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STI and HIV Testing and Diagnosis Among 15–44 Years Old Patients with and without Opioid Use Disorder

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Abstract

Background: The association between illicit opioid use and prescription opioid misuse and sexually transmitted infections (STIs) has not been examined recently. Our study aims to explore differences in STI/HIV care, delivery of recommended testing and diagnoses among patients with and without opioid use disorder (OUD).

Methods: Using 2019 MarketScan commercial claims data, we identified 15–44 years old male and female patients, to assess the percentages of STI/HIV diagnoses (using ICD10-CM) and screening (using Current Procedure Terminology codes) among patients with or without OUD diagnoses codes. We further assessed STI/HIV testing and diagnoses by demographic factors.

Results: We identified 24,724 patients with OUD codes among 7.31 million patients. Both STI/HIV testing and diagnoses were significantly ($p < 0.05$) higher among patients with OUD codes versus without: testing percentages were 16.81% versus 12.93% for chlamydia, 22.31% versus 16.62% for gonorrhea, 15.26% versus 7.61% for syphilis and 18.18% versus 7.60% for HIV and diagnoses were 0.80% versus 0.35% for chlamydia, 0.30% versus 0.11% for gonorrhea, 0.23% versus 0.07% for syphilis and 0.74% versus 0.33% for HIV. Similarly, among 0.53 million 15–24 years old females who received services suggestive of sexual activity, chlamydia testing was significantly ($p < 0.05$) higher among patients with OUD codes versus without (59.78% versus 55.66%).

Conclusions: Patients with OUD codes have higher percentages of STI/HIV testing and diagnoses codes compared to those without OUD codes. Clinicians may want to consider a comprehensive multidisciplinary (OUD and STI prevention) approach in patient care and provide recommended STI/HIV screening among patients with OUD if not performed.

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DISCLAIMER: 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.

Summary

Patients with Opioid use disorder (OUD) had a higher percentage of STI/HIV testing and diagnoses than those without OUD, especially among sexually active female patients. Clinicians may want to consider a comprehensive multidisciplinary (OUD and STI prevention) approach in patient care when applicable.

Keywords

Opioid use disorder; chlamydia; gonorrhea; syphilis and HIV testing; STI; diagnoses; testing; commercially-insured

In the United States (US), 5.6 million Americans aged 12 years or older reported having opioid use disorder (OUD) in the past year, and 9.2 million people reported heroin use or prescription pain reliever misuse in the past year according to the National Survey on Drug Use and Health (NSDUH) 2021. The most represented misused medications reported in the United States were hydrocodone, oxycodone, and codeine.¹ The 2021 Youth Risk Behavior Survey showed that 6% of youth reported misuse of prescription opioids during the past 30 days.²

Prescription opioid misuse among adolescents is associated with sexual behaviors such as having first sex before age 13, having four or more lifetime sexual partners, not using a condom during last sexual intercourse, and intoxication before sex.^{3,4} Some sexual behaviors and misuse of prescription opioids and use of illicit opioids are also associated among young adults. Friedman et al. found in a sample of 464 persons aged 18–29 years who misused prescription opioids or used heroin, respondents also reported having had multiple sexual partners (42%), inconsistent condom use (80%), group sex (6%), and sex with persons who inject drugs (PWID, 40%).⁵ All of these behaviors substantially increase the risk for contracting HIV or STIs:^{6,7} an annual report by the Minnesota Department of Health stated that STIs had increased during recent years among persons who use drugs (e.g., heroin, prescription opioids, and methamphetamines).⁸ National surveillance data during 2013–2017 showed an increase in reported methamphetamine use, injection drug use, heroin use, and sex with a person who injects drugs among women and heterosexual men with primary and secondary syphilis.⁹ A study also suggested that adverse outcomes such as opioid overdose deaths may not always be associated with STI rates, as indicated by a study.¹⁰

Both the Centers for Disease Control and Prevention (CDC) and the US Preventive Services Task Force recommend that all sexually active females aged ≥24 years receive annual testing for chlamydia and gonorrhea, and both entities also recommend that all sexually active persons at increased risk (e.g., persons living with HIV and men who have sex with men) be screened for chlamydia, gonorrhea, and syphilis at least annually.^{11–13} Regarding OUD, the dimensions of a comprehensive assessment and diagnosis as described by the American Society of Addiction Medicine include biomedical conditions and complications.¹⁴ Although not necessary at the first visit, the importance of emergent

or urgent medical problems is emphasized, including laboratory tests including for HIV; consideration of testing for STIs is also suggested.

Administrative claims data have been utilized in STI¹⁵ and survey data have been utilized in sexual behaviors and OUD¹⁶ research in the past, but STI testing and diagnoses among persons with OUD codes and those without OUD codes has not been examined using administrative claims data. The use of administrative claims data allows researchers to use electronic patient level records to capture STI testing and STI diagnosis more accurately than survey data. One ecological study identified a positive association between opioid prescribing rates (used as a proxy for prescription opioid misuse) at county levels and rates of gonorrhea among males;¹⁷ however, there is a void in the literature that evaluates STI testing and care among patients with OUD to assess potential missed opportunities for routine STI care and evaluation.

Our study aims to examine STI testing and diagnoses among persons with OUD and among persons without OUD diagnoses stratified by sex. Also, we aim to assess the associations between STI testing and diagnoses among both groups by demographic factors and health plan type (e.g., sexual activity status of females, region of residence, age group, and metropolitan statistical area [MSA] status). This study aims to improve understanding of routine STI care and associated risk among patients with and without OUD codes.

Methods

We examined the 2019 Truven Health MarketScan® commercial claims database, which includes approximately 40 million U.S. residents with commercial health insurance plans [(e.g., health maintenance organizations (HMO), preferred provider organizations (PPO), point-of-service (POS), and fee-for-service)]. The commercial claims database is comprised of de-identified patient claims information on patient health care service usage for outpatient or inpatient services, dates of service, patient demographics (e.g., age and sex), place of service, *International Classification of Disease*, Tenth Revision (ICD-10 CM) codes, Current Procedural Terminology Codes (CPT) codes, outpatient pharmaceutical use, provider details, and reimbursement information.¹⁸ The commercial claims data also include geographic variables (e.g., region of residence, state of residence, and the first 3 digits of the zip code).¹⁸ A CDC human subjects review determined that use of the commercial claims data did not constitute human subjects research because only de-identified data were used. Therefore, institutional review board review was unnecessary for this study.

Our study population included all male and female persons aged 15–44 years who had at least one clinical encounter claim during January 1–December 31, 2019 and 11 months of insurance enrollment during 2019. The rationale for selecting persons between the ages of 15 and 44 is that STIs occur most commonly among both male and female patients in this age group.¹⁹ A separate sensitivity analysis performed among all ages to understand overall impact of different age groups on results.

We defined OUD as a diagnosis code indicating opioid abuse (F11.1) or opioid dependence (F11.2) during 2019 and excluded F11.9 (opioid use disorder, unspecified) to be consistent

with methodology of previous publication.¹⁶ Patient data were then classified into 2 groups: (1) patients with OUD diagnosis codes and (2) patients without OUD codes. To determine STI diagnoses, we used ICD-10-CM codes to identify patient records for those with STIs corresponding to those with the highest prevalence nationally: chlamydia, gonorrhea, syphilis, or HIV infection (Supplemental Appendix 1).¹⁹ We used CPT codes to identify patients who were tested for chlamydia, gonorrhea, syphilis, or HIV (Supplemental Appendix 1). We further stratified testing and diagnoses rates by sex, age groups, region, type of health plan and MSA status.

A separate analysis was conducted among females with and without OUD codes to assess services that indicate sexual activity among female patients aged 15–24 years of age using criteria provided by Healthcare Effectiveness Data and Information Set (HEDIS), which requires a medical encounter associated with reproductive or sexual health services (e.g., cervical cancer testing [Papanicolaou test or smear] or pelvic examination, contraceptive, pregnancy, STI, or infertility services) for female patients aged 16–24 years.²⁰ The term “sexually active or sexually active female” would be defined as per the claims of reproductive or sexual health services indicative of sexual activity according to criteria of HEDIS measure. For this sub-analysis, men were excluded as these criteria do not apply to men.

We used SAS software version 9.4 (SAS Institute, Cary, NC, USA) to conduct the data analyses and used chi-square and binomial distribution tests to estimate percentages and confidence intervals for this study and to test for statistically significant differences between groups. We compared confidence intervals between the patients with OUD diagnosis codes versus those without OUD diagnosis codes and considered results to be statistically significant if confidence intervals did not overlap. Based on MarketScan confidentiality guidelines, results were not reported for cases with cell sizes <11.²⁰

Results

We identified 3.61 million male patients and 3.70 million female patients aged 15–44 years in the database who had coverage for 11 months (Table 1). Of those 7.31 million patients, 46.96% resided in the South, 80.27% resided in MSA/urban areas, and 49.34% of those without missing insurance type had PPO as type of insurance. Overall, 0.34% of patients had OUD claims in 2019. The demographic categories with the highest percent of OUD patients were male (0.41%), patients aged 35–39 years (0.46%) or aged 40–44 years (0.45%), patients who resided in rural areas (0.45%), and patients with POS as health insurance (0.49%) or PPO (0.48%). Patients who resided in the Northeast (0.38%) had the highest percent of OUD claims in 2019 among all four US census regions.

Overall, percentages of STI testing among 15–44 year old patients were significantly higher for all four STIs among those with OUD diagnosis codes compared to those without OUD codes (Table 2). For most demographic categories, percentages of STI testing for all four STIs among those with OUD diagnosis codes were significantly higher than those without OUD codes, except for chlamydia for sexually active female patients and 30–39 year old patients and gonorrhea for HMO and POS plans (Table 2). Of 0.53 million sexually active

female patients aged 15–24 years, the percentage of chlamydia testing was 55.67% overall, 59.78% among female patients with OUD, and 55.66% among female patients without OUD ($P<0.05$) (data not shown).

Further analysis revealed a similar pattern for the percentages of STI diagnoses among the overall cohort of 15–44 year old patients. Those with OUD diagnosis codes showed significantly higher percentages of STI diagnoses compared to those without OUD codes for all four STIs (Table 3). Most demographic categories (cell size ≥ 11) showed significantly higher percentages of STI diagnoses compared to those without OUD codes for all four STIs, except for 4 categories (i.e., region, MSA, health plan, plan type) that showed similar percentages of chlamydia or HIV diagnosis between those with OUD and those without OUD (Table 3). Of 0.53 million sexually active female patients aged 15–24 years, the overall percentage of chlamydia diagnoses was 2.07%. When stratified by OUD groups, 4.43% of female patients with OUD and 2.06% of female patients without OUD had chlamydia diagnoses ($P<0.05$) (data not shown).

Discussion

According to our study findings, among patients aged 15 to 44, the percentages of STI diagnoses were greater for males, females, and sexually active females with OUD diagnoses than for those without OUD diagnoses for the majority of STIs. Similar findings by Acheampong et al. indicate one or more STIs among persons reported using illicit drug or illicit drug plus prescription and noted illicit drug use with or without prescription opioid use exhibit increased risk for STIs.²¹ In the absence of additional information about potential comorbid conditions that result in increased visits creating more opportunities for STI testing, elevated STI testing and diagnoses among those with OUD diagnoses could follow from previous studies showing associations between illicit opioid use and prescription opioid misuse and sexual behavior.^{4,5,22} Increased rates of STI testing in persons diagnosed with OUD may suggest that persons with OUD are more likely to report behaviors that prompt testing or that providers that treat OUD are more comfortable with providing STI care.

The Department of Health and Human Services (HHS) recently set STI control and prevention targets for 2025 and 2030 through a national strategic plan. Through this effort, CDC plans to increase annual chlamydia screening among sexually active female patients 16–24 years old from the current rate of 58.8%, to 66.4% by the year 2025 and 76.5% by the end of year 2030.²³ Despite this, chlamydia testing was higher among patients 15–24 year old (55.67%) compared to national estimates for commercial health plans for chlamydia testing (47.2%–51.5%), a gold standard provided by the National Committee for Quality Assurance (NCQA)²⁰ for 2019. It is encouraging that these findings show those with OUD diagnoses codes are receiving higher percentages of STI testing. This may reflect awareness of associations between risk behavior for STIs or HIV and misuse of prescription opioids or use of illicit opioids^{4,5,22} or suggest better healthcare engagement, uptake of testing, provider perception or acceptability of risk in OUD group. Although differences in chlamydia testing among patients with or without OUD is statistically significant but may not be clinically meaningful, the testing pattern across all other STIs among OUD is similar suggesting OUD patients may be more likely to receive STI testing. Overall, the

percentages of STI testing were suboptimal in this study even among those with OUD codes and clinicians could consider increased attention to providing recommended STI screening services at recommended intervals to their patients (both with and without OUD diagnoses). A sexual risk assessment is an important component of providing optimal sexual health services to patients.¹¹ Healthcare providers may be able to better address patient needs by recognizing patients' exposure to multiple risk factors, including prescription opioid misuse and illicit opioid use by incorporating tools such as Screening, Brief Intervention, and Referral to Treatment (SBIRT) tool,²⁴ to assess for STI and risk for substance use disorder simultaneously and help facilitate timely treatment, linkage to care and use of effective interventions to prevent STI progression and evidence-based treatments for OUD including medications for opioid use disorder (MOUD).^{25, 26}

There are several limitations to our study. First, the MarketScan commercial claims database is comprised of patients, and their family members, who are privately insured through predominantly large employers; therefore, the data are not representative of the general US population. Second, only 0.34% of patients were identified as patients with OUD; patients with OUD or illicit drug use might be under-identified in the claims dataset. We were only able to identify patients with OUD who were in care for OUD. Third, STI/HIV diagnoses lacked confirmed positive laboratory results for the patients with or without OUD diagnosis codes. Additionally, higher testing among patients with OUD diagnoses codes may have contributed to the higher percentages of STI/HIV diagnosis, perhaps capturing asymptomatic infections among patients with OUD. Fourth, sexual behaviors that may place patients at higher STI risk are poorly recorded in administrative claims data. Therefore, the association between STI/HIV acquisition and these sexual behaviors cannot be examined in these data. Fifth, CDC recommends all persons aged 13–64 years get tested for HIV at least once and persons with risk factors such as persons with injection drug use get tested once a year.²⁷ Our study focused on reproductive age group 15–44 years. Despite increasing the upper age limit to 64 years, our sensitivity analysis didn't find significant variations in results except for HIV diagnosis which was highest among 25–29 years old population. Sixth, our data, as with all administrative claims data, are expected to have administrative errors, incomplete fields, inaccuracies, or missing data regarding patient substance use and opioid use disorders and sexual behavioral information.²⁶

Although CDC presently offers no specific guidelines for routine preventive services for STIs among patients with OUD diagnoses, providers could conduct appropriate sexual risk assessments, offer advice and recommended annual STI screening and integrate interventions that were discussed previously into care for their patients to reduce risk and prevent STI/HIV infections.^{24,28} Future studies can focus on alternative sources of data that capture patients with OUD diagnoses that also contain information related to patients' sexual behaviors, and STI-related laboratory results to assess potential risks for STIs and HIV among people with OUD.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Substance Abuse and Mental Health Services Administration. (2022). Key substance use and mental health indicators in the United States: Results from the 2021 National Survey on Drug Use and Health (HHS Publication No. PEP22–07-01–005, NSDUH Series H-57). Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. <https://www.samhsa.gov/data/report/2021-nsduh-annual-national-report>
2. Jones C, Clayton H, Deputy N, et al. Prescription Opioid Misuse and Use of Alcohol and Other Substances Among High School Students — Youth Risk Behavior Survey, United States, 2019. *MMWR Supplements* 2020;69:38–46. [PubMed: 32817608]
3. Clayton HB, Bohm MK, Lowry R, Ashley C, Ethier KA. Prescription Opioid Misuse Associated With Risk Behaviors Among Adolescents. *Am J Prev Med* 2019;57(4):533–539. [PubMed: 31443955]
4. Bhatia D, Mikulich-Gilbertson SK, Sakai JT. Prescription Opioid Misuse and Risky Adolescent Behavior. *Pediatrics* 2020;145(2).
5. Friedman SR, Mateu-Gelabert P, Ruggles KV, et al. Sexual Risk and Transmission Behaviors, Partnerships and Settings Among Young Adult Nonmedical Opioid Users in New York City. *AIDS Behav* 2017;21(4):994–1003. [PubMed: 28058567]
6. Abdallah I, Conserve D, Burgess TL, Adegbite AH, Oraka E. Correlates of HIV-related risk behaviors among self-identified heterosexual men who have sex with men (HMSM): national survey of family growth (2002, 2006–2010, and 2011–2017). *AIDS Care* 2020;32(12):1529–1537. [PubMed: 32024380]
7. Anderson JE, Mosher WD, Chandra A. Measuring HIV risk in the U.S. population aged 15–44: results from Cycle 6 of the National Survey of Family Growth. *Adv Data* 2006(377):1–27.
8. Minnesota Department of Health. Sexually transmitted and injection drug-related infections rose in Minnesota in 2016. News Release: Sexually transmitted and injection drug-related infections rose in Minnesota in 2016 (govdelivery.com).
9. Kidd SE, Grey JA, Torrone EA, Weinstock HS. Increased Methamphetamine, Injection Drug, and Heroin Use Among Women and Heterosexual Men with Primary and Secondary Syphilis - United States, 2013–2017. *MMWR Morb Mortal Wkly Rep* 2019;68(6):144–148. [PubMed: 30763294]
10. Drewes MR, Jones J, Christiansen EN, Wilson JP, Allen B, Sloan CD. Geospatial and Temporal Associations between Increases in Opioid Deaths, Socioeconomics, and Rates of Sexually Transmitted Infections in the Northeast United States 2012–2017. *Int J Environ Res Public Health* 2020;18(1).
11. LeFevre ML, Force USPST. Screening for Chlamydia and gonorrhea: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med* 2014;161(12):902–10. [PubMed: 25243785]
12. US Preventive Services Task Force. Screening for Syphilis Infection in Nonpregnant Adolescents and Adults: US Preventive Services Task Force Reaffirmation Recommendation Statement. *JAMA*. 2022;328(12):1243–1249. [PubMed: 36166020]
13. Workowski KA, Bachmann LH, Chan PA, et al. Sexually Transmitted Infections Treatment Guidelines, 2021. *MMWR Recomm Rep* 2021;70(4):1–187.
14. American Society of Addictive Medicine (2020) National Practice Guideline For the Treatment of Opioid Use Disorder 2020 Focused Update, Rockville, MD.
15. Tao G, Irwin KL. Receipt of HIV and STD testing services during routine general medical or gynecological examinations: variations by patient sexual risk behaviors. *Sex Transm Dis* 2008;35(2):167–71. [PubMed: 18090177]

16. Dunphy C, Zhang K, Guy GP, Jones CM. Naloxone dispensing among the commercially insured population in the United States from 2015 to 2018. *Preventive Medicine* 2021;153:106820. [PubMed: 34599923]
17. Abara WE, Hong J, Dorji T, et al. Association between trends in county-level opioid prescribing and reported rates of gonorrhea cases in the United States. *Ann Epidemiol* 2019;36:26–32. [PubMed: 31405718]
18. Hansen L. CS. White Paper - Health Research Data for the Real World: The MarketScan Databases. . Truven Health Analytics. (http://truvenhealth.com/portals/0/assets/PH_11238_0612_TEMP_MarketScan_WP_FINAL.pdf).
19. 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 2019. 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, 2019.
20. National Committee for Quality Assurance (NCQA). HEDIS 2022: Chlamydia Screening in Women. National Committee for Quality Assurance. (<https://www.ncqa.org/hedis/measures/chlamydia-screening-in-women/>).
21. Acheampong AB, Striley CW, Cottler LB. Prescription opioid use, illicit drug use, and sexually transmitted infections among participants from a community engagement program in North Central Florida. *J Subst Use* 2017;22(1):90–95. [PubMed: 29515331]
22. Mateu-Gelabert P, Guarino H, Jessell L, Teper A. Injection and sexual HIV/HCV risk behaviors associated with nonmedical use of prescription opioids among young adults in New York City. *J Subst Abuse Treat* 2015;48(1):13–20. (In eng). [PubMed: 25124258]
23. U.S. Department of Health and Human Services. 2020. Sexually Transmitted Infections National Strategic Plan for the United States: 2021–2025. Washington, DC.
24. Hargraves D, White C, Frederick R, et al. Implementing SBIRT (Screening, Brief Intervention and Referral to Treatment) in primary care: lessons learned from a multi-practice evaluation portfolio. *Public Health Reviews* 2017;38(1):31. [PubMed: 29450101]
25. Cuffe KM, Coor A, Hogben M, Pearson WS. Health Care Access and Service Use Among Behavioral Risk Factor Surveillance System Respondents Engaging in High-Risk Sexual Behaviors, 2016. *Sexually Transmitted Diseases* 2020;47(1) (https://journals.lww.com/stdjournal/Fulltext/2020/01000/Health_Care_Access_and_Service_Use_Among.13.aspx).
26. Dowell D, Ragan KR, Jones CM, Baldwin GT, Chou R. CDC Clinical Practice Guideline for Prescribing Opioids for Pain - United States, 2022. *MMWR Recomm Rep* 2022;71(3):1–95.
27. Centers for Disease Control and Prevention. (2022, June 9). HIV testing. Centers for Disease Control and Prevention. <https://www.cdc.gov/hiv/testing/index.html>
28. US Preventive Services Task Force. Screening for Unhealthy Drug Use: US Preventive Services Task Force Recommendation Statement. *JAMA*. 2020;323(22):2301–2309. [PubMed: 32515821]

Table 1

Demographic characteristics of OUD and Non-OUD patients aged 15–44 years, MarketScan Commercial Claims data 2019

	ALL		OUD		NON-OUD	
	Total	%	N	%	N	%
Total	7311339	100	24724	0.34	7286615	99.66
Sex *						
Male	3607497	49.34	14897	0.41	3592600	99.59
Female	3703842	50.66	9827	0.27	3694015	99.73
SA Female *(15–44 years)	1875118	25.65	6357	0.34	1868761	99.66
Age Group *						
15–19	1245061	17.03	831	0.07	1244230	99.93
20–24	1340116	18.33	4219	0.31	1335897	99.69
25–29	1049461	14.35	3819	0.36	1045642	99.64
30–34	1152817	15.77	4384	0.38	1148433	99.62
35–39	1255483	17.17	5766	0.46	1249717	99.54
40–44	1268401	17.35	5765	0.45	1262696	99.55
Region *						
Northeast	1095951	14.99	4167	0.38	1091784	99.62
North Central	1501626	20.54	4899	0.33	1496727	99.67
South	3433089	46.96	11836	0.34	3421253	99.66
West	1249041	17.08	3758	0.30	1245283	99.70
Unknown	31632	0.43	64	0.20	31568	99.80
MSA *						
Missing	677465	9.27	2692	0.40	674773	99.60
Rural/Non-MSA	765124	10.46	3474	0.45	761650	99.55
MSA/Urban	5868750	80.27	18558	0.32	5850192	99.68
Health Plan *						
Employer	5192784	71.02	16702	0.32	5176082	99.68
Health Plan	2118555	28.98	8022	0.38	2110533	99.62
Plan Type *						
HMO	781714	13.57	2507	0.32	779207	99.68
POS	519555	9.02	2542	0.49	517013	99.51
PPO	2841989	49.34	13456	0.48	2828533	99.52
CDHP	738696	12.82	2877	0.39	735819	99.61
HDHP	756644	13.14	2310	0.31	754334	99.69
Other	121222	2.1	772	0.64	120450	99.36
Missing	1551519		260		1551259	

^(*)Note: Variables indicated by are mutually exclusive and indicates P-value <0.001 considered to be statistically significant

SA Female- Sexually active female

OUD- Opioid Use Disorder

Non-OUD- Patients without OUD

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Table 2

STI/HIV testing among patients with OUD and without OUD codes among 15–44 years old by demographic characteristics, MarketScan Commercial Claims data 2019

			Received CT test				Received GC test				Received TP test		
	ODU	NON-ODU	ODU		NON-ODU		ODU		NON-ODU		ODU		
	Total	Total	n	% (CI%)	n	% (CI%)	n	% (CI%)	n	% (CI%)	n	% (CI%)	n
Total	24724	7286615	4156	16.81(16.35–17.28)	942416	12.93(12.91–12.96)	5516	22.31(21.79–22.83)	1210684	16.62(16.59–16.64)	3773	15.26(14.81–15.71)	5543
Sex													
Male Patients	14897	3592600	1590	10.67(10.18–11.18)	186813	5.20(5.18–5.22)	2059	13.82(13.27–14.39)	261559	7.28(7.25–7.31)	1993	13.38(12.84–13.94)	1463
Female Patients	9827	3694015	2566	26.11(25.25–26.99)	755603	20.45(20.41–20.50)	3457	35.18(34.23–36.13)	949125	25.69(25.65–25.74)	1780	18.11(17.36–18.89)	4080
Sexually Active Female Patients (15–44 years)	6357	1868761	2566	40.36(39.16–41.58)	755603	40.43(40.36–40.50)	3222	50.68(49.45–51.92)	879142	47.04(46.97–47.12)	1757	27.64(26.54–28.76)	4064
Age Group													
15–19	831	1244230	258	31.05(27.91–34.32)	114333	9.19(9.14–9.24)	312	37.55(34.24–40.94)	175337	14.09(14.03–14.15)	165	19.86(17.19–22.73)	276
20–24	4219	1335897	1335	31.64(30.24–33.07)	253658	18.99(18.92–19.05)	1533	36.34(34.88–37.81)	288100	21.57(21.50–21.64)	1203	28.51(27.15–29.90)	1007
25–29	3819	1045642	903	23.64(22.30–25.03)	189643	18.14(18.06–18.21)	1087	28.46(27.04–29.92)	223996	21.42(21.34–21.50)	819	21.45(20.15–22.78)	1209
30–34	4384	1148433	643	14.67(13.63–15.75)	171720	14.95(14.89–15.02)	858	19.57(18.41–20.78)	220084	19.16(19.09–19.24)	578	13.18(12.20–14.22)	1422
35–39	5766	1249717	567	9.83(9.08–10.63)	128472	10.28(10.23–10.33)	897	15.56(14.63–16.52)	176261	14.10(14.04–14.17)	561	9.73(8.98–10.52)	1038
40–44	5765	1262696	450	7.89(7.20–8.62)	84590	6.70(6.66–6.74)	829	14.53(13.63–15.47)	126906	10.05(10.00–10.10)	447	7.84(7.15–8.56)	587
Region													
Northeast	4167	1091784	766	18.38(17.22–19.59)	195573	17.91(17.84–17.99)	966	23.18(21.91–24.49)	239735	21.96(21.88–22.04)	717	17.21(16.07–18.39)	1111
North Central	4899	1496727	857	17.49(16.44–18.59)	173918	11.62(11.57–11.67)	1153	23.54(22.35–24.75)	233347	15.59(15.53–15.65)	682	13.92(12.96–14.92)	859
South	11836	3421253	1850	15.63(14.98–16.30)	427988	12.51(12.47–12.54)	2483	20.98(20.25–21.72)	550262	16.08(16.04–16.12)	1792	15.14(14.50–15.80)	2679
West	3758	1245283	675	17.96(16.75–19.23)	141591	11.37(11.31–11.43)	902	24.00(22.64–25.40)	183072	14.70(14.64–14.76)	576	15.33(14.19–16.52)	872
Unknown	64	31568	N/A		3346	10.60(10.26–10.94)	12	18.75(10.08–30.46)	4268	13.52(13.14–13.90)	N/A		20
MSA													
Missing	2692	674773	382	14.19(12.89–15.57)	70565	10.46(10.38–10.53)	526	19.54(18.06–21.09)	97253	14.41(14.33–14.50)	307	11.40(10.23–12.67)	384
Rural/ Non-MSA	3474	761650	456	13.13(12.02–14.29)	72488	9.52(9.45–9.58)	650	18.71(17.43–20.05)	99913	13.12(13.04–13.19)	407	11.72(10.66–12.83)	346

			Received CT test				Received GC test				Received TP		
	ODD	NON-ODD	ODD		NON-ODD		ODD		NON-ODD		ODD		
	Total	Total	n	% (CI%)	n	% (CI%)	n	% (CI%)	n	% (CI%)	n	% (CI%)	n
Urban/MSA	18558	5850192	3318	17.88(17.33–18.44)	799363	13.66(13.64–13.69)	4340	23.39(22.78–24.00)	1013518	17.32(17.29–17.36)	3059	16.48(15.95–17.03)	4812
Health Plan													
Employer	16702	5176082	2892	17.32(16.74–17.90)	665403	12.86(12.83–12.88)	3801	22.76(22.12–23.40)	851181	16.44(16.41–16.48)	2597	15.55(15.00–16.11)	3778
Health Plan	8022	2110533	1264	15.76(14.97–16.57)	277013	13.13(13.08–13.17)	1715	21.38(20.49–22.29)	359503	17.03(16.98–17.08)	1176	14.66(13.89–15.45)	1765
Plan Type													
HMO	2507	779207	129	16.71(14.14–19.53)	24979	20.74(20.51–20.97)	171	22.15(19.27–25.25)	30481	25.31(25.06–25.55)	122	15.80(13.30–18.57)	134
POS	2705	587920	411	16.39(14.96–17.90)	148912	19.11(19.02–19.20)	552	22.02(20.41–23.69)	184323	23.66(23.56–23.75)	369	14.72(13.35–16.17)	891
PPO	13293	2757626	501	18.52(17.07–20.04)	103839	17.66(17.56–17.76)	660	24.40(22.79–26.06)	134679	22.91(22.80–23.02)	494	18.26(16.82–19.77)	734
CDHP	2877	735819	2159	16.24(15.62–16.88)	426496	15.47(15.42–15.51)	2889	21.73(21.03–22.44)	556689	20.19(20.14–20.23)	1906	14.34(13.75–14.95)	2415
HDHP	2310	754334	485	16.86(15.51–18.28)	116552	15.84(15.76–15.92)	629	21.86(20.36–23.42)	148066	20.12(20.03–20.21)	444	15.43(14.13–16.81)	643
Other	772	120450	428	18.53(16.96–20.17)	111301	14.75(14.67–14.84)	562	24.33(22.59–26.13)	143051	18.96(18.88–19.05)	398	17.23(15.71–18.83)	648
Missing	260	1551259	43	16.54(12.23–21.62)	10337	0.67(0.65–0.68)	53	20.38(15.66–25.80)	13395	0.86(0.85–0.88)	40	15.38(11.22–20.35)	74

Note: “Bold” indicates statistically significant when comparison of confidence intervals between OUD and Non-ODD groups do not overlap

Abbreviations: OUD-with Opioid use disorders codes, Non-ODD- without opioid use disorder codes, CT- Chlamydia trachomatis, GC- Neisseria gonorrhoeae, TP- Treponema pallidum (syphilis), HIV- Human immunodeficiency virus, CI- Confidence interval, HMO-Health maintenance organization, POS-Point of service, PPO- Preferred provider organization, HDHP- High-deductible health plan, CDHP- Consumer driven health plan

Table 3

STI/HIV diagnosis among patients with OUD and without OUD codes among 15–44 years old by demographic characteristics, MarketScan Commercial Claims data 2019

			Received CT Diagnosis				Received GC Diagnosis				Received TP Diagnosis				
	ODU	NON-ODU	ODU		NON-ODU		ODU		NON-ODU		ODU		NON-ODU		
	Total	Total	n	% (CI%)	n	% (CI%)	n	% (CI%)	n	% (CI%)	n	% (CI%)	n	% (CI%)	n
Total	24724	7286615	198	0.80(0.69–0.92)	25367	0.35(0.34–0.35)	75	0.30(0.24–0.37)	7989	0.11(0.11–0.11)	57	0.23(0.17–0.30)	5379	0.07(0.07–0.08)	182
Sex															
Male Patients	14897	3592600	53	0.36(0.27–0.47)	6132	0.17(0.17–0.18)	30	0.20(0.14–0.29)	3651	0.10(0.10–0.10)	38	0.26(0.18–0.35)	3927	0.11(0.11–0.11)	134
Female Patients	9827	3694015	145	1.48(1.25–1.73)	19235	0.52(0.51–0.53)	45	0.46(0.33–0.61)	4338	0.12(0.11–0.12)	19	0.19(0.12–0.30)	1452	0.04(0.04–0.04)	48
Sexually Active Female Patients (15–44 years)	6357	1868761	139	2.19(1.84–2.58)	18842	1.01(0.99–1.02)	45	0.71(0.52–0.95)	4314	0.23(0.22–0.24)	19	0.30(0.18–0.47)	1444	0.08(0.07–0.08)	45
Age Group															
15–19	831	1244230	18	2.17(1.29–3.40)	4179	0.34(0.33–0.35)	N/A		998	0.08(0.08–0.09)	N/A		155	0.01(0.01–0.01)	
20–24	4219	1335897	75	1.78(1.40–2.22)	9912	0.74(0.73–0.76)	33	0.78(0.54–1.10)	2628	0.20(0.19–0.20)	24	0.57(0.36–0.85)	848	0.06(0.06–0.07)	36
25–29	3819	1045642	39	1.02(0.73–1.39)	4659	0.45(0.43–0.46)	18	0.47(0.28–0.74)	1674	0.16(0.15–0.17)	12	0.31(0.16–0.55)	1120	0.11(0.10–0.11)	39
30–34	4384	1148433	25	0.57(0.37–0.84)	2942	0.26(0.25–0.27)	N/A		1226	0.11(0.10–0.11)	N/A		1292	0.11(0.11–0.12)	36
35–39	5766	1249717	25	0.43(0.28–0.64)	2105	0.17(0.16–0.18)	N/A		866	0.07(0.06–0.07)	N/A		1055	0.08(0.08–0.09)	40
40–44	5765	1262696	16	0.28(0.16–0.46)	1570	0.12(0.12–0.13)	N/A		597	0.05(0.04–0.05)	N/A		909	0.07(0.07–0.08)	30
Region															
Northeast	4167	1091784	31	0.74(0.51–1.05)	4315	0.40(0.38–0.41)	18	0.43(0.26–0.68)	1596	0.15(0.14–0.15)	N/A		1096	0.10(0.09–0.11)	41
North Central	4899	1496727	37	0.76(0.53–1.04)	3965	0.26(0.26–0.27)	19	0.39(0.23–0.60)	1299	0.09(0.08–0.09)	N/A		560	0.04(0.03–0.04)	32
South	11836	3421253	101	0.85(0.70–1.04)	13313	0.39(0.38–0.40)	27	0.23(0.15–0.33)	4000	0.12(0.11–0.12)	35	0.30(0.21–0.41)	2939	0.09(0.08–0.09)	82
West	3758	1245283	29	0.77(0.52–1.11)	3661	0.29(0.28–0.30)	11	0.29(0.15–0.52)	1063	0.09(0.08–0.09)	N/A		745	0.06(0.06–0.06)	27
Unknown	64	31568	N/A		113	0.36(0.30–0.43)	N/A		31	0.10(0.07–0.14)	N/A		39	0.12(0.09–0.17)	
MSA															
Missing	2692	674773	16	0.59(0.34–0.96)	2151	0.32(0.31–0.33)	N/A		719	0.11(0.10–0.11)	N/A		508	0.08(0.07–0.08)	19
Rural/ Non-MSA	3474	761650	19	0.55(0.33–0.85)	2297	0.30(0.29–0.31)	N/A		558	0.07(0.07–0.08)	N/A		241	0.03(0.03–0.04)	22

			Received CT Diagnosis				Received GC Diagnosis				Received TP Diagnosis				
	ODD	NON-ODD	ODD		NON-ODD		ODD		NON-ODD		ODD		NON-ODD		
	Total	Total	n	% (CI%)	n	% (CI%)	n	% (CI%)	n	% (CI%)	n	% (CI%)	n	% (CI%)	n
Urban/MSA	18558	5850192	163	0.88(0.75–1.02)	20919	0.36(0.35–0.36)	63	0.34(0.26–0.43)	6712	0.11(0.11–0.12)	19	0.25(0.19–0.34)	4630	0.08(0.08–0.08)	141
Health Plan															
Employer	16702	5176082	139	0.83(0.70–0.98)	16716	0.32(0.32–0.33)	47	0.28(0.21–0.37)	5123	0.10(0.10–0.10)	36	0.22(0.15–0.30)	377817	0.06(0.06–0.07)	127
Health Plan	8022	2110533	59	0.74(0.56–0.95)	8651	0.41(0.40–0.42)	28	0.35(0.23–0.50)	2866	0.14(0.13–0.14)	21	0.26(0.16–0.40)	176544	0.10(0.09–0.10)	55
Plan Type															
HMO	2507	779207	N/A		691	0.57(0.53–0.62)	N/A		276	0.23(0.20–0.26)	N/A		148	0.12(0.10–0.14)	
POS	2705	587920	16	0.64(0.37–1.03)	3817	0.49(0.47–0.51)	N/A		1309	0.17(0.16–0.18)	N/A		762	0.10(0.09–0.10)	20
PPO	13293	2757626	28	1.04(0.69–1.49)	2956	0.50(0.48–0.52)	11	0.41(0.20–0.73)	974	0.17(0.16–0.18)	N/A		830	0.14(0.08–0.09)	23
CDHP	2877	735819	99	0.74(0.61–0.91)	11853	0.43(0.42–0.44)	37	0.28(0.20–0.38)	3615	0.13(0.13–0.14)	33	0.25(0.17–0.35)	2430	0.09(0.09–0.09)	95
HDHP	2310	754334	24	0.83(0.54–1.24)	3152	0.43(0.41–0.44)	N/A		957	0.13(0.12–0.14)	N/A		669	0.09(0.08–0.10)	18
Other	772	120450	25	1.08(0.70–1.59)	2601	0.34(0.33–0.36)	N/A		761	0.10(0.09–0.11)	N/A		479	0.06(0.06–0.07)	10
Missing	260	1551259	N/A		297	0.02(0.02–0.02)	N/A		97	0.01(0.01–0.01)	N/A		61	0.00(0.00–0.01)	

Note: “Bold” indicates statistically significant when comparison of confidence intervals between OUD and Non-ODD groups do not overlap

Abbreviations: OUD-with Opioid use disorders codes, Non-ODD- without opioid use disorder codes, CT- Chlamydia trachomatis, GC- Neisseria gonorrhoeae, TP- Treponema pallidum (syphilis), HIV- Human immunodeficiency virus, CI- Confidence interval, HMO-Health maintenance organization, POS-Point of service, PPO- Preferred provider organization, HDHP- High-deductible health plan, CDHP- Consumer driven health plan