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Syphilis and HIV/Syphilis Co-infection Among Men Who Have Sex With Men (MSM) in Ecuador

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Abstract

There is a reemergence of syphilis in the Latin American and Caribbean region. There is also very little information about HIV/Syphilis co-infection and its determinants. The aim of this study is to investigate knowledge, attitudes, and practices regarding sexually transmitted infections (STIs), in particular syphilis infection and HIV/Syphilis co-infection, as well as to estimate the prevalence of syphilis among men who have sex with men (MSM) in a city with one of the highest HIV prevalence rates in Ecuador. In this study, questionnaires were administered to 291 adult MSM. Questions included knowledge about STIs and their sexual practices. Blood samples were taken from participants to estimate the prevalence of syphilis and HIV/syphilis co-infection. In this population, the prevalence of HIV/syphilis co-infection was 4.8%, while the prevalence of syphilis as mono-infection was 6.5%. Participants who had syphilis mono-infection and HIV/syphilis co-infection were older. Men who had multiple partners and those who were forced to have sex had increased odds of syphilis and HIV/syphilis co-infection. A high prevalence of syphilis and self-reported STI was observed, which warrants targeted behavioral interventions. Co-infections are a cause for concern when treating a secondary infection in a person who is immunocompromised. These data suggest that specific knowledge, attitudes, and behaviors among MSM are associated with increased odds of STIs (including HIV/syphilis co-infections) in this region of Ecuador.

Keywords

MSM, syphilis, HIV, co-infection, Ecuador

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Introduction

Syphilis infection has reemerged as an issue of concern among men who have sex with men (MSM) worldwide (Botham et al., 2013; Jansen et al., 2015; Schumacher, Muvva, Nganga-Good, Miazad, & Jennings, 2013). Currently, there is an increase in the number of cases of syphilis in the Latin American and Caribbean region (Zoni, González, & Sjögren, 2013). However, there seems to be insufficient epidemiologic indicators for this disease in some of these countries, including Ecuador (Zoni et al., 2013). There is even less information to adequately describe the current state of HIV/syphilis co-infection rates and its associated factors across this region, especially for Ecuador.

It has been previously suggested that persons infected with a sexually transmitted infection (STI) are at greater risk of acquiring HIV through sexual transmission

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(Bernstein, Marcus, Nieri, Philip, & Klausner, 2010). Syphilis infection among HIV seronegative MSM was reported to be associated with elevated risk of acquiring HIV infection (Solomon et al., 2014). In a study among a cohort of HIV seronegative MSM, Solomon et al. (2014) reported that men who tested positive for syphilis were almost three times as likely to acquire HIV by the end of the study period when compared with those who tested negative for syphilis. One of the mechanisms for this observed increased risk is the loss of skin continuity during primary syphilis infection (i.e., syphilitic ulcer) leading to increased exposure and vulnerability for pathogen invasion (Centers for Disease Control and Prevention, 2015).

It is not uncommon for some STIs to go unnoticed as in some cases they are asymptomatic or may have varied symptomatic presentations. In the case of syphilis, the primary infection may be either symptomless or present as a painless ulcer. If untreated, syphilis will progress into secondary and tertiary stages which may manifest as mucocutaneous rash and neurosyphilis, respectively (Zetola, Engelman, Jensen, & Klausner, 2007). It has been reported that syphilis presents differently in persons infected with HIV (Lynn & Lightman, 2004). Among HIV infected patients, there seems to be a higher rate of asymptomatic primary syphilis and infection progresses more rapidly from primary to secondary stages (Lynn & Lightman, 2004). Therefore, among HIV-infected patients syphilis is usually diagnosed during the secondary stage of the disease, mostly by serology (Lynn & Lightman, 2004). In the case of secondary syphilis, patients may present with fever and a painless rash, which may be misdiagnosed as a mild viral infection (Brom, Goren, & Segal, 2014; Dhaliwal, Patel, & Menter, 2012). In addition, among receptive MSM partners, primary syphilis ulcer could be unnoticed due to the fact that it is painless and inconspicuously located. In such scenario, primary syphilis would be undiagnosed and untreated and therefore more likely to progress into secondary and tertiary stages (Zetola et al., 2007).

It has been reported that co-infection of HIV with other communicable diseases may be associated with increased drug resistance. For instance, it has previously reported that HIV/Tuberculosis co-infected patients are more likely to develop multidrug resistant tuberculosis (World Health Organization, 2013). Based on this observation, it could be inferred that HIV/STI co-infection, specifically HIV/syphilis co-infection could potentially lead to drug resistance in the syphilis bacteria (Zetola & Klausner, 2007).

A report from the Government of Ecuador (United Nations Programme on HIV/AIDS & Ministerio de Salud Pública del Ecuador, 2010) noted a significant rise in the number of HIV infections since the beginning of the 2000s and even more since 2008. In Ecuador, HIV epidemic is still concentrated among most-at-risk populations, including MSM (United Nations Programme on HIV/AIDS & Ministerio de Salud Pública del Ecuador, 2010). Despite improved availability of antiretroviral treatment in the Caribbean and Latin America (Gutierrez & Atienzo, 2012), HIV testing among MSM in Ecuador remains at low levels (Jacobson et al., 2014). In order to describe the current status of HIV and syphilis co-infections among MSMs and to identify their associated risk factors, a cross-sectional study was conducted in the Northwest region of Ecuador. This geographical location was selected based on the high proportion of persons infected with HIV reported in this area.

Method

Study Design and Study Population

This report is part of a study conducted on MSM recruited from a city with a high HIV prevalence rate in the Northwest Region of Ecuador, described elsewhere (I. Hernandez et al., 2016). A cross-sectional study was conducted among individuals registered in the local MSM association and their partners/contacts. The study team had several meetings with the local MSM association to explain the research goals. Representatives (Board Members) of the local MSM Association created a list of the association's members using either aliases or first names only (either real or fictitious), as per the member's own choice. There was never a list with full, real names. Since the Association's Board Members were in charge of directly contacting potential participants and considering that they already had their own previously established communication channels, this list never included contact information or personal identifiers. In total, 501 members were registered in this alias/first name only list. A sample size of 233 individuals was required based on: (a) study population size, (b) an estimated HIV prevalence rate of 19%, (c) an 80% response rate, and (d) a 20% Type II error. For random selection of the participants, a study-specific ID number was assigned to each person in the list. Participants in the randomly generated list were invited by the Association's Board Members to participate if they acknowledged having had sex with another man in the previous 6 months. Consenting male adults (18 years and older) were recruited unless exclusion criteria were met. Those who were inebriated or who had any mental disability or who for any other reason were not able to understand and provide informed consent were excluded. The association representatives retained the alias/first name only list to invite selected members to participate and to coordinate their trip to the research facility. The principal investigator had access to the ID numbers but did not retain the alias/first name only list. This was done to protect participant's privacy and confidentiality.

A total of 291 participants were included in this analysis based on their HIV and syphilis test results (i.e., all participants who had HIV/syphilis co-infection, syphilis mono-infection or no infection were included). Participants with HIV mono-infections (n = 15) were excluded from this analysis but included in an HIV-focused analysis, which has previously been reported (I. Hernandez et al., 2016). A representative of the local MSM association helped locate the selected individuals and coordinated their travel to the research location. A questionnaire was administered to all participants to assess their knowledge, attitudes, and sexual practices. Questionnaires were administered in a private room in the presence of one study member/health care professional. Questionnaires were administered in Spanish by native Spanish speakers. Confidentiality was better ensured throughout the study by assigning research-specific ID numbers which were accessible only to the principal investigator. Participants also provided blood specimens which were tested for HIV and syphilis.

Laboratory Techniques

Syphilis Testing. Syphilis testing was done using the Venereal Disease Research Laboratory (VDRL) Syphilis™ test manufactured by Wama Produtos para Laboratório Ltda, in Brazil. Sera were first tested with VDRL, which has a sensitivity between 78% and 86% to detect primary syphilis, 100% to detect secondary syphilis, and 95% to detect latent syphilis, and a specificity between 85% and 99% (U.S. Preventive Services Task Force, 2004). Negative results were considered final. Sera testing positive on VDRL were then tested with *Treponema pallidum* particle agglutination assay (TPPA), which has a sensitivity of 84% to detect primary syphilis, 100% to detect other stages of the disease, and a specificity of 96% (U.S. Preventive Services Task Force, 2004). False–positive results were defined as VDRL+, TPPA−, whereas active syphilis was defined as a double positive result (i.e., VDRL+ and TPPA+). Participants were provided with their results approximately 1 week later. Those with an active syphilis diagnosis were treated immediately by the nurse with a single intramuscular injection of 2.4m IU of benzathine penicillin, free of charge.

HIV Testing. Diagnosis of HIV was done in accordance to the Ministry of Health's (MOH) policies and guidelines, which were based on recommendations from the World Health Organization. Sera for HIV-1 were tested in batches using a Vironostika Ab Elisa test kit. Negative results were considered final. Positive results were confirmed with Unigold HIV-1/2 rapid test. Negative results with Unigold were considered negative. Positive results with Unigold, confirming previous positive results with Vironostika, were considered positive. There was no additional testing. HIV results were reported on forms matched by study number. The results were reported to the MOH and they followed up persons who tested positive for HIV as per their protocol.

Questionnaire and Measurements

The questionnaire and definitions for sexual behavioral practices, as well as the theoretical framework for the research design and analysis were developed from previously published research (Clark et al., 2008; Tabet et al., 2002). Examples of some definitions used in the analysis are included below.

Demographics. Participants were asked to provide demographic information such as the following:

Where do you live?—(In the city/outside the in the district/outside the district)
Do you have a stable partner?—(Male only/female only/both/none)
What is the highest level of education that you completed?—(Did not complete secondary/completed secondary)

Outcomes. The following outcomes were measured in this study:

HIV/syphilis (co-infection/mono-infection/no infection)—Participants were classified as having HIV/syphilis co-infection if they tested positive for both HIV and active syphilis, syphilis mono-infection if they tested positive for active syphilis and negative for HIV, or no infection if they tested negative for HIV and negative for syphilis.
Self-reported STI (yes/no)—Participants were asked if they had problems with their genitals during the previous 3 months. If they responded "yes" they were classified as "yes" for self-reported STI otherwise they were classified as "no."
Reported condom use (always/not always)—Participants were asked on the questionnaire "Do you generally use condoms" with each type of partner that they had. Response choices were "always," "often (more than half of the time)," "sometimes (less than half of the time)," and "rarely/never." Participants responding "always" with each partner that they reported on were classified "always" for reported condom use. Otherwise they were classified as "not always."

Consistent condom use (consistent/inconsistent)—Participants were also asked "Did you use a condom the last time you had oral sex" and "Did you use a condom the last time you had anal sex" for each type of partner that they had. Response choices were "yes" and "no." If participants' *reported condom use* was "always" and they indicated "yes" for using a condom the last time they had oral and anal sex for each partner that they reported on, then consistent condom use was classified as "consistent." Otherwise they were classified as "inconsistent."

Knowledge. Participants were asked questions on HIV transmission. There were 10 questions in total. Five questions included correctly identifying ways in which HIV can be transmitted such as "Do you think that HIV can be transmitted receiving a blood transfusion?" for which the correct response is "yes." The other five questions included correctly identifying ways in which HIV cannot be transmitted such as "Do you think HIV can be transmitted by using the same bathroom as someone who is infected with HIV?" for which the correct response is "no." Correct responses were totaled.

Behavior. Participants were asked about their practices. Questions included the following:

During the past 30 days, did you have sex with another man other than your male stable partner (MSP)?—(Yes/no)
Do you generally use condoms when you have sex with your MSP?—(Always/often [more than half the time]/sometimes [less than half the time]/rarely/never)
During the past 30 days, were you forced to have anal sex?—(Yes/no)

Data Analysis

Data from the questionnaires and laboratory results were registered in duplicate into an EPI-INFO database. Quality assurance and data analysis were performed using STATA version 12. The main outcome for this study was HIV/syphilis co-infection. Bivariate analysis was done using *t* tests and chi-square analyses for quantitative and categorical variables, respectively. Variables that were significantly associated with the outcomes (i.e., HIV/syphilis co-infection or self-reported STI) were included in the multivariable analyses.

Multivariable analyses were conducted using logistic regression models predicting HIV/syphilis co-infection, and self-reported STI. Odds ratios (*OR*s) were adjusted for demographic characteristics that were significantly associated with each outcome. Type I error was set at 5% ($\alpha = .05$).

Ethical Considerations

This study was conducted in adherence to good clinical practices and local regulations. This cross-sectional survey and the subsequent data analysis were approved by registered institution review boards in Ecuador (Comité de Bioética, Centro de Biomedicina, Universidad Central del Ecuador) and the United States (Institutional Review Board, University of South Florida).

Results

Baseline Demographics

There were 291 participants included in this study. Participants' ages ranged from 18 years to 56 years with a mean age of 23 years. Regarding having a stable partner, 187 (64%) participants reported that they did not have a stable partner, while 20 (7%) reported having a MSP only, 72 (25%) reported having a female stable partner (FSP), and 6 (2%) reported having both, a MSP and a FSP. One hundred and fifty-four (53%) participants reported not completing a secondary education.

Participants displayed high comprehensive knowledge about HIV transmission answering on average 8 questions correctly out of 10. One hundred and eight (37%) participants had previously taken an HIV test voluntarily. Forty-four (15%) participants reported having an STI during the past 3 months. One hundred and seventy-three (59%) participants indicated that they would go to the MOH's health center if they were to have sexual or urinary tract-related health concerns. While 42 (14%) indicated that they would go to a private clinic with such concerns.

HIV/Syphilis Co-infection

In this study, 14 (4.8%) participants had HIV/syphilis co-infection, while 19 (6.5%) had syphilis mono-infection. The mean age of participants who had HIV/syphilis co-infection was 26.5 years (SD = 6.8). These men were older than those who had syphilis mono-infection (M = 25.1 years; SD = 6.7 years) and were older than those who had no infection (M = 22.5 years; SD = 6.5 years; Table 1). In bivariate analyses, HIV/syphilis co-infection was significantly associated with failure to identify HIV/AIDS as an STI ($p < .05$) and marginally associated with the perception that medication can help a person living with HIV live a normal life ($p < .10$; Table 3). Similarly, HIV/syphilis co-infection was significantly associated with not having sex with a woman during the past 30 days, having sex with a man other than an MSP, and being forced to have receptive anal sex (Table 2).

Table 1. Demographic Characteristics Across HIV/Syphilis Status.

Demographic	HIV/syphilis, co-infection (*n* = 14)	Syphilis, mono-infection (*n* = 19)	Neither infection (*n* = 258)
	n (%)	*n* (%)	*n* (%)
Current age (years)*			
Mean (*SD*)	26.4 (6.8)	25.1 (6.7)	22.5 (6.5)
Have a stable partner[a,**]			
No	9 (4.8)	10 (5.4)	168 (89.8)
Male only	3 (15.0)	4 (20.0)	13 (65.0)
Female only	1 (1.4)	2 (2.8)	69 (95.8)
Both male and female	0 (0.0)	1 (16.7)	5 (83.3)
Level of education			
Secondary incomplete	8 (5.2)	10 (6.5)	136 (88.3)
Secondary or higher	6 (4.4)	9 (6.6)	122 (89.0)
Have a job			
Yes	5 (5.0)	9 (8.9)	87 (86.1)
No	9 (4.8)	10 (5.4)	168 (89.8)

[a]Missing values = 6.
*$p < .05$ (student *t*). **$p < .05$ (chi-square).

Table 2. Bivariate Associations With HIV/Syphilis.

Outcome	HIV/syphilis, co-infection (*n* = 14)	Syphilis, mono-infection (*n* = 19)	Neither, infection (*n* = 258)
	n (%)	*n* (%)	*n* (%)
Self-reported STI in the past 3 months[a]			
Yes	4 (9.1)	4 (9.1)	36 (81.8)
No	10 (4.3)	15 (6.4)	210 (89.3)
Self-reported condom use[b]			
Always	9 (5.8)	12 (7.7)	134 (86.5)
Not always	5 (4.8)	7 (6.7)	93 (88.5)
Consistent condom use[b]			
Consistent	6 (4.8)	7 (5.6)	112 (89.6)
Inconsistent	8 (5.9)	12 (8.9)	115 (85.2)
Had sex in past 30 days with a woman[c,**]			
Yes	1 (0.8)	2 (1.5)	130 (97.7)
No	5 (4.7)	6 (5.6)	96 (89.7)
Had sex in past 30 days with woman not FSP[d]			
Yes	1 (1.0)	1 (1.0)	98 (98.0)
No	3 (1.9)	9 (5.8)	144 (92.3)
Sex in past 30 days with man not MSP[e,**]			
Yes	10 (22.7)	9 (20.5)	25 (56.8)
No	3 (4.6)	6 (9.1)	57 (86.3)
Forced to have receptive anal sex in past 30 days[f,**]			
Yes	2 (22.2)	5 (55.6)	2 (22.2)
No	10 (11.2)	11 (12.4)	68 (76.4)

Note. STI = sexually transmitted infection; FSP = female stable partner; MSP = male stable partner.
[a]Missing values = 12. [b]Missing values = 31. [c]Missing values = 51. [d]Missing values = 35. [e]Missing values = 181. [f]Missing values = 193.
*$p < .10$ (chi-square/Fisher's exact test). **$p < .05$ (chi-square/Fisher's exact test).

Age-adjusted *OR*s are displayed in Table 4. Men who had a MSP only had four times the odds (*OR* = 4.3; 95% confidence interval [CI; 1.0, 17.9]) of men with no stable partner of having HIV/syphilis co-infection, and five

Table 3. Behavior Practices Across Outcomes HIV/Syphilis.

Behavior	HIV/syphilis, co-infection (n = 14) n (%)	Syphilis, mono-infection (n = 33) n (%)	Neither infection (n = 258) n (%)
Identified HIV/AIDS as an STI[a,**]			
Yes	2 (1.7)	6 (5.1)	109 (93.2)
No	12 (7.5)	13 (8.2)	134 (84.3)
Can medication help a person living with HIV live a healthy life[b,*]			
Yes	11 (7.0)	14 (9.0)	131 (84.0)
No	3 (2.9)	4 (3.9)	95 (93.2)
In the past 30 days had oral sex with men who were[c]			
MSP/friend	9 (25.0)	8 (22.2)	19 (52.8)
Pimp/client	1 (12.5)	5 (62.5)	2 (25.0)
In the past 30 days had anal sex with men who were[d,**]			
MSP/friend	8 (20.0)	9 (22.5)	23 (57.5)
Pimp/client	3 (37.5)	4 (50.0)	1 (12.5)
Previously taken an HIV test voluntarily[e,**]			
Yes, less than 6 months ago	1 (3.3)	5 (16.7)	24 (80.0)
Yes, 6-12 months ago	2 (8.0)	2 (8.0)	21 (84.0)
Yes, more than a year ago	7 (12.1)	7 (12.1)	44 (75.8)
No	4 (2.4)	5 (3.0)	160 (94.6)
Know the test results[f]			
Yes	10 (9.8)	13 (12.8)	79 (77.4)
No	0 (0.0)	1 (10.0)	9 (90.0)

Note. STI = sexually transmitted infection; MSP = male stable partner.
[a]Missing values = 15. [b]Missing values = 33. [c]Missing values = 247. [d]Missing values = 243. [e]Missing values = 9. [f]Missing values = 1.
*p < .10 (chi-square/Fisher's exact test). **p < .05 (chi-square/Fisher's exact test).

times the odds (OR = 5.2; 95% CI [1.4, 18.8]) of having syphilis mono-infection. Men who had both a MSP and a FSP had three times the odds of men with no stable partner of testing positive for syphilis mono-infection though this estimate was not statistically significant. Men who had an FSP only had reduced odds of having both HIV/syphilis co-infection and syphilis mono-infection but these estimates were not statistically significant. Men who had sex with a man who was not their MSP had increased odds of HIV/syphilis co-infection (OR = 10.0; 95% CI [2.2, 44.7]) and syphilis mono-infection (OR = 3.8; 95% CI [1.2, 12.0]) compared with men who only had sex with their MSP. Men who had been forced to have receptive anal sex during the past 30 days also had increased odds of HIV/syphilis co-infection (OR = 7.9; 95% CI [1.0, 65.1]) and syphilis mono-infection (OR = 16.5; 95% CI [2.8, 97.8]) compared with men who had not been forced to do so. Men who had previously taken an HIV test had increased odds of both HIV/syphilis co-infection and syphilis mono-infection. However, the odds of HIV/syphilis co-infection were not statistically significant, while the odds of syphilis mono-infection did display statistical significance (OR = 4.9; 95% CI [1.7, 14.4]). Participants who knew their previous HIV results had increased odds of both HIV/syphilis co-infection (OR = 11.3; 95% CI [1.4, 91.2]) and syphilis mono-infection. The odds of syphilis mono-infection did not display statistical significance.

Finally, a multivariable logistic regression model adjusting for significant covariates identified in the bivariate analysis was conducted. Men having sex with a man that was not an MSP, and men who were forced to have receptive anal sex predicted HIV/syphilis co–infection and syphilis mono–infection, respectively (Table 5).

Discussion

Based on the high prevalence rate of HIV/syphilis co-infection (4.8%) and the even higher prevalence rate of syphilis mono-infection (6.5%), persons who test positive for syphilis should be tested for HIV and vice versa (Jansen et al., 2015). These results are consistent with studies conducted among MSM populations of other countries indicating that HIV and syphilis could be markers for each other and as such persons should be screened for one infection once the other has been detected. It has been reported that the presence of syphilis predicted HIV incidence among MSM and transgender women who had sex with men (Jansen et al., 2015; Solomon et al., 2014). It has also been reported that MSM who have been

Table 4. Age-Adjusted *OR*s From Logistic Regression Models.

	HIV/syphilis, co-infection[a]	Syphilis, mono-infection[a]
Characteristic	*OR* [95% CI]	*OR* [95% CI]
Stable partner		
None	1.0	1.0
Male only	4.3 [1.0, 17.9]**	5.2 [1.4, 18.8]**
Female only	0.3 [0.03, 2.2])	0.5 [0.1, 2.3]
Both	—	3.4 [0.4. 31.6]
Sex with a woman in the past 30 days		
Yes	0.1 [0.0, 1.2]*	0.2 [0.0, 1.2]*
No	1.0	1.0
Sex in past 30 days with man not MSP		
Yes	10.0 [2.2, 44.7]**	3.8 [1.2, 12.0]**
No	1.0	1.0
Forced to have receptive anal sex in the past 30 days		
Yes	7.9 [1.0. 65.1]**	16.5 [2.8, 97.8]**
No	1.0	1.0
In the past 30 days had anal sex with		
MSP/friend	1.0	1.0
Pimp/client	7.4 [0.7, 83.9]*	9.3 [0.9, 96.8]*
Previously taken an HIV test		
Yes, less than 6 months ago	1.6 [0.2, 15.2]	6.5 [1.7, 24.2]**
Yes, 6-12 months ago	3.4 [0.6, 20.3]	2.8 [0.5, 15.7]
Yes, more than a year ago	5.4 [1.5, 19.9]**	4.5 [1.3, 15.3]**
No	1.0	1.0
Know the HIV test results		
Yes	1.5 [0.2, 13.1]	—
No	1.0	1.0
Consistent condom use		
Consistent	0.8 [0.3, 2.4)	0.6 [0.2, 1.7]
Inconsistent	1.0	1.0

Note. OR = odds ratio; CI = confidence interval; MSP = male stable partner.
[a]Adjusted for age.
*$p < .10$. **$p < .05$.

diagnosed with HIV, contract syphilis soon after (Schumacher et al., 2013). This study indicates that MSM who previously took an HIV test had greater odds of having syphilis mono-infection compared with HIV/syphilis co-infection. Other studies have reported that a history of STI has been reported to be associated with increased HIV incidence (Bautista et al., 2004; Jansen et al., 2015).

HIV/syphilis co-infections are of particular concern. First, among the MSM population there is a high risk of transmission (Jansen et al., 2015; Schumacher et al., 2013). In addition to this, anal syphilis may pose an additional diagnostic challenge since ulcers are painless and inconspicuous and therefore making it more likely for the disease to progress into its secondary and tertiary stages (Watts, Greenberg, & Khachemoune, 2015). It is important to identify the factors that are associated with HIV/syphilis co-infection in order to increase understanding of this phenomenon and to inform appropriate public health interventions. It was observed that, although not statistically significant, having the perception that medication could help a person living with HIV live a normal life was marginally associated with HIV/syphilis co-infection ($p < .10$). This slightly nonsignificant trend is important for two reasons. Number one, it may represent an underlying belief that HIV is "treatable" and this, in turn, might relate to relaxed application of preventative measures. Second, this result suggests that there is an association between these two variables. Further research is required to confirm this association and to elucidate the mechanisms that may explain it, as was suggested in the previous sentences. Interestingly, it was observed that participants who reported having only a male as stable partner had increased odds of HIV-syphilis co-infection or syphilis mono-infection. Stable male partnership has previously been associated with other STIs among MSM in Brazil (Rodrigues et al., 2009).

Table 5. Age-Adjusted Multivariable Logistic Regression Models.

Characteristic	HIV/syphilis, co-infection *OR* [95% CI]	Syphilis, mono-infection *OR* [95% CI]
Stable partner		
None	1.0	1.0
Male only	1.0 [0.1, 6.7]	2.1 [0.4, 11.4])
Female only	—	—
Both	—	—
Sex in past 30 days with man not MSP		
Yes	10.4 [1.4, 78.4]**	4.1 [0.8, 21.4]*
No	1.0	1.0
Forced to have receptive anal sex in the past 30 days		
Yes	11.0 [0.7, 174.4]*	23.9 [1.9, 301.6]**
No	1.0	1.0
Previously taken an HIV test		
Yes, less than 6 months ago	—	2.0 [0.3, 16.0]
Yes, 6-12 months ago	0.2 [0.0, 2.9]	0.3 [0.0, 4.7]
Yes, more than a year ago	0.8 [0.1. 5.1]	1.0 [0.2, 6.4]
No	1.0	1.0

Note. OR = odds ratio; CI = confidence interval; MSP = male stable partner.
**p* < .10. ***p* < .05.

It has previously been reported that MSM who test positive for HIV are not only at increased risk for contracting syphilis but other STIs also (Solomon et al., 2014). HIV-positive MSM have an increased risk for anal human papilloma virus infections (A. L. Hernandez et al., 2014). This elevated risk is associated with being the receptive partner during the sexual act. MSM receptive partners are at higher risk for anal human papilloma virus infections (A. L. Hernandez et al., 2014). Although study participants were not asked about sexual positioning (i.e., whether they were the insertive and/or the receptive partner), some reported that they had been forced to have receptive anal sex during the past 30 days. This was estimated to increase the odds of having both HIV/syphilis co-infection and syphilis mono-infection, with there being higher odds of participants having syphilis mono-infection. While it may appear that insertive partners do not have the same risk of STI as receptive partners, MSM should be made aware that sexual positioning according to HIV status has not been observed to be effective in preventing HIV transmission in serodiscordant relationships. This suggests that positioning may not provide protection against syphilis and other STIs. In fact, high transmission rates of HIV from the receptive partner to the insertive partner have been reported (Goodreau et al., 2012). Furthermore, role reversal typically negates the seemingly low transmission rates from receptive to insertive partner (Beyrer et al., 2012). Oral contact also provides a pathway for the transmission of STIs (A. L. Hernandez et al., 2014). Only 30 (10%) participants reported that they used a condom the last time that they had oral sex.

It has previously been reported that the more sexual partners a person has, the greater their risk for contracting an STI regardless of sexual orientation (Rosenberg, Gurvey, Adler, Dunlop, & Ellen, 1999; Townsend, Zembe, Mathews, & Mason-Jones, 2013). As expected, participants who indicated that they had had sex with another man apart from their MSP had increased odds of HIV/syphilis co-infection and syphilis mono-infection. Increased number of partners provides increased opportunity for unprotected sex acts. The question of partner notification therefore arises. Once a person tests positive for an STI, how likely is he to notify his partners? This refers to their stable partner as well as other partners. Transgender women and MSM perceived casual partner notification to be the least important (Segura et al., 2013). In this study, there were some participants who reported having sex with multiple male partners as well as female partners. Most participants reported that they did not have a stable partner. This phenomenon consisting of, participants having multiple casual partners, syphilis being difficult to diagnose and persons failing to notify their partners; can potentially lead to a situation in which a relatively high proportion of the general population are now susceptible to becoming infected and not knowing. This high proportion of persons in the general population may also transmit an infection because their partners have not notified them about their potential risk of infection.

Enhanced monitoring of MSM diagnosed with syphilis could help identify other STIs that may be present. There was a high proportion of self-reported STI in this study (15%). Participants were asked if they had problems with their genitals during the past 3 months. It is difficult to ascertain exactly which part of the body they consider to be their genitals. Male genitalia typically refers to the penis and scrotum (Dinotta, Nasca, & Micali, 2013). If participants became aware of ulcers in their anus, they may not think to get them checked out because they do not consider their anus part of their genitals. In their study, Rompalo et al. (2001) noted that patients infected with HIV who also had secondary syphilis presented with genital ulcers more frequently and thus persons with ulcers confined to the anus will seldom be diagnosed until the disease progresses or displays additional symptoms. Health care providers, particularly those who treat MSM should, therefore, be informed about the emerging trend of HIV/syphilis co-infection and be able to quickly identify it in patients who are already living with HIV in order to provide treatment as quickly as possible. In the later stages of syphilis, treatment options may be limited and even with extended treatments there is no guarantee of damage reversal (Kent & Romanelli, 2008).

Interventions aimed at MSM living with HIV should provide them with the knowledge on how to identify ulcers that may be indicative of syphilis. In addition, MSM should also be informed about the pathology of syphilis and the fact that even though ulcers may resolve themselves without treatment, they should seek medical attention. It was observed that persons who had completed at least a secondary education had half the odds of having an STI compared with those who had not. This suggests that persons with at least a secondary education are aware of safer sex practices and thus experience a low rate of STIs. Fortunately, it was also observed in this study that most participants go to the MOH health center when they suspect that they may have an STI. This again suggests that health care providers need to be aware of this issue and be able to properly screen and diagnose any STI, which may be present. A nontrivial proportion (17%) of participants indicated that they self-medicate (medication was not specified) when they have a problem with their genitals. This has the danger of leading to drug resistant strains of syphilis, which is particularly challenging if this occurs in a person with HIV/syphilis co-infection.

The results of this study have provided some elucidation to the health needs of MSM in the Northwest region of Ecuador. The region in which this study was conducted is a poorer region of the country where some persons do not have access to improved access to basic services like water and sanitation, let alone specialized HIV health care services. It is evident that this area is in need of specialized HIV services to address the needs of MSM. In particular, this report suggests that the health care providers in this region and perhaps those who serve MSM in general need to be aware of the reemergence of syphilis as a concern, both the mono-infection and HIV/syphilis co-infection, as well as the challenges associated with adequate management. In addition, the results of this study highlight the urgent need to continue to investigate these issues in this population group to establish causal mechanisms and properly identify risk factors leading to mono-infections (either syphilis or HIV) or co-infections (HIV/syphilis) in order to design appropriate, targeted preventive measures.

Limitations

This study has some limitations. Measures such as condom use and the subsequently defined consistent condom use were reported to be higher than rates reported in previous literature such as the one conducted by Sanchez–Gomez that utilized computer-assisted self-interviews for data collection (Sánchez-Gómez et al., 2014). It is therefore possible that participants in this study provided answers to questions that may have been biased. Future studies utilizing other data collection methods are needed to explore with more depth in the issues related to HIV/syphilis co-infection among MSM in this region of Ecuador. In addition, studies aimed at developing best practices for conducting studies of this nature (i.e., studies that cover topics which may be difficult to discuss with third parties like researchers) are required.

In addition to this, participants were not asked identical questions about their female partners and their male partners. This prevented us from exploring in more detail the HIV-syphilis STI dynamic as it relates to practices that vary according to partner sex.

Data reported in this study is representative of the local MSM community. Additional studies expanded to other geographical areas are needed to ascertain the needs of each geographical area as they vary in culture and practices.

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References

Bautista, C., Sanchez, J., Montano, S., Laguna-Torres, V., Lama, J., Kusunoki, L., . . . Tambare, A. (2004). Seroprevalence of and risk factors for HIV-1 infection among South American men who have sex with men. *Sexually Transmitted Infections*, *80*, 498-504.

Bernstein, K. T., Marcus, J. L., Nieri, G., Philip, S. S., & Klausner, J. D. (2010). Rectal gonorrhea and chlamydia reinfection is associated with increased risk of HIV seroconversion. *Journal of Acquired Immune Deficiency Syndromes*, *53*, 537-543.

Beyrer, C., Baral, S. D., Van Griensven, F., Goodreau, S. M., Chariyalertsak, S., Wirtz, A. L., & Brookmeyer, R. (2012). Global epidemiology of HIV infection in men who have sex with men. *Lancet*, *380*, 367-377.

Botham, S. J., Ressler, K.-A., Maywood, P., Hope, K. G., Bourne, C. P., Conaty, S. J., . . . Mayne, D. J. (2013). Men who have sex with men, infectious syphilis and HIV coinfection in inner Sydney: Results of enhanced surveillance. *Sexual Health*, *10*, 291-298.

Brom, A., Goren, I., & Segal, G. (2014). The "great masquerader" strikes again: Secondary syphilis presentation with erythema multiforme (EM)-like lesions. *European Journal of Case Reports in Internal Medicine*, *1*(1). Retrieved from http://ejcrim.com/index.php/EJCRIM/article/view/161/202

Centers for Disease Control and Prevention. (2015). *Syphilis—CDC fact sheet (detailed)*. Retrieved from http://www.cdc.gov/std/syphilis/stdfact-syphilis-detailed.htm

Clark, J. L., Konda, K. A., Munayco, C. V., Pún, M., Lescano, A. G., Leon, S. R., . . . Coates, T. J. (2008). Prevalence of HIV, herpes simplex virus-2, and syphilis in male sex partners of pregnant women in Peru. *BMC Public Health*, *8*. Retrieved from http://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-8-65

Dhaliwal, S., Patel, M., & Menter, A. (2012). Secondary syphilis and HIV. *Proceedings (Baylor University. Medical Center)*, *25*, 87-89.

Dinotta, F., Nasca, M. R., & Micali, G. (2013). Anatomy of male genitalia. In G. Micali & F. Dinotta (Eds.), *Atlas of male genital disorders* (pp. 1-3). Milan, Italy: Springer-Verlag.

Goodreau, S. M., Carnegie, N. B., Vittinghoff, E., Lama, J. R., Sanchez, J., Grinsztejn, B., . . . Buchbinder, S. P. (2012). What drives the US and Peruvian HIV epidemics in men who have sex with men (MSM)? *PLoS ONE*, *7*, e50522.

Gutierrez, J.-P., & Atienzo, E. (2012). Syphilis and herpes simplex virus type 2 sero-prevalence among female sex workers and men who have sex with men in Ecuador and Andhra Pradesh (India). In N. Malla (Ed.), *Sexually transmitted infections* (pp. 183-198). Rijeka, Croatia: InTech.

Hernandez, A. L., Efird, J. T., Holly, E. A., Berry, J. M., Jay, N., & Palefsky, J. M. (2014). Incidence of and risk factors for type-specific anal human papillomavirus infection among HIV-positive MSM. *AIDS*, *28*, 1341-1349.

Hernandez, I., Reina-Ortiz, M., Johnson, A., Rosas, C., Sharma, V., Teran, S., . . .Izurieta, R. (2016). Risk factors associated with HIV among men who have sex with men (MSM) in Ecuador. *American Journal of Men's Health*. Advance online publication. doi:10.1177/1557988316646757

Jacobson, J. O., Sánchez-Gómez, A., Montoya, O., Soria, E., Tarupi, W., Urquizo, M. C., . . . Gómez, B. (2014). A continuing HIV epidemic and differential patterns of HIV-STI risk among MSM in Quito, Ecuador: An urgent need to scale up HIV testing and prevention. *AIDS and Behavior*, *18*, 88-98.

Jansen, K., Thamm, M., Bock, C.-T., Scheufele, R., Kücherer, C., Muenstermann, D., . . . Hamouda, O. (2015). High prevalence and high incidence of coinfection with hepatitis B, hepatitis C, and syphilis and low rate of effective vaccination against hepatitis B in HIV-positive men who have sex with men with known date of HIV seroconversion in Germany. *PLoS ONE*, *10*, e0142515.

Kent, M. E., & Romanelli, F. (2008). Reexamining syphilis: An update on epidemiology, clinical manifestations, and management. *Annals of Pharmacotherapy*, *42*, 226-236.

Lynn, W., & Lightman, S. (2004). Syphilis and HIV: A dangerous combination. *Lancet: Infectious Diseases*, *4*, 456-466.

Rodrigues, J., Grinsztejn, B., Bastos, F. I., Velasque, L., Luz, P. M., de Souza, C.T., . . . Veloso, V. G. (2009). Seroprevalence and factors associated with herpes simplex virus type 2 among HIV-negative high-risk men who have sex with men from Rio de Janeiro, Brazil: A cross-sectional study. *BMC Infectious Diseases*, *9*, 39. doi:10.1186/1471-2334-9-39

Rompalo, A. M., Joesoef, M. R., O'Donnell, J. A., Augenbraun, M., Brady, W., Radolf, J. D., . . . Group, H. S. (2001). Clinical manifestations of early syphilis by HIV status and gender: Results of the syphilis and HIV study. *Sexually Transmitted Diseases*, *28*, 158-165.

Rosenberg, M. D., Gurvey, J. E., Adler, N., Dunlop, M. B., & Ellen, J. M. (1999). Concurrent sex partners and risk for sexually transmitted diseases among adolescents. *Sexually Transmitted Diseases*, *26*, 208-212.

Sánchez-Gómez, A., Jacobson, J. O., Montoya, O., Magallanes, D., Bajaña, W., Aviles, O., . . . Morales-Miranda, S. (2014). HIV, STI and behavioral risk among men who have sex with men in a setting of elevated HIV prevalence along Ecuador's pacific coast. *AIDS and Behavior*, *19*, 1609-1618.

Schumacher, C., Muvva, R., Nganga-Good, C., Miazad, R., & Jennings, J. (2013). P3.212 Young persons and men who have sex with men are more likely to have had an early syphilis diagnosis shortly before or after an HIV diagnosis. *Sexually Transmitted Infections*, *89*(Suppl. 1), A214-A215.

Segura, E., Perez-Brumer, A., Sanchez, J., Peinado, J., Salvatierra, J., Lama, J., & Clark, J. (2013). P4.069 Perceived importance of STI/HIV partner notification among men who have sex with men (MSM) and transgender women (TW) in Lima and Callao, Peru (2010). *Sexually Transmitted Infections*, *89*(Suppl. 1), A310.

Solomon, M. M., Mayer, K. H., Glidden, D. V., Liu, A. Y., McMahan, V. M., Guanira, J. V., . . . Bekker, L.-G. (2014).

Syphilis predicts HIV incidence among men and transgender women who have sex with men in a preexposure prophylaxis trial. *Clinical Infectious Diseases*, *59*, 1020-1026.

Tabet, S., Sanchez, J., Lama, J., Goicochea, P., Campos, P., Rouillon, M., . . . Celum, C. (2002). HIV, syphilis and heterosexual bridging among Peruvian men who have sex with men. *AIDS*, *16*, 1271-1277.

Townsend, L., Zembe, Y., Mathews, C., & Mason-Jones, A. J. (2013). Estimating HIV prevalence and HIV-related risk behaviors among heterosexual women who have multiple sex partners using respondent-driven sampling in a high-risk community in South Africa. *Journal of Acquired Immune Deficiency Syndromes*, *62*, 457-464.

United Nations Programme on HIV/AIDS & Ministerio de Salud Pública del Ecuador. (2010). *Informe nacional sobre los progresos realizados en la aplicación del UNGASS: Ecuador, 2010 (National report on the progres made to apply UNGASS: Ecuador, 2010 [Ecuador - 2010 UNGASS Country Progress Report])*. Retrieved from http://data.unaids.org/pub/Report/2010/ecuador_2010_country_progress_report_es.pdf

U.S. Preventive Services Task Force. (2004). Screening for syphilis infection: Recommendation statement. *Annals of Family Medicine*, *2*, 362-365. doi:10.1370/afm.215

Watts, P. J., Greenberg, H. L., & Khachemoune, A. (2015). Unusual primary syphilis: Presentation of a likely case with a review of the stages of acquired syphilis, its differential diagnoses, management, and current recommendations. *International Journal of Dermatology*, *55*, 714-728.

World Health Organization. (2013). Tuberculosis. *Saudi Medical Journal*, *34*, 1205-1207.

Zetola, N. M., Engelman, J., Jensen, T. P., & Klausner, J. D. (2007). *Syphilis in the United States: An update for clinicians with an emphasis on HIV coinfection*, *82*, 1091-1102. doi:10.4065/82.9.1091

Zetola, N. M., & Klausner, J. D. (2007). Syphilis and HIV infection: An update. *Clinical Infectious Diseases*, *44*, 1222-1228.

Zoni, A. C., González, M. A., & Sjögren, H. W. (2013). Syphilis in the most at-risk populations in Latin America and the Caribbean: A systematic review. *International Journal of Infectious Diseases*, *17*, e84-e92.