factors [15, 98]. The confluence of psychological risk factors prevalent among MSM (i.e., depression, sexual compulsivity) with the propensity to seek out high-risk public venues for sex, calls for multi-level, "combination" interventions designed to reduce sexual risk behavior. Mayer et al. [99] refer to "prevention packages with culturally-tailored components" (p.6) that in the Mexican context would ideally include enhanced promotion of condom use and distribution of condoms, improved availability of and access to mental health treatment and counseling services, and expanded HIV/STI testing in public venues. Such interventions would also ideally address prevailing social conditions in Mexico, including poverty, homophobia, discrimination and violence against MSM [100–102].

Supporting information

S1 Data File. Data for study on correlates of anal sex among MSM in Tijuana, Mexico.
(SAV)

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