DRUG ENFORCEMENT ADMINISTRATION

**Office of Forensic Sciences**

Special Testing and Research Laboratory

# Annual Fentanyl Report

## CY 2023

**UNCLASSIFIED PRB# 2025-017**

This report was prepared by the DEA Special Testing and Research Laboratory (SFL1) of the Office of Forensic Sciences. Requests for copies and feedback are welcome and may be directed to the laboratory at SFL1.Administration@dea.gov.

## Summary

The United States Drug Enforcement Administration (DEA) Office of Forensic Sciences laboratory system is comprised of ten regional laboratories distributed across the United States. Domestic fentanyl seizures are identified and quantitated in the laboratory system's regional laboratories. The information provided on the following pages summarizes the collective results of fentanyl samples analyzed in these laboratories for CY 2023.

A select number of domestically seized fentanyl samples are submitted to DEA's Fentanyl Profiling Program (FPP) to provide scientific data and intelligence information on illicit fentanyl. DEA's regional laboratories routinely submit samples from domestic seizures to the FPP. In addition, samples from foreign sources are also submitted. Submissions to the FPP are analyzed for purity, adulteration and dilution, and classified to a synthetic route. FPP findings provide a snapshot of current fentanyl quality and trafficking trends but may not reflect the domestic or global illicit fentanyl supply in its entirety.

FPP data presented in this report summarizes the collective results of wholesale fentanyl samples seized in the United States (U.S.) during CY 2023. Domestic and foreign fentanyl trends observed by the FPP over the last five years are also discussed throughout this report.

Results presented in this report are subject to change as they only account for the information available at the time of extraction from DEA laboratory databases.

### Inside this issue:



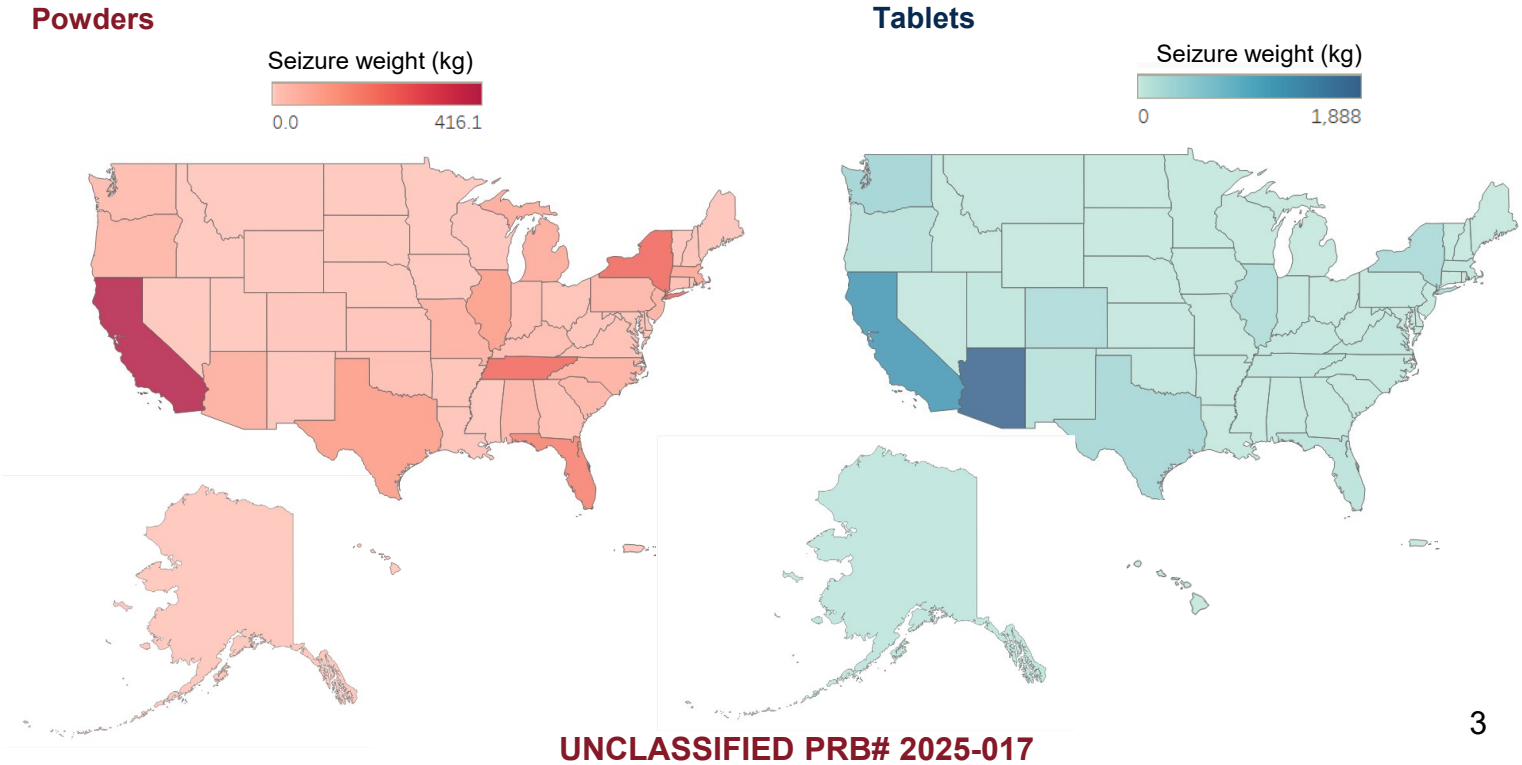
*2 mg fentanyl on pencil tip*

*"Rainbow" fentanyl tablets*

## Key Findings

- In CY 2023, **13,164 fentanyl exhibits** were submitted to regional laboratories representing **6,902 kg**.
- Fentanyl was identified as the primary drug in **26.8**% of all the drug evidence submitted to regional laboratories.
- The average purity of fentanyl powder samples analyzed by DEA's regional laboratories was **19.7%.** The average purity of fentanyl tablet samples analyzed by DEA's regional laboratories was **2.4 mg/tablet.**
- Fentanyl presented in crystalline, powder and/or rock-like form **accounted for 54%** of exhibits analyzed by the laboratory system, while fentanyl presented in tablet form **accounted for 41%** of exhibits.
- The Gupta method using a borohydride reducing agent was the primary synthetic route used in the synthesis of fentanyl samples examined by the FPP this reporting period
- There was an increase in the use of t-BOC protected precursors observed by the FPP in CY 2023
- The average fentanyl powder purity for domestic samples analyzed by FPP was **33.5%** with a range of 0.3% to 86.8%. The average tablet contained **2.3 mg/tablet** of fentanyl with a range of 0.1 to 7.0 mg per tablet
- Three hundred twenty six (67%) of the tablet samples examined by FPP contained at least 2 mg of fentanyl.

**Figure 1.** DEA Laboratory System Fentanyl Reporting Maps



## Domestic Submissions

In CY 2023, 6,902 kilograms of fentanyl were analyzed by regional laboratories. The table below summarizes fentanyl exhibits analyzed by state. This data was compiled from DEA's Advanced Information on Drugs Dashboard 2.0 (AIDD).

### Powders

| State | Number of Exhibits | Net Weight (kg) |
|---|---|---|
| AL | 96 | 47.1 |
| AK | 18 | 3.7 |
| AZ | 67 | 66.0 |
| AR | 73 | 13.5 |
| CA | 657 | 416.1 |
| CO | 27 | 8.6 |
| CT | 301 | 28.4 |
| DE | 78 | 12.3 |
| DC | 179 | 4.6 |
| FL | 751 | 167.2 |
| GA | 154 | 25.5 |
| HI | 23 | 3.4 |
| ID | 3 | 0.03 |
| IL | 229 | 107.1 |
| IN | 139 | 30.9 |
| IA | 15 | 0.5 |
| KS | 8 | 11.9 |
| KY | 209 | 31.4 |
| LA | 54 | 11.7 |
| ME | 71 | 8.4 |
| MD | 129 | 14.6 |
| MA | 339 | 84.3 |
| MI | 167 | 74.3 |
| MN | 2 | 0.04 |
| MS | 33 | 3.6 |
| MO | 413 | 60.3 |
| MT | 38 | 1.4 |
| NE | 15 | 0.1 |
| NV | 19 | 1.7 |
| NH | 119 | 13.6 |
| NJ | 255 | 60.0 |
| NM | 9 | 5.1 |
| NY | 498 | 227.7 |
| NC | 296 | 59.9 |
| ND | 4 | 0.1 |
| OH | 158 | 14.0 |
| OK | 115 | 27.0 |
| OR | 109 | 50.1 |
| PA | 293 | 48.6 |
| PR | 95 | 6.9 |
| RI | 49 | 16.9 |
| SC | 88 | 48.0 |
| SD | 1 | 0.01 |
| TN | 219 | 223.2 |
| TX | 215 | 109.2 |
| UT | 1 | 0.01 |
| VT | 62 | 2.6 |
| VA | 127 | 23.1 |
| WA | 146 | 35.6 |
| WV | 459 | 12.3 |
| WI | 112 | 7.0 |

### Tablets

| State | Number of Exhibits | Net Weight (kg) |
|---|---|---|
| AL | 68 | 9.2 |
| AK | 87 | 47.8 |
| AZ | 428 | 1888.2 |
| AR | 93 | 18.3 |
| CA | 687 | 1204.8 |
| CO | 237 | 196.3 |
| CT | 27 | 2.8 |
| DE | 9 | 0.1 |
| DC | 33 | 2.7 |
| FL | 215 | 77.0 |
| GA | 65 | 8.6 |
| HI | 16 | 2.0 |
| ID | 15 | 2.4 |
| IL | 119 | 174.1 |
| IN | 128 | 27.4 |
| IA | 22 | 6.5 |
| KS | 47 | 20.5 |
| KY | 99 | 29.6 |
| LA | 23 | 0.8 |
| ME | 4 | 0.2 |
| MD | 46 | 6.2 |
| MA | 158 | 49.7 |
| MI | 20 | 4.3 |
| MN | 18 | 11.4 |
| MS | 43 | 5.2 |
| MO | 64 | 4.4 |
| MT | 241 | 16.6 |
| NE | 28 | 3.4 |
| NV | 93 | 15.9 |
| NH | 17 | 0.4 |
| NJ | 20 | 8.3 |
| NM | 255 | 115.6 |
| NY | 283 | 218.3 |
| NC | 81 | 13.1 |
| ND | 24 | 4.4 |
| OH | 46 | 6.4 |
| OK | 102 | 45.7 |
| OR | 171 | 112.5 |
| PA | 63 | 27.5 |
| PR | 15 | 3.2 |
| RI | 17 | 4.3 |
| SC | 30 | 4.5 |
| SD | 0 | 0 |
| TN | 151 | 48.7 |
| TX | 823 | 267.8 |
| UT | 63 | 42.7 |
| VT | 2 | 0.004 |
| VA | 135 | 43.0 |
| WA | 431 | 305.5 |
| WV | 39 | 2.7 |
| WI | 51 | 5.9 |
| WY | 5 | 2.2 |
| US VI | 1 | 0.1 |

## Domestic Submissions

**Crystalline, powder and rock-like exhibits accounted for 54% of exhibits analyzed in 2023. Tablet exhibits were 41% of analyzed exhibits. Approximately 1% of exhibits were gum-like or resin and less than 1% of exhibits were liquid.**

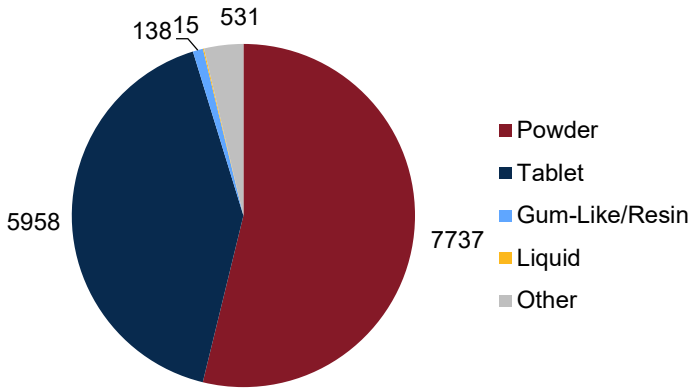



**Figure 3:** Substances Commonly Reported in Powder Exhibits

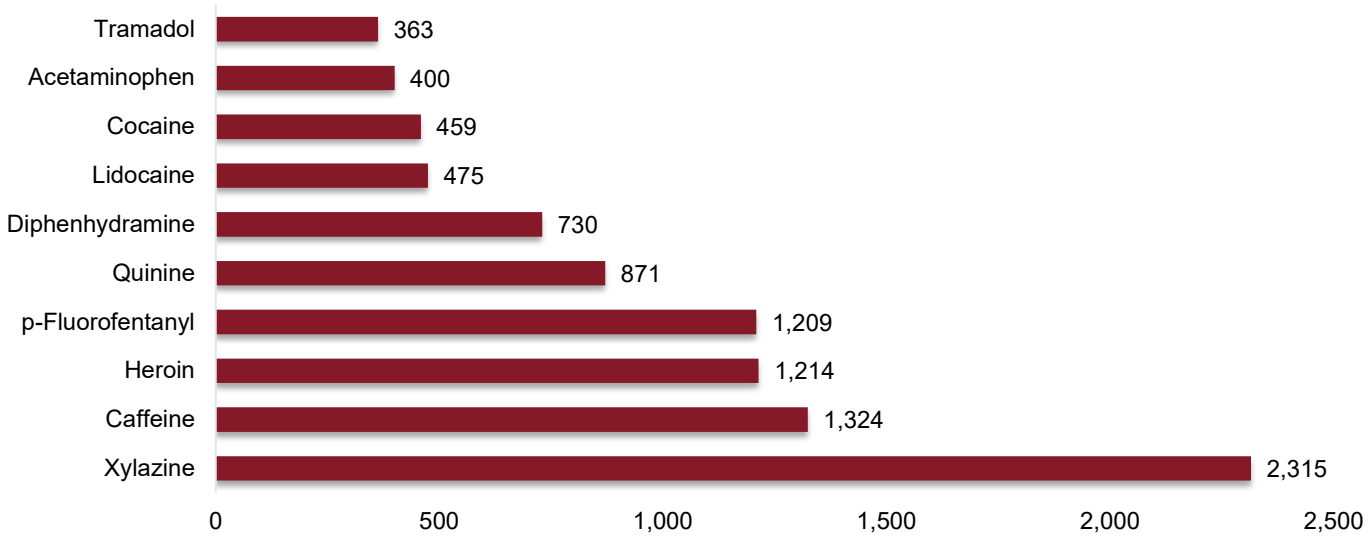
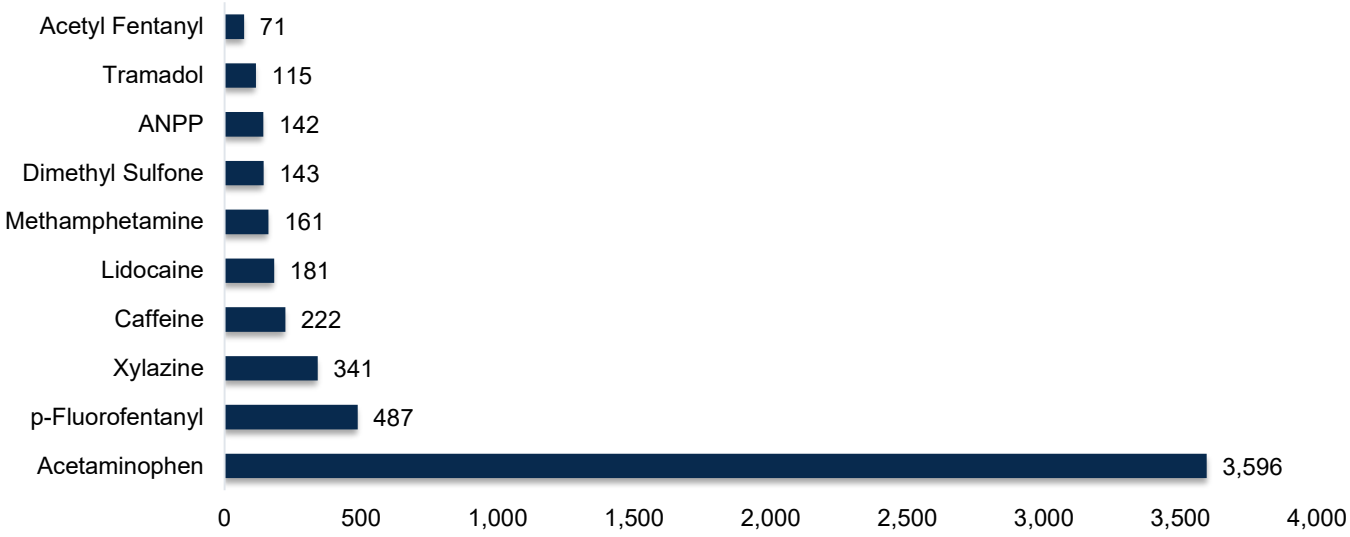



**Figure 4:** Substances Commonly Reported in Tablet Exhibits




*This data was compiled from AIDD. The data represents drug evidence seized and analyzed by the DEA regional laboratories in CY 2023.*

## Chemical Analysis Trends

**Figure 5:** Regional Lab Purity and Seizure Trends (powdered forms)

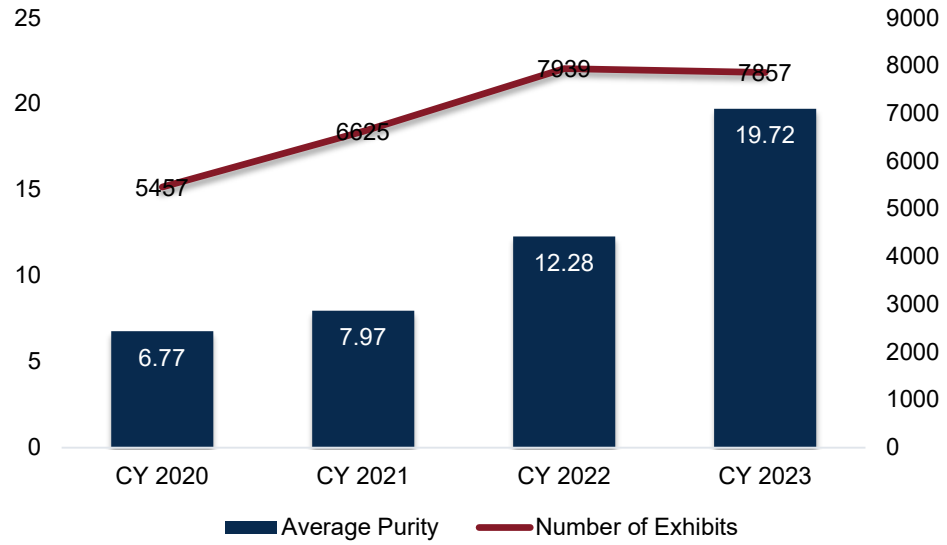
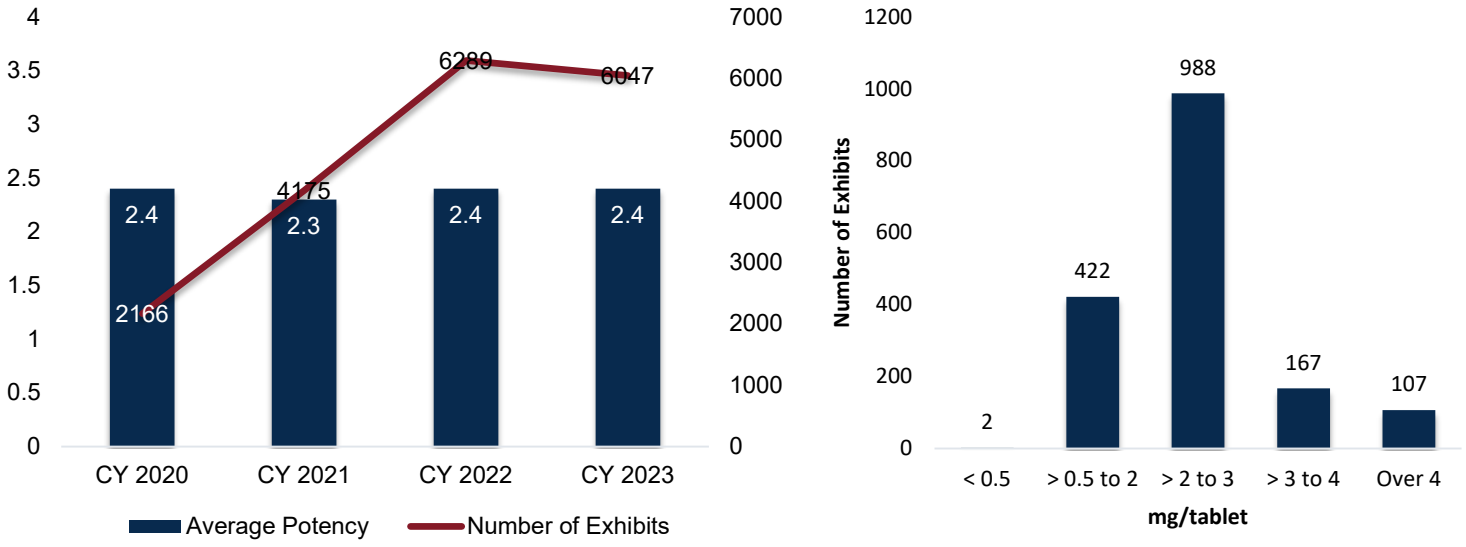



**Figure 6:** Regional Lab Potency and Seizure Trends (tablet forms)

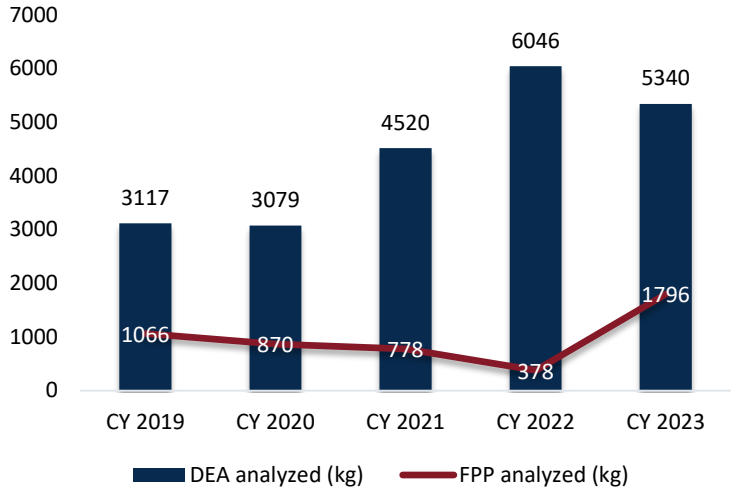



*This data was compiled from AIDD. The data represents drug evidence seized and analyzed by the DEA regional laboratories in CY 2023.*

## Domestic Submissions

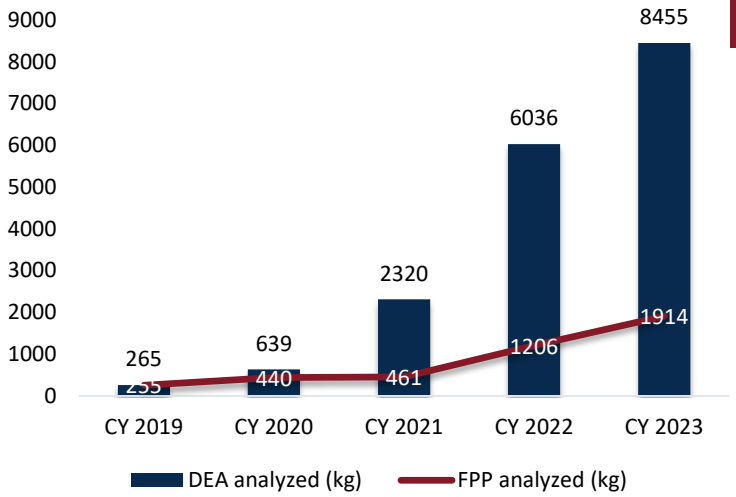
In each of the last 4 years, FPP analyzed samples from U.S. seizures totaling between 378 – 1796 kg for powders and 255 – 1914 kg for tablets. This is 6 – 35 % (powders) and 20 – 96% (tablets) of all samples analyzed by the DEA laboratory system during the same reporting period.

**Fentanyl Powder Samples Analyzed by DEA Laboratory System and FPP (kg)**




*Internal DEA laboratory system data extracted 08/02/2024*

**Fentanyl Tablet Samples Analyzed by DEA Laboratory System and FPP (kg)**

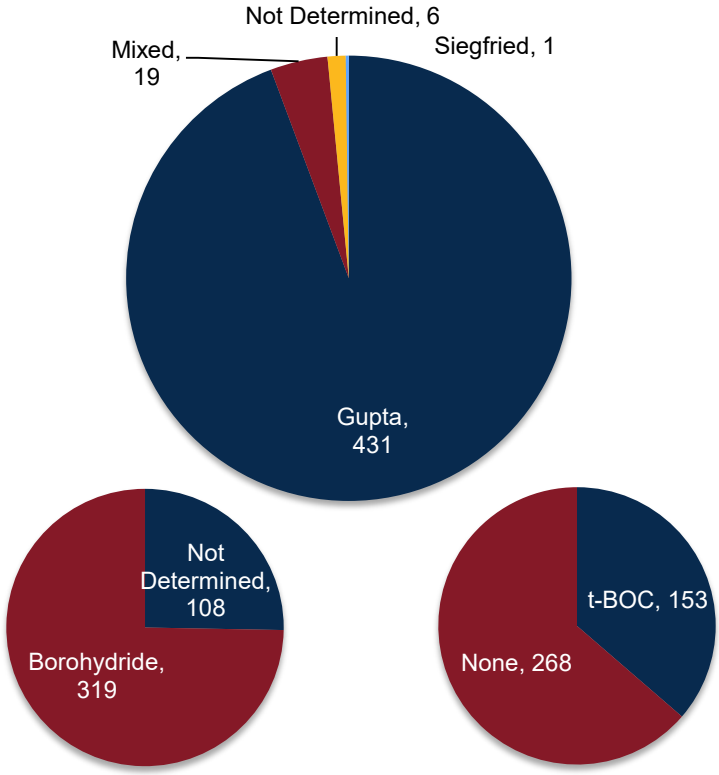



*Internal DEA laboratory system data extracted 08/02/2024*

## Domestic Results and Trends

### Synthetic Route Classification – Powders

Four hundred fifty eight samples representing more than 1796 kg of fentanyl powder were examined. Approximately 94% of the fentanyl powder samples analyzed by the FPP were synthesized using the Gupta patent method or a modified Gupta method. Of the Gupta-related samples, approximately 74% of the samples indicated the use of a borohydride as the reducing agent in the reaction. Approximately 36% of the samples indicated the use of a t-BOC protected precursor chemical. Approximately 4% of the fentanyl powder samples analyzed by the FPP were determined to have a mixed route, meaning the samples showed characteristics of more than one synthetic route. For less than 1% of the fentanyl powder samples analyzed by the FPP, the route could not be determined. This typically occurs when there is insufficient sample for analysis or the sample does not contain sufficient impurities for classification. One sample was determined to have been synthesized via the Siegfried route.

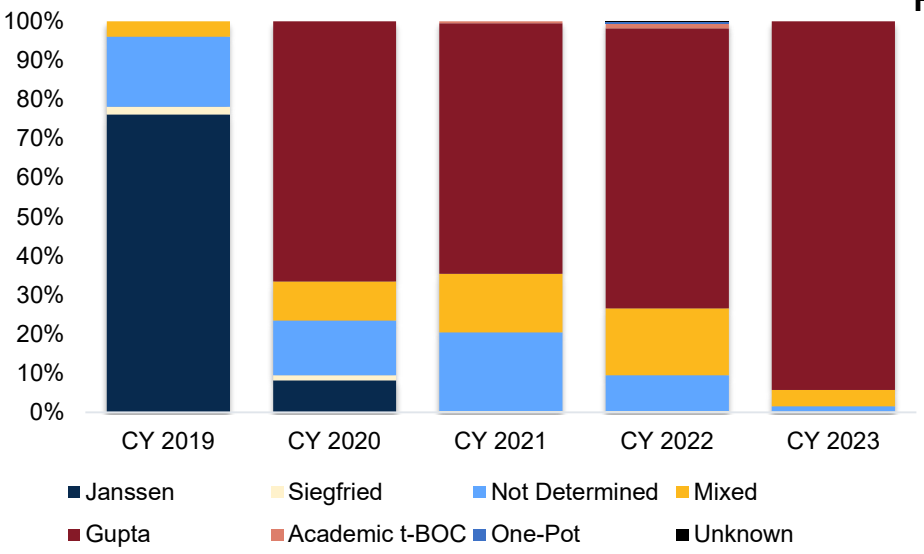



*Precursor chemicals associated with the various routes are included on page 15*

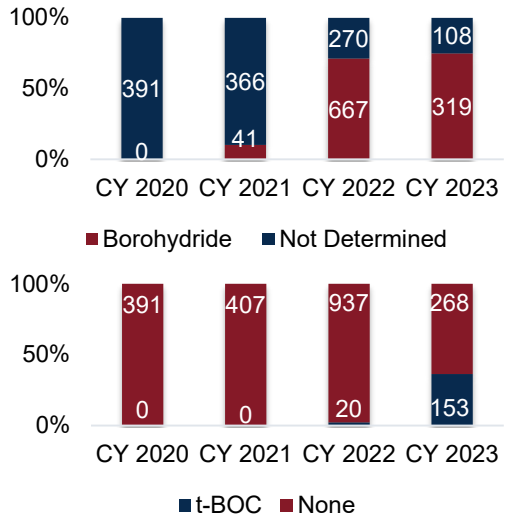
## Synthetic Route Classification – Powders, continued

The primary synthetic route employed in the synthesis of illicit fentanyl powder has changed since CY 2019. In CY 2019, the Janssen route was the primary synthetic route identified by the FPP. The following year, the Gupta patent method became the most prevalent synthetic route. Since CY 2022, a modified version of the Gupta method using a borohydride as the reducing agent has become the predominant method used in the synthesis of illicit fentanyl powder. An increase in the use of t-BOC protected precursors was noted in CY 2023.

**Synthetic Route of Fentanyl Powders: U.S. Seized FPP Samples (CY 2019 – 2023)**

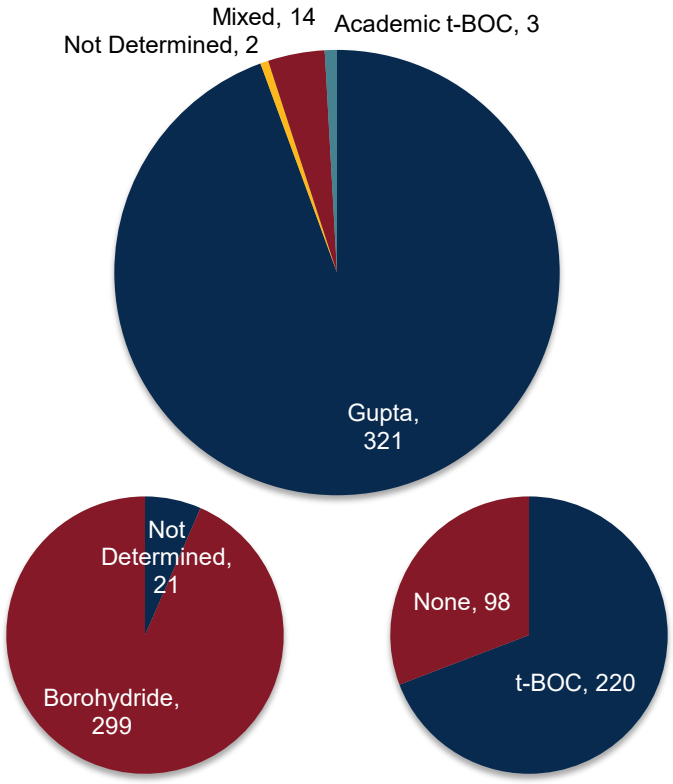



**Use of Borohydride Reducing Agents and t-BOC Protected Precursors: U.S. Seized FPP Powder Samples (CY 2020 – 2023)**




## Synthetic Route Classification – Tablets

Three hundred forty samples representing more than 1914 kg were examined. Approximately 94% of the fentanyl tablet samples analyzed by the FPP were synthesized using the Gupta patent method or a modified Gupta method . Of the Gupta-related samples, approximately 88% of the samples indicated the use of a borohydride as the reducing agent in the reaction. Approximately 65% of the samples indicated the use of a t-BOC protected precursor chemical. Approximately 4% of the fentanyl powder samples analyzed by the FPP were determined to have a mixed route, meaning the samples showed characteristics of more than one synthetic route. For approximately 0.6% of the fentanyl powder samples analyzed by the FPP, the route could not be determined. This typically occurs when there is insufficient sample for analysis or the sample does not contain sufficient impurities for classification.

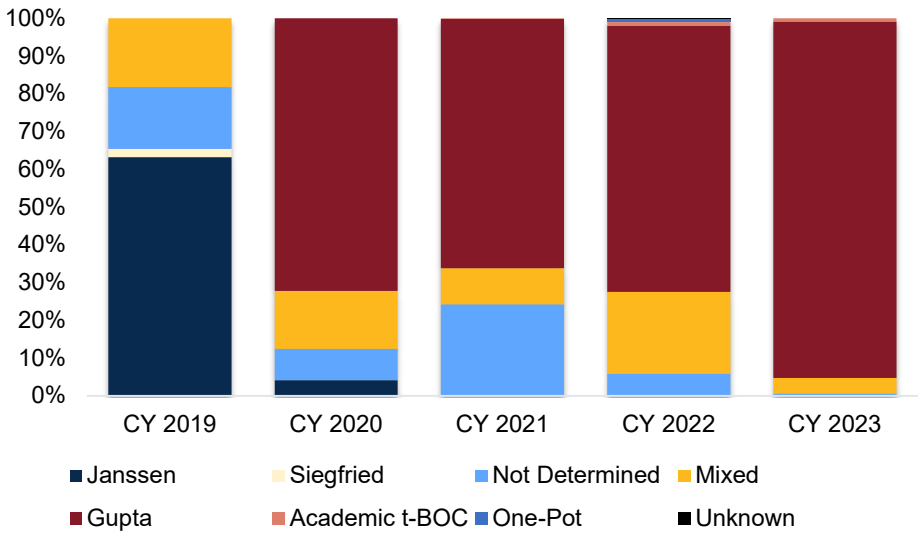



*Precursor chemicals associated with the various routes are included on page 15*

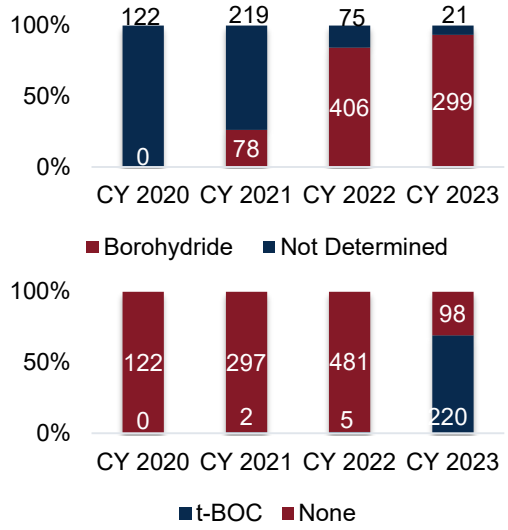
## Synthetic Route Classification – Tablets, continued

The primary synthetic route employed in the synthesis of illicit fentanyl tablets has changed since CY 2019. In CY 2019, the Janssen route was the primary synthetic route identified by the FPP. The following year, the Gupta patent method became the most prevalent synthetic route. Since CY 2022, a modified version of the Gupta method using a borohydride as the reducing agent has become the predominant method used in the synthesis of illicit fentanyl used in tablets. An increase in the use of t-BOC protected precursors was noted in CY 2023.

**Synthetic Route of Fentanyl Tablets: U.S. Seized FPP Samples (CY 2019 – 2023)**



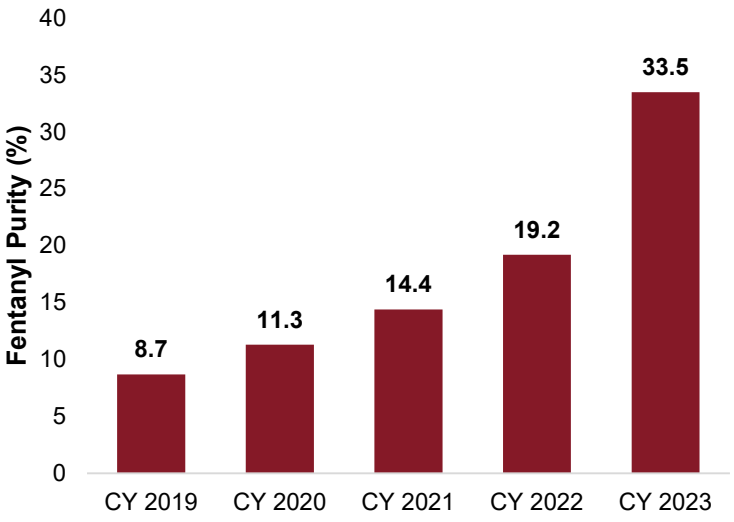

**Use of Borohydride Reducing Agents and t-BOC Protected Precursors: U.S. Seized FPP Tablet Samples (CY 2020 – 2023)**




## Purity and Adulterants/Diluents – Powders

The average fentanyl purity was 33.5% with a range of 0.3% to 86.8%. This is a significant increase from CY 2022 when the average purity was 19.2%, though this higher average purity could be due to changes in the sampling plan made part way through CY 2022. No samples had purities exceeding 90%. When determined, most samples were fentanyl HCl; one sample had a citrate salt form. The salt form could not be determined for three exhibits due to low fentanyl concentration.

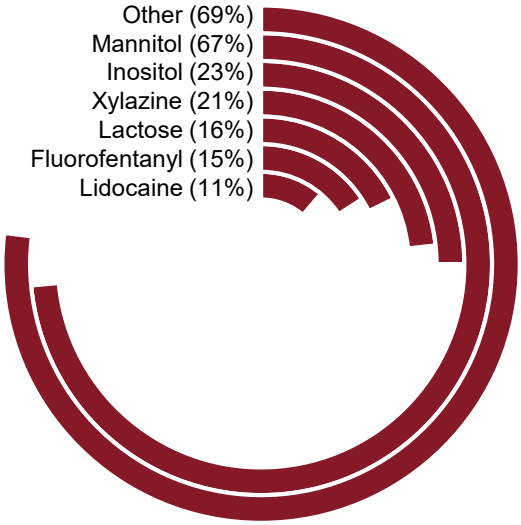
The significant increase in purity in CY 2023 is likely due to a change in the FPP sampling plan, which changed to focus more on wholesale level seizures. These larger seizures generally have a higher purity as they are not yet significantly adulterated domestically.



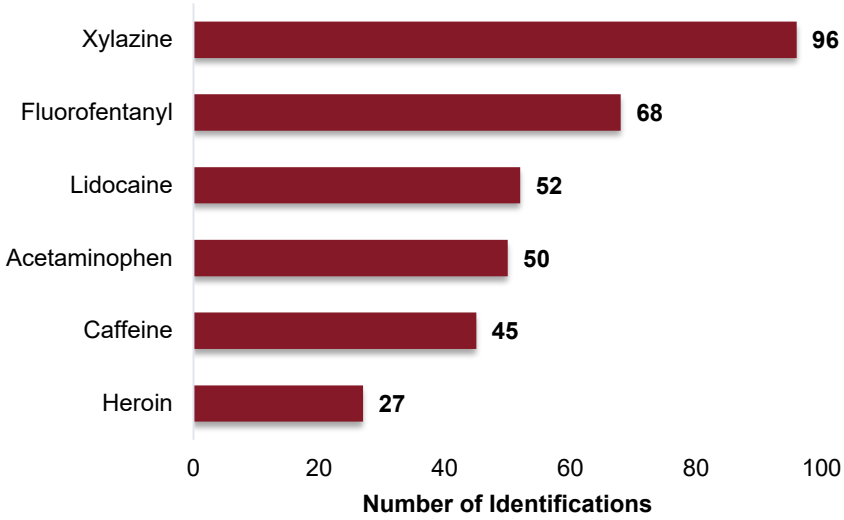
## Purity and Adulterants/Diluents – Powders, continued

The top substances reported with fentanyl in powders are various sugars. The prevalence of sugars has changed slightly since CY 2021 with a decline in the number of inositol and lactose identifications.

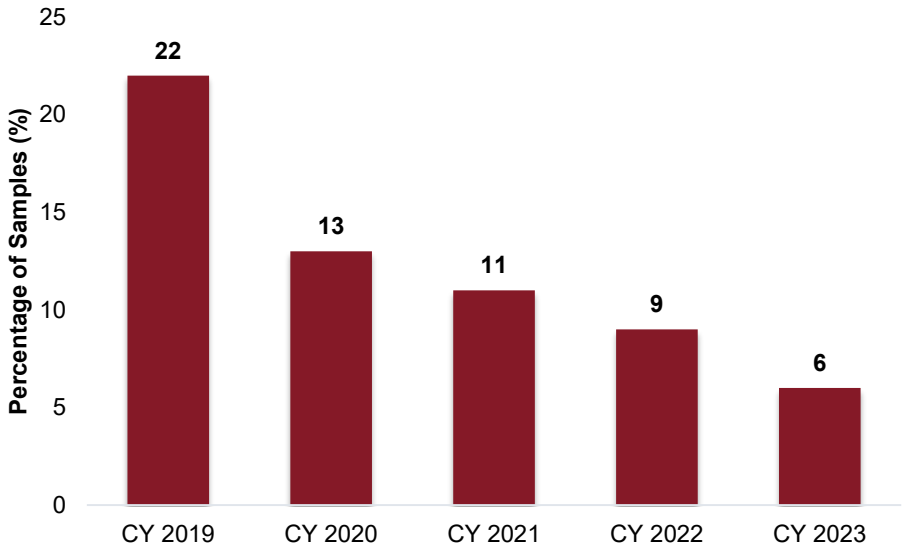
Substances falling into the “other” category include caffeine, tramadol, and heroin, among others.




Xylazine co-identifications increased from 14% in CY 2021 to 21% in CY 2023. There was a small decrease in fluorofentanyl identifications from its presence in 18% of fentanyl powder samples analyzed by FPP in CY 2022 to 15% of samples in CY 2023.




Since CY 2019, the FPP has seen a significant decrease in the co-identifications of fentanyl and heroin.

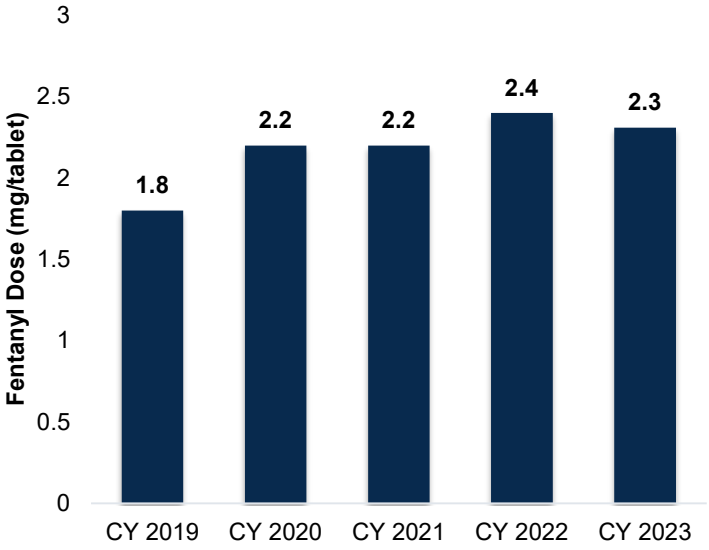


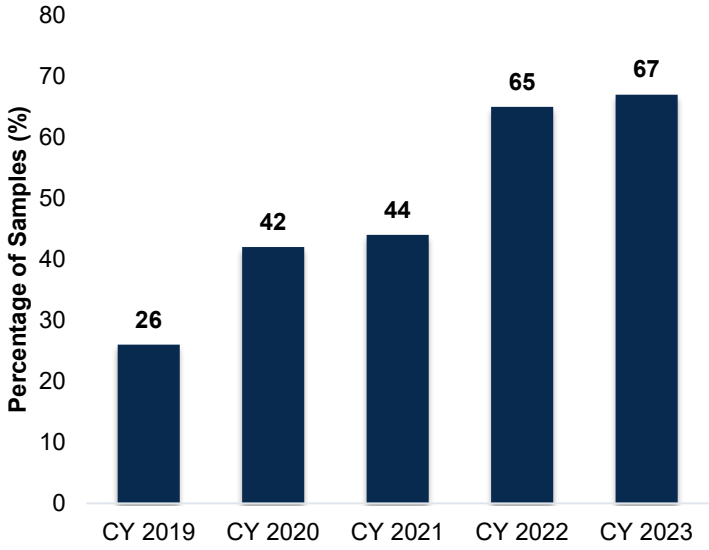
## Purity and Adulterants/Diluents – Tablets

The average tablet contained 2.3 mg of fentanyl with a range of 0.1 to 7.0 mg/tablet. When determined, exhibits were fentanyl HCl. The salt form was not determined in 5 exhibits due to low fentanyl concentration. The average fentanyl tablet contains 0.5 mg more fentanyl per tablet in CY 2023 than it did in CY 2019.

### Tablets Containing at Least 2 mg of Fentanyl

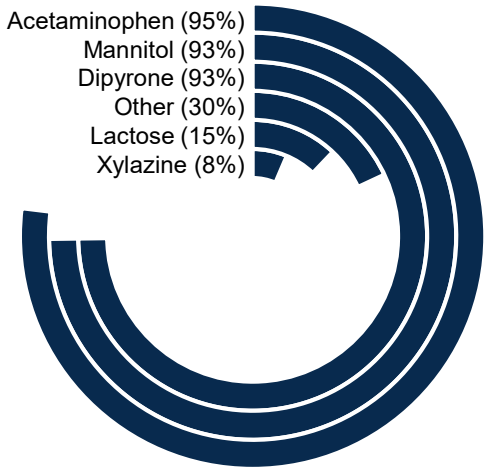
A lethal dose of fentanyl is postulated to be approximately 2 mg (0.002 grams)[1]; however in opioid-naïve users, a much lower amount of fentanyl could result in serious adverse effects, including death. Three hundred twenty six of the tablet exhibits quantitated (67%) contained at least 2 mg of fentanyl. Since CY 2019, a greater percentage of tablets analyzed by the FPP contain at least 2 mg of fentanyl.




Consistent with previous years, acetaminophen, dipyrone, and mannitol are the most common adulterants and diluents observed in fentanyl tablets analyzed by the FPP.

Substances falling into the “other” category include fluorofentanyl, lidocaine, and caffeine, among others.



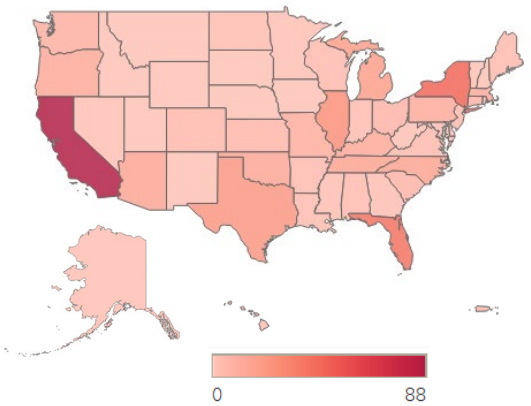

[1] www.euda.europa.eu/publications/drug-profiles/fentanyl_en

## CONUS Seizures – Powders

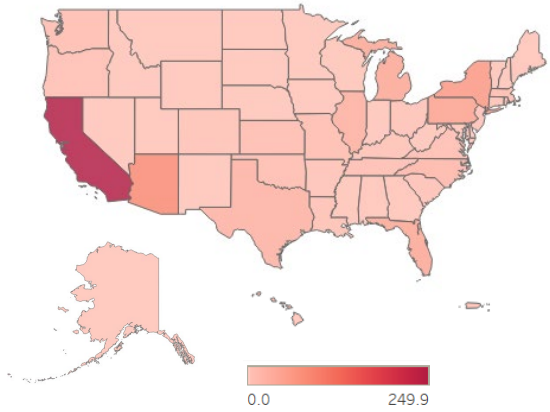
The following table and map summarize the number of powder samples submitted to the FPP, total kg seized, and purity by state.

| State | Total Samples | Total Seized (kg) | Average Fentanyl Purity (%) | Min. Fentanyl Purity (%) | Max. Fentanyl Purity (%) |
|---|---|---|---|---|---|
| AK | 1 | 1.0 | 30.5 | - | - |
| AL | 4 | 2.2 | 28.7 | 24.0 | 41.0 |
| AR | 4 | 5.0 | 33.1 | 30.4 | 38.3 |
| AZ | 15 | 84.6 | 48.7 | 2.0 | 80.1 |
| CA | 88 | 249.9 | 33.6 | 1.0 | 85.4 |
| CO | 5 | 6.2 | 12.7 | 0.4 | 28.7 |
| CT | 7 | 7.9 | 30.6 | 5.1 | 73.2 |
| FL | 40 | 42.8 | 33.2 | 0.5 | 77.3 |
| GA | 2 | 2.0 | 30.6 | 20.7 | 40.5 |
| IL | 26 | 31.8 | 36.2 | 3.5 | 82.4 |
| IN | 3 | 0.0 | 2.6 | - | - |
| KS | 6 | 14.0 | 3.3 | 1.4 | 11.4 |
| KY | 13 | 6.0 | 25.6 | 5.6 | 74.4 |
| LA | 3 | 7.3 | 20.0 | 2.7 | 51.3 |
| MA | 13 | 14.1 | 17.4 | 0.9 | 48.7 |
| MD | 2 | 1.0 | 14.5 | 6.3 | 22.4 |
| ME | 4 | 2.2 | 3.3 | - | - |
| MI | 19 | 42.5 | 49.9 | 2.4 | 71.6 |
| MN | 1 | 1.0 | 48.3 | - | - |
| MO | 11 | 13.8 | 44.9 | 7.4 | 79.9 |
| MS | 2 | 1.3 | 21.6 | 9.0 | 34.2 |
| NC | 16 | 22.0 | 25.6 | 10.4 | 56.1 |
| ND | 3 | 0.0 | 24.6 | 18.9 | 27.9 |
| NJ | 4 | 4.3 | 37.2 | 28.0 | 61.9 |
| NV | 1 | 1.0 | 66.0 | - | - |
| NY | 46 | 63.3 | 37.0 | 2.9 | 75.3 |
| OH | 7 | 5.8 | 10.2 | 2.1 | 16.6 |
| OK | 14 | 13.9 | 45.5 | 13.5 | 86.9 |
| OR | 13 | 9.7 | 20.9 | 3.0 | 38.4 |
| PA | 12 | 50.7 | 43.1 | 12.8 | 69.5 |
| PR | 3 | 3.3 | 40.1 | 22.7 | 63.1 |
| RI | 2 | 4.6 | 59.3 | 55.4 | 63.3 |
| SC | 7 | 7.1 | 42.1 | 5.8 | 76.9 |
| TN | 16 | 11.7 | 22.7 | 5.5 | 43.4 |
| TX | 22 | 27.1 | 33.6 | 0.6 | 82.5 |
| VA | 4 | 11.8 | 25.5 | 12.2 | 37.7 |
| WA | 10 | 12.8 | 38.4 | 14.9 | 50.7 |
| WI | 4 | 1.2 | 13.0 | 4.5 | 37.3 |
| WV | 1 | 0.2 | 10.5 | - | - |

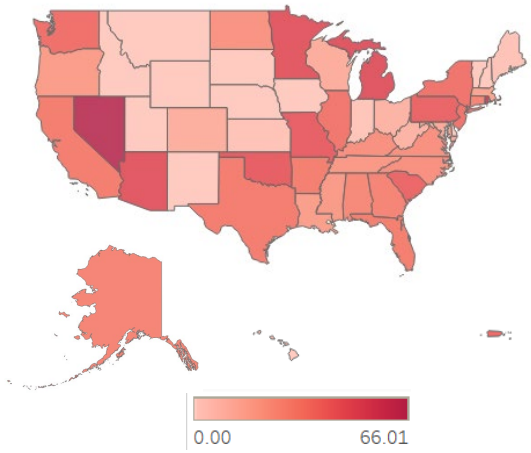
**States With Fentanyl Powder Seizures—CY 2023**




**Net Weight of Fentanyl Powder Seizures by State—CY 2023**




**Average Fentanyl Powder Purity by State—CY 2023**

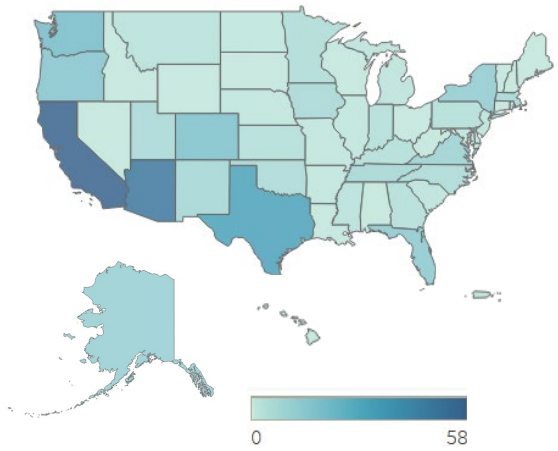


## CONUS Seizures – Tablets

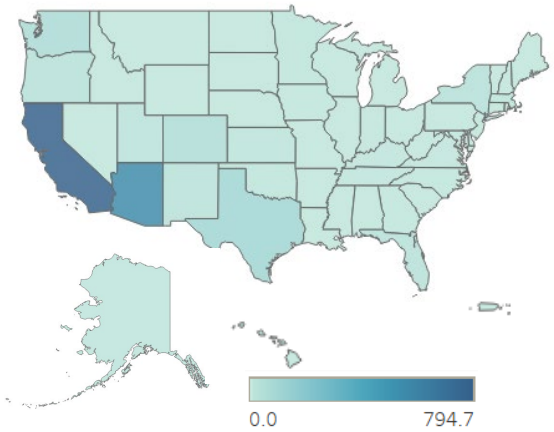
The following table and map summarize the number of tablet samples submitted to the FPP, total kg seized, and purity by state.

| State | Total Seizures | Total Seized (kg) | Average Fentanyl Potency (mg/tab) | Min. Fentanyl (mg/tab) | Max. Fentanyl (mg/tab) |
|---|---|---|---|---|---|
| AK | 11 | 12.8 | 1.6 | 0.5 | 4.4 |
| AR | 1 | 1.0 | 5.4 | - | - |
| AZ | 49 | 557.0 | 2.4 | 1.2 | 4.8 |
| CA | 58 | 794.7 | 2.3 | 0.2 | 4.6 |
| CO | 18 | 63.8 | 2.3 | 0.7 | 5.2 |
| DC | 1 | 0.8 | 2.6 | - | - |
| FL | 14 | 34.4 | 2.5 | 1.2 | 4.2 |
| GA | 4 | 3.7 | 1.6 | 0.8 | 2.4 |
| IA | 7 | 5.3 | 2.7 | 2.1 | 3.2 |
| IL | 1 | 2.1 | 2.0 | - | - |
| IN | 4 | 6.6 | 2.1 | 1.9 | 2.3 |
| KS | 4 | 18.2 | 1.5 | 1.0 | 1.8 |
| KY | 4 | 11.2 | 2.8 | 1.8 | 3.9 |
| MA | 7 | 17.5 | 1.5 | 0.7 | 2.4 |
| MD | 1 | 3.0 | 3.2 | - | - |
| MI | 2 | 1.7 | 2.4 | 2.4 | 2.4 |
| MN | 5 | 15.0 | 2.6 | 0.5 | 4.1 |
| MO | 1 | 1.5 | 1.7 | - | - |
| MS | 3 | 2.8 | 1.8 | 0.6 | 2.7 |
| MT | 3 | 0.9 | 2.5 | 2.2 | 2.9 |
| NC | 6 | 3.8 | 2.9 | 1.5 | 5.3 |
| ND | 1 | 0.7 | 0.9 | - | - |
| NE | 1 | 1.1 | 1.9 | - | - |
| NJ | 2 | 2.2 | 2.5 | 2.5 | 2.6 |
| NM | 8 | 31.5 | 2.3 | 1.9 | 2.5 |
| NY | 13 | 41.0 | 2.4 | 1.8 | 4.3 |
| OK | 6 | 16.0 | 2.8 | 1.5 | 4.9 |
| OR | 16 | 34.0 | 2.0 | 1.3 | 2.4 |
| PA | 4 | 2.5 | 2.8 | 2.1 | 4.7 |
| PR | 2 | 2.1 | 2.9 | 2.3 | 3.5 |
| RI | 3 | 3.0 | 5.4 | 2.3 | 7.0 |
| SC | 2 | 3.1 | 1.4 | 0.3 | 2.4 |
| TN | 8 | 11.6 | 2.6 | 1.1 | 3.9 |
| TX | 32 | 104.1 | 2.4 | 1.4 | 4.8 |
| UT | 7 | 27.1 | 2.1 | 2.0 | 2.5 |
| VA | 10 | 7.2 | 1.9 | 1.5 | 2.3 |
| WA | 20 | 69.4 | 2.5 | 1.1 | 3.9 |

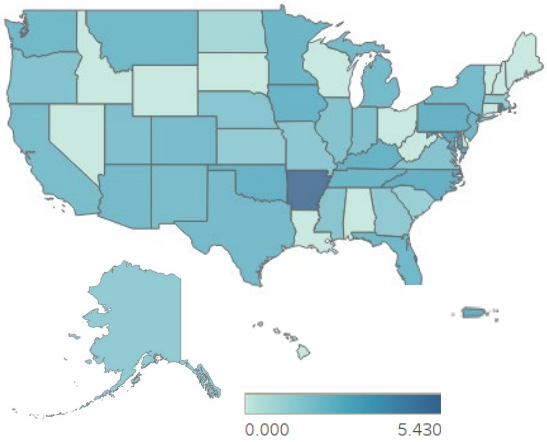
**States With Fentanyl Tablet Seizures—CY 2023**




**Net Weight of Fentanyl Tablet Seizures by State—CY 2023**




**Average Fentanyl Dose by State—CY 2023**



## Other Forms

### Tars

| Primary Fentanyl | Purity (%) | Description | Route |
|---|---|---|---|
| Fentanyl | 4.22 | Black tar | Gupta, reducing agent not determined |
| Fentanyl | 4.92 | Black tar | Not Determined |

These samples were seized in the following states: GA (1), OR (1). Heroin or heroin alkaloids were identified in both samples. Other common diluents include inositol, lactose, and dextrose.

### Illicitly Prepared Liquids

| Primary Fentanyl | Purity (%) | Description | Route |
|---|---|---|---|
| Fentanyl | <1% | Colorless, aqueous liquid | Gupta with borohydride reducing agent |
| Fentanyl | <1% | Colorless, aqueous liquid | Gupta with borohydride reducing agent |
| Fentanyl | <1% | Colorless, aqueous liquid | Gupta with borohydride reducing agent, t-BOC precursor |
| Fentanyl | Not Determined | Colorless, aqueous liquid | Gupta with borohydride reducing agent, t-BOC precursor |

These samples were seized in the following states: CA (3), AZ (1). Heroin or heroin alkaloids were identified in both samples. Other common diluents include salicylic acid, dipyrone, acetaminophen, lidocaine, mannitol, lactose, and caffeine.

## Fentanyl-Related Compound Submissions

Twenty samples containing fentanyl-related compounds as the primary fentanyl were examined. The following table summarizes data obtained from the analyses.

| Fentanyl-Related Compound | # Exhibits | Purity (%) | Description |
|---|---|---|---|
| Fluorofentanyl | 14 | 2.4 - 38.4 | Powder = 12<br>Tablets = 2 |
| Fluoroacetylfentanyl | 3 | 22.7<br>(quantitated in 1 sample) | White powder (3) |
| Carfentanil | 3 | 0.08 – 1.2 | Powder = 2<br>Tablets = 1 |

## Southwest Border Seizures

Twenty five powder samples and 39 tablet samples seized at Ports of Entry (POE) along the United States/Mexico border were analyzed during this reporting period. A drug quality breakdown by POE are summarized as follows:

| Form | State | Number of Samples | Purity Range (% or mg/tab) | Average Purity (% or mg/tab) | Synthetic Route | Adulterants/Diluents |
|---|---|---|---|---|---|---|
| Powder | AZ | 6 | 34.8 – 78.7 | 47.8 | Gupta (5) (all with borohydride reducing agent, 3 with t-BOC precursor) Mixed (1) | Mannitol (4), Xylazine, (1), Inositol (1), Methamphetamine (1), Fluorofentanyl (1) |
| | CA | 12 | 20.0 – 71.9 | 43.2 | Gupta (12) (8 with borohydride reducing agent, 2 with t-BOC precursor) | Mannitol (9), Lidocaine (3), Xylazine (2), Dimethyl sulfone (1), Fluorofentanyl (1), Lactose (1), Phenacetin (1) |
| | NM | 0 | ——- | ——- | ——- | ——- |
| | TX | 7 | 18.1 – 82.5 | 46.8 | Gupta (7) (6 with borohydride reducing agent, 2 with t-BOC precursor) | Acetaminophen (3), Mannitol (1), Inositol (1), Xylazine (1) |
| Tablets | AZ | 15 | 1.5 – 3.6 | 2.3 | Gupta (15) (all with borohydride reducing agent, 12 with t-BOC precursor) | Mannitol (15), Acetaminophen (14), Dipyrone (7), Dimethyl sulfone (1), Inositol (1), Lactose (2) |
| | CA | 17 | 0.1 – 4.0 | 2.2 | Gupta (17) (all with borohydride reducing agent, 10 with t-BOC precursor) | Acetaminophen (17), Dipyrone (17), Mannitol (16), Lactose (3), Caffeine (1), Lidocaine (1) |
| | NM | 0 | ——- | ——- | ——- | ——- |
| | TX | 8 | 1.5 – 3.3 | 2.3 | Gupta (7) Mixed (1) (all with borohydride reducing agent, 5 with t-BOC precursor) | Acetaminophen (8), Dipyrone (8), Mannitol (8), Lactose (4), Fluorofentanyl (2), Xylazine (1), Lidocaine (1), Inositol (1) |

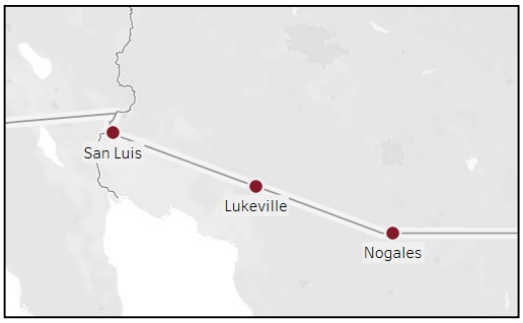
# FPP Laboratory Analysis Summary by POE

## Arizona POE Seizures

**Powders**

**Nogales**

**6 seizures**
**Total seizure weight: 14.3 kg**
**Synthetic Route: Gupta (5)**
(all with borohydride reducing agent, 3 with t-BOC precursor)
**Mixed (1)**
**Purity: 34.8 – 78.7%**

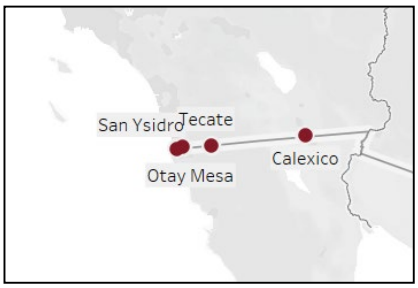



**Tablets**

**Nogales**

**15 seizures**
**Total seizure weight: 197.7 kg**
**Synthetic route: Gupta (15)**
(all with borohydride reducing agent, 12 with t-BOC precursor)
**Dosage: 1.5 – 3.6 mg/tab**

## California POE Seizures




**Powders**

**Otay Mesa**

**3 seizures**
**Total seizure weight: 52.1 kg**
**Synthetic Route: Gupta (3)**
(all with borohydride reducing agent, none with t-BOC precursor)
**Purity: 20.0 – 71.9%**

**San Ysidro**

**8 seizures**
**Total seizure weight: 55 kg**
**Synthetic Route: Gupta (8)**
(5 with borohydride reducing agent, 4 with t-BOC precursor)
**Purity: 21.1 – 62.2%**

**Tablets**

**Calexico**

**5 seizures**
**Total seizure weight: 8.2 kg**
**Synthetic route: Gupta (5)**
(all with borohydride reducing agent, 3 with t-BOC precursor)
**Dosage: 0.1 – 2.9 mg/tab**

**Otay Mesa**

**5 seizures**
**Total seizure weight: 463.7 kg**
**Synthetic route: Gupta (5)**
(all with borohydride reducing agent, 2 with t-BOC precursor)
**Dosage: 1.7 – 2.3 mg/tab**

**San Ysidro**

**7 seizures**
**Total seizure weight: 197.7 kg**
**Synthetic route: Gupta (7)**
(all with borohydride reducing agent, 5 with t-BOC precursor)
**Dosage: 1.5 – 3.6 mg/tab**

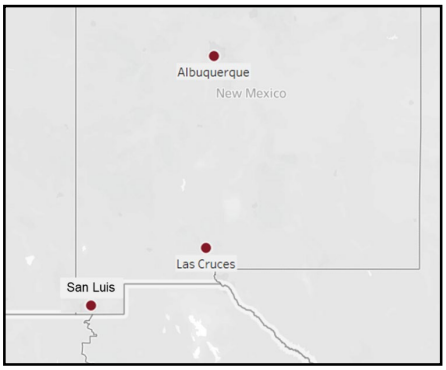
## New Mexico POE Seizures

### Powders

None

### Tablets

None




## Texas POE Seizures

### Powders

**Brownsville**

**1 seizure**
**Total seizure weight: 0.9 kg**
**Synthetic Route: Gupta (1)**
(all with borohydride reducing agent, all with t-BOC precursor)
**Purity: 44.4%**

**El Paso**

**1 seizure**
**Total seizure weight: 5.9 kg**
**Synthetic Route: Gupta (1)**
(all with borohydride reducing agent, all with t-BOC precursor)
**Purity: 82.5%**

**Laredo**

**5 seizures**
**Total seizure weight: 6.0 kg**
**Synthetic Route: Gupta (5)**
(4 with borohydride reducing agent, none with t-BOC precursor)
**Purity: 18.1 – 53.1%**

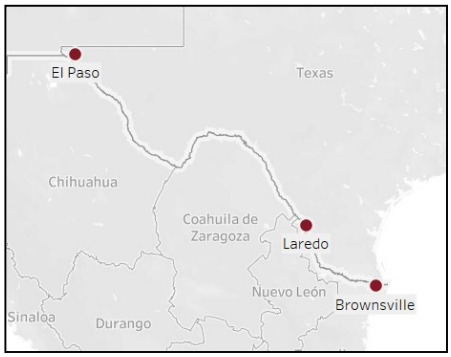
### Tablets

**El Paso**

**7 seizures**
**Total seizure weight: 2.0 kg**
**Synthetic route: Gupta (6)**
(all with borohydride reducing agent, 4 with t-BOC precursor)
**Mixed (1)**
**Dosage: 1.5 – 3.3 mg/tab**

**Laredo**

**1 seizure**
**Total seizure weight: 1.0 kg**
**Synthetic route: Gupta (1)**
(all with borohydride reducing agent, all with t-BOC precursor)
**Dosage: 2.2 mg/tab**



## Foreign Results

### Canada

Seven fentanyl HCl samples were analyzed. A summary of these results can be found in the table below. One sample consisted of a pink-purple rock-like powder which contained not fentanyl, but was found to contain carfentanil (1.2%), sildenafil, and mannitol. The synthetic route was not determined.

| Substances Identified | Synthetic Route | Description |
|---|---|---|
| Fentanyl (10.5%), Caffeine (21.4%), Dimethyl sulfone (42.2%), Medetomidine, Aposcopolamine, Scopolamine | Gupta (none with borohydride reducing agent, none with t-BOC precursor) | Green, rock-like powder |
| Fentanyl (3.7%), Lactose (2.5%), Mannitol (48.6%), Caffeine (11.7%), Dimethyl sulfone | Gupta (with borohydride reducing agent, none with t-BOC precursor) | Light blue, chunky powder |
| Fentanyl (11.3%), Mannitol (1.8%), Caffeine (22.5%), Dimethyl sulfone, Medetomidine, Scopolamine | Gupta (none with borohydride reducing agent, none with t-BOC precursor) | Green, chunky powder |
| Fentanyl (NQ), Mannitol (1.9%), Caffeine (12.3%), Fluorofentanyl, Bromazolam | Mixed (Gupta/Siegfried) | Green, chunky powder |
| Fentanyl (21.5%), Caffeine (38.0%) | Gupta (none with borohydride reducing agent, none with t-BOC precursor) | Purple, chunky powder |
| Fentanyl (9.6%), Caffeine (10.7%), Diphenhydramine (1.0%), Xylazine, Bromazolam | Gupta (none with borohydride reducing agent, none with t-BOC precursor) | Turquoise & green, rock-like powder |
| Fentanyl (4.6%), Dimethyl sulfone (38.9%), Mannitol (16.2%), Caffeine (13.7%), Xylazine, Theophylline (13.0%), Cocaine, Flubromazepam, Bromazolam, Metonitazene | Gupta (none with borohydride reducing agent, none with t-BOC precursor) | Turquoise & green, rock-like powder |

### Honduras

Four samples consisting colorless liquid in glass ampules were submitted for analysis. The samples were found to contain fentanyl citrate (NQ). Two of the ampules had indications of other controlled substances. Additional sampling has been requested to confirm. The synthetic route was not determined due to low purity.

### Nigeria

One sample consisting of colorless liquid was submitted for analysis. The sample was found to contain fentanyl (NQ). The synthetic route was not determined due to low purity.

# Background Information

## Sampling Plan

At it's inception in October 2017, FPP received fentanyl samples weighing greater than 100 g from the DEA laboratory system. FPP also received submissions of any fentanyl related substances, regardless of weight. In October 2021, that sampling plan was limited for the DEA's laboratories in New York and San Diego, due to the overwhelming number of samples submitted by those laboratories. Targeted sampling of "rainbow fentanyl" tablets occurred between August 2022 and March 2023. In January 2023, FPP focused efforts on seized samples weighing greater than 800 g. In July 2023, new sampling guidance was released to the DEA laboratory system advising the submission of samples containing fentanyl, fentanyl-related compounds, and precursor chemicals when the net weight is greater than or equal to 800 g. Glassine baggies are not accepted and liquid fentanyl samples are considered on a case-by-case basis.

## Synthetic Route Classifications

Synthetic route classifications are listed in the table below. Synthetic route classification results from an analysis of the impurities in the fentanyl sample. Synthetic routes have been reproduced at the Special Testing and Research Laboratory. Synthetic route classifications for CY 2023 changed slightly to provide more granularity and transparency in the chemistry. Samples classified as Gupta-1 are now reported as Gupta/borohydride/no protecting group and samples classified as Gupta-2 are now reported as Gupta/either borohydride or not determined (as appropriate)/t-BOC.

| Synthetic Route | Associated Precursors and Other Chemicals |
|---|---|
| Janssen | 1-benzyl-4-piperidone, aniline, toluene, LAH, propionyl chloride, palladium on carbon, hydrogen gas, phenethyl halide |
| Siegfried/Valdez | piperidone, phenethyl halide, potassium carbonate, cesium carbonate, acetonitrile, aniline, acetic acid, methanol, STAB or sodium borohydride, propionyl chloride, pyridine, dichloromethane, diisopropylethylamine |
| One-Pot | piperidone, phenylacetaldehyde, dichloroethane, trimethylamine, STAB, acetic acid, aniline, propionyl chloride |
| Gupta (patent) and Modified Gupta (formerly reported as Gupta, Gupta-1, and Gupta-2) | Piperidone, t-BOC-piperidone, aniline, acetic acid, zinc powder, sodium borohydride, 4-AP, t-BOC-4-AP, phenethyl halide, diisopropylethylamine or pyridine, propionyl chloride, methanol, hydrochloric acid |
| Academic t-BOC (formerly reported as t-BOC Norfentanyl) | t-BOC-piperidone, aniline, acetic acid, zinc powder, t-BOC-4-AP, propionyl chloride, diisopropylethylamine or pyridine, methanol, hydrochloric acid, phenethyl halide |
| Mixed | Indications of multiple synthetic routes |
| Not Determined | Synthetic route could not be determined |