

Concordance between self-reported STI history and biomedical results among men who have sex with men in Los Angeles, California

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ABSTRACT

Objectives HIV studies and risk assessments among men who have sex with men (MSM) frequently use self-reported STI history as a proxy for true STI history. The objective of our study was to assess the validity of self-reported STI history through comparison with laboratory-confirmed biomedical results.

Methods Data were analysed for MSM attending the Los Angeles LGBT Center (the Center) from August 2011 to July 2015. We identified 10 529 unique MSM who received testing for chlamydia, gonorrhoea and/or syphilis and had a later visit in which they self-reported their STI history to a clinic counsellor during a risk assessment.

Results MSM who had an STI in the past year self-reported their STI history with 51%–56% accuracy, and MSM who had an STI more than a year ago self-reported their STI history with 65%–72% accuracy. Among MSM with any positive STIs at the Center, black/African-American and Hispanic MSM were more likely to inaccurately self-report their positive results for gonorrhoea (adjusted OR (aOR): 1.48, 95% CI 1.09 to 2.01; aOR: 1.39, 95% CI 1.14 to 1.70). Additionally, HIV-positive MSM were more likely to inaccurately self-report their positive results for gonorrhoea (aOR: 1.63, 95% CI 1.22 to 2.18) and/or syphilis (aOR: 2.19, 95% CI 1.08 to 4.47).

Conclusions This is the first study that attempts to evaluate the validity of self-reported STI history among MSM. We found that self-reported STI history may not be an appropriate proxy for true STI history in certain settings and minority populations. Clinical guidelines and research studies that rely on self-reported STI history will need to modify their recommendations in light of the limited validity of these data.

INTRODUCTION

Gay, bisexual and other men who have sex with men (MSM) comprised two-thirds of newly diagnosed HIV infections in 2014, despite making up only 2% of the US population.¹ MSM also experience a higher prevalence of STIs than the general US population. In 2014, the Centers for Disease Control and Prevention (CDC) pooled a sample of over 18 000 MSM attending 26 STI clinics, and estimated that the median site-specific prevalence of gonorrhoea and chlamydia were 19.2% and 14.9%, respectively.² MSM also account for more cases of primary and secondary syphilis than men

who have sex with women and women across all racial/ethnic groups.²

Since the 1990s, numerous studies have demonstrated that chlamydia and gonorrhoea considerably increase both sexual HIV acquisition through increased biological susceptibility^{3–5} and HIV transmission through increased viral shedding.^{6–7} Similar relationships have been found for syphilis.^{7–9} In light of the strong biological link between STIs and HIV acquisition/transmission and high prevalence of STIs among MSM, it is increasingly important to accurately measure, monitor and reduce the burden of STIs among this population.^{1–2}

In HIV studies and risk assessments, STI history is collected from patients because it is a proxy for HIV risk, due to both biological factors as well as behavioural risk factors such as condom use and number of sexual partners. STI history is most often collected through self-report because it is quick and cost-effective. However, the validity and completeness of self-reported data among MSM has been unclear in research.^{10–12}

To the best of our knowledge, the validity of self-reported STI history as a proxy for true STI history has been understudied among MSM, but has been studied in other populations at high risk for HIV, including African-American adolescents,^{13–14} and injection drug users.¹⁵ In a study of 479 adolescent African-American females, Harrington *et al*¹³ evaluated the accuracy of self-reported STI test results over a period of 28 days. Participants with negative test results self-reported with nearly 100% accuracy; participants with positive test results self-reported with considerably less accuracy depending on the STI in question, ranging from 56.5% accurate (gonorrhoea) to 74.6% accurate (trichomoniasis). Among a sample of 126 African-American adolescents, Clark *et al*¹⁴ compared self-reported STI-related medical visits with actual visits over the past 6–12 months. Approximately 40% of the patients reported having zero medical visits for STIs even though chart review revealed at least one STI-related visit during the follow-up period. Kleyn *et al*¹⁵ assessed the agreement between 62 injection drug users' self-reported history and biomedical tests for hepatitis B, herpes simplex virus (HSV)-1, HSV-2 and syphilis. They observed a wide range of positive tests among those who reported a negative history (3.5%–61.3%), indicating questionable validity of self-reported history among this population.



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In light of the relationship between STIs and HIV, establishing the accuracy of self-reported STI history is critical for assessing risk of HIV acquisition and transmission among MSM, as well as identifying circumstances to provide recommended preventative services, such as pre-exposure prophylaxis (PrEP). The primary aim of our study is to explore the validity of self-reported STI history by MSM clinic patients compared with their laboratory-confirmed STI results. Specifically, we will assess the concordance of individuals' most recent self-reported history of chlamydia, gonorrhoea and syphilis with their actual medical history of these infections.

MATERIALS AND METHODS

Data collection

The Los Angeles LGBT Center ('the Center') specialises in caring for lesbian, gay, bisexual and transgender people, acknowledging the unique health needs of these populations. The Center provides a variety of health and social services, including primary care, transgender care, HIV care, HIV/STI testing, HIV prevention, mental health services, addiction recovery services and nutrition services. Data for this study were collected from the Sexual Health Program at the Center from August 2011 to July 2015.

MSM receiving STI testing services for chlamydia, gonorrhoea and syphilis at the Center were included in our study population if they were 18 years of age or older, had at least one STI testing visit and had a subsequent visit during which self-reported STI history was collected. MSM were defined as follows: (1) assigned male sex at birth, (2) had a gender identity of male and (3) identified as gay or bisexual, or reported having sex with another male in the past year.

For each unique client, we identified his most recent visit to the clinic. At this visit, each client completed a health risk assessment in a face-to-face (FTF) interview with an STI/HIV counsellor. During this risk assessment, the client self-reported his history of chlamydia, gonorrhoea and syphilis. For each STI, the client had the option to report his history as 'past year', 'ever' (more than a year ago) or 'never'.

Our outcome of interest was discordance between a client's self-reported STI history and his true STI history. We assessed the discordance of an individual's self-reported history for each STI through comparison with his medical history of STI testing results/diagnoses at the Center. Positive laboratory test results for chlamydia and gonorrhoea (at any bodily site) were used to indicate a positive history of chlamydia and gonorrhoea. A positive laboratory result and confirmed diagnosis were used to indicate a positive history of syphilis. Self-reported 'past year' history was considered concordant if the client had a positive STI result 0–366 days prior to the most recent visit. Self-reported 'ever' history was considered concordant if the individual only had a positive STI result more than 366 days prior to the most recent visit. Self-reported 'never' history was considered concordant if the individual had a history of only negative STI testing results at the Center. If the client's self-reported STI history and true STI history did not match, then the response was considered discordant.

We also abstracted information on the following covariates: age group, race/ethnicity, education level, HIV status, country of birth, substance use in the past year, presence of symptoms (on day of most recent positive test) and days since most recent positive test. We created a dichotomous composite variable for self-reported substance use in the past year. Substance use in the past year included any reported use of methamphetamine, ecstasy, cocaine, crack, heroin or gamma-hydroxybutyric acid to

a clinic counsellor. Clients were categorised as HIV-positive if they had an established HIV infection or had a first positive HIV test more than 10 days prior to their visit where STI history was self-reported visit. We also created three dichotomous composite variables for self-reported symptoms among those with a positive testing history of chlamydia, gonorrhoea and/or syphilis. Clients who reported any of the following urethral symptoms were considered symptomatic during STI testing: discharge, burning, itching, bleeding, pain, lesions, rash and/or swelling. Clients who reported that they had none of the previous symptoms were considered asymptomatic at testing.

Statistical methods

We used χ^2 tests to determine if there was a difference in the level of concordance between MSM with a positive STI history and MSM with a negative STI results. We limited the remainder of our analysis to MSM with positive results for chlamydia, gonorrhoea and/or syphilis. We developed three multivariable logistic regression models (one for each STI) in order to identify significant predictors of discordant self-reported STI history. We controlled for the following covariates in all three models: age group, race/ethnicity, education level, HIV status, country of birth, substance use in the past year, presence of symptoms (on day of most recent positive test) and days since most recent positive test.

We used a complete-case analysis approach for missing data. An α level of 0.05 was used for all statistical analyses. All analyses were performed using SAS V.9.4.

RESULTS

Demographics and risk factors

A total of 10 529 unique MSM met the inclusion criteria during the study period (table 1). Almost half (49%) were white, one-half (51%) had a college degree or higher and a majority (80%) were born in the USA. Less than one-fifth (17%) of the men reported substance use in the year prior to their most recent visit, and 5% were HIV-positive. Among our study population, 2275 MSM (22%) had at least one positive test result for chlamydia, 2669 MSM (25%) had at least one positive test result for gonorrhoea and 289 MSM (3%) had at least one laboratory-confirmed diagnosis of syphilis (early latent, late latent, primary or secondary).

Bivariate analyses

Of the MSM who tested positive for an STI in the year prior to their most recent visit, 51% (n=574) concordantly self-reported 'past year' for chlamydia, 56% (n=744) for gonorrhoea and 56% (n=70) for syphilis (table 2). Of the MSM who tested positive for an STI more than a year prior to their most recent visit, 65% (n=741) concordantly self-reported 'ever' for chlamydia, 69% (n=919) for gonorrhoea and 72% (n=118) for syphilis. Of the MSM with only negative test results at the Center, 74% (n=6093) concordantly self-reported 'never' for chlamydia, 68% (n=5356) for gonorrhoea and 88% (n=8981) for syphilis. Collapsing across affirmative categories of self-report ('ever' or 'past year'), 81% of our study population correctly reported their positive results for chlamydia, 86% for gonorrhoea and 90% for syphilis.

Multivariable logistic regression

In a multivariable analysis among MSM with any positive chlamydia result at the Center, the only variable which exhibited a significant association ($p < 0.0001$) with the outcome of interest was days since last positive chlamydia test (see supplementary

Table 1 Demographics and risk factors of men who have sex with men (MSM) who had STI testing and subsequently reported STI history at the Los Angeles LGBT Center, August 2011–July 2015 (N=10 529)

Demographic category	N	Per cent
Age group (years)		
<25	1567	15
25–29	2717	26
30–39	3527	33
40+	2718	26
Race/ethnicity*		
White	5180	49
Hispanic	3125	30
Black/African-American	833	8
Other	1382	13
Partner type		
MSM	9149	87
MSMW	1380	13
Education level*		
High school or below	1337	13
Some college	2663	25
College degree or above	5421	51
HIV status		
HIV(–)	9958	95
HIV(+) [†]	571	5
Place of birth*		
USA	8414	80
Other	1366	13
Substance use*, [‡]		
No	8672	82
Yes	1840	17
Any chlamydia diagnosis		
Negative	8254	78
Positive	2275	22
Any gonorrhoea diagnosis		
Negative	7860	75
Positive	2669	25
Any syphilis diagnosis		
Negative	10 240	97
Positive	289	3
Total	10 529	100

*Total for category does not add to table total due to missing data.

[†]Individuals were classified as HIV(+) if they had an established HIV infection or had a positive HIV test 10 days or more prior to their most recent clinic visit.

[‡]Includes any self-reported use of methamphetamine, ecstasy, cocaine, crack, heroin or GHB in the past year.

GHB, gamma-hydroxybutyric acid; MSMW, men who have sex with women.

material). Otherwise, there were no significant differences in discordant self-reported history of chlamydia across categories of age group ($p=0.42$), race/ethnicity ($p=0.81$), education level ($p=0.23$), HIV status ($p=0.14$), country of birth ($p=0.93$), substance use ($p=0.56$) or symptoms ($p=0.72$).

In a multivariable analysis among MSM with positive results for gonorrhoea at the Center, race/ethnicity ($p=0.0004$), HIV status ($p=0.001$) and days since last positive gonorrhoea test ($p<0.0001$) were significantly associated with discordant self-reported history of gonorrhoea (table 3). Among this subset of the study population with positive results for gonorrhoea, black/African-American (adjusted OR (aOR): 1.48; 95% CI 1.09 to 2.01) and Hispanic MSM (aOR: 1.39; 95% CI 1.14 to 1.70) were more likely to inaccurately self-report their positive test

Table 2 Concordance of self-reported STI history and positive STI test results at the Los Angeles LGBT Center, August 2011 – July 2015 (N = 10 529)

Chlamydia test results			
Self-reported	0–366 days ago	>366 days ago	Negative only*
Past year	574 (51%)	188 (16%)	354 (4%)
Ever	346 (31%)	741 (65%)	1807 (22%)
Never	210 (19%)	216 (19%)	6093 (74%)
Total	1130	1145	8254
Gonorrhoea test results			
Self-reported	0–366 days ago	>366 days ago	Negative only*
Past year	744 (56%)	218 (16%)	438 (6%)
Ever	411 (31%)	919 (69%)	2066 (26%)
Never	176 (13%)	201 (15%)	5356 (68%)
Total	1331	1338	7860
Syphilis test results			
Self-reported	0–366 days ago	>366 days ago	Negative only*, [†]
Past year	70 (56%)	27 (16%)	314 (3%)
Ever	44 (35%)	118 (72%)	945 (9%)
Never	11 (9%)	19 (12%)	8981 (88%)
Total	125	164	10 240

*Individuals who reported a discordant positive STI history may have received STI/STD testing services outside the Center.

[†]The Center offers free treatment for all STIs. Individuals who are diagnosed with syphilis at health facilities outside the Center are often referred to the Center for syphilis treatment.

results for of gonorrhoea than white MSM. HIV-positive MSM were also more likely (aOR: 1.63; 95% CI 1.22 to 2.18) to inaccurately self-report their positive testing history of gonorrhoea than HIV-negative MSM.

In a multivariable analysis among MSM with positive results for syphilis (newly diagnosed with syphilis) at the Center, HIV status ($p=0.03$) and days since last positive syphilis test ($p<0.0001$) were significantly associated with discordant self-reported history of syphilis (table 4). HIV-positive clients were more likely (aOR: 2.19; 95% CI 1.08 to 4.47) to inaccurately self-report their positive history of syphilis than HIV-negative clients. Although race/ethnicity was not significant overall for this analysis ($p=0.08$), Hispanic (aOR: 2.18; 95% CI 1.03 to 4.60) and black/African-American (aOR: 2.19; 95% CI 0.84 to 5.70) MSM were more likely to inaccurately self-report their positive history of syphilis.

DISCUSSION

Our study sought to evaluate the validity of self-reported STI history among a clinical population of MSM, a group with significant STI and HIV morbidity. We found that MSM self-reported with 51%–56% accuracy for STIs occurring in the past year and 65%–72% accuracy for STIs occurring more than a year ago. As shown in table 2, the proportions of MSM who completely omitted their positive STI results ('never' reporters) were very similar across the two time frames, suggesting that complete omission of positive STI results is independent of when the STI actually occurred.

Across both time frames, MSM with a diagnosis of syphilis were able to self-report their syphilis history with greater accuracy than MSM with positive results for either chlamydia or gonorrhoea or gonorrhoea. This heightened accuracy may reflect increased awareness of syphilis diagnoses, given the strong patient outreach and public health campaigns which focus on syphilis. It may also suggest greater understanding of syphilis

Table 3 Predictors of discordant self-reported gonorrhoea history among MSM with a positive gonorrhoea result, Los Angeles LGBT Center, August 2011–July 2015 (n=2669)

Risk factor	Estimate	SE	p Value	aOR (95% CI)
Age group (REF≤25) (years)				p=0.34
25–29	0.16	0.13	0.22	1.17 (0.91 to 1.52)
30–39	0.05	0.13	0.68	1.06 (0.82 to 1.36)
40+	–0.06	0.15	0.69	0.94 (0.70 to 1.27)
Education level (REF=high school or below)				p=0.09
Some college	–0.01	0.14	0.96	0.99 (0.75 to 1.31)
College degree or higher	0.20	0.14	0.15	1.22 (0.93 to 1.59)
HIV status (REF=HIV–)				
HIV+	0.49	0.15	0.001	1.63 (1.22 to 2.18)
Race/ethnicity (REF=white)				p=0.0004
Black/African-American	0.39	0.16	0.01	1.48 (1.09 to 2.01)
Hispanic	0.33	0.10	0.001	1.39 (1.14 to 1.70)
Other	–0.12	0.14	0.40	0.89 (0.67 to 1.18)
Place of birth (REF=USA)				
Other	0.05	0.13	0.72	1.05 (0.81 to 1.35)
Substance use (REF=no)				
Yes*	0.10	0.10	0.34	1.11 (0.90 to 1.36)
Symptoms present (REF=yes)				
No	–0.05	0.09	0.56	0.95 (0.80 to 1.13)
Days since last positive gonorrhoea test (REF=6 months or less)				p<0.0001
6 months to 1 year	0.74	0.12	<0.0001	2.09 (1.65 to 2.65)
1 year to 18 months	0.17	0.13	0.20	1.19 (0.92 to 1.53)
18 months to 2 years	–0.35	0.15	0.02	0.70 (0.52 to 0.95)
2 years or more	–0.39	0.14	0.01	0.68 (0.51 to 0.89)

*Includes any self-reported use of methamphetamine, ecstasy, cocaine, crack, heroin or GHB.
aOR, adjusted OR; GHB, gamma-hydroxybutyric acid; MSM, men who have sex with men; REF, reference level.

Table 4 Predictors of discordant self-reported syphilis history among MSM with a syphilis diagnosis, Los Angeles LGBT Center, August 2011–July 2015 (n=289)

Risk factor	Estimate	SE	p Value	aOR (95% CI)
Age group (REF≤25) (years)				p=0.75
25–29	0.23	0.49	0.64	1.26 (0.48 to 3.31)
30–39	0.16	0.49	0.74	1.17 (0.45 to 3.06)
40+	–0.18	0.53	0.74	0.84 (0.30 to 2.36)
Education level (REF=high school or below)				p=0.11
Some college	0.88	0.43	0.04	2.42 (1.04 to 5.59)
College degree or higher	0.64	0.41	0.12	1.90 (0.85 to 4.23)
HIV status (REF=HIV–)				
HIV+	0.78	0.36	0.03	2.19 (1.08 to 4.47)
Race/ethnicity (REF=white)				p=0.08
Black/African-American	0.78	0.49	0.11	2.19 (0.84 to 5.70)
Hispanic	0.78	0.38	0.04	2.18 (1.03 to 4.60)
Other	–0.11	0.49	0.82	0.89 (0.34 to 2.36)
Place of birth (REF=USA)				
Other	0.11	0.41	0.79	1.12 (0.50 to 2.51)
Substance use (REF=no)				
Yes*	0.32	0.35	0.37	1.37 (0.69 to 2.74)
Symptoms present (REF=yes)				
No	0.27	0.29	0.36	1.31 (0.74 to 2.30)
Days since last positive syphilis test (REF=6 months or less)				p<0.0001
6 months to 1 year	0.55	0.41	0.19	1.73 (0.77 to 3.90)
1 year to 18 months	0.43	0.45	0.34	1.53 (0.64 to 3.67)
18 months to 2 years	–0.63	0.51	0.21	0.53 (0.20 to 1.44)
2 years or more	–1.44	0.50	0.004	0.24 (0.09 to 0.63)

*Includes any self-reported use of methamphetamine, ecstasy, cocaine, crack, heroin or GHB.
aOR, adjusted OR; GHB, gamma-hydroxybutyric acid; MSM, men who have sex with men; REF, reference level.

diagnosis due to the prolonged presence of treponemal antibodies in the blood, since these antibodies may continue to yield positive serological test results long after the initial infection has been treated.¹⁶

Among MSM with a positive STI result either in the past year or more than a year ago, the proportion of MSM who reported that they never had an STI was highest among those with a positive results for chlamydia and lowest among those with a diagnosis of syphilis. Of the three STIs included in this study, chlamydia is least likely to yield painful symptoms in men, perhaps making it the easiest to dismiss or remember accurately due to the lack of symptoms.¹⁷ From our multivariable logistic regression model, inaccurate recall of chlamydia was non-differential across all covariates except days since last positive test. This broad lack of memorability may reflect both the asymptomatic nature of the infection as well as public health priorities around STIs, which tend to be higher for syphilis and gonorrhoea than chlamydia.

Our study found that black/African-American and Hispanic MSM were more likely to inaccurately self-report positive results for gonorrhoea than white MSM. The reasons for this disparity are unclear. The proportions of rectal, urethral and pharyngeal infection were comparable between racial/ethnic groups, and the proportion of symptomatic individuals was highest among black/African-American MSM. Previous studies have found similar patterns of underreporting of risk factors by race/ethnicity among MSM.^{11 12} Additionally, our self-reported data were collected in FTF interviews, likely yielding some degree of social desirability bias.¹⁸

Our study has several important limitations. Individuals who self-reported a positive STI history ('past year' or 'ever') that did not reflect their STI testing history at the Center may have received testing services or been diagnosed at other clinics. Since we only have access to medical records for visits at the Center, we cannot confirm these diagnoses, and these individuals appear to self-report discordantly in our analysis. However, given the culturally competent care and free testing/treatment that are offered by the Center, many of the MSM in our population likely receive their STI testing services exclusively at the Center. Additionally, our study population may be less reluctant to report positive STI history compared with a population of MSM receiving care at other clinics, because of the culturally competent environment at the Center. The findings from our study may be optimistic compared with other high-risk populations, and may also not be generalisable to all MSM given the location and specialty of the Center.

Despite these limitations, our study also exhibits major strengths. The study population was large, lending greater statistical power than was generated by previous studies and allowing us to examine individual STIs. Additionally, the validity of self-reported STI history and the factors that may influence its level of accuracy have been understudied among MSM, despite the high burden of STIs and HIV faced by this population.

Implications

The findings from our study have implications for the continued use of self-reported STI history as a proxy for true STI history. Concordance between self-reported STI history and true STI history can be quite low, especially when the patient is asked to recall how long ago the STI occurred. The CDC recommends that STI/HIV prevention counselling should be offered to all patients who have had an STI in the past year.¹⁹ By relying on self-reported STI history alone, our results suggest that nearly

half of MSM who have had an STI in the past year are being misclassified, and subsequently may not be offered the recommended preventative counselling services.

The CDC also recommends that PrEP should be considered for HIV-uninfected MSM who are not in a mutually monogamous sexual relationship with an HIV-negative partner, and have been diagnosed with an STI in the past 6 months or have had anal sex without a condom.²⁰ Among our study population, 34%–39% of MSM who were diagnosed with an STI in the past 6 months inaccurately reported that they had an STI more than a year ago or reported that they were never diagnosed with an STI (data not shown). Based on the 6-month screening criterion, these individuals would not be offered PrEP. In these types of clinical settings, it may be advisable to verify self-reported STI history with medical record review, or to electronically flag MSM (in clinics using electronic medical records) who have recently tested positive for an STI so that these individuals are appropriately offered the recommended counselling or referred to HIV prevention services.

In settings where the time frame is less critical or not collected (ie, reporting an ever vs never STI history), using self-reported STI history as a proxy for true STI history may be more valid. A previous study similarly found better concordance between self-reported and true STI history when diagnosis date was removed from the analysis.²¹

We found significantly lower rates of accurately self-reported STI history among black/African-American and Hispanic MSM. This finding is especially concerning, given that both of these minority groups are at higher risk for HIV acquisition compared with white MSM.^{22 23} Where possible, self-reported risk factors and sensitive sexual behaviours should be collected via audio computer-assisted self-interview (ACASI) methods rather than in FTF interviews in order to minimise underreporting among these high-risk populations. Previous studies have noted significant underreporting of sexual risk behaviours in FTF versus ACASI, even among STD clinical populations.¹⁸ In situations where ACASI is not feasible, we recommend that questions regarding STI history include an 'unsure' option, which would minimise misclassification by identifying MSM who may need their STI history verified by other methods. Since August 2015, the risk assessments at the Center have incorporated such options.

Given its limited validity, the continued use of self-reported STIs as a proxy for true STI history may be insufficient in some clinical and research settings. In such situations, we advise using alternative data collection/validation methods in order to capture an appropriate estimate of true STI history.

Key messages

- ▶ Despite its frequency of use, self-reported STI history may be a poor proxy for true STI history in certain clinical and research settings.
- ▶ Black/African-American and Hispanic men who have sex with men (MSM) with a positive results for gonorrhoea are more likely to misreport their positive STI history than white MSM.
- ▶ HIV-positive MSM with positive results for gonorrhoea/diagnosis of syphilis are more likely to misreport their positive STI history than HIV-negative MSM.

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