PA GROUNDHOGS

Drug Purity Historical Analysis

January 2024 – February 2026

CFSRE Drug Checking Service · Quantitative Mass Spectrometry

Report generated March 2026

Executive Summary

This report presents a historical analysis of quantitative drug purity data collected by PA Groundhogs through the CFSRE Drug Checking Service between January 2024 and February 2026. A total of 632 samples were analyzed using mass spectrometry, enabling precise identification and quantification of primary substances and adulterants.

The analysis surfaces four major findings of harm reduction significance:

- Fentanyl purity has declined approximately 41% from early 2024 to early 2026, from a monthly average of roughly 9% to approximately 5.3%. This likely reflects increasing dilution with adulterants rather than reduced supply.
- Medetomidine has completely replaced xylazine as the dominant alpha-2 agonist adulterant in fentanyl samples. This transition occurred rapidly in early 2025 and has critical harm reduction implications since medetomidine does not respond to naloxone.
- para-Fluorofentanyl experienced a dramatic spike in September 2024 (20 co-detections) before nearly disappearing from the supply, consistent with a brief supply-chain incursion.
- Ketamine and MDMA emerged as significant sample categories in 2025, indicating PA Groundhogs is now serving a broader population beyond opioid drug users.

1. Dataset Overview

1.1 Collection Period and Volume

The dataset covers samples received by the CFSRE Drug Checking Service for PA Groundhogs from January 2024 through February 2026. Monthly sample counts range from a low of 2 (January 2024) to a high of 63 (September 2024).

Dataset Note

Monthly sample counts reflect collection event cadence rather than changes in drug supply. Large spikes in September 2024 (63), June 2025 (60), October 2025 (45), and January 2026 (40) correspond to high-volume outreach events or batch submission periods.

1.2 Monthly Sample Volume

Month	Samples	Month	Samples	Month	Samples
Jan 2024	2	Oct 2024	35	Jul 2025	34
Feb 2024	18	Nov 2024	42	Aug 2025	22
Apr 2024	10	Dec 2024	29	Sep 2025	22
May 2024	40	Jan 2025	18	Oct 2025	45
Jun 2024	13	Feb 2025	6	Nov 2025	20
Jul 2024	18	Mar 2025	3	Dec 2025	21
Aug 2024	27	Apr 2025	22	Jan 2026	40
Sep 2024	63	May 2025	7	Feb 2026	15

1.3 Substances Detected

Substance	Category	Cases	Avg Purity
Fentanyl	Opioid	347	6.9%
4-ANPP	Opioid precursor	308	< 2%
Lidocaine	Local anesthetic	180	17.9%
Xylazine	Adulterant (alpha-2)	144	25.1%
Medetomidine	Adulterant (alpha-2)	107	12.2%
Cocaine	Stimulant	100	59.4%
Methamphetamine	Stimulant	87	57.7%
Ketamine	Dissociative	54	57.9%
para-Fluorofentanyl	Opioid analog	51	1.3%
Procaine	Local anesthetic	71	22.1%
MDMA	Entactogen	19	42.6%
Heroin	Opioid	13	varies

2. Fentanyl Purity Trends

2.1 Overall Decline

Fentanyl was detected in 347 of 632 samples (54.9%). Average purity shows a clear declining trend from early 2024 through the present — from roughly 9% in the first half of 2024 to approximately 5.3% across 2025–2026. The overall linear trend reflects an approximately 41% decline in average purity.

Important Interpretation Note

Lower measured purity does not mean safer product. Fentanyl is active in microgram quantities, and inconsistent mixing creates dose hotspots within individual batches. This finding should guide supply monitoring and messaging about dose variability, not suggest reduced overdose risk.

2.2 Monthly Average Fentanyl Purity

Month	Avg Purity	# Samples	Notes
Feb 2024	8.0%	12	Baseline period
May 2024	10.9%	28	Includes outliers (46%, 51%)
Aug 2024	9.2%	19	
Sep 2024	5.0%	52	Largest month; diluted batch pattern
Oct 2024	12.4%	26	Elevated by 4 high-purity samples (56-59%)
Nov 2024	4.6%	31	
Dec 2024	6.5%	17	
Jan 2025	4.8%	7	Transition period begins
Apr 2025	5.0%	8	
Jun 2025	4.8%	16	
Sep 2025	6.2%	12	
Jan 2026	5.6%	27	
Feb 2026	4.8%	5	

2.3 Outlier Analysis

Several months contain data points that significantly affect monthly averages:

- May 2024: Two samples at 46% and 51% fentanyl content. Removing these drops the monthly average from 10.9% to ~7%.
- October 2024: Four samples at 56–59% fentanyl — likely near-pure preparations or pharmaceutical diversion. Removing these drops the October average from 12.4% to ~4.5%.

- February 2025: Only 3 samples with a very low average (1.4%). Small n makes this month unreliable as a trend indicator.

3. The Xylazine-to-Medetomidine Transition

3.1 Background

Alpha-2 adrenergic agonists (xylazine, medetomidine) have emerged as prominent adulterants in the illicit fentanyl supply. Originally veterinary sedatives, these compounds produce deep sedation and do not respond to naloxone. They are associated with distinctive skin wounds and significantly complicate overdose response.

Critical Harm Reduction Alert

Neither xylazine nor medetomidine responds to naloxone. Sustained rescue breathing is required even after naloxone is administered. Wound care guidance must now address both substances. Standard xylazine test strips do not detect medetomidine.

3.2 Transition Timeline

Through all of 2024, xylazine was the dominant alpha-2 agonist in the fentanyl supply — co-occurring in 100% of fentanyl-positive samples in February and May 2024. The transition began in March 2025 when medetomidine appeared for the first time. By April 2025, it had displaced xylazine as the primary adulterant. By September 2025, xylazine had essentially disappeared (0 co-detections).

Month	Fentanyl Samples	w/ Xylazine	w/ Medetomidine	Dominant
Feb 2024	12	12 (100%)	0	Xylazine
May 2024	28	28 (100%)	0	Xylazine
Sep 2024	52	21 (40%)	0	Xylazine
Nov 2024	31	9 (29%)	0	Xylazine (declining)
Jan 2025	7	1 (14%)	0	Transition
Mar 2025	1	0	1 (100%)	MEDETOMIDINE (first)
Apr 2025	8	1 (13%)	7 (88%)	Medetomidine
Jun 2025	16	2 (13%)	13 (81%)	Medetomidine
Sep 2025	12	0	7 (58%)	Medetomidine
Jan 2026	27	4 (15%)	23 (85%)	Medetomidine
Feb 2026	5	0	5 (100%)	Medetomidine

4. Local Anesthetic Adulterants

Local anesthetics (lidocaine, procaine, tetracaine) serve as cutting agents in fentanyl and cocaine samples. Their identity shifts across the dataset period in ways that track the broader supply-chain transition.

- Lidocaine dominated throughout 2024, present in 180 total samples with concentrations from under 5% to over 40%.
- Procaine and tetracaine emerged in early 2025, coinciding exactly with the xylazine-to-medetomidine shift — suggesting a coordinated supply-chain change.
- The combination of procaine/tetracaine + medetomidine + fentanyl became the dominant formulation by mid-2025, replacing the lidocaine + xylazine + fentanyl pattern of 2024.

5. Other Substances

5.1 Cocaine

Cocaine was detected in 100 samples at an average purity of 59.4%. Purity was highly variable — dipping to 23–28% average in September–October 2024 before recovering sharply to 75–90%+ in late 2025. The overall trend is modestly positive, with 2025 samples generally higher-purity than 2024.

5.2 Methamphetamine

Methamphetamine appeared in 87 samples at an average purity of 57.7%, consistent with high-purity P2P methamphetamine dominant on the East Coast. Average purity shows a modest downward drift from peaks of 75–82% in early 2024 to 50–65% through much of 2025.

5.3 Ketamine

Ketamine is absent from the 2024 data and first appeared in April 2025, with 54 total detections through February 2026. Average purity of 57.9% is consistent with diverted pharmaceutical-grade product. This substance profile is associated with club and party drug use populations rather than traditional opioid users.

Program Implication	The emergence of ketamine samples indicates PA Groundhogs is now serving a broader harm reduction population. Messaging, materials, and staff training should be updated to address risks relevant to ketamine and dissociative drug use.

5.4 para-Fluorofentanyl

para-Fluorofentanyl (pFF) appeared in 51 samples, with a dramatic spike in September 2024 (20 co-detections) followed by near-disappearance. This pattern is consistent with a brief supply-chain incursion. pFF is roughly equipotent to fentanyl and poses similar overdose risk.

6. Harm Reduction Implications

6.1 Messaging Updates Required

- Naloxone distribution messaging must clarify that neither xylazine nor medetomidine responds to naloxone, and that rescue breathing should continue even after naloxone is administered.
- Wound care guidance should be updated to reference medetomidine alongside xylazine, as both produce the same necrotizing wound pattern.

- People should be informed that a negative xylazine test strip does not mean their supply is free of alpha-2 agonists — existing strips do not detect medetomidine.

6.2 Fentanyl Purity Messaging

- Lower average purity reflects increased dilution, not reduced potency per dose. Hotspot dosing from uneven mixing remains the primary overdose risk.
- The wide purity range (0.1%–59%) underscores the unpredictability of street-level product and the importance of starting with a test dose.

6.3 Expanding Services

- Develop or source ketamine-specific harm reduction materials covering dosing, contraindications, and safer use.
- Update MDMA guidance to reflect current supply realities, including high purity variability.
- Consider expanding outreach venues and collection strategies to capture party drug users who may not identify as opioid users.

Appendix: Methodology

All samples were analyzed by the Center for Forensic Science Research and Education (CFSRE) using quantitative mass spectrometry. Purity figures represent the percentage by weight of each identified compound in the submitted sample matrix.

Monthly averages were calculated from all samples within a given calendar month meeting a minimum threshold ($n \geq 2$ for trend analysis). Months with fewer than 2 qualifying samples are excluded from trend visualizations but included in aggregate counts.

The dataset covers cases with agency code prefix PAG (PA Groundhogs), cross-referenced to CFSRE case numbers in the DC2024/DC2025/DC2026 series.

For questions about this analysis, contact PA Groundhogs at pagroundhogs.org