

HIV, syphilis and heterosexual bridging among Peruvian men who have sex with men

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Objectives: To determine prevalence of and risk factors associated with HIV and syphilis seropositivity and estimate incidence of HIV infection among Peruvian men who have sex with men (MSM) and characterize behaviors of men who report sex with both men and women ('bridgers').

Design: Cross-sectional study of MSM in Lima, Peru.

Methods: Four-hundred and fifty-one MSM (of whom 442 responded to the question regarding sexual orientation) recruited through street outreach. Each was interviewed and underwent serologic testing for syphilis and HIV, including the less sensitive enzyme immunoassay test to estimate HIV incidence.

Results: Overall, HIV and syphilis prevalence were 18.5% and 16.0%, respectively, with highest prevalence among cross-dressers (33.3% and 51.1%, respectively). The estimated overall HIV seroincidence was 11.2% per year (95% confidence interval, 4.8–23.6). Overall, 47.1% of men reported ever having sex with a woman: 78.6% of men self-identifying as heterosexuals, 85.1% of bisexuals, 35.5% of homosexuals, and 12.5% of cross-dressers. Of these, 26.5% were 'bridgers', of whom 55% reported two or more female partners during the last year. 'Bridgers' were less likely to have always used condoms during the past year for vaginal sex (17%) than for insertive anal sex with men (25.5%).

Conclusions: Among MSM in Peru, HIV and syphilis prevalence and HIV incidence were high, especially among cross-dressers. The high prevalence of bisexuality and low rates of consistent condom use, especially with female sexual partners indicates potential HIV transmission into the heterosexual population.

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Introduction

Heterosexual intercourse represents the main mode of HIV transmission in most developing countries [1].

However, in some Latin American and Asian countries [2,3], men who have sex with men (MSM) make up a disproportionately high number of reported AIDS cases. As of May 2000, MSM accounted for 42% of the

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total cumulative AIDS cases reported in the Andean Region (Peru, Colombia, Venezuela, Ecuador, and Bolivia) and had the highest prevalence rates [3]. The true proportion of AIDS cases attributable to same sex contact among men is likely to be higher given the strong social stigma against homosexuality, as reflected by the substantial proportion of MSM in Latin cultures including Peru, who self-identify as 'heterosexual' [4–6]. In Lima, a representative sample of men undergoing routine pre-employment physical examination, found that 11% reported previous sex with men, and 87% of these men also reported sex with women [7]. This current study and our study in the Dominican Republic [5] show that MSM comprise highly distinct subpopulations, based on their social strata, marital status, sexual identities, and communities of reference. Many of these populations reported distinctive sexual practices and sexual networks.

The declining male-to-female ratio of reported AIDS cases, together with the increasing number and visibility of women living with HIV infection in Latin America, have been characterized as 'heterosexualization' of the epidemic in the region. However, in Central America and the Andean Region, the epidemic still disproportionately affects traditional high-prevalence groups such as MSM, and sexual 'bridging' from bisexual men to women may account for a substantial proportion of ongoing heterosexual transmission, similar to injecting drug use contributing to transmission of HIV to heterosexuals in North America. A study of pregnant women presenting to a public maternity hospital in Lima found that most HIV-infected women were probably infected by their stable partners, and 27% of the HIV-seropositive male partners of those HIV-infected pregnant women reported sexual contact with other men, which was highly associated with HIV infection [odds ratio (OR), 6.9%; 95% confidence interval (CI), 1.4–35.5] [8].

The present study was undertaken to: (i) determine the prevalence of and risk factors associated with HIV infection and syphilis seroreactivity; (ii) use the less sensitive enzyme immunoassay (EIA) to estimate the incidence of HIV infection; (iii) characterize the behaviors of men who reported sex with both men and women in the past year ('bridgers'); and (iv) describe the diversity of self-reported sexual identity among MSM in Lima, Peru.

Methods

Study population and design

In 1996, men over 17 years of age who reported sexual contact with another man during the previous year were eligible to participate, regardless of prior HIV

testing history or HIV serostatus. A team of 30 experienced outreach workers/peer educators, representing the different subgroups of the diverse MSM community in Lima, recruited potential participants, through street-based outreach in settings where MSM meet, snowball referrals (i.e., referral by an individual already participating in the study), referrals from community facilities that provide services for MSM, posters and flyers in MSM-oriented businesses, and announcements in the press.

This study was approved by the Human Subjects Review Committee of the University of Washington and by the National AIDS and STD Control Program of Peru. Participants gave written informed consent. Trained counselors used a standardized questionnaire administered through face-to-face interviews. Participants underwent serologic testing for syphilis and HIV and genital and rectal examination. Men with symptomatic bacterial sexually transmitted diseases (STD) were provided syndromic treatment at no charge.

Laboratory methods

Antibodies to *Treponema pallidum* were measured by the quantitative Venereal Disease Research Laboratory (VDRL) test with confirmatory testing provided by *T. pallidum* hemagglutination (TPHA). Syphilis seroreactivity was defined as VDRL titer $\geq 1:1$ and reactive TPHA. Antibodies to HIV were detected by ELISA (Abbott Laboratories, Chicago, Illinois, USA) and repeatedly reactive sera were confirmed using Western blot (Cambridge Biotech, Worcester, Massachusetts, USA). The less sensitive EIA, utilizing methods previously described [9], was performed to detect persons with recent HIV infection among those who had positive HIV serologies. This less sensitive EIA has been validated only for HIV subtype B; 720 of 733 (98.2%) serum samples from HIV-infected persons from Peru, Colombia, Ecuador, Bolivia, Chile, and Paraguay were subtype B [10].

Statistical methods

Bivariate comparisons of selected variables used *t* tests for continuous variables and chi-squared tests or Fisher's exact tests for categorical variables. Variables found to be significantly associated ($P \leq 0.05$) or with an OR < 0.75 or > 1.5 were entered stepwise into a multivariate logistic regression model to identify independent predictors. The appropriate functional forms of the covariates in the logistic regression model were determined by generalized additive modeling [11]. Influence diagnostics, such as drop-1 case, and robust methods were used to examine for outliers and influential observations [12]. HIV incidence and CI were estimated using the formula described previously by Janssen et al. [9].

Results

Of 451 men who agreed to participate, over 90% were recruited by one-on-one street-based outreach or 'snowball' referral. Median age of participants was 25 years (range, 18–56 years), and the majority (91%) were single and of low socioeconomic status (median income of \$US100 per month). One-half reported fewer than 11 years of formal education.

Demographics, behavior characteristics, and HIV and syphilis seroreactivity according to self-perceived sexual identity

Of the 442 participants who responded to the question regarding sexual orientation, 6.3% self-identified as heterosexual, 22.9% as bisexual, 60% as homosexual and 10.9% as cross-dresser (Table 1). Interestingly, men from all four subgroups of sexual identity acknowledged ever having had sex with women, ranging from

Table 1. Associations between sexual self-identity and selected variables.^a

| | Heterosexual (n = 28) | Bisexual (n = 101) | Homosexual (n = 265) | Cross-dresser (n = 48) |
|---|--------------------------|-----------------------|-------------------------|---------------------------|
| Mean age (years ± SD) | 24.3 ± 5.4 | 24.8 ± 5.2 | 24.8 ± 5.0 | 28.0 ± 9.9 |
| Years of education [n (%)]** | | | | |
| 0–6 | 1 (3.6) | 2 (2.0) | 3 (1.1) | 11 (22.9) |
| 7–11 | 19 (67.9) | 45 (44.6) | 110 (41.5) | 31 (64.6) |
| > 11 | 8 (28.6) | 54 (53.5) | 152 (57.4) | 6 (12.5) |
| Mean income last month (\$US ± SD) | 109 ± 104 | 114 ± 104 | 131 ± 207 | 129 (± 116) |
| Ever had sex with a woman [n (%)]** | 22 (78.6) | 86 (85.1) | 94 (35.5) | 6 (12.5) |
| Number of female partners last year [n (%)]** | | | | |
| 0 | 9 (32.1) | 36 (35.6) | 238 (89.8) | 47 (97.9) |
| 1 | 6 (21.0) | 27 (26.7) | 18 (6.8) | 1 (2.1) |
| ≥ 2 | 13 (46.4) | 38 (37.6) | 9 (3.4) | 0 (0) |
| Condom usage with women last year (n = 112) [n (%)]* | | | | |
| Never | 7 (36.8) | 21 (32.3) | 18 (66.7) | 1 (100) |
| Sometimes | 10 (52.6) | 31 (47.7) | 4 (14.8) | 0 (0) |
| Always | 2 (10.5) | 13 (20.0) | 5 (18.5) | 0 (0) |
| Number of male sexual partners last year [n (%)]* | | | | |
| 1 | 11 (39.3) | 15 (14.9) | 48 (18.1) | 5 (10.4) |
| 2–4 | 12 (42.9) | 40 (39.6) | 97 (36.6) | 11 (22.9) |
| ≥ 5 | 5 (17.9) | 46 (45.5) | 120 (45.3) | 32 (66.7) |
| Number of men had insertive anal sex with last year [n (%)]** | | | | |
| 0 | 6 (21.4) | 10 (9.9) | 104 (39.2) | 35 (72.9) |
| 1 | 10 (35.7) | 21 (20.8) | 58 (21.9) | 1 (2.1) |
| 2–3 | 8 (28.6) | 42 (41.6) | 46 (17.4) | 1 (2.1) |
| ≥ 4 | 4 (14.3) | 28 (27.7) | 57 (21.5) | 11 (22.9) |
| Condom use during insertive anal sex last year (n = 287) [n (%)] | | | | |
| None | 6 (27.3) | 19 (20.9) | 36 (22.4) | 1 (7.7) |
| Sometimes | 10 (45.5) | 50 (54.9) | 93 (57.8) | 5 (38.5) |
| Always | 6 (27.3) | 22 (24.2) | 32 (19.9) | 7 (53.8) |
| Number of men had receptive anal sex with last year [n (%)]** | | | | |
| 0 | 20 (71.4) | 48 (47.5) | 27 (10.2) | 0 (0) |
| 1 | 4 (14.3) | 23 (22.8) | 58 (21.9) | 5 (10.4) |
| 2–4 | 3 (10.7) | 18 (17.8) | 106 (40.0) | 13 (27.1) |
| ≥ 5 | 1 (3.6) | 12 (11.9) | 74 (27.9) | 30 (62.5) |
| Condom use during receptive anal sex last year (n = 347) [n (%)] | | | | |
| None | 4 (50.0) | 15 (28.3) | 59 (24.8) | 6 (12.5) |
| Sometimes | 4 (50.0) | 25 (47.2) | 136 (57.1) | 31 (64.6) |
| Always | 0 (0) | 13 (24.5) | 43 (18.1) | 11 (22.9) |
| Received money for sex with a man at least once last year [n (%)]** | 12 (42.9) | 36 (35.6) | 73 (27.5) | 33 (68.8) |
| Has regular partner [n (%)] | 9 (32.1) | 45 (44.6) | 109 (41.1) | 20 (41.7) |
| Used condom last sex with regular partner (n = 173) [n (%)] | 1 (11.1) | 9 (20.9) | 27 (26.2) | 5 (27.8) |
| Ever had HIV test [n (%)]* | 7 (25.0) | 41 (40.6) | 117 (44.3) | 28 (58.3) |
| History of STD ever [n (%)]* | 13 (46.4) | 51 (50.5) | 99 (37.4) | 28 (58.3) |
| Drug use last year (n = 343) [n (%)]* | 3/24 (12.5) | 11/81 (13.6) | 18/200 (9.0) | 11/38 (28.9) |
| Syphilis seroreactive (VDRL ≥ 1 : 1 and TPHA+) [n (%)]** | 1/28 (3.6) | 12/101 (11.9) | 35/261 (13.4) | 23/45 (51.1) |
| Syphilis seroreactive (VDRL ≥ 1 : 16 and TPHA+) [n (%)]** | 0/28 (0) | 2/101 (2.0) | 23/261 (8.8) | 13/45 (28.9) |
| HIV positive [n (%)] ^{a,b} | 2/28 (7.1) | 16/101 (15.8) | 47/261 (18.0) | 15/45 (33.3) |

^aOf the original 451 men who agreed to participate, nine did not self-identify. ^bTwo participants with HIV infection did not self-identify. STD, Sexually transmitted disease; VDRL, Venereal Disease Research Laboratory test; TPHA, *Treponema pallidum* hemagglutination. * $P < 0.05$. ** $P < 0.001$.

12.5% of cross-dressers to 85.1% of bisexuals. A substantial proportion (46.4% of self-identified heterosexuals and 37.6% of bisexuals) reported two or more female partners in the last year. Of those who reported having sex with at least one woman in the last year, only a minority reported always using condoms: 10.5% of heterosexuals, 20.0% of bisexuals, and 18.5% of homosexuals.

All four subgroups reported high numbers (five or more) of male partners in the past year, ranging from 17.9% of heterosexuals to 66.7% of cross-dressers, and commonly reported insertive anal sex during the past year. However, among those who reported insertive anal sex in the last year, always using condoms was low overall and varied from 19.9% among homosexuals to 53.8% among heterosexuals. Receptive anal sex during the past year was reported by a majority of homosexual men, cross-dressers, and bisexual men (89.8%, 100%, and 52.5%, respectively). Notably, 28.6% of self-identified heterosexual men also reported receptive anal sex in the past year. Participants in all four subgroups reported receiving sex for money, with the highest proportions among heterosexuals (42.9%) and cross-dressers (68.8%).

HIV infection and syphilis seroreactivity according to sexual identity

HIV and syphilis seroreactivity were detected in 82 (18.5%) and 71 (16.0%) of 444 participants in whom sera was available, respectively. Less than half (43.7%) of men reported having been tested for HIV antibodies prior to the study, and importantly, only eight men who tested HIV positive reported having previously received a positive result. HIV seroprevalence varied significantly among sexual identity groups (Table 1). Cross-dressers were more likely to be HIV positive than either homosexuals (OR, 2.3; 95% CI, 1.0–4.8) or bisexuals (OR, 2.7; 95% CI, 1.1–6.5). Based on the proportion of HIV-positive men who were non-reactive on the less sensitive EIA, the estimated overall HIV seroincidence was 11.2% per year (95% CI, 4.8–23.6). Syphilis seroprevalence rates paralleled HIV infection rates by self-identified sexual orientation. Cross-dressers were more likely to be syphilis reactive than homosexuals (OR, 6.8; 95% CI, 3.2–14.1) or bisexuals (OR, 7.8; 95% CI, 3.1–19.7). Cross-dressers also had the highest prevalence (28.9%) of VDRL titers indicating recent acquisition or active syphilis ($\geq 1:16$).

Risk markers and risk factors associated with HIV infection

Variables associated with HIV serostatus by bivariate analysis included self-identification as a cross-dresser (compared to self-identified heterosexual men) (OR, 6.5; 95% CI, 1.4–31.1); receptive anal sex with six or more men in the last year (OR, 3.9; 95% CI, 1.8–8.7);

history of a STD in the past year (OR, 2.0; 95% CI, 1.2–3.4); lack of circumcision (OR, 4.1; 95% CI, 1.0–17.5); and reactive syphilis serology (OR, 3.5; 95% CI, 2.0–6.2).

In the multivariate logistic regression analysis, adjusting for other variables, HIV infection was independently associated with receptive anal sex during the last year (OR, 2.2; 95% CI, 1.0–4.6), reactive syphilis serology (OR, 2.9; 95% CI, 1.7–5.1), and history of STD in the past year (OR, 1.8; 95% CI, 1.1–3.0). Lack of circumcision did not remain as a significant correlate in the multivariate model.

In the multivariate logistic regression analysis, syphilis seroreactivity was independently associated with lower educational level (< 11 years of school; OR, 4.3; 95% CI, 1.2–16.7), receptive anal intercourse during the last year (OR, 3.6; 95% CI, 1.2–10.4), history of rectal discharge (OR, 2.6; 95% CI, 1.2–5.3), HIV positivity (OR, 2.5; 95% CI, 1.3–4.6), and self-identification as a cross-dresser (OR, 3.2; 95% CI, 1.5–6.9).

Characteristics related to MSM who were potential 'bridgers'

Of the 451 participants, 334 (74.1%) reported sex exclusively with men ('non-bridgers') and 117 (25.9%) acknowledged sex with both men and women ('bridgers') during the previous year (Table 2). Sixty-four (54.7%) 'bridgers' reported two or more female sexual partners in the last year, 20 (17.1%) reported always using condoms, and 50 (42.7%) reported never using condoms when having sex with women during the last year (data not shown). Importantly, with respect to transmission risk to women, 'bridgers' reported less frequent condom use during the last episode of vaginal sex (36.8%) than during the last episode of insertive (45.9%) or receptive anal sex (43.3%) with men.

Although 'bridgers' were less likely to use condoms with female partners, they had lower prevalence of HIV and syphilis than 'non-bridgers'. HIV infection rates were 11.1% among 'bridgers' and 21.1% among 'non-bridgers' (OR, 2.1; 95% CI, 1.1–5). All 13 of the HIV-seropositive 'bridgers' and 68 out of 69 HIV-seropositive 'non-bridgers' had sera tested by the less sensitive EIA, yielding estimated HIV seroincidence of 7.9% per year (95% CI, 0–22.1) among 'bridgers' and 12.5% per year (95% CI, 4.4–24.9) among 'non-bridgers'. Syphilis reactivity (OR, 1.7; 95% CI, 0.83–3.3) and serologic indication of more recent or active syphilis (VDRL > 1:16) (OR, 2.4; 95% CI, 0.91–10) were more common among 'non-bridgers' than 'bridgers'.

'Bridgers' reported similar numbers of male sexual partners as 'non-bridgers'. Consistent condom use

Table 2. Bivariate association between 'bridging' and selected variables.

| | Men who had sex with men and women in the last year ('bridgers') (n = 117) | Men who had sex with men exclusively in the last year ('non-bridgers') (n = 334) |
|---|--|--|
| Mean age [years (SD)] | 24.9 ± 5.3 | 25.2 ± 6.0 |
| Years of education [n (%)] | | |
| 0–6 | 2 (1.7) | 5 (1.5) |
| 7–11 | 54 (46.2) | 155 (46.4) |
| > 11 | 61 (52.1) | 164 (49.1) |
| Mean income last month (\$US ± SD) | 129 ± 110 | 124 ± 190 |
| Number of male sexual partners last year [n (%)] | | |
| 1 | 21 (17.9) | 59 (17.7) |
| 2–4 | 48 (41.0) | 116 (34.7) |
| ≥ 5 | 48 (41.0) | 159 (47.6) |
| Number of men had insertive anal sex with last year [n (%)]** | | |
| 0 | 19 (16.2) | 137 (41.0) |
| 1 | 27 (23.1) | 65 (19.5) |
| 2–3 | 41 (35.0) | 58 (17.4) |
| ≥ 4 | 30 (25.6) | 74 (22.2) |
| Condom use during insertive anal sex last year (n = 295) [n (%)] | | |
| None | 25 (25.5) | 38 (19.3) |
| Sometimes | 48 (49.0) | 117 (59.4) |
| Always | 25 (25.5) | 42 (21.3) |
| Number of men had receptive anal sex with last year [n (%)]** | | |
| 0 | 57 (48.7) | 40 (12.0) |
| 1 | 17 (14.5) | 74 (22.2) |
| 2–5 | 26 (22.2) | 118 (35.3) |
| > 5 | 17 (14.5) | 102 (30.5) |
| Condom use during receptive anal sex last year (n = 354) [n (%)] | | |
| None | 14 (23.3) | 71 (24.1) |
| Sometimes | 33 (55.0) | 169 (57.5) |
| Always | 13 (21.7) | 54 (18.4) |
| Received money for sex with a man at least once last year [n (%)] | 47 (40.2) | 111 (33.2) |
| Has regular partner [n (%)] | 56 (47.9) | 129 (38.6) |
| Used condom last sex with regular partner (n = 175) [n (%)] | 12 (22.6) | 31 (25.4) |
| History of STD ever [n (%)]* | 63 (53.8) | 131 (39.2) |
| Drug use last year (n = 351) [n (%)] | 13 (14.4) | 30 (11.5) |
| HIV positive [n (%)]* | 13 (11.1) | 69 (21.1) |
| Syphilis seroreactive (VDRL ≥ 1 : 1 and TPHA+) [n (%)] | 13 (11.1) | 58 (17.7) |
| Syphilis seroreactive (VDRL ≥ 1 : 16 and TPHA+) [n (%)]* | 5 (4.3) | 33 (10.1) |

* $P < 0.05$. ** $P < 0.005$. STD, Sexually transmitted disease; VDRL, Venereal Disease Research Laboratory test; TPHA, *Treponema pallidum* hemagglutination.

during insertive sex in the last year was reported by only 25.5% and 21.3% of 'bridgers' and 'non-bridgers', respectively, with comparable rates of consistent condom use during receptive anal sex. In the multivariate model, 'bridgers' were more likely than 'non-bridgers' to report insertive anal intercourse in the last year (OR, 2.3; 95% CI, 1.3–4.1), to currently have a regular sexual partner (OR, 1.6; 95% CI, 1.0–2.6), and to have reported a STD ever (OR, 2.1; 95% CI, 1.3–3.5). 'Bridgers' were less likely than 'non-bridgers' to report receptive anal sex (OR, 0.20; 95% CI, 0.10–0.3) and less likely to be HIV positive (OR, 0.50; 95% CI, 0.20–0.90).

Discussion

This study is the first to correlate risk behavior, particularly bisexuality, with HIV and syphilis rates

among a large and diverse cross-sectional sample of MSM in Lima, Peru. We found HIV and syphilis rates were significantly different among Peruvian MSM, with the highest prevalence rates among cross-dressers and homosexuals. Not surprisingly, a high proportion of MSM who self-identified as heterosexual or bisexual reported both male and female partners. We termed men who reported sex with both men and women in the last year 'bridgers' and found that they reported more insertive anal sex than 'non-bridgers', had comparable numbers of male partners, and a majority of their recent sex with both male and female sexual partners was unprotected. The cross-dressers interviewed in this study reported large numbers of male partners, and receptive as well as insertive anal sex. Based on a previous study of MSM in Peru [13], male partners of cross-dressers are largely heterosexually-identified and also represent an important potential bridge group for spread of HIV and syphilis to the general heterosexual population.

'Bridge populations' have been described in transmission of HIV and other STD. Using sexual network analysis, Morris and colleagues [14] reported that heterosexual Thai men who frequent female commercial sex workers contribute disproportionately to the spread of HIV and other STD to women. Gorbach et al. [15] described the high prevalence of 'active bridging' (defined as unprotected sex with female sex workers and low risk female partners) among heterosexual men in Cambodia and found an association between bridging and STD symptoms.

In other Latin cultures, a substantial proportion of MSM have been reported to self-identify as heterosexual or bisexual, rather than homosexual [4,5,16]. Our behavioral eligibility criteria included sexual behavior in the last year rather than self-reported sexual identity, thus allowing us to gather information on MSM who traditionally might have been excluded if we had enrolled only men who self-identify as homosexual or bisexual.

Previous studies have reported HIV prevalence among MSM in Lima of 11.1% in 1985 [17] and 6.5% in 1988 [18], but were limited by small sample sizes. The current study used more peer outreach-based recruitment strategies, which successfully recruited a diverse sample of study participants and provides an assessment of estimated HIV incidence and prevalence of this diverse sample of MSM in Lima. The estimated HIV seroincidence of 11.2% per year suggests that MSM are being infected at high rate even if the lower bound of the 95% CI (4.8% per year) is closer to the actual HIV incidence.

Not surprisingly, anal sex was a risk factor for being HIV-infected, independent of other variables. Reactive syphilis serology and a reported history of STD ever were also independently associated with HIV seropositivity suggesting that genital ulcer disease and other STD may be important risk factors for HIV transmission among MSM in Peru. While genital ulcer disease is a significant risk factor for heterosexual transmission of HIV, especially in the developing world, few studies have examined this association among MSM, after controlling for sexual behavior. Syphilis seropositivity was found to be a significant correlate of prevalent HIV infection in our study of MSM in the Dominican Republic (adjusted OR, 4.0; 95% CI, 1.4–11.3), after adjusting for sexual behavior [5]. Serologic evidence of syphilis or herpes simplex virus infection and history of syphilis or anogenital herpes have also been independently associated with HIV infection among MSM in studies undertaken in the USA and the Netherlands [19–21].

This study has inherent biases and limitations. First, the recruitment methods relied on convenience sampling

and may not be truly representative of the MSM population in Lima. Second, the cross-sectional design of this study makes it impossible to infer temporal relationships of reported biologic or behavioral risk factors with HIV seropositivity. Third, the sample size of 442 has limited power to estimate HIV incidence [9] as reflected in the wide confidence intervals. However, even the lower bound of the 95% CI for estimated HIV incidence (4.8% per year) is two-fold higher than that observed in contemporaneous cohorts of MSM in the USA [22,23]. While these data were collected in 1996, our recent cohort studies of MSM in 1999–2000 document similar HIV and syphilis prevalence and HIV incidence rates, even after antiretroviral agents have been introduced to a small number of patients in Peru [24].

In summary, this study has identified behavioral profiles among MSM in Peru that are associated with substantially different risks of HIV and syphilis, low rates of and inconsistent condom usage, and potential sexual 'bridging' between MSM and the general population of women. The shape and scope of the HIV epidemic is greatly influenced by the degree of mixing between people with different prevalences of disease and risk behavior. 'Disassortative' mixing between differing risk groups leads to the largest spread [25] of HIV infection and other STD. The most efficient strategies for reducing the spread of the disease are to prevent transmission among those with the highest rates of partner change and to reduce unprotected and disassortative sexual mixing. Prevention of infection among those with the highest rates of partner change has a multiplier effect in terms of preventing many more subsequent, secondary infections [26].

The different behavioral profiles among MSM in Latin America offer both a challenge and an opportunity for innovative prevention and intervention strategies. Prevention strategies should be developed and evaluated to address the dynamic and varied sexual behavior profiles of MSM. Non-stigmatizing prevention efforts should target the most marginalized and vulnerable MSM, such as cross-dressers, who have the highest rate of HIV and syphilis. Prevention services should be coordinated for heterosexuals and MSM to reduce HIV and syphilis transmission rates in bisexual men. Prevention strategies directed at STD control among MSM may help reduce HIV transmission to both their male and female partners.

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