

Understanding the Evolving Drug Landscape: The Epidemiology

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Disclosure Information

Understanding the Evolving Drug Landscape:

The **Epidemiology**

April 24, 2026

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Learning Objectives

Review

Review the epidemiology of illicit drug use and notable shifts in use trends

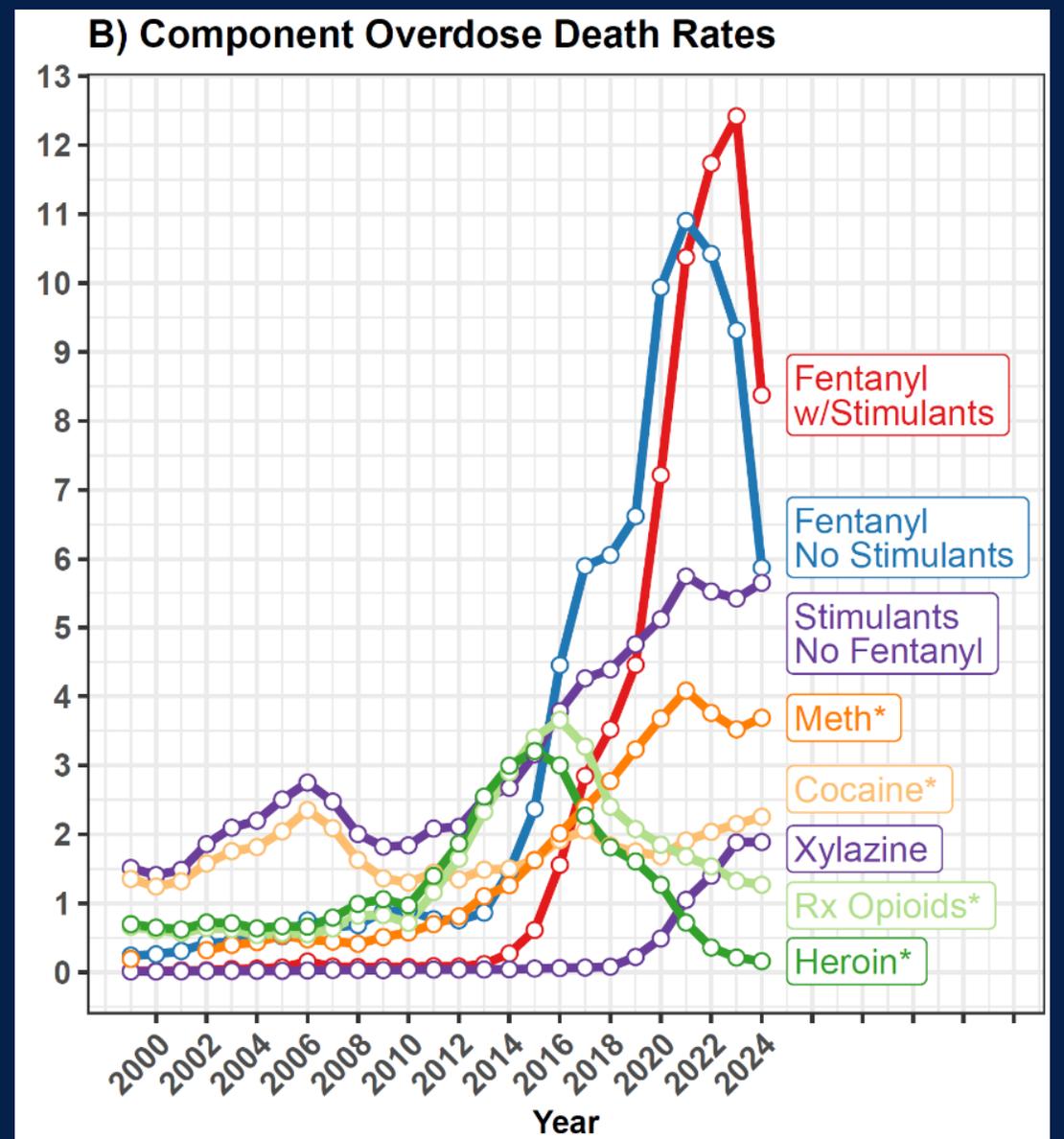
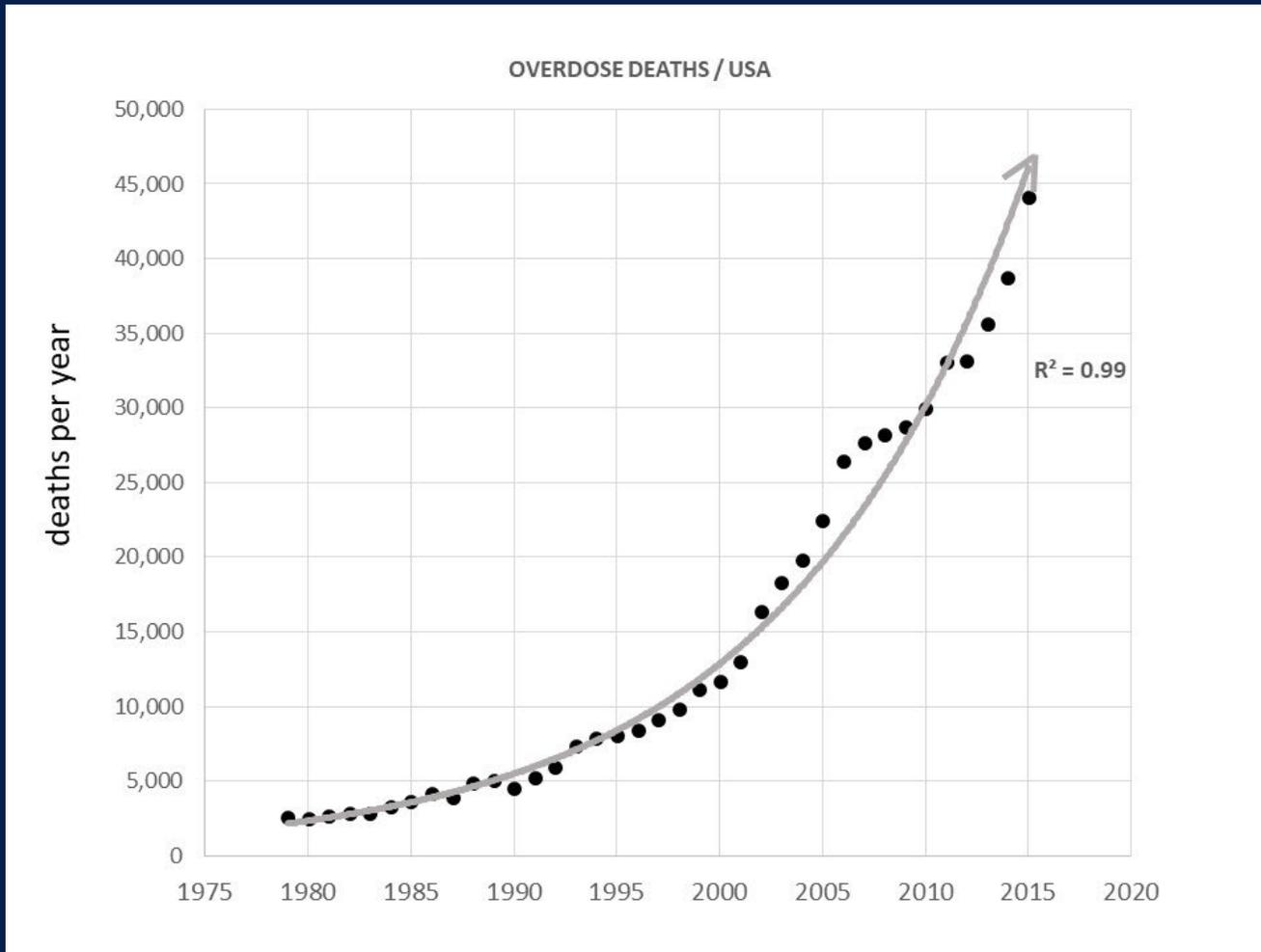
Describe

Describe emerging trends in the drug supply and novel sources of these data, including community drug checking data

Provide

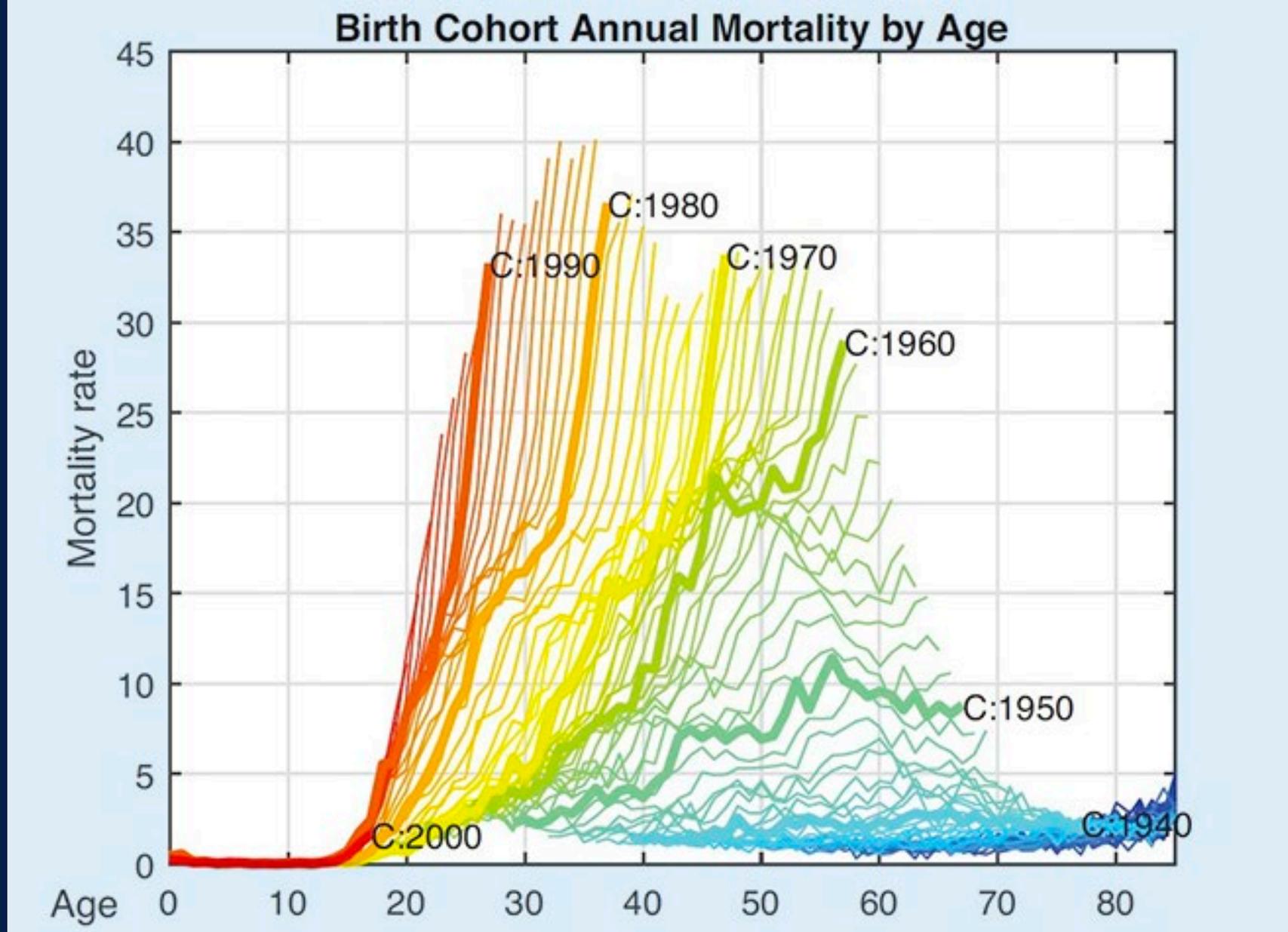
Provide examples of how data from community drug checking are being used by people who use drugs and in clinical and public health applications

Exponential Trends



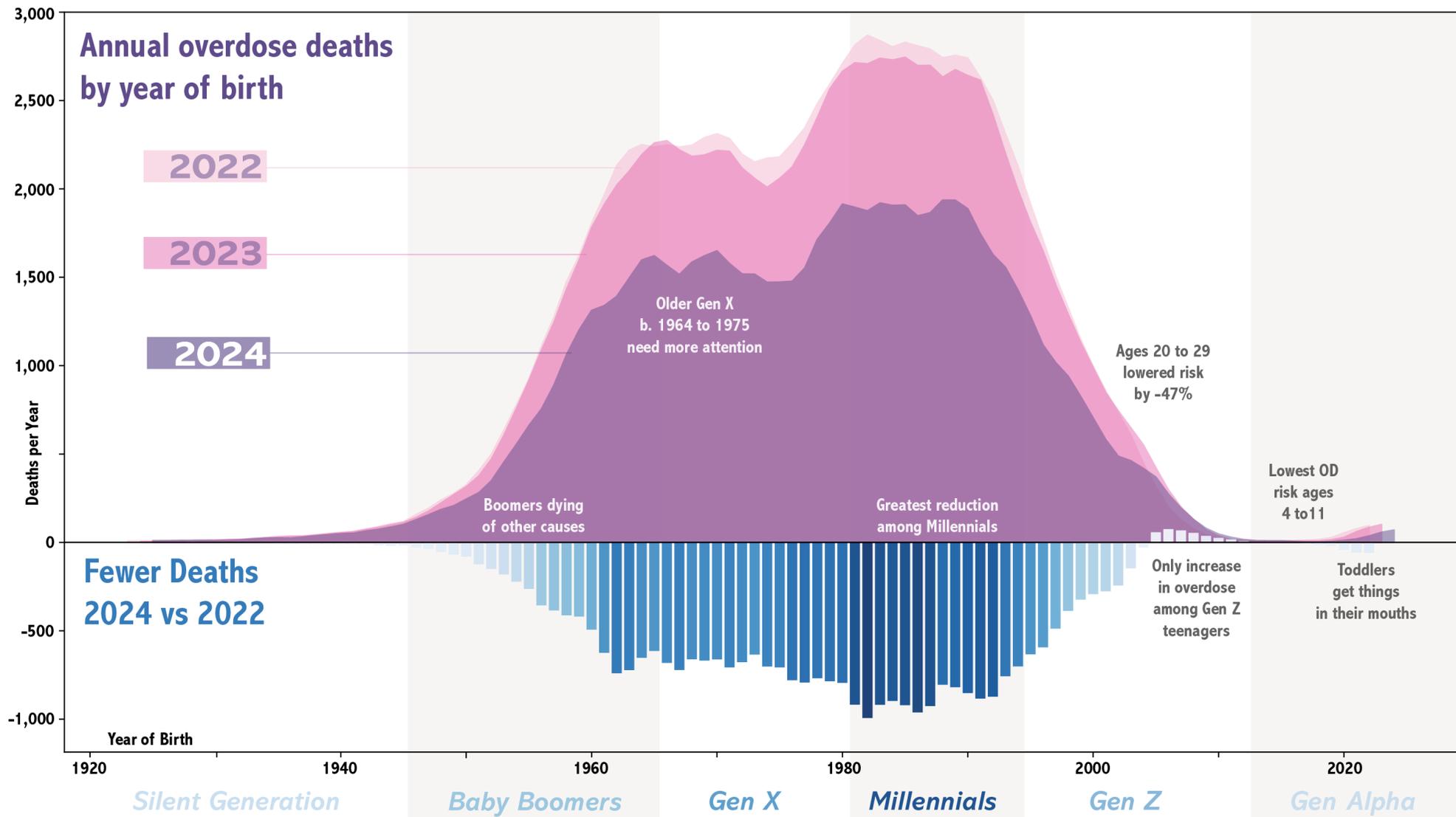
Source: Jalal H, Buchanich JM, Roberts MS, Balmert LC, Zhang K, Burke DS. Changing dynamics of the drug overdose epidemic in the United States from 1979 through 2016. *Science*. 2018;361(6408):eaau1184. doi:10.1126/science.aau1184

Medrxiv preprint: Friedman, Joseph & Palamar, Joseph & Ciccarone, Daniel & Gaines, Tommi & Borquez, Annick & Shover, Chelsea & Strathdee, Steffanie. (2025). Characterizing Declines in US Overdose Deaths Compared to Exponential Predictions. 10.1101/2025.10.24.25338732.



Source: Jalal, H., Buchanich, J.M., Sinclair, D.R. *et al.* Age and generational patterns of overdose death risk from opioids and other drugs. *Nat Med* 26, 699–704 (2020). <https://doi.org/10.1038/s41591-020-0855-y>



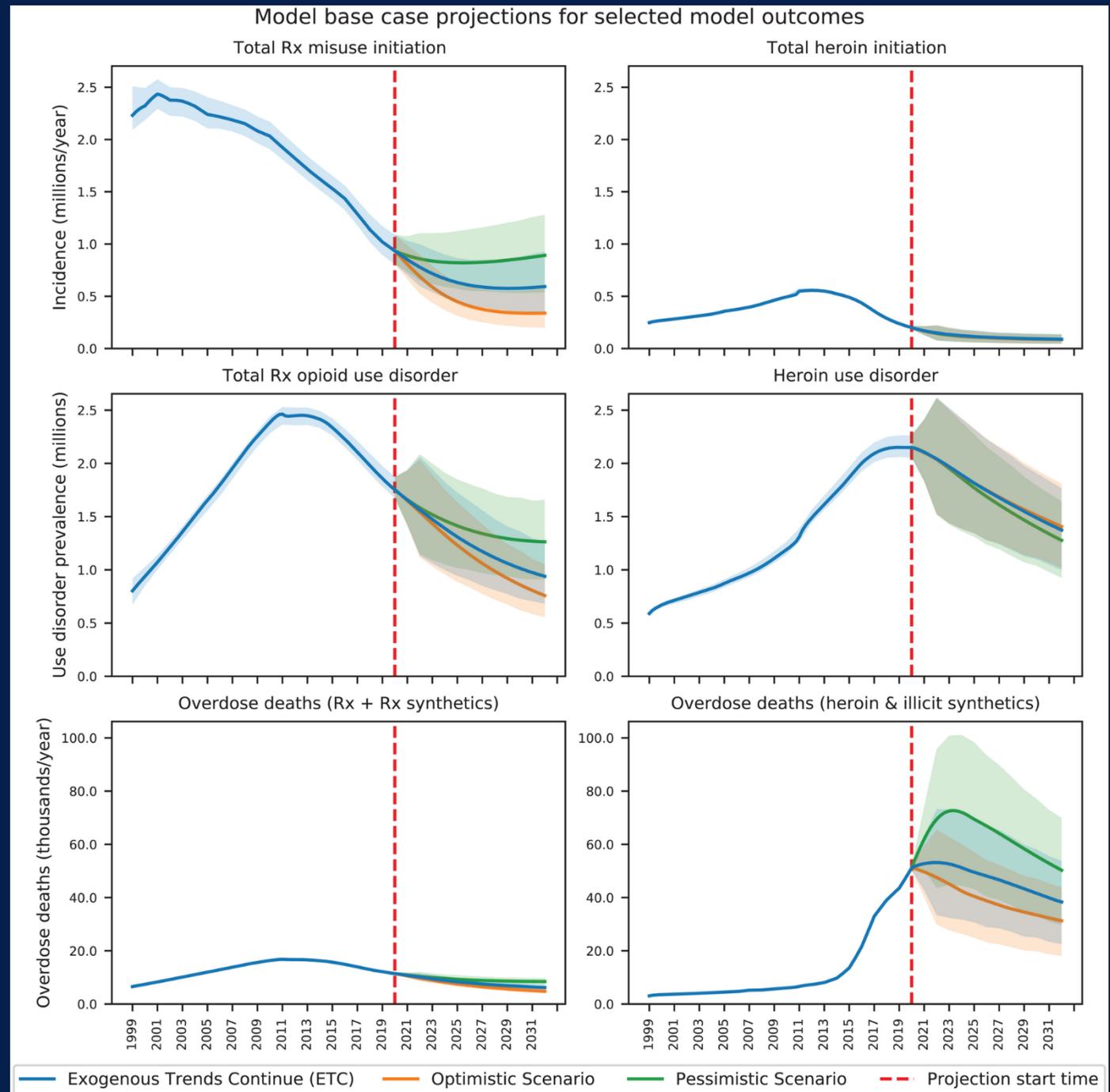


US Overdose Deaths 2022-24 Source: CDC WONDER, processed by UNC Opioid Data Lab



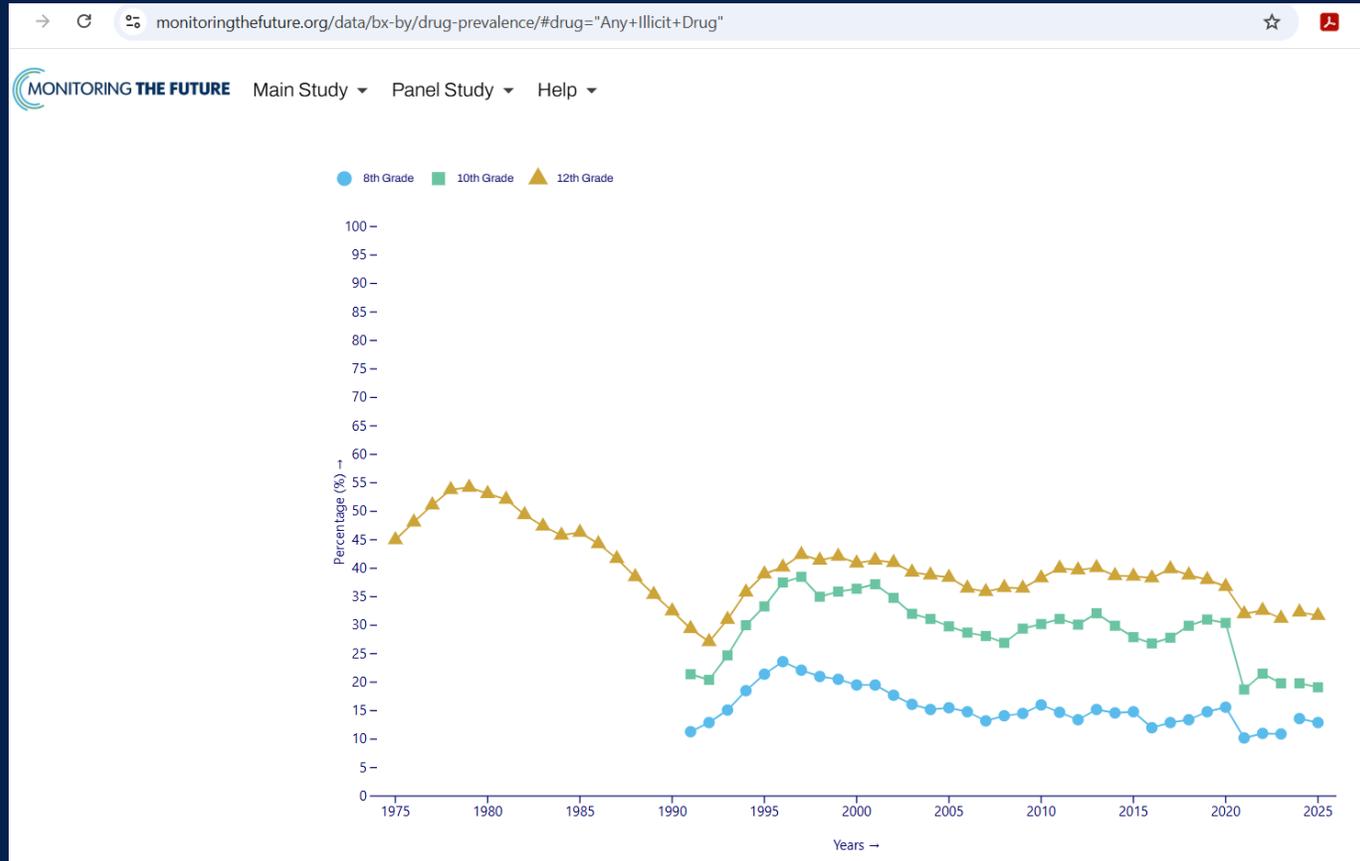
Simulated historical and projected trajectories for selected variables, under three sets of assumptions: ETC (blue), optimistic (orange), and pessimistic (green). Bands are 95% Crls for estimated underlying values (historical portion, before 2020) and for projected reported data (after 2020); Crls for projected reported values account for measurement noise, and hence are wider. Full results are in [SI Appendix, section S5](#). [Source](#)

Stringfellow EJ, Lim TY, Hasgul Z, Jalali MS. Structural Drivers of the Drop in Opioid Overdose Deaths in the US. *JAMA Psychiatry*. 2026 Jan 1;83(1):101-103. doi: [10.1001/jamapsychiatry.2025.3584](https://doi.org/10.1001/jamapsychiatry.2025.3584). PMID: 41296354; PMCID: PMC12658751.



Looking to the future...

- ◆ Monitoring the Future surveys indicate high levels of abstinence across substances for adolescents, low levels of use overall



Miech, R. A., Patrick, M. E., O'Malley, P. M., Jager, J. O. and Jang, J. B. (2026). Monitoring the Future national survey results on drug use, 1975–2025: Overview and detailed results for secondary school students. Monitoring the Future Monograph Series. Ann Arbor, MI: Institute for Social Research, University of Michigan. Available at <https://monitoringthefuture.org/results/annual-reports/>

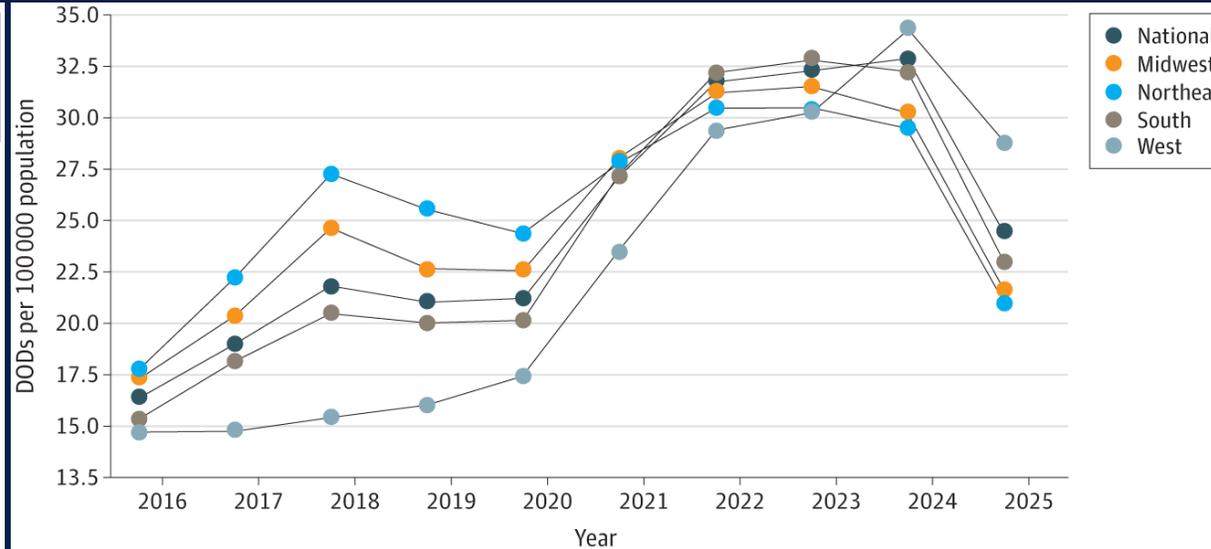
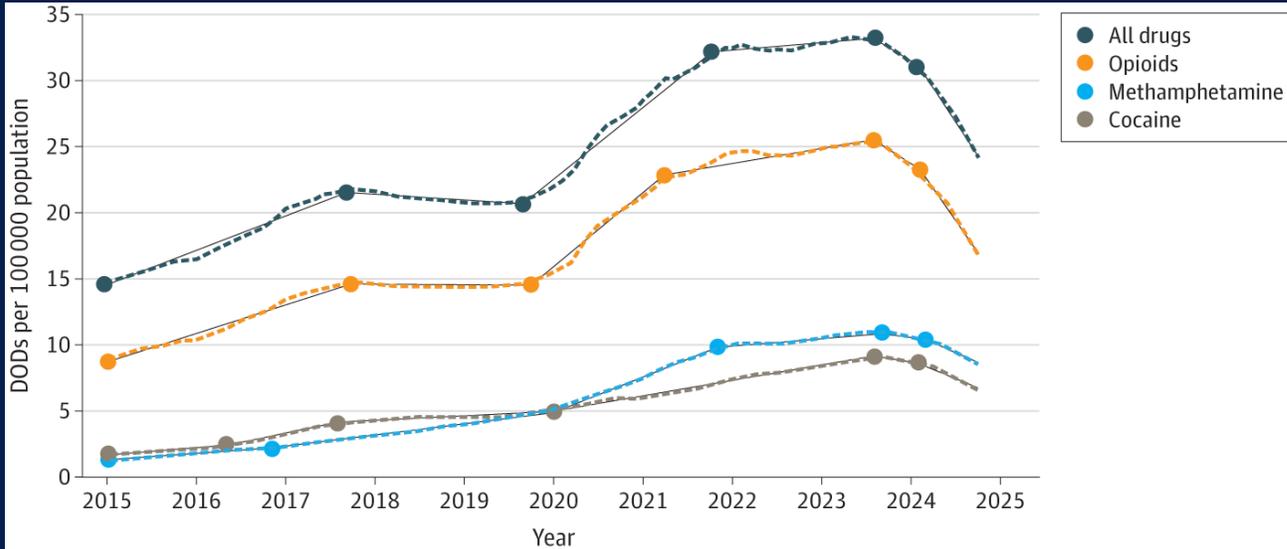


Table 2. Annual Change in DOD Rates by Decedent Demographics

Characteristic	Annual change in DOD rate ^a								
	2015	2016	2017	2018	2019	2020	2021	2022	2023
Overall	1.56	3.36	1.91	-0.99	0.90	6.17	34.44	0.26	-1.04
Age, y									
15-24	1.03	2.69	0.28	-1.84	0.38	5.30	0.73	-1.82	-1.90
25-34	3.84	7.54	3.92	-2.92	0.12	12.05	5.19	-2.30	-4.97
35-44	3.37	6.61	4.07	-0.81	2.15	12.46	9.04	0.89	-2.03
45-54 y	1.86	4.43	3.29	-2.55	1.57	9.14	7.72	1.39	-1.83
≥55	0.78	1.94	1.36	0.34	1.16	2.55	5.91	1.47	0.07
Race									
American Indian or Alaska Native	NA	NA	NA	NA	2.82	6.54	8.65	4.09	0.02
Asian	NA	NA	NA	NA	0.28	1.24	0.24	0.74	-0.31
Black or African American	NA	NA	NA	NA	3.45	10.24	8.85	3.45	1.70
Native Hawaiian or Other Pacific Islander	NA	NA	NA	NA	-0.30	1.68	6.07	-0.70	5.77
White	NA	NA	NA	NA	0.51	5.98	4.04	-0.41	-1.65
Multiracial	NA	NA	NA	NA	0.79	4.29	2.15	1.07	0.28
Sex									
Female	0.66	1.52	0.89	-0.83	0.13	3.12	2.55	-0.24	-0.87
Male	2.49	5.25	2.96	-1.16	1.69	9.19	6.38	0.77	-1.20
Ethnicity									
Hispanic or Latino	0.96	1.78	1.12	0.40	1.72	4.70	3.57	1.45	0.20
Not Hispanic or Latino	1.67	3.72	2.11	-1.24	0.73	6.53	4.63	-0.07	-1.34

Abbreviations: DOD, drug overdose death; NA, not applicable.

^a Based on Centers for Disease Control and Prevention WONDER and US Census Bureau intercensal population estimates.



Post LA, Ciccarone D, Unick GJ, et al. Decline in US Drug Overdose Deaths by Region, Substance, and Demographics. *JAMA Netw Open.* 2025;8(6):e2514997. doi:10.1001/jamanetworkopen.2025.14997



POLICY ARTICLE | DRUG POLICY



Did the illicit fentanyl trade experience a supply shock?

A synthesis of government and social media data suggests a disruption, possibly tied to events in China

KASEY VANGELOV, KEITH HUMPHREYS, JONATHAN P. CAULKINS, HAROLD POLLACK, BRYCE PARDO, AND PETER REUTER [Authors Info & Affiliations](#)

SCIENCE · 8 Jan 2026 · Vol 391, Issue 6781 · pp. 134-136 · DOI: 10.1126/science.aaa6130

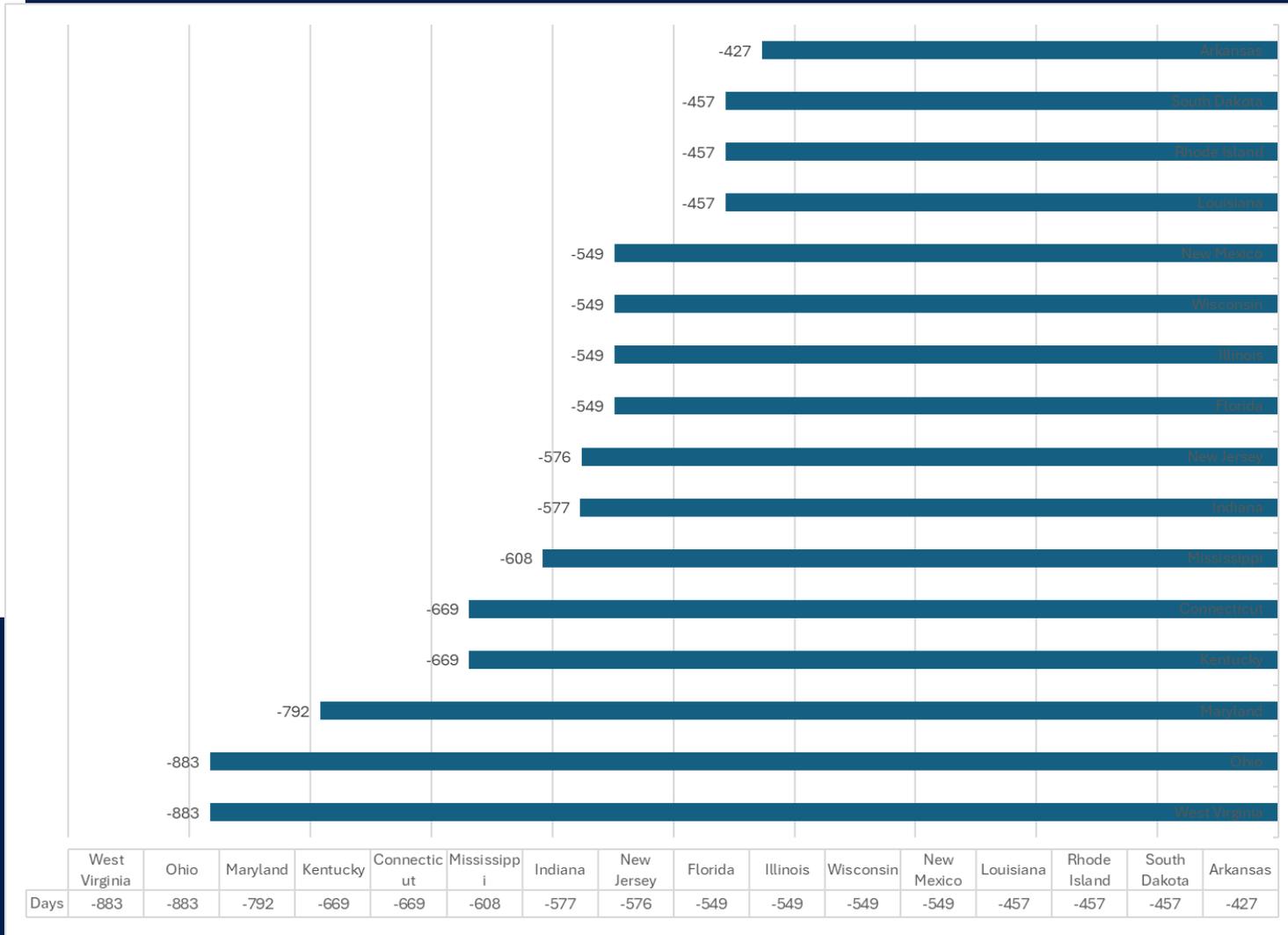
4,621 views 1 quote CHECK ACCESS

Abstract

Fatal overdoses from synthetic opioids, most notably fentanyl, steadily increased more than 25-fold in the United States over 15 years, peaking at 76,000 in 2023 (1). This trend began to sharply reverse in mid-2023, dropping the annual rate of fentanyl overdose deaths (ODDs) by over a third by the end of 2024 (1). Explaining this unexpected drop is of major scientific and policy interest. Whether a supply shock could account for a substantial part of the decline is challenging to determine be-



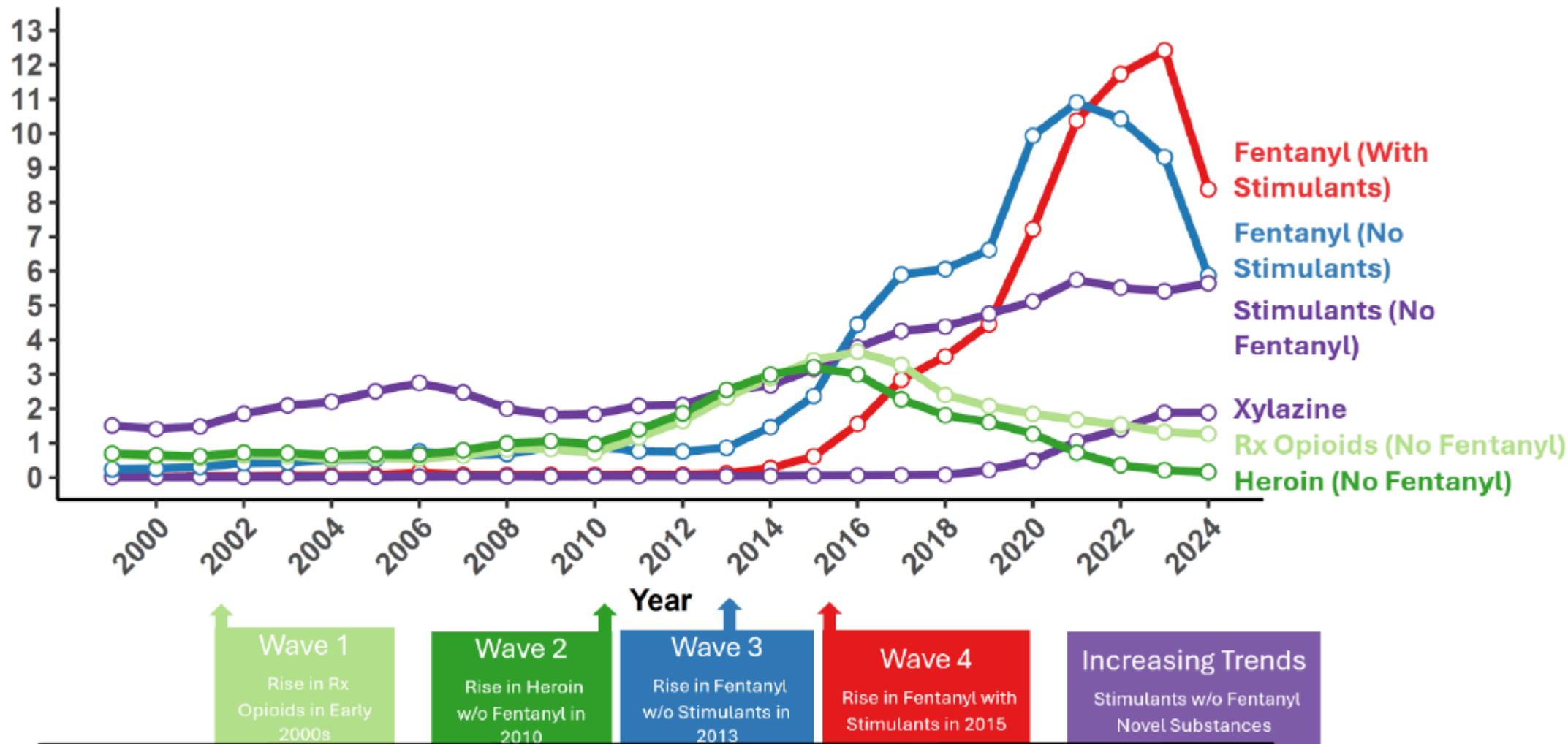
States where opioid overdose reductions



16 states experienced reductions in overdose deaths prior to Q3 2023.



The Four Waves of the Overdose Crisis



Medrxiv preprint: Friedman, Joseph & Palamar, Joseph & Ciccarone, Daniel & Gaines, Tommi & Borquez, Annick & Shover, Chelsea & Strathdee, Steffanie. (2025). Characterizing Declines in US Overdose Deaths Compared to Exponential Predictions. 10.1101/2025.10.24.25338732.

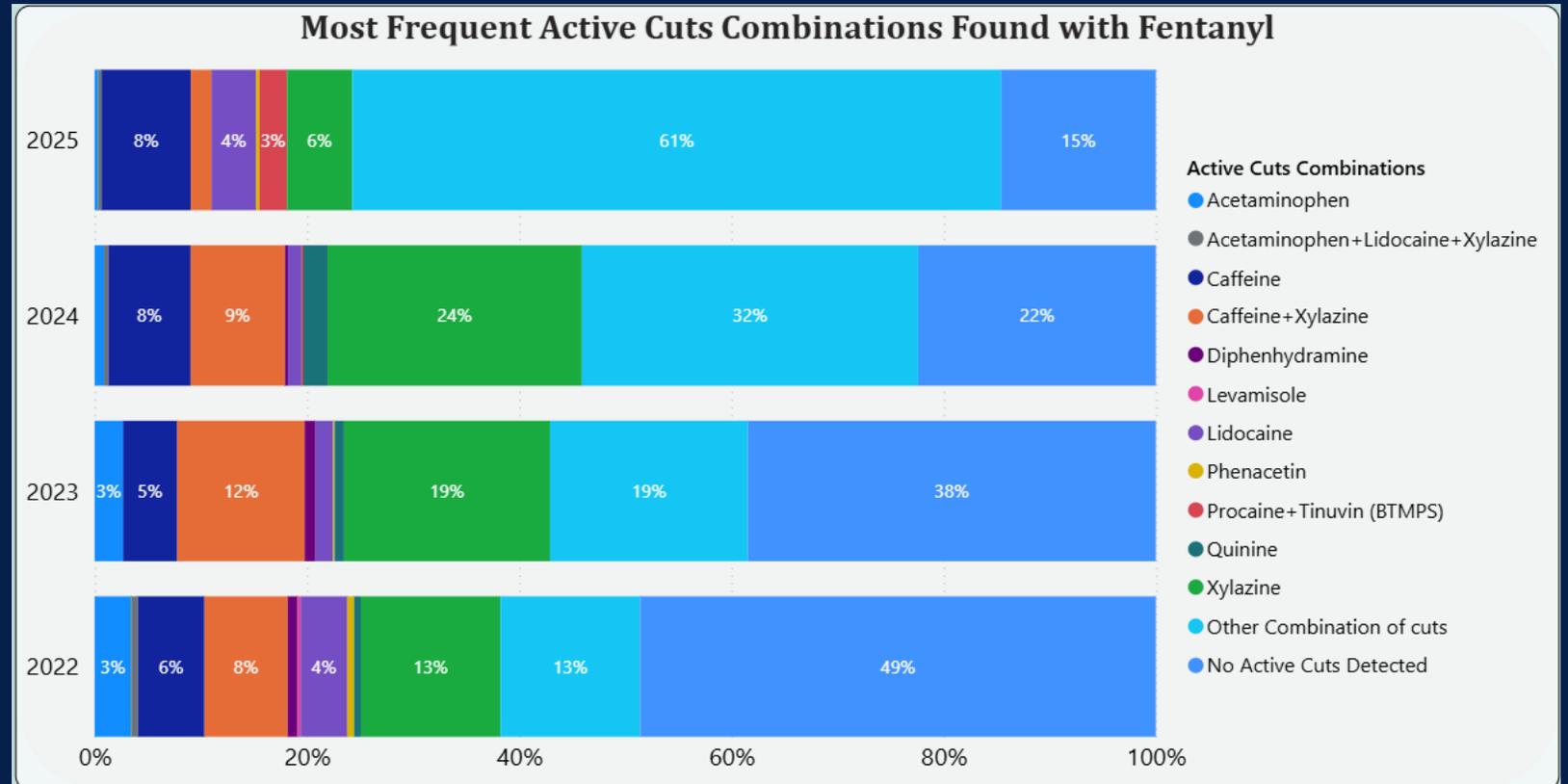


Fentanyl in transition

This figure shows the active cuts found in drug samples where the primary substance is fentanyl. Samples are from Massachusetts from 2022 to 2025.

The proportion of fentanyl samples with no other active cuts found has decreased over time.

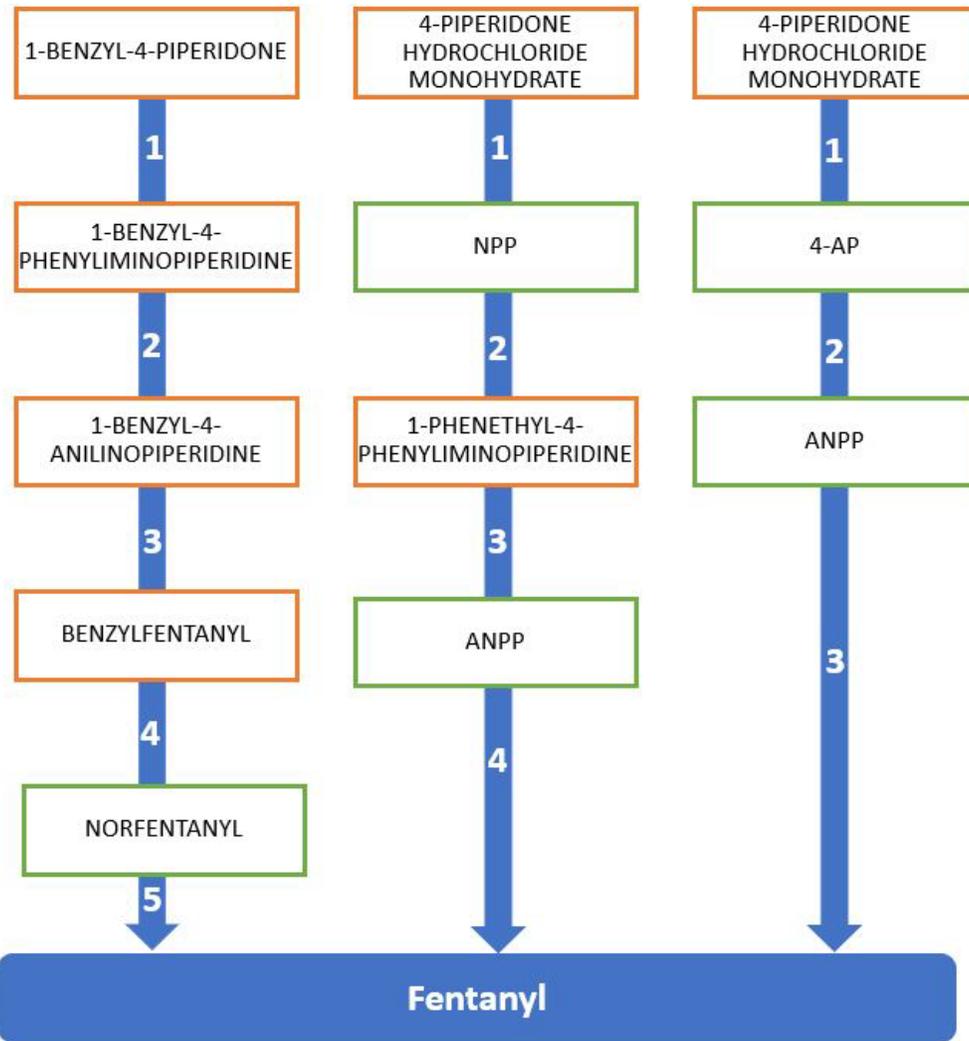
More of the fentanyl supply has active cuts and the complexity and combinations of active cuts in fentanyl has increased over time.



Note: This figure only shows active cutting agents in a primary substance. Inactive cuts or byproducts may also be present and affect its purity. A drug's strength depends on its active ingredient content, not on the presence of cuts.

What about fentanyl potency? Medical grade fentanyl is **not** illicitly manufactured fentanyl potency. Fentanyl synthesis changes. Drug purity and potency differ by geography and time; quantitative lab results (% weight) can reflect both purity and potency. Research and better drug supply sampling to understand shifts are needed.

“Janssen” method “Siegfried” method Gupta et al. (2009)



Source: UNODC elaboration, based on UNODC, “An Expanding Synthetic Drugs Market – Implications for Precursor Control”, *Global SMART Update*, vol. 23 (March 2020).

Valez et al., 2014.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0108250>



Dope Sold as: Fentanyl ID: 10861

ID: 10861
Name: Dope
Other Names:
UniqueCode: AC2021B866A
GC/MS:
• Fentanyl : 200
• 4-ANPP : 80
• 1-Propionyl-4-anilinopiperidine : 20
• Benzylfentanyl : 2
• Phenethyl 4-ANPP : 2
• Acetylfentanyl : 1

Test Date: Jul 31, 2021
Pub. Date: Jul 31, 2021
Src Location: Boston, MA
Submitter: Boston, MA
Loc: United States
Color: White / Off White
Size: 5 mg
Data Source: [DrugsData](#)
Tested by: DDL
Lab's ID: 21070076

Sold as: Fentanyl
Expected to be: 'Raw' fentanyl

Lab comments:
The 1-Propionyl-4-anilinopiperidine was identified by library match reference standard for 1-Propionyl-4-anilinopiperidine available at

Description
Off-white/white powder, kind of chunky.
Experience Note: 'Really strong, urines aren't showing fent.'

White Powder Sold as: Heroin ID: 11434

ID: 11434
Name: White Powder
Other Names:
UniqueCode: AC2021B1029
Marquis: Orange (orange/brown)
Mecke: No Reaction
Mandelin: No Reaction
GC/MS:
• Caffeine : 400
• 4-ANPP : 100
• Xylazine : 100
• Fentanyl : 1
• Phenethyl 4-ANPP : 1

Test Date: Oct 20, 2021
Pub. Date: Oct 20, 2021
Src Location: Greenfield, MA
Submitter: Greenfield, MA
Loc: United States
Color: White
Size: 5 mg
Data Source: [DrugsData](#)
Tested by: DDL
Lab's ID: 21100065

Sold as: Heroin
Expected to be: Not Specified

Description
White powder in baggie. Sample name given as "Heroin".

Off-White Powder (Presidents) Sold as: Heroin ID: 19624

ID: 19624
Name: Off-White Powder
Other Names: Presidents
UniqueCode: AC2024B4431
Fentanyl Test Strip (FTS): Positive
Color: Off White
Size: 1 mg
Data Source: [DrugsData](#)
Tested by: DDL
Lab's ID: 24030099

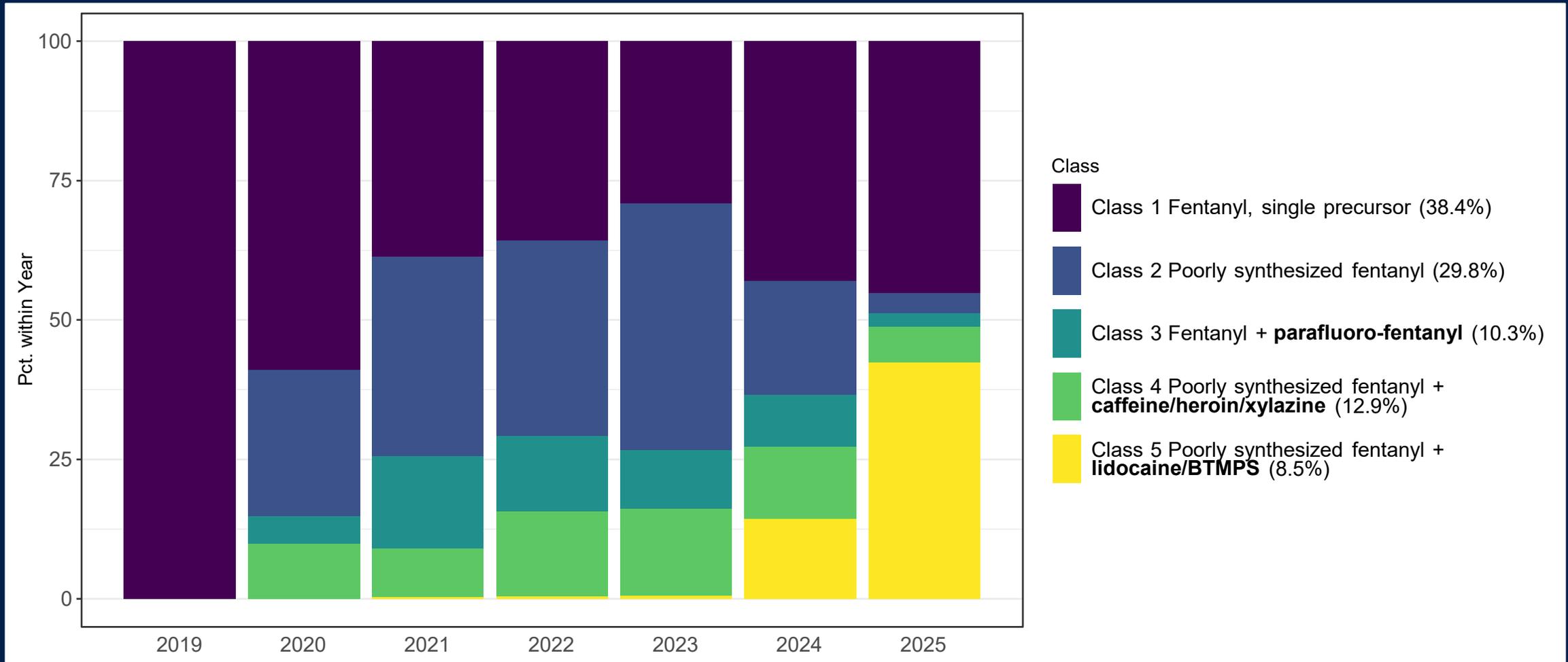
Test Date: Mar 28, 2024
Pub. Date: Mar 28, 2024
Src Location: Pittsfield, MA
Submitter: Pittsfield, MA
Loc: United States
Color: Off White
Size: 1 mg
Data Source: [DrugsData](#)
Tested by: DDL
Lab's ID: 24030099

Sold as: Heroin
Expected to be: Not Specified
Has Been Tried: Yes

Sugars / Diluents Detected
The lab identified sugars or diluents in this sample: Mannitol

Description
Off-white powder residue with "Presidents" stamp in baggie.

Profile of Fentanyl “Typologies” by Year



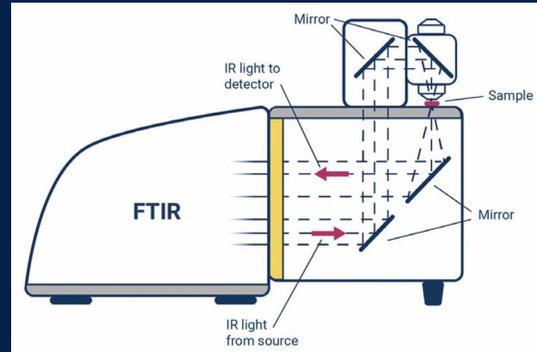
Source: MADDs, 2026



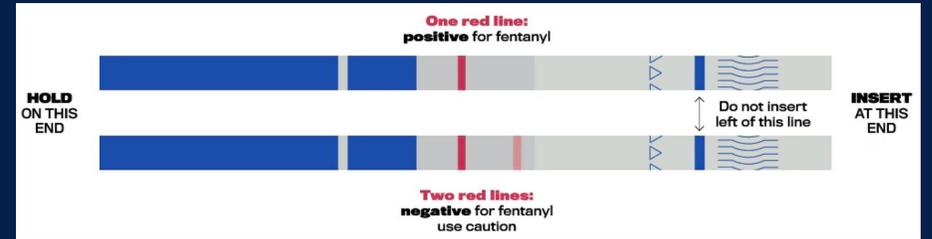
Drug Checking Process



Sample / Data collection



FTIR / Mobile IR analysis



Immunoassay test strips



Deliver initial results w/ harm reduction counseling & safety planning



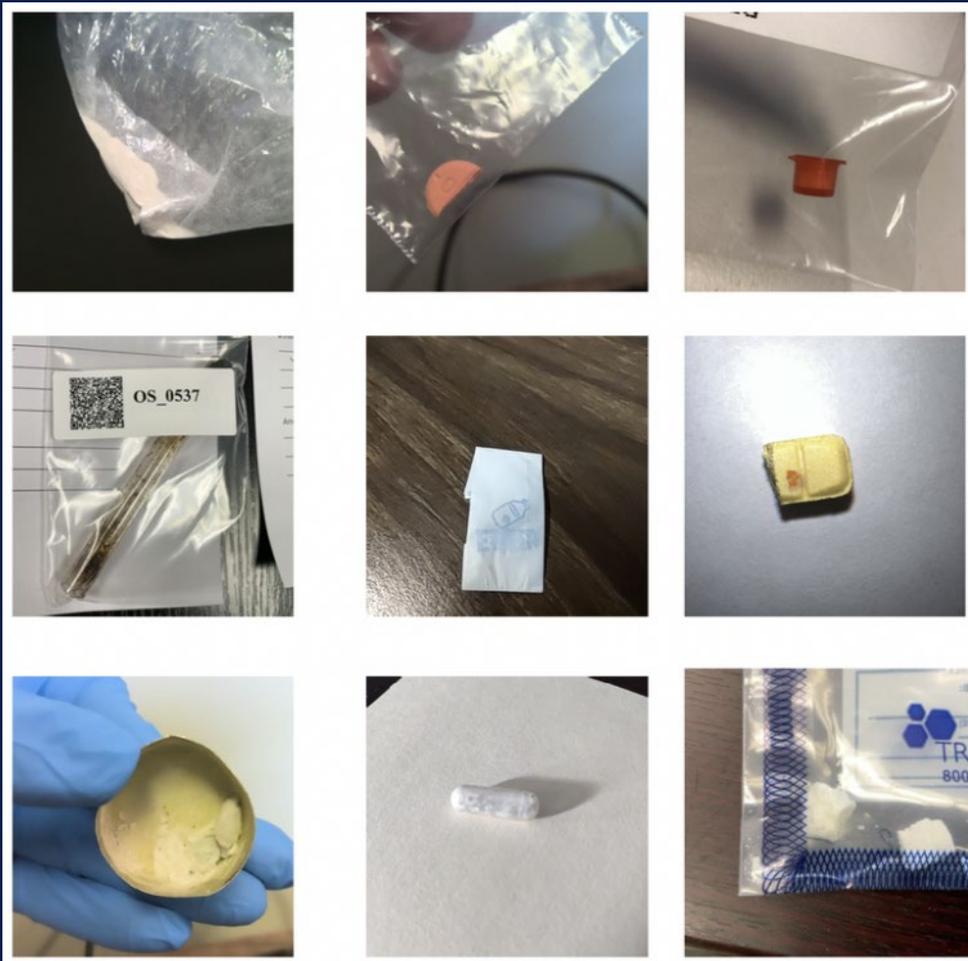
Laboratory analysis



Deliver secondary results w/ harm reduction counseling & safety planning

Criteria & Types of Samples We Test

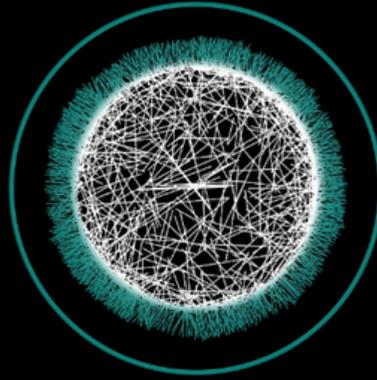
Types of Samples Tested



- Powders
 - Crystals/rocks
 - Pills /capsules
 - Containers
 - Used pipes
 - Bags /wax folds
 - Used cookers
 - Used cottons
 - Plant materials do not test well (cannabis, mushrooms, etc.)
- Good sample size = ~1 grain of rice
 - If testing residue it should be visible to the naked eye

Any used items like containers, baggies, cookers, pipes, etc. should only be used once or with one substance so there's no cross contamination

Do NOT test any biological samples.
Do NOT test syringes or items with visible blood.



STREET CHECK COMMUNITY DRUG CHECKING

[CLICK HERE TO VIEW DRUG RESULTS](#)

StreetCheck is an innovative community-partnered project to develop and standardize sample collection, analysis, and reporting for community drug checking programs. As the street drug supply is unregulated and unpredictable, community drug checking helps people who use drugs better understand what substances are in the drugs they use. The vision of **StreetCheck** streamlines community illicit drug sample collection through a free, web-based platform and app service, speeds up analysis of the samples, and makes it easier to communicate results back. The project began in Massachusetts, connects sites in the Northeast, and welcomes community partners throughout the country.

www.streetcheck.org

[About StreetCheck](#)



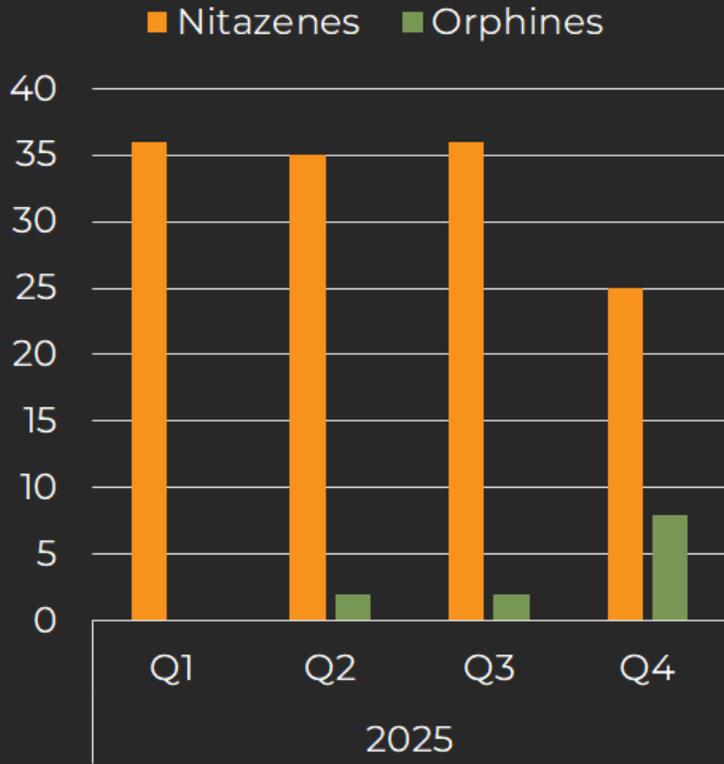
maddsbrandeis@gmail.com

[Have a suggestion for us?](#)

EARLY ORPHINE ANALOGUE TRENDS

Orphines: Benzimidazole-2-ones
Brorphine, Spirochlorphine,
Cychlorphine
"Potent but purposeful"

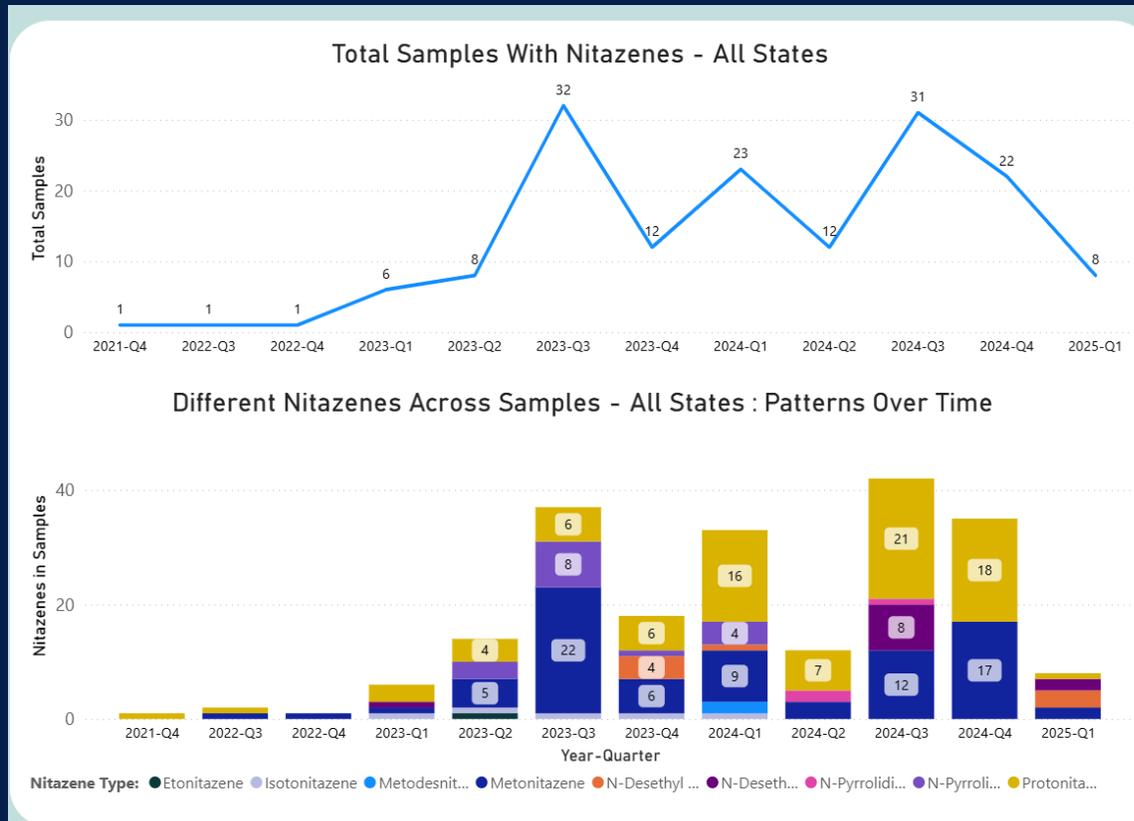
TOXICOLOGY SPECIMENS



Nitazenes

Type of synthetic opioid that ranges in potency

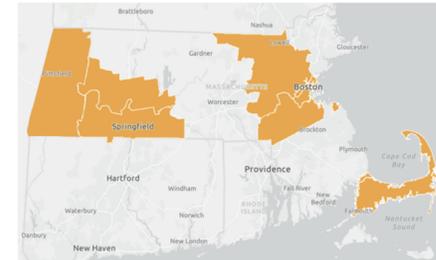
- Can be weaker, similar strength or stronger than fentanyl depending on the type
- Longer duration of action
- Often found in opioids (dope/heroin/fentanyl), mixed with xylazine, medetomidine, or designer benzodiazepine
- Often multiple nitazenes in one sample



Massachusetts Drug Supply Data Stream (MADDS) Public Health Bulletin: Emerging Nitazenes Trend July 2024

Recently, more drug samples tested in Massachusetts have been found to contain trace amounts of nitazenes, including protonitazene, isotonitazene, and metonitazene. Nitazenes are a type of synthetic opioid. Some are weaker than fentanyl, while others can be up to 40 times stronger. These drugs are often mixed with dope, fentanyl, and heroin. It's common to find more than one nitazene in a single sample, like isotonitazene with metonitazene or metonitazene with protonitazene. They are also often found mixed with fentanyl and xylazine. The number of samples tested by MADDS found to contain nitazenes was 6 in 2023 and 17 from January to July 2024 (detected by lab in trace amounts).

Nitazenes by Lab Testing based on County of Drug Sample Origin



Nitazenes are a group of very strong synthetic drugs. They can be much stronger than fentanyl, which means they can be very dangerous, even in small amounts.

Nitazenes have been found in illegal drugs, making them risky because people might not know they're taking them. This map shows places in Massachusetts where we have seen nitazenes in the drug supply recently.

Naloxone can save lives during an overdose. It's very effective, but you might need to give extra doses if the overdose involves nitazenes. Always give naloxone, give rescue breaths, and call 911.

Map shown is based on StreetCheck data from January 2023 to July 2024

Clinical data on nitazenes are limited because these drugs are not approved for human use. However, they are expected to cause typical opioid effects and have a high risk of overdose. People using nitazenes may develop a higher tolerance to opioids and experience more severe and quicker withdrawal symptoms. People describe nitazenes as "hard to smoke," with the vapors having a yellowish tint. People using nitazenes also report rashes, ear ringing, passing out, overdoses, and feeling very sick after using drugs that contain nitazenes.

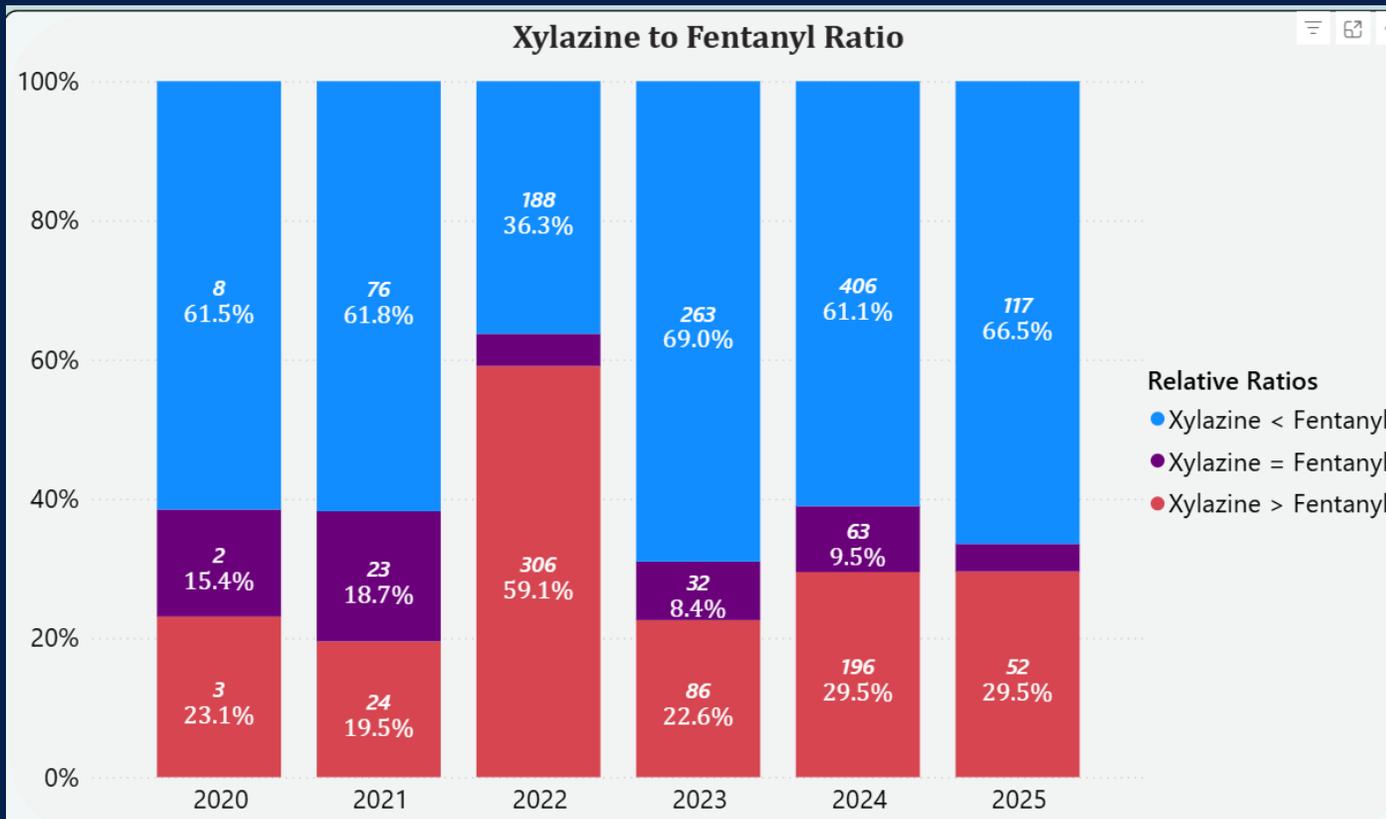
Naloxone (Narcan) can treat nitazene-related overdoses, but you might need to use more doses and do rescue breathing for longer because nitazenes are very strong. Wait 2-3 minutes between each dose of naloxone, and give rescue breaths in between. Always call 911. High dose naloxone (containing >4mg of naloxone per unit) is not recommended. It is better to give smaller doses of naloxone and repeat if needed. There is no evidence that nitazenes are resistant to naloxone.

* All samples were provided by harm reduction programs or donated by police departments for MADDS testing. MADDS is a state-funded collaboration between Brandeis University researchers, the Massachusetts Department of Public Health, various town police departments, and local harm reduction agencies. Contact us at maddbrandeis@gmail.com.



Xylazine

- ◆ After a COVID-era surge of xylazine (a veterinary sedative) added to fentanyl, the amount of xylazine in drug samples also containing fentanyl is decreasing.
- ◆ Cause hard-to-heal xylazine-associated wounds. Suppliers exhibit avoidance tactics.



Lawrence, MA Aug 29, 2025

BTMPS (Tinuvin 770)

UV absorbent, plasticizer: not controlled substance

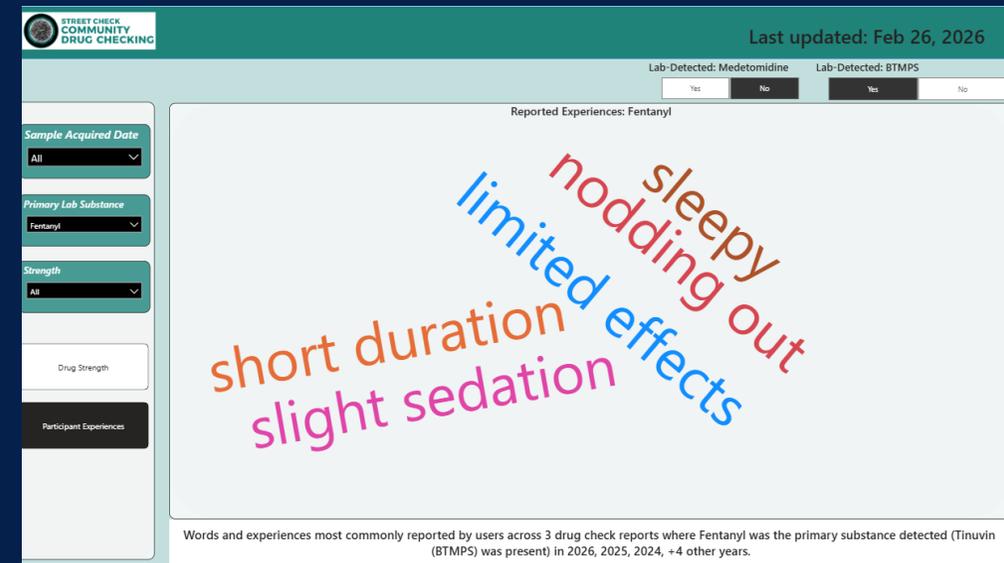
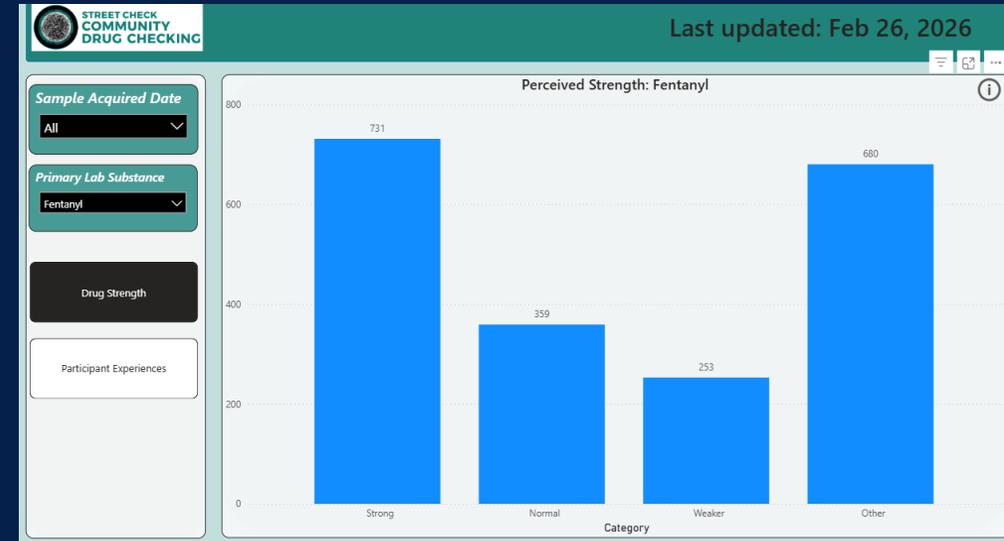
Appeared in dope/heroin/fentanyl samples in summer 2024 in Northeast, earlier (spring 2024) on West Coast

Varying concentrations, from very high proportions of the sample to trace amounts

Not associated with nonfatal or fatal overdose

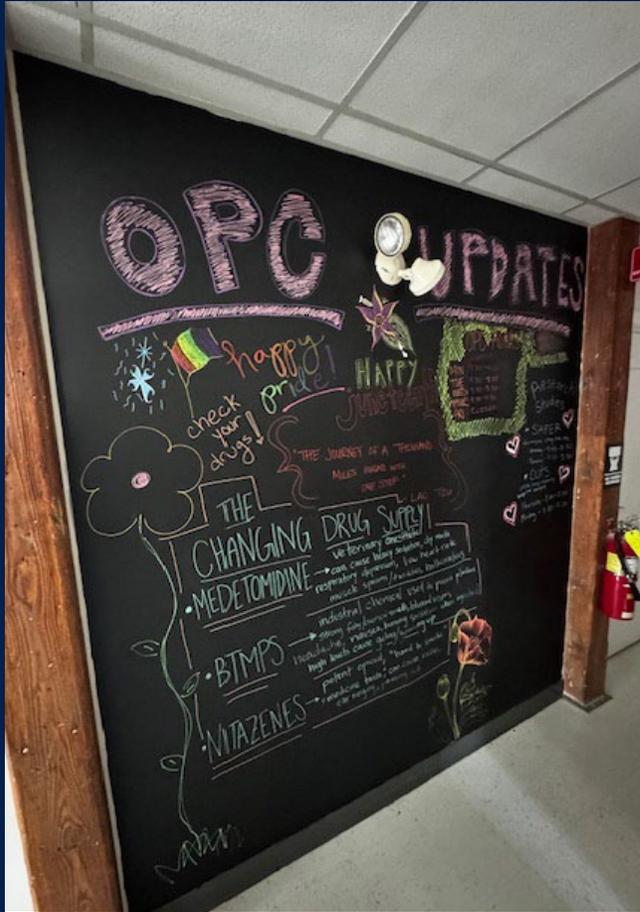
Use experience is negative, “fishy smell”, can gum up and cause irritation at injection site, nasal passages when snorted, lung irritation when smoked

Continues to be found in 25% of fentanyl/heroin/opioid drugs (Feb 2026)



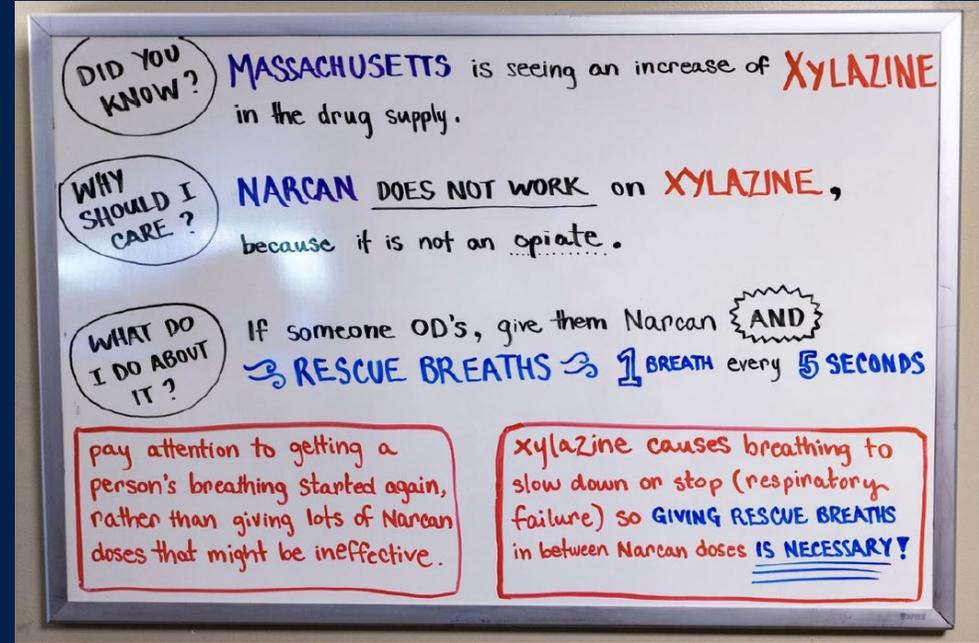
Actionable Awareness

Overdose prevention site, RI



PLEASE BE ADVISED:
THERE HAS BEEN AN INCREASE IN FATAL OVERDOSES IN THE PROVIDENCE/PAWTUCKET AREA. THESE OVERDOSES ARE BEING ATTRIBUTED TO AN INCREASE IN "TAINTED" ILLICIT PILLS. PLEASE SPEAK TO YOUR COUNSELOR AND/OR NURSING PERSONNEL TO DISCUSS HOW YOU CAN STAY SAFE.

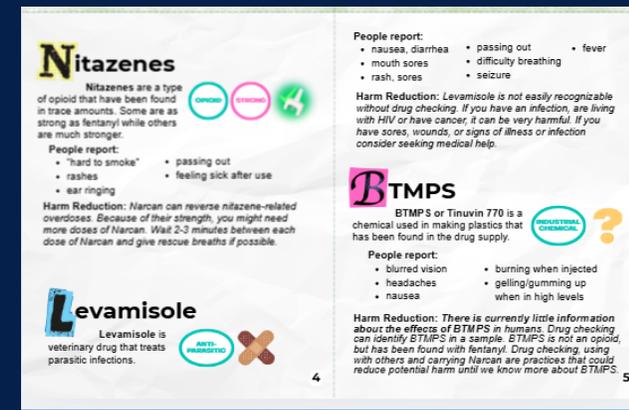
Mobile methadone van, RI



Harm reduction program, MA



Zine at Drop-in, RI



Supply Changes Influence Use

- ◆ Inconsistency in purity and potency influences:
 - ◆ Withdrawal & tolerance
 - ◆ Overdose risk
 - ◆ Combining behaviors of people who **use** drugs
 - ◆ Combining/cutting behaviors of people who **sell** drugs
- ◆ Smoking of higher potency opioids, pill form
- ◆ Learning from past mistakes: pill form vs. powder reduce contamination risks and increase consistency (purity)
- ◆ Pill batch variability remains problematic (potency)

In the U.S., the leading route of drug use involved in overdose deaths changed from injection to smoking*



Consider enhancing harm reduction services to reach people who use drugs by smoking

Provide naloxone and fentanyl test strips

Conduct peer outreach

Emphasize risk of overdose when drugs are smoked



*CDC's State Unintentional Drug Overdose Reporting System (SUDORS)

bit.ly/mm7306a4

FEBRUARY 15, 2024

MMWR

Source: Tanz LJ, Gladden RM, Dinwiddie AT, et al. Routes of Drug Use Among Drug Overdose Deaths – United States, 2020–2022. MMWR Morb Mortal Wkly Rep 2024;73:124–130. DOI: <http://dx.doi.org/10.15585/mmwr.mm7306a2>



Changes to Routes of Administration

While patterns of smoking and snorting of drugs and transitions to injection were typical, new patterns were also observed.

Reverse Transition

Injection



Sniffing or
smoking

Health risks & outcomes
(e.g., skin infections,
reducing overdose risk)

I tried the other way [injecting] and it wasn't really my thing. Just kind of, it was like 'ugh'. I see a lot of people how they break out in sores and... abscesses and stuff like that. So, I was like, I'll just keep sniffing. – Hispanic/Latine man, Western MA

...so I know you can still OD from snorting or something, but it doesn't hit your system as fast. And so in my head, I'm thinking at least if I'm not shooting, I'm kind of lessening my chances of ODing, if that makes sense. – White woman, Southeastern MA

Summary

Drug overdose mortality is declining, likely due to intertwined structural and supply related factors

- Western areas, older people who use drugs continue to see high overdoses
- Young people have increased risk of overdose due to infrequent use and high potency substances
- Racial and ethnic disparities in drug and overdose persist

Emerging substances to watch out for include unexpected additives like metedomidine and BTMPS and novel substances like nitazenes and -orphines

Supply changes are a synthetic era reality. Polysubstance use occurs whether intended or not.

Community drug checking can be helpful for clinical care and prevention. Support its growth and look to these data for rich insights.

Thank you!

For questions, contact

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References

1. Jalal H, Buchanich JM, Roberts MS, Balmert LC, Zhang K, Burke DS. Changing dynamics of the drug overdose epidemic in the United States from 1979 through 2016. *Science*. 2018;361(6408):eaau1184. doi:10.1126/science.aau1184
2. Friedman, Joseph & Palamar, Joseph & Ciccarone, Daniel & Gaines, Tommi & Borquez, Annick & Shover, Chelsea & Strathdee, Steffanie. (2025). Characterizing Declines in US Overdose Deaths Compared to Exponential Predictions. 10.1101/2025.10.24.25338732.
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