Published in final edited form as:

J Acquir Immune Defic Syndr. 2009 May 1; 51(Suppl 1): S47–S51. doi:10.1097/QAI.0b013e3181a2671d.

High HIV and Ulcerative Sexually Transmitted Infection Incidence Estimates among Men who Have Sex with Men in Peru: Awaiting for an Effective Preventive Intervention

Jorge Sanchez¹, Javier R. Lama¹, Jesus Peinado¹, Andres Paredes², Aldo Lucchetti¹, Kevin Russell³, Tadeusz Kochel³, and Jose L. Sebastian⁴

¹ Investigaciones Medicas en Salud (INMENZA), Lima, Peru

² Hospital Nacional de Policia, Lima, Peru

³ US Naval Medical Research Detachment (NMRCD), Lima, Peru

⁴ National STD and AIDS Control Program, Ministry of Health of Peru, Lima, Peru

Abstract

Background—In the Andean Region, HIV and sexually transmitted infections (STI) are most prevalent among men who have sex with men (MSM), but incidence estimates and associated factors have never been prospectively assessed.

Methods—A cohort of 1056 high-risk HIV-negative MSM in Lima, Peru, was recruited during 1998–2000 (The ALASKA Cohort) and a nested case-control analysis conducted between seroconverters and non-seroconverters, matched 1:3 by age and duration of follow-up for comparison of risk behaviors, acute retroviral symptoms, circumcision, and STI.

Results—During average follow-up of 335 days, 34 men seroconverted, providing a HIV incidence estimate of 3.5/100 person-years (95% CI: 2.3–4.7). High syphilis (9.2/100 person-years, 95% CI: 6.7–10.1) and HSV-2 infection (10.4/100 person-years, 95% CI: 8.6–11.9) incidence estimates were obtained. HIV seroconverters were more likely than men who remained seronegative to report fever ≥ 3 days (46% vs. 7%), to seek medical care (62% vs. 27%), and to have ≥ 1 casual partner (86.2% vs. 74.1%) since their last visit. HIV seroconverters also were more likely to have acquired syphilis or HSV-2 infection (31% vs. 8% among initially HSV-2 seronegative men) while were less likely to be circumcised (4.2% vs. 20.6%, a non-significant difference). In multivariate analysis, incident

Corresponding Author: Dr. Jorge Sanchez, Investigaciones Medicas en Salud (INMENZA), Jr. Jose De La Torre Ugarte 166, Lima 14, Peru, e-mail address: jsanchez@inmensa.org.

Jorge Sanchez (1995–2000) and Jose L. Sebastian (2002 to date) have been Directors of the National STD and AIDS Control Program, Ministry of Health of Peru.

Javier R. Lama, Andres Paredes and Aldo Lucchetti were staff members of the National STD and AIDS Control Program, Ministry of Health of Peru during the study period.

Kevin Russell and Tadeusz Kochel are employees of the U.S. Government. This work was prepared as part of their official duties. Title 17 USC 105 provides that Copyright protection under this title is not available for any work of the U.S. Government. Title 17 USC 101 defines a U.S. Government work as a work prepared by an employee of the U.S. Government as part of that person's official duties.

The opinions and assertions contained herein are the private ones of the writers and are not to be construed as official or as reflecting the views of the Peru Government or U.S. Navy Department or the Naval Service at large.

Study protocols were approved by the University of Washington, US Naval Medical Research Center, and Asociación Civil Via Libre Institutional Review Boards in compliance with all applicable federal regulations governing the protection of human subjects. Participants provided written informed consent.

The findings of this study were presented in part at the 1st IAS Conference on HIV Pathogenesis and Treatment. Buenos Aires, Argentina. July 8–11, 2001. Abstract No. 264.

syphilis or HSV-2 infection (OR: 5.9, 95% CI 1.5–22.7) and sex with any casual partner (OR: 4.8, 95% CI: 0.9–26.2) were associated with HIV seroconversion.

Conclusions—STI that may cause anogenital ulcers are important risk factors for HIV acquisition among high-risk MSM in Lima, a population with a very high HIV incidence estimate. Synergistic interventions focusing in preventing both HIV and HSV-2, like male circumcision, are warranted to be assessed, especially in MSM populations with low levels of circumcision and high incidence estimates of ulcerative STI.

Keywords

homosexual men; Peru; HSV-2 infection; syphilis; HIV infection; incidence

INTRODUCTION

Men who have sex with men (MSM) comprise the largest HIV-infected population in the Andean Region. Between 1996 and 2002, a steady increase in HIV seroprevalence from 18.5% to 22.3% was described among MSM in Lima, Peru, reflecting high HIV incidence estimates,¹ being the lowest 4.8% in 1998.² Furthermore, syphilis and Herpes Simplex Virus type 2 (HSV-2) infection were described as strongly and independently associated with prevalent HIV infection among MSM in Peru.³ Nonetheless, neither HIV nor sexually transmitted infection (STI) prospectively determined incidence estimates, and factors associated with incident infection have been described among MSM in the Andean Region.

Despite widespread promotion of low risk behavior, condom use, and voluntary counseling and testing for HIV and STIs, no other effective HIV prevention strategies focusing on MSM are available. The EXPLORE trial, a phase IIb efficacy trial of a 10-session behavioral intervention showed no significant reduction of HIV incidence when compared with regular counseling.⁴ Recently, among high risk MSM, the HPTN 039 trial has shown that acyclovir suppressive therapy is not effective in reducing HIV acquisition,⁵ whereas, the STEP Study failed to show that a vector vaccine inducing cellular-mediated immune response prevents HIV infection.⁶ Despite recent success of circumcision as a method to reduce HIV,^{7–9} HSV-2 and genital ulcerative disease (GUD)¹⁰ acquisition in heterosexual men, there is still a biological and community equipoise that prevents the implementation of this strategy among MSM. However, its role preventing HIV infection among MSM is worthy of consideration and evaluation given the recent association of uncircumcised status with HIV acquisition into the STEP Study.⁶

In 1998, the Ministry of Health (MoH) of Peru implemented HIV prevention activities for MSM in Lima, including “gay-friendly” primary health care public clinics, where free condoms and lubricants, voluntary HIV counseling and testing, and bacterial sexually transmitted diseases (STD) diagnosis and treatment were provided. To prospectively evaluate both HIV and ulcerative STI incidence estimates and its behavioral and biological correlates, we recruited a cohort of high-risk HIV-negative MSM at these clinics.

METHODS

Study Subjects

From October 1998 through May 2000, five MoH clinics, each located at one of the most densely populated districts of Lima, conducted free HIV and STD screening among adult MSM in Lima. Recruitment and referral of participants were based on “snowball” techniques and outreach by peer educators representing diverse MSM sub-cultures of Lima at previously-mapped venues. At each clinic, a counselor driven interview for demographics and sex

behavior, risk reduction counseling, serologic testing for HIV and syphilis, rectal and pharyngeal *Neisseria gonorrhoeae* microbiological diagnosis and treatment, and urethral discharge and genital ulcer syndromic management,¹¹ were conducted on all participants. HIV-negative MSM, 18 years of age or older were eligible and invited to participate in the cohort if they reported any of the following: 1) STI diagnosed at screening or during the last six months; 2) self-identification as a sex worker; 3) no condom use during the last anal intercourse; 4) anal intercourse with >5 partners in the past 6 months; or 5) sexual partner of an HIV-infected man with condoms not consistently used. In a formative research conducted soon after the study started, participants named themselves as the “ALASKA Cohort”, referring to a very popular Mexican/Spanish pop music singer of 1980s, who is a social movement icon in Latin America for homosexual social equity. Human Subjects Review Committees at the University of Washington, the U.S. Naval Medical Research Center, and Asociacion Civil Via Libre approved the study protocol; participants provided written informed consent.

Study Visit Procedures

Enrolled men were asked to return at every 6 months for a standardized clinical and behavioral interview and STI testing. The behavioral interview included: 1) male sex partner types during the past six months categorized as stable (“men with whom you have a special relationship”) or casual (“men who are not your stable partner(s)”; 2) sexual practices and condom use with each partner type, and 3) the number of female sex partners during the participant’s lifetime and during the past six months. Participants with laboratory-diagnosed STDs or STD syndromes were treated.¹¹ Risk reduction counseling, condoms, and lubricants were provided.

Laboratory Tests

Specimens included: 1) first-void urine for leukocyte esterase test (Multistix®2, Bayer, Elkhart, IN) or microscopy of spun urine for white blood cells; 2) pharyngeal and rectal specimens for culture for *N. gonorrhoeae*; and 3) peripheral blood for detection of antibodies to HIV-1 (ELISA, Vironostika, Organon Tecnica, Durham, NC; and Western blot, Biorad Laboratories, Hercules, CA), *Treponema pallidum* (rapid plasma reagin [RPR], Organon Tecnica, Durham, NC) and HSV-2 (type-specific Western blot¹² performed at the University of Washington on sera from the last visit, and all available earlier samples from HSV-2 seropositive persons to test time of HSV-2 seroconversion).

Case-Control Analysis

Complete behavioral and laboratory data available for HIV-seroconverters were included in a nested case-control study comparing HIV seroconverters to MSM who did not seroconvert during follow-up. Three controls were matched to each case by age (± 1 year) and duration of follow-up since enrollment (± 90 days). If ≥ 3 potential controls were identified, the final three controls were randomly selected.

Statistical Methods

Statistical analyses utilized the Statistical Package for the Social Sciences (SPSS, Chicago, IL). Univariate analyses included Chi-square or Fisher’s exact tests for categorical variables, and parametric and non-parametric tests, as appropriate, for continuous variables. In association with HIV-infection, associated variables with p-values < 0.1 upon univariate analysis were entered into a multivariate stepwise backward enter logistic regression model to predict variables associated with HIV seroconversion.

RESULTS

Cohort enrollment and follow-up

A total of 2061 men were enrolled into the ALASKA cohort and 1056 (51.2%) completed at least one follow-up visit with mean follow-up of 335 (standard deviation, s.d. ± 167) days. Men completing at least one follow-up visit had a higher proportion of circumcision rates, reported more casual male partners and more anal sex with casual partners than men who did not complete a follow-up visit ($p < 0.05$, each comparison), but did not differ significantly by age, reporting a stable partner(s), condom use patterns, history of receipt of money or gifts for sex or history of recent STI syndromes or diagnosis of an STI at enrollment from those who did not complete a follow-up visit (data not shown).

Characteristics of cohort participants

The mean age of men completing ≥ 1 follow-up visit was 26.4 (s.d. ± 6.7) years. Participants reported a median of 4 (range 0–1960) casual male sex partners during the prior six months, and medians of 0 and 2 casual partners with whom they had insertive and receptive anal sex, respectively. Half of men reported always using condoms for receptive and almost one third for insertive anal sex, respectively (Table 1). A total of 22.1% of men reported having had a female sex partner in their lifetime. Receipt of money or gifts for sex in the last six months was acknowledged by 24.4% of men. Circumcised men represented 21.2% of the participants. Self-reported STDs in the past six months were common: 15.5% of men reported urethral discharge, 12.4% genital or anal ulcers, and 3.2% symptoms of proctitis. At enrollment, 21.6% had reactive serologic tests for syphilis; overall, 7.8% had RPR titers $> 1:8$, suggestive of early syphilis. Rectal and pharyngeal gonorrhea were diagnosed in 0.7% and 1.2%, respectively.

Incidence of HIV-1 and Ulcerative STIs

During 971 person-years of observation, 34 men acquired HIV-1 infection, a rate of 3.5/100 person-years (95% confidence interval [CI]: 2.3–4.7). There were 89 incident syphilis cases (either a RPR seroconversion among negative participants at enrollment or a four-fold RPR titer increase among the lowest RPR titer reached after treatment among positive participants at enrollment) providing a rate of 8.4/100-person years (95% CI: 6.7–10.1). Among men who were HSV-2 seronegative at enrollment, the HSV-2 seroconversion rate was 10.4/100 person-years (95% CI: 8.6–11.9).

Symptoms during seroconversion

Since their prior visit, HIV seroconverters more frequently reported symptoms compatible with an acute retroviral syndrome than non-seroconverters, including fever ≥ 3 days duration (46.4% vs. 7.4%), lymph node enlargement (25% vs. 6.2%), or weight loss (42.3 vs. 17.1%, $p < 0.05$, each comparison). Seroconverters were also more likely than controls to report any illness of ≥ 3 days that interfered with daily activities (39.3% vs. 13.6%) or seeking medical care for an illness (62.1% vs. 27.4%, $p < 0.05$, each comparison).

Behaviors

No differences between HIV seroconverters and men who remained seronegative were found for the proportion of having any recent HIV-positive sex partner (4.3% vs. 4.1%) or any recent stable partners (38.5% vs. 51.9%, Table 2). However, HIV-seroconverters reported both more casual partners (median 4) since their last study visit than did HIV-negative men (median 2, $p < 0.01$) and more frequently reported any casual male partner than controls ($p < 0.05$).

Sexually-acquired infections

At enrollment, 42.3% (11/26) of cases and 41.5% (34/82) of controls were HSV-2 seropositive (no significant difference); whereas 27.6% (8/29) of cases and 8% (7/87) controls were positive to syphilis ($p<0.05$). Among initially HSV-2 seronegative men, HSV-2 seroconversion was somewhat more common among cases (30.8%, 4/13) than controls (11.9%, 5/42, $p=0.19$). HSV-2 seroconversion antedated HIV seroconversion by at least 6 months in 3 of 4 HIV seroconverters. Pharyngeal gonococcal infection was detected in 3 (13.0%) of 23 tested cases and in 1 (1.5%) of 67 controls at the last follow-up visit ($p<0.05$); urethral or rectal gonorrhea was not detected in either cases or controls. Nine (31.0%) of 29 HIV seroconverters and seven (8.0%) of 87 controls were identified with incident syphilis infection or HSV-2 infection ($p<0.01$, Table 2).

Circumcision effect

HIV seroconverters were marginally less likely to be circumcised than non-seroconverters (4.2% vs. 17.1%, $p=0.09$, Table 2). Among participants with incident syphilis or HSV-2 infection, HIV seroconversion occurred in 8 out of 13 (61.5%) uncircumcised men, while in 1 out of 2 (50.0%) circumcised men ($p=0.01$). Among participants with neither syphilis nor HSV-2 incident infection, HIV seroconversion happened in 15 out of 73 (20.5%) uncircumcised versus in 0 out of 12 (0%) circumcised men (no significant difference).

Multivariate models

Only recently acquired syphilis or HSV-2 infection (odds ratio [OR] 5.9, 95% CI: 1.5–22.7, $p=0.01$) and sex with any casual partner (OR 4.8, 95% CI: 0.9–26.2, $p=0.06$) remained significantly and marginally associated respectively, with incident HIV-1 infection in a multivariate model.

DISCUSSION

The HIV incidence of 3.5% in this cohort of high-risk MSM in Lima exceeds that observed incidences in high-risk MSM in the United States and Europe,^{13–15} resembling that observed in Brazil,^{16, 17} and confirms that MSM in Lima constitute an important target population for intensified and innovative behavioral and/or biomedical effective prevention interventions. Recently-acquired syphilis or HSV-2 infection and sex with any casual partner were the two significant correlates of HIV acquisition among MSM in this nested case-control analysis. Innovative prevention strategies to be implemented in MSM in Lima need also to target the acquisition of ulcerative STI given the high incidences rates of syphilis and HSV-2 infection, which exceed those described in other settings.^{18, 19}

Combined incident syphilis or HSV-2 infection was almost six times more frequently detected in HIV seroconverters than in men who remained seronegative. Anogenital ulcers provide a ready portal of entry for HIV and in particular, incident HSV-2 infection may enhance HIV susceptibility due to increased duration and frequency of recurrences and sub-clinical HSV-2 reactivation in the first year after HSV-2 acquisition.^{20, 21}

Compared to MSM who remained seronegative, MSM in Peru who acquired HIV more often reported symptoms including fever ≥ 3 days duration, lymph node enlargement, or weight loss, and were more than four-fold more likely to report any illness of ≥ 3 days duration that interfered with daily activities and to have sought medical care for that illness. The high proportion of men with acute retroviral syndrome symptoms and health care-seeking behavior may provide an opportunity for early intervention during high viral load and potentially heightened infectiousness.^{22, 23}

Limitations of this study include modest power to assess interactions between biologic factors (e.g.: lack of circumcision) and sexual practices that may modify the risk of HIV acquisition. Men may have experienced normative pressures concerning the reporting of sensitive behaviors. However, questionnaires were administered prior to knowledge of HIV test results and thus differential recall bias appears unlikely. Men who participated in this cohort represent a very high-risk MSM sub-population in Lima as defined by the entry criteria that visited socialization venues where study recruitment was conducted, who were aware of the availability of the study clinics, and who voluntarily accepted participation. Likewise, MSM perceiving themselves at higher risk for HIV and/or STI acquisition may have been more willing to participate, which would have contributed to the reported higher incidence estimates. Participant retention rates reflected the limited resources for individual-level retention activities in a public funding setting. Using the same entry criteria, posterior more structured cohorts and interventions provided similar HIV incidence estimates,^{5, 6, 24} reflecting a high-risk population in need for an effective preventive intervention. Measured differences between men with and without follow-up were minor but these groups may have differed on other, unmeasured dimensions.

Given the high rates of new HIV and STI infections, our data suggest that MSM in Lima constitute an important target population for intensified and innovative biomedical interventions, and in particular for synergistic prevention strategies to prevent both HIV and ulcerative STI acquisition. While these strategies are being designed and tested, behavioral interventions to increase condom use and reduce the number of casual sex partners, as well as, screening for STI, particularly syphilis and HSV-2, and HIV are clearly needed. HIV testing and symptom recognition to identify HIV seroconverters may reduce secondary HIV transmission. Interventions to prevent and suppress HSV-2 infection may be important to stem the HIV epidemic among MSM in Latin America. Assessing the effect of male circumcision to synergistically prevent HIV and HSV-2 acquisition among MSM is warranted, especially in populations with low levels of circumcision and high incidences of GUD.

Acknowledgments

The authors gratefully acknowledge the mentoring of the University of Washington Center for AIDS Research: Drs. Connie Celum, Jim P. Hughes, Rhoda Ashley-Morrow, Richard Zuckerman, and William Whittington; the contributions of Dr. Lourdes Kusunoki and Mr. Jose Ojeda for project coordination and management; Mr. Martin Lacherre, Mr. Hugo Sanchez and Mr. Roberto Escudero for field coordination and recruitment/retention activities; Mrs. Rosario Leon and Mrs. Julia Campos for information, education and communication activities; the staff of the participating health centers (Asociación Via Libre, Raul Patrucco Health Center, Alberto Barton Health Center, Surquillo Health Center, Tahuantinsuyo Bajo Health Center, Chorrillos I Health Center and San Jose Health Center); and the men who gave their time to participate in this study. Monica Negrete, Gloria Chauca and Gladys Carrion of US NMRCDC provided invaluable laboratory assistance.

Disclaimer: Study was supported by the National STD and AIDS Control Program, Ministry of Health (MoH) of Peru; Ayuda CONTRASIDA, USAID Peru; University of Washington Center for AIDS Research; Fogarty International Center, US National Institutes of Health; and US Naval Medical Research Center Detachment (NMRCDC), Lima, Peru.

References

1. Janssen RS, Satten GA, Stramer SL, et al. New testing strategy to detect early HIV-1 infection for use in incidence estimates and for clinical and prevention purposes. *JAMA* Jul 1;1998 280(1):42–48. [PubMed: 9660362]
2. Sanchez J, Lama JR, Kusunoki L, et al. HIV-1, sexually transmitted infections, and sexual behavior trends among men who have sex with men in Lima, Peru. *J Acquir Immune Defic Syndr* Apr 15;2007 44(5):578–585. [PubMed: 17279049]

3. Lama JR, Lucchetti A, Suarez L, et al. Association of herpes simplex virus type 2 infection and syphilis with human immunodeficiency virus infection among men who have sex with men in Peru. *J Infect Dis* Nov 15;2006 194(10):1459–1466. [PubMed: 17054077]
4. Koblin B, Chesney M, Coates T. Effects of a behavioural intervention to reduce acquisition of HIV infection among men who have sex with men: the EXPLORE randomised controlled study. *Lancet* Jul 3–9;2004 364(9428):41–50. [PubMed: 15234855]
5. Celum C, Wald A, Hughes J, et al. Effect of aciclovir on HIV-1 acquisition in herpes simplex virus 2 seropositive women and men who have sex with men: a randomised, double-blind, placebo-controlled trial. *Lancet* Jun 21;2008 371(9630):2109–2119. [PubMed: 18572080]
6. Robertson, M.; Mehrotra, D.; Fitzgerald, D., et al. Efficacy results from the STEP Study (Merck V520 Protocol 023/HVTN 502): A phase II test-of-concept trial of the MRKAd5 HIV-1 gag/pol/nef trivalent vaccine. Paper presented at: 15th Conference on Retroviruses and Opportunistic Infections; Feb 3–6, 2008; Boston, MA, US. Abstract No. 88LB
7. Auvert B, Taljaard D, Lagarde E, Sobngwi-Tambekou J, Sitta R, Puren A. Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: the ANRS 1265 Trial. *PLoS Med* Nov;2005 2(11):e298. [PubMed: 16231970]
8. Bailey RC, Moses S, Parker CB, et al. Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomised controlled trial. *Lancet* Feb 24;2007 369(9562):643–656. [PubMed: 17321310]
9. Gray RH, Kigozi G, Serwadda D, et al. Male circumcision for HIV prevention in men in Rakai, Uganda: a randomised trial. *Lancet* Feb 24;2007 369(9562):657–666. [PubMed: 17321311]
10. Tobian, A.; Srwadda, D.; Quinn, T., et al. Trial of male circumcision: Prevention of HSV-2 in men and vaginal infections in female partners, Rakai, Uganda. Paper presented at: 15th Conference on Retroviruses and Opportunistic Infections; Feb 3–6, 2008; Boston, MA, US. Abstract No. 28LB
11. PROCETSS. Guía Nacional de Manejo de Casos de Enfermedades de Transmisión Sexual. Lima: Ministerio de Salud del Perú; 1998.
12. Ashley RL, Militoni J, Lee F, Nahmias A, Corey L. Comparison of Western blot (immunoblot) and glycoprotein G-specific immunodot enzyme assay for detecting antibodies to herpes simplex virus types 1 and 2 in human sera. *J Clin Microbiol* Apr;1988 26(4):662–667. [PubMed: 2835389]
13. Kuiken CL, van Griensven GJ, de Vroome EM, Coutinho RA. Risk factors and changes in sexual behavior in male homosexuals who seroconverted for human immunodeficiency virus antibodies. *Am J Epidemiol* Sep;1990 132(3):523–530. [PubMed: 2389756]
14. Buchbinder SP, Douglas JM Jr, McKirnan DJ, Judson FN, Katz MH, MacQueen KM. Feasibility of human immunodeficiency virus vaccine trials in homosexual men in the United States: risk behavior, seroincidence, and willingness to participate. *J Infect Dis* Nov;1996 174(5):954–961. [PubMed: 8896495]
15. Tabet SR, Krone MR, Paradise MA, Corey L, Stamm WE, Celum CL. Incidence of HIV and sexually transmitted diseases (STD) in a cohort of HIV-negative men who have sex with men (MSM). *AIDS* Oct 22;1998 12(15):2041–2048. [PubMed: 9814873]
16. Harrison LH, do Lago RF, Friedman RK, et al. Incident HIV infection in a high-risk, homosexual, male cohort in Rio de Janeiro, Brazil. *J Acquir Immune Defic Syndr* Aug 15;1999 21(5):408–412. [PubMed: 10458622]
17. Suttmoller F, Penna TL, de Souza CT, Lambert J. Human immunodeficiency virus incidence and risk behavior in the 'Projeto Rio': results of the first 5 years of the Rio de Janeiro open cohort of homosexual and bisexual men, 1994–98. *Int J Infect Dis* Dec;2002 6(4):259–265. [PubMed: 12718818]
18. van der Bij AK, Stolte IG, Coutinho RA, Dukers NH. Increase of sexually transmitted infections, but not HIV, among young homosexual men in Amsterdam: are STIs still reliable markers for HIV transmission? *Sex Transm Infect* Feb;2005 81(1):34–37. [PubMed: 15681720]
19. Jin F, Prestage GP, Mao L, et al. Transmission of herpes simplex virus types 1 and 2 in a prospective cohort of HIV-negative gay men: the health in men study. *J Infect Dis* Sep 1;2006 194(5):561–570. [PubMed: 16897652]
20. Benedetti JK, Zeh J, Corey L. Clinical reactivation of genital herpes simplex virus infection decreases in frequency over time. *Ann Intern Med* Jul 6;1999 131(1):14–20. [PubMed: 10391810]

21. Koelle DM, Benedetti J, Langenberg A, Corey L. Asymptomatic reactivation of herpes simplex virus in women after the first episode of genital herpes. *Ann Intern Med* Mar 15;1992 116(6):433–437. [PubMed: 1310837]
22. Jacquez JA, Koopman JS, Simon CP, Longini IM Jr. Role of the primary infection in epidemics of HIV infection in gay cohorts. *J Acquir Immune Defic Syndr* Nov;1994 7(11):1169–1184. [PubMed: 7932084]
23. Cates W Jr, Chesney MA, Cohen MS. Primary HIV infection--a public health opportunity. *Am J Public Health* Dec;1997 87(12):1928–1930. [PubMed: 9431278]
24. Whittington, WLH.; Sanchez, J.; Davis, A., et al. High prevalence of HSV-2 infection and high rates of partner concurrency among Peruvian men who have sex with men (MSM). Paper presented at: 15th Biennial Congress, International Society for Sexually Transmitted Diseases Research; 2003; Ottawa, Canada. Abstract No. 0693

Table 1

Age, Sexual Behaviors, Circumcision Status and Sexually Transmitted Diseases Among 1056 HIV-Negative MSM Followed Prospectively in Lima, Peru

Age—mean (SD)	26.4 (±6.7)
Sexual behavior, last 6 months	
Total casual male sex partners (SP) -- median [range]	4 [0–1960] *
# SP, insertive anal sex	0 [0–715] *
# SP receptive anal sex	2 [0–1960] *
Always used condoms with casual male partners	
With receptive anal sex	49.9%
With insertive anal sex	29.9%
Had female partner (ever)	22.1%
Received money/gifts for sex	24.4%
Circumcision	21.2% *
Sexually Transmitted Diseases	
Self-report STI (last 6 months)	
Urethritis	15.5%
Anal or genital ulcer	12.4%
Proctitis	3.2%
Syphilis	
Reactive RPR	21.6%
RPR titer >1:8	7.8%
Gonorrhea	
Rectal	0.7%
Pharyngeal	1.2%

* Greater values than participants lost-to-follow-up (P<0.05)

Table 2

Participant Characteristics, Sexual Behaviors, and Sexually Transmitted Infections prior to Seroconversion Among MSM who Seroconverted to HIV (Cases) Compared to non-HIV Seroconverter MSM (Controls)

Factor	# with/total responding (%)		P-value
	HIV seroconverters (n=29)	Non HIV seroconverters (n=87)	
Age—median (range)	25.7 (18–41)	25.7 (18–43)	NS
Follow up—median (range)	379 (91–644)	420 (58–707)	NS
Any HIV positive partner	1/23 (4.3)	3/73 (4.1)	NS
Any stable male partner	10/26 (38.5)	40/77 (51.9)	NS
Unprotected insertive anal sex *	9/26 (34.6)	29/77 (37.6)	NS
Unprotected receptive anal sex *	7/26 (26.9)	20/75 (26.6)	NS
Any casual male partners(s)	25/29 (86.2)	63/85 (74.1)	<0.05
Unprotected insertive anal sex *	20/25 (80)	60/78 (76.9)	NS
Unprotected receptive anal sex *	14/27 (51.8)	45/76 (59.2)	NS
Circumcised	1/24 (4.2%)	13/63 (17.1)	NS **
Pharyngeal gonococcal infection	3/23 (13.0)	1/67 (1.5)	<0.05
Incident syphilis or HSV-2 infection	9/29 (31.0)	7/87 (8.0)	<0.01

NS = not significant;

* Risk behaviors reported for interval between last visit (first HIV positive for cases and comparable visit for controls) and prior visit;

** P=0.06