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Drug Positivity, Co-Detection Patterns, and Demographic Predictors in Patients Seeking Substance Use Disorder Treatment, United States, 2023

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Abstract

Objective: To examine drug positivity, co-detection patterns, and demographic associations across 14 drug categories in patients seeking substance use disorder (SUD) treatment.

Methods: This cross-sectional study analyzed 2023 urine drug testing data from Quest Diagnostics. Included were patients aged ≥15 years with a valid first urine drug test result ordered by SUD treatment providers. Tests screened for 14 drug categories, including fentanyl, heroin (6-acetylmorphine only), prescription opioids, stimulants, benzodiazepines, and others. Outcomes included drug positivity, paired drug co-detection, and associations with age, sex, insurance type, and geographic region using multivariable logistic regression.

Results: Among 99,224 patients, most were aged 35−54 years (46.9%), male (62.6%), on Medicaid (48.2%) or private insurance (46.5%), and resided in the Northeast (56.3%). Buprenorphine (24.5%) and fentanyl (17.5%) had the highest positivity rates, with fentanyl frequently co-detected with other substances. Patients aged ≥25 years had higher odds of drug positivity (adjusted odds ratio [AOR] range: 1.3−9.8), except for fentanyl, methamphetamine, and amphetamine. Males had higher odds of fentanyl (AOR, 1.1) and cocaine (AOR, 1.1) positivity but lower odds for most other drugs. Medicaid beneficiaries had increased odds for multiple substances, including methadone (AOR, 3.4) and buprenorphine (AOR, 1.7), versus those with private insurance. Regional variation was notable, with higher odds for buprenorphine in the Midwest and South, but lower odds for methadone compared to the Northeast.

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Disclaimer: The findings and conclusions in this study are those of the authors and do not necessarily represent the official position of the U.S. Centers for Disease Control and Prevention.

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Conclusions: This study highlights variations in substance presence and co-detection across 14 drug categories in SUD treatment patients, underscoring the need for tailored prevention and treatment strategies.

Keywords

substance use disorder; polysubstance use; drug positivity; clinical drug testing

INTRODUCTION

Nonfatal and fatal drug overdose rates in the United States increased rapidly from 2018 to 2023 (Casillas et al., 2022; Holland et al., 2021), although both started to decline in late 2023 (Centers for Disease Control and Prevention, 2025; Pickens et al., 2025). This rise has coincided with increases in concomitant drug use−either simultaneous or sequential−and growing involvement of stimulants and synthetic opioids in fatal overdoses (Friedman and Shover, 2023; Kariisa et al., 2019). Evidence from 2020 also indicates a significant increase in the use of non-prescribed fentanyl, likely illegally manufactured fentanyl (IMF), especially in high-risk drug combinations, which may be fueling the increasing trends despite reduced clinical laboratory drug testing that limits the ability to detect such patterns (Niles et al., 2021).

Substance use disorder (SUD) treatment facilities are specialized healthcare settings that provide care and support for patients with SUD, with nearly 1.5 million admissions reported in 2022 (Substance Abuse and Mental Health Services Administration, 2024a). Urine drug testing (UDT) is commonly used in these settings due to its informative nature, cost, ease of sample collection, and ability to detect metabolites (Jarvis et al., 2017). UDT has proven clinically useful, especially with the emergence of new and synthetic derivatives, despite challenges in interpretation, such as detecting rapidly metabolized substances (Mahajan, 2017; Nafziger and Bertino, 2009; Whitley et al., 2022).

The complexity of substance use, particularly demographic and geographic variability, among patients at SUD treatment facilities has not been fully described for co-detection patterns. Previous studies on substance and polysubstance use may not fully reflect the complexity of current use patterns, particularly among SUD patients, due to the following limitations: 1) examining a limited range of substances (Compton et al., 2021; Schneider et al., 2019); 2) focusing primarily on fatal overdose data (Friedman and Shover, 2023; Schneider et al., 2021); 3) relying on self-reported survey data, which may introduce response bias, such as social desirability bias and recall bias (Compton et al., 2021; Fendrich et al., 2004; Schneider et al., 2021; Designing Surveys for Evaluations and Research, 2022); 4) not prioritizing SUD patients (Compton et al., 2021; Friedman and Shover, 2023); and 5) underutilizing urine drug testing data, which has shown to be valuable for both timely surveillance as well as providing both qualitative and quantitative results (Whitley et al., 2022).

To explore these aspects further, this cross-sectional study uses a large UDT database to examine drug positivity for commonly used substances, including medications for opioid use disorder (MOUD; buprenorphine and methadone), and combinations of multiple substances

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among patients from SUD treatment providers. Understanding populations at higher risk for overdose, particularly those who may use more than one drug at SUD treatment facilities, may help frame and evaluate appropriate treatment and prevention efforts.

METHODS

Data source and study sample

This cross-sectional study used de-identified UDT data from Quest Diagnostics. This activity was reviewed by U.S. Centers for Disease Control and Prevention (CDC), deemed research not involving human subjects, and was conducted consistent with applicable federal law and CDC policy. UDT was ordered by clinicians as part of routine care, focusing on substance use treatment providers. We analyzed specimens tested via presumptive immunoassay screens confirmed by liquid chromatography-tandem mass spectrometry (LC-MS/MS) or solely by LC-MS/MS, conducted from January 1 to December 31, 2023. LC-MS/MS provided definitive and quantitative drug and metabolite results.

This study included patients aged ≥15 years seeking or undergoing SUD treatment, defined as those who visited substance use treatment providers and underwent UDT. Specimens were excluded if they (1) lacked a patient identification number, (2) lacked age information, (3) had abnormal validity testing results with no drug positivity, or (4) were from patients aged <15 years. To ensure consistency and reduce potential bias from repeated testing or treatment-related drug use changes, only each patient's first specimen was included.

Outcomes

This study analyzed drug positivity, co-detection patterns, and associations between drug positivity and patient characteristics across 14 drug categories at the patient level. The analyzed drug categories included fentanyl, heroin (6-acetylmorphine [6-AM] only), codeine/morphine, hydrocodone/hydromorphone, oxycodone/oxymorphone, buprenorphine, methadone, other prescription opioids, amphetamine only, methamphetamine, cocaine, methylphenidate, gabapentin, and benzodiazepines. Supplemental Materials (Table S1) provide details on parent drugs and metabolites included in each category. A drug category was considered positive if any of its parent drugs or metabolites were detected on UDT. Prescription information was not available; therefore, detected substances could not be classified as prescribed versus nonmedical use.

Sample characteristics

We categorized age in groups based on the records at the time of the first specimen collection (15–24, 25–34, 35–54, and ≥55 years). Other covariates included sex (female and male), insurance type (Medicaid, Medicare, and private), and U.S. census region (Northeast, Midwest, South, and West).

Statistical Analysis

We analyzed the frequency distributions of patient characteristics. The proportion of drug positivity for each of the 14 drug categories was calculated as the number of patients who tested positive, divided by the total number of patients tested (positive or negative) for that

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specific drug. The 95% confidence intervals (CIs) for drug positivity were estimated using the Wilson binomial method (Brown et al., 2001).

To assess co-detection, we examined all pairwise combinations of the 14 drug categories (91 unique pairs) to identify instances where both drugs were detected in the same specimen. Network analysis (Victor et al., 2023), visualized the frequency of co-detections among categories. In the visualization, node size represents positivity frequency, with larger nodes indicating more frequent detections, while edge (line) thickness reflects the frequency of co-detections between connected nodes. The network was generated using the "igraph" package (https://cran.r-project.org/web/packages/igraph/index.html) in R statistical software (version 4.4.0, http://www.r-project.org/).

Associations between patient characteristics and drug positivity were examined using multivariable logistic regression to calculate adjusted odds ratio (AOR). All analyses, except for the network visualization, were conducted using SAS (version 9.4, SAS Institute Inc.) and Stata SE (version 18.0, StataCorp LLC).

RESULTS

This study included data from UDT specimens from 99,224 patients aged ≥15 years who were receiving or seeking SUD treatment in 2023. Most were aged 35−54 years (46.9%), followed by 25−34 years (27.7%), ≥55 years (15.0%), and 15−24 years (10.4%) (Table 1). The majority were male (62.6%) and resided in the Northeast (56.3%) and South (25.2%) census regions. Medicaid (48.2%) and private insurance (46.5%) were primary insurance types.

Drug positivity across 14 drug categories

The proportion of patients testing positive varied significantly across the 14 tested categories (Table 2). Buprenorphine had the highest positivity at 24.5% (95% CI, 24.2%–24.8%), followed by fentanyl (17.5%; 95% CI, 17.2%–17.7%), gabapentin (15.8%, 95% CI, 15.2%–16.3%), benzodiazepines (15.2%, 95% CI, 15.0%–15.5%), and cocaine (12.5%, 95% CI, 12.3%–12.7%). The least frequent substance detected was heroin (6-AM) at 0.03% (95% CI, 0.02%–0.04%).

Co-detected drug combinations

Table 3 presents the top ten co-detected drug combinations among 14 drug categories. The most common were buprenorphine and gabapentin (7.2%; 95% CI, 6.9%–7.6%), fentanyl with cocaine (6.9%; 95% CI, 6.7%–7.1%), fentanyl with methadone (5.7%; 95% CI, 5.5%–5.9%), and fentanyl with buprenorphine (4.5%; 95% CI, 4.3%–4.6%).

The network visualization illustrates polydrug combinations among 14 drug categories, highlighting 91 pairwise connections (Figure 1). Aligning with the leading combinations (Table 3), fentanyl and buprenorphine are central nodes with strong links to multiple substances. Gabapentin also appears as a prominent node, with notable connections to buprenorphine, benzodiazepines, fentanyl, cocaine, methamphetamine, and methadone.

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Association with patient characteristics

Associations of drug positivity with age, sex, insurance type, and US census region were observed across the 14 drug categories. Figure 2 displays AORs of drug positivity for 8 drug categories in the top 10 co-detected drug combinations, with full results in the Supplemental Materials (Table S4). Compared with patients aged 15–24 years, older patients generally had higher odds of drug positivity (AOR range: 1.3–9.8), except for fentanyl (AOR, 0.8; 95% CI, 0.7–0.84), methamphetamine (AOR, 0.7; 95% CI, 0.6–0.8), and amphetamine only (AOR 0.8; 95% CI, 0.6– 0.9), where those aged ≥55 years had lower odds. Notably, substantially higher AORs (i.e., >3.0) were observed for methadone (AORs: 3.9, 5.9, and 8.7, respectively) and hydrocodone/hydromorphone (AORs: 3.1, 4.3, and 8.8) across the older age groups (25–34, 35–54, and ≥55 years), with AORs increasing with age.

Sex differences showed that males had slightly higher odds of testing positive for fentanyl (AOR, 1.1; 95% CI, 1.0–1.1) and cocaine (AOR, 1.1; 95% CI, 1.1–1.2) compared to females. However, males had lower odds for other substances, including methadone (AOR, 0.9; 95% CI, 0.8–0.9), buprenorphine (AOR, 0.8; 95% CI, 0.8–0.8), benzodiazepines (AOR, 0.8; 95% CI, 0.8–0.8), oxycodone/oxymorphone (AOR, 0.8; 95% CI, 0.7–0.9), hydrocodone/hydromorphone (AOR, 0.6; 95% CI, 0.6–0.7), gabapentin (AOR, 0.6; 95% CI, 0.6–0.7), and amphetamine only (AOR, 0.5; 95% CI, 0.5–0.6).

Compared to privately insured, Medicaid beneficiaries had higher odds of positivity for buprenorphine (AOR, 1.7; 95% CI, 1.7−1.8), fentanyl (AOR, 1.5; 95% CI, 1.4−1.5), gabapentin (AOR, 1.2; 95% CI, 1.1−1.3), cocaine (AOR, 1.2; 95% CI, 1.2−1.3), methadone (AOR, 3.4; 95% CI, 3.2−3.6), methamphetamine (AOR, 1.3; 95% CI, 1.3−1.4), and codeine/morphine (AOR, 1.2; 95% CI, 1.1−1.3). Medicare beneficiaries had higher odds for buprenorphine (AOR, 1.8; 95% CI 1.7−2.0), gabapentin (AOR, 1.9; 95% CI 1.6−2.3), methadone (AOR, 2.5; 95% CI 2.3−2.8), methamphetamine (AOR, 1.3; 95% CI 1.1−1.4), oxycodone/oxymorphone (AOR, 1.7; 95% CI 1.5−2.0), and hydrocodone/hydromorphone (AOR, 1.5; 95% CI 1.3−1.8) than those privately insured.

Drug positivity varied significantly by region and substance. The Midwest and South had higher odds of positivity for buprenorphine (AOR, 2.0; 95% CI, 2.0−2.1 and 2.7; 95% CI, 2.5−2.8, respectively), fentanyl (AOR, 1.6; 95% CI, 1.6−1.7 and 1.4; 95% CI, 1.3−1.5), methamphetamine (AOR, 4.8; 95% CI, 4.5−5.2 and 4.7; 95% CI, 4.4−5.0), and codeine/morphine (AOR, 1.4; 95% CI, 1.2−1.5 and 1.6; 95% CI, 1.5−1.7) compared to the Northeast, but lower odds for methadone (AOR, 0.6; 95% CI, 0.5−0.6 and 0.5; 95% CI, 0.5−0.5). The West had higher odds for gabapentin (AOR, 2.7; 95% CI, 1.8−4.0), benzodiazepines (AOR, 1.6; 95% CI, 1.5−1.8), and methamphetamine (AOR, 4.5; 95% CI, 4.1−5.0) compared to the Northeast, but lower odds for buprenorphine (AOR, 0.8; 95% CI, 0.7−0.9), cocaine (AOR, 0.5; 95% CI, 0.5−0.6), and methadone (AOR, 0.1; 95% CI, 0.1−0.2).

DISCUSSION

This study provides a comprehensive analysis of drug positivity patterns among patients seeking or receiving SUD treatment, highlighting significant variability across substances and patient characteristics. Buprenorphine had the highest positivity rate, which may be

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attributable to treatment for SUD in this study population, followed by fentanyl, often co-detected with other substances. Adults aged ≥25 years had higher odds of positivity, with males more likely to test positive for fentanyl and cocaine but having lower odds for other drugs. Medicaid beneficiaries had higher odds of testing positive for fentanyl, cocaine, methamphetamine, and MOUD compared to those privately insured. These results underscore the complexity of substance use among people seeking treatment for SUD and the need for tailored interventions for those with polysubstance use.

Buprenorphine had the highest drug positivity rate among SUD patients, more than double that of methadone. In this treatment-seeking population, detection of buprenorphine may reflect prescribed, therapeutic use rather than nonmedical use. Buprenorphine was also frequently co-detected with other substances, which should be interpreted cautiously in the context of ongoing care within a SUD treatment setting. Higher detection of buprenorphine may be attributable, in part, to greater accessibility, a more favorable overdose risk profile, and the availability of office-based prescribing compared with methadone, which has traditionally required frequent in-person dosing at federally certified programs, although these requirements were relaxed during the COVID-19 pandemic (Substance Abuse and Mental Health Services Administration, 2024b; Levander et al., 2022). Policy changes, including the relaxation of the Drug Addiction Treatment Act of 2000 waiver (X-Waiver) in 2021 (Federal Register, 2021) and its elimination in 2022 (CONGRESS.GOV, 2022), may have contributed to broader availability of buprenorphine by expanding the number of clinicians permitted to prescribe it, though it may not be sufficient to substantially expand buprenorphine prescribing (U.S. Department of Health and Human Services, 2022; Guy et al., 2025; Luo and Erikson, 2023)

Given that buprenorphine's detection window in urine drug tests is approximately 3–4 days (Substance Abuse and Mental Health Services Administration, 2021Substance Abuse and Mental Health Services Administration), its presence may indicate active use, reflecting either adherence to SUD treatment—expected in this patient population—or, less likely, potential misuse. It may also signal the need to assess increased overdose risk from concurrent use with substances causing respiratory depression (Dowell et al., 2022). Conversely, buprenorphine-negative test results could suggest nonadherence, absence of concurrent use, or potential diversion, particularly if prescribed by a clinician. Our findings of a 24.5% positivity rate should be interpreted in a patient-centered approach, considering clinical circumstances and treatment engagement.

Fentanyl was the second most common substance detected and appeared in seven of the top ten co-detected combinations. Cocaine was the most common co-detected substance with fentanyl, followed by MOUD and methamphetamine. The co-detection of MOUD may reflect SUD treatment. High fentanyl positivity alongside cocaine and methamphetamine aligns with rising nonfatal and fatal fentanyl overdoses in the United States. Nonfatal fentanyl-related hospital visits increased from 2021 through 2023 (Centers for Disease Control and Prevention, 2024a), and nearly seven in ten drug overdose deaths in 2023 involved IMFs (Tanz et al., 2024), frequently combined with cocaine and methamphetamine (Centers for Disease Control and Prevention, 2024b). Recent findings further support this trend, showing increased concentrations of fentanyl, cocaine, and methamphetamine in

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urine specimens from 2013 to 2023 (Huhn et al., 2024). The frequent co-detection of cocaine may also reflect regional patterns, as 56% of patients in this analysis were from the Northeast, where cocaine exhibits the highest detection rate, in contrast to other regions where methamphetamine predominates (U.S. Drug Enforcement Administration, 2023). Fentanyl's growing prevalence over the past decade (Palamar et al., 2024; Spencer et al., 2019), its introduction as an adulterant in the illegal market, and its frequent mixing with other substances (McKnight et al., 2023) have likely contributed to its widespread impact. Moreover, limited studies suggest some users are unaware of their exposure to fentanyl (Magura et al., 2024; McKnight et al., 2023), which may help explain the high co-detection rates observed in this study. This underscores the need for enhanced risk reduction strategies, including education and access to drug checking services.

Our findings on polysubstance patterns highlight several notable combinations that may reflect concurrent prescribing practices or complex clinical management. Excluding fentanyl, the most frequently observed combinations were buprenorphine with gabapentin, buprenorphine with benzodiazepines, and gabapentin with benzodiazepines. The frequent detection of gabapentin may be related to substantial increases in its use in the U.S. and globally in recent decades (Chan et al., 2023). From 2009 to 2016, gabapentin use nearly doubled among commercially insured U.S. adults (Pauly et al., 2020), and gabapentinoid prescribing from EDs increased by 504% from 2012 to 2021(Ramdin et al., 2024). Gabapentin is often prescribed alongside other medications, with 96.4% of visits involving concomitant prescriptions, including 58.4% with central nervous system (CNS) depressants and high off-label use for psychiatric indications (Table S5 in the Supplemental Materials) (Costales and Goodin, 2021). The concurrent use of gabapentin with CNS depressants and opioids poses a risk of respiratory depression, particularly in elderly patients, emphasizing the need for careful monitoring by clinicians (Costales and Goodin, 2021; Gomes et al., 2017).

This study reveals significant variability in drug positivity across patient age and sex, insurance type, and geographic regions, consistent with and expanding upon prior research. Adults (≥25 years) had higher odds of testing positive for most substances, including MOUD, than young people (15–24 years), likely correlating with higher nonfatal and fatal overdoses in middle-aged populations and increased exposure to medications like opioids for chronic pain management (Centers for Disease Control and Prevention, 2024a; Centers for Disease Control and Prevention, 2024b). It may also reflect higher rates of MOUD treatment retention among older adults relative to younger patients (Carew and Comiskey, 2018; Rajaratnam et al., 2009). Meanwhile, patients aged 55 or older had lower odds of drug positivity for fentanyl and methamphetamine, possibly due to less exposure to illicit drug markets and generational differences in drug use and risk-taking behaviors (The Recovery Village, 2024). Sex differences showed that males had slightly higher odds of testing positive for fentanyl and cocaine, while females were more likely to test positive for buprenorphine, gabapentin, and benzodiazepines. These patterns align with CDC data on nonfatal overdose ED visits for fentanyl, cocaine, and benzodiazepines (Centers for Disease Control and Prevention, 2024a).

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Differences in drug positivity by insurance type may reflect socioeconomic influences, with Medicaid beneficiaries having higher odds of positivity for fentanyl, cocaine, methamphetamine, and MOUD than those with private insurance, possibly indicating a disproportionate impact on patients with lower socioeconomic status (Centers for Disease Control and Prevention, 2024a; Amaro et al., 2021). Regional variations in methamphetamine use, with higher odds in the Midwest, South, and West, align with previous studies identifying these regions as hotspots for methamphetamine availability and use (Jones et al., 2022; Prohaska and Machado, 2021). However, estimates for the West should be interpreted cautiously, as this region represents only a small proportion of our study sample (6%). Conversely, the Northeast had higher odds of methadone positivity but lower odds of buprenorphine, possibly due to a higher concentration of opioid treatment programs and a greater proportion of patients having methadone per capita compared to other regions (Furst et al., 2022).

LIMITATIONS

This study has several limitations. First, findings may not generalize beyond patients seeking SUD treatment in this network, as results may differ across settings, depend on provider practices, have limited geographic generalizability, and may not adequately represent uninsured patients. Second, interpretation of UDT results is constrained by incomplete contextual information in the Quest dataset, including clinicians' management strategies, patients' treatment history, and UDT scheduling. Because tests were collected without consistent details on timing, treatment phase, or prescription status, the sample likely represents a heterogeneous mix of individuals entering, continuing, or stabilizing in treatment. The lack of prescription data (e.g., for MOUD or gabapentin) limits our ability to distinguish therapeutic use from nonmedical use; however, in this SUD treatment setting, detection of MOUD may represent prescribed treatment rather than nonmedical use. In addition, because testing is not random – such as being conducted at intake or in response to suspected use – positivity rates may be biased upward. Third, detection windows vary by substance; while most drugs are detectable for 1–2 days, others like methadone, buprenorphine, and cocaine may persist longer (Substance Abuse and Mental Health Services Administration, 2021). Consequently, the timing of drug use may affect results, and the presence of multiple substances in a single test does not necessarily indicate concurrent use. Therefore, inferences regarding co-detection should be interpreted with caution, although positive results generally reflect recent use. Fourth, drug metabolism complicates interpretation. Codeine and morphine were grouped, as morphine can result from codeine, heroin, or morphine use, and codeine may stem from prescriptions or heroin (Dasgupta, 2020; Lotsch, 2005). Heroin was identified by 6-AM, its unique intermediate metabolite, but due to rapid metabolism (Dasgupta, 2020), some heroin use may have been missed. Lastly, testing frequency varied by substance and patient, with drugs like gabapentin tested far less often than fentanyl. While testing panels appeared generally comparable across demographic groups, differences at the patient level may still bias detection rates due to limited testing for certain substances.

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CONCLUSIONS

This study provides valuable insights into drug positivity patterns among patients seeking or undergoing SUD treatment. The findings highlight substantial variability across substances, patient characteristics, and regions, reflecting the complexity of substance use in this population. These results expand the understanding of demographic and geographic variability in detected substances, underscoring the need for tailored public health strategies to effectively address the multifactorial nature of drug exposure and its associated risks. For clinicians, interpretation of UDT findings may benefit from a patient-centered approach, as results may reflect diverse scenarios, including medication adherence; co-detection related to treatment of comorbid conditions; inadequate treatment dosing or possible relapse when MOUDs are detected in combination with another opioid; off-label use outside of the standard of care; or other nonmedical exposure. While these findings offer meaningful insight into substances detected among individuals engaged in SUD treatment, they should be interpreted in light of the aforementioned limitations. The results are best viewed as descriptive of testing outcomes within treatment settings rather than as estimates of broader drug use prevalence or co-detection behavior. As this study focused on the co-detection of two substances, future research may explore polydrug use involving more than two substances and include longitudinal assessments to better understand the causal pathways underlying observed patterns and assess the effectiveness of interventions in improving patient outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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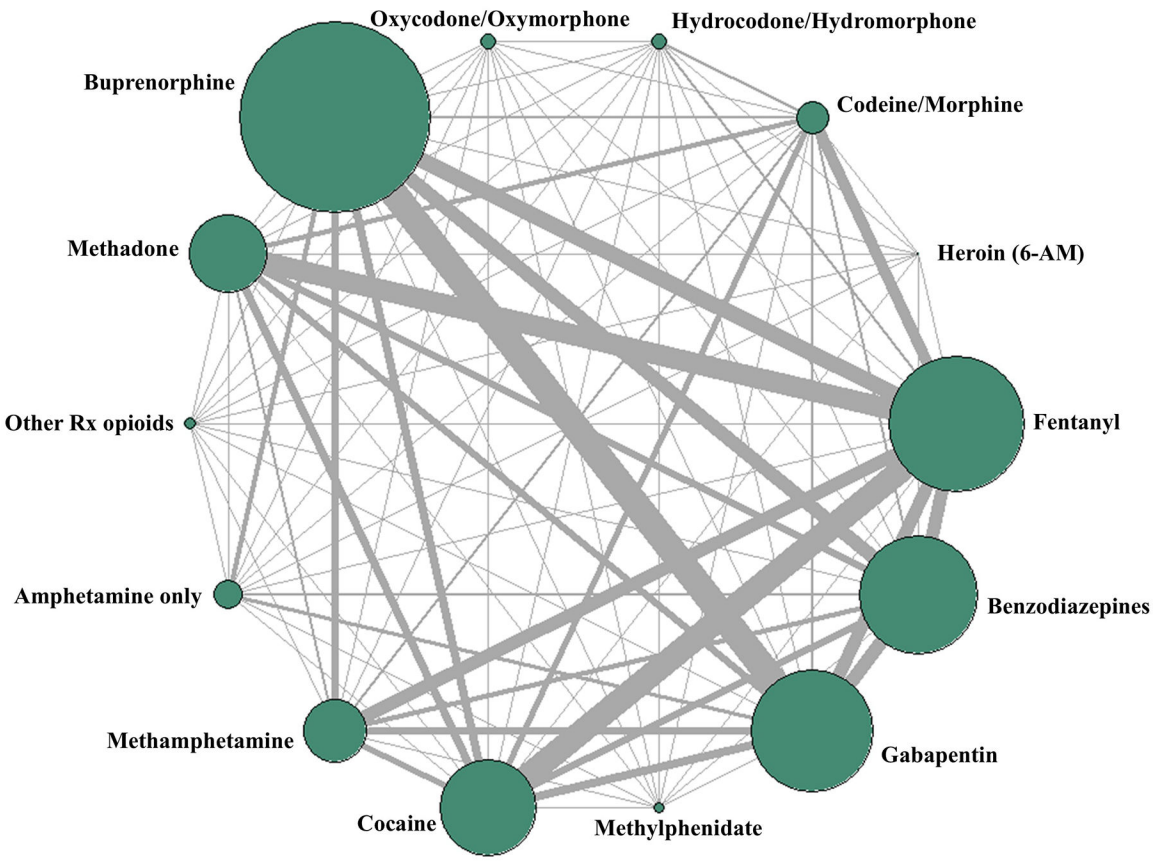


Figure 1. Drug positivity and co-detection across 14 drug categories among patients visiting substance use treatment specialists, 2023 Quest Diagnostics urine drug testing data

6-AM, 6-acetylmorphine; Rx, prescription.

Other Rx opioids include meperidine, tapentadol, tramadol, and propoxyphene; Methamphetamine (includes methamphetamine and amphetamine, or methamphetamine only).

A larger node indicates a higher proportion of patients testing positive for that drug, calculated based on the number of patients tested for each drug, which varied by drug. Note that fewer tests were ordered and conducted for drugs such as gabapentin, other Rx opioids, and methylphenidate compared to other drugs (Supplemental Materials, Table S2). Buprenorphine was the most frequently detected substance (25%), followed by fentanyl (18%), gabapentin (16%), benzodiazepines (15%), cocaine (13%), methadone (10%), methamphetamine (8%), codeine/morphine (4%), amphetamine only (4%), oxycodone/oxymorphone (2%), hydrocodone/hydromorphone (2%), other Rx opioids (2%), methylphenidate (1%), and 6-AM (0.03%).

A thicker line indicates a higher frequency of co-presence of paired substances. The ten most prevalent combinations were buprenorphine and gabapentin (7.2%), fentanyl and cocaine (6.9%), fentanyl and methadone (5.7%), fentanyl and buprenorphine (4.5%), buprenorphine and benzodiazepines (3.9%), fentanyl and methamphetamine (3.9%), gabapentin and benzodiazepines (3.8%), fentanyl and benzodiazepines (3.8%), fentanyl and gabapentin (3.7%), fentanyl and codeine/morphine (3.4%).

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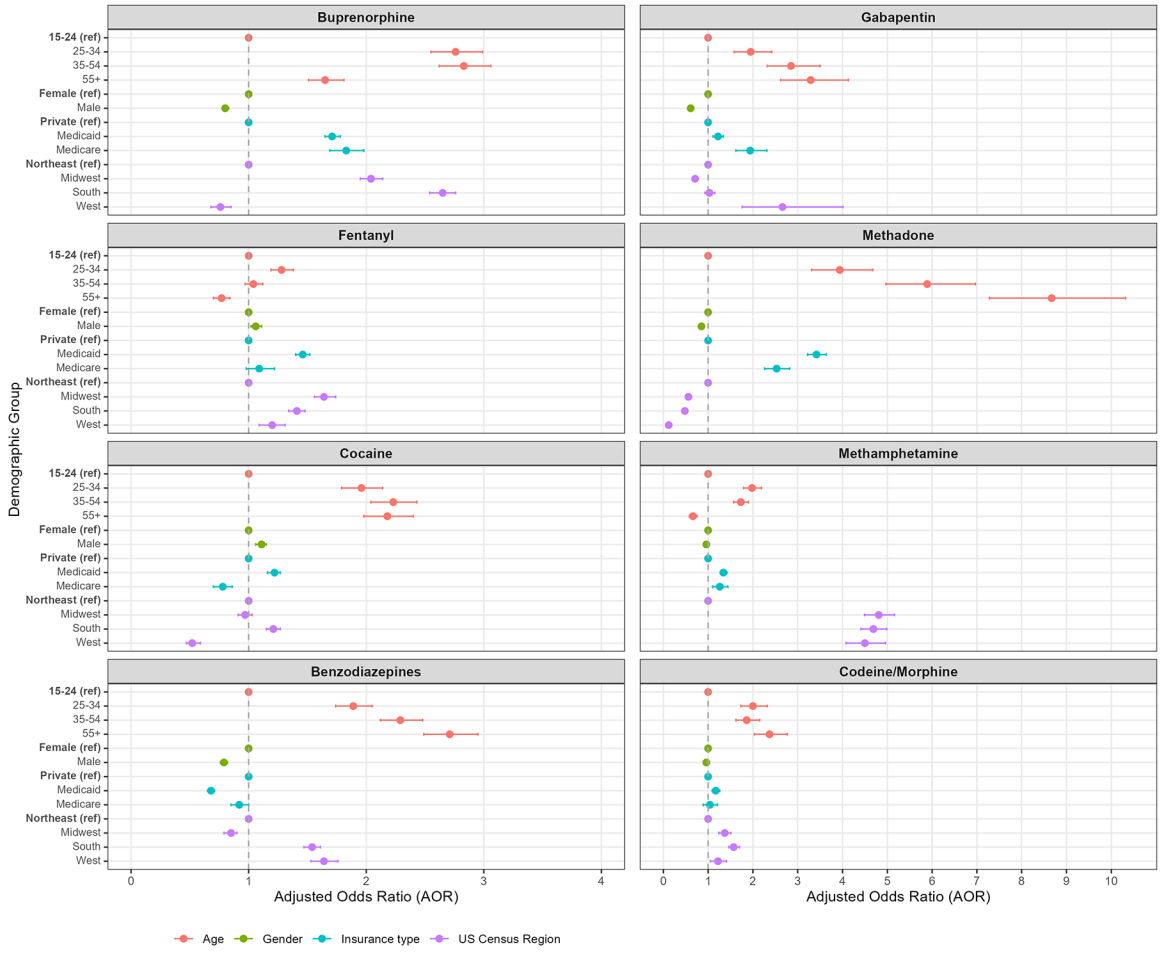


Figure 2. Adjusted odds ratios for test positivity in the top 8 detected drug categories among patients visiting substance use treatment specialists, 2023 Quest Diagnostics urine drug testing data

Horizontal lines represent 95% confidence intervals.

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Table 1.

Characteristics of patients visiting substance use treatment specialists, 2023 Quest Diagnostics urine drug testing data

Characteristics	N	%	95% CI
Patient age, years			
15–24	10,335	10.4	[10.2, 10.6]
25–34	27,494	27.7	[27.4, 28.0]
35–54	46,550	46.9	[46.6, 47.2]
≥55	14,845	15.0	[14.7, 15.2]
Patient sex [a]			
Female	36,531	37.4	[37.1, 37.7]
Male	61,139	62.6	[62.3, 62.9]
Insurance type [a]			
Medicaid	47,693	48.2	[47.9, 48.5]
Medicare	5,216	5.3	[5.1, 5.4]
Private	46,027	46.5	[46.2, 46.8]
U.S. Census region [a]			
Northeast	55,805	56.3	[56.0, 56.6]
Midwest	12,413	12.5	[12.3, 12.7]
South	24,957	25.2	[24.9, 25.4]
West	6,000	6.0	[5.9, 6.2]

CI, confidence interval

[a]Patients with unknown or missing information on sex (1.6%), insurance type (0.3%), and U.S. Census region (0.05%) are not included in this table.

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Table 2.

Proportion of patients testing positive across 14 drug categories among patients visiting substance use treatment specialists, 2023 Quest Diagnostics urine drug testing data

Drug categories	Patients testing positive		
	N	%[d]	95% CI
Buprenorphine	19,385	24.5	[24.2, 24.8]
Fentanyl	13,019	17.5	[17.2, 17.7]
Gabapentin	2,896	15.8	[15.2, 16.3]
Benzodiazepines[a]	14,180	15.2	[15.0, 15.5]
Cocaine	11,599	12.5	[12.3, 12.7]
Methadone	7,687	10.0	[9.8, 10.3]
Methamphetamine[b]	7,521	8.2	[8.0, 8.3]
Codeine/Morphine	3,959	4.3	[4.1, 4.4]
Amphetamine only	3,375	3.7	[3.5, 3.8]
Oxycodone/Oxymorphone	1,824	2.0	[1.9, 2.1]
Hydrocodone/Hydromorphone	1,823	2.0	[1.9, 2.1]
Other prescription opioids[c]	252	1.5	[1.3, 1.7]
Methylphenidate	102	1.4	[1.1, 1.6]
Heroin (6-AM)	22	<0.1	[0.02, 0.04]

CI, confidence interval; 6-AM, 6-acetylmorphine

[a]Benzodiazepines include alprazolam, midazolam, triazolam, clonazepam, flurazepam, lorazepam, nordiazepam, oxazepam, and temazepam.

[b]Methamphetamine includes methamphetamine and amphetamine, or methamphetamine only.

[c]Other prescription opioids include meperidine, tapentadol, tramadol, and propoxyphene.

[d]Drug positivity rates are based on the number of patients tested for each drug, which varies; test counts by drug category are provided in the Supplemental Materials (Table S2). Note that tests for gabapentin, other prescription opioids, and methylphenidate were ordered less frequently than others.

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Table 3.

Top ten co-detected drug combinations across 14 drug categories among patients visiting substance use treatment specialists, 2023 Quest Diagnostics urine drug testing data

Drug combinations	Patients testing positive		
	N	%[c]	95% CI
Buprenorphine and Gabapentin	1,282	7.2	[6.9, 7.6]
Fentanyl and Cocaine	4,972	6.9	[6.7, 7.1]
Fentanyl and Methadone	3,602	5.7	[5.5, 5.9]
Fentanyl and Buprenorphine	2,986	4.5	[4.3, 4.6]
Buprenorphine and Benzodiazepines[a]	3,005	3.9	[3.8, 4.0]
Fentanyl and Methamphetamine[b]	2,784	3.9	[3.8, 4.0]
Gabapentin and Benzodiazepines[a]	665	3.8	[3.5, 4.1]
Fentanyl and Benzodiazepines[a]	2,708	3.8	[3.6, 3.9]
Fentanyl and Gabapentin	650	3.7	[3.4, 3.9]
Fentanyl and Codeine/Morphine	2,464	3.4	[3.3, 3.6]

CI, confidence interval

[a]Benzodiazepines include alprazolam, midazolam, triazolam, clonazepam, flurazepam, lorazepam, nordiazepam, oxazepam, and temazepam.

[b]Methamphetamine includes methamphetamine and amphetamine, or methamphetamine only.

[c]Drug positivity rates are based on the number of patients tested for each drug, which varies; test counts by drug category are provided in the Supplemental Materials (Table S2). Note that tests for gabapentin, other prescription opioids, and methylphenidate were ordered less frequently than others.