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## In Peru, reporting male sex partners imparts significant risk of incident HIV/STI infection: all men engaging in same-sex behavior need prevention services

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### Abstract

**Background**—Detailed information on the sexual behavior of bisexual, non-gay identified men and the relationship between same-sex behavior and HIV/STI incidence are limited. This study provides information on the sexual behavior with male partners of non-gay identified men in urban, coastal Peru and the relationship of this behavior with HIV/STI incidence.

**Methods**—We analyzed data from 2146 non-gay identified men with a baseline and then two years of annual follow-up, including detailed information on sexual behavior with up to 5 sex partners, to determine characteristics associated with bisexual behavior. Discrete time proportional hazards models were used to determine the effect of self-reported sex with men on subsequent HIV/STI incidence.

**Results**—Over the three study visits, sex with a man was reported by 18.9% of men, 90% of whom also reported sex with a female partner. At baseline, reported bisexual behavior was associated with other sexual risk behaviors such as exchanging sex for money and increased risk of HIV, HSV-2, and gonorrhea. The number of study visits in which recent sex with men was reported was positively correlated with risk of other sexual risk behaviors and incident HIV, HSV-2, and gonorrhea. Recent sex with a man was associated with increased HIV/STI incidence,

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HR 1.79 (95% CI 1.19 – 2.70), after adjusting for socio-demographics and other sexual risk behaviors.

**Conclusions**—Given the prevalence of recent sex with men and the relationship of this behavior with HIV/STI incidence, interventions with non-gay identified men who have sex with men and their partners are warranted.

### Keywords

Bisexual men; Men who have sex with men; sexual risk behavior; HIV/STI prevention; Peru

## Introduction

From the outset of the HIV epidemic in Peru, HIV has been concentrated among gay-identified men who have sex with men (MSM) and male-to-female transgender women (1, 2), research and prevention programs have primarily focused on these groups. Most studies have not targeted bisexual or non-gay identified MSM in their samples. Those who are included are not representative as they are enrolled using convenience sampling methods with bisexual men who congregate and socialize with gay-identified men (3, 4). Other bisexual men or non-gay identified MSM are often not included in these studies because they do not participate in the same social spaces or activities as gay-identified MSM.

A salient perception among Latin Americans is that HIV/STI risk is associated with a gay or 'trans' sexual identity instead of same sex sexual behavior. This identity-based linkage has been shown to limit the adoption of safer sex behaviors among non-gay identified MSM (5, 6). Non-gay identified MSM are considered a neglected population at high risk for HIV infection (7), they are also more likely to report concurrent female sex partners than gay-identified MSM (8).

Interventions directed toward men who have sex with men and women (MSMW) and non-gay identified men are needed, but the necessary information to design these interventions based on detailed behavioral data are lacking (9). Better descriptions of sexual behavior among these men are needed to determine their risk and their place within sexual networks to begin to design targeted interventions (10–12). Additionally, studies assessing the relationship of this behavior with HIV/STI incidence as well as data outside of the US/Europe are particularly lacking (12).

This study focuses on a group of non-gay identified, socially marginalized men, referred to as *esquineros* or corner men, from low-income *barrios* in coastal Peru. These men are of interest given their higher risk for HIV/STIs (13) and frequent bisexual behavior (14). Several issues remain unanswered, such as if their sexual risk behaviors change over time, including their reports of sex with men. This study focuses on describing the sexual behavior of this population and its association with HIV/STI incidence over the course of a two-year HIV prevention study.

## Methods

These data are from the Peru site of a community randomized phase III HIV/STI prevention trial, which has been described elsewhere (15–17). Briefly, three high-risk sub-populations were identified ethnographically and recruited for participation from venues of high social interaction within low-income *barrios*. The sample included all of the population ethnographically identified as belonging to the three sub-populations of interest. The three sub-populations were 1) *esquineros*, young, under or un-employed non-gay identified men often involved in drug use or sales within the *barrio*; 2) women who defied societal norms

by spending time in the streets with the *esquineros* and 3) gay-identified or male-to-female transgender women. Only the *esquineros* are included in this analysis.

The intervention was not effective in reducing sexual risk behavior or STI infection among the *esquineros* (18, 19). The trial lasted 24 months and had assessment visits at 0, 12, and 24 months that included a behavioral assessment and testing for HIV/STIs. The behavioral assessment collected information regarding socio-demographics, alcohol and drug use, and sexual risk behavior including detailed information on the participants' last 5 sex partners.

The study only collected data from participants who gave written informed consent to participate and the study was approved by the Committee on Human Research of the University of California, San Francisco; University of California, Los Angeles; and Cayetano Heredia University of Peru.

### Laboratory analysis

After completing pre-test counseling, participants were asked to provide urine and whole blood samples for diagnosis of HIV (EIA: BioRad and Biomerieux; WB: BioRad), HSV-2 (Herpes Select), syphilis (RPR with TPPA confirmation), gonorrhea (Roche PCR) and Chlamydia (Roche PCR) at each study visit.

### Variables used

Data from the behavioral and laboratory assessments collected at each study visit are analyzed. For the descriptive analyses, the dichotomous variable of reporting a male partner or not at each study visit (0, 12, and 24 months) was based on the sex partner specific questions. Based only on data collected at the baseline visit, *esquineros* were also categorized into men reporting sex only with men (MSM), sex only with women (MSW) and sex with men and women (MSMW). Additionally, *esquineros* were further categorized based on never reporting sex with men, reporting sex with a man at one study visit, and reporting this behavior at two or three study visits. Most sexual risk behavior data was based on the detailed questions regarding the last five sex partners in the past 6 months. The question regarding the exchange of sex for money or gifts was asked with regard to any sex partner in the past 3 months. Sex was defined as either anal or vaginal sex. We also assessed sex without a condom in general and by the partner's sex as well as sex without a condom with non-stable partners, again in general and by the partner's sex.

The biological outcome measure is incident STI at the 12 or 24 month visit, defined as a new case of HIV, HSV-2, syphilis, gonorrhea or Chlamydia. Treatment was offered for all treatable STIs (syphilis, gonorrhea, and Chlamydia) at each study visit for those participants testing positive, over 90% received treatment from the study; all cases of gonorrhea and Chlamydia at subsequent visits were treated as incident cases. For syphilis incidence, a new syphilis case was defined as a four-fold increase in RPR titer and test-of-cure visits were conducted to monitor treatment. As participants could have an incident STIs at both follow-up visits, both cases from participants with incident STIs at multiple study visits are included.

### Data analysis

We conducted two comparative analyses, the first to assess differences in socio-demographics, sexual risk behaviors, and STI/HIV prevalence between MSW, participants reporting sex only with women (MSW), sex with men and women (MSMW), and sex with only men (MSM) at baseline. Both the 3-group comparison and each 2-group comparisons were conducted. In the second analysis, differences in socio-demographics, sexual risk behaviors, and STI/HIV incidence between participants reporting sex with a man never vs.

at one study visit, vs. at two or three study visits were assessed. These comparative analyses used chi-square tests with Fisher's exact test when appropriate, Kruskal-Wallis equality-of-populations rank test, and Wilcoxon rank-sum tests.

For the analysis of STI incidence, discrete time proportional hazard models were used. This model was chosen as information on incident STIs were collected at yearly study visits and are not related to the timing of a specific event. This model also uses a person-period database allowing for multiple events for each person, as participants could experience more than one incident STI. The model also adjusts for within-individual correlation using cluster adjusted command standard errors taking into account the multiple observations on most subjects. We took two multivariate modeling approaches, the first included potential confounding variables based on our theoretical model. The second used a nested model approach with forward selection including variables that improved the overall model fit based on likelihood ratio testing.

## Results

### Population Description

At baseline, the study enrolled 2146 *esquineros*. Of these men, 1847 (86.1%) returned at 12 months and 1699 (79.1%) at 24 months. The basic characteristics of this population have been described previously (13, 20); briefly these are primarily single (66.6%), young men (median age 22, IQR 20–26), with high school education (49.0%), most of whom do not have steady work (88.8%) and some have food insecurity (35.9%).

### Reporting sex with a man during the study

Sex with a male partner in the past 6 months was reported by 12.5% at baseline, 8.1% at 12 months and 7.2% at 24 months. Longitudinally, 18.9% of men reported ever having sex with a man, with 14.5% reporting this behavior once, 2.7% reporting it twice and 1.7% at all three study visits. Although the behavior decreases after baseline, this does not appear to be associated with not returning for subsequent study visits or with reporting fewer sex partners. There was no difference comparing *esquineros* in reporting sex with men at the baseline visit between those who did and did not return for the final study visit (12.5% vs. 12.6%,  $p=0.98$ ). Most of the men who reported having sex with a male partner also report sex with female partners (96.1% of men reporting sex with a man at one study visit, 84.2% of men reporting sex with a man at two study visits, and 44.4% of men reporting sex with a man at all three study visits also report sex with female partners).

### Associations with bisexual or homosexual behavior at baseline

At baseline, bisexual or homosexual behavior was associated with younger age, being single, not having stable work, and having been previously tested for HIV infection. Bisexual or homosexual behavior was also significantly associated with all of the sexual risk behaviors assessed. Additionally, for most of the sexual risk variables assessed the MSMW reported more risky behavior than the MSW and the MSM (see Table 1). The only sexual risk behavior that was higher among MSM was having sex without a condom with a male partner; however, this appears to be related to having a stable partner as the prevalence of reporting sex without a condom with a non-stable male partner was higher among MSMW than among MSM. Despite the higher risk behavior among MSMW, those reporting only male partners had higher STI prevalence at baseline for all STIs except Chlamydia, which was highest among the MSMW.

The comparison of the MSMW to the MSM, the MSMW to the MSW yielded similar results to the comparison of the three groups together. Conversing the MSW and MSM were more

similar. Comparing MSMW to MSM stable work, having an HIV test prior to the study, and herpes infection were non-significant, while having unprotected sex in the past 3 months was significantly different (p-value 0.002). The comparisons between MSW and MSMW are significant for all of the same variables as the 3-group comparison; except for herpes, syphilis, and recent syphilis infection which were non-significant. Many fewer variables were significantly different comparing the MSW to the MSM, marital status, receiving VCT prior to the study, having unprotected sex in the past 3 months, and all of the STIs other than Chlamydia and gonorrhea were all significantly different.

### Associations with reporting sex with a man at multiple study visits

In bivariate analysis, reporting sex with a man during the study was associated with younger age, being single, not having stable work, and having been previously tested for HIV infection. Additionally, sexual risk behaviors associated with reporting sex with a man during the study included using drugs and alcohol prior to sex, exchanging sex for money or other goods, having a greater number of sex partners and having sex without a condom with a non-primary partner. Finally, incident HIV, HSV-2 and gonorrhea infection were also associated with reporting male partners more frequently (see Table 2). For many of these variables, there is increased risk for those men who report having male partners at two or three visits in comparison with only at one study visit. For all significant variables, the trend test for an increase in these behaviors or STI/HIV incidence with reporting sex with a man at an increasing number of study visits was also statistically significant.

### Reporting sex and HIV/STI incidence

Longitudinally, almost half of the men had an STI over the course of the study. Almost 30% were STI positive at one visit, 14.7% were positive at two visits and 2.9% were positive at all three study visits. The overall STI/HIV cumulative incidence rate was 10.3%. The incidence of Chlamydia was 6.1%, gonorrhea was 0.8%, syphilis was 0.7%, HIV was 0.4%, and HSV-2 was 4.0%. The effect of reporting sex with a man was significantly associated with having an incident STI infection, HR 1.91 (95% CI 1.27 – 2.88). This relationship remained virtually unchanged after adjusting for socio-demographics and sexual risk behaviors (HR 1.79 (95% CI 1.19 – 2.70)) (See Table 3). When using a nested model approach, age was the only variable other than reporting a male partner to significantly improve model fit. Reporting a male partner remained significantly associated with STI incidence after adjusting for age (HR of 1.92, 95% CI 1.28 – 2.88).

There were some refusals to report sex of each partner; these refusals were higher at baseline than at subsequent visits. In all, there were 259 (4.5% of sex partners reported) refusals to report the sex of a partner at baseline, 107 (2.6%) refusals at 12 months and 13 (0.4%) at 24 months. The number of sex partners reported did decrease slightly overtime, from a mean 2.65 at baseline to 2.04 at 24 months (p-value <0.001). Looking at the 123 *esquineros* who refused to answer the question about partner's sex with at least one partner at baseline; refusal was associated with reporting more partners (p-value <0.001), but not to loss to follow-up (p-value 0.711) or STI incidence (p-value 0.283). Refusal was not statistically associated with reporting sex with a man (p-value 0.103). However, refusers may have been somewhat less likely to report this behavior (7.7% vs. 12.8% among non-refusers).

## Discussion

Reporting sex with men was common among the *esquineros* and is the primary behavioral risk factor for incident STI infection in this population. These results match the epidemiology of HIV/STIs in Peru as both are concentrated among MSM. Therefore, it

follows that for this non-gay identified population having sex with a male partner or partners places individuals at higher risk of STIs than other sexual risk behaviors.

These data also show that having sex with a man may be primarily a transient event among *esquineros*; most *esquineros* who report male partners do so only once and this behavior is more common among younger men. However, there is a small group who consistently report male partners and they are also less likely to report bisexual behavior and had the highest STI incidence. The men reporting bisexual behavior at baseline reported significantly more sexual risk behavior than either the MSW or MSM, consistent with past data about MSMW reporting riskier sexual behavior (9, 21). Although the *esquineros* with only male partners at baseline have higher STI/HIV prevalence, their risk behavior is often lower than that of the bisexual men. This may be related to partnership characteristics among men who have sex only with men or only with women vs. men who have sex with both men and women. This was shown in a previous analysis with this population, in which sex only with male partners or only with female partners was associated with more permanent relationships and lower sexual risk behavior than among bisexual men (14). Overall there is a high prevalence of unprotected sex occurring in this population and interventions to improve condom use would be beneficial.

The *esquineros* also have a relatively high burden of STI infection. Although this STI burden is highly associated with sex with men, the prevalence and incidence among the men with only female partners is not negligible, especially for Chlamydia infection. HIV testing was highly associated with sex with men; approximately 23% of these men reported having an HIV test prior to the study. It is promising that men with male sex partners report more HIV testing as this may indicate higher HIV risk perception and/or more access to testing. However, more testing and HIV/STI services are needed for this population.

This analysis shows that epidemiologically, having sex with a man increases risk of acquiring an STI/HIV among the *esquineros*. The social and contextual reasons behind *esquineros* men reporting sex with men are varied and can be seen in other reports regarding this population. Reasons behind sex with men may include sexual attraction to men, although this may be overtly denied or closeted, a lack of access to female partners especially at younger ages and exchanging sex for money or other goods including drugs and alcohol (22–25). Sex with men may also occur in more unstable situations as these behaviors go against social norms and often lead to stigmatization, discrimination and even violence; therefore, they may occur in public places or when under the influence of alcohol/drugs decreasing the ability to consistently use condoms and increasing the risk of these encounters (22, 24). Increasing our understanding of these contextual and social aspects of sex between men including non-gay identified men can help to shape more effective prevention interventions in the future.

This analysis has several limitations. First, for those participants with more than 5 sex partners we do not have detailed information on the sex of these partners and therefore may be misclassifying men who had male sex partners, but not among the last 5 sex partners. However, only 7% of men reported more than 5 sex partners. Additionally, there was no question about sexual orientation. The lack of a question on sexual orientation is mitigated by the ethnographic recruitment, which included only men who were not self and community identified as 'gay.' The STI outcome may also be an underestimate of incidence if participants sought medication to treat or spontaneously cleared additional infections (26) between study visits.

The refusal to report a partner's sex was an additional limitation; however, refusals decreased over time and were not related to drop-out. It appeared that these refusals might

have been related to participant burn out during the lengthy interview. During the follow-up interviews, participants were more forthcoming with information about their sex partners, although slightly fewer sex partners were reported over time. These data were also collected in the context of an HIV/STI prevention trial; however, the intervention was ineffective overall and within this sub-population (18, 19) and the intervention did not try to decrease same-sex behavior. Additionally, the generalizability of these findings may be limited as they may be linked to the sexual norms of Peru and/or Latin America. Although there are many reports of non-gay identified MSM worldwide (27–31), the proportion of MSM that are non-gay identified and their sexual behavior may vary culturally.

These data demonstrate increased HIV and STI incidence associated with having sex with men among this population. It does appear that MSM recognize their increased risk and seek HIV testing more than MSW; however, this does not appear to be translate into other protective behaviors. Notably, condom use even with non-stable partners is low and should be targeted by interventions. Additionally, these data show the prevalence of male-male sex among non-gay identified men. The HIV/STI prevention and care efforts sector should work toward recognizing this diversity and include outreach to non-gay identified men who have sex with men. The MSM under study are not conventionally included in studies or interventions for MSM, who have been the focus of HIV/STI prevention efforts in Peru. Their risks for STI/HIV and sexual risk behavior are important for both their male and female partners, but are also indicative of the potential sexual network linkages between the these partners that is unaddressed by current HIV/STI prevention programs. As the intervention under study was unsuccessful at increasing condom use and decreasing STI incidence among this population, innovative prevention strategies will be needed to address their HIV/STI risk.

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**Table 1**Bivariate analysis of bisexual behavior at baseline among *esquineros*

	Sex only with women n= 1868 (87.5%)	Sex with men and women n= 193 (9.0%)	Sex only with men n= 75 (3.5%)	3 group comparison
<b>Demographics (baseline)</b>				p-value *
Age median (IQR)	22 (20 – 26)	21 (19 – 23)	21 (20 – 26)	<0.001 *
Civil Status				<0.001
Single	64.6%	76.2%	90.7%	
Married or Living w/Partner	30.4%	16.6%	8.0%	
Widowed/Separated/Divorced	5.0%	7.2%	1.3%	
Graduated High School	49.1%	46.6%	54.7%	0.497
Has stable work	23.3%	11.4%	20.0%	0.001
Food insecurity				0.296
At least once a week	19.4%	25.4%	21.3%	
At least once a month	16.1%	14.0%	10.7%	
Rarely	41.6%	42.5%	41.3%	
Never	22.9%	18.1%	26.7%	
Received VCT prior to the study	22.3%	29.0%	36.0%	0.004
<b>Risk Behavior</b>				
Used drugs	29.8%	38.9%	21.3%	0.007
Used alcohol before sex	64.9%	87.1%	72.0%	<0.001
Used drugs before sex	17.3%	33.7%	12.0%	<0.001
Exchanged money for sex	12.7%	48.2%	17.6%	<0.001
No. of sex partners, last 6 months	1 (1 – 3)	3 (2 – 5)	1 (1 – 3)	<0.001 *
Had sex without a condom, 3 months	80.8%	86.5%	69.9%	0.008
Had sex without a condom with a male partner, 3 months	-	49.2%	69.9%	0.003 †
Had sex without a condom with a female partner, 3 months	80.8%	80.3%	-	0.875 †
Had sex without a condom with a non-stable partner, 3 months	56.1%	81.4%	58.9%	<0.001
Had sex without a condom with a male non-stable partner, 3 months		48.7%	58.9%	0.137 †
Had sex without a condom with a female non-stable partner, 3 months	56.1%	71.0%	-	<0.001 †
<b>Prevalent STIs/HIV</b>				
HIV	0.3%	2.1%	6.7%	<0.001
Herpes	12.8%	15.5%	23.0%	0.027
Syphilis	2.5%	1.0%	6.8%	0.038
Syphilis (RPR 1:8 / TPPA+)	1.5%	0.0%	5.4%	0.010
Gonorrhea	0.4%	1.6%	0.0%	0.122
Chlamydia	5.5%	7.3%	2.7%	0.371

P-values determined by chi-square with Fisher's exact test when appropriate, unless otherwise specified

\* P-value calculated using the Kruskal-Wallis equality-of-populations rank test

† P-value calculated for a 2-group comparison only

**Table 2**Bivariate analysis of reporting a male sex partner during the two years of follow-up among *esquineros*

	Never sex with a man n=1741 (81.2%)	Sex with a man at one study visit n=311 (14.5%)	Sex with a man at 2 or 3 study visits n=93 (4.3%)	p-value
<b>Demographics (baseline)</b>				
Age median (IQR)	22 (20–26)	21 (19–25)	21 (19–25)	0.003*
Civil Status				<0.001
Single	64.2%	74.6%	83.9%	
Married or Living w/Partner	30.8%	19.9%	10.8%	
Widowed/Separated/Divorced	5.0%	5.5%	5.4%	
Graduated High School	49.0%	47.9%	52.7%	0.721
Has stable work	24.0%	14.8%	14.0%	<0.001
Food insecurity				0.817
At least once a week	19.6%	21.9%	22.6%	
At least once a month	15.6%	16.4%	15.1%	
Rarely	41.7%	42.4%	39.8%	
Never	23.1%	19.3%	22.6%	
Received VCT prior to the study	22.0%	26.7%	36.6%	0.002
<b>Risk Behavior (ever during the study)</b>				
Used drugs	35.8%	47.0%	41.9%	0.001
Used alcohol before sex	80.1%	91.6%	94.6%	<0.001
Used drugs before sex	22.3%	39.6%	39.8%	<0.001
Exchanged money for sex	22.4%	44.0%	60.2%	<0.001
Total No. of sex partners (all three visits)	4 (3–6)	6 (4–9)	8 (5–12)	<0.001*
Had sex without a condom, 3 months	94.0%	94.9%	92.5%	0.673
Had sex without a condom with a male partner, 3 months	-	52.4%	75.3%	<0.001
Had sex without a condom with a female partner, 3 months	94.0%	88.1%	59.1%	<0.001
Had sex without a condom with a non-stable partner, 3 months	71.6%	87.8%	88.2%	<0.001
Had sex without a condom with a male non-stable partner, 3 months	-	47.6%	73.1%	<0.001
Had sex without a condom with a female non-stable partner, 3 months	71.6%	76.5%	55.9%	0.001
<b>Incident STIs/HIV</b>				
HIV	0.3%	0.7%	2.7%	0.021
Herpes	3.4%	4.6%	13.4%	<0.001
Syphilis	0.7%	1.1%	0.0%	0.705
Gonorrhea	0.5%	1.8%	3.2%	0.005
Chlamydia	5.6%	8.1%	7.5%	0.237

P-values determined by chi-square with Fisher's exact test when appropriate, unless otherwise specified

\* P-value calculated using the Kruskal-Wallis equality-of-populations rank test

**Table 3**Sex with men as a risk factor for Incident STI/HIV infection among *esquineros*

	<b>Incident STI/HIV HR (95% CI)</b>
Sex with men	1.91 (1.27 – 2.88)
Sex with men adjusted for Age, marital status, and stable work	1.90 (1.26 – 2.86)
Sex with men adjusted for Sexual Risk Behaviors *	1.83 (1.22 – 2.75)
Sex with men adjusted for Age, marital status, stable work, and Sexual Risk Behaviors *	1.79 (1.19 – 2.70)
Sex with men adjusted for Age, based on a nested model approached using LRT **	1.92 (1.28 – 2.88)

\* Drug use, using alcohol prior to sex, using drugs prior to sex, exchanging money for sex, number of sex partners, and reporting unprotected sex with a female non-primary partner

\*\* Likelihood Ratio Testing, including stepwise the variable that most improves the LR of the model