



Drug Checking Updates from Philadelphia, PA

What's Trending: NPS Discovery Webinar Series, 1/11/2024

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INTRODUCTION

- Philadelphia DPH Div. of Substance Use Prevention and Harm Reduction
- Partnership with CFSRE since 2020

Mission:

- Monitor the drug supply of Philadelphia
- Alert to newly identified threats
- Conduct surveillance on trends
- Support analysis of results data



A typical Philly dope bag (left) and powder.(right)

WORKFLOW

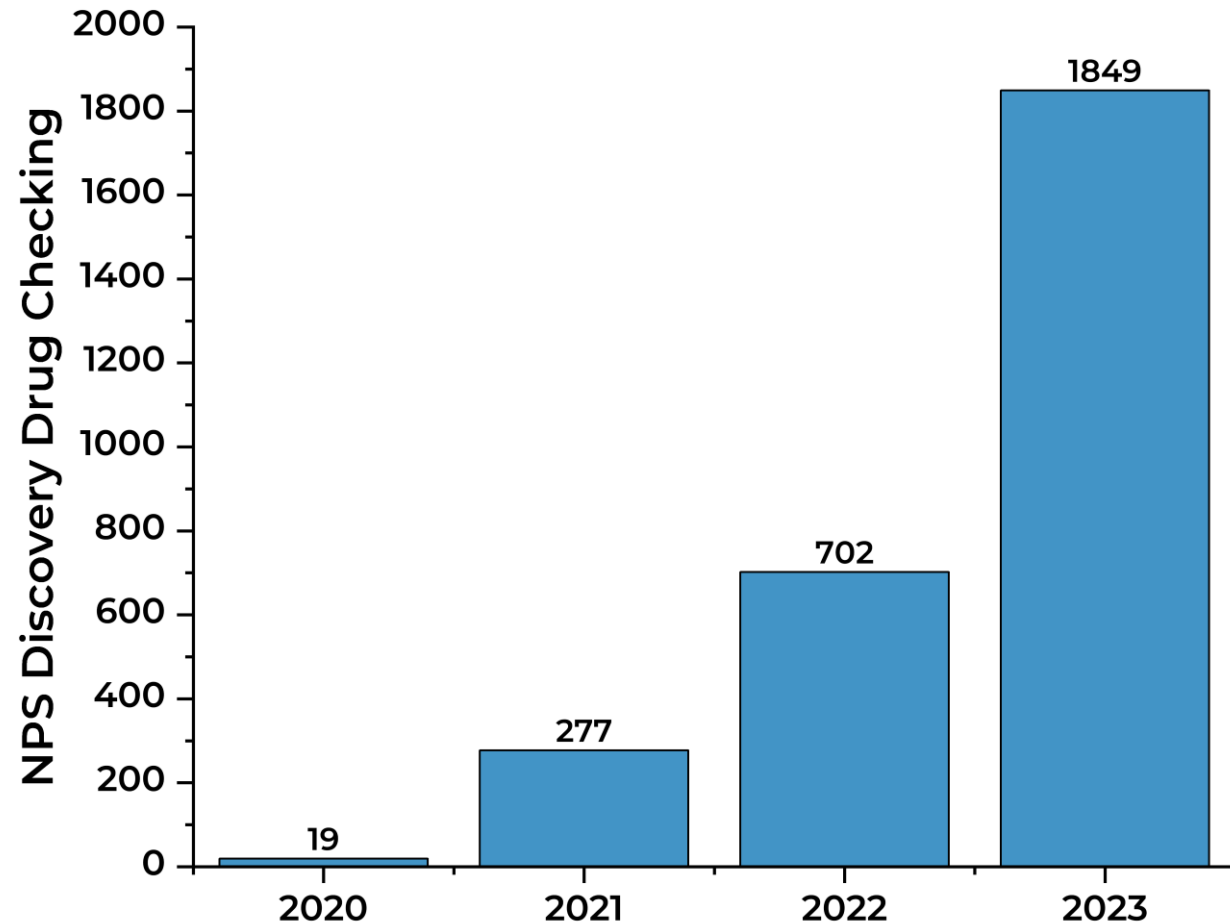
- Perform compound identification
 - Acid/Base extraction
 - GC-MS (full scan)
 - HPLC-QTOF (data independent acquisition)
- Perform compound quantification
 - Base extraction
 - GC-MS (full scan)
 - External calibrators (prepared from solid analytical materials)
 - Quality controls (prepared from separate stocks of certified reference materials when appropriate)



DRUG CHECKING - SAMPLES ANALYZED

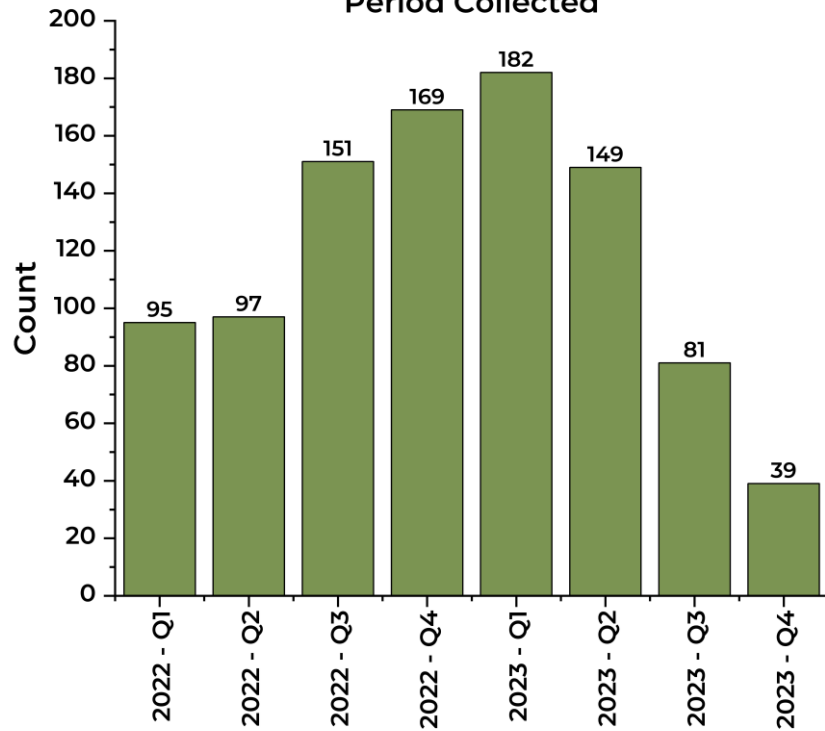
- I started at CFSRE in March 2022.
- >150% sample increases year over year in 2022 and 2023.
- Challenges:
 - Sample Burden
 - Diversity of samples
 - Diversity of sample information
 - Different requirements of results

Drug Checking Samples by Year Received

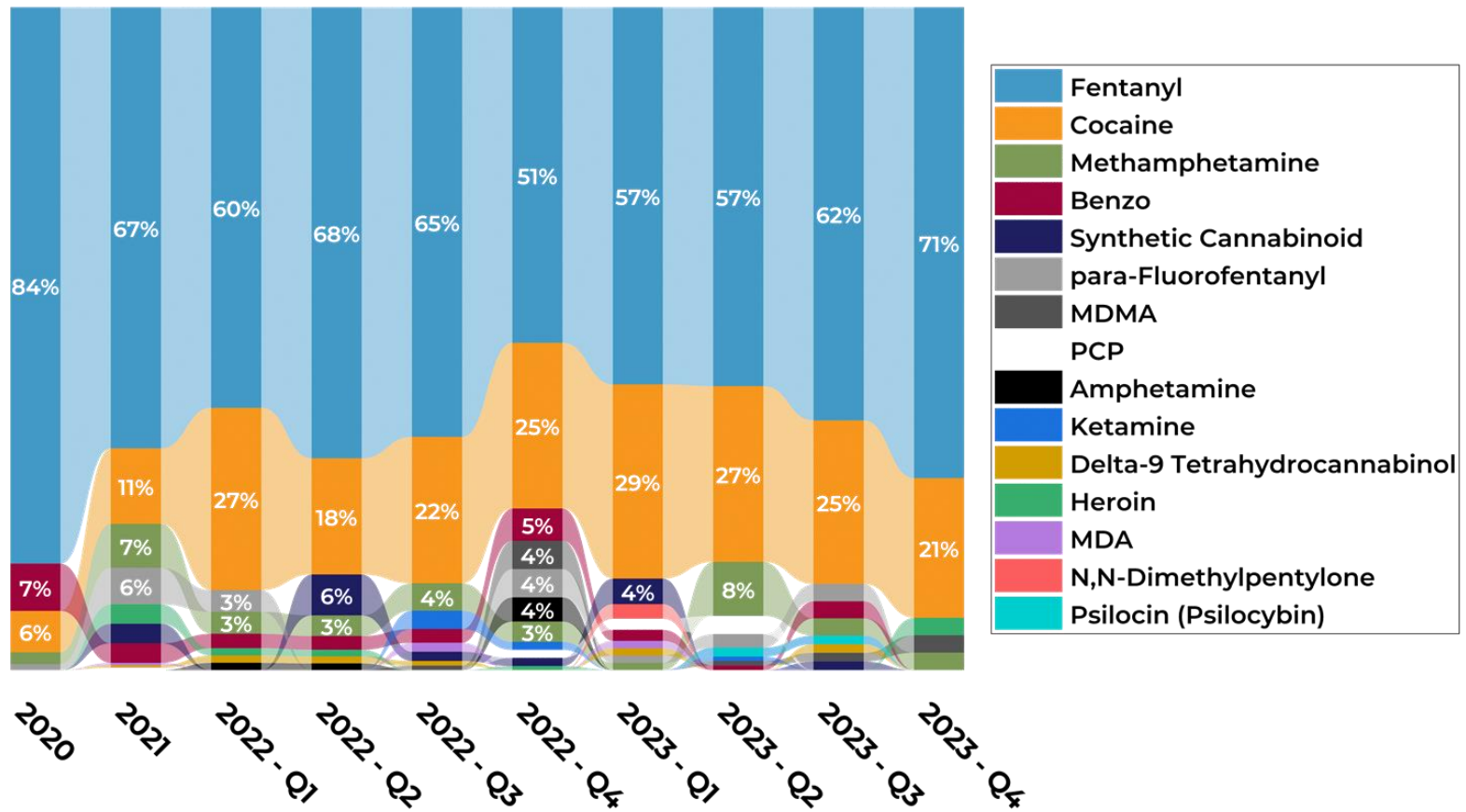


PDPH SAMPLES

Count of PDPH Samples Analyzed by Period Collected

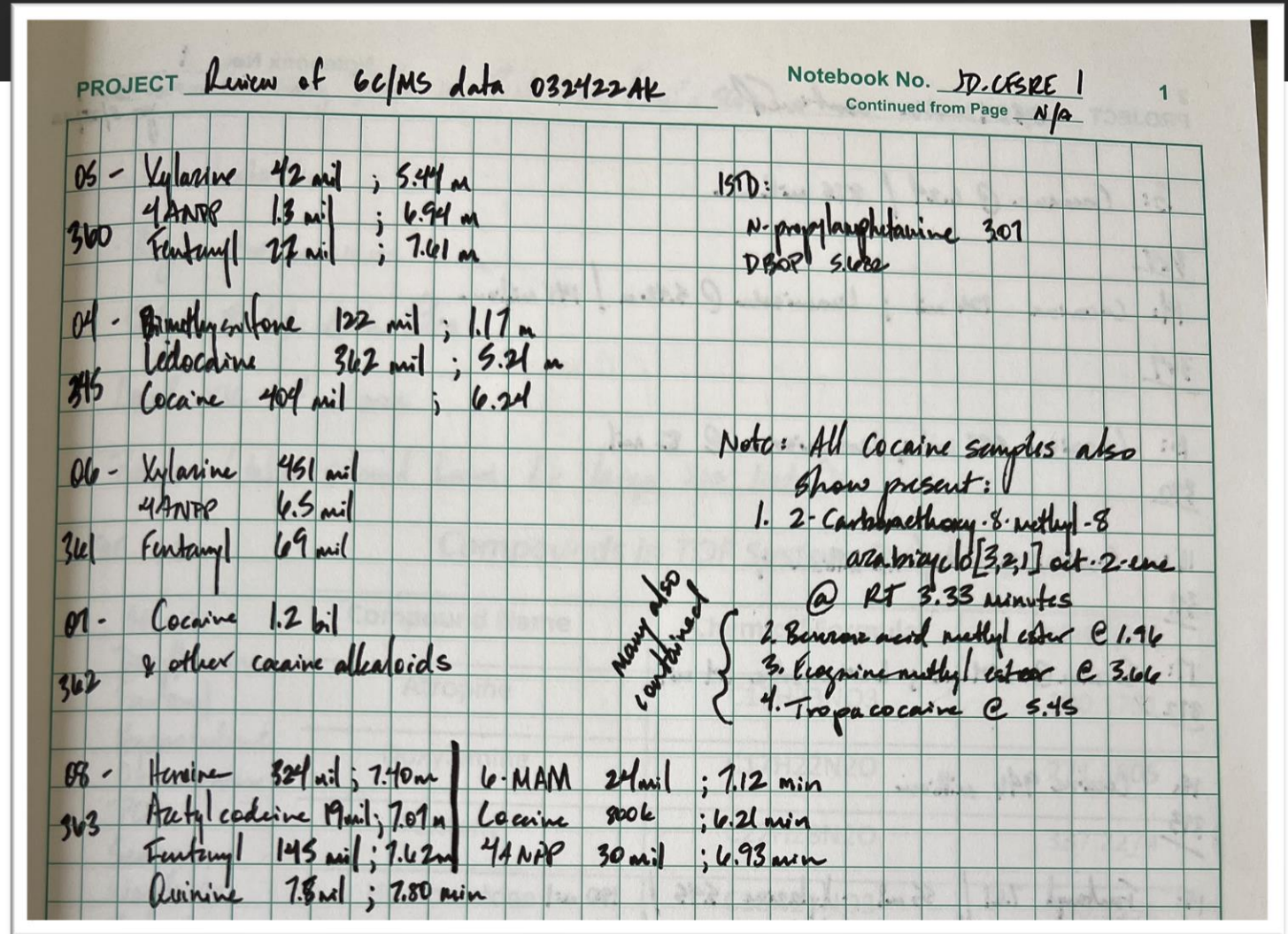


Primary Component Found in PDPH Drug Checking Samples



EARLY DAYS

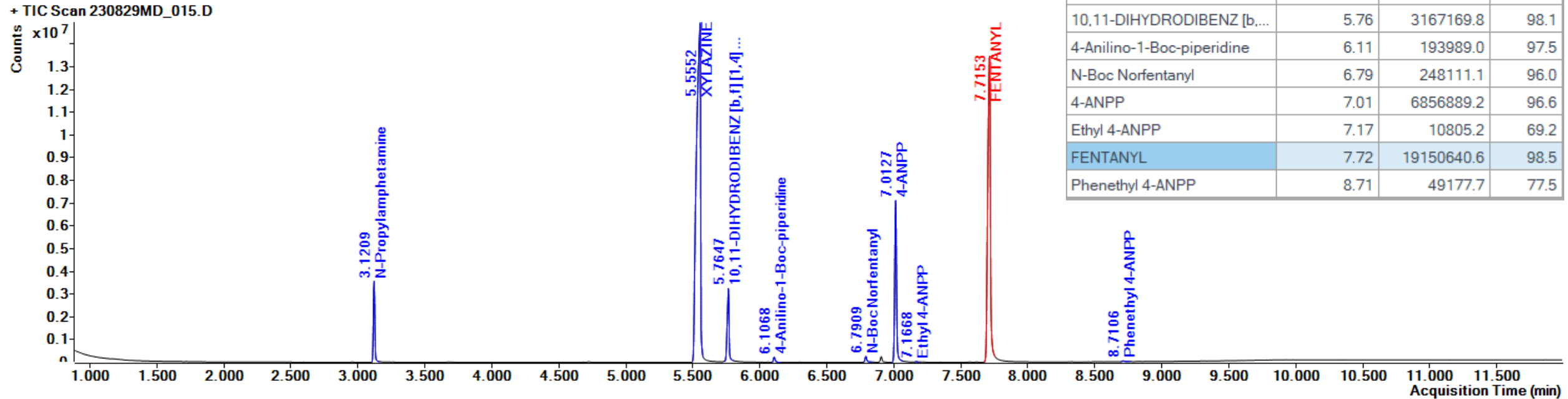
- Started at CFSRE March 2022.
- Status of the Workflow
 - MeOH dilution
 - Run GC-MS and HPLC-QTOF for qualitative identification
 - Results (compounds and relative peak areas) collected manually
- Items for improvement
 - Quant method
 - Data Framework



Page 1 of my first lab notebook at CFSRE

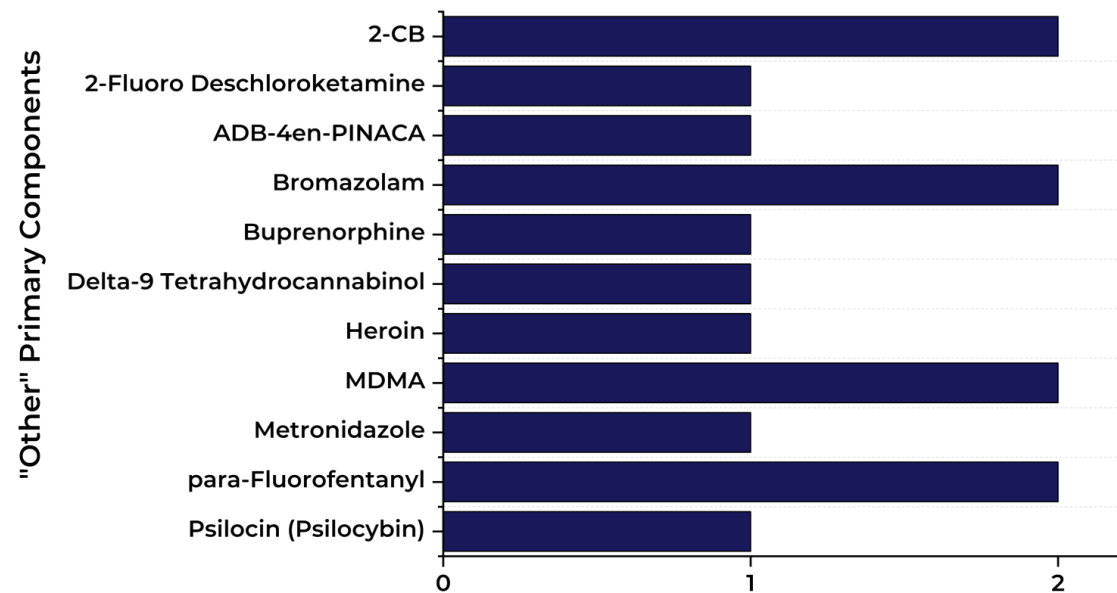
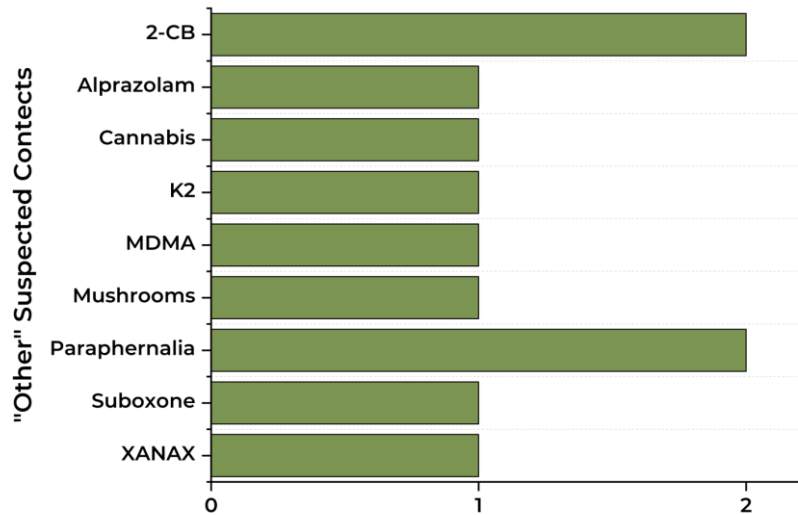
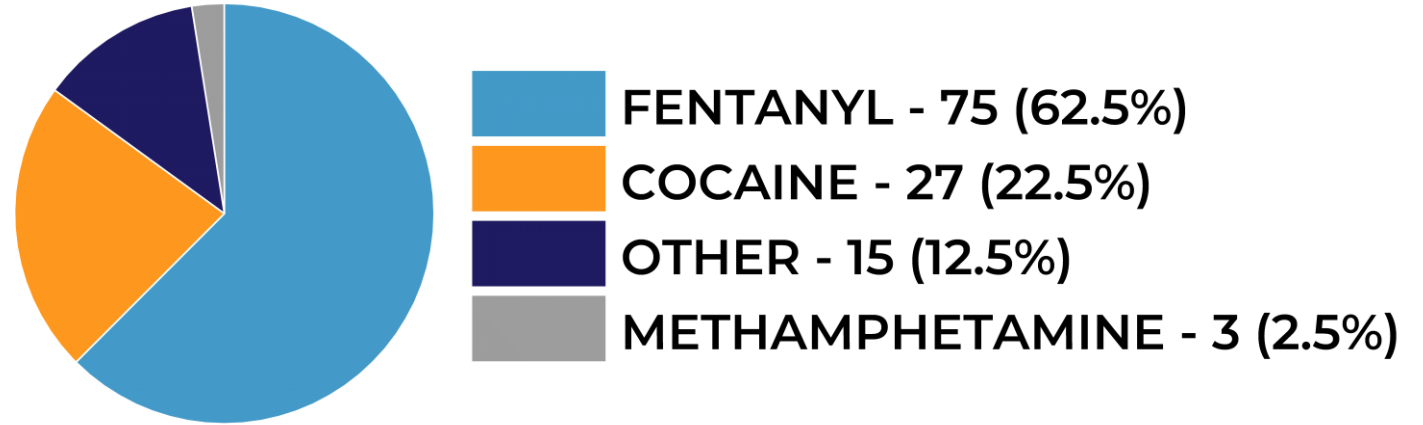
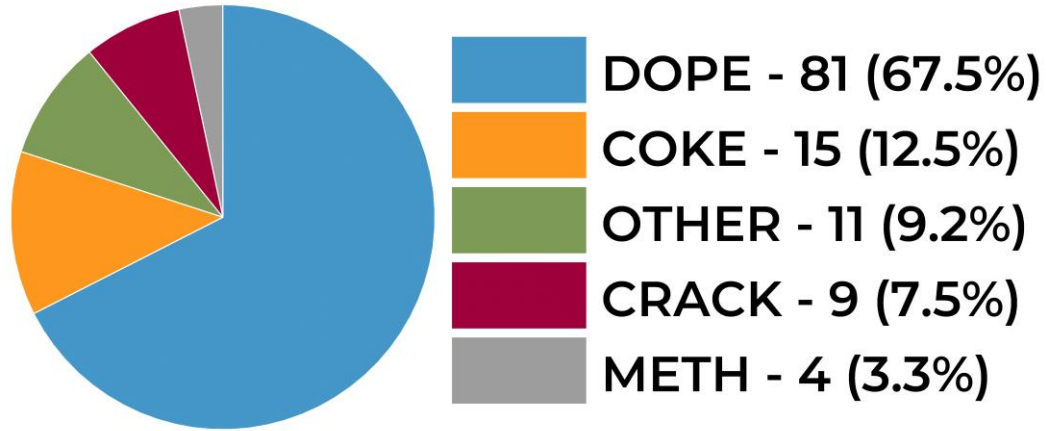
MAJOR IMPROVEMENTS

Compound Name	Component RT	Component Area	Match Factor
N-Propylamphetamine	3.12	2770711.1	99.0
XYLAZINE	5.56	32161654.1	95.9
10,11-DIHYDRODIBENZ [b,...	5.76	3167169.8	98.1
4-Anilino-1-Boc-piperidine	6.11	193989.0	97.5
N-Boc Norfentanyl	6.79	248111.1	96.0
4-ANPP	7.01	6856889.2	96.6
Ethyl 4-ANPP	7.17	10805.2	69.2
FENTANYL	7.72	19150640.6	98.5
Phenethyl 4-ANPP	8.71	49177.7	77.5

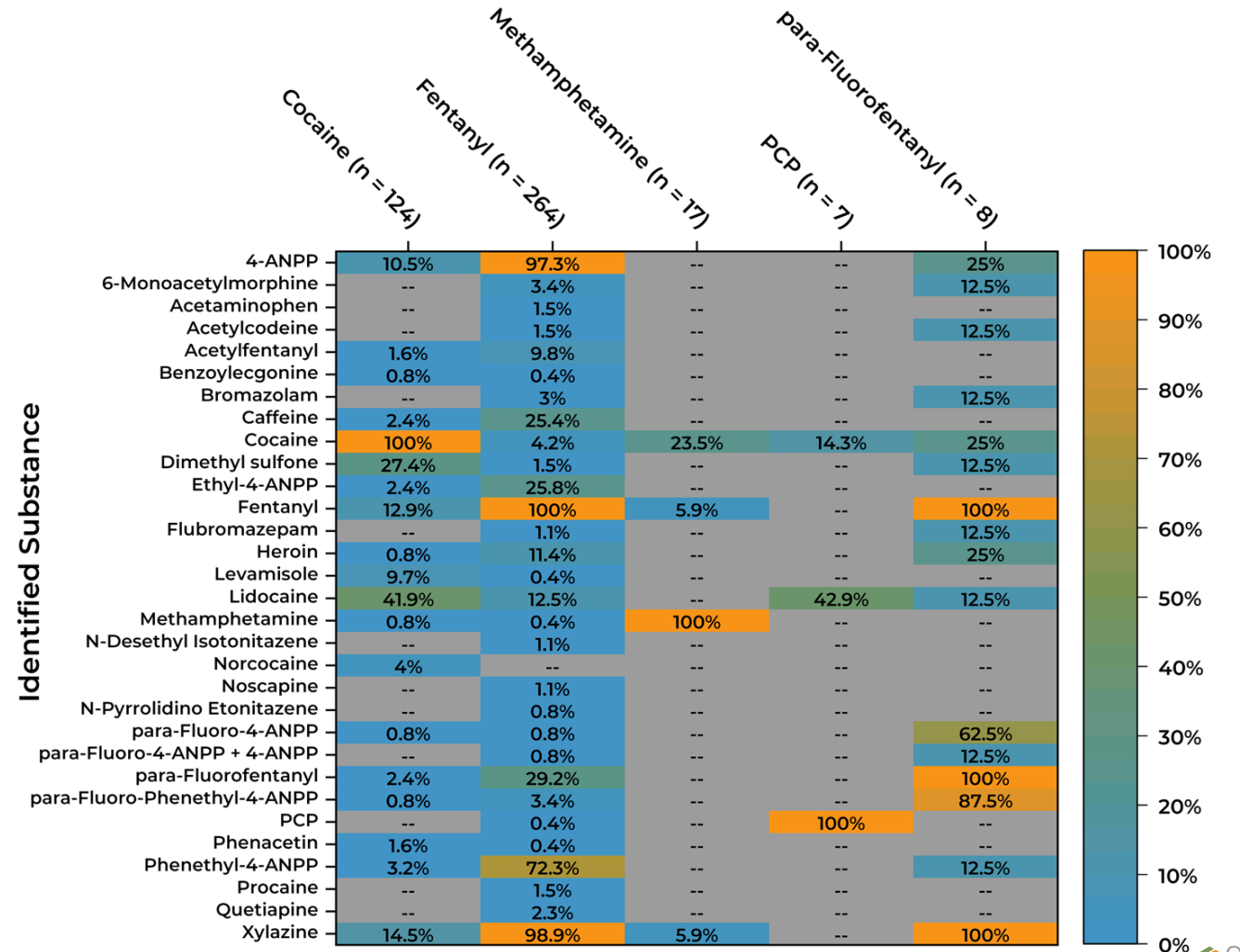
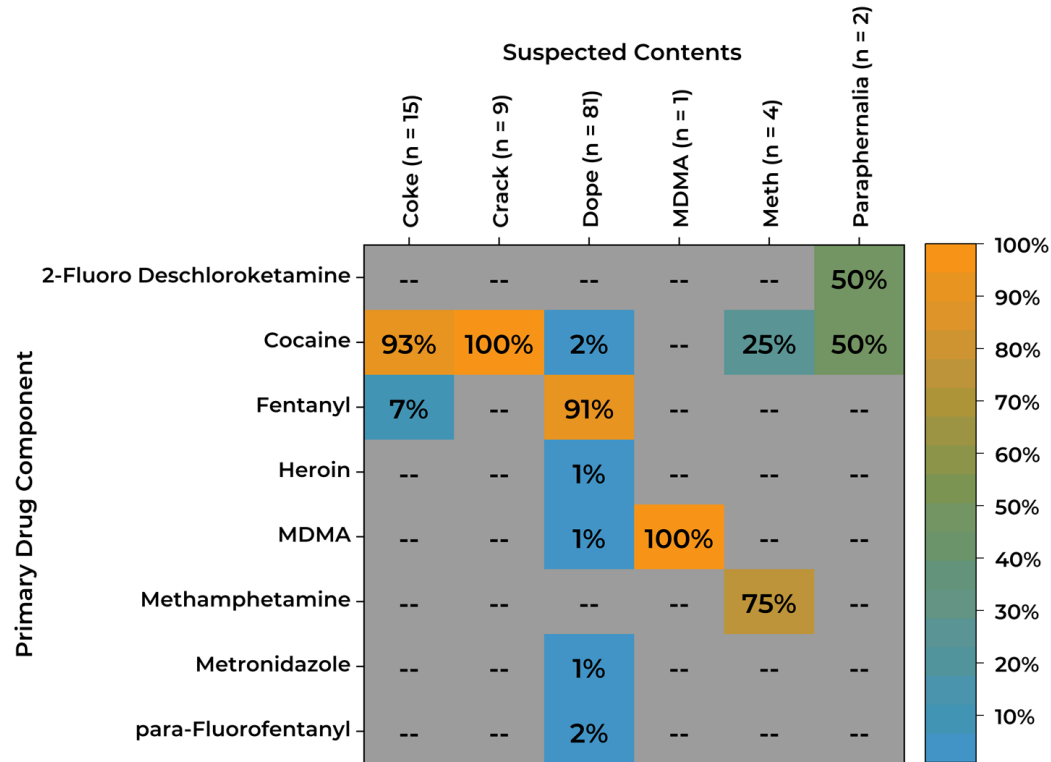


1. FENTANYL, XYLAZINE, 4-ANPP, N-BOC-4-AP, N-BOC-Norfentanyl, Phenethyl 4-ANPP, Ethyl 4-ANPP
2. Clean results, **compute relative parts**, filter results, concatenate results
3. Fentanyl (1p), Xylazine (1.7p), 4-ANPP (0.4p), Phenethyl-4-ANPP (trace), Ethyl-4-ANPP (trace)

Q3/Q4 2023 - SUSPECTED VS PRIMARY



SUSPECTED DRUG VS PRIMARY COMPONENT



DESCRIPTIVE STATISTICS

Data	N total	Mean	Standard Deviation	Minimum	1st Quartile (Q1)	Median	3rd Quartile (Q3)	Maximum
Fentanyl	188	13.36%	8.71%	0.11%	6.73%	11.70%	19.61%	39.99%
Xylazine	190	41.96%	17.98%	0.89%	32.49%	44.39%	54.88%	71.77%
para-Fluorofentanyl	55	2.63%	5.77%	0.20%	0.50%	0.94%	2.32%	39.30%
Heroin	20	1.98%	1.42%	0.07%	1.13%	1.80%	2.89%	4.69%
4-ANPP	180	2.35%	1.84%	0.04%	0.87%	1.92%	3.49%	10.10%
Methamphetamine	14	63.65%	13.79%	50.25%	50.73%	57.83%	77.03%	85.70%
Cocaine	102	50.75%	26.94%	0.39%	26.74%	57.20%	73.44%	99.00%
Lidocaine	51	16.64%	17.42%	0.16%	2.53%	11.93%	21.80%	55.02%
Caffeine	41	4.04%	5.85%	0.13%	0.59%	1.06%	5.39%	23.48%

BETTER DESCRIPTIVE STATISTICS

- “What is the average concentration?”
- Group samples accordingly
 - primary drug component
 - sample type
 - suspected component
 - date collected
- Several Filters may be applied for some samples

Data	Primary Group	N total	Mean	Standard Deviation	Minimum	Median	Maximum
Cocaine	Cocaine	169	49.2%	26.1%	0.1%	50.4%	99.0%
Lidocaine	Cocaine	71	20.8%	18.8%	0.8%	12.4%	85.9%
Xylazine	Cocaine	19	9.7%	11.7%	0.8%	5.6%	47.6%
Fentanyl	Cocaine	17	2.5%	2.6%	0.1%	1.5%	8.4%
4-ANPP	Cocaine	11	0.5%	0.2%	0.2%	0.5%	1.1%
para-Fluorofentanyl	Cocaine	3	0.9%	0.5%	0.5%	0.7%	1.5%
Methamphetamine	Cocaine	3	6.3%	4.5%	2.1%	5.7%	11.1%
Fentanyl	Fentanyl	424	13.3%	8.5%	0.3%	11.6%	53.1%
Xylazine	Fentanyl	413	40.3%	17.4%	0.2%	42.1%	77.4%
4-ANPP	Fentanyl	404	2.5%	2.0%	0.1%	1.9%	12.3%
para-Fluorofentanyl	Fentanyl	89	1.7%	2.2%	0.2%	0.9%	13.7%
Caffeine	Fentanyl	43	4.3%	6.1%	0.1%	1.1%	23.5%
Lidocaine	Fentanyl	39	2.2%	3.2%	0.2%	0.9%	14.3%
Heroin	Fentanyl	24	2.8%	3.5%	0.1%	1.8%	13.9%
Cocaine	Fentanyl	6	10.1%	13.9%	0.4%	5.4%	37.3%
Fentanyl	Heroin	3	9.3%	7.6%	1.3%	10.4%	16.3%
Heroin	Heroin	3	11.3%	9.0%	1.0%	16.0%	17.0%
Methamphetamine	Methamphetamine	25	61.2%	26.9%	3.4%	62.7%	93.6%
Xylazine	para-Fluorofentanyl	12	36.4%	21.9%	6.6%	40.3%	71.8%
para-Fluorofentanyl	para-Fluorofentanyl	12	11.6%	11.3%	2.2%	6.5%	39.3%
Fentanyl	para-Fluorofentanyl	11	4.5%	5.7%	0.2%	2.4%	18.6%
4-ANPP	para-Fluorofentanyl	10	1.2%	1.7%	0.1%	0.5%	5.6%
Heroin	para-Fluorofentanyl	3	2.4%	1.9%	0.2%	3.3%	3.6%
Lidocaine	para-Fluorofentanyl	3	9.8%	9.4%	0.2%	10.2%	19.0%

KEY FINDINGS - FENTANYL

- Quantitative analysis

Q1 2022 – 15.3%

Q2 2022 – 11.1%

Q3 2022 – 12.9%

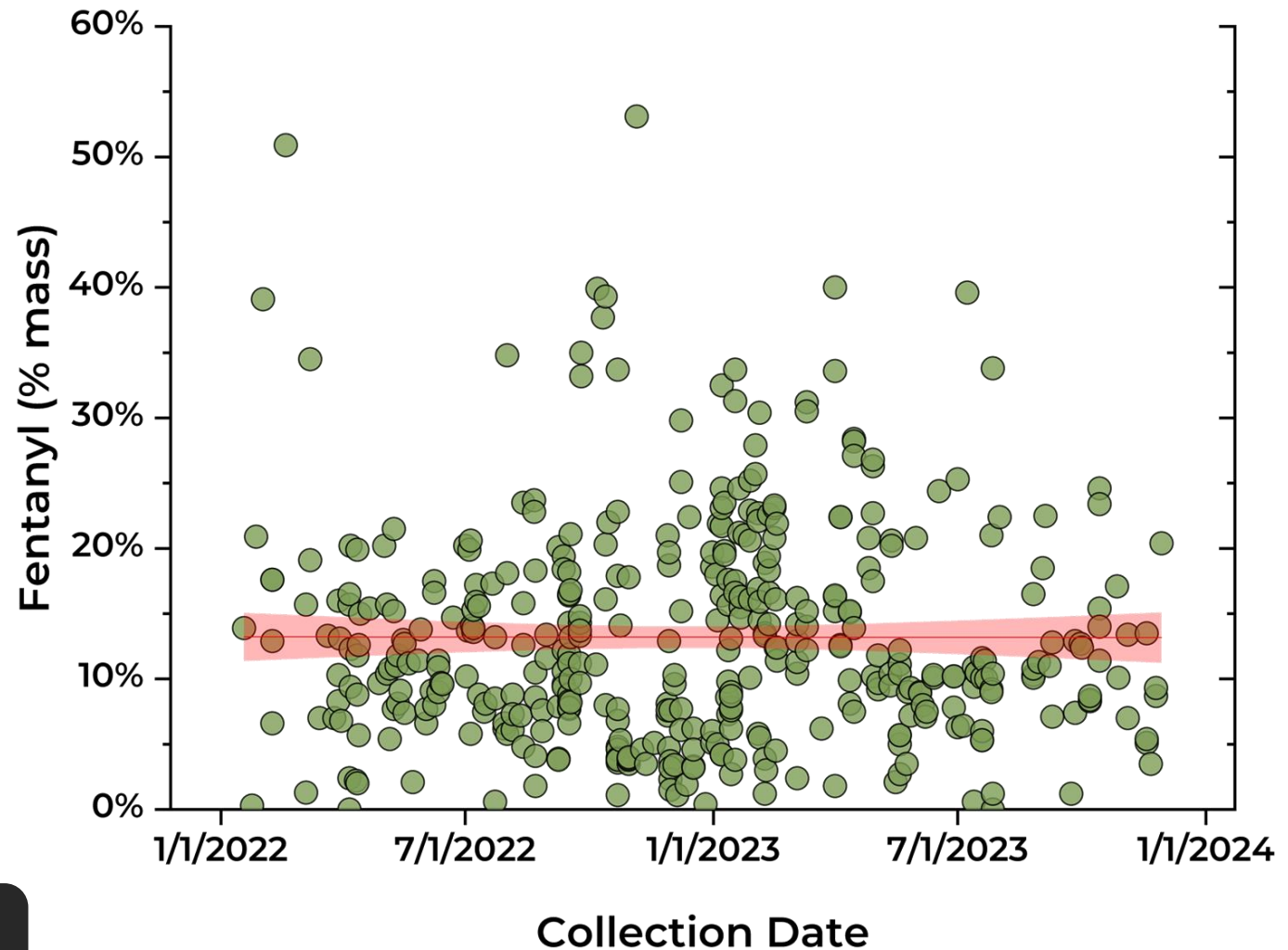
Q4 2022 – 12.2%

Q1 2023 – 15.6%

Q2 2023 – 14.0%

Q3 2023 – 12.3%

Q4 2023 – 12.0%



KEY FINDINGS - XYLAZINE

- Quantitative analysis

Q1 2022 – 26.4%

Q2 2022 – 33.5%

Q3 2022 – 33.6%

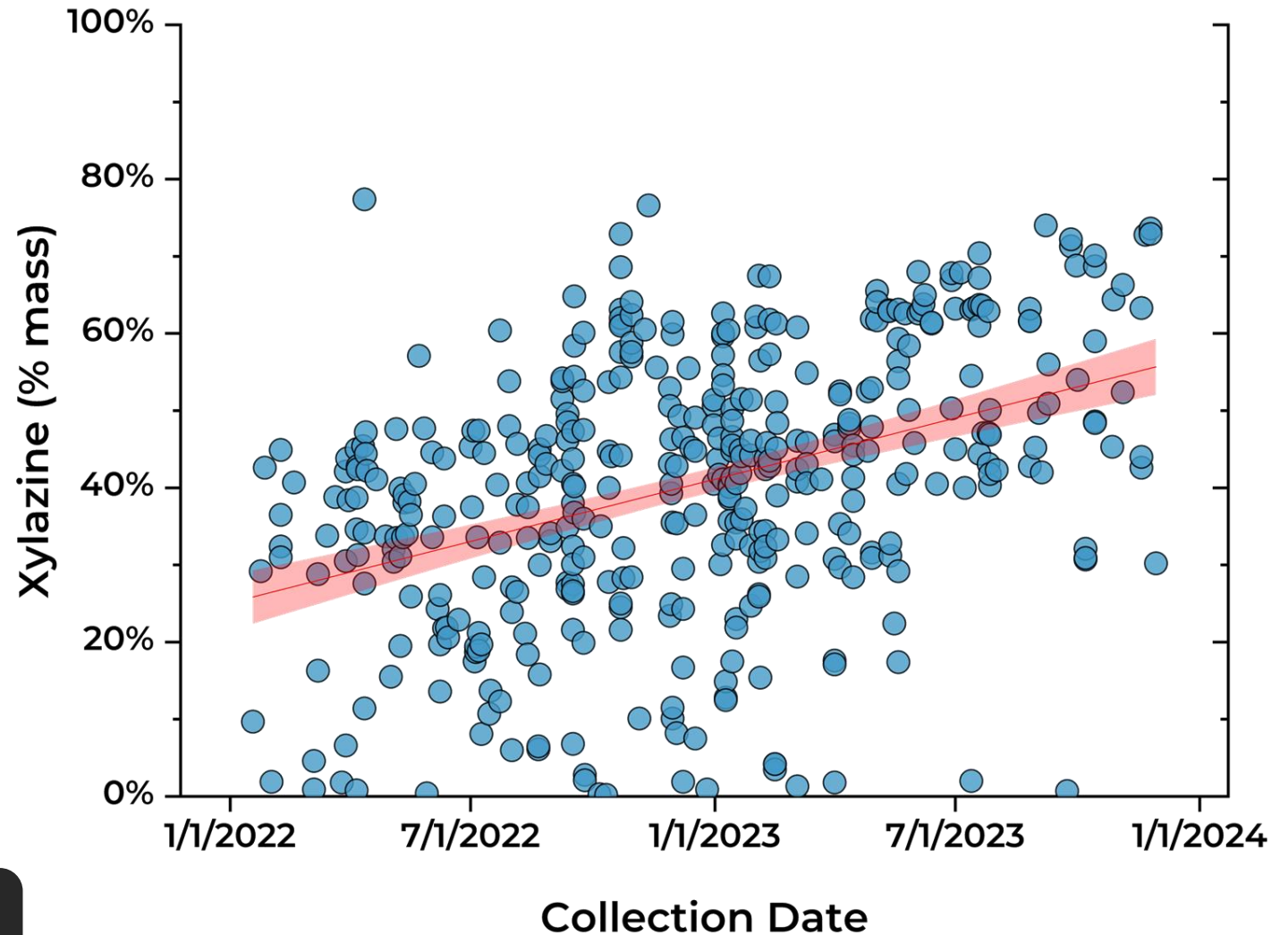
Q4 2022 – 40.6%

Q1 2023 – 40.2%

Q2 2023 – 47.0%

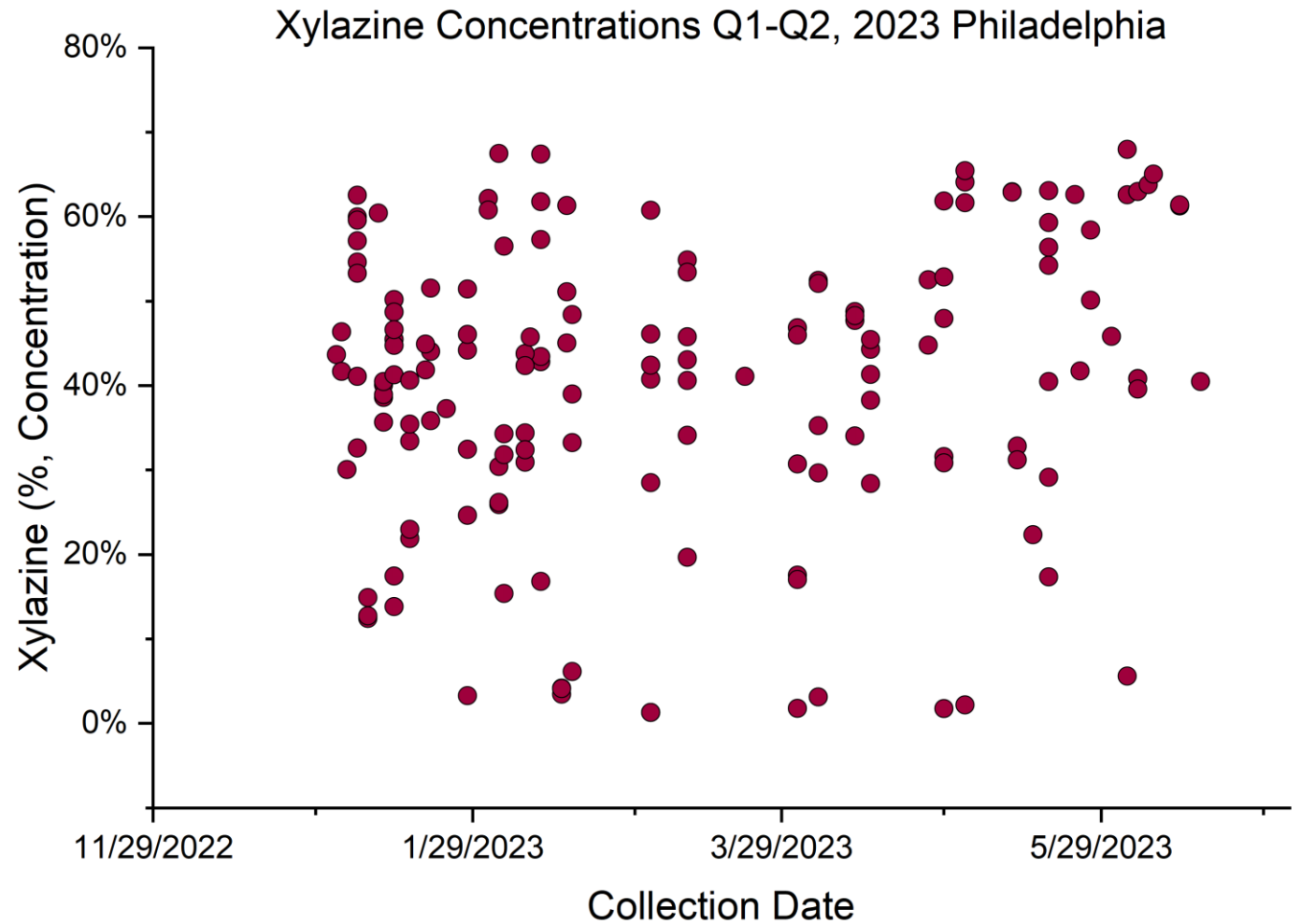
Q3 2023 – 53.0%

Q4 2023 – 53.5%



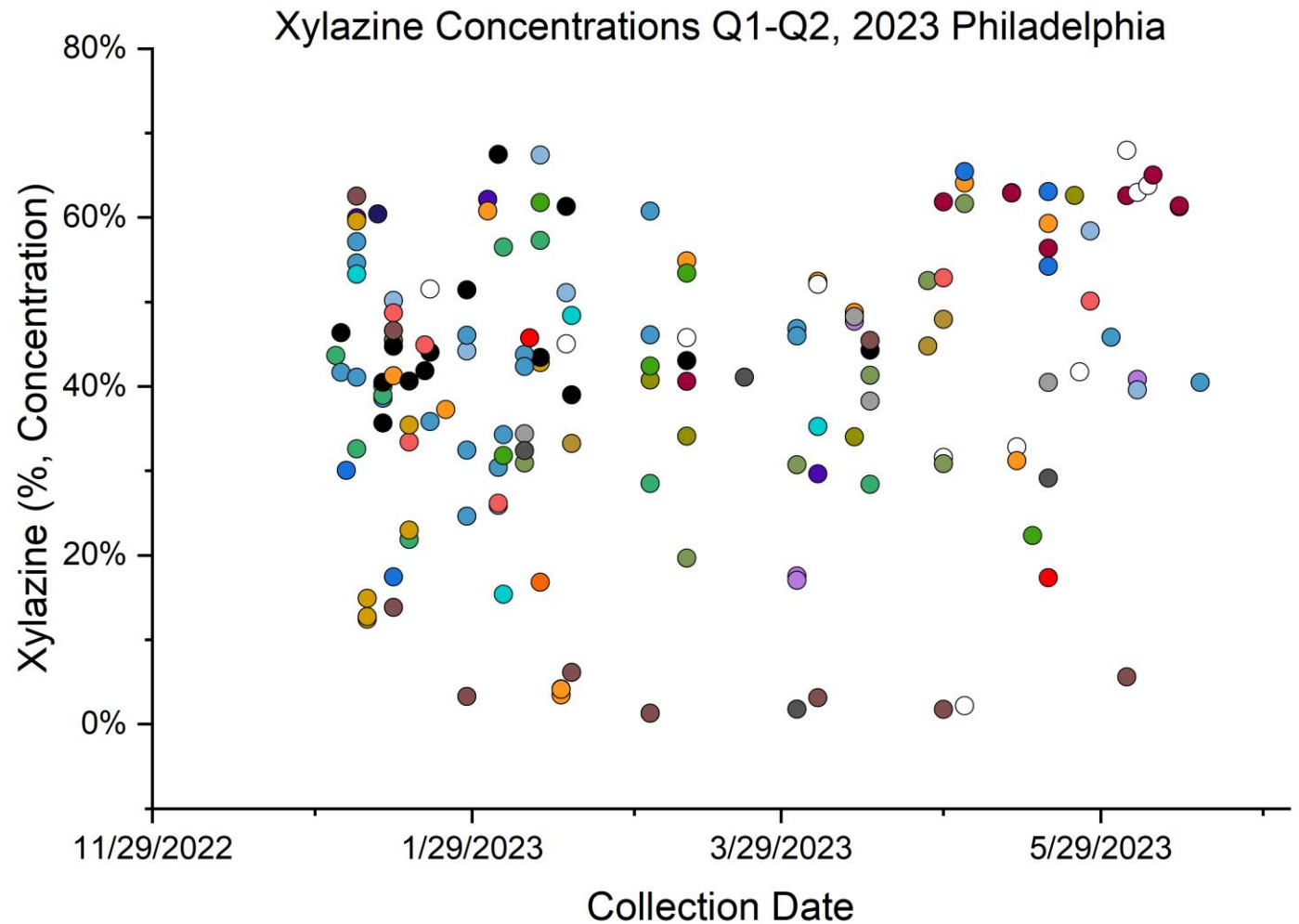
KEY FINDINGS - XYLAZINE

- View samples in which xylazine was quantified
- Plot by collected date as a dependent variable



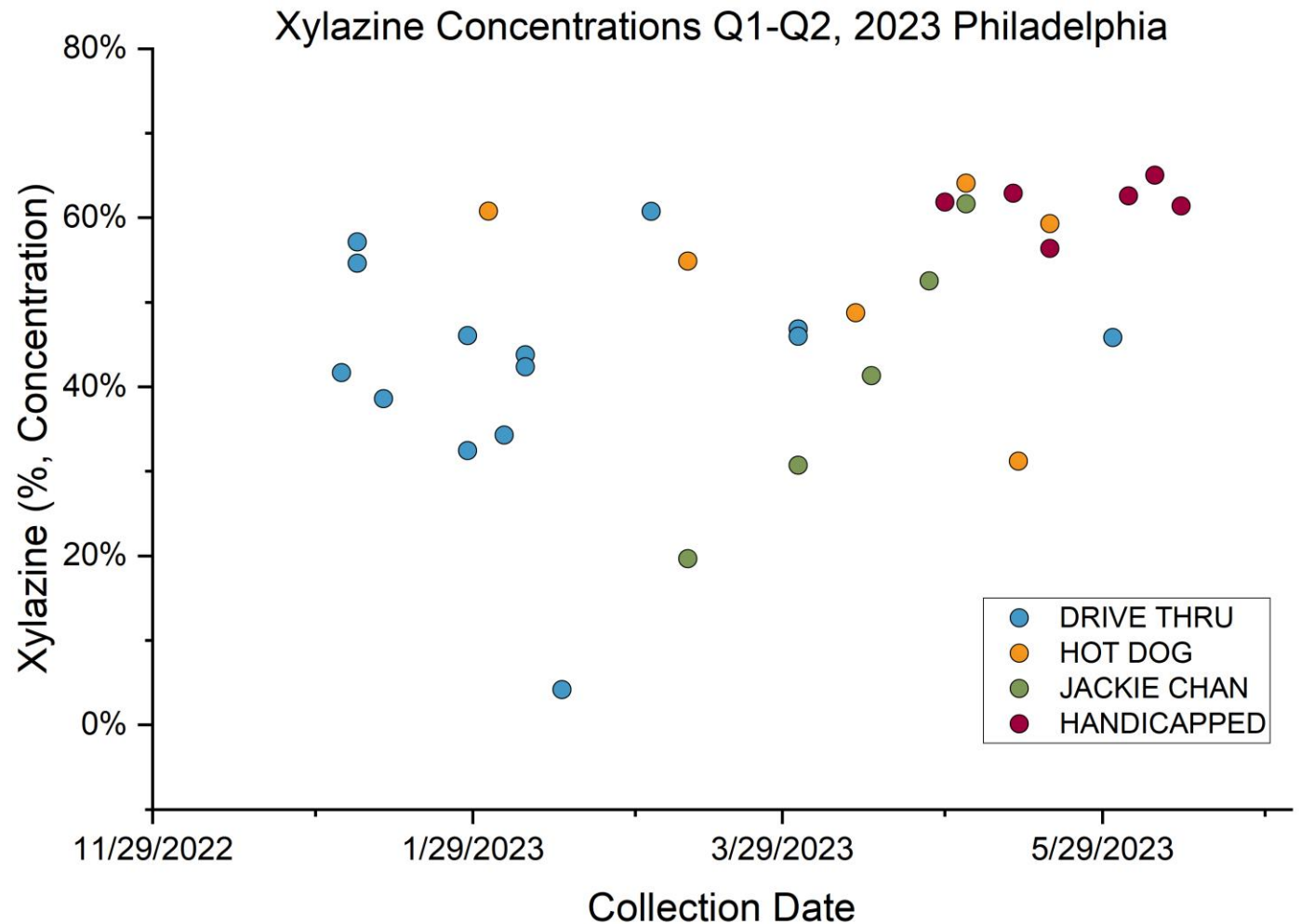
KEY FINDINGS - XYLAZINE

- View samples in which xylazine was quantified
- Sort by collected date as a dependent variable
- Color key by marking on glassine bag



KEY FINDINGS - XYLAZINE

- View samples in which xylazine was quantified
- Sort by collected date as a dependent variable
- Color key by marking on glassine bag
- Reduce data to markings with frequency $\geq N=5$
- Scale point size by fentanyl concentration



ACKNOWLEDGEMENTS



NIJ | National Institute of Justice

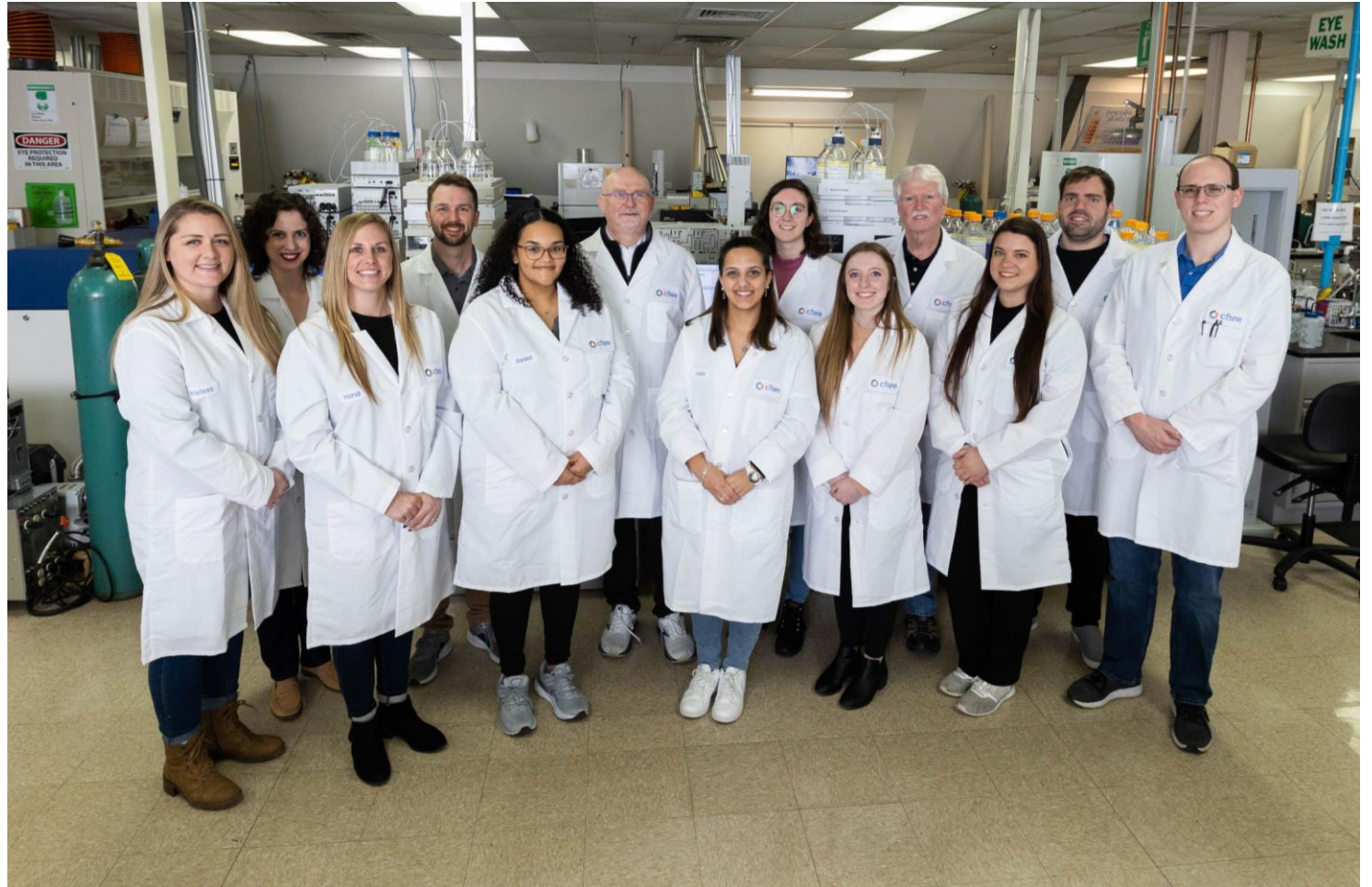
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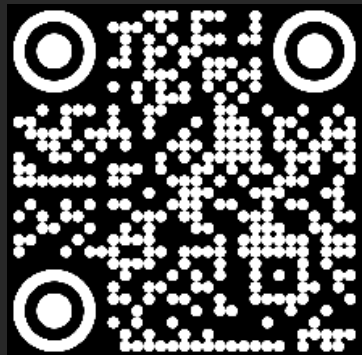




Thank you!

Questions?

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