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Sexual Network Characteristics and Partnership Types among Men Who Have Sex With Men Diagnosed with Syphilis, Gonorrhoea, and/or Chlamydia in Lima, Peru

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Abstract

Objectives—Sexual networks are known to structure STI transmission among men who have sex with men (MSM). We sought to estimate the risks of STI diagnosis for various partnership types within these networks.

Methods—Our cross-sectional survey analysed data from 1,376 MSM screened for a partner management intervention in Lima, Peru. Participants were tested for HIV, syphilis, gonorrhoea (NG) and chlamydia (CT) and completed surveys on their demographics, sexual identity/role, HIV status, partnership types, and sexual network from the prior 90 days. Chi-square and Wilcoxon Rank-Sum tests compared participants without an STI to those diagnosed with 1) syphilis, 2) NG and/or CT [NG/CT], and 3) syphilis and NG/CT co-infection [co-infection].

Results—40.8% (n=561/1376) of participants were diagnosed with an STI (syphilis: 14.9%, NG/CT: 16.4%, co-infection: 9.5%). 47.9% of all participants were living with HIV and 8.9%

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Contributorship

All authors contributed to critical review of this analysis. Additionally, JG contributed to study planning, coordination, and acquisition of data. RC contributed to study planning, coordination, acquisition of data, and review of results from analysis. ES contributed significantly to data cleaning, statistical analysis, and interpretation of data. JLC, CSB, and JEL contributed to study coordination, statistical analysis, interpretation of data, and manuscript development. JRF was the submitting author and contributed during each phase of development.

Competing Interests

No, there are no competing interests for any author

Research Ethics Approval

Each participant provided written informed consent prior to enrollment in the study. The protocol was approved by the Office of Human Research Participant Protection at the University of California, Los Angeles, (#18–002002) and the Comité Institucional de Bioética at Vía Libre (#Nº 8924). The parent study from which this secondary analysis is derived is registered on clinicaltrials.gov (NCT04553211).

were newly diagnosed. A greater proportion of participants with syphilis and co-infection were living with HIV (73.5%, p<0.001; 71.0%, p<0.001) compared to those with NG/CT (47.8%) or no STI (37.8%). Participants with syphilis more often reported sex-on-premises venues (SOPV) as the location of their last sexual encounter (51.7%, p=0.038) while those with NG/CT tended to meet their last sexual partner online (72.8%, p=0.031). Respondents with co-infection were the only STI group more likely to report transactional sex than participants without an STI (31.3%, p=0.039).

Conclusions—Sexual networks and partnership types of Peruvian MSM are associated with differential risks for STIs. Participants diagnosed with syphilis tended to meet single-encounter casual partners at SOPV, while MSM with NG/CT were younger and often contacted casual partners online. Co-infection had higher frequency of transactional sex. These findings suggest the potential importance of public health interventions through combined syphilis/HIV screening at SOPV, syphilis screening at routine clinic appointments for MSM living with HIV, and directed advertisements and/or access to NG/CT testing through online platforms.

Keywords

Disease Transmission, Infectious; Homosexuality, Male; Gonorrhea; Chlamydia Infections; Syphilis

BACKGROUND

Men who have sex with men (MSM) are disproportionately affected by the HIV and STI epidemics in Latin America.(1) Estimates of STI prevalence among MSM in Peru are 19.7% for chlamydia (CT), 15.2% for gonorrhoea (NG), and 7.8%–28.9% for syphilis, compared to 4.2% for CT, 0.1% for NG, and 0.5% for syphilis in the general population.(2–6) Broad messaging for STI testing/treatment has not adequately slowed ongoing HIV/STI transmission.(7–9) Individual risk behaviours, dyadic characteristics, and sexual network factors among MSM are linked to higher STI prevalence.(10–13) It is essential to better understand how these factors affect STI prevalence among core subgroups to develop targeted and effective interventions.

Partnership contexts can impact STI transmission through differences in sexual risk behaviours. Among stable partnerships, greater familiarity and emotional intimacy influence perceived risk of HIV/STI acquisition.(14,15) As perceived risk within a partnership decreases, though actual transmission risk may remain constant, condomless anal intercourse (CAI) occurs more often. As a result, stable partnerships contribute to an estimated one-third of new HIV diagnoses in Peru.(16,17) Among non-stable partners, misconceptions of HIV/STI risk based on sexual identity contribute to high frequency of CAI.(12,14) In one study, heterosexual/bisexual-identifying MSM were perceived to have less HIV/STI risk compared to gay-identifying MSM and transwomen (TW), even when recently diagnosed with an STI.(10,14) CAI similarly occurs more often in non-stable partnerships with heterosexual/bisexual-identifying partners, demonstrating variations in HIV/STI transmission risk based on partnership context.

Similarly, sexual networks influence STI prevalence predominantly through the connectedness and composition of one's sexual network.(18,19) Studies in Peru identified subgroups based on sexual identity and role within networks of MSM at high STI risk.(10,13) Greater STI prevalence in a network, in turn, is associated with increased risk of STI exposure and acquisition.(3,19) As one's connectedness with core transmission subgroups increases, so does risk for HIV and STI acquisition.(8,18,19) The presence of groups that disproportionately contribute to STI transmission suggests appropriately designed interventions for these groups could lead to a disproportionate reduction in STI incidence in the overall population.

However, STI transmission patterns vary by pathogen, such that partnership and sexual network factors do not affect NG, CT, and syphilis transmission uniformly. Studies in Peru describe role-based sexual identities, in which the *activo* (insertive) partner maintains a masculine/dominant role while the *pasivo* (receptive) partner embodies a more feminine/submissive role, with differential risk for STI transmission.(10,20) MSM endorsing an *activo* sexual role had lower prevalence of syphilis and HIV but higher prevalence of urethral NG/CT, while *pasivo* partners had higher prevalence of HIV, syphilis, and rectal NG/CT.(2,10) Another study found higher likelihood of syphilis transmission within male-only sexual networks with greater proportions of *moderno/versátil* (both insertive and receptive intercourse) MSM.(13) Partnerships and networks, alongside individual and biological factors, contribute to heterogeneous risk for STI acquisition.

Most studies examining dyadic/sexual network characteristics have focused on sexual risk behaviours or HIV status rather than STI diagnosis.(18,19) In Peru, few studies including biological confirmation of STI status have examined detailed sexual network characteristics. To our knowledge, we provide one of the first studies to analyse behavioural patterns of MSM in Peru with different sexual partnership types by defining distinct groups according to type of STI diagnosis (NG/CT and/or syphilis). By utilizing information collected prior to STI diagnosis, we aim to better understand risks for both STI acquisition *and* transmission in sexual networks of MSM.

METHODS

Study Population

We evaluated data from 1,376 MSM screened for a partner management study at *Vía Libre*, a non-profit integrated sexual health centre in Lima, Peru, from June 2022 – March 2023. Eligibility was limited to adults who were assigned male sex at birth, identified as male, and reported CAI with at least one male or TW in the last six months.

Study Procedures

Participants completed computer-assisted self-interview (CASI) questionnaires addressing individual and sexual network characteristics within the last 90 days. Sexual network characteristics were stratified by partnership type (principal, casual, anonymous, transactional). Trained research staff instructed participants to assign each partnership to

one of these categories and facilitated an interview evaluating the number of sexual partners and frequency of sexual behaviour in the last 90 days, based upon partner type.

STI Diagnosis/Treatment

Participants were screened for HIV, syphilis, NG, and CT. Study staff provided pre- and post-test HIV risk reduction counselling and laboratory technicians collected blood for 4th Generation HIV testing (Alere, Waltham, MA) and HIV-1 RNA PCR for positive samples (Aptima HIV-1 Quant Dx; Hologic, San Diego, CA). Participants were informed of their results and referred to local HIV treatment services providing antiretroviral treatment (ART), if applicable. Syphilis screening utilized the Determine™ Syphilis TP (Abbott, Abbott Park, IL) immunoassay, with positive results confirmed by DPP® Syphilis Screen & Confirm Assay (Chembio, Medford, NY) and serial dilution of positive titres by laboratory staff. Physicians diagnosed untreated syphilis according to treatment history and prior RPR titre(s). Participants were tested for pharyngeal, rectal, and urethral *Chlamydia trachomatis* and *Neisseria gonorrhoeae* via the Aptima Combo 2® Assay (Hologic Aptima, Woburn, MA). All participants who tested positive for syphilis, NG, and/or CT received treatment according to CDC guidelines.(21)

Data Analysis

We stratified participants by STI diagnosis, defined as rectal, pharyngeal, and/or urethral NG/CT and/or untreated syphilis. We did not differentiate according to anatomic site and included all participants with data from at least one site (no participants were missing NG/CT data from all sites; n=9 participants were missing one or more sites). Participants reporting non-male sex-at-birth and/or gender/sexual identity were excluded from this study (n=32). Unless otherwise stated, missing or “other” responses accounted for slight variations in sample size (missing data not imputed). Chi-square and Wilcoxon Rank-Sum tests compared individual and sexual network data of participants without any STI to those diagnosed with 1) syphilis, 2) NG/CT, and 3) NG/CT-syphilis co-infection.

Respondent variables included age, education (recategorized as post-diploma education Y/N), sexual identity (heterosexual or bisexual versus homosexual), sexual role (*activo*, *pasivo*, *moderno*/*versátil*), transactional sex (receipt of goods/services in exchange for sex), and HIV serostatus. We created an “HIV Spectrum” variable to capture participant awareness of their HIV serostatus, defined as: 1) Participants who were not living with HIV and aware of their status; 2) Participants who were living with HIV and aware of their status (prior diagnosis); and 3) Participants living with HIV and unaware of their status (new diagnosis). Awareness was based on self-report of participants’ most recent HIV test result (positive/negative/indeterminate/never received) accurately corresponding with the results of laboratory detected viral load, if applicable.

We grouped sexual network characteristics from the last 90 days by partner type: principal, casual, and anonymous. Transactional sex partners were considered an exclusive category. All partnership types were analysed by number of partners and episodes of receptive and insertive CAI. We analysed reported sexual identity and sexual role of participants’ most recent principal and casual partners while analysing participants’ most recent casual

and anonymous partners by sexual encounter location (sex-on-premises venues [SOPV] or other). Further, we analysed principal partners by type of relationship (open or exclusive), casual partners by their method of initial contact (online or in-person) and number of encounters (one-time or repeated), and anonymous partners by average number of reported partners per visit to SOPV. To account for multiple partnership types reported by the same participant, we conducted a sensitivity analysis using multivariable logistic regression models that evaluated relationships between partner type and sexual orientation with each of our STI outcomes (Supplemental Tables 1–3). To account for differences across STI diagnoses, we conducted multinomial logistic regression to estimate unadjusted odds of syphilis, GC/CT, or co-infection (compared to no STI infection) for last 90-day partnership characteristics (Supplemental Tables 4–5).

We chose a p-value of <0.05 to define statistical significance, while accounting for multiple comparison tests in variables with greater than two endpoints using the Bonferroni method. The adjusted p-values were $p<0.0083$.(22) All analyses were conducted using Stata 14.2 (StataCorp, College Town, TX).

Ethics Statement and Permissions

Participants provided written informed consent prior to study enrolment. The protocol was approved by the Office of Human Research Participant Protection at the University of California, Los Angeles, (#18–002002) and the *Comité Institucional de Bioética* at *Vía Libre* (#Nº 8924). The parent study from which this secondary analysis is derived is registered on clinicaltrials.gov (NCT04553211).

Patient and public involvement

Patients and the public were not specifically involved with study design and coordination for this research project given its cross-sectional design. Patient and community involvement was taken into consideration for the partner management study from which this data was drawn. The results of this study were shared with the community organization working with the study population.

RESULTS

Sample Characteristics

1,376 participants were included in our analysis. Median age was 31 years (IQR:25–38) and 70.0% received education beyond high school. Most participants endorsed a homosexual sexual identity (68.5%) and *moderno* sexual role (54.4%). One quarter endorsed some form of transactional sex (24.2%). The median number of reported partners in the last 90 days was 12 (IQR:5–20), with a much smaller percentage reporting a principal partner (22.6%,) versus casual (88%) or anonymous partners (80.3%), in the last 90 days.

47.9% of this sample were living with HIV and most were negative for any other STI (59.2%). 204 (14.9%) participants were diagnosed with syphilis, 226 (16.4%) with NG/CT only, and 131 (9.5%) with NG/CT and syphilis. Of all NG/CT diagnoses, 16.0% were pharyngeal, 7.3% urethral, 53.2% rectal, and 23.5% multi-site.

Participant Characteristics by STI Diagnosed

We report respondent characteristics in Table 1 with “No STI” as the reference group for each STI diagnosis. All groups with STIs were less likely to report their sexual role as *activo* instead of *pasivo* or *moderno* (p<0.001) compared to those with no STI diagnosis. Respondents with syphilis had the highest proportion of *pasivo* participants at 28.9% (58/204), while those with co-infection reported the highest frequency of *moderno*-identified participants, at 61.6% (77/131). In terms of sexual identity, 76.4% of participants with syphilis identified as homosexual (p=0.018) as opposed to 67.8% (538/815) without an STI. Overall, 73.5% of MSM with syphilis had a confirmed HIV diagnosis, of whom 20% (120/150) were new diagnoses. Compared to MSM without an STI, participants with untreated syphilis were more likely to be living with HIV (150/204, p<0.001) and to be newly diagnosed with HIV (p<0.001). These participants also reported larger sexual networks, with a median of 15 sexual partners (IQR:7–20, p=0.004) and receptive CAI with 4 partners (1–10, p<0.001) in the last 90 days, compared to 10 sexual partners (IQR:5–20) and 2 (IQR:0–6) receptive CAI partners among participants without an STI.

MSM with NG/CT infection shared few characteristics with MSM with syphilis. They were the youngest group, with a median age of 28 (IQR:23–33, p<0.001) and reported similar sexual identities to those without an STI. While still endorsing *pasivo* or *moderno* sexual roles more often than MSM without STI, those with NG/CT reported the highest percentage of *activo* respondents at 16.2% (36/226). This group was more likely to be living with HIV (47.8%, p=0.007), but at lower frequencies than participants with syphilis mono- or co-infection. MSM with NG/CT infection did not have any differences in terms of awareness of living with HIV compared to MSM without an STI. Finally, while participants with NG/CT reported engaging in receptive CAI with more recent partners (Median:3, IQR:1–8, p=0.002), their overall sexual network was not significantly larger than MSM without an STI.

Men with NG/CT-syphilis co-infection shared many characteristics with participants diagnosed with syphilis alone. Most MSM with co-infection identified as homosexual (76.6%, 98/131, p=0.046), and were more likely to have HIV (71.0%, p<0.001), including a new diagnosis (10.6%, p<0.001), than MSM without STI. Only 15% (14/93) of participants living with HIV were previously undiagnosed. Respondents with co-infection were the only group more likely to report transactional sex than participants without an STI (31.3%, 41/131, p=0.039), and reported a greater median number of sexual partners (15, IQR:7–22, p=0.014) and partnerships with receptive CAI (6, 1–11, p<0.001).

Sexual Network Characteristics Stratified by Partner Type

We report sexual network characteristics from the last 90 days in Table 2 according to STI diagnosis grouped by reported partnership type(s). Among the 310 participants reporting a principal partner, MSM diagnosed with NG/CT were more likely to report their partner’s sexual identity as bisexual (41.2%, 21/55, p=0.022) compared to those without an STI.

1,209 participants reported a recent casual partner. All participants diagnosed with an STI were more likely to report their most recent casual partner’s sexual role as *activo* compared

to those with no STI, though the difference was greater for syphilis (48.3%, 86/180, p<0.001) and co-infection (55.9%, 62/112, p<0.001) than for NG/CT (42.9%, 84/196, p=0.026). Accordingly, median number of episodes of receptive CAI with single-contact casual partners was higher among men with syphilis (3, IQR:0–10, p<0.001), NG/CT (2, 0–6, p=0.011), and co-infection (5, 0–9, p<0.001) than MSM with no STI.

Participants diagnosed with syphilis were more likely to report a SOPV as the location of their last sexual encounter (51.7%, p=0.038), to have been with a single-contact casual partner (59.4%, p=0.010), and to have reported a greater median number of single-contact casual partners (10, 5–17, p=0.009) compared to MSM with no STI. In contrast, participants diagnosed with NG/CT were more likely to report meeting their last sexual partner online (72.8%, p=0.031) than MSM with no STI. Those diagnosed with co-infection reported larger networks of casual partners (Median:14, IQR:6–20, p=0.005) than participants without an STI, whether one-time (10, 2–19, p=0.043) or repeated casual partners (3, 1–6, p=0.043).

Of the 1,101 participants who reported sex with an anonymous partner, respondents diagnosed with syphilis (Median:3, IQR:1–5, p=0.021) and co-infection (3, 2–6, p<0.001) reported sex with a greater number of anonymous partners during each visit to SOPV than those without an STI. Only MSM diagnosed with syphilis reported a greater median number of anonymous partners (8, 1–15, p=0.047) in the prior 90-day period than participants with no STI.

DISCUSSION

Our study adds to research describing differences in sexual network characteristics among MSM in Peru diagnosed with NG/CT, syphilis, and NG/CT-syphilis co-infection, compared to those without an STI diagnosis. We demonstrate heterogeneous patterns of STI transmission between subgroups of MSM, as defined by risk behaviours in different dyadic contexts, particularly in terms of partnership type and sexual network composition. A detailed understanding of how high-risk partnership contexts differentially affect transmission of distinct STI pathogens can be applied to integrate more resource-efficient interventions within key networks.

Participants diagnosed with syphilis had larger sexual networks composed primarily of single-contact casual partners, many of which were anonymous partners met at SOPV's. SOPV's are common meeting places for casual or anonymous partnerships in Lima, particularly for MSM with larger family units, in which sexuality-related stigma discourages bringing partners home for sexual encounters.(23) SOPV's have been associated with high-risk sexual behaviour including greater numbers of sexual partners, more frequent transactional sex, and substance use in conjunction with sex.(23) The high prevalence of syphilis and previously undiagnosed HIV among MSM frequenting these venues suggest the potential utility of combined HIV and syphilis screening at SOPV's, an evidence-based strategy with wide community acceptance among MSM in Lima.(24)

MSM with NG/CT tended to be younger, more often met casual partners online, and reported more episodes of receptive CAI compared to MSM without an STI – despite similar

sexual network sizes. These findings confirm prior research in Lima, Peru associating online partnerships with more sexual partners, more frequent CAI, SOPV use, and greater risk of NG/CT transmission.(25) Our study, however, did not find significantly more SOPV use for sexual encounters in the NG/CT subgroup than MSM without an STI. This difference is likely because many MSM in Peru use online sites to find partners, regardless of risk behaviour or STI status, and not all will use online sites to meet at SOPV's. It indicates the need for further research to understand which partnership factors contribute to NG/CT-specific STI transmission. In addition, men with NG/CT infection more often reported their principal partner's sexual identity as bisexual than men with no STI. The unequal balance of power between bisexual-identifying MSM and their gay-identified MSM or TW partners during condom negotiations has been linked to CAI and urethral NG/CT diagnosis among *activo* men in Latin America.(2,10) Bisexual-identified MSM in these partnerships may contribute to NG/CT transmission outside of all-male sexual networks. Public health efforts should focus on this population using partner notification strategies to counteract this transmission.(26)

While the subgroup with NG/CT and syphilis co-infection shared similar sexual network characteristics to those with syphilis, we identified several key differences. MSM with co-infection were the only group that had higher frequency of transactional sex and reported more repeat casual partners, as well as more episodes of receptive CAI, compared to participants without an STI. Transactional sex is well demonstrated to impair condom negotiations through conditions of economic necessity, social marginalization, and client preference.(27) Our findings confirm research showing that MSM in transactional partnerships, particularly in the context of larger and less-dense sexual networks, are at greater risk for acquisition of all STI's and remain an important group to address in future HIV/STI prevention strategies.(28)

This study has several key limitations. First, a cross-sectional survey based on self-reported partnership data is inherently subject to recall bias and inaccuracy. However, using an interviewer-administered survey allowed participants to describe their partnerships in detail and study staff to verify responses while creating a broad picture of their sexual network. Second, we used a convenience sample of MSM at high-risk for STIs recruited from an ongoing study at an HIV/STI research centre, which reported high frequency of anonymous and casual partnerships. This restriction limits generalizability of our findings to the overall MSM population in Peru but supports our goal to develop interventions addressing the needs of key subgroups of MSM vulnerable to STI transmission. We are only able to describe distributional differences surrounding participant and sexual network characteristics, which should be considered when interpreting our findings. We are unable to describe associations across STI diagnoses or adjust for participant/network characteristics in regression models due to sample size and multicollinearity across variables. However, we did conduct a sensitivity analysis evaluating participant/sexual network characteristics according to STI diagnosis in both multivariable logit as well as multinomal logit models (Supplemental Tables 1–5). Finally, we were unable to complete additional analyses comparing STI groups based on anatomic site of NG/CT diagnosis as sufficient power to detect differences would require a much larger sample. This is an important question for future research

to help disentangle how pathogen characteristics, dyadic partnership formations, and social-structural contexts all contribute to differential patterns of STI transmission.

Our findings highlight the complicated overlapping contributions of individual, partnership, and sexual network characteristics to STI transmission among MSM in Peru. While individual behaviour contributes to risk for STI acquisition, partnership type changes the context for transmission of certain pathogens. The method and location of partnership formation separates subgroups with more frequent NG/CT transmission (e.g., younger MSM in online partnerships) compared to syphilis (e.g., older MSM in anonymous partnerships at SOPV's) or MSM at high-risk for both (e.g., men in transactional sexual partnerships). These findings highlight the need to invest in novel yet evidence-based public health strategies to effectively address current STI transmission patterns: targeted messaging (online advertisements for and/or access to NG/CT testing), venue-based testing (syphilis screening at HIV clinics and SOPV), and network level interventions (e.g., partner notification and expedited partner therapy) among core populations of MSM at-risk for specific pathogens.(23–26,29) More research should focus on two priorities: first, better defining how individual, partnership, and network factors differ among distinct partnerships; second, how these factors contribute to differential STI transmission. By doing so, we can better address the current HIV/STI epidemic among MSM in Peru.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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KEY MESSAGES

What is already known on this topic

Sexual networks among MSM structure transmission of STIs.

What this study adds

Our study differentiates between NG/CT, syphilis, and NG/CT-syphilis co-infection and demonstrates heterogeneous patterns of STI transmission within subgroups of MSM. These patterns are defined by risk behaviours in different dyadic contexts, particularly partnership type and sexual network composition.

How this study might affect research, practice, or policy

These findings suggest the need for evidence-based public health interventions that utilize site and STI-specific testing strategies to increase access to testing and treatment for MSM.

Table 1:

Participant characteristics by STI Diagnosis among MSM in Lima, Peru (2022–23)

Participant Characteristics (n=1,376)	No STI (n=815)	Syphilis (n=204)	NG/CT (n=226)	Co-infection[a] (n=131)
	n (%)	n (%)	n (%)	n (%)
Age[b]	31 (25–38)	33 (27–40)	28 (23–33) ***	30 (26–36)
Education				
High School or Less	243 (29.8)	57 (27.9)	66 (29.2)	47 (35.9)
Post-Diploma Education	572 (70.2)	147 (72.1)	160 (70.8)	84 (64.12)
Sexual Identity				
Hetero/Bisexual	256 (32.2)	47 (23.6) *	72 (32.9)	30 (23.4) *
Homosexual	538 (67.8)	152 (76.4)	147 (67.1)	98 (76.6)
Sexual Role				
Activo	239 (29.5)	27 (13.4) ***	36 (16.2) ***	14 (11.2) ***
Pasivo	155 (19.1)	58 (28.9)	56 (25.2)	34 (27.2)
Moderno	416 (51.4)	116 (57.7)	130 (58.6)	77 (61.6)
HIV Diagnosis	308 (37.8)	150 (73.5) ***	108 (47.8) *	93 (71.0) ***
HIV Spectrum[c]				
Aware/HIV-	296 (49.0)	29 (16.2) ***	69 (39.0)	30 (24.4) ***
Aware/HIV+	250 (41.4)	120 (67.0)	88 (49.7)	79 (64.2)
Unaware/HIV+	58 (9.6)	30 (16.8)	20 (11.3)	14 (11.4)
Transactional Sex	187 (23.0)	57 (28.0)	47 (20.8)	41 (31.3) *
Full Sexual Network[b]				
Number of Partners	10 (5–20)	15 (7–20) **	12 (6–20)	15 (7–22) *
Insertive CAI	2 (0–7)	3 (0–10)	2 (0–7)	2 (0–9)
Receptive CAI	2 (0–6)	4 (1–10) ***	3 (1–8) **	6 (1–11) ***
Partnership Type Reported				
Principal Only	18 (2.2)	2 (1.0)	5 (2.2)	4 (3.1)
Casual Only	95 (11.9)	16 (8.0)	30 (13.4)	17 (13.3)
Anonymous Only	54 (6.7)	18 (9.0)	21 (9.4)	10 (7.8)
Casual & Anonymous	467 (58.3)	123 (61.2)	119 (53.1)	74 (57.8)
Principal & Casual or Anonymous	167 (20.8)	42 (20.9)	49 (21.9)	23 (18.0)

NG = gonorrhoea; CT = chlamydia; CAI = Condomless Anal Intercourse;

[a] "Co-infection" indicates syphilis and NG/CT infection (at any site);

[b] Median (Interquartile Range);

[c] Participants unaware of their HIV-uninfected serostatus were excluded from this variable

P-Values:

* <0.05;

** <0.01;

*** <0.001

Table 2:

Sexual partner characteristics and sexual network data from the last 90 days comparing MSM with STI diagnosis to MSM without STI in Lima, Peru (2022–23)

Partner Characteristics	No STI n (%)	Syphilis n (%)	NG/CT n (%)	Co-infection[a] n (%)
Principal Partner (n=310)	**(n=185)**	**(n=44)**	**(n=55)**	**(n=27)**
Sexual Identity				
Hetero/Bisexual	40 (24.5)	12 (30.8)	21 (41.2) *	3 (11.5)
Homosexual	123 (75.5)	27 (69.2)	30 (58.8)	23 (88.5)
Sexual Role				
Activo	52 (30.8)	12 (30.8)	15 (28.3)	7 (26.9)
Pasivo	43 (25.4)	10 (25.6)	11 (20.8)	5 (19.2)
Moderno	74 (43.8)	17 (43.6)	27 (50.9)	14 (53.9)
Type of Relationship				
Open (v. Monogamous)	144 (88.3)	39 (92.9)	42 (87.5)	20 (83.3)
Sexual Network[b]				
Number of Principal Partners[c]	0 (0–1)	0 (0–0) *	0 (0–1)	0 (0–0) *
Insertive CAI Principal Partners[c]	1 (0–1)	1 (0–1)	1 (0–1)	0 (0–1) *
Receptive CAI Principal Partners[c]	1 (0–1)	1 (1–1)	1 (0–1)	1 (0–1)
Casual Partner (n=1,209) [d]	(n=721)	(n=180)	(n=196)	(n=112)
Sexual Identity				
Hetero/Bisexual	203 (29.9)	58 (34.3)	64 (36.0)	36 (33.6)
Homosexual	475 (70.1)	111 (65.7)	114 (64.0)	71 (66.4)
Sexual Role				
Activo	243 (34.3)	86 (48.3) ***	84 (42.9) *	62 (55.9) ***
Pasivo	239 (33.7)	34 (19.1)	48 (24.5)	15 (13.5)
Moderno	227 (32.0)	58 (32.6)	64 (32.7)	34 (30.6)
Meeting Location/Format				
Online	425 (64.3)	104 (62.3)	134 (72.8) *	78 (71.6)
In-person	236 (35.7)	63 (37.7)	50 (27.2)	31 (28.4)
Sexual Encounter Location				
SOPV	311 (43.1)	93 (51.7) *	86 (43.9)	53 (47.3)
Not SOPV	411 (56.9)	87 (48.3)	110 (56.1)	59 (52.7)
Number of Encounters				
One Time Only (v. Repeated)	351 (48.6)	107 (59.4) **	94 (48.2)	55 (49.1)
Sexual Network[b]				
Number of Casual Partners[c]	10 (5–19)	14 (7–20) ***	10 (5–22)	14 (6–20) **
Sexual Network: Casual Single-Contact[b]				
Number of Single-Contact Partners[c]	7 (3–15)	10 (5–17) **	8 (3–18)	10 (2–19) *

Partner Characteristics	No STI n (%)	Syphilis n (%)	NG/CT n (%)	Co-infection[a] n (%)
Principal Partner (n=310)	**(n=185)**	**(n=44)**	**(n=55)**	**(n=27)**
Insertive CAI Single-Contact Partners[c]	2 (0–5)	2 (0–8)	2 (0–5)	1 (0–8)
Receptive CAI Single-Contact Partners[c]	1 (0–5)	3 (0–10) ***	2 (0–6) *	5 (0–9) ***
Sexual Network: Casual Repeated[b]				
Number of Repeated Partners[c]	2 (1–5)	3 (1–5)	2 (0–4)	3 (1–6) *
Insertive CAI Repeated Partners[c]	1 (0–3)	1 (0–4)	1 (0–2) *	0 (0–3) *
Receptive CAI Repeated Partners[c]	1 (0–3)	1 (0–4) *	1 (0–3) *	2 (0–4) **
Anonymous Partner (n=1,101) [d]	(n= 643)	(n= 175)	(n= 175)	(n=104)
Sexual Encounter Location				
Not SOPV	234 (37.0)	62 (35.8)	69 (40.3)	39 (37.9)
SOPV	398 (63.0)	111 (64.2)	102 (59.7)	64 (62.1)
SOPV – Anonymous Partners/Visit[c]	3 (1–4)	3 (1–5) *	3 (1–5)	3 (2–6) ***
Sexual Network[b]				
Number of Anonymous Partners[c]	5 (1–11)	8 (1–15) *	5 (1–13)	3 (0–15)

NG = gonorrhoea; CT = chlamydia; CAI = Condomless Anal Intercourse; SOPV = Sex-on-premises Venues;

[a] "Co-infection" indicates syphilis and NG/CT infection (at any site);

[b] Reported by the participant for the indicated partnership type;

[c] Median (Interquartile Range);

[d] Characteristics are of most recent partner

P-Values:

* <0.05;

** <0.01;

*** <0.001