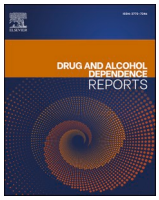
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Short communication

Xylazine prevalence and concentration in the Los Angeles fentanyl market, 2023–2025

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HIGHLIGHTS

- Xylazine has arrived to West Coast fentanyl markets.
- Among illicit fentanyl samples in LA, xylazine positivity increased significantly.
- Xylazine concentration was low, with a highly skewed distribution.
- The average participant may be exposed to a clinically meaningful dose of xylazine.
- Xylazine positive samples contained a significantly lower concentration of fentanyl.

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ABSTRACT

Background: The veterinary sedative xylazine has been mostly described on the East Coast—yet early reports indicate that it is now arriving to West Coast fentanyl markets. Emerging drug checking approaches can provide information about the concentration and prevalence of xylazine in illicit fentanyl.
Methods: Fentanyl samples from a community-based drug checking program in Los Angeles, California were assessed using direct analysis in real time mass spectrometry (DART-MS). A subset was analyzed with liquid chromatography-mass spectrometry (LC-MS) to quantify the concentration of xylazine, fentanyl, and other compounds.
Results: Among n = 536 fentanyl-positive samples, n = 103 were xylazine-positive, and n = 78 had quantitative results available. Xylazine positivity rose from 0 % in 2023 quarter 1 to a peak of 29.5 % in 2025 quarter 1. A significant time trend was observed (OR per quarter year= 1.35 [95 %CI: 1.19–1.52]). Xylazine concentration in fentanyl samples was generally low, with a highly skewed distribution (mean=2.42 %, sd=7.80 %). 76.9 % of xylazine-positive samples had <1.0 % xylazine concentration. Compared to xylazine-negative samples, xylazine-positive samples were more likely to contain bis(2,2,6,6-tetramethyl-4-piperidyl) sebacate (BTMPS) [46.60 % vs 17.30 %], and lidocaine (65.0 % vs 29.6 %), and had lower average fentanyl concentration (6.12 % vs 10.7 %).
Conclusions: We note increasing xylazine positivity among samples of illicit fentanyl in Los Angeles, California. The distribution of xylazine concentration is highly skewed, with a small number of very high concentration samples, and majority with <1 %. Nevertheless, more research is needed to study the health impacts of even the low concentration xylazine that is most predominant here; the average participant may still be exposed to a physiologically significant dose of xylazine.

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1. Background

The rise of the veterinary sedative xylazine as a fentanyl additive has been linked to more complicated overdose response, worsening soft tissue infections, and other health risks for people who use drugs (Bufanda et al., 2025; Cano et al., 2024; Friedman et al., 2022; Jawa et al., 2024). Consequently, in 2023 xylazine was identified as an emerging threat by the Biden Administration in the United States, and it has been the focus of a growing body of literature (Gupta et al., 2023; Zagorski et al., 2023).

Xylazine as an illicit drug supply adulterant has been mostly studied—and has been most prevalent—on the East Coast, yet early reports indicate that it is now spreading across the country, and arriving to West Coast fentanyl markets (Bufanda et al., 2025; Friedman, 2025). Xylazine has mostly been characterized in terms of binary presence/absence, either among overdose autopsy toxicology (Cano et al., 2024; Friedman, 2025) or via xylazine testing strips on urine or drug samples (Bowles et al., 2021; Copeland et al., 2024; Hauschild et al., 2023). However, there is great potential value in quantifying the percent concentration of xylazine in illicit fentanyl samples, for improved estimation of exposure among people who use drugs. This is now possible with emerging drug checking approaches. Here we describe both the qualitative prevalence, and quantitative percent concentration, of xylazine among illicit fentanyl samples from a community-based drug checking program in Los Angeles, CA from the first quarter (Q1) 2023 to the second quarter (Q2) of 2025.

2. Methods

Samples of drug product were provided anonymously by clients seeking services at a community-based drug checking program in Los Angeles, California. Samples were sent to the National Institute of Standards and Technology (NIST) for laboratory-based qualitative testing using direct analysis in real time mass spectrometry (DART-MS). A subset also underwent quantitative analysis with liquid-chromatography mass spectrometry (LC-MS).

The laboratory methodologies employed here have been previously described (Appley et al., 2023; Sisco et al., 2017). Briefly, DART-MS spectra were analyzed against libraries of over 1300 substances, including pharmaceutical and illicit drugs, adulterants, cutting and bulking agents, precursor chemicals, and other substances (e.g., adhesives, food products, etc.). The LC-MS quantification panel included xylazine, fentanyl, fentanyl precursor chemicals, other illicit drugs, and common adulterants. The limitation of quantification in the LC-MS panel was about 0.1 %, and samples below this threshold were imputed at 0.1 % (Shover et al., 2025). The limit of detection was approximately 0.1 % for DART-MS (Sisco et al., 2017). LC-MS testing is generally considered to be a “gold standard” for paraphernalia testing, with extremely high sensitivity and specificity. The precision of quantification can be generally considered to fall within 20 % of the measured value; therefore, the standard error around an estimated xylazine concentration of 1 % would be 0.8–1.2 %.

During the study period (2023 Q1–2025 Q2) a total of n = 1645 samples were brought for assessment by participants. Of these, n = 1453 were sent to NIST for confirmatory testing (all samples for which clients accepted confirmatory studies, the remainder represent clients only interested in point-of-care testing). A total of n = 536 samples tested positive for fentanyl on DART-MS and were therefore considered as part of the universe of samples for the present study. Of these, n = 311 were also sent for LC-MS testing.

Among fentanyl-positive samples, bivariate logistic regression analysis was used to assess the statistical significance of the xylazine-positivity time trend observed during the study period. Separate bivariate logistic regressions were also employed to assess the relationship between xylazine positivity (predictor) and the presence/absence of bis (2,2,6,6-tetramethyl-4-piperidyl) sebacate (BTMPS), heroin, methamphetamine, cocaine, and lidocaine (one regression per outcome variable). Differences in average fentanyl concentration between xylazine positive and negative samples were assessed using a bivariate quasi-Poisson regression, with fentanyl concentration as the outcome variable, and xylazine presence as the predictor. The UCLA Institutional Review Board reviewed and approved this project (protocol IRB-22–0760) and additionally determined that aspects of this work constituted public health surveillance and not human subjects research.

3. Results

Among a total of n = 536 fentanyl-positive samples analyzed between 2023 Q1–2025 Q2, most samples were expected to be opioids by program participants. N = 436 were expected to be fentanyl, n = 48 heroin, n = 7 other opioids, n = 4 cocaine, n = 2 MDMA, n = 2 benzodiazepines, and n = 1 2C-B. N = 36 had missing or ‘unknown’ drug expectation.

Xylazine positivity rose from 0 % of n = 17 samples in 2023 Q1 to a peak of 29.5 % of n = 78 samples in 2025 Q1, before declining slightly in 2025 Q2 to 22.2 % of n = 45 samples (Fig. 1). In bivariate logistic regression analysis, a positive time trend was observed, with each additional quarter year associated with increased odds of xylazine positivity (OR= 1.35 [95 %CI: 1.19–1.52]).

Among n = 103 xylazine-positive samples, n = 78 had quantitative results available. Of these xylazine concentration was generally low, with a highly skewed distribution (mean=2.42 %, geometric mean=0.30 %, sd=7.80 %) [Table 1]. 76.9 % of xylazine-positive samples had less than 1 % xylazine concentration.

Xylazine-positive samples had a significantly lower concentration of fentanyl compared to xylazine-negative samples, with a mean concentration of 6.12 % (sd=7.23 %) vs 10.7 % (sd=12.3 %) respectively, and an estimated quasi-Poisson rate ratio of 0.57 (95 %CI: 0.40–0.80). This indicates that among fentanyl samples, the fentanyl concentration of xylazine-positive samples was on average 43 % lower relative to those without the co-detection of xylazine.

Compared to xylazine-negative samples, xylazine-positive samples were more likely to contain BTMPS (46.60 % vs 17.30 %, OR=4.17; 95 %CI: 2.63–6.60), and lidocaine (65.0 % vs 29.6 %, OR=4.43; 95 % CI: 2.82–6.99). No significant differences were observed for heroin, cocaine, or methamphetamine positivity (Table 1).

4. Discussion

Among illicit fentanyl samples from community drug checking sites in LA, we note a significant increase in xylazine positivity over time, especially after 2024 Q2. In the most recent data in our study, xylazine was present in 1 out of every 4–5 fentanyl samples.

This adds to a growing body of literature showing that xylazine is spreading across the country from East to West, and that it has now arrived to the West Coast (Bufanda et al., 2025; Friedman, 2025; Gupta et al., 2023). For instance xylazine has been detected nationally, and on the West Coast among smaller samples derived from xylazine testing strips on drug paraphernalia, and patient urine samples (Friedman et al., 2024; Thompson et al., 2024). Xylazine has also been detected in wastewater samples from at least two states in the US (Delcher et al., 2024).

Compared to these other approaches, the LC-MS quantification approach leveraged here allows for more information about the composition of the illicit drug supply and xylazine’s role in it. Previous studies leveraging gold standard quantification methods among community-based drug checking data, which have detected xylazine, have been more common on the East Coast, and have generally leveraged smaller sample sizes (Park et al., 2024). To our knowledge, this also represents the largest study, to-date, of quantitative xylazine testing results. One prior analysis quantified xylazine among n = 8 fentanyl samples in Rhode Island, finding that concentration ranged from 0.4 %

to 11.8 %. Here, we observed a highly skewed distribution of xylazine concentration, with a small number of high concentration samples, and a majority with concentrations under 1 %.

Further study will be required to assess the physiological importance of the lower concentration xylazine most common here, which was generally found at lower concentrations than fentanyl among the same samples. It is not clear if the potential negative health effects associated with xylazine—such as persistent soft tissue infections and injury, cardiovascular complications, and overdose management complicated by synergism with opioids—would be found with lower dose xylazine, or only with the higher doses that comprised the minority of our sample.

Given that the average participant at our study sites consumes about 1.0 g of illicit fentanyl daily, and the 2.4 % average concentration that we observed here, the resulting average dose of 24 mg of xylazine daily (among the fraction of participants consuming only xylazine-positive samples) may still be pharmacologically significant. Given a skewed distribution of xylazine concentration, the geometric mean of 0.30 % concentration, and a resulting average dose of 3 mg of xylazine, may be more informative. Xylazine has not been extensively studied in humans. Dosing for veterinary anesthetic purposes varies by species, but generally ranges from 0.01–2.5 mg/kg (Anaesthesia of the Dog, 2014; Valverde and Doherty, 2008). Hypotension and bradycardia have been described in human overdoses with doses as low as 0.73 mg/kg (Ruiz-Colón et al., 2014). Assuming an average human adult size of 70 kg, doses of 3 mg or 24 mg would correspond to 0.04 mg/kg or 0.34 mg/kg, respectively, which do overlap with the range of anesthetic dosing observed in veterinary literature. Given a highly skewed distribution, the smaller number of participants exposed to high dose xylazine may be at significant risk compared to the larger number of participants exposed to lower doses. Nevertheless, this is speculative, and we are not able to assess effects on humans with the current study design. Further studies are needed on this topic. Furthermore, it is unknown to what degree smoking – a dominant route of administration for illicitly manufactured fentanyl in Los Angeles and the West Coast generally – rather than injecting impacts the bioavailability and health effects of xylazine (Eger et al., 2024).

Additional research will also be required to assess if this distribution of xylazine concentration holds true in other fentanyl markets, or if it is unique to the part of Los Angeles where this sample was drawn from. Given the nature of community-based drug checking, the sample presented here may be vulnerable to convenience bias and is therefore limited in its ability to generalize to the greater West Coast, Southern California, or even the wider Los Angeles area. Although the sample generally represents a stable segment of the Los Angeles market over time, we are unable to measure potential ways that the client base may have shifted during the study period. Other limitations may include that the LC-MS quantitation panel used during the majority of the study window included only twelve substances, and that DART-MS analysis may be unable to detect certain larger-molecule substances such as sugars and other common fillers. Only a subset of samples had quantification results available, which included samples processed starting in

Table 1
Characteristics of xylazine positive and negative fentanyl samples. Characteristics of xylazine-positive and negative samples are compared, including the mean xylazine and fentanyl concentrations, and the co-prevalence of other substances. Differences in fentanyl concentration are assessed using a rate ratio (RR) from a bivariate quasi-Poisson generalized linear model, while differences in substance co-prevalence were assessed using odds ratios (OR) from bivariate logistic regressions.

	Xylazine Absent (N = 433)	Xylazine Present (N = 103)	Overall (N = 536)	OR/RR (95 %CI)
Xylazine Concentration				
Mean (SD)	—	2.42 % (7.80 %)	2.42 (7.80 %)	–
Fraction under 1 % concentration		0.769	0.769	–
Fentanyl Concentration				
Mean (SD)	10.7 % (12.3 %)	6.12 % (7.23 %)	9.55 % (11.4 %)	0.57 (0.40–0.80)
Other Substance Prevalence (%)				
BTMPS	17.30 %	46.60 %	22.90 %	4.17 (2.63–6.60)
Cocaine	5.54 %	3.88 %	5.22 %	0.68 (0.23–2.02)
Methamphetamine	9.70 %	11.70 %	10.10 %	1.23 (0.62–2.43)
Heroin	11.10 %	5.83 %	10.10 %	0.49 (0.20–1.19)
Lidocaine	29.60 %	65.00 %	36.40 %	4.43 (2.82–6.99)

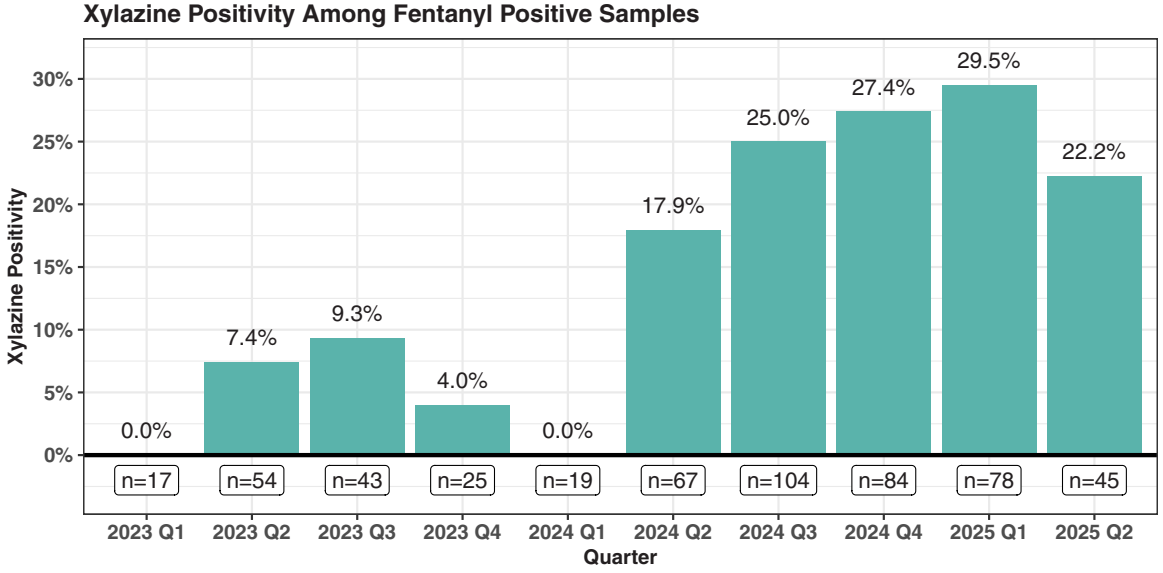


Fig. 1. Xylazine positivity among fentanyl-positive samples, 2023Q1–2025Q2. Xylazine positivity among fentanyl-positive samples brought to drug checking services in Los Angeles are shown by quarter, between the first quarter (Q1) of 2023 and the second quarter (Q2) of 2025.

2023 Q3, for which sufficient sample mass was provided by participants (approximately 5 mg, or half of a 10 mg microscoop). This may bias the results in an unpredictable direction if samples with more mass available were likelier to contain more or less xylazine.

The lower concentration of fentanyl among xylazine-positive samples is also notable. This may indicate that xylazine represents an alternative strategy for achieving a physiologically potent product, compared to higher-concentration fentanyl formulations. Xylazine also had a greater chance of co-occurring with BTMPS, and lidocaine, which are both novel fentanyl adulterants of unclear physiological significance in the context of illicit drug use (Friedman et al., 2024; Shover et al., 2025).

In sum, this work presents one of the first analyses documenting the proliferation of xylazine in the West Coast illicit fentanyl supply of the United States, finding a significantly increasing prevalence over time between 2023 and 2025. It also provides the largest sample of quantitative xylazine testing results to-date. Future research is needed to assess the potential health impacts of low concentration xylazine adulteration of fentanyl samples.

CRediT authorship contribution statement

Adam J. Koncsol: Writing – review & editing, Visualization, Software, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Caitlin A. Molina:** Writing – review & editing, Validation, Resources, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Morgan E. Godvin:** Writing – review & editing, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Ruby Romero:** Writing – review & editing, Resources, Project administration, Methodology, Investigation, Data curation, Conceptualization. **spider davila:** Writing – review & editing, Resources, Project administration, Methodology, Investigation, Data curation. **Elham Jalayer:** Writing – review & editing, Resources, Project administration, Methodology, Data curation. **Oscar Arellano:** Writing – review & editing, Resources, Project administration, Methodology, Investigation, Data curation. **Brian Hurley:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Conceptualization. **Amanda Cowan:** Writing – review & editing, Resources, Project administration, Methodology, Investigation, Data curation. **Joseph Friedman:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Chelsea L. Shover:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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