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Venue-Based HIV-Testing: An Effective Screening Strategy for High-Risk Populations in Lima, Peru

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Abstract

Venue-based testing may improve screening efforts for HIV and syphilis, thereby reducing transmission. We offered onsite rapid dual HIV and syphilis testing at venues popular among MSM and/or transgender women in Lima, Peru. We used Poisson regression to calculate adjusted prevalence ratios (aPRs) for factors associated with each infection. Most (90.4%) of the 303 participants would test more frequently if testing was available at alternative venues. New cases of HIV (69) and syphilis infection (84) were identified. HIV was associated with recent sex work (aPR 1.11; 95% CI 1.02–1.22), sex with a partner of unknown serostatus (aPR 1.18; 95% CI 1.09–1.27), exclusively receptive anal sex role (aPR 1.16; 95% CI 1.03–1.30) or versatile sex role (aPR 1.17; 95% CI 1.06–1.30) compared to insertive. Syphilis was associated with reporting role versatility (aPR = 2.69; 95% CI 1.52–5.74). Sex work venues had higher syphilis prevalence 47% versus 28% in other venues, p value = 0.012. Venue-based testing may improve case finding.

Keywords HIV · Latin America · Syphilis · MSM · Transgender women

Resumen

Realizar pruebas en lugares de encuentro puede mejorar la detección del VIH y sífilis, llegando a reducir transmisión. Ofrecíamos pruebas rápidas para sífilis y VIH en lugares populares entre HSH y/o mujeres transgénero en Lima, Perú. Calculamos razones de prevalencia ajustados (aRP) para factores asociados con cada infección usando regresión de Poisson. La mayoría (90.4%) de los 303 participantes realizarían pruebas más frecuentemente si estuvieran disponibles en lugares alternativos. Se identificaron nuevos casos de VIH (69) y sífilis (84). VIH fue asociado con trabajo sexual (aPR = 1.11; IC95% 1.02-1.22), tener una pareja de seroestatus desconocido (aPR = 1.18; IC95% 1.09-1.27), sexo anal exclusivamente receptiva (aPR = 1.16; IC95% 1.03-1.30) o rol sexual versátil (aPR = 1.17; 95% CI 1.06-1.30) en comparación con insertivo. Sífilis fue asociado con versatilidad de rol (aPR = 2.69; IC95% 1.52-5.74). Los lugares de trabajo sexual tuvieron una mayor prevalencia de sífilis 47% en comparación con 28% en otros, valor-p = 0.012. Pruebas en lugares de encuentro pueden mejorar la búsqueda de casos.

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Introduction

In Peru, the prevalence of Human Immunodeficiency Virus (HIV) infection among high-risk populations such as men who have sex with men (MSM) and transgender women is estimated to be between 18 and 22% (compared to < 1% in the general population) [1]. Multiple approaches have been described for combating that high prevalence, however given the lack of pre-exposure prophylaxis (PrEP) [2] and other prevention methods in Peru, universal test and treat strategies are the primary means of HIV prevention [3]. The Peruvian Ministry of Health guidelines for MSM and transgender women recommend an average of two HIV tests per year

[4]. That strategy is supported by previous studies, which demonstrate that a substantial portion of new HIV infections come from individuals unaware of their HIV-infection status [5, 6].

Among MSM and transgender women in Peru, however, only 6.2% reported testing in accordance with Peruvian Ministry of Health guidelines, every 6 months, in a previous community-based sample [7]. Perceptions of stigma and risk have been shown to be barriers to HIV testing [7, 8].

Several studies have reported successful implementation of mobile testing for HIV and other sexually transmitted infections (STIs) [9–12]. Venue-based time–space-sampling has been shown to be effective in recruiting MSM and transgender women who had not previously been tested for HIV, and who had significantly higher prevalence of previously undiagnosed HIV when compared to convenience sampling and respondent driven sampling [13]. However, that study did not focus on high-risk venues, and the time required for participation limited uptake. If uptake can be improved, it therefore may provide an effective screen strategy for high-risk populations, as well as offering epidemiologic information on hidden-populations.

This study aims to investigate if venue-based testing is feasible and acceptable, as well as to provide insight into the causes of the poor testing uptake, with the goal of guiding further efforts to improve HIV screening among MSM and transgender women in Peru.

Methods

We offered onsite HIV testing at 34 different locations including bars, clubs, and parks known to be popular among the MSM and transgender women communities in Lima, Peru. Times and locations were selected based on formative research conducted prior to the study fieldwork. Selection was aimed at finding high-risk locations; this was not a surveillance study, but aimed to show that there was a need for non-clinic based testing, which could help to find HIV positive MSM and transgender women who were unaware of their status. We enrolled participants who were assigned male sex at birth, between the ages of 18–45 years, reported condomless anal sex with a man or transgender women in the past year, live in Lima/Callao, and were either HIV-uninfected or unaware of their HIV status. Consequently, individuals were asked in private prior to testing if they were living with HIV, if so they were asked to fill out a separate survey on their engagement in HIV care, results from this survey are not included herein. A 40-question tablet-based survey was then completed by the participants to capture sexual risk behaviors in the past 3 months, HIV testing history, and their opinions of venue-based testing. Tests were conducted in a modified station wagon with space in the

back for a counselor and participant. Participant confidentiality was aided by blocking out the windows of the vehicle. Point of care testing was conducted using a dual immunoassay for HIV and *Treponema pallidum*—the causative organism of syphilis (SD BIOLINE HIV/Syphilis Duo, Republic of Korea). Confirmation of HIV infection was performed using the *OnSite* HIV Ag/A 4th Generation Rapid Test (CTK Biotech, California, USA). Confirmation of syphilis was performed using rapid plasma reagin (RPR) titers and *Treponemal palladium* particle agglutination (TPPA) assays. Dual rapid tests were donated by Standard Diagnostics, Incorporated. Results were provided during private post-test counseling, HIV infection was confirmed during the fieldwork and contact information was collected from participants for study staff to aid with linkage to care. Syphilis rapid test results were confirmed using lab-based RPR testing. In the field, participants were informed that their result required confirmation and contact information was collected to be able to inform them about the need for treatment. Those participants who required treatment were then contacted to receive it at one of two non-governmental organizations, both known for working with MSM and transgender women. All fieldwork was completed in 2016.

We performed bivariate analyses using a Poisson regression model. Number of male sex partners in the past three months was analyzed as a categorical variable (0, 1, 2–3, 4–9, ≥ 10). Variables that were significant in bivariate analysis (p-value ≤ 0.05) were considered for the multivariate model. We used a backward stepwise approach to develop two different multivariable Poisson regression models calculating adjusted prevalence ratios (aPRs) to describe associations with HIV infection or syphilis. Both models included number of male sex partners and sex role for anal sex as these are known to be associated with the outcomes of interest. All analyses were performed using STATA software version 14.2 (StataCorp®, College Station, TX, USA).

For participants who refused testing, we conducted a three-question mini-survey filled out by study staff to ask their reasons for refusal, verbal consent was provided for this survey. In addition, we offered referral coupons for free HIV and syphilis testing at either of two local non-governmental organizations to all eligible individuals who refused participation at the recruitment venue. We report descriptive statistics on their reasons for non-participation. We also compared prior HIV testing between those who refused venue-based testing and enrolled participants using Chi square testing. This study received approval from the Institutional Review Board committees at Universidad Peruana Cayetano Heredia and University of California, Los Angeles.

Results

Of the 585 MSM and transgender women approached for enrollment, 303 were enrolled (51.8%) and gave informed consent (300 were enrolled onsite, while three were enrolled offsite via free referral testing coupons). Of the 282 (48.2%) participants who refused onsite HIV testing, only 19 (6.7%) individuals accepted a free referral coupon, and of those, only three (15.8%) mentioned above actually presented to clinic for HIV testing. The most common reason reported for refusal was that the participant did not have enough time, reported by 99 participants (35.1%), followed by 77 (27.3%) participants who stated they would prefer a more discrete place (Table 1). The average time from enrollment to completion of all study procedures, including post-test counseling, was between 30 and 40 min. Of the 282 individuals not tested 14 (5.0%) participants reported never being tested for HIV, compared to 28 (9.2%) of the 303 participants who received testing at the recruitment venue that reported never being tested for HIV (p-value = 0.007).

Among those who received testing, 89 (29.4%) identified as *travesti* (the local term for a transgender woman), or transgender, and 54.5% of participants reported attending the testing venue at least once a week. Condomless insertive anal sex was reported by 139 (45.9%) of participants with any sex partner in the prior three months, and 124 (40.9%) participants reported condomless receptive anal intercourse in the prior three months. Importantly, 65 (21.5%) reported their last sex partner was a woman.

The majority of participants, 158 (52.2%), reported running out of money to pay for their basic needs such as water, food, or housing in the past year. When asked about education level, 95 (31.4%) participants reported not completing secondary school. Receiving money for sex in the prior 3 months was reported by 167 (55.1%) participants. Use of drugs or alcohol prior to sex was reported by 266 participants (87.8%).

With regard to past HIV testing, 54 (17.8%) had never been tested for HIV, while 124 (40.9%) reported testing in accordance with national Ministry of Health and WHO recommendations of testing every 6 months, and 57 (18.8%) reported testing within the last year, while 68 (22.4%) reported testing more than 1 year ago. The most commonly reported reason for not testing more frequently was perceived low risk of infection (20.1%), followed by (18.5%) reporting that they were unsure where to go for testing, and (18.2%) who reported fear of positive results (Table 1). Among participants, 105 (34.7%) perceived their risk of contracting HIV infection as low while 60 (19.8%) perceived their risk as high on a scale of high, moderate, low, or no risk. Long distance to the clinics was reported as a barrier to testing in 37 (12.2%) participants, and 274 (90.4%) reported they would test for HIV more frequently if testing was offered in alternative settings such as bars or clubs. A preference for HIV testing in public places such as parks and plazas was expressed by 171 (56.4%) participants, while 49 (16.2%) maintained they would prefer a clinic or a private place.

We identified 69 (22.8%) new cases of HIV infection among our population. Reporting sex with a partner of

Table 1 Reported reasons for not testing for HIV and reasons for not testing for HIV more frequently among MSM and transgender women in Lima, Peru

Refusers: reasons for not testing	No.	%	Participants: reasons for not testing more frequently	No.	%
No time	99	35.1	No difficulty testing frequently	101	33.3
Preference for a more discrete location	77	27.3	Low perceived risk	61	20.1
Recent HIV test	54	19.1	Unsure where to get a test	56	18.5
Low perceived risk	41	14.5	Fear of a positive result	55	18.2
Not their focus at the time of the survey	41	14.5	Long distance to testing clinic	37	12.2
Fear of a positive result	38	13.5	Incompatibility with testing clinic hours	23	7.6
Preference for testing alone, without friends present	22	7.8	Fear a lack of confidentiality	21	6.9
Lack of confidence in the rapid POC test	21	7.4	No time	21	6.9
Fear a lack of confidentiality	10	3.5	Long wait time	15	5.0
Lack of trust in study team	8	2.8	Fear of discrimination	13	4.3
Test will not be helpful	6	2.1	Cost of testing	12	4.0
Fear of discrimination	4	1.4	No risk behavior	2	0.7
			Fear of blood draw	2	0.7
			Misunderstanding recommendations of biannual testing	1	0.3
Total*	282		Total*	303	

*Participants could select multiple options

unknown HIV infection serostatus, a history of receiving money in exchange for sex, and either a receptive or versatile sex role (compared to exclusively insertive) for anal sex were significantly associated with prevalent HIV infection (Table II). Though prevalence was higher among transgender woman (compared to a cisgender MSM) after adjustment, being transgender was protective against HIV infection aPR 0.88 (95% CI 0.77 - 0.997). This change occurred, after adjusting for sex work.

We also identified 84 (27.8%) new cases of syphilis diagnosed by reactive RPRs, 38 of which had titers greater than or equal to 1:8. Of the 84 syphilis cases, 33 (39.3%) were co-infected with HIV (p value < 0.001). Reporting role versatility for anal sex was associated with syphilis infection compared to reporting an exclusively insertive role (Table 2).

We also explored if venue-type was associated with increased prevalence of HIV infection or syphilis. There was no significant difference in HIV prevalence comparing discos (23%), bars (22%), and sex work venues (23%), p value 0.949. There was a significant difference in overall syphilis prevalence comparing discos (27%), bars (21%), and sex work venues (44%), p value 0.012. The prevalence of recent syphilis (defined as an RPR titer $\geq$ 1:8) was 12% in discos, 11% in bars and 17% in sex work venues, which was no longer significant, p value 0.540.

Discussion

We implemented venue-based testing with rapid tests for HIV and syphilis at several locations known to be popular among MSM and transgender women communities. That intervention lead to the identification of 69 previously undiagnosed cases of HIV infection and 84 cases of syphilis, almost half of which were likely recent infection. Several studies have successfully implemented venue-based testing methods with a concomitant increase in new HIV diagnoses [9–12, 14, 15]. The prevalence of HIV infection and syphilis in our study were on the higher end of prior prevalence estimates [1, 16–18], and higher than the prevalence of these infections in a previous time–space-sampling study in Peru [13]. That high prevalence is likely due to a focus on high risk venues, including areas with substantial presence of sex workers. Thus, one utility of venue-based testing may be the ability to screen hidden populations who may not otherwise access traditional testing services.

In multivariable modeling, we found a higher prevalence of HIV infection among individuals reporting exclusively receptive anal sex as well as versatile anal sex when compared to insertive alone. Similarly, we found a higher prevalence of syphilis among those reporting a versatile role for anal sex. Those findings are consistent with a previous study among MSM and transgender women in Peru, which

demonstrated significantly lower rates of HIV infection among participants reporting insertive anal sex only [19] and higher rates of syphilis among those reporting receptive anal sex [20]. Mucosal disruption following receptive anal sex likely increases the risk of rectal STIs given the fragility of the rectal mucosa [21]. Furthermore, there may have been additional risk of HIV infection conferred by rectal *Neisseria gonorrhoeae* and *Chlamydia trachomatis* infections [22–25]; however, we did not test for those infections in the present study. Prior studies have documented a high prevalence of rectal *Neisseria gonorrhoeae* and *Chlamydia trachomatis* infections among similar populations of MSM and transgender women in Peru [26, 27].

Reporting sex with a partner of unknown HIV infection serostatus as well as reporting a history of receiving money in exchange for sex were both associated with prevalent HIV infection in our population. Likely those findings reflect high-risk behavior and are consistent with prior reports [28, 29]. Non-disclosure of HIV infection status not only has been associated with higher rates of condomless anal intercourse and other high-risk behaviors [30, 31], but also limits serosorting and sero-positioning [32, 33].

Identifying as a transgender woman was protective against HIV infection compared to identifying as a cisgender MSM, importantly, this finding occurred only after adjusting for sex work. Previous studies have demonstrated both a higher and a lower prevalence of HIV infection among transgender women [27, 34]. The current result may be related to the exclusion of individuals already known to be living with HIV from this study.

Given the high-risk behaviors reported by our population, the discrepancy of actual risk with perceived risk is concerning. A similar discrepancy has been reported previously [35, 36], and has been associated with reduced HIV testing in Peru [7]. Risk education, therefore, is an area that warrants expansion. Interestingly, however, a greater proportion of participants who perceived themselves as at high risk for HIV infection were infected with HIV when compared to those who perceived themselves as low risk or zero risk. That finding may be the result of the high proportion of infections among sex workers in our population. We found a significant association between reporting sex work and increased perception of risk of HIV infection (data not shown). A more accurate self-perception of risk among sex workers has been reported previously [37].

Venue-based testing appeared to be a favorable method for testing among those who received testing, as over 90% reported they would test for HIV infection more frequently if it were made available at alternative locations such as bars and clubs. That finding is consistent with what participants reported to be barriers to testing: long distances to the testing clinics, lack of knowledge about where to go for testing, and the incompatibility of clinic hours with participants'

Table 2 Prevalence and multivariate model of associations with HIV infection and syphils among MSM and transgender women sampled at high-risk venues in Lima, Peru

Variables	HIV prevalence (%)	PR (95% CI)	aPR (95% CI)	Syphilis prevalence (%)	PR (95% CI)	aPR (95% CI)
Identifies as a transgender women						
Yes	29.1	**1.09 (1.00–1.18)**	**0.88 (0.77–0.997)**	38.4	**1.78 (1.22–2.59)**	0.65 (0.39–1.08)
No	19.1	Ref	Ref	21.6	Ref	Ref
Sex with partner of unknown serostatus						
Yes	32.7	**1.20 (1.12–1.29)**	**1.18 (1.09–1.27)**	32.1	1.44 (0.98–2.13)	
No	11.1	Ref	Ref	22.2	Ref	
Sex with partner of known negative serostatus						
Yes	28.6	0.94 (0.85–1.04)		26.7	1.01 (0.64–1.60)	
No	20.7	Ref		27.0	Ref	
Sex with partner of known positive serostatus						
Yes	21.7	1.00 (0.86–1.15)		8.7	0.31 (0.08–1.17)	
No	22.1	Ref		28.5	Ref	
Sex in alternative location						
Yes	24.3	0.93 (0.85–1.02)		29.7	0.64 (0.36–1.13)	
No	15.5	Ref		19.0	Ref	
Use of sex app to find sex						
Yes	26.8	0.94 (0.87–1.02)		29.5	0.89 (0.61–1.29)	
No	20.2	Ref		26.1	Ref	
History of receiving money for sex						
Yes	30.4	**1.15 (1.07–1.24)**	**1.11 (1.01–1.22)**	37.3	**2.29 (1.48–3.52)**	1.37 (0.82–3.14)
No	13.3	Ref	Ref	16.3	Ref	Ref
Sex role for anal sex						
Insertive	11.7	Ref	Ref	15.8	Ref	Ref
Receptive	31.0	**1.18 (1.07–1.30)**	**1.16 (1.03–1.30)**	28.2	**1.79 (1.02–3.10)**	1.63 (0.84–3.14)
Versitile	36.8	**1.22 (1.12–1.34)**	**1.17 (1.06–1.30)**	47.1	**2.98 (1.86–4.76)**	**2.69 (1.52–5.74)**
Number of male sex partners						
0	6.7	Ref	Ref	13.3	Ref	Ref
1	12.8	1.06 (0.95–1.18)	0.97 (0.87–1.10)	12.8	0.96 (0.34–2.73)	0.46 (0.13–1.58)
2–3	25.4	1.16 (1.06–1.31)	1.04 (0.92–1.18)	28.6	**2.14 (1.01–4.56)**	1.57 (0.68–3.61)
4–9	28.1	1.20 (1.05–1.38)	1.04 (0.90–1.20)	21.9	1.64 (0.65–4.12)	1.12 (0.43–2.92)
≥10	32.1	1.24 (1.13–1.35)	1.09 (0.94–1.27)	41.5	**3.11 (1.57–6.17)**	2.01 (0.84–4.77)
Months without sufficient money to cover basic necesities, last 12 months						
0	23.1	Ref		27.3	Ref	
1–6	21.0	0.98 (0.90–1.06)		28.0	1.03 (0.70–1.51)	
>7	31.8	1.07 (0.91–1.25)		22.7	0.83 (0.37–1.90)	
Last sex partner was a stable partner						
Yes	19.9	Ref		22.6	Ref	
No	25.9	1.05 (0.97–1.14)		33.6	**1.49 (1.02–2.17)**	
Condomless receptive anal sex						
Yes	33.1	1.07 (0.96–1.20)		40.5	**1.68 (1.00–2.84)**	
No	24.1	Ref		24.1	Ref	
Condomless insertive anal sex						
Yes	21.0	0.97 (0.88–1.07)		28.3	1.07 (0.66–1.72)	
No	25.00	Ref		26.5	Ref	
Perceived risk of HIV infection						
High	30.1	**1.15 (1.06–1.24)**		38.1	**2.03 (1.34–3.07)**	**1.62 (1.06–2.47)**
Low	13.9	Ref		18.8	Ref	Ref
Ilicit drug or alcohol use prior to sex						
Yes	23.3	1.02 (0.94–1.11)		25.9	0.86 (0.59–1.26)	
No	21.4	Ref		30.1	Ref	

Bold indicates p value < 0.05

All variables were asked with regard to behavior in the past 3 months, unless other wise specified

schedules. Importantly, overall uptake of venue-based testing was only 50%. While that is higher than a previous time–space-sampling study in Peru, which reported 21.3% uptake [13], venue-based testing is not appealing to all populations.

One major consideration of any venue-based testing method is linkage to care once a new diagnosis has been made. Unfortunately, in Peru linkage to care remains a major obstacle to adequate treatment. That may be reflected in our study by the low percentages of those who refused onsite testing, received a free referral coupon, and actually presented to clinic for testing. Further work will be necessary to evaluate means of overcoming the barriers to establishing care for infection.

The most common reason for refusing testing among those approached was lack of time, which may explain why uptake in our study was higher than in the previous reported by Clark et al.; the time from recruitment to completion for participants in our study was 30–40 min, whereas Clark et al. report 45–60 min completion times [13]. Future venue-based testing interventions, therefore, should strive to reduce the amount of time from recruitment to completion to maximize uptake, which can be accomplished by eliminating a survey or reducing the survey length. As a public health strategy, no survey is needed, only a brief assessment of HIV risk in pre-test counseling.

Importantly, only one quarter of our population reported being tested in accordance with national Ministry of Health recommendations. However, the majority reported testing within the last year, which represents an increase over 42.3% who reported testing within the last year from a prior study among a similar population [7]. Though potentially indicating that screening efforts have had some success, there remains a high proportion of MSM and transgender women inadequately screened, thus re-emphasizing the need for scaled up HIV screening efforts among MSM and transgender women in Peru; onsite testing and free referral testing may mitigate the number of individuals with lack of access to testing services [7].

Despite a reported preference for hospital-based or clinic/health post-based testing among those who refused onsite testing, a very small percentage accepted free testing referral coupons, and even fewer actually presented to clinic for testing. Similar low rates of coupon acceptance and use have been reported previously [13]. Perhaps home self-tests for the subpopulation that is uncomfortable with venue-based testing may be an acceptable alternative [38, 39]. Thus, we suspect that improved uptake of HIV testing among MSM and transgender women in Peru may require a multipronged approach.

There are several limitations to our study. Primarily this was a community sample of participants attending one of several locations, which inherently selects for a specific population. Locations were purposefully sampled to focus on high risk individuals and thus the disease prevalence reported is not generalizable. Additionally, as this was a cross-sectional analysis no conclusions as to causation can be drawn. However, as our aim was to demonstrate the ability of venue-based sampling methods to reach previously under-screened populations, these limitations do not negate the importance of our findings.

Conclusion

Our results demonstrate that venue-based testing may improve case finding among MSM and transgender women in Peru. Additionally, the adherence to screening recommendations may be aided by offering the type of non-traditional settings studied herein.

Compliance with Ethical Standards

Conflict of interest The authors have no conflicts of interest.

Ethical Approval This article does not contain any studies with animals performed by any of the authors. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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