

Differences in Partner Services Outcomes for Men Who Have Sex With Men Diagnosed With Primary and Secondary Syphilis by HIV Serostatus

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Background: Differences in partner services outcomes in men who have sex with men (MSM) by HIV serostatus have not been explored as a potential driver of differential early syphilis (ES) burden in this population.

Methods: We compared partner services outcomes (number of partners named, notified, tested, diagnosed, and treated) between HIV-positive and HIV-negative MSM initiated for ES partner services in Texas from 2013 to 2016 using logistic regression and Wilcoxon-Mann-Whitney tests. Logistic regression was used to assess the relationship between HIV serostatus and having a no-partner-initiated (NPI) partner services interview controlling for demographic characteristics, prior partner services interactions, and geosocial phone application use.

Results: A total of 4161 HIV-positive MSM and 5254 HIV-negative MSM were initiated for ES partner services. HIV-positive MSM named fewer partners than did HIV-negative MSM (mean, 1.2 vs. 1.9; $P < 0.001$) and had lower indices of partners notified, tested, diagnosed, and treated. HIV seropositivity was significantly associated with NPI. However, this association was not significant when limited to MSM with previous partner services interviews (adjusted risk ratio [aRR] 1.06; $P = 0.38$); in this subset of MSM, using geosocial phone application was negatively associated with having an NPI interview (aRR, 0.90), and having 1 (aRR, 1.33) or more than 1 previous NPI interview (aRR, 1.57) was associated with an NPI interview during the study period.

Conclusions: Suboptimal outcomes for syphilis partner service may result in missed opportunities for testing and treatment of sexual contacts, which could allow for propagation of syphilis. Implementation of innovative protocols is needed to ensure that partner services continue to be an effective and acceptable method of syphilis disease intervention in MSM.

Over the past several decades, the burden of early syphilis (ES) in the United States has become concentrated among specific risk groups, primarily men who have sex with men (MSM).¹ In 2016, 60% (2746) of ES cases occurred in MSM. Population estimates of MSM in Texas, first published in 2015,² and recently recalculated to incorporate newly identified data sources and methodologies (publication pending) have enabled HIV and syphilis rate calculations for this population. From 2010 to 2016, the number and rate of ES cases in Texas MSM increased from 1283 and 226.9 per 100,000 population to 2746 and 432.1 per 100,000 population, a rate more than 15 times higher than that in total Texas male subjects (28.0/100,000).³ Several explanations have been proposed to explain

the high burden of syphilis in MSM, including adoption of seroadaptive behaviors,⁴ increases in condomless sex,⁵ prevention fatigue,^{6,7} and the introduction of geosocial phone applications (apps) for selection of sex partners.⁸⁻¹²

In addition, there are large disparities in syphilis burden by HIV seropositivity in both Texas and the United States overall.^{3,13-16} To calculate the differential burden in syphilis rates in Texas, the number of HIV-negative MSM was estimated by subtracting the number of MSM living with HIV reported to Texas' Enhanced HIV/AIDS Reporting System (eHARS) from the total Texas MSM population estimate. Nearly 2% of HIV-positive MSM were diagnosed as having ES in 2016 (980 cases; 1878.0/100,000). In the same year, the rate of ES in HIV-negative MSM was only 302.8 per 100,000 (1766 cases).

Local and regional health departments provide sexually transmitted disease (STD) partner services in response to syphilis morbidity. Core program activities traditionally conducted by disease intervention specialists (DISs) include elicitation of sex partners of infected individuals to provide confidential notification of exposure to HIV/STDs and testing of persons at high risk for infection. The scope of partner services activities has recently expanded to include risk reduction counseling, linkage and relinkage to HIV care, and referral to preexposure prophylaxis.¹⁷

Partner services programs are expected to meet a set of standards representing the minimum outcomes needed to achieve effective disease intervention.¹⁸ The increasing burden of syphilis coupled with an expanded scope of activities strains partner services' ability to effectively provide disease intervention. It is plausible that a decline in partner services outcomes, such as decreased partner elicitation, notification, and treatment of exposed partners, may contribute to an increase in syphilis morbidity, and differential outcomes by serostatus may contribute to a disparity in disease burden.

The objective of this analysis was to compare partner services outcomes for ES in MSM by HIV serostatus. Our main outcome of interest was the proportion of partner service interviews that were unsuccessful in eliciting partners, referred to as no-partner-initiated (NPI) interviews. We chose this as our main outcome because all other performance indices (number of partners notified, tested, and treated) depend on partner elicitation, and Texas partner services programs are expected to elicit an average of 2.0 partners per ES case. HIV serostatus, demographic characteristics, prior partner services interactions, and geosocial phone app use were included in a multivariate analysis to evaluate the relative effect of HIV serostatus on whether interviews resulted in NPI. Other partner services outcomes evaluated included number of partners named, notified, tested, and treated per case.

MATERIALS AND METHODS

Case Selection

The study population included Texas male subjects 13 years or older with a diagnosis of primary, secondary, or early latent syphilis who were reported to Texas' STD Surveillance System

(STD*MIS) and initiated for partner services between January 1, 2013, and December 31, 2016. Male subjects with an HIV diagnosis date of at least 30 days before their syphilis diagnosis, determined through a match to eHARS, were classified as HIV positive at the time of syphilis diagnosis.

Men who have sex with men were considered interviewed if partner services successfully contacted them, obtained consent to conduct the interview, and collected any risk, social, and/or medical history and/or conducted risk reduction counseling, regardless of whether information on sex partners was elicited. Male subjects interviewed by partner services were classified as MSM if there was indication of male-male sexual contact in their STD*MIS partner services record during the study period or in their Texas' eHARS record if they were HIV positive at the time of their syphilis diagnosis. It was not possible to determine MSM status for HIV-negative male subjects who were not interviewed, because risk factors are only collected and recorded in the data systems for persons infected. Evidence of male-male sexual contact was defined as a disclosure of male sexual partners during the infection period by the patient, regardless of reported sexual orientation, or self-identification as gay or bisexual. Because gender identity is not routinely captured in partner services data, male sex may reflect either current gender identity or sex at birth.

Partner Services Data and Terminology

Partner services data were obtained from Texas' STD*MIS. An index patient is a person diagnosed as having syphilis for whom partner services were initiated. A partner was defined as a person with whom the index patient had oral, vaginal, or anal sexual contact at least once during the interview period. The interview period may vary depending on the symptom duration and whether symptom onset date is known.¹⁷

Data Analysis

The trend in proportion of partner services interviews resulting in NPI during the study period was assessed using the Cochran-Armitage trend test. Tukey test was used to check for significant differences in the number of partners named by MSM with primary versus secondary versus early latent syphilis. Demographic characteristics and partner services outcome measures for study period syphilis diagnoses were compared between HIV-positive and HIV-negative MSM using odds and risk ratios (RRs) obtained through logistic regression, Wald χ^2 , and Wilcoxon-Mann-Whitney tests. The main partner services outcome assessed was whether a partner services interview resulted in NPI. We assessed 5 additional partner services indices: (1) notification index (number of named partners notified of their syphilis exposure per case), (2) testing index (number of partners tested for syphilis per case), (3) epidemiologic index (number of partners receiving preventive syphilis treatment per case), (4) case-finding index (number of new syphilis cases identified per case), and (5) brought-to-treatment index (number of named partners receiving curative syphilis treatment per case).

Univariate and multivariate logistic regression was used to test the association of patient characteristics with the probability of having an NPI interview for the study period syphilis diagnosis. Patient characteristics assessed in the model included HIV serostatus at the time of the syphilis diagnosis, race (white non-Hispanic, black non-Hispanic, Hispanic any race, and other race/unknown), age (treated as a continuous variable after centering), stage of disease (primary, secondary, or early latent), reported use of geosocial phone apps, the number of previous partner services interviews for HIV and/or bacterial STD (0, 1, >1), and the number of previous partner services initiations as a partner to a case of HIV/STD

(0, 1, >1). We used the same univariate and multivariate logistic regression, with the addition of number of previous NPI interviews (0, 1, >1) on a subset of MSM with evidence of at least 1 previous interview for HIV or bacterial STD.

RESULTS

Characteristics of MSM Interviewed for Partner Services

A total of 12,977 primary, secondary, and early latent syphilis cases in male subjects 13 years or older were initiated for partner services between 2013 and 2016. Seven percent of male subjects (953) were initiated for ES partner services more than once in the study period. Partner services interviews were conducted for 91.1% of the cases included in the analysis. Of the 11,825 diagnoses for which a partner services interview was conducted, 9415 (79.6%) were in MSM, 44.2% of which were HIV positive at the time of their syphilis diagnosis (Fig. 1). Of the 1152 ES cases not interviewed by partner services, 767 (66.6%) were in HIV-positive male subjects. Compared with HIV-negative male subjects, HIV-positive male subjects were less likely to be interviewed (RR, 0.89; $P < 0.001$). Reasons for not having an interview in HIV-positive male subjects included partner services' inability to contact the patient (64%), patient refusal (34%), and other, nonspecified reasons (2%). Among male subjects not interviewed, HIV-positive male subjects were no more likely to have refused partner services compared with HIV-negative male subjects (RR, 1.16; $P = 0.11$).

HIV-positive MSM were significantly older than HIV-negative MSM (mean age at diagnosis, 35.8 vs. 29.9 years; $P < 0.001$; Table 1). HIV-positive MSM were more likely to have early latent syphilis ($P < 0.001$) and be non-Hispanic black ($P < 0.001$), and were less likely to report using geosocial phone apps for selection of sexual partners (RR, 0.81; $P < 0.001$). Eighty percent of HIV-positive MSM had previously been initiated by Texas partner services for HIV or bacterial STD (RR, 9.3; $P < 0.001$), and 48% had been initiated by partner services after being named as a sex partner by an index patient with HIV or STD (RR, 1.46; $P < 0.001$). Of HIV-positive MSM who had been initiated by partner services for HIV or STD infection at least once before the study period diagnosis, 46% had evidence of at least 1 previous NPI interview (RR, 1.18; $P = 0.01$).

Partner Services Outcomes

The proportion of NPI partner services interviews for ES in MSM increased from 26.3% in 2013 to 32.8% in 2016 ($P < 0.001$). The trend was significant for both HIV-negative (18.9%-25.6%, $P < 0.001$) and HIV-positive MSM (35.8%-42.8%, $P < 0.001$; Fig. 2).

On average, MSM with primary syphilis named 1.6 partners (median, 1.0; range 0-24), MSM with secondary syphilis named 1.5 partners (median, 1.0, range 0-47), and MSM with early latent syphilis named 1.7 partners (median, 1.0; range, 0-65); these differences were not significant at the $P < 0.05$ level. More than 40% of partner services in HIV-positive MSM were NPI interviews compared with 23% of partner services in HIV-negative MSM ($P < 0.001$). HIV-negative MSM named more partners compared with HIV-positive MSM (1.9 vs. 1.2, $P < 0.001$; Table 2). All partner services outcome indices were significantly higher for HIV-negative MSM (Table 2).

Correlates of Unsuccessful Partner Elicitation

In the univariate logistic regression analysis, HIV-positive serostatus (RR, 1.76), age (RR, 1.03), Hispanic ethnicity (RR, 0.89),

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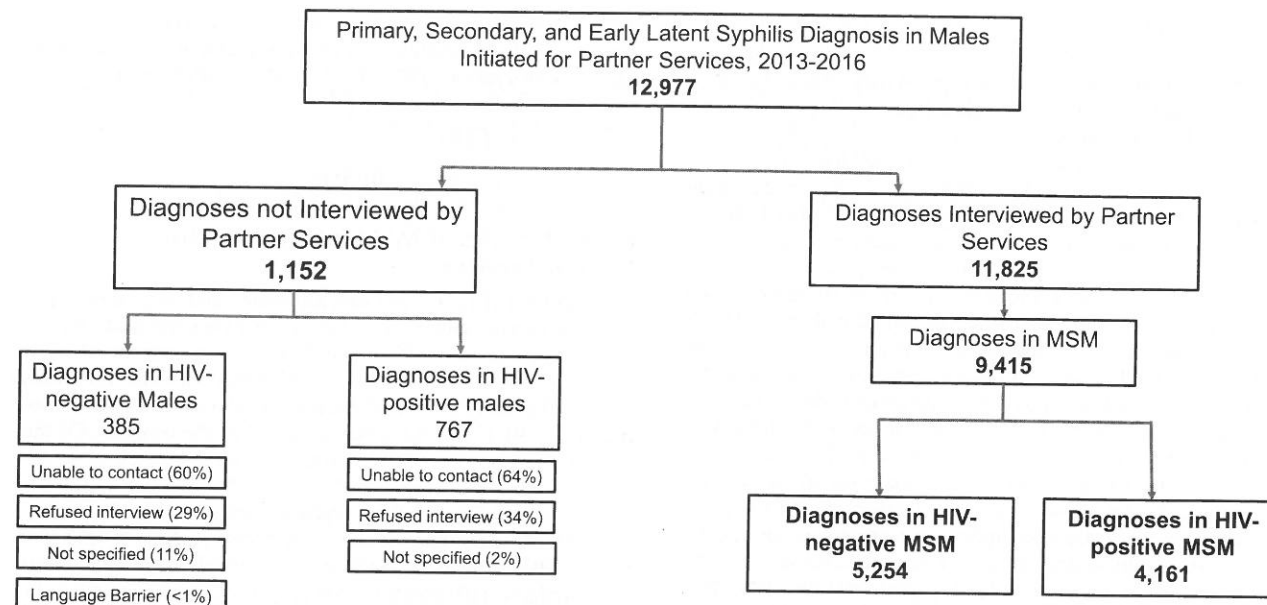


Figure 1. Case selection.

geosocial app use for partner selection (RR, 0.78), having at least 1 previous partner services interview (1 partner services initiation: RR, 1.43; >1 partner services initiation: RR, 1.75), and having at least 1 previous initiation by partner services as a sex partner to an HIV/STD case (1 previous partner initiation: RR, 0.68; >1 previous partner initiation: RR, 0.68) were all significantly associated with the probability of having an NPI interview for ES partner services in the study period ($P < 0.01$; Table 3). All these covariates, with the exception of Hispanic ethnicity, remained significant in the multivariate analysis. When the univariate logistic regression

analysis was restricted to MSM who had previously been initiated for at least 1 partner services for HIV/STD infection, HIV-positive serostatus (RR, 1.18), age (RR, 1.02), geosocial app use for partner selection (RR, 0.79), having more than 1 previous partner services interview for HIV/STD infection (>1 partner services initiation RR 1.21), having at least 1 previous initiation by partner services as a sex partner to an HIV/STD case (1 previous partner initiation: RR, 0.72; >1 previous partner initiation: RR, 0.60), and having at least 1 previous NPI partner services interview for HIV/STD infection (1 previous NPI: RR, 1.65; >1 NPI: RR,

TABLE 1. Characteristics Interviewed by Partner Services for ES, by HIV Serostatus, 2013 to 2016

	Total MSM (n = 1185)	HIV-Negative MSM (n = 5254)	HIV-Positive MSM (n = 4161)	P
Mean age at diagnosis, y	32.5	29.9	35.8	<0.001
Race/Ethnicity				
White	30%	31%	30%	<0.001
Black	28%	23%	35%	
Hispanic	38%	42%	33%	
Other/unknown race	3%	4%	2%	
Disease stage				
Primary	12%	16%	8%	<0.001
Secondary	35%	37%	31%	
Early latent	53%	47%	61%	
Geospatial apps for partner selection	40%	44%	35%	<0.01
Prior Texas partner services interactions				
Initiated for HIV and/or STI infection				
0	67%	93%	35%	<0.001
1	25%	6%	45%	
>1	9%	<1%	20%	
Initiated as sex partner to HIV and/or STI				
0	60%	67%	51%	<0.001
1	23%	23%	23%	
>1	17%	10%	25%	
Prior NPI Partner Services interview*		N = 369	N = 2,710	
0	55%	61%	54%	<0.001
1	36%	37%	36%	
>1	9%	2%	10%	

*Limited to those with at least 1 prior partner services interview for HIV/STI. STI indicates sexually transmitted infection.

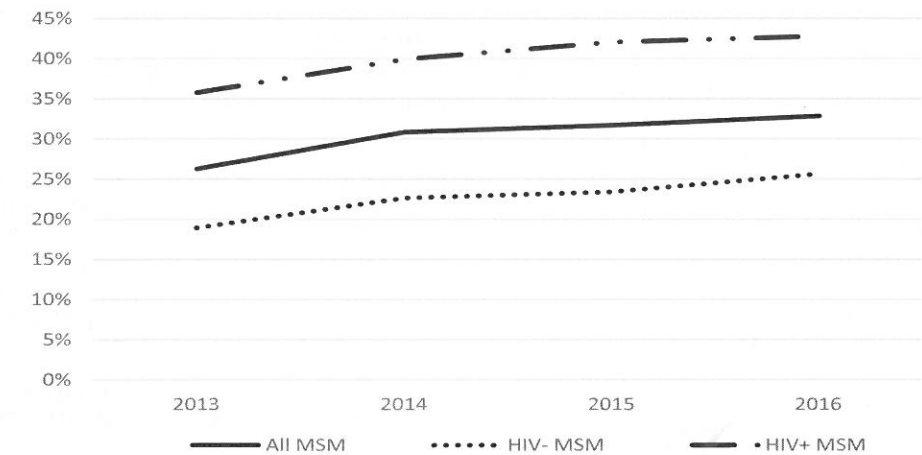


Figure 2. Proportion of ES interviews with NPI interviews by year, 2013 to 2016.

2.10) were all associated with having an NPI partner services interview ($P < 0.001$). Adjusting for the other covariates, HIV-positive serostatus (adjusted RR [aRR], 1.06; $P = 0.38$) and having more than 1 previous partner services interview (aRR, 0.97; $P = 0.50$) for HIV/STD were not associated with NPI outcome; having 1 (aRR, 1.33) or more than 1 (aRR, 1.57) prior NPI partner services interview was significantly associated with an NPI outcome during the study period (Table 4).

DISCUSSION

These findings demonstrate suboptimal partner services outcomes for MSM with ES in Texas. During the study period, one third of all ES partner services interviews in MSM resulted in NPI, and this proportion increased consistently from 2013 to 2016. An average of 1.6 partners were elicited per partner services interview, 0.4 short of Texas' partner services standards,¹⁸ and an average of 1.2 partners were notified of their exposure. Fewer than 1 partner per interview was tested, and only 1 partner for every 2 interviews was provided preventive treatment. Only 0.15 new syphilis infections were detected and treated per interview. These outcomes represent a missed opportunity to provide critical disease intervention in a population at continued high risk for syphilis morbidity.

We found significant differences in ES partner services outcomes for MSM by HIV serostatus. Partner services elicited fewer partners from HIV-positive MSM, and named partners were less likely to receive the recommended testing and preventive treatment when indicated. Most notably, partner services for ES in HIV-positive MSM were more likely to result in NPI, and this association remained significant when controlling for previous partner services interactions, geosocial phone app use, race, age, and diagnosis. However, in MSM with evidence of at least 1 prior

Texas partner services interview for HIV or STD, controlling for these covariates rendered HIV serostatus unassociated with future NPI outcome.

In MSM with at least 1 prior Texas partner services interview, evidence of more than 1 previous NPI interviews was the strongest predictor of an NPI partner services ES interview during the study period. In other words, a previous unsuccessful partner services interaction predicted the same outcome during the study period. Disease intervention specialists conducting partner services are able to view their clients' partner services history and outcomes in Texas' STD*MIS system. Although history of NPI may be indicative of a patient's consistent disinclination to participate in partner services, it is also possible that evidence of a previous NPI interview influences partner services assumptions about a client's current acceptance of partner services. As partner services programs experience heavy case loads due to increased syphilis morbidity along with additional required program activities, some DIS may choose to prioritize cases they anticipate to be more productive and spend less time pursuing cases they predict to be unsuccessful.

"Prevention fatigue," or the diminished adherence of MSM to HIV prevention practices over time, has been cited as a contributor to increased HIV/STD risk behaviors in MSM.^{6,7} Similarly "partner services fatigue" is a plausible explanation for declining partner services outcomes in patients after multiple partner services interactions. In our multivariate analysis, having 1 or more than 1 prior partner services interviews was highly associated with having an NPI interview during the study period. However, having 1 or more than 1 prior partner services initiations as a sex partner to an index patient was negatively associated with having an NPI interview. The first finding supports the idea that repeated initiation for partner services decreases patient participation. The latter finding was unexpected but may be explained by an increasing

TABLE 2. Partner Services Outcomes for MSM Interviewed by Partner Services for ES, by HIV Serostatus, 2013 to 2016

	Total MSM	HIV-Negative MSM	HIV-Positive MSM	P
NPI interview	30.7%	23.0%	40.4%	<0.001
Partner index				
Mean	1.61	1.94	1.21	<0.001
Median	1.0	1.0	1.0	<0.001
Notification index	1.24	1.52	0.89	<0.001
Testing index	0.88	1.09	0.61	<0.001
Epidemiologic index	0.47	0.60	0.32	<0.001
Case-finding index	0.15	0.19	0.10	<0.001
Brought-to-treatment index	0.15	0.19	0.10	<0.001

TABLE 3. Correlates of NPI interviews in MSM With ES Interviewed by Texas Partner Services, 2013 to 2016

	Univariate RR (95% CI)	P	Adjusted RR (95% CI)	P
HIV seropositive (reference: HIV negative)	1.76 (1.66–1.87)	<0.001	1.32 (1.23–1.41)	<0.001
Age	1.026 (1.023–1.028)	<0.001	1.02 (1.014–1.019)	<0.001
Race/ethnicity (reference: white, non-Hispanic)				
Black, non-Hispanic	0.97 (0.90–1.05)	0.49	1.07 (1.00–1.14)	0.05
Hispanic	0.89 (0.82–0.95)	0.001	1.05 (0.98–1.11)	0.17
Other/unknown race	1.00 (0.85–1.20)	0.92	1.11 (0.96–1.27)	0.17
Diagnosis (reference: primary)				
Secondary	1.11 (0.99–1.23)	0.056	0.98 (0.90–1.08)	0.75
Early latent	1.05 (0.95–1.16)	0.33	0.93 (0.86–1.01)	0.11
Geospatial apps for partner selection	0.78 (0.73–0.83)	<0.01	0.79 (0.75–0.84)	0.001
Prior initiations for previous partner services for HIV/STI infection (reference: 0)				
1	1.43 (1.34–1.53)	<0.001	1.14 (1.07–1.22)	<0.001
>1	1.75 (1.60–1.90)	<0.001	1.32 (1.21–1.43)	<0.001
Prior initiations as sex partner to HIV and/or STI (reference: 0)				
1	0.68 (0.62–0.74)	<0.001	0.73 (0.68–0.79)	<0.001
>1	0.68 (0.62–0.75)	<0.001	0.65 (0.60–0.71)	<0.001

CI, confidence interval; STI, sexually transmitted infection.

level of trust developed by patients who are offered expedited testing and treatment after a potential exposure to HIV and bacterial STDs. Interacting with partner services as a named sex partner may reassure patients of the overall value and confidential nature of STD partner services and increase the likelihood they name their sex partners if they receive partner services for a future infection.

In 2013, Texas partner services began standardized data collection on the use of geosocial apps by persons diagnosed with HIV and syphilis in response to the rising popularity of these applications for sexual partner selection. Many of these apps allow users to remain anonymous, which other research has suggested may contribute to an increase in sexual partners among MSM who use them and an inability to identify partners to partner services.^{19,20} However, reported geosocial app use was protective against NPI interviews in our study population when controlling for other covariates in both univariate and multivariate analyses. Apps can retain a record of communication between users and

may allow index patients to access and recall basic information (name, user name, and/or general location) about partners selected through an app. This finding is supported by data from New York, demonstrating that integration of phone apps into partner services interview procedures allowed index patients to more easily recall partners and provide locating information to DIS.²¹ Another potential explanation is that geosocial app users named more partners that did nonusers (2.04 vs. 1.33, $P < 0.001$), a certain proportion of whom they will have exchanged contact information.

There are several limitations that may have impacted our analysis. The data sources used for this analysis only included information on partner services conducted in Texas. Men who have sex with men in our study population may have previously received partner services for HIV or STD in another state, but we were not able to include the outcomes of these interactions into our analysis. We were not able to assess how many MSM in our study population had partner services in other states; however, only 15% of the HIV-positive MSM in our study population were

TABLE 4. Correlates of NPI Interviews in MSM With ES Interviewed by Texas Partner Services Who Had ≥1 Prior Partner Services Initiation, 2013 to 2016

	Univariate RR (95% CI)	P	Adjusted RR (95% CI)	P
HIV seropositive (reference: HIV negative)	1.18 (1.02–1.38)	0.02	1.06 (0.93–1.20)	0.38
Age	1.021 (1.018–1.025)	<0.001	1.012 (1.009–1.106)	<0.001
Race/ethnicity (reference: white, non-Hispanic)				
Black, non-Hispanic	1.00 (0.90–1.11)	0.99	1.05 (0.96–1.15)	0.30
Hispanic	0.85 (0.58–1.24)	0.39	1.03 (0.94–1.12)	0.55
Other/unknown race	1.12 (1.01–1.25)	0.03	0.85 (0.64–1.14)	0.28
Diagnosis (reference: primary)				
Secondary	1.05 (0.88–1.26)	0.59	0.97 (0.84–1.13)	0.73
Early latent	1.14 (0.97–1.36)	0.12	1.01 (0.88–1.17)	0.87
Geospatial apps for partner selection	0.79 (0.71–0.87)	<0.001	0.90 (0.84–0.98)	0.016
Prior initiations for previous partner services for HIV/STI infection (reference: 1)				
>1	1.21 (1.11–1.33)	<0.001	0.97 (0.88–1.07)	0.50
Prior initiations as sex partner to HIV and/or STI (reference: 0)				
1	0.72 (0.64–0.81)	<0.001	0.83 (0.69–0.83)	<0.001
>1	0.60 (0.53–0.67)	<0.001	0.76 (0.69–0.83)	<0.001
Prior NPI partner services for HIV/STI infection (reference: 0)				
1	1.65 (1.50–1.82)	<0.001	1.33 (1.23–1.44)	<0.001
>1	2.10 (1.87–2.36)	<0.001	1.57 (1.37–1.80)	<0.001

CI, confidence interval; STI, sexually transmitted infection.

diagnosed as having HIV outside Texas. Risk information collected during the interview, including MSM status and phone app use, is based on patient self-report and may be subject to social desirability bias. It was not possible to determine from the available data whether NPI interviews are indicative of patient refusal to name partners or an inability to recall partners based on partner selection practices. In addition, it is likely that some proportion of MSM elected to notify some or all of their partners of their syphilis exposure independently of partner services, which may have skewed our estimate of partner services outcomes in MSM of either or both serostatus.

Findings from this study suggest that changes to partner services processes may be needed to increase syphilis disease intervention effectiveness in MSM, because HIV serostatus and geosocial phone app use cannot be solely implicated in NPI interview outcomes. Given that repeated partner services interviews are associated with NPI interviews, alternative methods of partner services delivery, such as Internet-based partner services,²² telephone interviews,²³ and SMS partner notification,²⁴ should be assessed for acceptability and outcomes. In addition, engagement from stakeholders may offer new solutions for tailoring partner services for MSM.²⁵ Texas is currently working to integrate client satisfaction surveys into routine evaluation activities, with the objective of identifying methods most acceptable to persons receiving partner services while maintaining program efficiency. Implementation of innovative protocols should incorporate monitoring and evaluation of outcomes to ensure that partner services continue to be an effective method of syphilis disease intervention in MSM in an era of evolving technology and disease prevention.

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