Practice Notes

Selective Participation in Syphilis Partner Services and Implications for Control Efforts, Fulton County, Georgia, 2013-2015

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ABSTRACT

Background: Partner services is an important component of syphilis control, but not all persons with syphilis participate, limiting the strategy's potential effectiveness and possibly introducing selection biases into analyses of risk factors for reinfection. This study aimed to describe demographic and clinical differences between partner-services participants and non-participants in Fulton County, Georgia, and to assess the association between participation and syphilis re-diagnosis.

Methods: Using surveillance data, we identified primary and secondary syphilis cases in Fulton County with a first diagnosis in 2013-2015. We compared the distributions of demographic and clinical characteristics between participants and non-participants using chi-squared tests. We used multivariable log binomial regression to examine the association between syphilis re-diagnosis within two years and partner-services participation.

Result:. Among 1,067 persons with primary/secondary stage syphilis diagnoses in Fulton County during 2013–2015, partner-services participants (n=698) were younger than non-participants (n=369) (mean age: 31 vs. 34 years), and more likely to be female (7.0% vs. 2.7%) and Black (78.7% vs. 64.8%). Findings from this study suggest that the association of partner services with syphilis re-diagnosis differs by HIV status, with lower risk of syphilis re-diagnosis among men with HIV (adjusted risk ratio [aRR]=0.80, 95% CI: 0.55–1.14) but not among men without HIV (aRR=1.19, 95%CI: 0.57–2.49).

Conclusion: Partner-services participants differed notably from non-participants. We encourage other health departments to conduct similar assessments to improve participation by high-risk patients.

Keywords: Syphilis, Treponema pallidum, partner services

INTRODUCTION

Recurrent infections can play an important role in syphilis epidemics (Brewer, Peterman, Newman, & Schmitt, 2011; Katz, Lee, Gray, Marcus, & Pierce, 2011; Kenyon, Osbak, & Apers, 2018). Individuals with prior sexually transmitted infections (STIs) are at high risk for reinfection (Hsu et al., 2018). To prevent onward transmission and reinfection following syphilis treatment, partner-services programs seek to identify and treat potentially exposed sex partners (Hogben, Collins, Hoots, & O'Connor, 2016). Public health outreach staff, including Disease Investigation Specialists (DIS), undertake partner-services investigations, interviewing infected persons to identify and locate at-risk contacts and to identify risk factors for infection. Thus, partner services contribute to understanding of the epidemiology of infection.

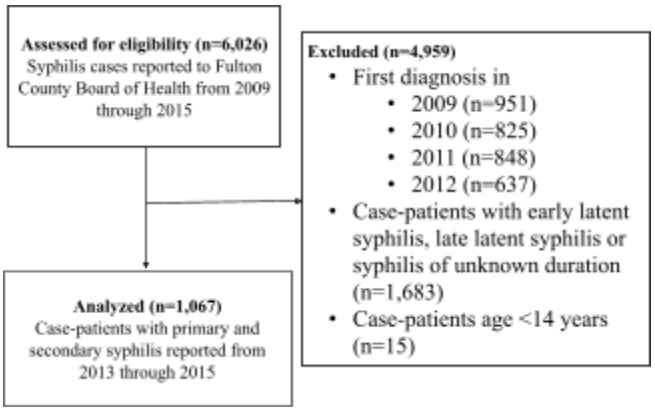
Participation in partner-services interviews is voluntary. Selective participation could reduce the potential effectiveness of syphilis prevention and control efforts. Moreover, analyses of risk factors for syphilis reinfection often rely on data collected through partner-services interviews (Brewer et al., 2011; Chaulk, 2013; Cohen et al., 2012; Jain et al., 2017; Kassem, Bartschi, & Carter, 2018; Katz et al., 2011; Phipps, Kent, Kohn, & Klausner, 2009). Systematic differences between interview participants and non-participants may introduce notable selection biases into what is known about risk factors for reinfection.

Fulton County, Georgia has one of the highest reported rates of primary and secondary syphilis in the U.S, and differs demographically from high incidence areas that have been the focus of previous epidemiologic studies (CDC, 2018). We aimed to (1) describe demographic and clinical differences between individuals with syphilis in Fulton County who did and did not complete a partner-services interview upon initial syphilis diagnosis; and to (2) determine whether participation in partner-services interviews is associated with syphilis re-diagnosis within two years of initial diagnosis.

METHODS

We used the State Electronic Notifiable Disease Surveillance System (SENDSS) to identify reported cases of primary or secondary stage syphilis in Fulton County residents aged over 13 years between January 2013 and December 2015 (Figure 1). We defined "first" syphilis diagnoses as those reported in 2013–2015 with no previous report in SENDSS during 2009–2012. From the same database, we identified re-diagnoses with primary, secondary, or early latent stage syphilis in this cohort in the two years following their first diagnosis.

Figure 1. *Study population selection from 6,026 individuals with syphilis reported to Fulton County Board of Health, 2009–2015*



Georgia healthcare providers and laboratories are required by law (OCGA 31-12-2) to report syphilis immediately to the Georgia Department of Public Health (DPH). Upon notification of syphilis diagnoses in the county, the Fulton County Board of Health prioritizes and attempts to contact persons with primary and secondary syphilis to provide partner-management services.

Data on baseline demographic characteristics (age, sex, and race/ethnicity), clinical features (disease stage, diagnosis date), and gonococcal and chlamydia co-infections in individuals first diagnosed with syphilis between 2013 and 2015 in Fulton County (the study cohort) were obtained from SENDSS through Georgia DPH. Georgia DPH matched the study cohort to the Enhanced HIV/AIDS Reporting System database using unique patient identifiers. Following data linkage and de-identification, we identified those co-infected with HIV at the time of the first syphilis episode and those with gonorrhea and chlamydia diagnoses in the preceding year.

To assess factors associated with partner-services participation upon initial syphilis diagnosis (Aim 1), we compared frequencies between partner-services participants and non-participants and calculated prevalence ratios and their 95% confidence intervals. For categorical variables, we used the chi-square or Fisher's exact test with 2-tailed p-values. As HIV infection could modify associations of partner-services participation with demographic or clinical factors, we also looked at associations stratified by HIV status.

To examine the association between syphilis re-diagnosis and partner-services participation (Aim 2), we restricted the analysis to men (since there were no re-diagnoses reported in women). To assess potential confounders, we explored the association of re-diagnosis with demographic and clinical characteristics using the methods described for Aim 1. We then constructed a multivariable log binomial regression model that included age and race as a priori confounders and an interaction term between partner-services participation and HIV status (a hypothesized effect modifier) (Zetola & Klausner, 2007).

The Georgia DPH's institutional review board approved this study.

RESULTS

In Fulton County, 1,067 individuals older than 13 years had primary or secondary stage syphilis diagnoses first reported between 2013 and 2015 (Figure 1). The mean age of first infection was 32.4 (standard deviation=9.8) years. The majority of patients were male (94.5%) and non-Hispanic Black (73.9%) (Table 1**)**. More than half were persons with HIV (55.1%) but only a small proportion had a diagnosis of gonorrhea (6.2%) or chlamydia (4.7%) in the year preceding their first syphilis diagnosis (Table 1). Most had secondary stage syphilis (82.6%). The median time to syphilis re-diagnosis was 410 days (interquartile range [IQR]: 275–578).

Of the 1,067 individuals with primary or secondary syphilis, 65% (n=698) participated in partner-services interviews upon first syphilis diagnosis. Interviewed and non-interviewed case-patients differed on a number of demographic and clinical characteristics (Table 1). Increase in age was associated with reduced likelihood of participating in partner-services interviews with a dose-response trend. Compared to non-interviewees, interviewees were more likely to be female than male (prevalence ratio [PR]=1.29, 95% CI: 1.14–1.46) and Black (PR=1.30, 95% CI: 1.13–1.5) or Hispanic (PR=1.28, 95% CI: 1.00–1.62) than White. They were less likely to have been diagnosed with primary (compared to secondary) stage syphilis (PR=0.88, 95% CI: 0.77–1.00). Individuals who had gonorrhea in the year prior to diagnosis were more likely to participate compared to those who did not (PR=1.17, 95% CI: 1.01–1.35). The magnitude and direction of the associations between partner-services participation and these variables did not differ meaningfully by HIV status.

Among the same 1,067 individuals, 130 (12.2%) syphilis re-diagnoses (primary, secondary, or early latent syphilis) were reported within two years of the baseline syphilis

Table 1. *Demographic and clinical characteristics of individuals with primary and secondary syphilis in Fulton County by partner services interview completion status and re-diagnosis, 2013–2015*

Characteristic	Overall (n=1067), No.	Partner services (n=698), n/N (%)**	Prevalence ratio (95% CI)	Re-diagnosis (n=130),n/N (%)**	Risk ratio (95% CI)
Age (years)					
14–24 (Ref)	*242*	*184/242 (76.0)*	*1*	15/242 (6.2)	*1*
25–29	*261*	*183/261 (70.1)*	*0.92 (0.83, 1.03)*	38/261 (14.6)	**2.35 (1.33, 4.16)**
30–39	*311*	*185/311 (59.5)*	***0.78 (0.70, 0.88)***	48/311 (15.4)	**2.49 (1.43, 4.34)**
40+	*253*	*146/253 (57.7)*	***0.76 (0.67, 0.86)***	29/253 (11.5)	**1.85 (1.02, 3.36)**
Sex					
Male	*1008*	*649/1008 (64.4)*	*1*	130/1008 (12.9)	--
Female	*59*	*49/59 (83.1)*	***1.29 (1.14, 1.46)***	0/59 (0.0)	0
Race/ethnicity					
Non-Hispanic White (ref)	*187*	*100 /187(53.5)*	*1*	24/187 (12.8)	1
Non-Hispanic Black	*788*	*549/788 (69.7)*	***1.30 (1.13, 1.5)***	97/788 (12.3)	0.96 (0.63, 1.46)
Hispanic	*44*	*30/44 (68.2)*	***1.28 (1.00, 1.62)***	6/44 (13.6)	1.06 (0.46, 2.44)
Other/unknown	*48*	*19/48 (39.6)*	*0.74 (0.51, 1.08)*	3/48 (6.3)	0.49 (0.15, 1.55)
Gonorrhoea*					
No	*1001*	*648/1001 (64.7)*	*1*	125/1001 (12.5)	1
Yes	*66*	*50/66 (75.8)*	***1.17 (1.01, 1.35)***	5/66 (7.6)	0.61 (0.26, 1.43)
Chlamydia*					
No	*1017*	*671/1017 (66.0)*	*1*	127/1017 (12.5)	1
Yes	*50*	*27/50 (54.0)*	*0.82 (0.63, 1.06)*	3/50 (6.0)	0.48 (0.16, 1.46)
HIV status					
Negative	*479*	*314/479 (65.6)*	*1*	30/479 (6.3)	1
Positive	*588*	*384/588 (65.3)*	*1 (0.91, 1.09)*	100/588 (17.0)	**2.72 (1.84, 4.01)**
Syphilis stage at first diagnosis					
Secondary (ref)	*881*	*589/881 (66.9)*	*1*	114/881 (12.9)	1
Primary	*186*	*109/186 (58.6)*	***0.88 (0.77, 1.00)***	16/186 (8.6)	0.66 (0.40, 1.09)

Abbreviations: CI=confidence interval. N.B. values in bold are statistically significant at the 0.05 significance level, prevalence (risk) ratios are calculated as the proportion of partner services (re-diagnosis) in the index category of each characteristic relative to the respective reference category. *In year prior to syphilis diagnosis. **n is the number of partner-services participants or re-diagnoses. N is the total number of observations for the row variable. repeat diagnosis with primary, secondary, and early syphilis only

diagnosis; all were men. Compared to those under 25 years old, older age was associated with increased risk of re-diagnosis (Table 1). Prevalent HIV infection at first syphilis diagnosis was positively associated with re-diagnosis; persons with HIV comprised 76.9% of individuals with re-diagnoses compared to 52.1% of individuals without re-diagnoses ($p<0.01$). The racial distributions of those with and without re-diagnoses were similar and not statistically different.

Among men with HIV at first syphilis diagnosis, the two-year risk of syphilis re-diagnosis was 20% lower (adjusted risk ratio [aRR]=0.80, 95% CI: 0.55–1.14) in partner-services participants compared to non-participants, after controlling for age and race. Among men without HIV, participants in partner-services interviews had 19% higher (aRR=1.19, 95% CI: 0.57–2.49) risk of re-diagnosis compared to non-participants, controlling for the same factors.

DISCUSSION

In Fulton County, partner-services participants differed notably from non-participants. We found differences according to sex, age, race, gonorrhea infection, and syphilis stage at first diagnosis. While men comprised the majority of case-patients—including all re-diagnoses—they were less likely to participate than women. Similarly, older case-patients, though more likely to have re-diagnoses, were less likely to participate in partner services. These findings suggest that partner services could better target high-risk groups. Moreover, public health practitioners should consider the potential selection bias that these differences may introduce to analyses of risk factors for syphilis infection that use behavioral information obtained through partner-services interviews.

A core aim of partner services is syphilis prevention and control. Although not statistically significant, our findings suggest that partner-services participation is associated with a lower risk of syphilis re-diagnosis in men with HIV but not in men without HIV. It is not clear whether this association is due to a causal effect of partner services on syphilis re-diagnosis or to unmeasured factors that influence a person's propensity to participate in partner services and their risk of re-diagnosis. Nevertheless, as HIV is a strong correlate of syphilis re-diagnosis, prioritizing persons with HIV for partner services could be an effective approach to reducing re-diagnoses. Other preventive measures should include increasing access to and availability of syphilis screening. In the near future, doxycycline prophylaxis may also become a preventive strategy (Ghanem, Ram, & Rice, 2020).

Our study has several limitations. Firstly, some individuals with previous syphilis diagnoses may have been misclassified as first cases. For example, people with previous syphilis episodes in other states may have been erroneously classified as having an initial diagnosis in Fulton County. Similarly, our estimate of the proportion of syphilis re-diagnoses is likely to be an underestimate because we could not identify re-diagnoses in patients who may have left Georgia and been reported in other jurisdictions. However, our finding that 12.2% of individuals with primary and secondary syphilis had a repeat diagnosis of primary, secondary or early stage syphilis within two years of a presumed first diagnosis is consistent with those of other studies in high incidence areas (Cohen et al., 2012; Katz et al., 2011). Secondly, we had insufficient power to provide statistical evidence of interaction by HIV status. However, the magnitude and direction of our stratified results suggest that the association between partner-services participation and syphilis re-diagnosis differs according to HIV status. Thirdly, we did not have data on use of anti-retroviral treatment or pre-exposure prophylaxis, which has been associated with increased risk of STIs (Serpa, Huynh, Nickell, & Miao, 2019; Traeger et al., 2019).

IMPLICATIONS FOR PUBLIC HEALTH

In Fulton County, Georgia, syphilis case-patients who participated in partner services differed from non-participants, potentially limiting the usefulness of partner services for syphilis control, as high-risk groups, such as men, were less likely to participate. Differences in participants and non-participants in partner services could introduce selection bias into our understanding of the risk factors for syphilis because partner-services interviews are the mechanism through which health departments collect information on behavioral risk factors for syphilis. These findings may also have implications beyond syphilis, as there may be selective participation in partner services for other STIs. Moreover, COVID-19 case investigation and contact tracing efforts build on the contact-tracing platform developed for STIs, and they too may suffer from selective participation. We encourage other health departments to conduct similar assessments of partner services to improve participation by high-risk patients and to evaluate whether such services are related to re-diagnosis.

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