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Infrequent STI Testing in New York City Among High Risk Sexual and Gender Minority Individuals Interested In Self- and Partner-Testing

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Abstract

Testing for sexually transmitted infections (STIs) remains low among sexual and gender minority populations. We assessed STI testing history using a retrospective survey among 129 HIV-negative cisgender men who have sex with men (cMSM) and transgender women who have sex with men (tWSM) who were at high risk for STI acquisition. All participants were enrolled in a parent study on self- and partner-testing for HIV and syphilis, and reported condomless anal intercourse with multiple partners during the prior 3 months. We additionally used bivariate tests to evaluate participants' STI testing by their history of using pre-exposure prophylaxis (PrEP). One-in-seven respondents ($n = 18$) reported having never tested for an STI, one-quarter ($n = 33$) had not tested in the past year, and two-thirds (n = 83) had never used PrEP. PrEP-naïve respondents were less likely to report recent STI testing (47% vs. 85%). "Routine doctor's visit" was the most prevalent reason for testing, but was less common among PrEP-naïve respondents (83% vs. 100%). Testing was remarkably low given the sample's high risk of HIV and STI infection. Findings suggest that STI testing is more frequent among those who have ever used PrEP, but the risk of selection bias warrants evaluation in a larger probability sample.

Keywords Sexually transmitted infections · Testing · Sexual and gender minorities · Partner testing · Pre-exposure prophylaxis

Introduction

Routine testing for sexually transmitted infections (STIs) is essential to reverse burgeoning epidemics of STIs and to identify individuals who are at elevated risk of HIV acquisition [1–3]. Sexual and gender minority (SGM) populations bear a disproportionate burden of incident STIs. These STIs synergistically contribute to the disproportionate burden of HIV infections in SGM populations relative to the general population [4, 5]. Current guidelines in the United States from the Centers for Disease Control and Prevention (CDC) recommend that cisgender men who have sex with men (cMSM) and transgender women who have sex with men (tWSM) be tested for STIs at all anatomical sites of sexual contact at least annually, and every 3 to 6 months if they are at increased risk [6]. However, regular STI testing among SGM populations is frequently inadequate, as adherence to these guidelines is low [7, 8]. Even among users of pre-exposure prophylaxis (PrEP), for whom the CDC recommends quarterly STI screening [9], inconsistent screening is common [10].

Self- and partner-testing, whereby clients collect their own specimens and administer their own tests, is an empirically supported approach to increase HIV screening [11], particularly among sexually active SGM populations [12]. A similar approach could likewise improve screening for additional STIs, though a recent systematic review found

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that controlled trials of self- and partner-testing have yielded mixed results for STI screening among key populations [12]. Understanding the STI testing histories and reasons for testing among SGM populations at high sexual risk, particularly those interested in self- and partner-testing, could improve our understanding of factors that lead to their low rates of STI screening.

Using data collected as part of a study on the use of a smartphone app to facilitate self- and partner-testing for HIV and syphilis, we examined the self-reported prevalence of STI testing, positivity, and reasons for testing among a sexually active sample of cMSM and tWSM at high risk for STI acquisition. Additionally, we explored how PrEP might impact STI testing history among the sample and hypothesized that respondents who had never used PrEP would report a lower prevalence of routine STI testing as compared to those who had ever used PrEP.

Materials and Methods

The Institutional Review Board at the New York State Psychiatric Institute approved all study procedures.

Methods

Recruitment

We recruited participants via partner-seeking applications, online posts, and in-person outreach for a parent study to see whether people would screen their sexual partners for HIV and syphilis using *SMARTtest*, a smartphone-based application dedicated to self- and partner-testing using a rapid combination assay, the INSTI Multiplex® [13]. In order to learn from individuals experienced with partner testing, recruitment included 42 participants from a prior study at our institution that involved partner testing for only HIV and no other STIs, without a smartphone app [14]. The parent study's first phase focused on hypothetical self- and partner-testing in order to support app development; the second phase, beginning 18 months later, focused on actual use of the INSTI Multiplex® alongside the newly developed app, *SMARTtest*. Participants did not overlap between the two phases and the cross-sectional assessments and eligibility criteria described below were the same across the two phases, except that in the second phase participants had to own a smartphone. Respondents in the later sample were more likely to report never taking PrEP and to have not taken PrEP in the past 3 months; more likely to identify as people of color and as transgender women; and less likely to report being fully employed and being a former participant in a previous self- and partner-testing study at our research institution. There were no other demographic differences.

Study staff briefly screened for eligibility by telephone, then conducted consent in-person at our research offices. Participants were eligible if they identified as cMSM or tWSM, 18 years of age or older, HIV-uninfected; and reported concurrent sexual partnerships, rarely or never using condoms during anal intercourse, and at least three condomless episodes of intercourse within the past three months. Recruitment procedures resulted in screening 215 individuals. Of these, 152 respondents were eligible. The final sample comprised 129 participants who visited our offices and signed written consent.

Data Collection

Participants completed a computer assisted self-interview (CASI) of their demographic characteristics, sexual behavior, HIV and STI knowledge, testing history, and use of PrEP. Data collection occurred in two phases, from December 2016-September 2017 and from March 2019 to February 2020. A detailed description of the development of the parent study has been previously published [13].

Measurement

Demographics

Participants responded to questions about their age, sexual orientation, gender identity, racial and ethnic identification, employment, education, and income.

HIV Testing History

Questions about HIV testing included a history of using an in-home OraQuick rapid test for self- and partner-testing, and the frequency and reasons for past HIV testing.

STI Testing History

The CASI questionnaire asked participants to report whether they had *ever tested* for each of several STIs (e.g., gonorrhea, syphilis) and whether they had *ever tested positive*. Participants were then asked to indicate the time frame (i.e., within the past year; more than a year ago) for each STI test and its corresponding positive test result. The CASI questionnaire further prompted participants to endorse one or more reasons for testing for each STI (e.g., "Had symptoms of an STD"; "Routine doctor's visit"). We created an additional composite variable, *Any STI*, to indicate a history of testing, testing positive, and reasons for testing for at least one STI, regardless of the specific infection.

PrEP Use

Participants were asked to report whether they had ever used PrEP and, if so, if they had used PrEP within the past three months. We then dichotomized the sample based on *Ever used PrEP* (i.e., either in the past three months or prior to the last three months) or *Never used PrEP*.

Data Analysis

To assess reasons for testing, the prevalence of STI testing, and testing positive, we examined descriptive statistics for each STI and for *Any STI*. To test our hypothesis of increased testing between PrEP and non-PrEP users, we evaluated these same variables using t-tests, Chi-square tests, and Fisher exact tests, comparing those who had *Never used PrEP* vs. those who had *Ever used PrEP*.

Results

Sample Characteristics

As seen in Table 1, participants had a mean age of 40.9 years ($SD = 12.2$), with an annual income of \$40,973 ($SD = \$79,878$). The majority identified as cisgender men (85%), with a sizeable minority identifying as transgender women (15%). 91% of the sample identified as either gay/homosexual or bisexual and nearly 80% identified as African American, Latinx, or more than one race/ethnicity. Just under half reported a college degree or higher level of education, and about one-third reported full-time employment. 36% reported ever taking PrEP, and 67% of these participants reported taking PrEP within the past three months. In data not shown, those who reported ever using PrEP were more likely to report being younger ($M = 37.0$, $SD = 12.3$ vs. $M = 43.0$, $SD = 11.7$, $t(127) = 2.7$, $p = 0.007$) and less likely to report being students ($n = 8$, 17.4% vs $n = 5$, 6.0%; $X^2(1, N = 129) = 4.2$, $p = 0.040$). There were no other statistically significant differences by demographic characteristics between the two groups.

HIV Testing History

As expected from the inclusion of participants from a prior HIV self- and partner-testing study, nearly half of the respondents had previously used a rapid in-home HIV test; the vast majority of these reported a history of self-testing, and fewer reported a history of testing partners (Table 1). Participants reported testing for HIV, on average, five times in the past 2 years ($M = 5.3$; $SD = 3.8$), slightly less than the average frequency of testing among those who had recently used PrEP ($M = 7.1$, $SD = 2.9$), those who had ever used

PrEP ($M = 6.9$, $SD = 3.5$), and those who reported ever conducting self- and partner-testing ($M = 6.1$, $SD = 3.8$). The average frequency of testing was slightly lower among those who had not participated in a previous self- and partner-testing study ($M = 5.0$; $SD = 4.0$) as well as among those who, in addition to not previously participating in a self- and partner-testing study, had never taken PrEP ($M = 4.2$, $SD = 3.9$). The most common reasons for recent HIV testing were "I get tested for HIV regularly" (47%), "routine check-up" (42%), and "concern about a possible exposure" (29%). Testing because a "doctor suggested I get tested" was endorsed less frequently (11%).

History and Recency of *Ever Tested* for an STI

As seen in Table 2, overall, 61% of respondents reported testing in the past year for at least one STI. 14% reported having never tested for an STI and 26% reported having not tested for an STI in the past year. Within each STI, the most common infections tested in the past year were chlamydia, gonorrhea, and syphilis (endorsed by 43–44% of respondents).

Prevalence of *Ever Tested Positive* for an STI

Among respondents who had ever tested for an STI, nearly 58% had ever tested positive (Table 2). Among these, nearly one-quarter (24%) tested positive in the past year and one-third (33%) last tested positive more than a year ago. Within each STI, positive tests in the past year were more frequently reported for chlamydia (15%) and herpes, gonorrhea, and trichomoniasis (each at 10%).

Reasons for STI Testing

Across all STIs, the most commonly reported reason for testing, endorsed by 90% of those who had ever tested, was "Routine doctor's visit" (Table 2). This same reason was the most endorsed within each STI as well, ranging from 71 to 92%. "Had symptoms" was the next most endorsed reason across STIs (30%), with relatively higher endorsement for gonorrhea, herpes, genital warts, and chlamydia (ranging from 14 to 20%). Similarly, hearing about a sexual partner having an STI or being told by a sexual partner about an STI, together, were endorsed by 30% of respondents as reasons for testing, most commonly reported for chlamydia, herpes, and syphilis (ranging from 14 to 17%).

Bivariate Comparisons of *Never PrEP Use* vs. *Ever PrEP Use*

Table 3 presents respondents' history and recency of STI testing, comparing those who reported never using PrEP

Table 1 Sample characteristics of sexually active cisgender men and transgender women who have sex with men (*N* = 129)

	Mean (*SD*; Range)
Age	40.9 (12.2; 20–73)
Annual income (USD)	40,972.5 (79,878.0; 0–780,000)
	n (%)[a]
Education	
Less than high school graduate	7 (5.4)
High school graduate/General Equivalency Degree	27 (20.9)
Partial college	36 (27.9)
College graduate	36 (27.9)
Graduate school	23 (17.8)
Currently a student	13 (10.1)
Race/Ethnicity[b]	
Non-Hispanic/Latinx	93 (73.2)
African American	59 (63.4)
White	25 (26.9)
Other/more than one	9 (9.7)
Hispanic/Latinx	34 (26.8)
African American	13 (38.2)
White	9 (26.5)
Other/more than one	12 (35.3)
Gender identity	
Man	110 (85.3)
Woman	2 (1.6)
Transgender	17 (13.2)
Sexual identity	
Gay/homosexual	90 (70.9)
Bisexual	27 (21.3)
Straight/heterosexual	6 (4.7)
Other	4 (3.1)
Employment	
Full-time	41 (31.8)
Part-time	43 (33.3)
Not working	45 (34.9)
Ever used PrEP	46 (35.7)
Taken PrEP within the last 3 months	31 (24.0)
Participated in previous self- and partner-testing study	42 (32.6)
HIV testing history	
Ever used OraQuick for self- or partner-testing	61 (47.3)
Ever used OraQuick for self-testing	59 (45.7)
Ever used OraQuick for partner-testing	37 (28.7)
# of times tested in past 2 years (M, SD; range)	5.3 (3.8; 0–20)
Taken PrEP within the last 3 months	7.1 (2.9; 2–15)
Ever used PrEP	6.9 (3.5; 2–20)
Ever used OraQuick for SPT	6.1 (3.8; 0–20)
Reasons for most recent HIV test	
It was part of my routine check up	54 (42.5)
My doctor suggested I get tested	14 (11.0)
I was concerned about a possible exposure	37 (29.1)

Table 1 (continued)

	n (%)[a]
It was a requirement to get insurance	1 (0.8)
It was required by a government agency (e.g. immigration service, armed forces)	0 (0.0)
Testing was offered at a venue (nightclub, bathhouse, etc.), and I decided to do it there	19 (15.0)
It was part of a research study	19 (15.0)
A partner asked me to get tested	7 (5.5)
I get tested for HIV regularly	59 (46.5)
Typically tests for HIV	
Alone	118 (94.4)
With friends	3 (2.4)
With sexual partner	4 (3.2)

[a]Ns may not sum to 129 due to missing data. Percents are of those with non-missing data

[b]Two participants refused to answer, one of whom indicated African American racial identification without any response to the question about Latinx ethnicity. Percents for Ethnicity (Latinx vs. not) are of 127; percents for race are of N within ethnic group

to those who reported ever using PrEP. Those who never used PrEP were significantly less likely to report having ever tested for any STI (81% vs. 96%, $X^2(1) = 5.5$, $p = 0.019$) and to have tested in the past year (47% vs. 85%, $X^2(1) = 17.7$, $p < 0.001$). PrEP-naïve respondents were also more likely to have last tested more than a year ago (42% vs. 11%, $X^2(1) = 11.8$, $p = 0.001$). We found evidence of this same pattern for chlamydia, gonorrhea, hepatitis B, hepatitis C, and syphilis. The pattern partially held for human papilloma virus (HPV), herpes, and trichomoniasis.

In data not shown, PrEP-naïve respondents were also less likely to report ever using the OraQuick Rapid HIV test kit for self- or partner-testing (36% vs. 67%, $X^2(1) = 11.6$, $p = 0.001$); and testing for HIV as part of a routine checkup (33% vs. 59%, $X^2(1) = 7.7$, $p = 0.005$) or because they tested for HIV regularly (36% vs. 65%, $X^2(1) = 10.21$, $p = 0.001$). In terms of other STIs, they were significantly less likely to report ever testing positive for any STI (43% vs. 80%, $X^2(1) = 14.3$, $p < 0.001$); recently testing positive for any STI (10% vs. 46%, $X^2(1) = 17.6$, $p < 0.001$); and recently testing positive specifically for chlamydia (3% vs. 26%, Fisher's exact test $p = 0.003$). In terms of reasons for STI testing, PrEP-naïve respondents less often reported testing because of a routine doctor's visit (83% vs. 100%, Fisher's exact test $p = 0.002$) and because a sexual partner had told them they had an STI (5% vs. 25%, Fisher's exact test $p = 0.002$). For gonorrhea specifically, PrEP-naïve respondents were also less likely to report testing because of a routine doctor's visit (69% vs. 88%, $X^2(1) = 4.2$, $p = 0.040$). No other significant differences were detected for other individual STIs.

Discussion

In this high risk sample of SGM respondents that would benefit from regular HIV and STI testing, testing for STIs was low overall. This includes testing for the most common STIs: more than half of the sample indicated not having tested in more than a year for either chlamydia, gonorrhea, or syphilis. STI testing was significantly less common among those who reported never using PrEP. Differences in specific reasons for STI testing between PrEP-naïve respondents and their PrEP-experienced counterparts suggest that PrEP users' engagement with routine medical care facilitates STI screening.

Consistent screening followed by treatment is an essential path toward curbing burgeoning STI epidemics [3], yet among our respondents, sampled for their high risk of infection, a minority reported testing in accordance with CDC-recommended screening guidelines [6]. This low engagement suggests that respondents experience barriers to STI testing even in New York City, where concerted efforts have been made to market and offer STI screening at low or no cost [15]. This finding is particularly surprising given that all participants disclosed behavioral risks that match eligibility criteria for STI screening and reported interest in testing [6, 9]. Likewise, respondents demonstrated their capacity to initiate services by virtue of their enrollment in our testing study: they travelled to our research office, situated on a medical center where STI screenings (as well as PrEP services) are readily available at no cost, and then proceeded to engage in similar procedures to those required for screening. Yet more than half of PrEP-naïve respondents and one in ten PrEP-experienced respondents had not tested for any STIs in the past year, despite reporting risk for STI acquisition in the past 3 months.

Table 2 History and recency of testing for sexually transmitted infections, prevalence of testing positive, and reasons for testing among sexually active cisgender men and transgender women who have sex with men (N = 129)

	Any STI	HPV	Genital warts	Herpes	Chlamydia	Gonorrhea	Hepatitis B	Hepatitis C	Syphilis	Trichomoniasis
	n (%)									
N[a]	129	129	129	128	129	128	128	129	129	128
Ever tested										
No	18 (14.0)	91 (70.5)	100 (77.5)	69 (53.9)	48 (37.2)	43 (33.6)	54 (42.2)	57 (44.2)	49 (38.0)	108 (84.4)
Recently tested (in the past year)	78 (60.5)	20 (15.5)	22 (17.1)	38 (29.7)	57 (44.2)	56 (43.8)	47 (36.7)	49 (38.0)	55 (42.6)	15 (11.7)
Last tested > 1 year ago	33 (25.6)	18 (14.0)	7 (5.4)	21 (16.4)	24 (18.6)	29 (22.7)	27 (21.1)	23 (17.8)	25 (19.4)	5 (3.9)
N[b]	111	37	28	59	81	85	74	72	80	20
Ever tested positive										
No	47 (42.3)	30 (81.1)	24 (85.7)	42 (71.2)	47 (58.0)	51 (60.0)	72 (97.3)	70 (97.2)	56 (70.0)	18 (90.0)
Yes, in the past year	27 (24.3)	1 (2.7)	0 (0.0)	6 (10.2)	12 (14.8)	9 (10.6)	1 (1.4)	0 (0.0)	5 (6.3)	2 (10.0)
Yes, but not in the past year	37 (33.3)	6 (16.2)	4 (14.3)	11 (18.6)	22 (27.2)	25 (29.4)	1 (1.4)	2 (2.8)	19 (23.8)	0 (0.0)
N[c]	109	37	28	58	81	85	74	72	80	20
Reasons for testing										
Had symptoms of an STD	33 (30.3)	4 (10.8)	4 (14.3)	9 (15.5)	11 (13.6)	17 (20.0)	0 (0.0)	0 (0.0)	9 (11.3)	1 (5.0)
Sexual partner told me they had an STD	14 (12.8)	1 (2.7)	0 (0.0)	5 (8.6)	10 (12.3)	4 (4.7)	2 (2.7)	0 (0.0)	4 (5.0)	0 (0%)
Heard that a sexual partner had an STD	16 (14.7)	0 (0.0)	2 (7.1)	3 (5.2)	4 (4.9)	3 (3.5)	1 (1.4)	2 (2.8)	7 (8.8)	2 (10.0)
Routine doctor's visit	98 (89.9)	31 (83.8)	20 (71.4)	43 (74.1)	61 (75.3)	66 (77.6)	67 (90.5)	66 (91.7)	65 (81.3)	17 (85.0)
Part of a research study	4 (3.7)	1 (2.7)	2 (7.1)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.4)	2 (2.8)	0 (0.0)	0 (0.0)

[a] Ns may not sum to 129 due to missing data

[b] Ns may not sum due to missing data

[c] Ns may not sum due to missing data and because respondents could choose multiple reasons for testing. Percents are of those with non-missing data

Table 3 Comparisons of STI testing history and recency of testing by use of PrEP among sexually active cisgender men and transgender women who have sex with men (N = 129)

	N^1	%	Never PrEP N = 83		Ever PrEP N = 46		Chi-square Test Statistic (p)*
			n^1	%	n^1	%	
Any STI							
Ever tested[a]	111	86	67	81	44	96	5.5 (.019)
Recently tested[b]	78	61	39	47	39	85	17.7 (< .001)
Last tested > 1 year ago[c]	33	26	28	42	5	11	11.8 (.001)
HPV							
Ever tested[a]	38	30	15	18	23	50	14.5 (< .001)
Recently tested[b]	20	16	6	7	14	30	12.2 (< .001)
Last tested > 1 year ago[c]	18	14	9	60	9	39	1.6 (.208)
Genital warts							
Ever tested[a]	29	23	15	18	14	30	2.6 (.107)
Recently tested[b]	22	17	12	15	10	22	1.1 (.292)
Last tested > 1 year ago[c]	7	5	3	20	4	29	FET (.682)
Herpes							
Ever tested[a]	59	46	29	35	30	65	10.6 (.001)
Recently tested[b]	38	30	16	20	22	48	11.3 (.001)
Last tested > 1 year ago[c]	21	16	13	45	8	27	2.1 (.145)
Chlamydia							
Ever tested[a]	81	63	39	47	42	91	24.9 (< .001)
Recently tested[b]	57	44	19	23	38	83	42.8 (< .001)
Last tested > 1 year ago[c]	24	19	20	51	4	10	16.9 (< .001)
Gonorrhea							
Ever tested[a]	85	66	45	55	40	87	13.6 (< .001)
Recently tested[b]	56	44	21	26	35	76	30.5 (< .001)
Last tested > 1 year ago[c]	29	23	24	53	5	13	15.7 (< .001)
Hepatitis B							
Ever tested[a]	74	58	37	45	37	80	15.1 (< .001)
Recently tested[b]	47	37	18	22	29	63	21.4 (< .001)
Last tested > 1 year ago[c]	27	21	19	51	8	22	7.1 (.008)
Hepatitis C							
Ever tested[a]	72	56	36	43	36	78	14.6 (< .001)
Recently tested[b]	49	38	19	23	30	65	22.5 (< .001)
Last tested > 1 year ago[c]	23	18	17	47	6	17	7.7 (.005)
Syphilis							
Ever tested[a]	80	62	37	45	43	94	30.0 (< .001)
Recently tested[b]	55	43	18	22	37	80	41.8 (< .001)
Last tested > 1 year ago[c]	25	19	19	51	6	14	12.9 (< .001)
Trichomoniasis							
Ever tested[a]	20	16	11	13	9	20	1.0 (.315)
Recently tested[b]	15	12	6	7	9	20	4.6 (.032)
Last tested > 1 year ago[c]	5	4	5	46	0	0	FET (.038)

*For cell counts < 5, Fisher's exact tests (FET) include a significance level without a test statistic

[1]Ns may not sum to 129 due to missing data. Percents are of those with non-missing data

[a]Compared to respondents who never tested

[b]Compared to respondents who have not tested recently (i.e., never tested or last tested more than a year ago)

[c]Compared to respondents who have tested recently

Numerous barriers to the receipt of STI testing exist for both patients and their providers. Our parent study was grounded in the Information-Motivation-Behavior Model. In an analysis among just respondents who participated in hypothetical use of a smartphone app to facilitate testing, we detected low knowledge, low risk perception and low concern about STIs [16]. Additional barriers to STI testing include a lack of access or affordability, and stigma toward STIs, HIV, homosexuality, and specific acts like anal sex [17–22]. These barriers to engagement in services tend to be more prevalent among younger, racial and ethnic minority, and SGM populations [21–27]. Additionally, provider-side obstacles include a lack of knowledge regarding services for SGM populations, lack of time, and discomfort with sexual history taking, all of which contribute to their reluctance to provide STI testing and screening [8, 19, 28, 29]. Indeed, in a recent Baltimore sample, STI screening among PrEP users was limited, likely because providers offered extra-genital screening based on reported behavior rather than as routine care [20]. Incorporating STI testing as part of routine care, rather than based on patient report of symptoms or risk behavior, may be essential to overcoming barriers to testing, across services. Additionally, our sample all participated in self- and partner-testing with at-home test kits, which suggests that home-based service provision may be a compelling option to increase engagement in STI testing [11]

PrEP users in our sample, like PrEP users in other samples [30, 31], were more likely than their PrEP-naïve counterparts to report testing positive. Engagement in PrEP presents an opportunity to regularly access additional preventive care services, like STI screening and treatment [32, 33], as our sample indicated by routine care. PrEP-experienced participants reported receiving more positive STI test results, which may plausibly be attributed to their increased screening. This suggests that the sample's similarly at-risk PrEP-naïve respondents, who report less frequent STI screening, may be living with undiagnosed STIs that could, without the benefit of PrEP, synergistically elevate their HIV risk. The greater likelihood of chlamydia positivity among PrEP-experienced respondents demonstrates this point: chlamydia is most likely to be asymptomatic and only detected upon routine screening [6], and may be just as prevalent among PrEP-naïve respondents yet remain undiagnosed. This is particularly alarming given the likelihood of HIV acquisition among SGM individuals in New York City who test positive for STIs [2, 34].

Our study has several limitations. Self-report may limit the accuracy of STI testing history as measured because of recall bias across time periods and also because respondents may not have always fully understood or recalled which infections were screened within a panel, or may have conflated a clinician's presumptive diagnosis and treatment as a positive test result for a specific STI. For example, HPV is often diagnosed via clinical examination of genital warts, not a 'test' per se. For this reason, we constructed a broad measure of testing for any STI; this composite variable's consistency with patterns among specific STIs may mitigate some of this measurement error. Future assessment based on chart review would offer greater accuracy. Our study involved secondary data analysis and the original sample size was not powered to detect differences between current PrEP users, those who have discontinued PrEP use, and PrEP-naïve respondents. Future examination of differences between these groups could more rigorously determine whether a history of PrEP use, even if now discontinued, contributes to greater STI testing, a question we could not answer in our secondary analysis [35]. Additionally, our participants were recruited based on their interest in using self- and partner-testing, and our sample predominantly comprised people of color. Along with our small sample size, these aspects limit the generalizability of our findings, though our findings do indicate STI testing trends in a population that faces high risk for STI and HIV acquisition. Our cross-sectional study also cannot determine causality; it may be the case that PrEP-experienced respondents were already more likely to test for STIs prior to their use of PrEP. Given this significant limitation in our sample, large observational studies are needed to assess for potential confounding. Finally, future research should assess this topic more rigorously, specifically in a larger sample less prone to sampling bias and with the inclusion of a theory-based characterization of both psychological and organizational/structural determinants [35], to understand barriers and their potential remediation in a sample that is otherwise engaged in STI testing research.

We found very low STI testing in a sample at high risk for STI acquisition and our findings suggest that enrolling at-risk SGM populations in PrEP for HIV may benefit their engagement in testing for additional STIs. Yet barriers remain to enrollment in both STI screening and PrEP enrollment for SGM populations, as indicated by our respondents, who were eligible for yet under-engaged in both services. If those interested and willing to engage in PrEP can be reached through home-based services [11], as our sample was engaged in HIV/STI testing through home-based services, this effort may be a pathway to curbing both the HIV and STI epidemics.

Data Availability Reasonable requests for de-identified participant data may be submitted to the corresponding author.

Declarations

Conflict of interest Authors report grants from the National Institute of Child Health and Human Development, National Institute of Allergy and Infectious Diseases, and National Institute of Mental Health during the conduct of the study. No other interests to report.

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

Consent for Publication Not applicable.

Ethical Approval This research project was approved by the Institutional Review Board at the New York State Psychiatric Institute.

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