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Online Sex-Seeking among Men Who Have Sex with Men in Nigeria: Implications for Online Intervention

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Abstract

The TRUST/RV368 project was undertaken to apply innovative strategies to engage Nigerian MSM into HIV care. In this analysis we evaluate characteristics of online sex-seekers from the TRUST/RV368 cohort of 1,370 MSM in Abuja and Lagos. Logistic regression and generalized estimating equation models were used to assess associations with online sex-seeking. Online sex-seeking (n=843, 61.5%) was associated with participation in MSM community activities, larger social and sexual networks, and higher levels of sexual behavior stigma. In addition, online sex-seeking was associated with testing positive for HIV at a follow-up visit (Adjusted Odds Ratio

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[aOR]=2.02, 95% Confidence Interval [CI]=1.37, 2.98) among those who were unaware of or not living with HIV at baseline. Across visits, online sex-seekers were marginally more likely to test positive for chlamydia/gonorrhea (aOR=1.28, 95% CI=0.99, 1.64). Online sex-seekers in Nigeria are at increased risk for HIV/STIs but may not be benefiting from Internet-based risk reduction opportunities.

Keywords

HIV; STIs; MSM; Internet sex partners; Africa

Introduction

Men who have sex with men (MSM) are among the populations at highest risk for HIV infection (1). In Nigeria, the prevalence of HIV among MSM is 11–48%, whereas the overall adult prevalence is 3% (2–4). MSM face high levels of stigma as a result of their sexual practices, including verbal, physical, and psychological abuse (5). High levels of sexual behavior stigma may act as a barrier to HIV testing and care for MSM, and this is particularly problematic in countries with concentrated key population epidemics where anti-gay legislation erects further barriers (6–10). In some parts of Nigeria, homosexual activity between men is punishable by death (11). As a result, there is a strong need for HIV prevention interventions to reach these highly stigmatized and high-risk men.

In many countries, the prevalence of online sex-seeking is particularly high among MSM, with 34–50% of MSM who were sampled offline across North America, China, and Europe reporting use of the Internet to find sex partners (12–14). Data from Sub-Saharan Africa are more limited, but a previous study identified a prevalence of 39% for online sex-seeking in Lesotho and 44% in Swaziland (15). This high prevalence has partly been due to the increasing popularity of the Internet and smart phone technology, which has led to a widespread phenomenon of online sex-seeking (16, 17). Furthermore, in countries with high levels of sexual behavior stigma affecting MSM, highly stigmatized MSM may be more likely to seek sex online. A qualitative study conducted among MSM in Chengdu, China, noted that anonymity and safety were major contributing factors to using the Internet to find male sex partners (18). Another study of MSM in New York City indicated that MSM who wished to conceal their sexual orientation were more likely to seek male partners online than were MSM who were open about their orientation (19). In the Sub-Saharan African context there is limited information on the frequency and drivers of online sex-seeking among MSM.

Recently, Internet-based interventions have been developed in the US, Europe, and other settings to engage online sex-seekers in preventative HIV interventions (20–22). Previous successes have included the ability for online interventions to increase HIV/STI knowledge, risk reduction, and HIV/STI testing, although the evaluation of most online interventions has depended on self-reported behavioral change (23–25). Overall, the availability of smartphone technology in Sub-Saharan Africa coupled with high levels of sexual behavior

stigma (15, 17) presents opportunities to develop and optimize Internet-based technologies for HIV prevention programs.

This study describes the patterns and drivers of online sex-seeking among a prospective cohort of MSM presenting for HIV testing and treatment in Abuja and Lagos, Nigeria. Our goals were to: 1) Improve the understanding of the characteristics of Nigerian MSM who use the Internet to find sex partners (i.e., socio-demographics, social networks, sexual networks, and sexual behavior stigma), and 2) Test the association of online sex-seeking with HIV/STI diagnoses and HIV treatment-related variables over time. Characteristics were chosen for analysis based on associations with HIV risk and online sex-seeking that were identified in recent studies (15, 26–29), and because these characteristics would inform the development or adaptation of online interventions to the Nigerian setting.

Methods

Study Population and Design

Data were collected as part of the TRUST/RV368 study, which was implemented as a collaboration between the Institute of Human Virology (IHV) at the University of Maryland, Johns Hopkins University, the International Center for Advocacy on the Right to Health (a Nigerian CBO), IHV-Nigeria (PEPFAR implementing partner and Nigerian research center of excellence), and the U.S. Military HIV Research Program. Participants were recruited at two study sites in Abuja and Lagos from March 2013 to August 2015 using respondent-driven sampling (RDS) (4, 29). Briefly, RDS is a chain-referral process whereby initial recruits or “seeds” are identified in the target population during an initial recruitment (wave 0). These seeds recruit their peers, who then recruit additional peers, and so on until the desired sample size is reached, resulting in multiple waves of recruitment. RDS has been shown to be effective in populations of MSM who are less engaged in the MSM community as well as in HIV prevention activities (29, 30).

MSM were eligible to participate if they presented to the study site with a valid RDS coupon, self-reported being assigned male sex at birth, were able to provide informed consent in English or Hausa, and reported a history of insertive or receptive anal intercourse in the previous 12 months. In addition, participants had to be aged 16 or older with men under the age of 18 considered emancipated minors who were exempt from parental consent for the purpose of this study. The men had to be willing to enroll and participate in follow up for 18 months, including completion of quarterly structured interviewer-administered questionnaires and HIV and STI testing and treatment monitoring.

Ultimately, ten seeds recruited 1,371 baseline participants that resulted in up to 27 recruitment waves. Equilibrium was reached for several socio-demographic characteristics including age, sexual orientation, and education. Equilibrium was defined as the point at which the cumulative sample proportions came within 2% of the final sample proportions, and did not fluctuate more than 2% during the sampling of additional waves (31). For the current analysis, one participant was excluded due to missing data on the key variable of interest (report of using the Internet to find male sex partners).

This study was approved by the Federal Capital Territory Health Research Ethics Committee, the University of Maryland Baltimore Institutional Review Board (IRB), and the Walter Reed Army Institute of Research IRB. Informed consent was obtained from all individual participants included in this study.

Data Collection and Key Measures

Participants were administered a structured survey instrument across seven different study visits. The survey instrument was validated in previous studies of MSM throughout Sub-Saharan Africa (30, 32–34) and was pre-tested in Lagos and Abuja before enrollment and initiation of the study. Survey measures of interest included socio-demographics, MSM social and sexual networks, experiences and perceptions of sexual behavior stigma in social and healthcare settings, and HIV treatment uptake.

Online Sex-Seeking—At visit 0, 2, 4, and 6, participants were asked, “Where (in what type of place) do you meet new male sexual partners?” and were asked to choose from a list of possible places. The possible response options were: private home, bar or club, private party, brothel, street or park, private vehicle, hotel or guest house, news advertisements or cards, online, school or work, or mosque or church. Participants could choose more than one location. At visit 1, 3, and 5 participants were asked how often they used the Internet to look for male sexual partners since their last visit. Those who indicated “yes” to meeting partners online or those who reported any recent Internet use for the purpose of looking for male sex partners were categorized as currently meeting male sex partners online.

MSM Social and Sexual Networks—Participants were asked to report the number of MSM that they knew and whether they participated in activities in their MSM community. They were also asked to report their number of male anal sex partners within the last 12 months and to give more detailed information about condom use, HIV status disclosure, and other information about their five most recent male sex partners. Using this information, we created a variable for “high risk sex” among participants not aware of living with HIV (i.e., self-reported HIV-negative or unknown status), which indicated whether a participant engaged in condomless anal sex with any of his five most recent male partners whose HIV status he did not know or who he knew to be HIV-positive. For participants who were aware of living with HIV (i.e., self-reported HIV positive), we created a variable for “serosorting”, which indicated whether the participant had engaged in condomless anal sex with any of his five most recent male partners whose HIV status he knew to be HIV-positive.

Sexual Behavior Stigma—Participants were asked whether they perceived or experienced stigma in personal, social, or healthcare settings because they have sex with men. This sexual behavior stigma was measured by a series of “yes” or “no” questions at visit 0, 2, 4, and 6. Sexual behavior stigma in personal settings was measured by asking participants whether they ever felt excluded by family members, felt like family members gossiped, or felt rejected by friends. Sexual behavior stigma in social settings was measured by asking whether participants knew of safe places in their community to socialize with other MSM, whether they did not feel protected by police, felt scared to walk around in public places, or were ever verbally harassed, blackmailed, or physically hurt because they

have sex with men. Sexual behavior stigma in healthcare settings was measured by asking participants if they ever avoided or felt afraid to go to healthcare services because they were worried that someone may learn that they have sex with men, if they ever felt that they were not treated well in a health center because someone knew they had sex with men, or if they ever heard a healthcare worker gossiping about them because they have sex with men. These measures have been used in previous studies conducted in Sub-Saharan Africa and have been found to be both prevalent and associated with increased online sex-seeking (15, 34–36).

HIV, Sexually-Transmitted Infections, and Treatment Uptake—During visits 1–6, participants were screened regardless of symptoms for rectal and urogenital *Neisseria gonorrhea* (NG) and *Chlamydia trachomatis* (CT) using the Aptima Combo 2 Assay (Hologic, Bedford, MA). Urine and rectal swab samples were transported weekly at 2–8°C to the Defense Reference Laboratory in Abuja. STI test results were generated within 3 weeks of receipt of the samples and participants were called back to the clinic for an off study visit to receive treatment if the laboratory diagnosis was positive. Those who tested positive were treated with appropriate antibiotics and retested at follow-up visits.

In addition, participants were tested for HIV using Abbott Determine HIV-1/2 test kits. The parallel testing algorithm was followed for high-risk individuals at baseline and among HIV-negative participants at each follow-up visit (37). Whole blood samples were collected for viral load testing at visits 1 – 6. HIV viral load was quantified using real-time polymerase chain reaction on the COBAS TaqMan platform (Roche Molecular Diagnostics, Pleasanton, CA). HIV suppression was defined as plasma HIV RNA <200 copies/mL. Current uptake of ARVs was defined by self-report of currently being treated for HIV or by having pharmacy records for ARVs at baseline or at subsequent visit. Those who tested positive for HIV received the standard of care clinical assessment. All HIV-positive participants were offered ART irrespective of their clinical status and CD4 count as part of a treatment as prevention strategy.

Statistical Analysis

Bivariate analysis was performed using logistic regression to assess associations between variables of interest with the outcome of meeting a male sex partner online at baseline. Pearson chi-square tests were used to compare prevalence of other venues for which online sex-seekers and non-online sex-seekers reported meeting male sex partners. Multivariate logistic regression models were used to assess the independent associations of MSM social and sexual networks as well as stigma with meeting a male sex partner online at baseline. In addition, multivariate models with generalized estimating equations (GEEs) and autoregressive correlation matrices were used to assess the association between meeting a male sex partner online and measurements of interest across study visits. GEEs were used to account for within-participant correlations and paired data of participants who had multiple study visits. Analyses were performed using SAS software version 9.4 (SAS Institute Inc., Cary, NC, USA).

Results

Venues for Meeting Male Sex Partners

The prevalence of meeting male sex partners online at baseline was 61.5% (n=843), with a much higher prevalence in Lagos (86.3%; n=372) as compared with Abuja (50.2%; n=471). Overall 53% (n=725) reported using the Internet almost every day (Table 1). The most popular websites/web-applications reported by participants for meeting new male sex partners included 2GO (57%), Facebook (52%), and WhatsApp (31%) (Figure 1). Grindr, a popular sex-seeking web-application used by MSM in the US, was reported to be used by 4% of participants in this cohort.

Online sex-seekers were more likely than those who did not meet male sex partners online to also meet male sex partners in a bar or club (54% vs. 37%, $p<0.001$), in a brothel (15% vs. 10%, $p=0.03$), in a private vehicle (30% vs. 22%, $p<0.001$), in a hotel or guesthouse (50% vs. 43%, $p=0.01$), through news advertisements or cards (10% vs. 3%, $p<0.001$), at school or work (62% vs. 53%, $p<0.001$), and at church or mosque (26% vs. 13%, $p<0.001$). However, they were less likely to meet male partners on the street or in a park (45% vs. 56%, $p<0.001$) and similarly likely to meet in a private home (62% vs. 65%, $p=0.23$) or party (57% vs. 52%, $p=0.07$).

Socio-demographics

Study participants who reported being Muslim (compared to Christian) (Odds Ratio [OR]=0.18, $p<0.001$), and ever being married or cohabiting with a male or female partner were less likely to report finding male sex partners online (OR=0.44, $p<0.001$) (Table 1). In contrast, those who were aged 20–26 years (compared to aged 16–19 years, OR=1.52, $p=0.005$), reported a secondary school (OR=21.26, $p<0.001$) or higher education (OR=48.7, $p<0.001$), owned a mobile phone (OR=6.28, $p<0.001$), and used the Internet almost every day (compared to sometimes, OR=2.14, $p<0.001$) were more likely to report using the Internet to find sexual partners.

MSM Social/Sexual Networks

In the bivariate analysis, those who reported a larger MSM network (OR=1.02, $p=0.001$), reported participation in MSM community activities (OR=1.81, $p<0.001$), reported a larger number of male anal sex partners (OR=1.05, $p<0.05$), and participated in an earlier RDS accrual wave (a marker of community “connectedness” (29, 30)) (OR=0.93, $p<0.001$) were more likely to seek-sex online (Table 2). After adjusting for age, education level, marital status, religion, and study site, the variables that remained significantly associated with online sex-seeking were participation in an earlier RDS accrual wave (Adjusted Odds Ratio [AOR]=0.97, $p=0.03$), participation in MSM community activities (AOR=1.45, $p=0.02$), and engagement in high risk sex (AOR=1.52, $p=0.03$).

Sexual Behavior Stigma

In the bivariate analysis, feeling excluded by family members (OR=1.73, $p=0.005$), feeling gossiped about by family members (OR=1.60, $p=0.001$), and feeling rejected by friends (OR=1.62, $p=0.001$) were associated with increased likelihood of online sex-seeking (Table

3). Online sex-seeking was also associated with believing that there was no safe place to socialize with other MSM (OR=2.07, $p<0.001$), not feeling protected by police (OR=2.42, $p<0.001$), feeling scared to walk around in public (OR=1.41, $p=0.02$), being verbally harassed (OR=1.71, $p<0.001$), being blackmailed (OR=2.39, $p<0.001$), and being physically hurt (OR=2.51, $p<0.001$). In addition, ever being afraid to seek healthcare services (OR=3.44, $p<0.001$), avoiding healthcare services (OR=4.35, $p<0.001$), being treated poorly by a healthcare worker (OR=4.80, $p<0.001$), and hearing a healthcare worker gossip about the participant's sexual behavior (OR=3.12, $p<0.001$) were also associated with online sex-seeking. In the adjusted models, most of these associations remained significant except for feeling excluded by family members (AOR=1.56, $p=0.06$), feeling gossiped about by family members (AOR=1.41, $p=0.06$), being scared to walk around in public (AOR=1.26, $p=0.19$), and hearing healthcare workers gossip (AOR=1.47, $p=0.29$).

HIV, Sexually-Transmitted Infections, and Treatment Uptake

In the multivariate models, online sex-seeking was associated with testing positive for HIV among those presenting at the baseline study visit who were not already aware of living with HIV (AOR=2.02, $p<0.001$) (Table 4). Across study visits, online sex-seekers were also marginally more likely to test positive for chlamydia or gonorrhea (AOR=1.28, $p=0.06$). Among those living with HIV, no difference was observed in rates of ARV use (AOR=1.17, $p=0.41$) or viral suppression (AOR=1.36, $p=0.08$) between online sex-seekers and participants who did not seek sex online.

Discussion

The prevalence of 61.5% for online sex-seeking among TRUST/RV328 participants in Nigeria is even higher than the prevalence reported in previous years among MSM in other parts of the world such as Lesotho, Swaziland, North America, China, and Europe (12–15). This high prevalence suggests that online preventative interventions need to be developed, implemented, and evaluated in the African setting. We also found a link between sexual behavior stigma in social settings with online sex-seeking, which points to the impact of widespread societal prejudice, and is reflected in recent Nigerian legislation banning gay assembly and support for gay organizations. Our prior publication in this same population documented the negative impact of this law on service uptake and healthcare seeking (10). In addition, the current data support the concept that online sex-seeking provides a vehicle for non-public “hook ups” that protects MSM from potential prosecution. Notably, the participants who engaged in online sex-seeking were more likely to report sexual behavior stigma in social and healthcare settings, were younger, more educated, more engaged in the MSM community, and more likely to be at risk for HIV and STIs. This information may be useful for appropriately adapting online HIV prevention interventions to the Nigerian setting.

In the current analysis we observed that participants who enrolled in later waves of RDS recruitment were less likely to have used the Internet for sex-seeking. We know from a separate analysis using these data that clients enrolled in later waves of RDS were less likely to have tested for HIV (29). An intervention to expand access to services such as HIV testing

to this highly marginalized subset of the community with high rates of undetected HIV infection is a particular priority. Moreover, among self-reported HIV-negative participants, online sex-seeking was associated with high risk sex, which suggests that online interventions targeting behavioral change would have the potential to be highly impactful in this population. One potential intervention method could be to promote HIV status disclosure and negotiation of safer sex practices between partners before meeting (38). However, the feasibility of this approach would require pilot testing in a future study. In addition, the high overall prevalence of STIs including incident rectal STI infection observed in this cohort underscores the importance of presumptive STI testing and treatment (39), regardless of whether the interventions are implemented online or offline. Finally, we found that MSM who did not participate in the MSM community were less likely to meet sex partners online. MSM in this study reported meeting partners from a variety of other places aside from the Internet; although online sex-seekers tended to report a higher prevalence of meeting partners in several other venues suggesting an overall larger and more diverse sexual network. Alternatively, it is possible that participants discussed and selected physical meeting venues with partners who they first met online, which might also explain this finding if participants decided to report both the physical and online venues in their responses to these questions. Overall, these findings provide an important target for engagement in future online interventions, an approach that will require further understanding of the barriers to Internet access and intervention uptake.

The finding of a lack of significant association between online sex-seeking and receipt of ARVs or viral suppression points to opportunities for intervention to support treatment as prevention goals, by using technology to improve adherence to medication and support retention in care (40, 41). Our finding that mobile phone ownership was associated with meeting sex partners online provides opportunity to engage mobile-app technology to achieve these goals. However, additional research should investigate the potential use of mobile-app social media for HIV-related interventions in West Africa given potential challenges including infrastructure, policy, and competing research and social networking business goals (40).

There are potential limitations of this study. First, the associations reported here are exploratory and do not represent causality. Many associations were assessed using cross-sectional data at baseline and although some associations were assessed prospectively, in the absence of event-level data we cannot infer that participants' sexual network data pertain to the partners that they met online. Recent research suggests that factors such as whether the person actually meets their Internet-found partner in person is differentially and more strongly associated with HIV risk, and we did not collect these data (42). Further, in RDS there can be bias introduced by the non-random selection of individuals out of a recruiter's social network (43). However, because equilibrium was reached for several socio-demographic characteristics, this suggests a minimal overall bias due to non-random recruitment.

Finally, the sub-cohort in Abuja versus Lagos suggests different patterns of socio-demographics and behavior that could have impacted our results. Lagos is the largest city in Nigeria and is a fast-growing urban center. Participants in Lagos were younger, more

educated, more likely to be Christian compared to Muslim, and more likely to identify as gay compared to bisexual. Some of these socio-demographic characteristics may have contributed to the observation that MSM in Lagos were almost twice as likely to report online sex-seeking than participants in Abuja. However, in a sensitivity analysis, we found that the majority of relationships with online sex-seeking were consistent across both sites.

The findings of the current analysis reinforce the universality of challenges in achieving WHO goals for MSM worldwide, but also offer the opportunity to engage best practices in providing services to key populations for high impact. In particular, online interventions that have been successfully developed and tested in North America and Europe may be transferrable to the African context given the similar HIV risk profile and high prevalence of online sex-seeking. Internet-based strategies in Nigeria could enrich the current findings with further qualitative and formative research studies to better understand societal drivers of online sex-seeking. Rigorously designed intervention trials that quantify impact of Internet-based strategies on measurable prevention and treatment uptake and outcomes will advance the HIV prevention agenda for high impact in the African setting.

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Figure 1.

Websites/Web-applications used to meet male sex partners, among 388 participants at visit 1 who reported using the Internet to meet male sex partners. Participants could indicate more than one response.

Table 1

Prevalence of socio-demographic characteristics and bivariate associations with online sex-seeking among MSM in Nigeria at baseline (N=1,370)

Characteristic	n	%	OR	95% CI	P-value
Study Site					
Abuja	939	68.5	1.00	–	–
Lagos	431	31.5	6.26	4.63, 8.48	<0.001 ***
Age, in years					
16–19	244	17.8	1.00	–	–
20–26	756	55.2	1.52	1.14, 2.04	0.005 **
27+	370	27.0	1.04	0.75, 1.44	0.80
Sexual orientation					
Bisexual	860	62.9	1.00	–	–
Gay	507	37.1	0.89	0.71, 1.11	0.31
Education completed					
Primary school or less	127	9.3	1.00	–	–
Secondary school	839	61.6	21.26	10.65, 42.47	<0.001 ***
More than secondary	396	29.1	48.70	23.72, 99.97	<0.001 ***
Marital status					
Single/never married or cohabited	1198	87.6	1.00	–	–
Ever married/cohabited	170	12.4	0.44	0.32, 0.61	<0.001 ***
Religion					
Christian	939	68.8	1.00	–	–
Muslim	425	31.2	0.18	0.14, 0.23	<0.001 ***
Owns a mobile phone					
No	117	8.6	1.00	–	–
Yes	1244	91.4	6.28	4.03, 9.81	<0.001 ***
Internet use					
Never	374	27.6	–	–	–
Sometimes	258	19.0	1.00	–	–
Almost every day	725	53.4	2.14	1.49, 3.08	<0.001 ***

Note: Values may not sum to 100% due to rounding
CI=Confidence Interval
OR=Odds Ratio

p<0.001

p<0.01;

**

p<0.05;

*

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Table 2
Bivariate and multivariate associations of MSM social and sexual networks with online sex-seeking (N=1,370)

Explanatory variable	Median (IQR)	N (%)	OR	95% CI	p-value	AOR ^a	95% CI	p-value
<i>MSM social network</i>								
MSM network size	10 (7 – 50)	–	1.02 ^b	1.01, 1.03	0.001 ^{**}	1.01 ^b	1.00, 1.02	0.10
RDS accrual wave number	10 (6 – 15)	–	0.93	0.92, 0.95	<0.001 ^{***}	0.97	0.95, 1.00	0.03 [*]
Participation in MSM community activities	–	364 (44.0)	1.81	1.36, 2.41	<0.001 ^{***}	1.45	1.05, 2.01	0.02 [*]
<i>MSM sexual network</i>								
Number of male anal sex partners, past 12 mo.	5 (3 – 10)	–	1.05 ^c	1.00, 1.11	0.0458 [*]	1.02 ^c	0.97, 1.07	0.55
High risk sex, among participants not aware of living with HIV	–	233 (40.2)	1.16	0.83, 1.62	0.37	1.52	1.04, 2.22	0.03 [*]
Serosorting, among participants aware of living with HIV	–	48 (19.8)	0.83	0.42, 1.64	0.59	0.66	0.29, 1.47	0.31

* p<0.05;

** p<0.01;

*** p<0.001

^aModels adjust for age, education level, marital status, religion, and study site

^bPer 15 MSM

^cPer 5 male sex partners

Note: Separate regression models were used for each explanatory variable

AOR=Adjusted Odds Ratio

CI=Confidence Interval

IQR=Interquartile Range

OR=Odds Ratio

Table 3

Bivariate and multivariate associations between sexual behavior stigma and online sex-seeking (N=1,370)

Stigma	Meets Male Sex Partners Online (n/N)	OR	95% CI	p-value	AOR ^a	95% CI	p-value
<i>Personal</i>							
Family exclusion	105/145	1.73	1.18, 2.53	0.005**	1.56	0.98, 2.48	0.06
Family gossiped	194/277	1.60	1.21, 2.13	0.001**	1.41	0.99, 2.00	0.06
Friend rejection	187/266	1.62	1.21, 2.16	0.001**	1.47	1.03, 2.10	0.03*
<i>Social</i>							
No safe place to socialize with other MSM	334/462	2.07	1.62, 2.64	<0.001***	1.44	1.08, 1.93	0.01*
Did not feel protected by police	182/236	2.42	1.75, 3.36	<0.001***	1.57	1.07, 2.32	0.03*
Felt scared to walk around in public	174/256	1.41	1.06, 1.88	0.02*	1.26	0.89, 1.79	0.19
Verbally harassed	311/445	1.71	1.35, 2.18	<0.001***	1.53	1.13, 2.05	0.005**
Blackmailed	245/322	2.39	1.80, 3.18	<0.001***	2.19	1.55, 3.10	<0.001***
Physically hurt	209/271	2.51	1.85, 3.42	<0.001***	1.62	1.12, 2.35	0.01*
<i>Healthcare</i>							
Afraid to seek services	321/401	3.44	2.61, 4.53	<0.001***	2.05	1.48, 2.82	<0.001***
Avoided services	252/299	4.35	3.12, 6.08	<0.001***	2.15	1.46, 3.17	<0.001***
Treated poorly	58/66	4.80	2.27, 10.12	<0.001***	2.30	1.00, 5.27	0.0498*
Healthcare worker gossiped	57/69	3.12	1.66, 5.86	<0.001***	1.47	0.71, 3.04	0.29

* p<0.05;

** p<0.01;

*** p<0.001

^a All stigma items entered into separate models. Models adjust for age, self-reported HIV status, sexual orientation, education level, marital status, religion, and study site

AOR=Adjusted Odds Ratio

CI=Confidence Interval

OR=Odds Ratio

Table 4

Multivariate adjusted associations between online sex-seeking and HIV/STI outcome variables among MSM in Nigeria study across visits (N=1,370)

Outcome	n/N ^a	AOR	95% CI	p-value
<i>HIV/STI Diagnoses</i>				
Tested positive for HIV at any study visit ^b	256/734	2.02	1.37, 2.98	<0.001 ***
Positive for CT/NG ^c	251/777	1.28	0.99, 1.64	0.06
<i>Among those aware of living with HIV^d</i>				
Currently taking ARV	137/243	1.17	0.80, 1.72	0.41
Viral load suppressed	69/204	1.36	0.96, 1.91	0.08

p<0.001

^a Proportion of participants who indicated “yes” to the outcome variable among participants at baseline

^b Among those unaware of living with HIV at baseline. Model adjusts for age, sexual orientation, education level, marital status, religion, and study site.

^c Model adjusts for age, visit number, self-reported HIV status, sexual orientation, education level, marital status, religion, and study site.

^d Models adjust for age, visit number, sexual orientation, education level, marital status, religion, and study site.

Note: Separate regression models were used for each outcome variable

AOR=Adjusted Odds Ratio

CI=Confidence Interval

CT=Chlamydia trachomatis

NG=Neisseria gonorrhea