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STI/HIV Testing and Prevalence of Gonorrhea and Chlamydia Among Persons with Their Specified-Type Sex Partner

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Abstract

BACKGROUND: Previous studies have shown that sexually transmitted infections (STI) and human immunodeficiency virus (HIV) testing has varied, but STI prevalence was not estimated among patients during their health care visits in which a high-risk sexual partnership was documented. This study estimated gonorrhea, chlamydia, syphilis, and HIV testing rates and chlamydia and gonorrhea prevalence.

METHODS: From the de-identified commercial claims data of OptumLabs Data Warehouse, we identified men and women aged 15–60 years classified as having high-risk sexual relationships as diagnosis codes: Z72.51 for opposite-sex, Z72.52 for same-sex, and Z72.53 for same-and-opposite-sex relationships, stratified by gender, age group, region, type of health plan, and HIV status. We estimated STI testing rate and prevalence for chlamydia and gonorrhea among patients with high-risk sexual relationships. HIV testing was assessed only in high-risk sexual relationship patients without HIV.

RESULTS: Among 8.2 million females and 7.3 million males aged 15–60 years in the database from 2016 to 2019, 115,884 patients (0.7% of female, 0.8% of male) including 3,535 patients with HIV were diagnosed with high-risk sexual relationships. The testing rates for gonorrhea, chlamydia, syphilis, and HIV were 69.4% (confidence interval [CI]: 69.1–69.7), 68.9% (CI: 68.6–69.2), 43.4% (CI: 43.1–43.7), and 41.7% (CI: 41.4–42.0), respectively. Among patients with valid chlamydia and gonorrhea tests, 7.2% (CI: 7.0–7.5) and 2.6% (CI: 2.4–2.8) had positive chlamydia and gonorrhea test results, respectively, and varied by type of high-risk sexual relationship.

CONCLUSIONS: Our study findings of suboptimal STI screening among patient in high-risk sexual relationships are consistent with previous studies. Administrative records confirmed by lab results indicate a need for STI counseling, testing, and treatment among patients who are diagnosed with high-risk sexual relationships with same-sex, opposite-sex, or same-and-opposite sex partners.

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Conflicts of Interest: None. The findings and conclusions in this paper are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Keywords

Chlamydia; Commercially insured; Gonorrhea; STD/STI testing; Syphilis and HIV testing

Sexually transmitted infections (STIs) continue to be an ongoing public health crisis in the United States with increases in reported cases of all nationally notifiable diseases. In 2019, there were 1.8 million cases of chlamydia (a 19% increase since 2015), 616,392 cases of gonorrhea (a 56% increase since 2015), and 129,813 cases of syphilis (a 74% increase since 2015).[1] Recent increases in STIs may be attributed to increases in risk behaviors among adolescents or among men who have sex with men (MSM).[2,3] For example, 1 study showed that only 54% of youth reported using condoms in their most recent sexual encounter.[2] Oral contraception use, which increased from 17% to 21%, may have indirectly contributed to lower condom use.[2] Another study showed a significant increase in STIs among MSM taking human immunodeficiency virus (HIV) pre-exposure prophylaxis.[3] All MSM at higher risk for both STIs and HIV are recommended to receive STI and HIV screening by the Centers of Disease Control and Prevention (CDC) and the US Preventive Services Task Force (USPSTF).[4–6] Sexually active persons at higher risk for STI and HIV may include persons living with HIV or MSM, those having condom-less sex with multiple or anonymous partners, those engaging in anal sex without condoms, or those involved in sex trade for drugs or money.

Two recent studies have shown that STI testing rates varied among patients with diagnoses of high-risk sexual relationships.[7,8] However, the previous studies did not estimate STI prevalence. Our primary objective for this study is to assess prevalence of chlamydia and gonorrhea testing among patients identified with high-risk sexual relationships stratified by gender, age groups, region, type of health plan, HIV status, and the year of high-risk sexual relationship diagnosis. Our secondary objective is to evaluate STI/HIV testing rates among patients with high-risk sexual relationships diagnosis and prevalence of chlamydia and gonorrhea among patients with high-risk sexual relationships.

METHODS

We used the OptumLabs Data Warehouse (OLDW), a comprehensive, longitudinal, real-world data asset with de-identified commercially insured or Medicare patients in the United States. The OLDW database includes demographic and enrollment data, medical claims data, and outpatient pharmacy claims data. The OLDW also includes lab test result data from certain laboratories. The dataset was created using a unique enrollee identifier to link all the records and then de-identified prior to release to the authors. The OLDW database includes approximately 15.5 million commercially insured patients aged 15–60 years who had ≥1 medical claim in the medical claims data in 2016–2019, and lab records of 7.4 million commercially insured patients aged 15–60 years who had ≥1 lab test result in 2016–2019. The database includes information on the patient's year of birth, sex, type of insurance, US geographic region of residence, test type, anatomic site of specimen, test result, diagnostic codes (*International Classification of Diseases, 10th Revision, Clinical Modification [ICD-10 CM]*), and procedure codes (Current Procedure Terminology (CPT).

For this study, we focused on both men and women aged 15–60 years with commercial insurance who had ≥1 claim during 2016–2019 for any of the following three *ICD-10* codes identifying high-risk sexual relationships: Z72.51 for heterosexual, Z72.52 for bisexual, and Z72.53 for homosexual. We excluded Medicare patients from OptumLabs data because all Medicare patients from OptumLabs data were under managed care Medicare program, and the total sample size of Medicare patients was much smaller than commercially insured patients. To avoid categorical bias, we have identified these patients as opposite-sex partners if heterosexual behavior was indicated, same and opposite-sex partners for bisexual behavior, and same-sex partners for homosexual behavior. The first encounter date of the high-risk sexual relationship diagnosis was considered as the index date. Of those patients with high-risk sexual relationships, we identified HIV-infected patients if they had ≥1 claim with the *ICD-10* codes of B20 or Z21 in 2016–2019.

First, we estimated gonorrhea, chlamydia, syphilis, and HIV testing by CPT code documented on the index date among patients in high-risk sexual relationships using the medical claims data. To estimate the HIV testing rate, we further limited the analysis to patients without documented HIV infection. The CPT codes to identify STI/HIV testing are available in a previous publication.[7]

Second, we linked the high-risk sexual relationship patients' lab test results data limited to only gonorrhea or chlamydia tests if their test results were documented from 1 day before to 3 days after the index date.[8,9] Tests for gonorrhea or chlamydia were identified using description fields in Logical Observation Identifiers Names and Codes of "gonorr" or "chlam."[10] We then selected those tests if they were classified as gonorrhea and chlamydia detection tests. Tests were defined gonorrhea and chlamydia detection tests if gonorrhea and chlamydia tests consisted of rectal or anal specimens, pharyngeal or throat specimens, vaginal, endocervical, urethral or urine specimens, or other unspecified specimens. We did not include lab records with serum, blood, or conjunctival specimens for antigen or antibody tests. We defined valid lab results of gonorrhea and chlamydia as those with either positive or negative results. On the index date, we estimated the proportions of persons with gonorrhea tests who had positive gonorrhea tests as gonorrhea prevalence and that of persons with chlamydia tests who had positive chlamydia tests as chlamydia prevalence.

All analyses were performed using SAS version 9.4 (SAS Institute Inc.). χ^2 tests with 95% confidence intervals (CIs) were used to test the association between testing rates or positivity by any categorical variable. $P < .05$ in χ^2 for the association of 2 variables, or two 95% CIs without overlap for 2 rates, were considered as statistically significant.

In compliance with the data use agreement with OptumLabs, the results related to any cell with <11 counts were suppressed and reported as N/R in this study. Because the database was a de-identified analytic data set consisting of data collected as part of routine patient care, the study protocol was determined to be nonhuman subject research and was exempted from institutional review board review at the CDC.

RESULTS

We identified 15.5 million patients (8.2 million females, 7.3 million males) aged 15–60 years old in the OptumLabs commercial claims database from 2016 to 2019. Of these patients, the proportions with a diagnosis of high-risk sexual relationship were 0.8% overall, 0.7% among females and 0.8% among males. Patients diagnosed with high-risk sexual relationship were more likely to be identified as having high-risk sexual relationships with opposite-sex partners if they were female than male or if they had no documented HIV infection than those with documented HIV infection (Table 1).

Of 115,884 patients with a diagnosis of high-risk sexual relationship and of 112,349 patients with a high-risk sexual relationship diagnosis and no documented HIV infection, 80,404 patients (69.4% [CI: 69.1–69.7]) had chlamydia tests, 79,839 patients (68.9%]CI: 68.6–69.2]) had gonorrhea tests, 50,293 patients (43.4% [CI: 43.1–43.7]) had syphilis tests, and 48,288 (41.7% [CI: 4 1.4–42.0]) patients had HIV tests identified by CPT codes (Table 2). Patients were more likely to be tested for gonorrhea and chlamydia if they had opposite-sex partners compared to same-sex partners; patients were more likely to be tested for syphilis and HIV if they had high-risk sexual relationships with same-sex partners compared to opposite-sex partners.

Among the 115,884 patients diagnosed with high-risk sexual relationships, 31,29 2(27.0%) and 31,174 (26.9%) had valid chlamydia and gonorrhea tests, respectively, on the index date. Of those with valid chlamydia or gonorrhea tests, the proportion who had positive test results were 7.2% (CI: 7.0–7.5) and 2.6% (CI: 2.4–2.8), respectively (Table 3). Patients were more likely to have positive chlamydia tests if they were aged 15–24 years than other age groups, had high-risk sexual relationships with opposite-sex partners than with same-sex partners, and were male than female (Figure 1). Patients were more likely to have positive gonorrhea tests if they had documented HIV infection than those without documented HIV infection, 15–24 years of age group rather than other age groups, and same-sex partners rather than opposite-sex partners (Table 3).

Of 31,292 and 31,174 patients had valid chlamydia and gonorrhea tests, respectively, on the index date, 30,526 patients had both valid chlamydia and gonorrhea testing. The coinfection was about 9.7% among patients with positive chlamydia tests and 26.9% among patients with positive gonorrhea tests. Of those 30,526 patients, 0.7% (95%CI: 0.57–0.76) patients had coinfection overall, 0.7% (95% CI: 0.55–0.77) had coinfection among 26,955 patients with opposite-sex partners, and 0.8% (95% CI: 0.45–1.08) had coinfection among 2,998 patients with same-and-opposite sex partners.

Of 80,404 patients with chlamydia tests and 79,839 patients with gonorrhea tests identified by CPT codes on the index date in the medical claims data, 37.1% and 37.2% had valid chlamydia and gonorrhea tests, respectively, in the lab test result data. Of 31,292 patients with valid chlamydia tests and 31,174 patients with valid gonorrhea tests on the index date in the lab test result data, 95.4% and 95.3% had CPT-related chlamydia and gonorrhea tests, respectively, in the medical claims data.

DISCUSSION

Our study's main addition to the literature on STI prevention in persons with high-risk sexual relationships is the inclusion of test results for chlamydia and gonorrhea: about 7.5% positivity for chlamydia among patients in high-risk sexual relationships with opposite-sex partners and 5.8% positivity for gonorrhea among patients with high-risk sexual relationships with same-sex partners. The high chlamydia and gonorrhea prevalence, as well as suboptimal STI/HIV screening rates, suggest health care providers need to ensure STI counseling, testing, and treatment are provided for patients with high-risk sexual relationships. When treatment is provided in a timely manner, sequelae of chlamydia and gonorrhea can be prevented.[4]

Our study results showed a similar pattern for STI screenings, but the overall screening rates were higher in this study compared to a previously published study for chlamydia (69.38% vs 63.93%), for gonorrhea (68.90% vs 63.85%), and for syphilis (43.41% vs 39.23%), and except for HIV screening rates which were lower than those previously reported (41.67% vs 44.75%), respectively.[9] The previous study reported similarities as compared to Table 2: Chlamydia and gonorrhea screening were higher among both opposite-sex partners (65.27%, 65.21%) and same-and-opposite sex partners (57.66%, 56.64%) compared to same-sex partners (49.94%, 49.81%), whereas syphilis and HIV screening were higher among same-sex partners (51.48%, 57.76%) compared to opposite-sex (38.13%, 43.56%) or same-and-opposite-sex (41.59%, 48.22%), respectively.[7] Our results indicate missed opportunities for HIV testing and warrant further investigation on the causes and barriers of lower testing for HIV. Previous studies have reported barriers such as perceived cost, access to specialty care, and not feeling at risk as highest ranked barriers to HIV screening.[11] Among 9,389 non-HIV infected patients in high-risk sexual relationships with same-sex partners, only 50.3% were found to have HIV testing. This suggests a lack of adherence to CDC guidelines, which recommend frequent screening among population at higher risk for HIV.[12]

Although our study did not evaluate the reasons for low diagnosis rates of high-risk sexual relationships, a previous study evaluated attitude, beliefs, knowledge, and self-efficacy as determinants to be targeted to improve communication about sexual health among patients, parents, and health care providers. Each of them expressed a need to discuss sexual health and acknowledged that sexual health was a taboo topic uncomfortable to discuss.[13] Another study reported more than half of the youth avoided discussing sexual health and orientation concern to providers due to fear of health care privacy, heterosexist bias, and a general belief that minority youth did not receive an equitable treatment in health care settings. Youth reporting a physician initiating discussion about sexual orientation were more likely to get STI/HIV testing and preventive services.[14] The high-risk sexual relationship prevalence rates have not been reported as higher among 15- to 60-year-olds in previous studies, which is not surprising as high-risk sexual relationship-specific *ICD10* coding was introduced and implemented after October 2015. Lack of wide use of high-risk sexual relationship coding in clinical practice may also be a reason for under-reporting of high-risk sexual relationships. The low proportion of high-risk sexual relationship patients calls for developing a new communication strategy by conducting focused sexual history and counseling by providers and promotion of safer sexual practices. The barriers of having a

frank conversation among provider and patient need to be addressed. The American College of Obstetricians and Gynecologists (ACOG) cited several barriers in obtaining a sexual history, including a lack of confidence and adequate training or subject matter expertise, perceptions of limited treatment options, insufficient clinical time to conduct sexual history, underestimating prevalence of sexual dysfunction, and patients' reluctance to discuss sexual activity.[15] The CDC recommends that providers should focus on the five "P" areas (partners, practices, protection from STDs, past history of STDs, and prevention of pregnancy) while collecting information related to the sexual health of a patient.[16] This pertinent information is critical in understanding symptomatology associated with male and female reproductive systems, contraceptive use, sexual behaviors, possible risks for STIs/HIV, and history of STI screening. Possible reasons that many health care providers may not use these *ICD-10* codes that indicate sexual partnerships may be due to lack of reimbursement, lack of knowledge of such *ICD-10* codes, lack of clarity or distinction on the description of these codes to avoid inappropriately classifying gender expression of the patient, or fear of exacerbating stigma associated with gender identity. Because sexually active MSM are recommended to receive annual *Chlamydia trachomatis*/*Neisseria gonorrhoeae* (CT/GC) testing regardless of age, using these *ICD-10* codes will make reimbursement more easily approved. Providers could be hesitant to use diagnostic codes that would reduce patient privacy or be reluctant to ask patients about sexual behavior. If providers choose to use the patient diagnostic codes of high-risk sexual relationships, it would be more likely that providers have had a discussion on sexual risk behavior with their patients. Therefore, there is no reason for providers not to offer STI screening. Patients will benefit from recommended screenings, and those found to be infected can be diagnosed and treated in a timely manner to prevent further spread of STIs.

The IBM MarketScan data presents with strengths of a large convenient sample, allowing opportunity to cross-sectionally assess complete episodes of uniquely identified patients' health services encounters over time.

Limitations

This study has several limitations. First, as mentioned in the method section, not all medical claims had lab test results because the lab test result data were from a proportion of all contracted laboratories only. Therefore, a high proportion of medical visits in which patients had gonorrhea or chlamydia clinical diagnosis codes and had no lab records in the lab test results data were excluded for the prevalence estimates, and our results might be biased. Our study also had similar limitations as those described by Kumar et al,[9] which are common among studies using administrative claims data. Our study population consisted of only insured patients; therefore, screening and positivity among high-risk sexual relationships in our study did not represent patients with Medicaid-insured or uninsured patients. High-risk sexual relationships are likely prevalent among a younger, socially disadvantaged population that often lacks commercial insurance; therefore, reported STI prevalence in our study may be underestimated.

Testing performed at sites such as nonprofit organizations, free clinics, or nonparticipating laboratories outside of reimbursement system may not be captured by OptumLabs. Refusal

to receive HIV testing may also have resulted in underestimation of HIV testing rates. Providers who are unfamiliar with high-risk sexual relationship-indicated diagnostic codes and potential screening reimbursement may lead to underestimating individuals with high-risk sexual relationships indicated diagnoses and associated testing. The US Preventive Services Task Force recommends behavioral counseling and HIV screening for patients in high-risk sexual relationships,[17] which would help facilitate STI/HIV screening and reimbursement.[18] National physician associations as well as insurance companies may want to consider promoting use of *ICD-10* codes that help identify high-risk sexual relationships while ensuring patient privacy so that future interventions and resources can be directed toward targeted populations, with the result that timely STI services can be rendered and disparity among these population can be reduced.

CONCLUSION

Our study found gaps in STI testing among patients with high-risk sexual relationships, and that chlamydia and gonorrhea prevalence were high among patients with high-risk sexual relationships. Our study suggests that healthcare providers need to provide timely STI counseling, testing, and treatment for patients with high-risk sexual relationships.

References

1. National Center for HIV/AIDS Viral Hepatitis STD and TB Prevention (U.S.). Division of STD Prevention., Centers for Disease Control and Prevention (U.S.). Sexually Transmitted Disease Surveillance 2018. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Division of STD Prevention; 2018.
2. Kann L, McManus T, Harris WA, et al. Youth risk behavior surveillance - United States, 2017. MMWR Surveill Summ 2018;67(8):1–114. 10.15585/mmwr.ss6708a1.
3. Montãno MA, Dombrowski JC, Dasgupta S, et al. Changes in sexual behavior and STI diagnoses among MSM initiating PrEP in a clinic setting. AIDS Behav 2019;23(2):548–55. 10.1007/s10461-018-2252-9. [PubMed: 30117076]
4. Workowski KA, Bolan GA. Sexually transmitted diseases treatment guidelines, 2015. MMWR Recomm Rep 2015;64(RR-03):1–137.
5. LeFevre ML, U.S. Preventive Services Task Force. Screening for Chlamydia and gonorrhea: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med 2014;161(12):902–10. 10.7326/M14-1981. [PubMed: 25243785]
6. US Preventive Services Task Force (USPSTF), Bibbins-Domingo K, Grossman DC, et al. Screening for syphilis infection in nonpregnant adults and adolescents: US Preventive Services Task Force Recommendation Statement. JAMA. 2016;315(21):2321–7. 10.1001/jama.2016.5824. [PubMed: 27272583]
7. Kumar S, Patel C, Tao G. Frequency of STD testing services among commercially-insured patients with high risk sexual behaviors. Sex Transm Dis. 2019;95(Suppl 1):A92–A92. DOI: 10.1136/sextrans-2019-sti.235 %.
8. Tao G, Patel C. STI/HIV testing among Medicaid/CHIP-insured enrollees aged 15–60 years who were diagnosed with high risk sexual behaviors with their opposite-sex or same-sex partners. Sex Transm Dis 2021;48(7):488–92. 10.1097/olq.0000000000001336. [PubMed: 33264264]
9. Kumar S, Patel C, Tao G. Frequency of sexually transmitted infection/HIV testing among commercially insured patients with international classification of disease tenth revision specified sex partners. Sex Transm Dis 2020;47(5):347–53. 10.1097/olq.0000000000001145. [PubMed: 32304529]

10. Tao G, Workowski K, Bowden KE, et al. Estimating recommended gonorrhea and chlamydia treatment rate using linked medical claims, prescription, and laboratory data in US private settings. Sex Transm Dis 2021;48(3):167–73. 10.1097/olq.0000000000001290. [PubMed: 33003184]

11. Wise JM, Ott C, Azuero A, et al. Barriers to HIV testing: patient and provider perspectives in the deep south. AIDS Behav 2019;23 (4):1062–72. 10.1007/s10461-018-02385-5. [PubMed: 30607759]

12. DiNenno EA, Prejean J, Delaney KP, et al. Evaluating the evidence for more frequent than annual HIV screening of gay, bisexual, and other men who have sex with men in the United States: results from a systematic review and CDC expert consultation. Public Health Rep 2018;133(1):3–21. 10.1177/0033354917738769. [PubMed: 29182894]

13. Engelen MM, Knoll JL, Rabsztyn PRI, Maas-van Schaaijk NM, van Gaal BGI. Sexual health communication between healthcare professionals and adolescents with chronic conditions in western countries: an integrative review. Sex Disabil 2020;38(2):191–216. 10.1007/s11195-019-09597-0.

14. Fisher CB, Fried AL, Macapagal K, Mustanski B. Patient-provider communication barriers and facilitators to HIV and STI preventive services for adolescent MSM. AIDS Behav 2018;22(10):3417–28. 10.1007/s10461-018-2081-x. [PubMed: 29546468]

15. The American College of Obstetricians and Gynecologists. ACOG Committee Opinion - Sexual Health. Available at: https://www.acog.org/-/media/project/acog/acogorg/clinical/files/committee-opinion/articles/2017/07/sexual-health.pdf. Accessed September 10, 2019.

16. Centers for Disease Control and Prevention. A Guide to Taking a Sexual History. Available at: https://www.cdc.gov/std/treatment/Sexual-History.htm. Accessed September 10, 2021.

17. Lee KC, Ngo-Metzger Q, Wolff T, Chowdhury J, LeFevre ML, Meyers DS. Sexually transmitted infections: recommendations from the U.S. Preventive Services Task Force. Am Fam Physician 2016;94 (11):907–15. [PubMed: 27929270]

18. US Preventive Services Task Force, Owens DK, Davidson KW, et al. Screening for HIV Infection: US Preventive Services Task Force Recommendation Statement. JAMA 2019;321(23):2326–36. 10.1001/jama.2019.6587. [PubMed: 31184701]

CLINICAL SIGNIFICANCE

- Patients were more likely to be tested for gonorrhea (70.2%) and chlamydia (70.7%) if they were in opposite-sex-partner relationships and for syphilis (54.9%) and HIV (50.3%) in same-sex-partner relationships.
- Positivity was about 7.2% for chlamydia, 2.6% for gonorrhea, and 0.7% for coinfection. The positivity for chlamydia and gonorrhea varied by type of high-risk sexual relationship, respectively.
- There were missed opportunities for screening among patients with high-risk sexual relationships.

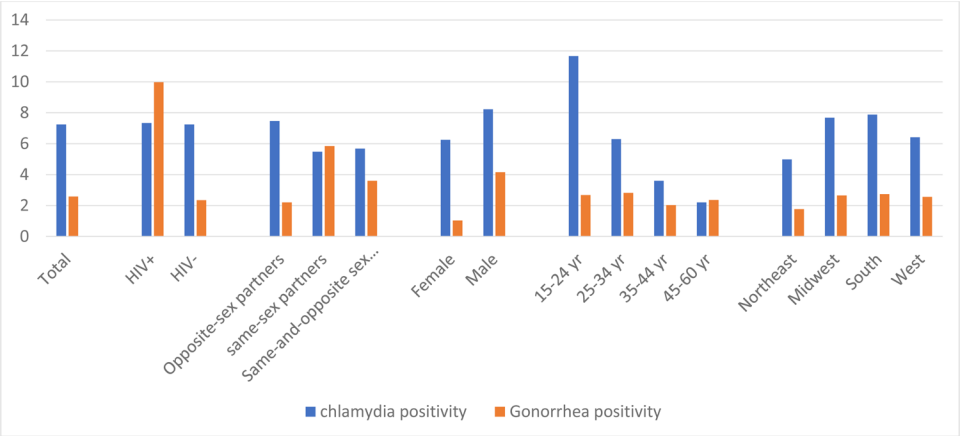

Figure 1:

Chlamydia and gonorrhea prevalence among patients with high-risk sexual relationship who had valid chlamydia and gonorrhea testing results on the index date.

Table 1.

Distribution of patient's sex partners among patients aged 15–60 years with high-risk sexual relationships during 2016–2019, OptumLabs data

Characteristics	Number of patients N (Col %)	% of patients with opposite-sex partners	% of patients with same-sex partners	% of patients with same-opposite-sex partners
Total	115884	88.4	9.6	2.0
Gender				
Female	59503(51.4)	97.4	0.7	1.9
Male	56381(48.7)	78.8	18.9	2.2
Age groups in years				
15–24	39583(34.2)	93.9	4.1	2.0
25–34	42040(36.3)	86.3	11.5	2.2
35–44	20225(17.5)	86.0	12.0	1.9
45–60	14036(12.1)	82.4	15.8	1.8
Region				
Midwest	24539(21.2)	90.9	6.9	2.2
Northeast	12902(11.1)	84.9	13.2	1.9
South	58099(50.1)	89.5	8.7	1.9
West	20045(17.3)	84.3	13.2	2.5
Unknown	299(0.3)	91.0	9.0	
Type of plan				
EPO	14912(12.9)	89.2	8.8	2.0
HMO	10428(9.0)	89.6	8.6	1.7
POS	87920(75.9)	88.1	9.8	2.1
PPO	2126(1.8)	87.7	10.0	2.3
Others	498(0.4)	90.0	7.8	2.2
HIV status				
Infected	3535(3.1)	49.1	48.7	2.2
un-infected	112349(97.0)	89.6	8.4	2.0
Year of High-risk Sexual Relationships Identified				
2016	27152(23.4)	88.5	9.3	2.2
2017	28175(24.3)	90.1	8.3	1.5
2018	29835(25.4)	88.5	9.4	2.2
2019	31172(26.9)	86.6	11.2	2.3

^ the percent represented for both patients with same-sex partners and patients with same-and-opposite-sex partners. EPO-exclusive provider organization; HMO-health maintenance organization; POS-point of service; PPO-preferred provider organization.

Table 2.

STI and HIV testing rates by CPT codes among patients aged 15–60 years with high-risk sexual relationships

Characteristics	Number of patients with - High-risk Sexual Relationships	Chlamydia testing %(95%CI)	Gonorrhea testing %(95%CI)	Syphilis testing %(95%CI)	Number of patients with High-risk Sexual Relationships who were with un-infected HIV	HIV testing* %(95%CI)
Total	115884	69.4 (69.1–69.7)	68.9 (68.6–69.2)	43.4 (43.1–43.7)	112349	41.7 (41.4–42.0)
Patient's sex partner						
Opposite-sex	102408 (88.4)	70.7 (70.4–71.0)	70.2(69.9–70.5)	42.2 (41.8–42.5)	100673(89.6)	40.8 (40.5–41.1)
Same-sex	11110(9.6)	57.1 (56.1–58.0)	57.0 (56.0–57.8)	54.9 (54.0–55.8)	9389(8.4)	50.3 (49.3–51.3)
Same-and-opposite-sex	2366 (2.0)	69.4 (67.5–71.3)	69.3 (67.5–71.2)	44.1 (42.1–46.1)	2287(2.0)	44.5 (42.5–46.6)

*HIV testing was assessed in patients with no diagnosis of HIV infection on the date of diagnosis

Note: STI- sexually transmitted infection, HIV- Human Immunodeficiency Virus, CPT- Current Procedural Terminology

Table 3.

Prevalence of chlamydia and gonorrhea among patients aged 15–60 years with high-risk sexual relationship who had valid chlamydia and gonorrhea tests at the index date

Characteristics	Number of patients with valid chlamydia tests	Prevalence of chlamydia % (95%CI)	Number of patients with valid gonorrhea tests	Prevalence of gonorrhea % (95%CI)
Total	31292	7.2(7.0–7.5)	31174	2.6(2.4–2.8)
Patient's sex partners				
Opposite-sex	27645	7.5(7.2–7.8)	27558	2.2(2.0–2.4)
Same-sex	3066	5.5(4.7–6.3)	3033	5.8(5.0–6.7)
Same-and-opposite-sex	581	5.7(3.8–7.6)	583	3.6(2.1–5.1)