

Missed and Delayed Syphilis Treatment and Partner Elicitation: A Comparison Between STD Clinic and Non-STD Clinic Patients

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Background: Because of increases in reported syphilis, we sought to identify factors associated with missed and delayed syphilis treatment and partner elicitation interview.

Methods: We reviewed syphilis cases reported during June 1, 2006 to May 31, 2007 and conducted multivariate logistic regression analyses to determine demographic and clinical predictors of missed and delayed syphilis treatment and partner elicitation interview.

Results: Of 638 syphilis cases, 38 (6%) were identified as untreated cases. Median time-to-treatment was 7 days (range: 0–380) and median time-to-partner elicitation interview was 14 days (range: 0–380 days) for all case-patients. Both intervals were shorter for patients among whom syphilis was diagnosed at the STD clinic versus non-STD facilities. In multivariate analysis, diagnosis at a non-STD clinic (AOR: 2.6; 95% CI, 1.0–6.9) and having a late infection of unknown duration (AOR: 2.1; 95% CI, 1.0–4.6) were significantly associated with untreated syphilis.

Conclusion: Time-to-treatment and time-to-partner elicitation interview were shorter for patients among whom syphilis was diagnosed at the STD clinic. For non-STD settings in Maricopa County, improvements in quality of care (i.e., timely treatment) and expeditious public health interventions (i.e., partner elicitation interview) are needed.

In the United States, reported primary and secondary (P and S) syphilis rates have increased from 3.0/100,000 population in 2001 to 5.7/100,000 population in 2006.¹ In Maricopa County, AZ, P and S syphilis case reports have increased from 110 in 2005 to 156 in 2006.² Similar to many other urban areas in the United States, Maricopa County is experiencing an increase in

syphilis, mainly among men who have sex with men (MSM), many of whom are coinfecting with HIV. In 2007, MSM accounted for 71% of all male P and S syphilis cases in Maricopa County.³ Because the primary modes of syphilis control include timely treatment and partner notification, success of these disease-control measures depends on both early diagnosis and appropriate treatment of patients, as well as partner elicitation interviews and referral of sex partners for treatment and testing. Because of prior national penicillin shortages, drug costs, and storage requirements associated with the recommended antibiotic, local providers do not always stock this medication at their clinics, and thus rely on the patient to report to the publicly funded sexually transmitted disease (STD) clinic for treatment and follow-up care.

Eliciting partner information and providing prompt treatment of infected persons and their partners remain the mainstay of sexually transmitted diseases prevention and control. Only a limited number of studies have measured and assessed the implications of missed and delayed syphilis treatment in clinical settings.⁴ The Centers for Disease Control and Prevention (CDC) recently instituted performance measures for STD control programs that include time from laboratory diagnosis to interview of the syphilis patient. Limited published data concerning implications of delays in time-to-treatment have been reported from studies of other sexually transmitted diseases.⁵ To determine factors associated with missed and delayed syphilis treatment in Maricopa County by clinic type, we conducted a retrospective investigation of all newly diagnosed syphilis cases reported to the Arizona STD Control Program during June 1, 2006 to May 31, 2007.

METHODS

Inclusion Criteria

Patients included Maricopa County residents (estimated population of 3.8 million in July 2006),⁶ aged ≥ 13 years, without history of syphilis infection and with a reported syphilis diagnosis during June 1, 2006 to May 31, 2007.

Case Definition

Stage of disease was ascertained by using CDC surveillance case definitions for syphilis.⁷

Predictor Measures

Diagnosing facility was classified as either a categorical, stand-alone, publicly funded STD clinic that offered STD screening, testing, and treatment or a non-STD clinic that provided STD services in addition to other clinical services

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The findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of the Centers for Disease Control and Prevention.

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(i.e., private, correctional, and public facilities; blood banks; Indian health services; HIV counseling services; and other).

Demographic and clinical variables were collected as part of routine surveillance. Information regarding risk behavior and contacts were collected from patient interviews conducted by CDIs. Demographic data included age, gender, race, employment status, sexual orientation, US citizenship status, intravenous and nonintravenous drug use, and history of incarceration during the previous 12 months. Sexual behavior variables included number of sex partners during the previous 12 months, having engaged in sex with anonymous partners, having exchanged money for sex, and specific venues for meeting sex partners (i.e., bars, bath houses, bookstores, etc.). Clinical variables included stage of disease, RPR titer, syphilis confirmatory test, self-reported or laboratory-confirmed HIV status, method of case detection, initial treatment information, and type of diagnosing facility.

Outcome Measures

The primary outcome was the number of untreated syphilis cases by clinic type. Among patients who received treatment, we calculated the interval between specimen collection and initial treatment to determine the number of patients who were evaluated and not treated at initial visit for primary and secondary syphilis and >7 days for latent infections (delayed treatment). Syphilis treatment was obtained from 3 sources—information from communicable disease report forms completed by health care providers, medical chart reviews conducted by communicable disease investigators (CDI), and telephone or face-to-face interviews conducted with patients by CDIs. Another outcome of interest was the number of syphilis cases who were interviewed within 7 days of receipt of the positive laboratory test by clinic type. Through these interviews, names and locating information of all elicited partners and suspects were identified. From patients who were interviewed, time-to-partner elicitation interview was calculated as the interval between specimen collection and initial interview. All outcomes were assessed by date of data abstraction (January 2008).

Statistical Analyses

For patients with multiple syphilis results reported during June 1, 2006 to May 31, 2007, only results of the first syphilis diagnosis were analyzed. Categorical variables were compared by using the χ^2 test, and continuous variables were compared by using the nonparametric equality-of-medians test. Frequencies were generated to determine univariate correlates of demographic, clinical, and initial treatment variables by type of diagnosing facility (i.e., STD vs. non-STD clinic) and stage of disease (i.e., primary, secondary, or other). Missing values were examined and determined to be missing at random by comparing mean differences of key independent variables. To avoid bias, we imputed missing values (16%) by using the hotdeck method through stochastic substitution. Multiple logistic regression analysis was used to test predictors of no syphilis treatment while adjusting for potential confounders. All known confounders and significant variables with $P < 0.10$ in univariate analysis were included in the multivariate model. Potential effect modifiers were investigated and identified by stratified analysis in logistic regression. A full model with significant covariates was selected, and we conducted a stepwise logistic regression and the Pearson goodness-of-fit test to validate and test the fit of the full and final model. A similar analysis was conducted to test predictors of delayed syphilis treatment by

using a subset of the data. In both analyses, we conducted multiple logistic regressions on the original and imputed data-sets; no changes in magnitude or significance of odds ratios were noted when using either data set. Only results that used imputed data sets are presented here. All statistical analyses were conducted by using STATA (version 9.0, Stata Corp, College Station, TX.).

RESULTS

Demographic and Behavioral Characteristics of Syphilis Patients

During June 1, 2006 to May 31, 2007, a total of 647 syphilis cases were reported to the Arizona Department of Health Services. Of these, 638 (99%) met the inclusion criteria. The median age of patients at syphilis diagnosis was 34 years (range: 16–78 years), and the majority of patients were US citizens (77%), male (73%), employed (72%), and heterosexual (56%). Overall, 183 (31%) diagnoses occurred at the publicly funded STD clinic, and 455 (69%) occurred at a non-STD clinic, including 123 (19%) at a correctional facility clinic. Of the 65 patients who had been screened because of referrals by another patient or CDI, 47 (72%) had been examined and investigated at the publicly funded STD clinic, and 18 (28%) had been examined at a non-STD clinic ($P < 0.001$). The majority (66.7%) of syphilis patients had known HIV infection status—118 (19%) were self-reported or laboratory-confirmed HIV-positive and 307 (48%) were self-reported or laboratory confirmed HIV negative.

A total of 317 (60%) of the 638 patients reported having had an anonymous sexual encounter, and 233 (45%) reported having at least 2 sex partners during the previous 12 months. A total of 140 (22%) patients reported having been incarcerated during the previous 12 months, and 189 (30%) reported having used illegal intravenous and/or nonintravenous drugs. A higher proportion of US citizens, HIV-positive patients, previously incarcerated persons and drug users were diagnosed at non-STD clinics compared to patients examined at the publicly funded STD clinic (Table 1).

Syphilis Diagnosis

Of 638 reported adult syphilis cases, 55 (8%) were primary, 87 (14%) were secondary, 136 (21%) were early latent, 266 (42%) were late latent, 91 (14%) were latent of unknown duration, and 3 (0.5%) were neurosyphilis infections (Table 2).

Time to Treatment

As of January 28, 2008, a total of 600 (94%) syphilis patients had received treatment, and of these, 178 (30%) had been examined at the publicly funded STD clinic, compared with 422 (70%) who had been examined at a non-STD clinic. Of 38 untreated patients, 33 (87%) had been examined at a non-STD clinic, 27 (71%) had experienced a late latent infection, 10 (26%) had experienced a latent infection of unknown duration, and 1 (3%) had experienced an early latent syphilis infection.

Median time to treatment was shorter for patients examined at the publicly funded STD versus a non-STD clinic across all stages of infection (0 vs. 7 days for primary [$P < 0.001$]; 0 vs. 6 days for secondary [$P < 0.001$]; and 3 vs. 12 days for all other syphilis infections [$P < 0.001$]). Treatment at the initial visit occurred more frequently for patients examined at the publicly funded STD clinic versus a non-STD clinic (57% vs.

TABLE 1. Method of Case Detection, Demographic and Behavioral Characteristics of Cases of Newly Diagnosed Syphilis Among Adults, Reported June 1, 2006 to May 31, 2007—Maricopa County, Arizona

Characteristic	Non-STD Clinic n = 455	STD Clinic n = 183	Total n = 638	P
Stage of disease	n(%)	n(%)	n(%)	<0.001
Primary	31 (6.8)	24 (13.1)	55 (8.6)	
Secondary	53 (11.6)	34 (18.6)	87 (13.6)	
Early latent	84 (18.5)	52 (28.4)	136 (21.3)	
Late latent	212 (46.6)	54 (29.5)	266 (41.7)	
Latent of unknown duration	72 (15.8)	19 (10.4)	91 (14.3)	
Neurosyphilis	3 (0.7)	0	3 (0.5)	
Method of detection*				<0.001
Index case	422 (95.9)	136 (74.3)	558 (89.6)	
Contact or cluster	18 (4.1)	47 (25.7)	65 (10.4)	
Diagnosing facility				<0.001
Health department	17 (3.7)	183 (100.0)	200 (31.4)	
Private facility	240 (52.8)	—	240 (37.6)	
Correctional facility	123 (27.0)	—	123 (19.3)	
Public facility	20 (4.4)	—	20 (3.1)	
Blood bank	13 (2.9)	—	13 (2.0)	
Indian Health Service	11 (2.4)	—	11 (1.7)	
HIV counseling	5 (1.1)	—	5 (0.8)	
Other	26 (5.7)	—	26 (4.1)	
Yr of diagnosis				0.51
2006	248 (54.5)	105 (57.4)	353 (55.3)	
2007	207 (45.5)	78 (42.6)	285 (44.7)	
Age (yr)				0.29
16–20	31 (6.8)	14 (7.7)	45 (7.1)	
21–30	138 (30.3)	71 (38.8)	209 (32.8)	
31–40	136 (29.9)	49 (26.8)	185 (29.0)	
41–50	101 (22.2)	37 (20.2)	138 (21.6)	
51–60	39 (8.6)	9 (4.9)	48 (7.5)	
≥61	10 (2.2)	3 (1.6)	13 (2.0)	
Gender				0.53
Male	326 (71.6)	139 (76.0)	465 (72.9)	
Female	124 (27.3)	42 (22.9)	166 (26.0)	
Transgender	5 (1.1)	2 (1.1)	7 (1.1)	
Pregnant at diagnosis [†]	3 (2.4)	0	3 (1.8)	0.60
Ethnicity*				0.08
Hispanic	180 (40.9)	94 (51.4)	274 (44.0)	
White	167 (37.9)	57 (31.1)	224 (36.0)	
Black	61 (13.9)	26 (14.2)	87 (13.9)	
American Indian	28 (6.4)	5 (2.7)	33 (5.3)	
Asian/Pacific Islander	4 (0.9)	1 (0.6)	5 (0.8)	
Employed*	223 (70.3)	117 (75.5)	340 (72.0)	0.24
US citizen*	342 (81.4)	121 (66.1)	463 (76.8)	<0.001
Self-reported HIV status				<0.001
Positive	90 (19.8)	28 (15.3)	118 (18.5)	
Negative	179 (39.3)	128 (70.0)	307 (48.1)	
Unknown	186 (40.9)	27 (14.7)	213 (33.4)	
Sexual orientation*				0.67
Heterosexual	219 (57.5)	98 (53.8)	317 (56.3)	
MSM	132 (34.6)	70 (38.5)	202 (35.9)	
Bisexual	30 (7.9)	14 (7.7)	44 (7.8)	
Two or more partners during the previous 12 mo*	149 (42.7)	84 (48.0)	233 (44.5)	0.25
Anonymous sex (ever)*	216 (61.7)	101 (57.4)	317 (60.3)	0.34
Gave money for sex (ever)*	31 (9.1)	12 (6.9)	43 (8.4)	0.39
Received money for sex (ever)*	26 (7.6)	0	26 (5.1)	<0.001
Where met partners*				
Bar	86 (19.6)	53 (29.0)	139 (22.3)	0.01
Bath house	19 (4.3)	4 (2.2)	23 (3.7)	0.20
Bookstore	18 (4.1)	6 (3.3)	24 (3.8)	0.63
Public venue	51 (11.6)	15 (8.2)	66 (10.6)	0.21
Private party	31 (7.0)	20 (10.9)	51 (8.2)	0.11
Through friend	101 (22.9)	46 (25.1)	147 (23.6)	0.56
Internet chat room	39 (8.9)	27 (14.7)	66 (10.6)	0.03
Incarcerated Within previous 12 mo*	131 (35.5)	9 (5.2)	140 (25.9)	<0.001
Used illegal drugs (ever)*	143 (32.5)	46 (25.1)	189 (30.3)	<0.001

(Continues)

TABLE 1. (Continued)

Characteristic	Non-STD Clinic n = 455 n (%)	STD Clinic n = 183 n (%)	Total n = 638 n (%)	P
Type of drug used [‡]				0.07
Methamphetamines	66 (46.1)	18 (39.1)	84 (44.4)	
Cocaine	18 (12.6)	12 (26.1)	30 (15.9)	
Marijuana	18 (12.6)	10 (21.8)	28 (14.8)	
Crack	15 (10.5)	3 (6.5)	18 (9.5)	
Other	26 (18.1)	3 (6.5)	29 (15.3)	

*Total is <100% because of missing observations.

[†]Denominator is based on 166 women.

[‡]Denominator is based on 189 persons who used illegal drugs.

8%, respectively [$P < 0.001$]) and for patients diagnosed with primary versus secondary syphilis versus latent stages (51% vs. 36% vs. 17%, respectively [$P < 0.001$]). Benzathine penicillin was administered to 515 (88%) patients, and receipt of this treatment did not differ by stage of disease nor by type of diagnosing facility (STD vs. non-STD clinic).

Time-to-Partner Elicitation Interview

Counseling and partner management services were provided at time of original interview by CDIs. As of January 25, 2008, a total of 524 (82%) syphilis patients had been interviewed at the STD clinic, in the field, or by telephone. Of these, 176 (34%) had been examined at the publicly funded STD clinic, and 348 (66%) had been examined at a non-STD clinic ($P < 0.001$). Among the 638 patients, 189 (36%) were interviewed within 7 days of receipt of the positive laboratory test. Similar to time to treatment, the median time-to-partner elicitation interview was shorter for patients examined at the publicly funded STD clinic than for patients examined at a non-STD clinic (0 vs. 20 days, respectively [$P < 0.001$]).

Correlates of Missed and Delayed Syphilis Treatment

Thirty-eight (6%) syphilis patients were not treated for syphilis (Table 3, Model I). Of these untreated patients, the median age was 34 years (range: 32–35 years); 29 (76%) were male; 18 (47%) were Hispanic; 11 (85%) were heterosexual; and 2 (5%) were coinfecting with HIV. In multivariate analysis, patients examined at the non-STD clinic (AOR: 2.6) and having a latent infection of unknown duration (AOR: 2.1) were significantly associated with no syphilis treatment.

Of 526 treated syphilis patients and 64 contacts, 319 (61%) patients and 17 (27%) contacts were classified as delayed syphilis treatment (Table 3, model II). The majority of these delayed cases were male ($n = 244$; 73%) and heterosexual ($n = 174$; 56%). Of these 244 male patients, 104 (43%) self-identified as men who have sex with men, and 71 (29%) were coinfecting with HIV. Gender was a confounder for late latent infections and was forced into the multivariate model. In the final multivariate model, after adjusting for gender and stage of disease, independent predictors of delayed syphilis treatment included being examined at a non-STD clinic (AOR: 5.9), and being detected as an index patient versus contact (AOR: 3.0).

DISCUSSION

This retrospective review of syphilis surveillance data demonstrates that treatment at a non-STD clinic is indepen-

dently associated with missed and delayed syphilis treatment. Further, effective medical intervention (as defined by time to treatment) and effective public health intervention (as defined by time-to-partner elicitation interview) were shorter when syphilis patients were diagnosed at the publicly funded STD clinic. To our knowledge, this study is the first to describe and compare time to syphilis treatment and time-to-partner elicitation interview between publicly funded STD and non-STD clinics in Arizona and in the United States.

The majority of cases of untreated syphilis in this sample had been diagnosed at a non-STD clinic. Untreated syphilis cases represent a public health threat if patients are examined, but remain untreated during an infectious stage and a personal health risk for progression to more serious complications (e.g., neurosyphilis). The substantial proportion of missed and delayed treatment in non-STD settings occurring during a period of increased syphilis morbidity indicates the increased need for provider knowledge of syphilis diagnosis and treatment, as well as improved patient knowledge of risk and access to categorical STD services. These findings will be used to develop provider educational campaigns that promote syphilis screening and to develop media campaigns that target high risk groups.

Our study demonstrates that the proportion of delayed syphilis treatment cases was higher among non-STD providers. Significantly fewer of the syphilis patients examined at the non-STD clinics had received treatment within 7 days of receiving a positive test result, as compared with patients who had been examined at the STD-clinic. These findings highlight the need for improvements in patient follow-up for treatment in non-STD settings. A decrease in time-to-treatment can be achieved in non-STD settings with prompt notification of positive serologic test results, followed by immediate treatment. However, this represents a challenge because few Arizona non-STD providers maintain stores of benzathine penicillin. One strategy being undertaken by public health officials in Maricopa County is the delivery of penicillin to community clinics. CDIs can then perform field interviews and partner elicitation in these clinics on the same day the patient receives treatment. Although this method seems promising, it has not yet been evaluated.

The cornerstone of public health intervention, as it relates to syphilis transmission, continues to be partner investigation and referral. Our study demonstrates a median time-to-partner elicitation interview of <1 day for syphilis patients who had been examined at the publicly funded STD clinic, and 20 days for patients who had been examined at non-STD clinics. Improvements in timeliness to interview can result in decreased syphilis transmission opportunities from infected undiagnosed partners to their additional sexual contacts. Patient

TABLE 2. Clinical Differences by Type of Diagnosing Facility and Stage of Disease of Newly Diagnosed Syphilis Among Adults, Reported June 1, 2006 to May 31, 2007—Maricopa County, Arizona

	Primary n = 55			Secondary n = 87			Early Latent n = 136			Unknown Latent n = 91			Late Latent n = 266		
	STD n = 24 %	Non-STD n = 31 %	P	STD n = 34 %	Non-STD n = 53 %	P	STD n = 52 %	Non-STD n = 84 %	P	STD n = 19 %	Non-STD n = 72 %	P	STD n = 54 %	Non-STD n = 212 %	P
Treated	100	100	—	100	100	—	100	99	0.43	100	74	<0.01	100	25	<0.01
Benzathine penicillin	100	90	0.21	94	85	0.19	94	90	0.65	88	85		86	86	0.87
Doxycycline	0	10		6	15		6	9		12	13		14	13	
Other	0	0		0	0		0	1		0	2		0	1	
Median time between screening and treatment (days)	0	7	<0.01	0	6	<0.01	0	14	<0.01	7	14	<0.01	7	14	<0.01
Interval between screening and treatment (d) [†]			<0.01			<0.01			<0.01			<0.01			<0.01
0	92	19		76	9		67	7		22	10		30	6	
1-7	4	32		15	47		23	29		39	43		22	24	
8-14	4	3		6	28		4	22		39	29		32	20	
15-30	0	39		0	13		6	23		0	14		4	22	
>30	0	7		3	2		0	19		0	5		12	28	
Interviewed	100	93	0.21	100	85	0.02	100	92	0.03	95	64	<0.01	89	71	<0.01
Median time between screening and interview (d)	0	23	<0.01	0	12	<0.01	0	18	<0.01	7	14	<0.01	7	28	<0.01
Interval between screening and interview (d) [‡]			<0.01			<0.01			<0.01			<0.01			<0.01
0	92	0		76	2		67	0		22	0		35	3	
1-7	4	14		18	22		25	18		44	13		23	5	
8-14	4	7		3	36		2	20		33	37		23	17	
15-30	0	55		0	29		4	38		0	41		4	33	
>30	0	24		3	11		2	25		0	9		15	43	

*Total is <100% because of missing observations.

[†]Denominator is based on 600 persons treated.

[‡]Denominator is based on 524 persons interviewed.

TABLE 3. Independent Predictors for Missed and Delayed Treatment of Cases of Newly Diagnosed Syphilis Among Adults, Reported June 1, 2006 to 31 May 2007—Maricopa County, Arizona

Characteristic	N = 38	OR (95% CI) [†]	AOR (95% CI) [‡]
Model I			
	n(%)		
Missed syphilis treatment*			
Diagnosed at a non-STD clinic	33 (86.8)	2.78 (1.08–7.14)	2.65 (1.02–6.93)
Stage of disease			
Primary	0	—	—
Secondary	0	—	—
Early latent	1 (2.6)	—	—
Late latent	27 (71.1)	—	—
Latent of unknown duration	10 (26.3)	2.29 (1.07–4.89)	2.15 (1.00–4.61)
Neurosyphilis	0	—	—
Age in yr (median)	34	1.00 (0.97–1.03)	—
Male (vs. female)	29 (76.3)	1.16 (0.54–2.51)	—
Ethnicity			
Hispanic	18 (47.4)	1.0	—
White	9 (22.7)	0.60 (0.26–1.35)	—
Black	4 (10.5)	0.69 (0.23–2.10)	—
Native American	2 (5.3)	0.9 (0.22–4.14)	—
Asian	0	—	—
Employed	2 (5.3)	—	—
US citizen	21 (80.8)	1.28 (0.47–3.47)	—
Self-reported HIV status			
Positive	2 (5.3)	1.04 (0.20–5.44)	—
Negative	5 (13.2)	1.0	—
Unknown	31 (81.6)	10.29 (3.90–26.90)	—
Sexual orientation			
Heterosexual	11 (84.6)	1.0	—
Gay	2 (15.4)	0.28 (0.06–1.27)	—
Bisexual	0	—	—
Used illegal drugs (ever)	1 (2.6)	1.74 (0.11–27.97)	—
Model II			
Delayed treatment [‡]	N = 336		
	n (%)		
Diagnosed at a non-STD clinic	290 (86.3)	6.30 (4.25–9.34)	5.92 (3.86–9.08)
Index case (vs. contact or cluster)	319 (96.4)	6.68 (3.48–12.81)	2.98 (1.43–6.23)
Stages of disease			
Primary	27 (8.0)	1.0	1.0
Secondary	56 (16.7)	1.87 (0.94–3.72)	1.83 (0.84–3.98)
Early latent	58 (17.3)	0.78 (0.42–1.46)	0.79 (0.38–1.64)
Late latent	156 (46.4)	1.95 (1.08–3.52)	1.37 (0.70–2.71)
Latent of unknown duration	37 (11.0)	0.87 (0.44–1.73)	0.52 (0.24–1.11)
Neurosyphilis	2 (0.6)	2.07 (0.18–24.23)	0.86 (0.07–10.25)
Female (vs. male)	87 (25.9)	1.02 (0.71–1.48)	1.13 (0.74–1.72)
Age in yr (median)	34	1.00 (0.99–1.01)	—
Ethnicity			
Hispanic	140 (42.3)	1.0	—
White	118 (35.6)	1.0 (0.70–1.45)	—
Black	52 (15.7)	1.39 (0.84–2.31)	—
Native American	19 (5.7)	1.31 (0.61–2.81)	—
Asian	2 (0.6)	0.55 (0.09–3.36)	—
Employed	187 (71.6)	0.97 (0.65–1.46)	—
US citizen	257 (79.3)	1.41 (0.95–2.08)	—
Self-reported HIV status			
Positive	73 (21.7)	1.0	—
Negative	163 (48.5)	0.96 (0.66–1.39)	—
Unknown	100 (29.8)	1.39 (0.86–2.24)	—
Sexual orientation			
Heterosexual	174 (56.0)	1.0	—
Gay	108 (34.7)	0.89 (0.62–1.27)	—
Bisexual	29 (9.3)	1.47 (0.76–2.85)	—
≥2 partners in the last 12 mo	129 (43.9)	0.93 (0.66–1.32)	—
Anonymous sex (ever)	176 (59.9)	0.94 (0.66–1.34)	—
Gave money for sex (ever)	29 (10.1)	1.70 (0.88–3.30)	—
Received money for sex (ever)	16 (5.6)	1.27 (0.57–2.87)	—
Incarcerated within last 12 mo	83 (27.8)	1.46 (0.98–2.20)	—
Used illegal drugs (ever)	110 (33.2)	1.17 (0.81–1.68)	—

OR indicates odds ratio; AOR, adjusted odds ratio.

*Outcome is defined as not being treated for syphilis.

[†]Odds ratio on the imputed dataset was obtained by using the hotdeck method.[‡]Outcome is defined as being evaluated and not treated ≥1 day for primary and secondary infections and >7 days for latent infections.

notification within 24 hours of receipt of a positive test result, scheduling return appointments ≤ 7 days after notification, and prompt public health reporting should be promoted to reduce time to interview in non-STD settings.

Interpreting these data presents certain limitations. There are multiple potential factors that can result in delays in treatment and partner elicitation interview. The contribution of many of these factors (i.e., time of receipt of results, time to health department report, time to assignment of cases to CDIs, and time from CDI case assignment to interview) were not evaluated in this study. Timely patient notification and treatment and rapid partner follow-up depend on accurate and rapid identification of infected persons. Limited access of rapid diagnostic tests and penicillin by non-STD clinic providers, as well as lack of onsite CDIs at non-STD clinics to perform interviews, likely contributed to delays in treatment and interview of infected persons at these non-STD clinics. Another limitation relates to clinical judgment and clinic function. The choice to screen patients for syphilis is not random, but rather based on clinical suspicion and experience. For example, for a patient presenting with a rash, non-STD providers might be more inclined to screen for diseases other than syphilis than providers at STD clinics, and thereby delay diagnosis, timely treatment, and partner notification. Completeness of syphilis reporting in Arizona has not been assessed and is another limitation. Although Arizona law mandates that medical providers and laboratories report positive syphilis tests and syphilis cases within 5 working days of diagnosis or treatment, our results might not include all syphilis cases diagnosed during the study period in Maricopa County.

Our findings underscore the need for a more rapid system of syphilis patient treatment and partner referral in non-STD clinical settings. Our study demonstrates that intervening in the chain of infection was more efficient when syphilis patients were examined at the publicly funded STD clinic. Enhanced disease awareness for patients and maintenance of STD clinical skills for non-STD clinicians are needed in Maricopa County. Health care providers, who are less skilled in STD clinical care, servicing populations at high risk should provide prompt referral to the STD clinic for their patients who are at risk for STDs. Provider awareness, clinical suspicion, and STD clinical skills will need to be enhanced in other jurisdictions as the magnitude of STDs diagnosed in nonpublicly funded STD settings continues to increase. Some specific pro-

vider awareness strategies in nonpublic settings include multicity intervention programs targeting MSM, weekly or monthly provider alerts by the health department, provider visits by CDIs, and provider training and education.⁸ Additional research is needed to determine non-STD provider diagnosis, treatment, and referral practices to develop effective public health strategies to decrease time-to-treatment and time-to-interview in these settings. Because many categorical STD clinics are closing their doors due to funding cuts, data demonstrating improved effective medical intervention and effective public health intervention at STD clinics should be used to educate county and state governments responsible in allocating resources for public health.

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