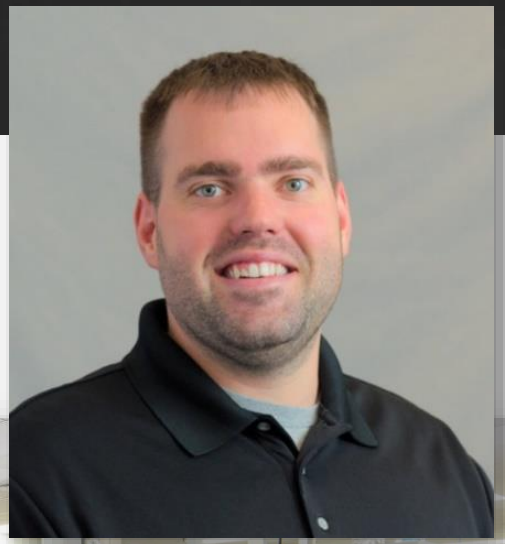
An Open Access Drug Early Warning System – Tracking Trends and Prevalence in the United States

NADDI Webinar Learning Series – Thursday July 13, 2023, from 1:00 to 2:00 PM ET

Alex J. Krotulski, Ph.D. – Center for Forensic Science Research and Education (CFSRE)

INTRODUCTION



- **Center for Forensic Science Research & Education**
  - Associate Director
    - Toxicology & Chemistry
  - Program Manager
    - NPS Discovery

- **Thomas Jefferson University**
  - Assistant Program Director
    - MS in Forensic Toxicology
  - Faculty / Lecturer

FUNDING DISCLOSURE

- CFSRE's NPS Discovery program is funded in part by the National Institute of Justice (NIJ), Office of Justice Programs (OJP), U.S. Department of Justice (DOJ).
  - Award Number: 15PNIJ-22-GG-04434-MUMU
  - The opinions, findings, conclusions and/or recommendations expressed in this publication are those of the author(s) and do not necessarily represent the official position or policies of the U.S. Department of Justice.

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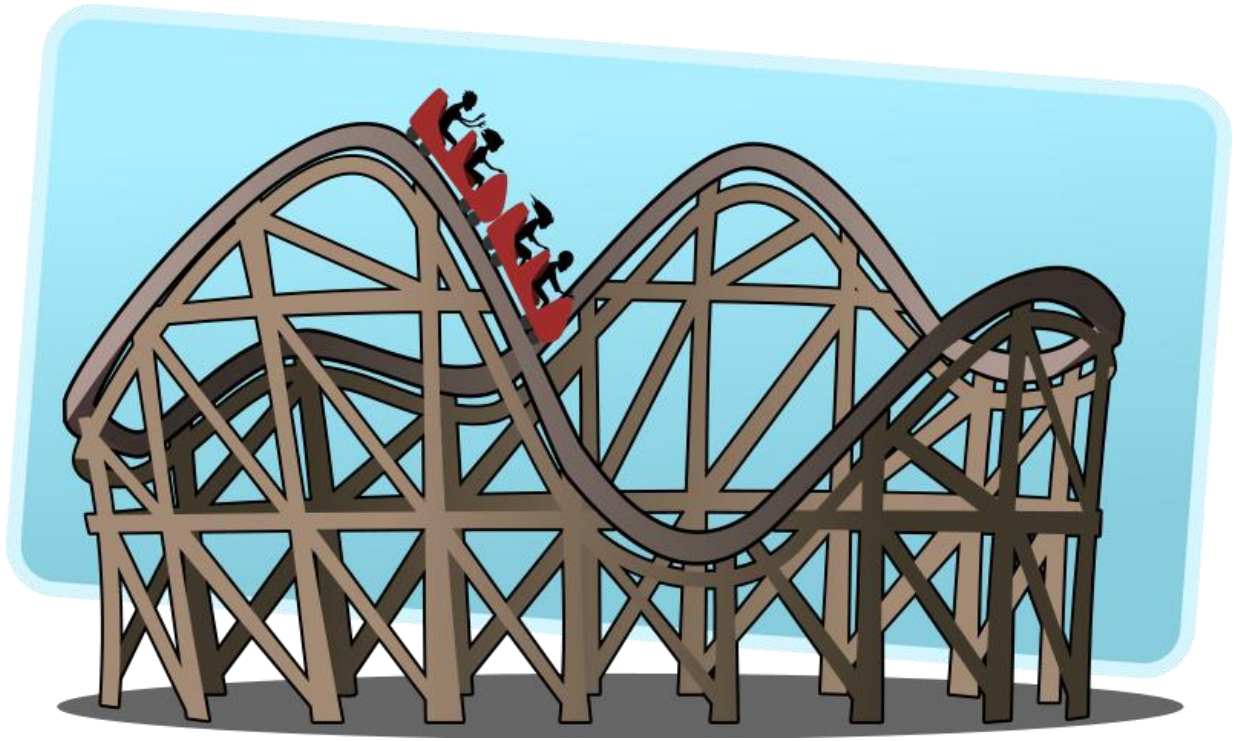
STRENGTHEN SCIENCE. ADVANCE JUSTICE.

PRESENTATION OUTLINE

- The CFSRE and NPS Discovery
  - Analytical Workflows and Our Approach
- NPS Trends, Positivity, and Prevalence
- Impacts, Outcomes, and Reporting
  - NPS Opioids
  - Synthetic Cannabinoids
  - Xylazine
  - Drug Checking Surveillance *(if time)*
- Where To Find Us !!



THE CFSRE & NPS DISCOVERY

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THE CFSRE & OUR LAB

- The Center for Forensic Science Research and Education (CFSRE)
  - 501(c)(3) non-profit research and educational facility
  - Home to *NPS Discovery* and other programs

Waters Xevo® G2-S LC-QTOF-MS

Sciex X500R LC-TOF-MS

Sciex TripleTOF® 5600+ LC-TOF-MS

Agilent 6495 LC-QQQ-MS

Agilent 6430 LC-QQQ-MS

Waters TQS LC-QQQ-MS

Waters TQD LC-QQQ-MS

Agilent 5975 GC-MS

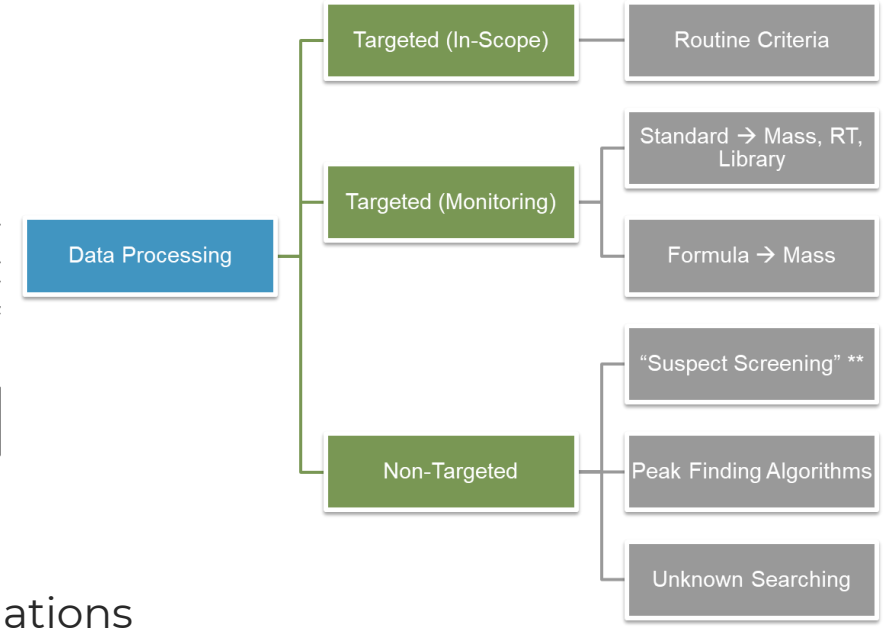
Agilent 5975 GC-MS

EXAMPLES OF SAMPLE "POPULATIONS"

- **Important → Right populations paired with good intelligence**
- **Toxicology Specimens:**
  - Collaborations with medical examiner and coroner offices, other toxicology labs, clinical partners, and other
  - Example: Initial toxicology testing negative but "suspected overdose"
- **Drug Materials:**
  - Collaborations with crime labs, law enforcement agencies public health partners, and others
  - Routine analysis vs. chemical characterization (structural elucidation)
- **Intelligence & Surveillance:**
  - Monitor online surface web gray market sites, drug use forums, etc.
  - Some correlation between sites and drug markets but delayed

ANALYTICAL WORKFLOWS & STRATEGIES

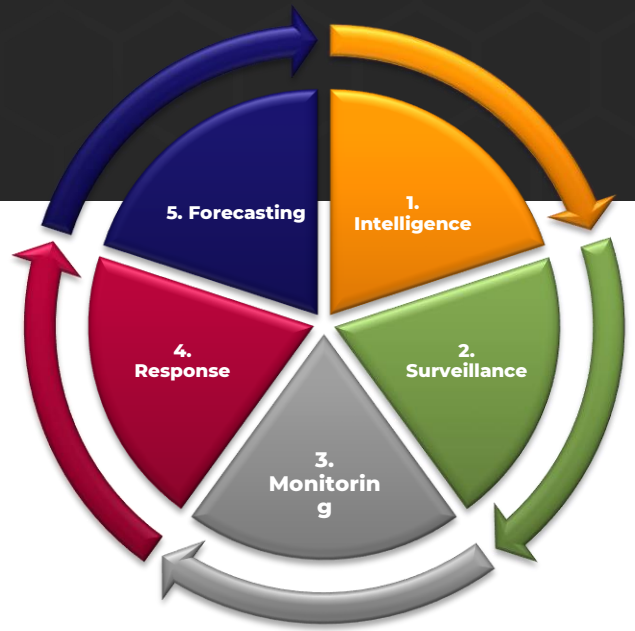
- **Sample-Mining (Prospective):**
  - Use of discarded authentic sample extract vials
  - High-*ish* volume, higher rate of incidence
  - Best for trend data (consistency)
- **Data-Mining (Retrospective):**
  - Use of electronic datafiles
  - Gives historical perspective
  - Not ideal way to discover NPS



- **Real-Time Surveillance / Case Analysis:**
  - Analysis of toxicology/chemistry samples from forensic investigations
  - Individual case basis but often can give insights into trending information

NPS DISCOVERY – THE CFSRE'S EWS

- Open-access drug early warning system (EWS)
  - Combine aspects of research & authentic cases
  - Analyze samples and generate data in-house
  - Develop a panel of high impact reports
  - Disseminate results and reports widely to stakeholders



2016	2017	2018	2019	2020	2021	2022
U-47700 & Furanylfentanyl	*N*-Ethyl Pentylone	Cyclopropylfentanyl & Methoxyacetylfentanyl	Isotonitazene	MDMB-4en-PINACA	Metonitazene & Nitazene Analogues	*N,N*-Dimethylpentylone
Deadly outbreak investigation involving 20+ cases centralized in Midwestern states.	Investigation of deaths and impaired driving cases involving new stimulant drug linked to Ecstasy and Molly use.	Postmortem investigations involving new fentanyl analogues linked to 40+ deaths in Midwestern states and Florida.	First outbreak investigation in the U.S. involving 20+ deaths, primarily from Indiana and Illinois.	Investigation of 50+ cases involving deaths and hospitalizations from states in the South, Midwest, and Northeast.	Continued monitoring and investigations of 40+ deaths involving new nitazene analogues emerging in various regions across the U.S.	First outbreak investigations involving a new stimulant drug linked to 50+ cases, including deaths, primarily originating from Florida and Northeastern states.

NECESSARY COMPONENTS OF A DRUG EARLY WARNING SYSTEM

- **Access to sample populations & data sources**
  - Toxicology samples – forensic and clinical
  - Drug materials – various distribution points
  - Surveys and drug use information
  - Online sources – drug fora, gray market sites, etc.
- **Framework that defines drugs of interest**
  - NPS vs. traditional drugs vs. adulterants, etc.
- **Uniform reporting format and structure**
- **Research initiatives / research programs**

- **Dissemination avenues**
  - Scientific community
  - Public health and public safety
  - Drug consuming populations and general public
- **Scientific and health expertise**
  - Pharmacology
  - Toxicology
  - Medical treatment
- **Collaborations, cooperation, information sharing, and plan for action**
  - Drug control and scheduling actions

BRIEF HISTORY & TIMELINE

2017
- Development of LC-QTOF-MS assay for >400 drugs (including many NPS)
- Began characterizing NPS using GC-MS, LC-QTOF-MS, and/or NMR workflows

2018
- Development and dissemination of first new drug monograph for NPS
- **Formally launched our NPS Discovery program**

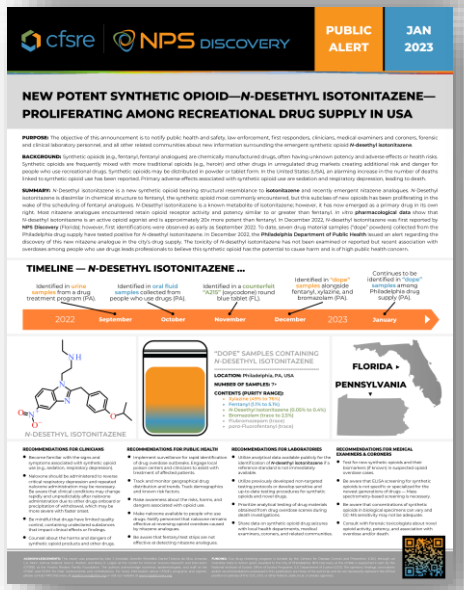
2019
- Launched first NPS Discovery website pages to archive reports and data
- Began issuing *Public Alerts* to scientific stakeholders and practitioners

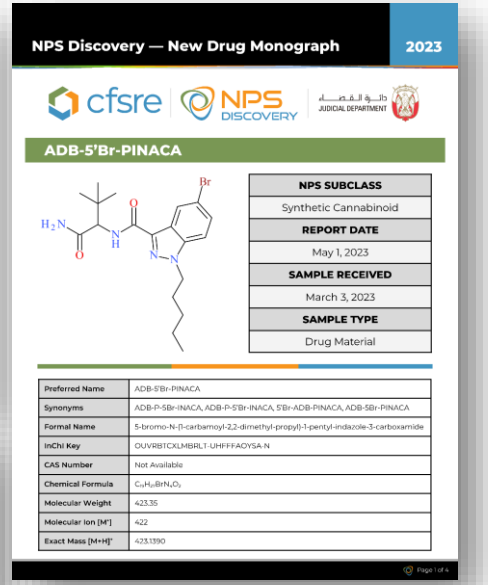
2020
- Expanded *Trend Reporting* to include all five major subclasses of NPS
- Continued data collections through onset of COVID-19 pandemic

2021
- Greatly expanding program outputs (including several new report types)
- Library database expanded to encompass >950 drugs and NPS

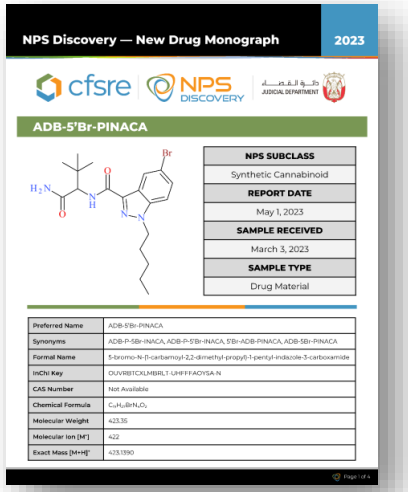
2022
- Advancements in *Drug Checking* initiatives (e.g., purity testing, potency index)
- Expansion of drug checking and clinical monitoring with new collaborators

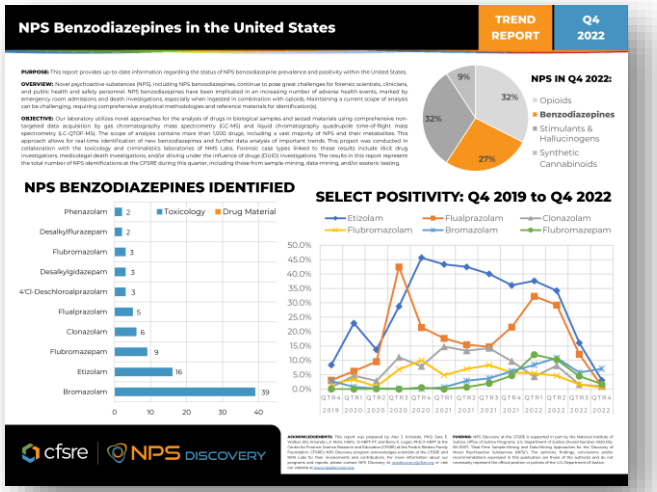
2023
- Continued expansion of *Clinica* / NPS investigations (database >1,100 drugs)
- **Launch of *NPS Discovery Quarterly Webinar Series***

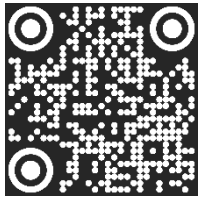


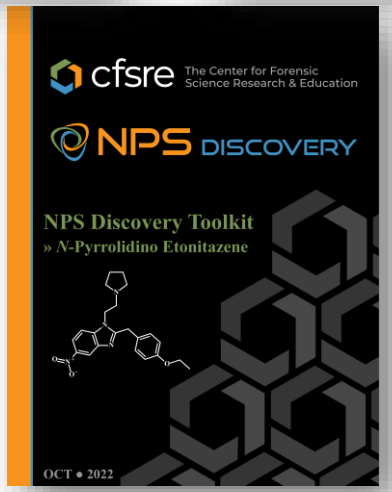


NPS DISCOVERY REPORTS









YEAR IN REVIEW ▸

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YEAR IN REVIEW 2022

Purpose: This report provides cumulative and updated statistics about the emergence and landscape of novel psychoactive substances (NPS) in the United States based on data developed by NPS Discovery at the CFSRE — a premier open-access drug early warning system utilizing an evidence-based approach to disseminate information for real-time public health and safety actions.

Since 2018, NPS Discovery has reported 137 newly discovered NPS in the United States (Figure 1). NPS opioids remain the largest subclass (Figure 2). In 2022, NPS Discovery reported the discovery of 21 NPS for the first time.

Figure 1: Newly discovered NPS reported for the first time since 2018.

Figure 2: Breakdown by subclass of newly discovered NPS, 2018-2022.

Since 2018, NPS Discovery has identified 218 NPS in forensic samples (Figure 3). NPS opioids, stimulants, and cannabinoids represent the largest subclasses observed. In 2022, 76 total NPS were detected (Figure 4).

Figure 3: Breakdown by subclass of individual NPS detected, 2018-2022.

Figure 4: Individual NPS detected each year, cumulative since 2018.

In 2022, NPS Discovery observed more than 2,200 total NPS detections within examined sample populations (Figure 5), a portion of more than 10,000 total NPS detections since our program launched in 2018 (Figure 6).

Figure 5: Total number of NPS detections among all samples analyzed since 2018.

Figure 6: Cumulative number of NPS detections since 2018.

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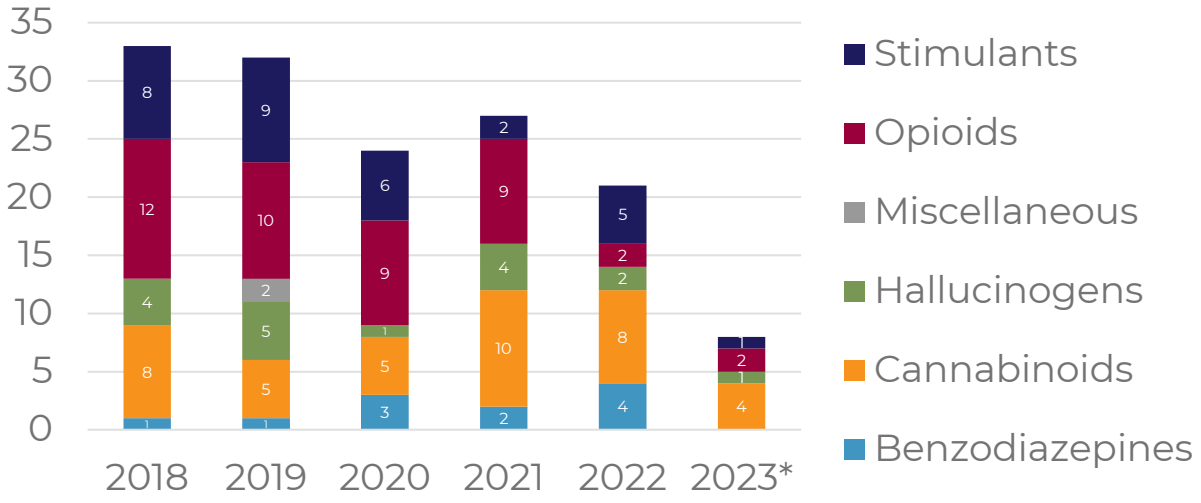
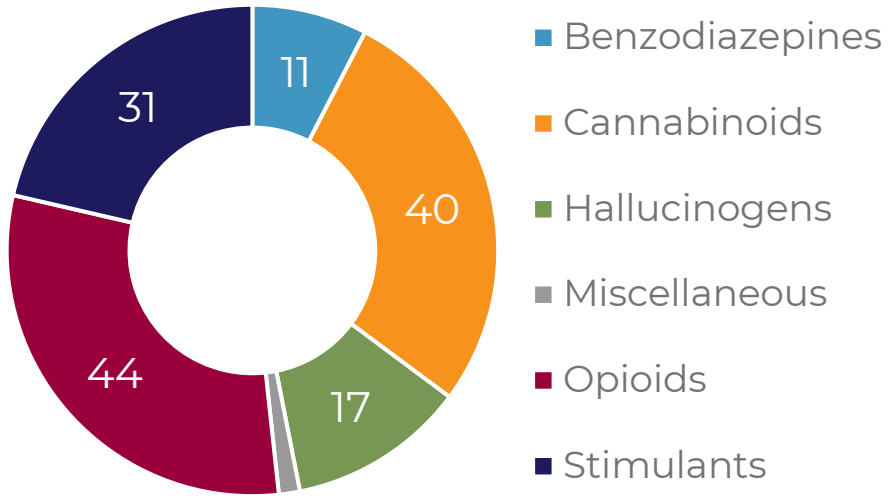
EMERGENCE OF NPS IN THE U.S.

- Since 2018, NPS Discovery has reported **145** newly discovered NPS (and counting)
- **NPS opioids** remain the largest subclass of newly emerging drugs encountered
- As of June 2023, NPS Discovery has reported **8** NPS for the first time this year





NEW DRUG MONOGRAPHS – 2023

Date	NPS Class	Drug Name	Formula	[M+]	[M+H]+
06/28/2023	Cannabinoid	**CHO-4'Me-5'Br-FUBOXPYRA**	C20H22BrFN2O2	420	421.0921
06/27/2023	Cannabinoid	**MDMB-BINACA**	C19H27N3O3	345	346.2125
06/26/2023	Cannabinoid	**MDMB-INACA**	C15H19N3O3	289	290.1499
06/23/2023	Opioid	***N*-Pyrrolidino Metonitazene**	C21H24N4O3	380	381.1921
06/22/2023	Opioid	***N*-Pyrrolidino Protonitazene**	C23H28N4O3	408	409.2234
06/21/2023	Hallucinogen	**25B-NBOH**	C17H20BrNO3	365	366.0699
06/20/2023	Stimulant	**4-Methylmethylphenidate**	C15H21NO2	247	248.1645
05/01/2023	Cannabinoid	**ADB-5'Br-PINACA**	C19H27BrN4O2	422	423.1390

Pending: Medetomidine (Misc.) and NMBMSB (Syn. Cann.)

LANDSCAPE OF NPS IN THE U.S.

- Since 2018, NPS Discovery has identified **more than 225** NPS in forensic samples
- **NPS opioids**, **stimulants**, and **cannabinoids** represent the largest subclasses observed

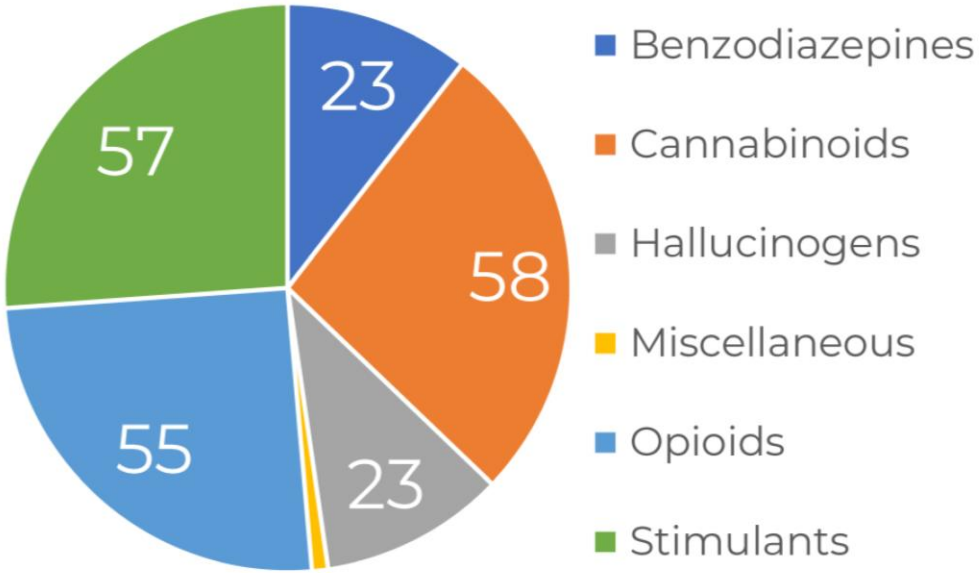


Figure 3: Breakdown by subclass of individual NPS detected, 2018-2022.

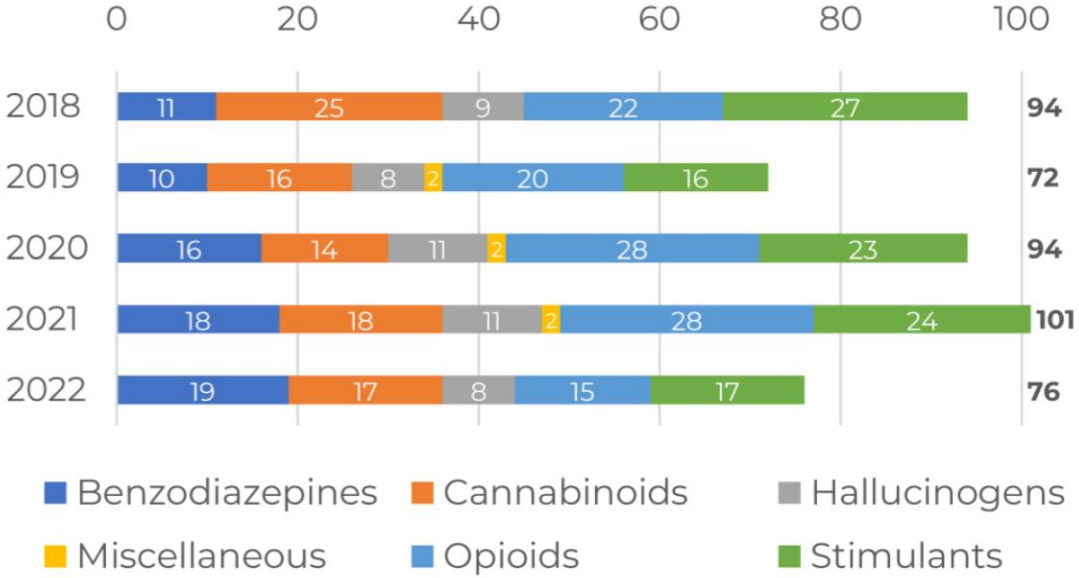


Figure 4: Individual NPS detected each year, cumulative since 2018.

PROLIFERATION OF NPS IN THE U.S.

- In 2022, NPS Discovery observed more than **2,200** total NPS detections
- A portion of more than **10,000** total NPS detections since 2018

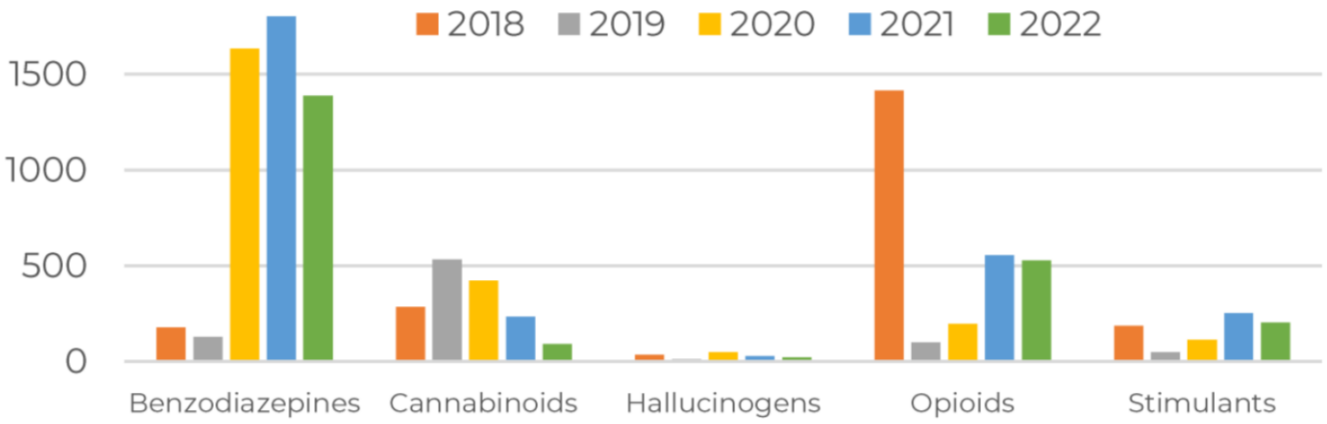


Figure 5: Total number of NPS detections among all samples analyzed since 2018.

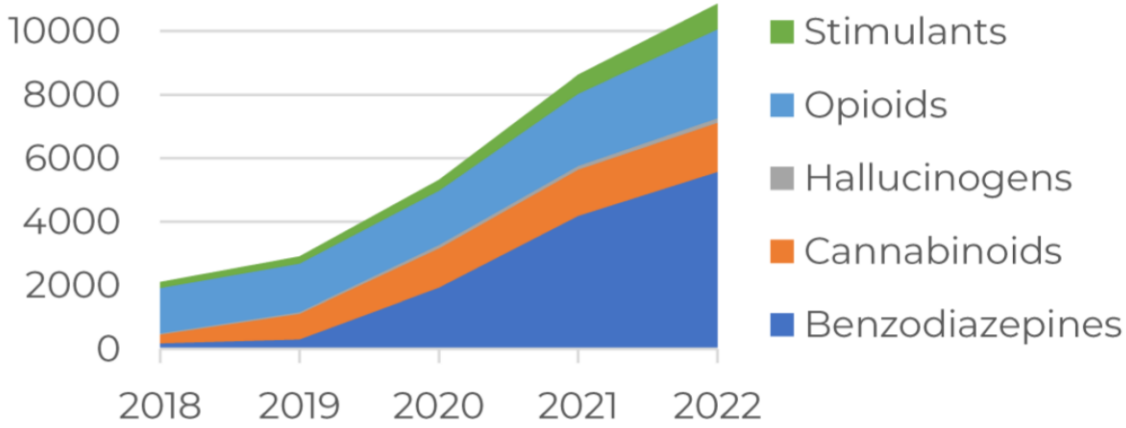


Figure 6: Cumulative number of NPS detections since 2018.

POSITIVITY PLOTS SINCE 2018

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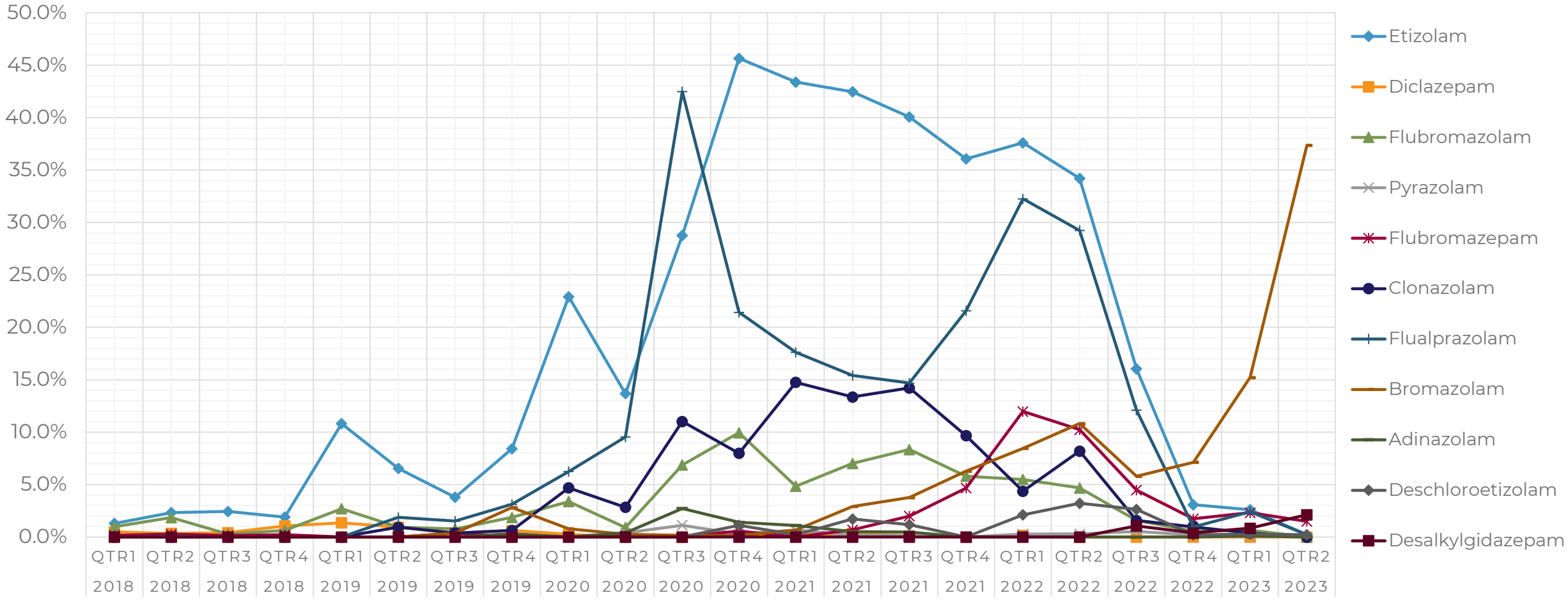
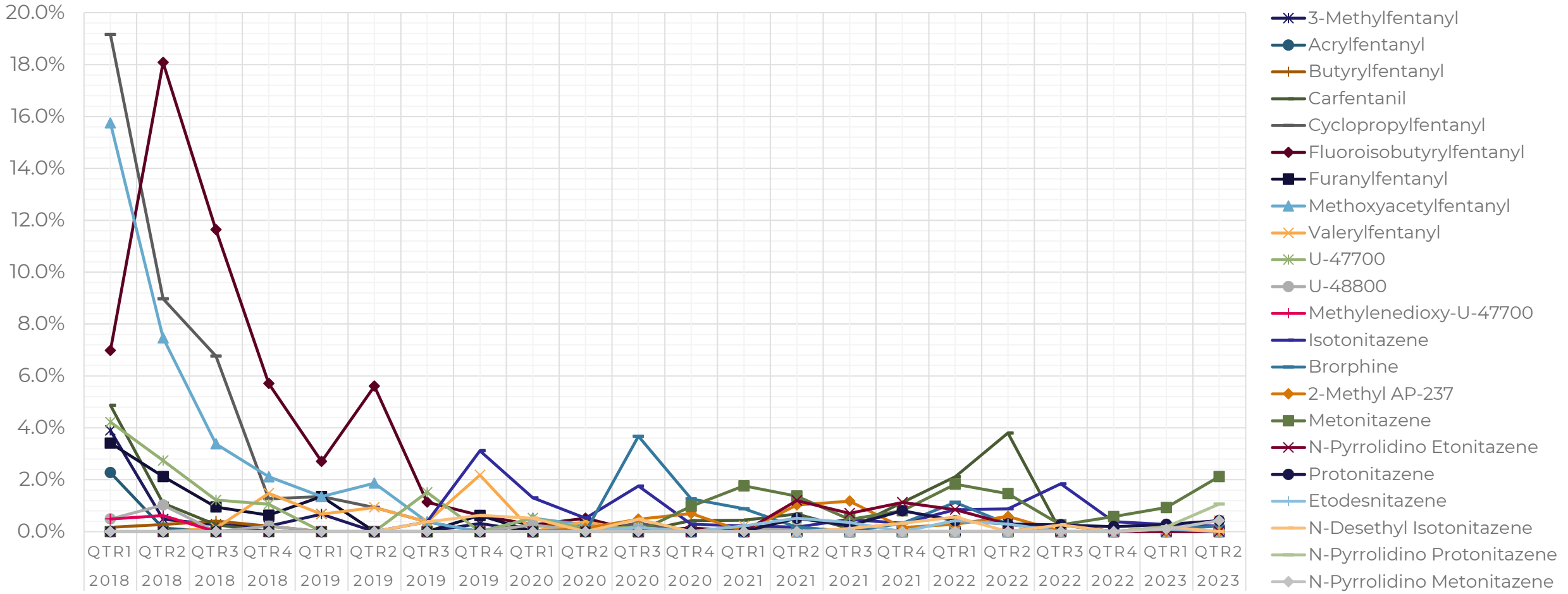
POSITIVITY PLOTS – NPS BENZODIAZEPINES

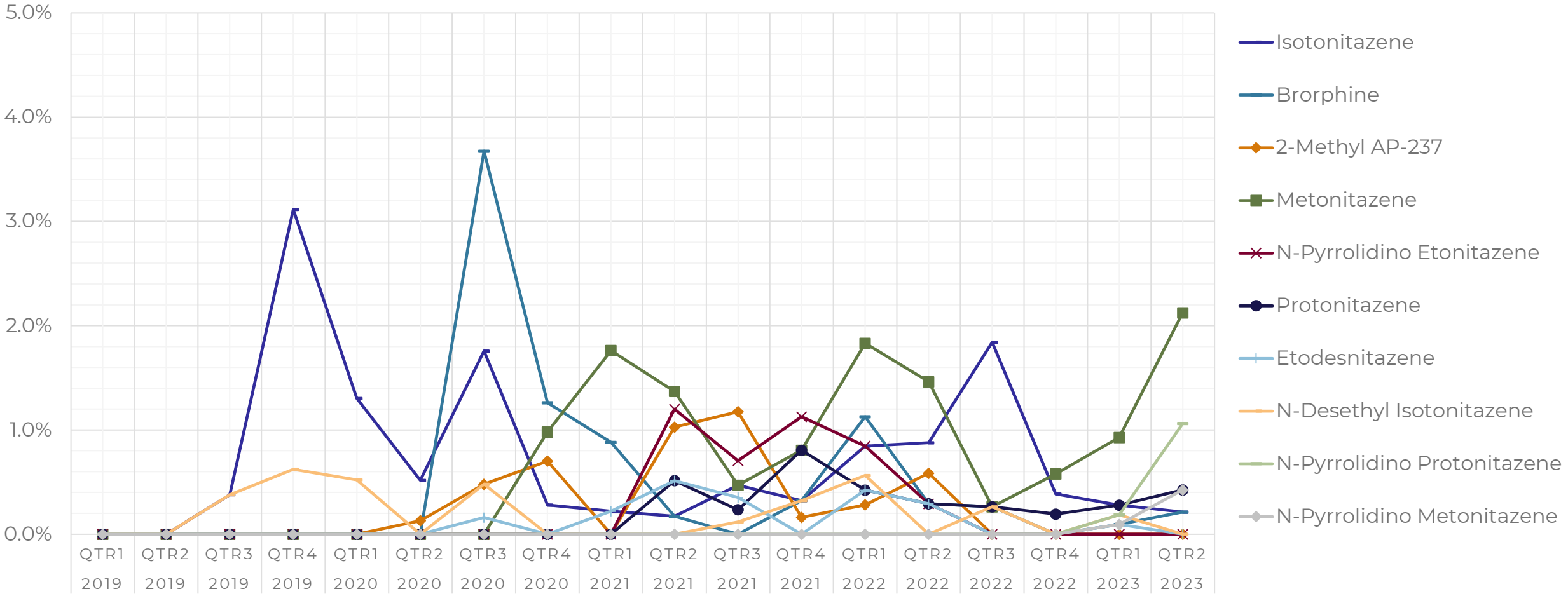


POSITIVITY PLOTS – NPS OPIOIDS

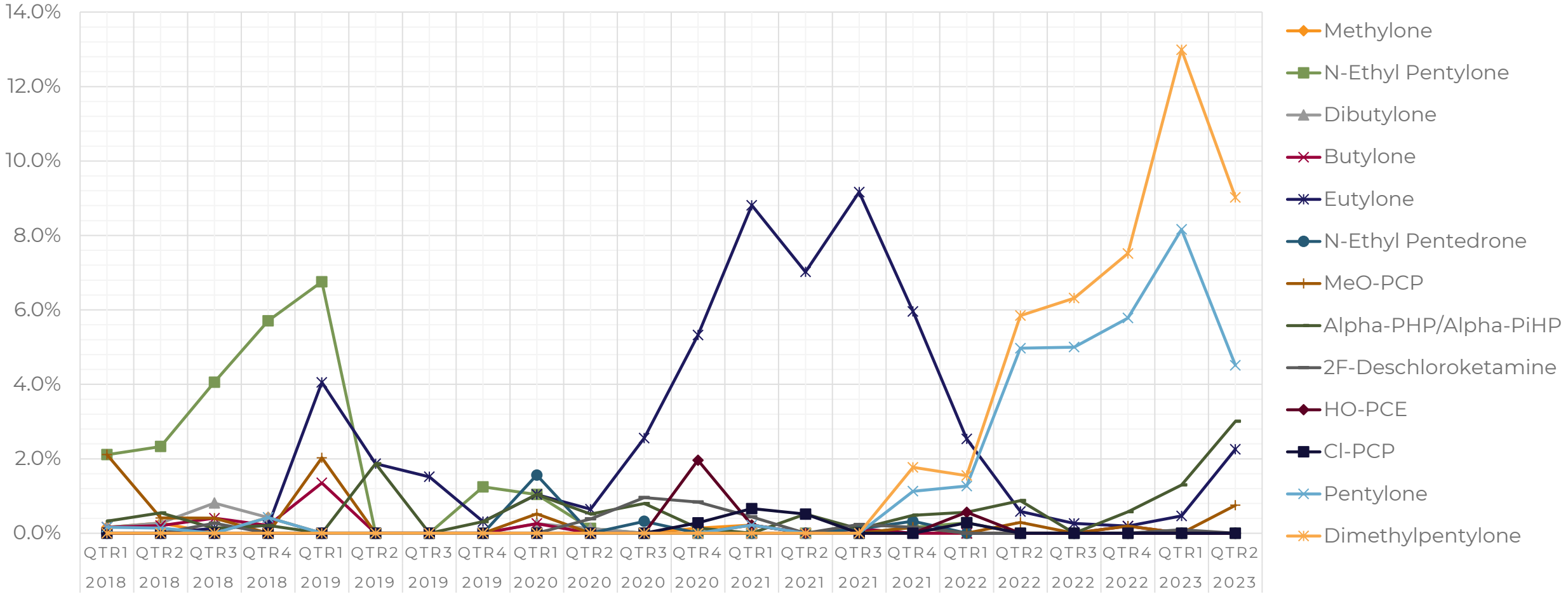


Note: Fluorofentanyl Excluded

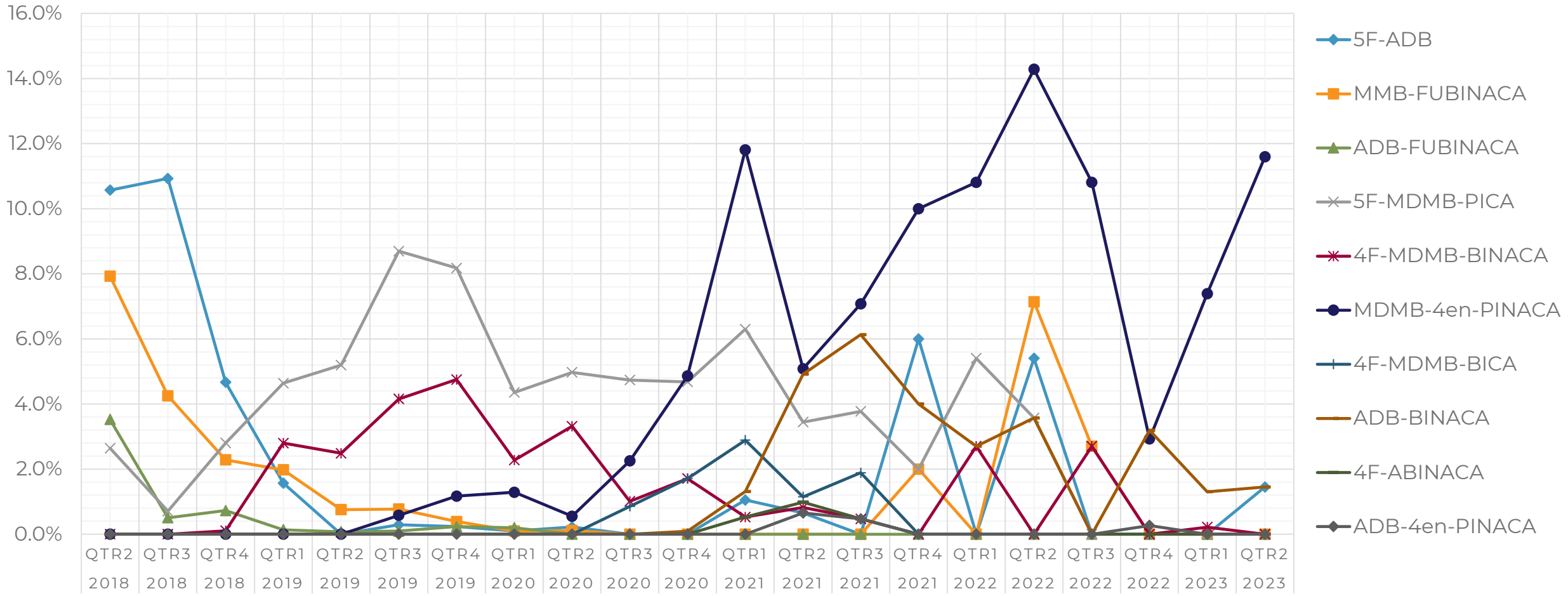
POSITIVITY PLOTS – NPS OPIOIDS (NEW GENERATION ONLY)



POSITIVITY PLOTS – NPS STIMULANTS & HALLUCINOGENS

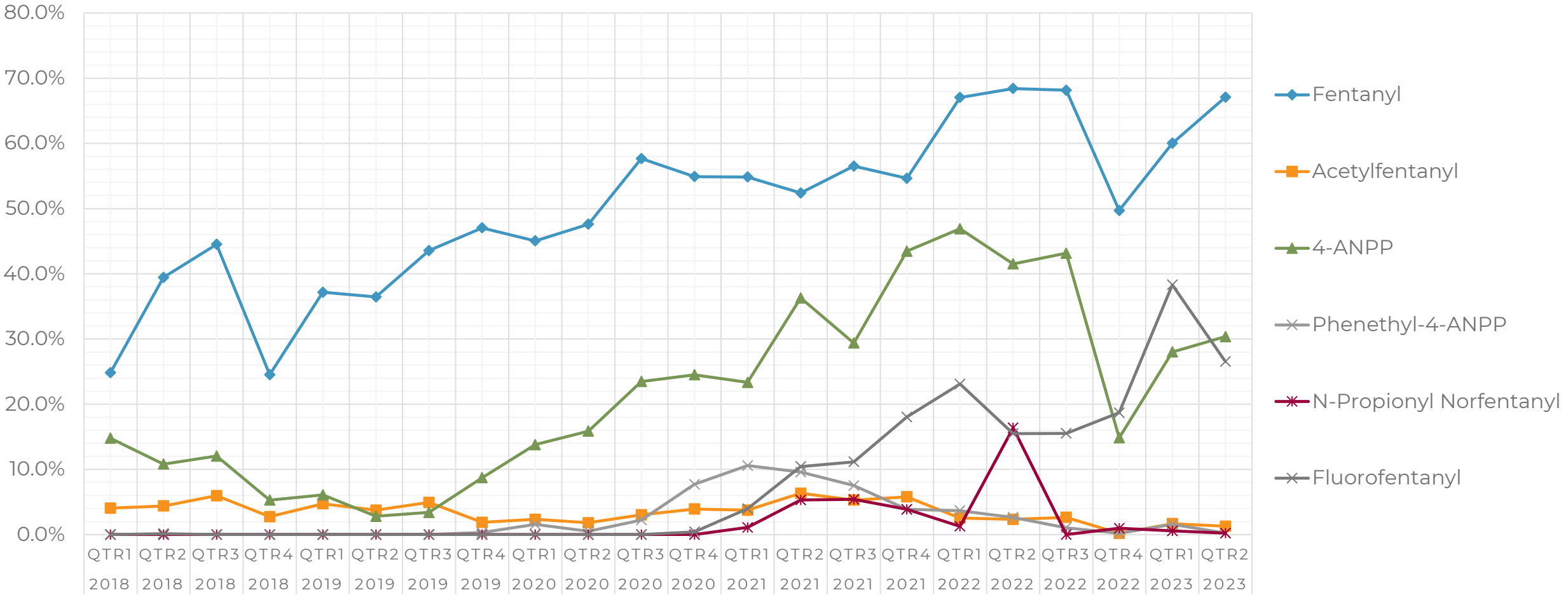


POSITIVITY PLOTS – SYNTHETIC CANNABINOIDS

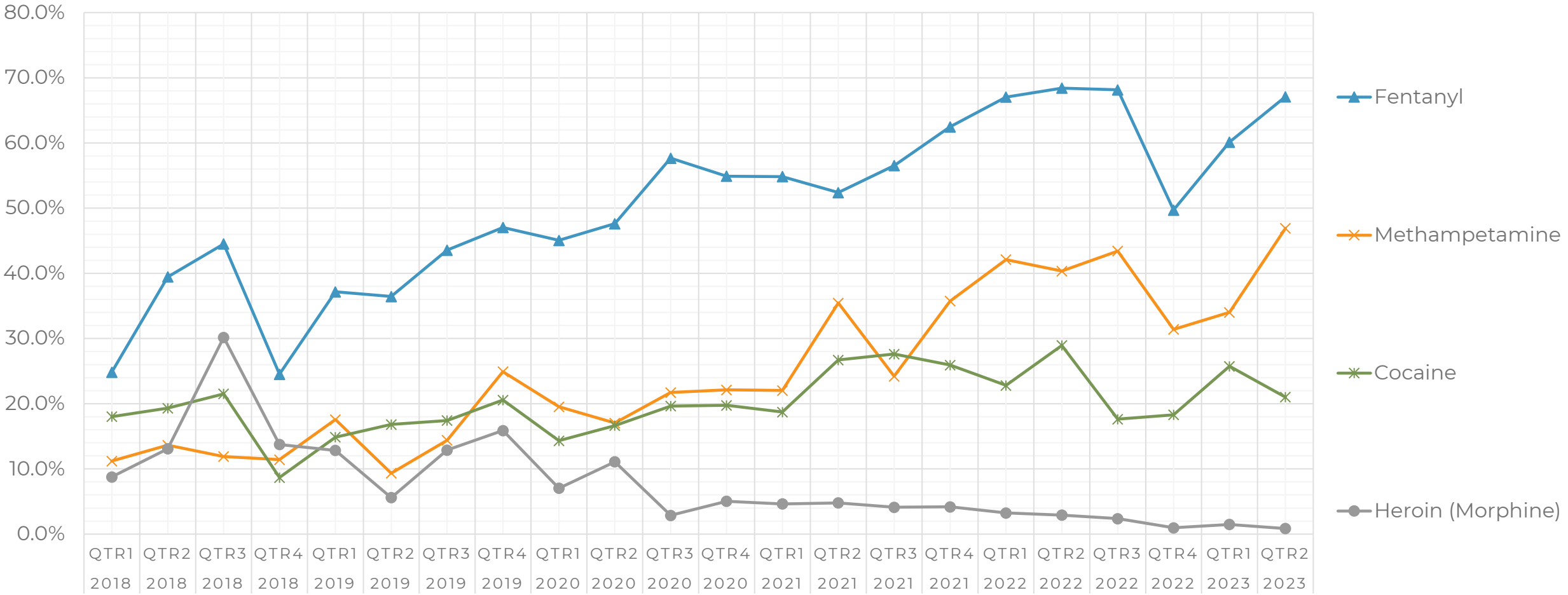


Note: Some quarters may be skewed due to low sample volume

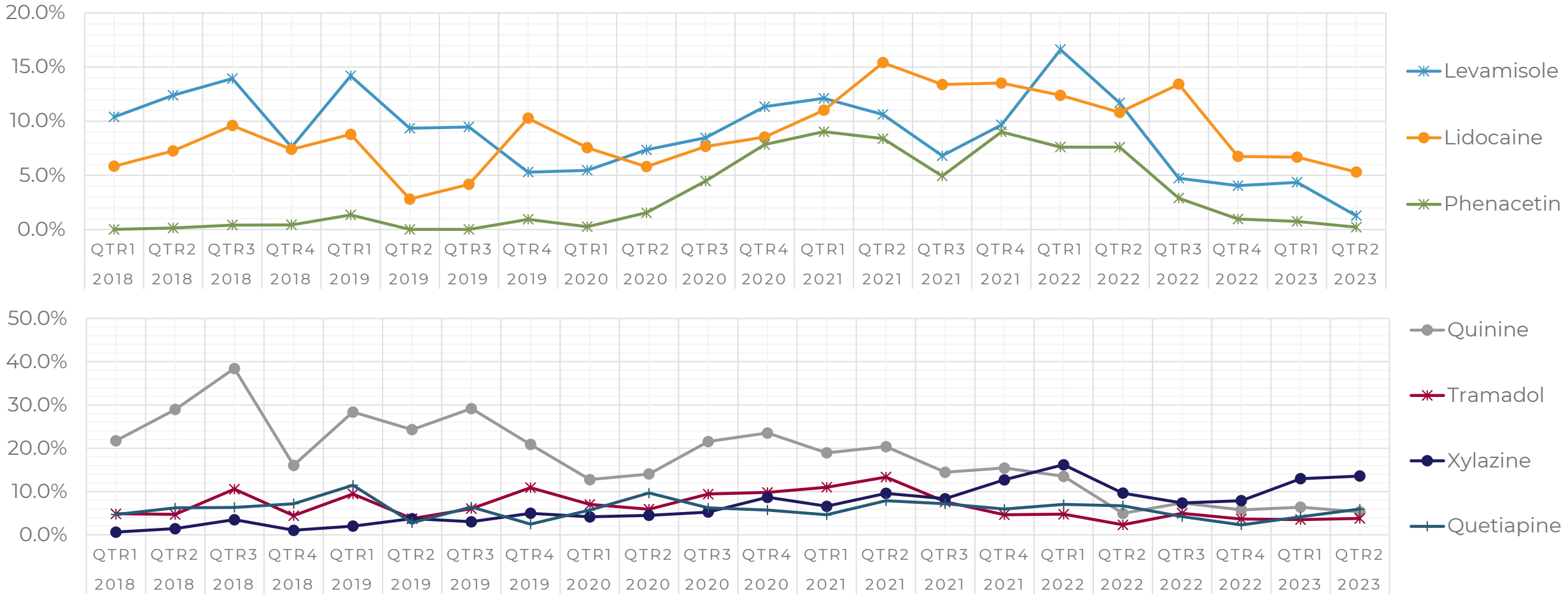
POSITIVITY PLOTS – FENTANYL & FLUOROFENTANYL



POSITIVITY PLOTS – TRADITIONAL DRUGS

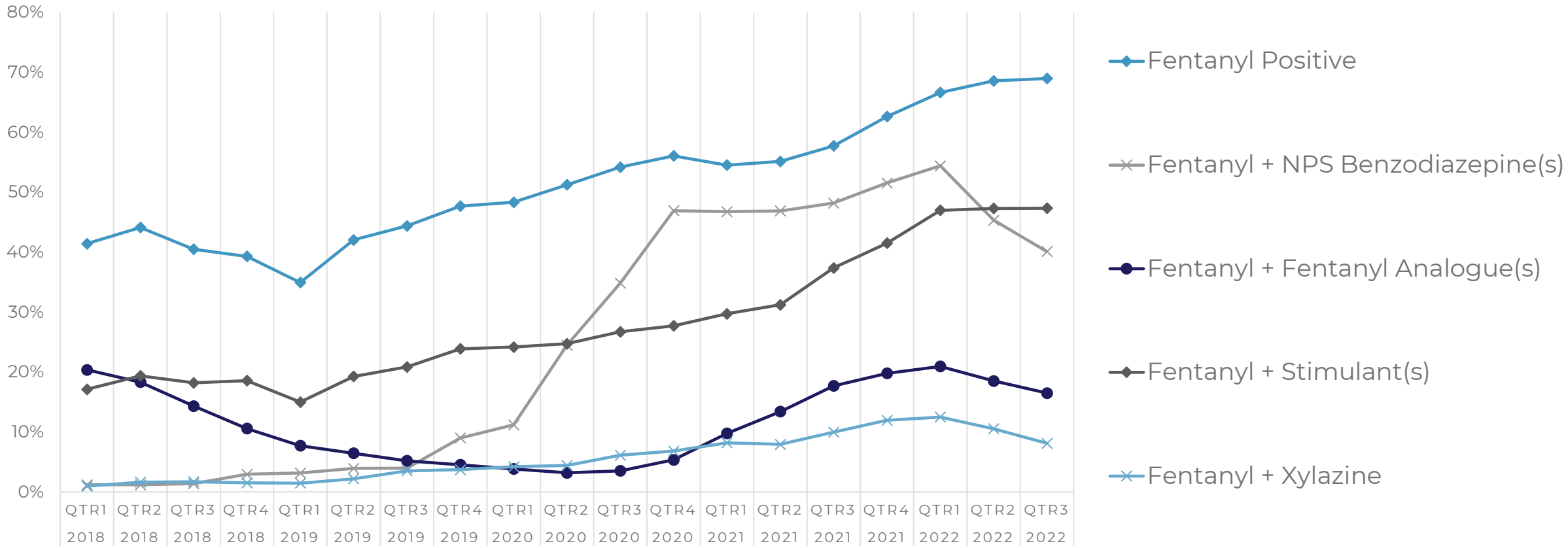


POSITIVITY PLOTS – ADULTERANTS



ENTERING THE POLYDRUG STAGE OF OPIOID EPIDEMIC

Fentanyl Co-Positivity – the “Nested Waves” Underlying Positivity and Prevalence



NPS OPIOIDS

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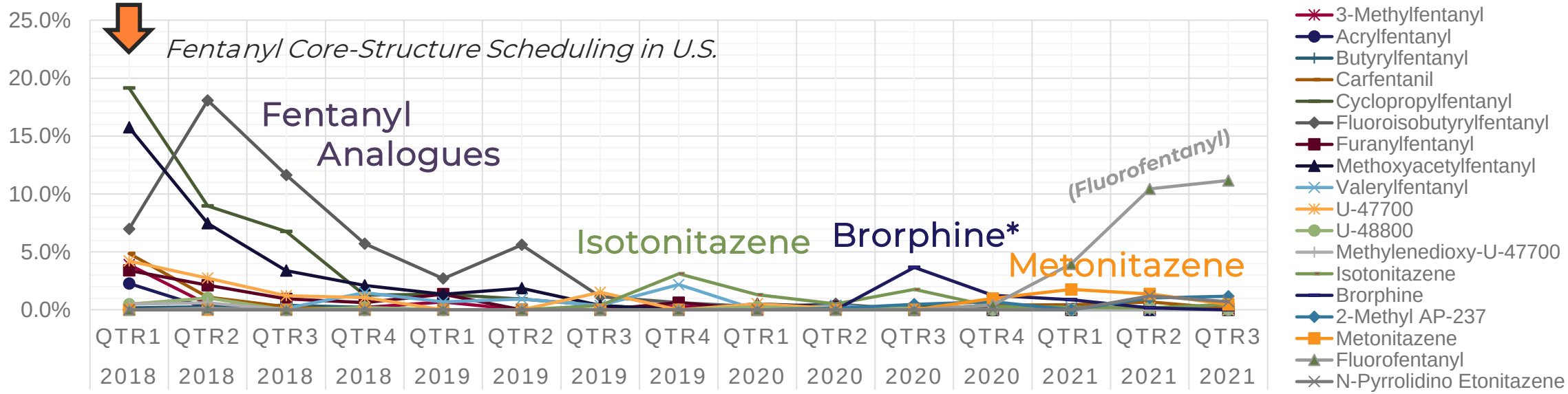
FENTANYL ANALOGUES → "NITAZENE ANALOGUES"

- In 2018, the DEA placed all **fentanyl-related substances** in Schedule I
  - Role of EWS → track what the impact of this scheduling action might be
- Between 2019 and 2021, NPS Discovery observed the **emergence of "nitazene analogues"**
  - And this has continued into 2023



*Not a "nitazene" analogue

NPS OPIOID DISCOVERIES SINCE 2018

2018

- MD-U-47700
- Phenylfentanyl
- U-47931E

2019

- Fluorofuranylfentanyl
- p-MeO-Fu-Fentanyl
- 2',5'-DiMeO-Fentanyl
- 2-Methyl AP-237
- AP-237
- Piperidylthiambutene
- 2F-Viminol
- **Isotonitazene**
- N-Methyl U-47931E
- p-Me-Cpr-Fentanyl

2020

- 3,4-Difluoro-U-47700
- N-Ethyl-U-47700
- para-Methyl AP-237
- Brorphine
- **Metonitazene**
- AP-238
- Fluorofentanyl
- Chlorofentanyl
- Bromofentanyl

2021

- **Butonitazene**
- **Etodesnitazene**
- **Flunitazene**
- ***N*-Pyrrolidino Etonitazene**
- **Protonitazene**
- **Metodesnitazene**
- ***N*-Piperidinyl Etonitazene**

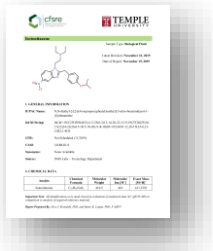
2022

- Dipyanone
- ***N*-Desethyl Isotonitazene**

2023

- ***N*-Pyrrolidino Metonitazene**
- ***N*-Pyrrolidino Protonitazene**

EWS IMPACT – NITAZENE ANALOGUE TIMELINES



First isotonitazene case
based on testing at CFSRE
(Toxicology, Aug. 2019)

Public alert issued
for isotonitazene (CFSRE)
(Nov. 2019)

Notice of intent
to schedule (DEA)
(June 2020)

Isotonitazene waning
in positivity (CFSRE)
(Q1/Q2 2020)

2019 1 2 3 4 5 6 7 8 9 10 11 12 2020 1 2 3 4 5 6 7 8 9 10 11 12 2021

EWS IMPACT – NITAZENE ANALOGUE TIMELINES

First brorphine case
based on testing at CFSRE
(Toxicology, June 2020)

Public alert issued
for brorphine (CFSRE)
(July 2020)

Notice of intent
to schedule (DEA)
(Dec. 2020)

Brorphine waning
in positivity (CFSRE)
(Q4 2020)

6 7 8 9 10 11 12 2020 1 2 3 4 5 6 7 8 9 10 11 12 2021 1 2 3 4 5 6 7 8

EWS IMPACT – NITAZENE ANALOGUE TIMELINES

First metonitazene case
based on testing at CFSRE
(Drug material, July 2020)

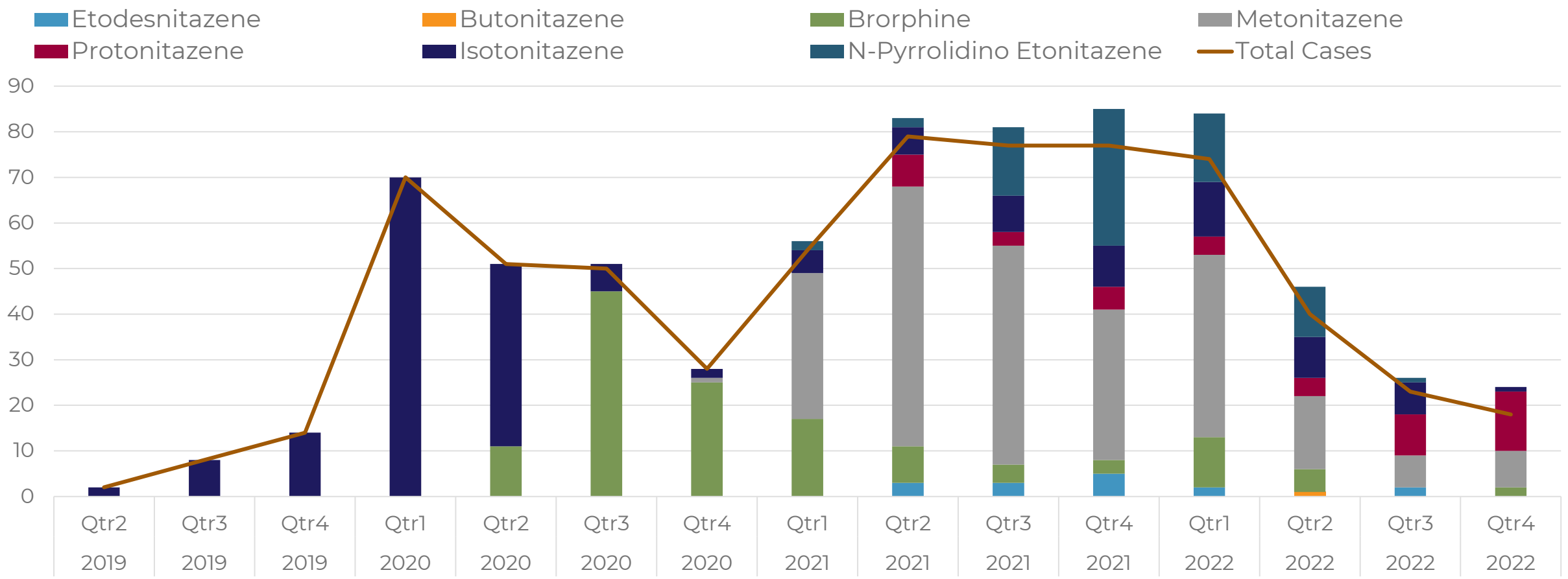
Public alert issued
for metonitazene (CFSRE)
(Jan. 2021)

Notice of intent
to schedule (DEA)
(Dec. 2021)

Metonitazene waning
in positivity (CFSRE)
(Q3/Q4 2021)

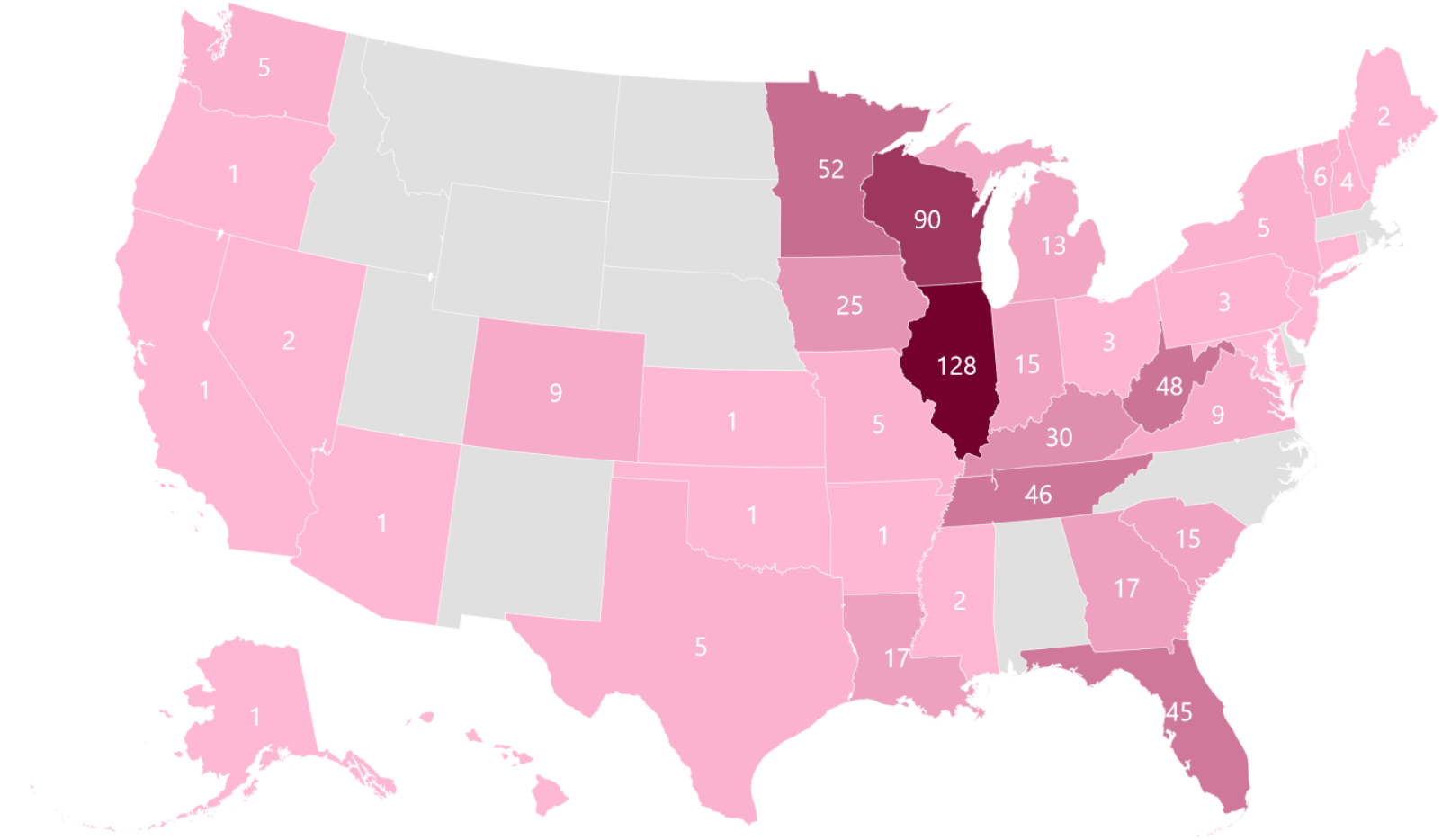
2020 1 2 3 4 5 6 7 8 9 10 11 12 2021 1 2 3 4 5 6 7 8 9 10 11 12 2022

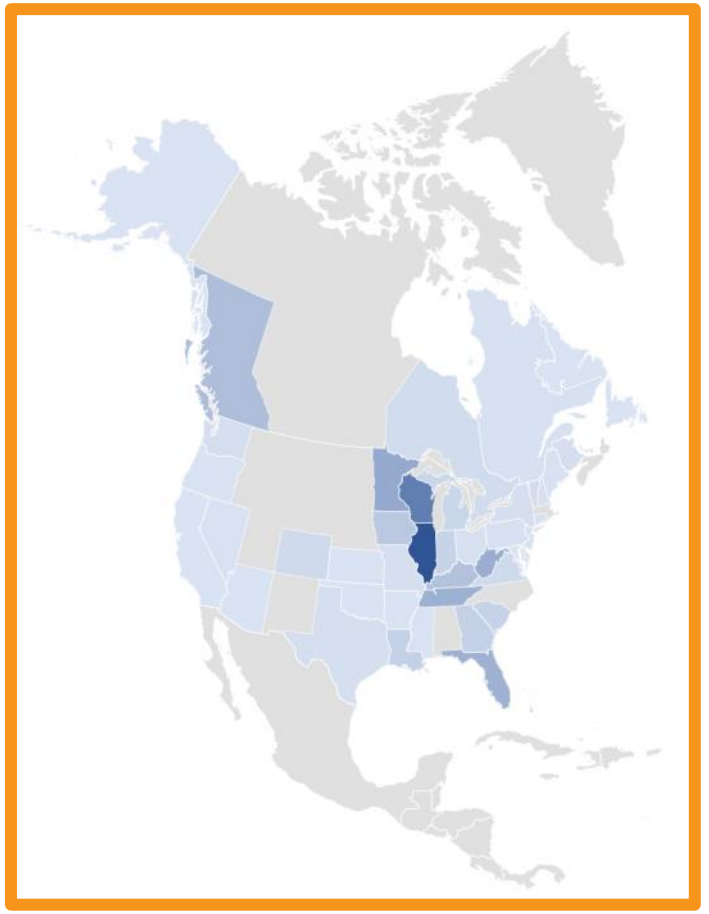
DIVERSIFICATION OF NITAZENE ANALOGUES



*Forensic toxicology cases. Data from NMS Labs & CFSRE

PROLIFERATION OF NITAZENE ANALOGUES





*Forensic toxicology cases. Data from NMS Labs representing cumulative identifications.
*Includes: isotonitazene, brorphine, metonitazene, N-pyrrolidino etonitazene, protonitazene

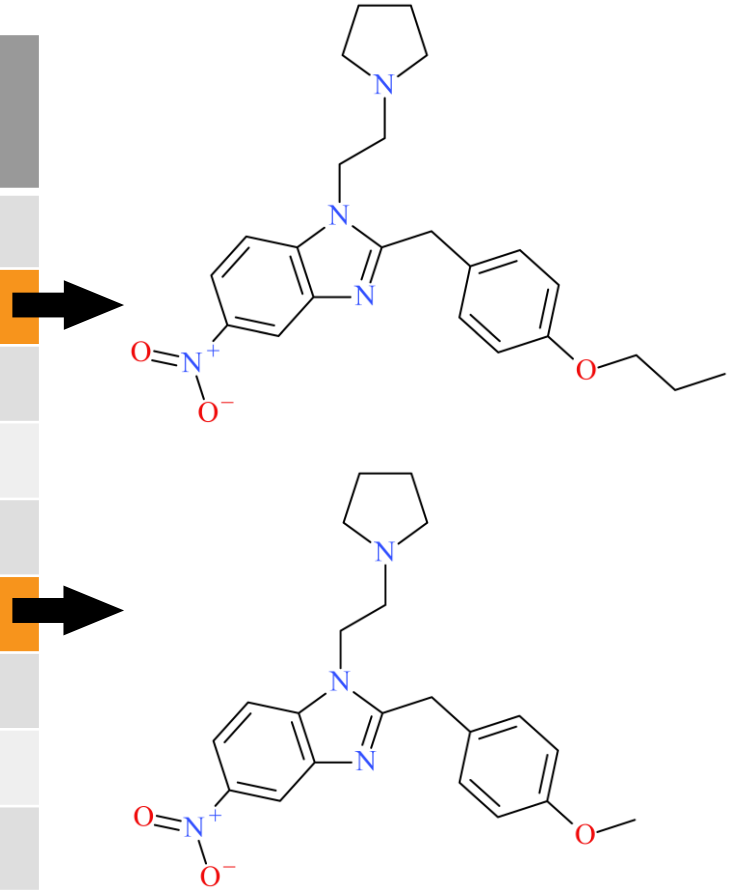
IN COMBINATION WITH OTHER DRUGS

Analogue	% Co-Positivity of Nitazene Analogue with...				
	Fentanyl	NPS Benzo.	Methamp.	Cocaine	Xylazine
Isotonitazene	57%	89%	30%	32%	11%
Brorphine	84%	100%	43%	29%	10%
Metonitazene	51%	94%	37%	16%	20%
N-Pyrro. Eto.	59%	89%	48%	37%	15%
Protonitazene	60%	87%	87%	13%	0%
Etodesnitazene	50%	92%	58%	17%	17%

*Forensic toxicology cases. Data from the CFSRE.

THE NEWEST ANALOGUES

Analogue	CFSRE Cases	Estimated Potency Compared to Fentanyl
N-Pyrrolidino Etonitazene	15	43x more
_N_-Pyrrolidino Protonitazene	**9**	**25x more**
Isotonitazene	69	9x more
Protonitazene	3	4x more
Metonitazene	18	2x more
_N_-Pyrrolidino Metonitazene	**5**	**2x more**
Fentanyl	-	-
Butonitazene	1	2x less
Etodesnitazene	15	4x less

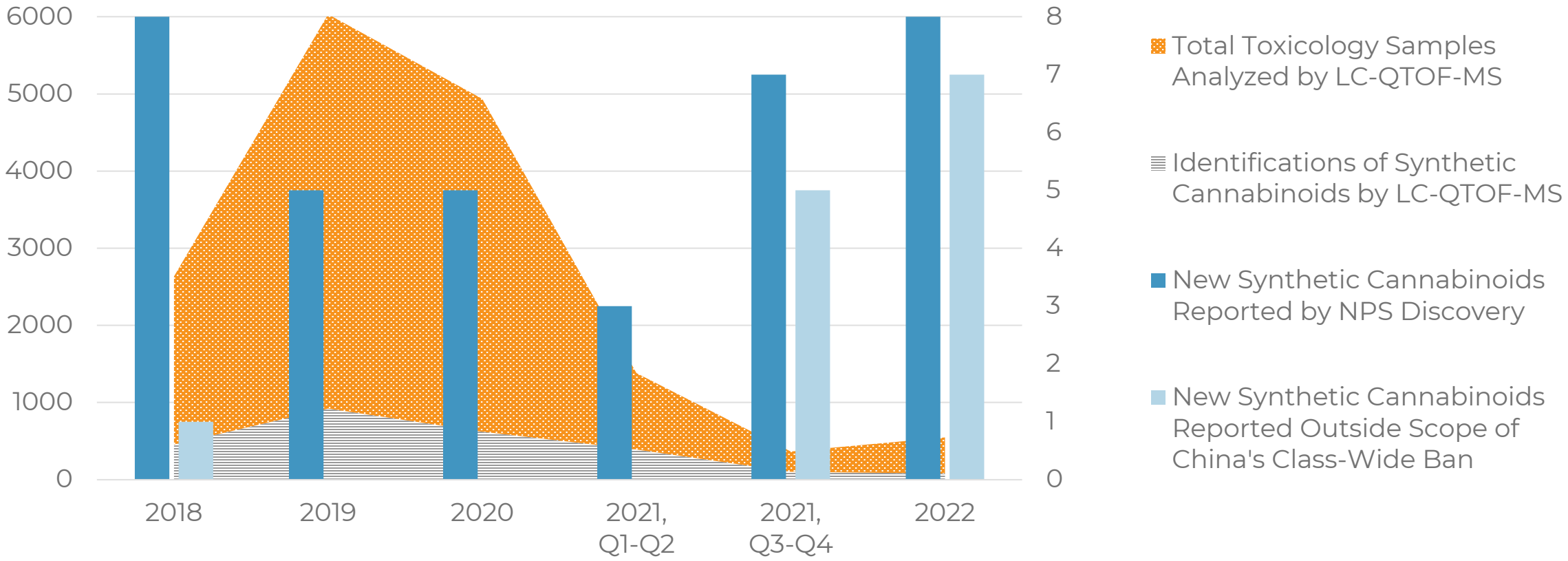


SYNTHETIC CANNABINOIDS

cfsre | NPS DISCOVERY

WHAT'S HAPPENING WITH SYNTHETIC CANNABINOIDS?

- Dramatic change in the landscape of synthetic cannabinoids (nationally and internationally)



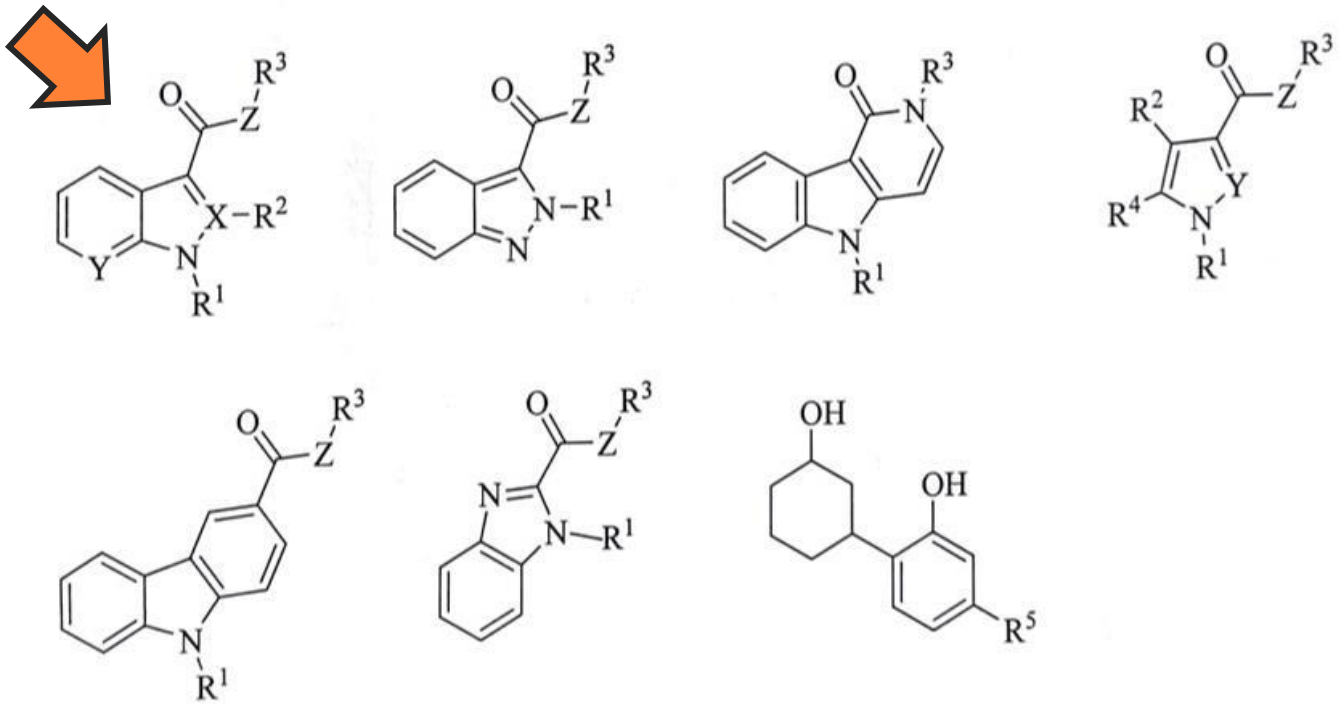
CHINA IMPOSES CLASS-WIDE BAN

The Questions:

1. How did this come about?
2. What is a “total ban”?
3. Is this even possible?

Effective: July 2021

QUICK REVIEW OF THE LEGISLATION



- ***Summary – This included previously prevalent indoles (-ICA's) and indazoles (-INACA's)***

- R1 represents substituted or unsubstituted C3-C8 **alkyl** group; substituted or unsubstituted heterocyclic group containing 1-3 heteroatoms; substituted or unsubstituted methyl or ethyl group substituted by heterocyclic group containing 1-3 heteroatoms.
- R2 represents hydrogen or methyl or no atom.
- R3 represents substituted or unsubstituted C6-C10 aryl group; substituted or unsubstituted C3-C10 **alkyl** group; substituted or unsubstituted heterocyclic group containing 1-3 heteroatoms; substituted or unsubstituted methyl or ethyl group substituted by heterocyclic group containing 1-3 heteroatoms.
- R4 represents hydrogen; substituted or unsubstituted phenyl group; substituted or unsubstituted benzyl group.
- R5 represents substituted or unsubstituted C3-C10 hydroxy group.
- X represents N or C.
- Y represents N or CH.
- Z represents O or NH or no atom.

SYNTHETIC CANNABINOID DISCOVERIES SINCE 2018

- NPS Discovery now (almost exclusively) sees new synthetic cannabinoids that fall **outside** the scope of the 2021 Chinese class-wide ban; however, expectation remain (as with all NPS).

2018

- Adamantyl-CHMINACA
- 5Cl-AKB48
- 5Br-AKB48
- 5F-EDMB-PINACA
- 5F-MDMB-PICA
- 5Cl-AB-PINACA
- **5F-AB-PFUPPYCA**
- MFUBINAC

2019

- 4F-MDMB-BINACA
- 5F-MPP-PICA
- APP-BINACA
- MDMB-4en-PINACA
- MMB-4en-PICA

2020

- 5F-CUMYL-PINACA
- 5F-EMB-PICA
- 4F-MDMB-BICA
- ADB-BINACA
- 5F-MDMB-PICA

2021

- 4F-ABINACA
- ADB-4en-PINACA
- ADB-HEXINACA
- **BZO-HEXOXIZID**
- **BZO-POXIZID**
- **5F-BZO-POXIZID**
- **ADB-FUBIATA**
- **BZO-CHMOXIZID**
- ADB-PHETINACA
- EDMB-PINACA

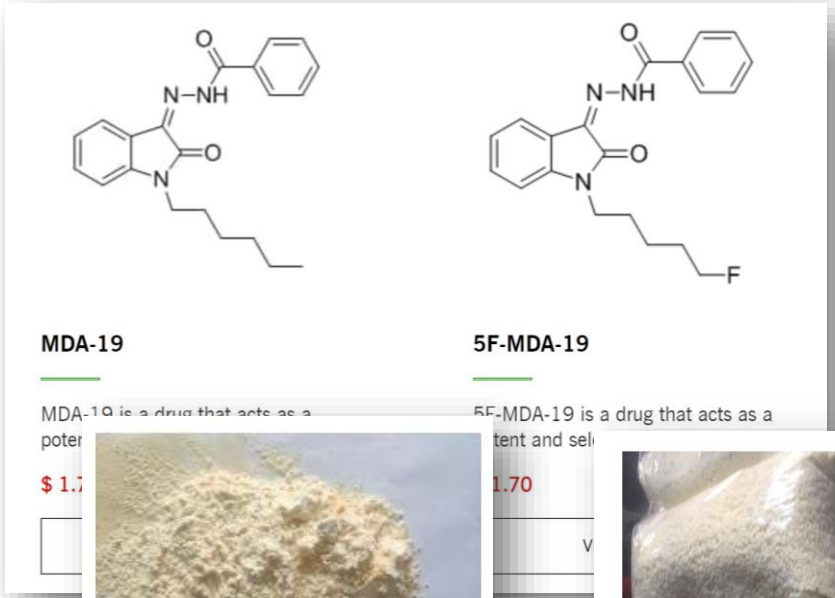
2022

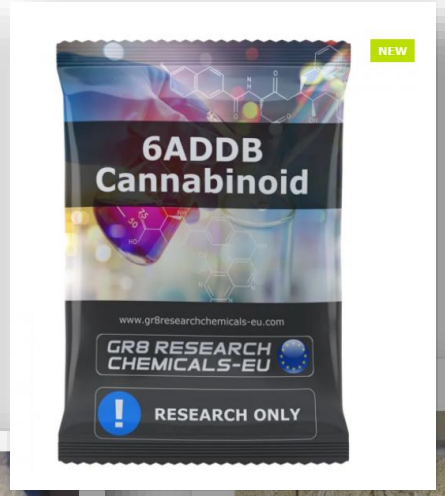
- **CH-PIATA**
- **ADB-5Br-INACA**
- **MDMB-5Br-INACA**
- **BZO-4en-POXIZID**
- **ADB-5'Br-BINACA**
- **CH-FUBIATA**
- CUMYL-TsINACA
- **ADB-INACA**

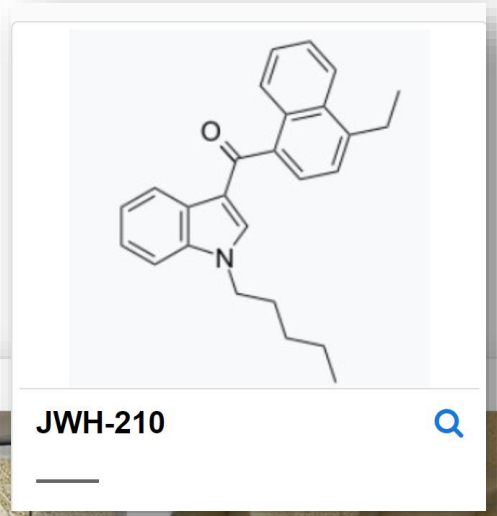
2023

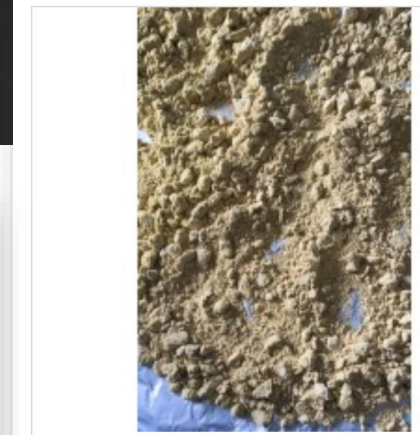
- **ADB-5'Br-PINACA**
- **MDMB-INACA**
- MDMB-BINACA
- **CHO-4'Me-5'Br-FUBOXPYRA**

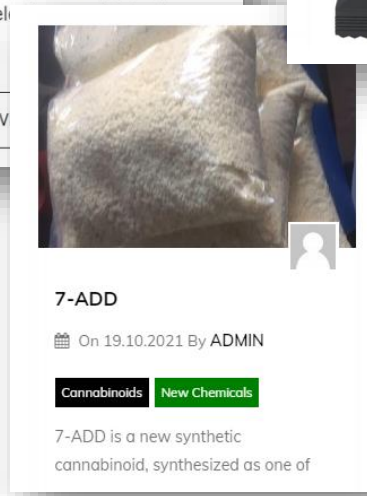
MONITORING GRAY MARKET SITES

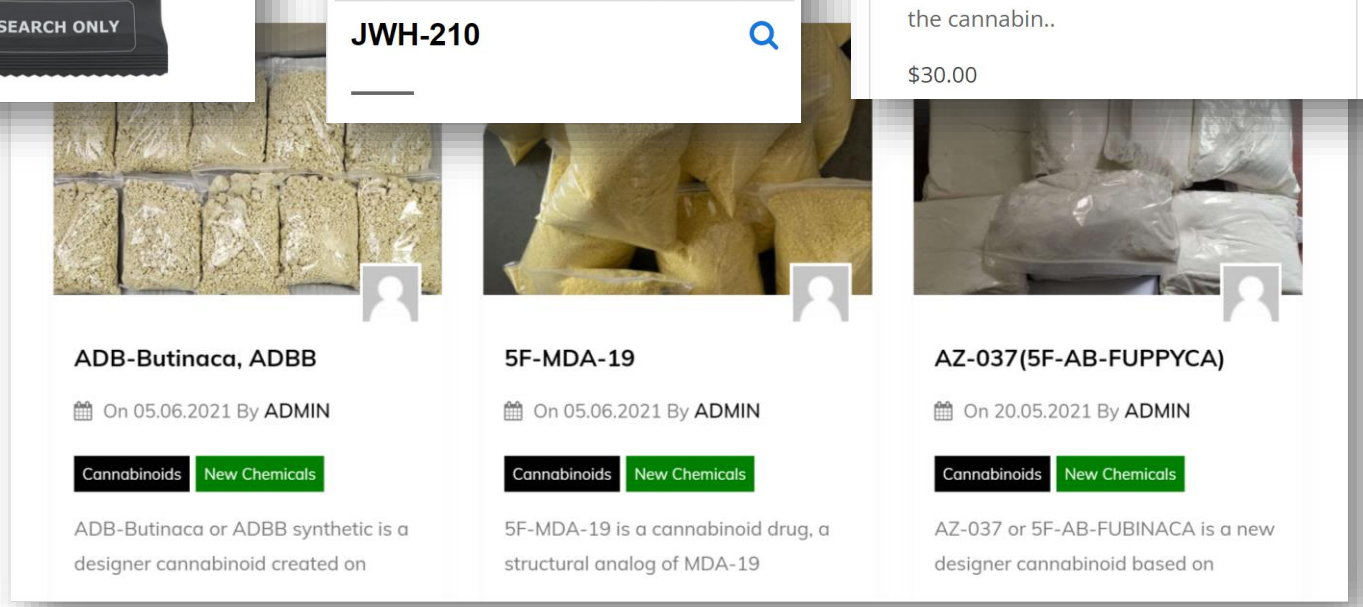












DIY SYNTHETIC CANNABINOIDS???

Home \ Cannabinoids \ ADB-BUTINACA PRECURSOR (SEMI-FINISHED)

ADB-BUTINACA PRECURSOR (SEMI-FINISHED)

$2,400.00 – $15,000.00

Since the finished product is already illegal in China, the laboratories there have found a solution and can provide us with a precursor to the good old adb butinaca.

Quantity

Choose an option

1 Add to cart

SKU: N/A

Category: Cannabinoids

You need:

1kg ADB-BUTINACA PRECURSOR (SEMI-FINISHED) – 3500$

3L DMF (CAS 68-12-2)

850g anhydrous potassium carbonate (CAS: 584-08-7)

680g of bromobutane (CAS: 109-65-9)

Instructions:

1. They were successively added into the reaction bottle;

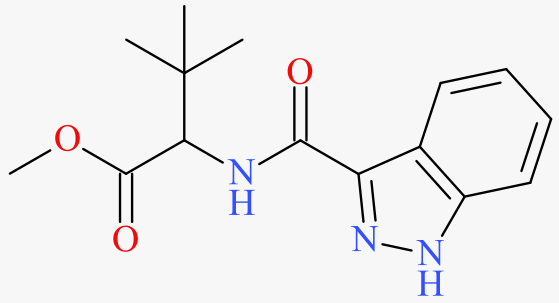
2. The temperature was raised to 70-80℃ for 5h; after the reaction, it was cooled to room temperature.

3. Prepare a bucket in advance and add 15L water;

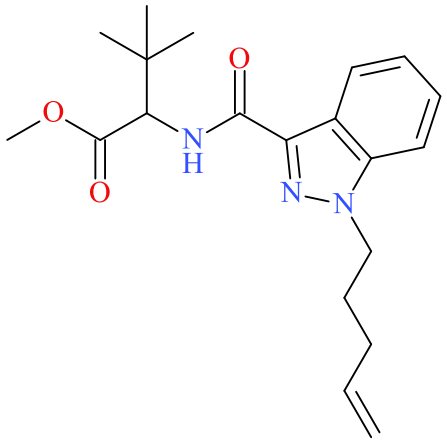
4. Then pour the reaction solution into the bucket, cool to room temperature, filter the solid, wash the solid to neutral and dry.

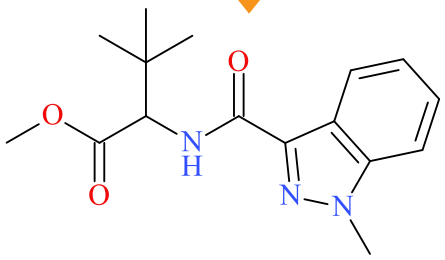
SYNTHETIC CANNABINOIDS PRECURSORS

MDMB-INACA

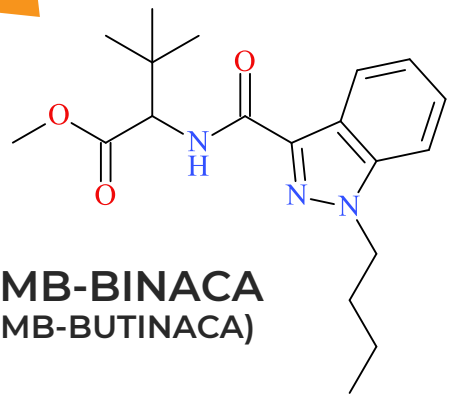


MDMB-4en-PINACA



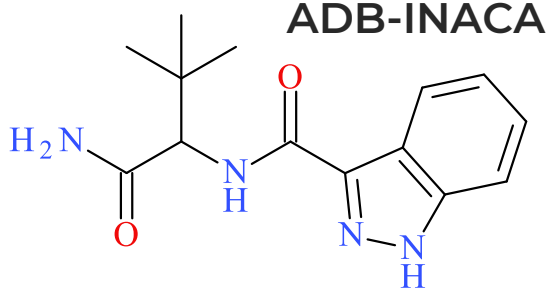


MDMB-???INACA ?

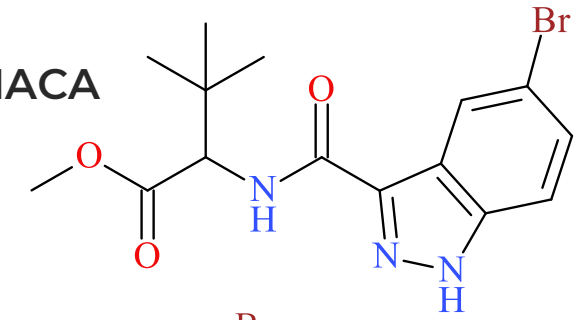


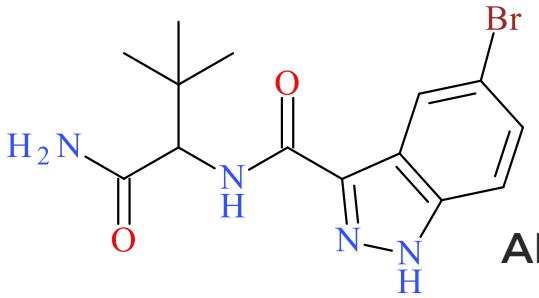
MDMB-BINACA
(MDMB-BUTINACA)

ADB-INACA



MDMB-5Br-INACA





ADB-5Br-INACA

XYLAZINE

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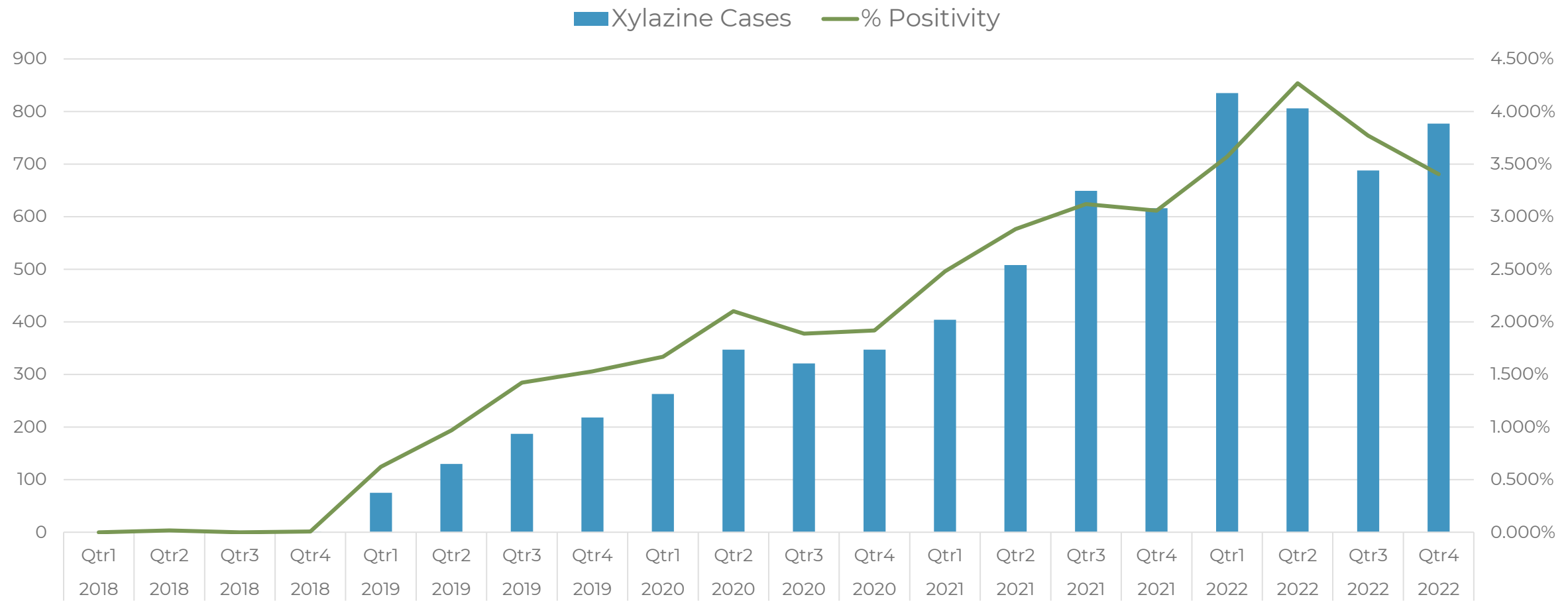
PREVALENCE OF XYLAZINE IN THE U.S.



*Data from NMS Labs / Not final numbers

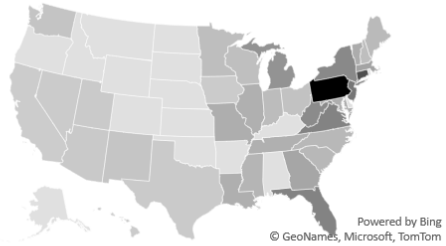
SPREAD OF XYLAZINE ACROSS THE U.S.

2020 Q1

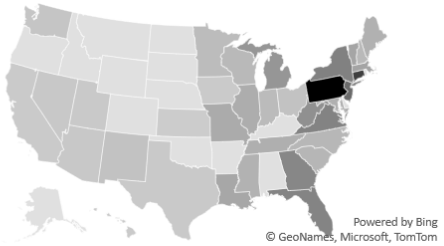
2020 Q2

2020 Q3

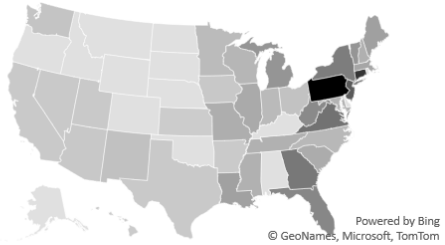
2020 Q4



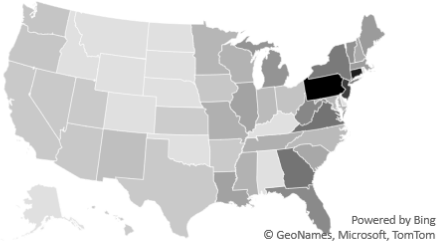
2021 Q1



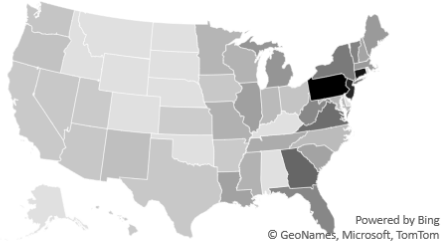
2021 Q2



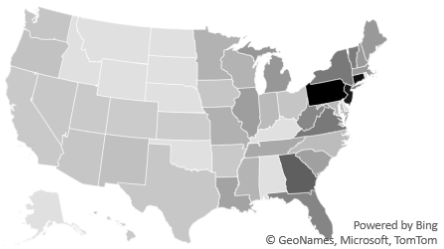
2021 Q3



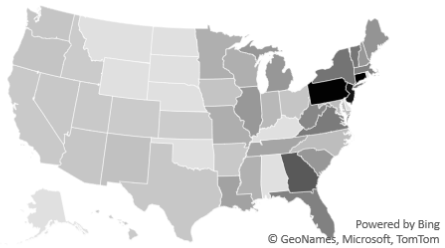
2021 Q4



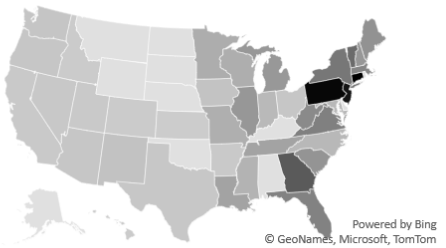
2022 Q1



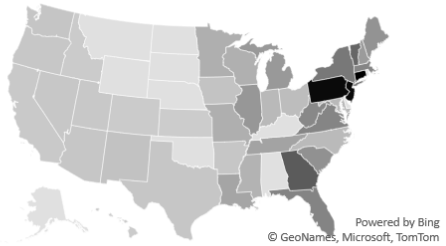
2022 Q2



2022 Q3



2022 Q4



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**Data from NMS Labs / Crude analysis with other necessary caveats*

DRUG CHECKING SURVEILLANCE

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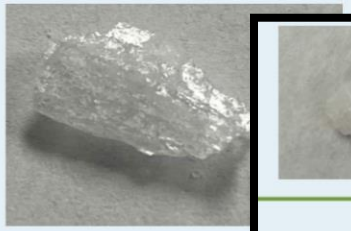
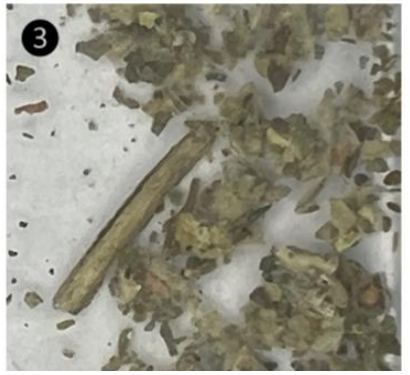
DRUG CHECKING RESULTS

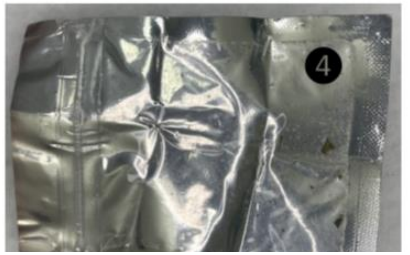
			
Clonazolam	Etizolam	Etizolam	Desalkylflurazepam
		  MDA	
Fentanyl, Gabapentin	*para*-Fluorofentanyl, Gabapentin	Methamphetamine	
			
Cocaine, Lidocaine	Cocaine, Lidocaine	Methamphetamine, Caffeine	Methamphetamine

Methamphetamine

Methamphetamine



ADB-5'Br-IANCA

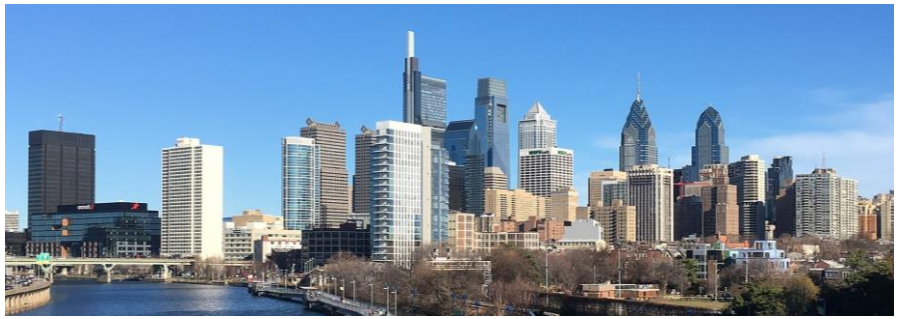


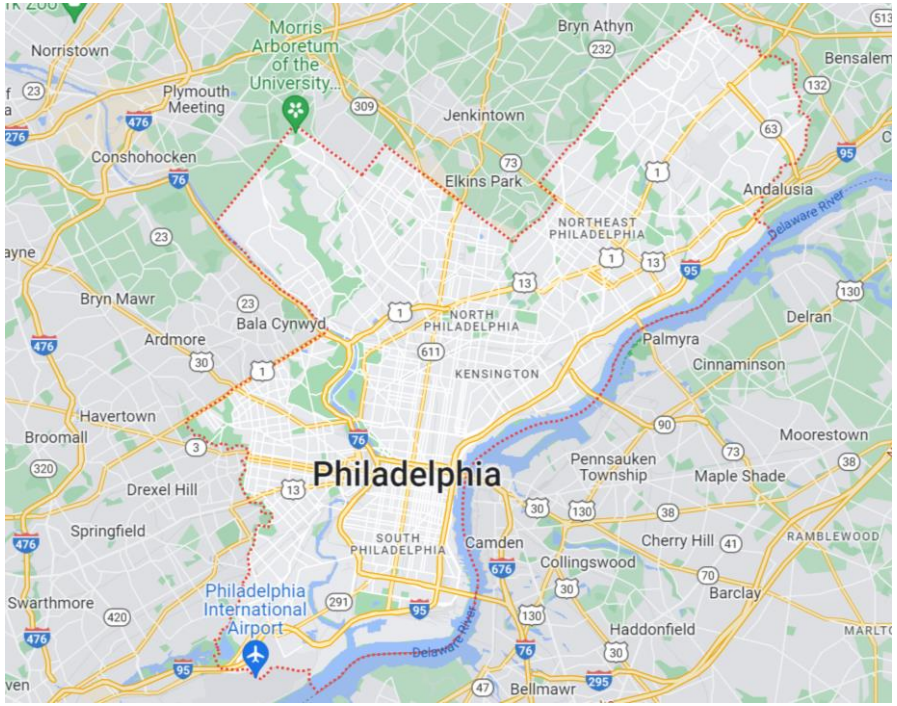
ADB-5'Br-IANCA

	
ADB-BINACA	ADB-BINACA

PHILADELPHIA & ITS DRUG SUPPLY

- Nestled in the center of the larger mid-Atlantic metropolitan region ("Northeast Corridor")
  - 6th largest city by population and 7th largest metro area
- **"Open air drug market"** (Kensington neighborhood)
- Drug markets → dope, crack/coke, meth, K2, etc.
- Continually changing and diverse drug environment
- Collaboration between the **CFSRE** and the **Philadelphia Department of Public Health (PDPH)**



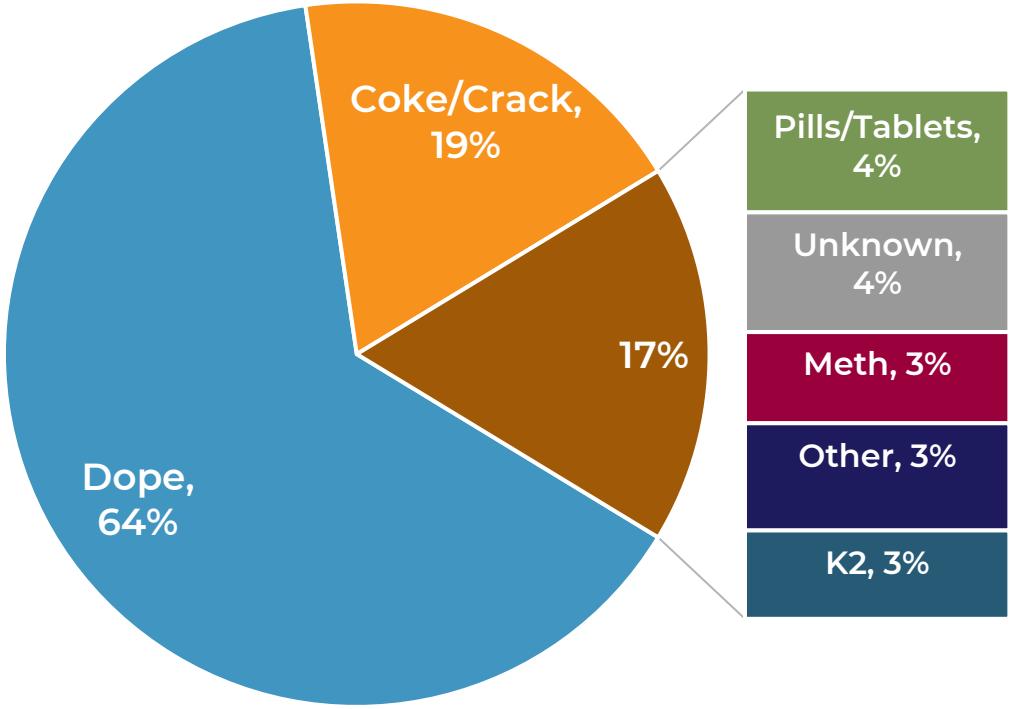


PDPH/CFSRE DRUG CHECKING

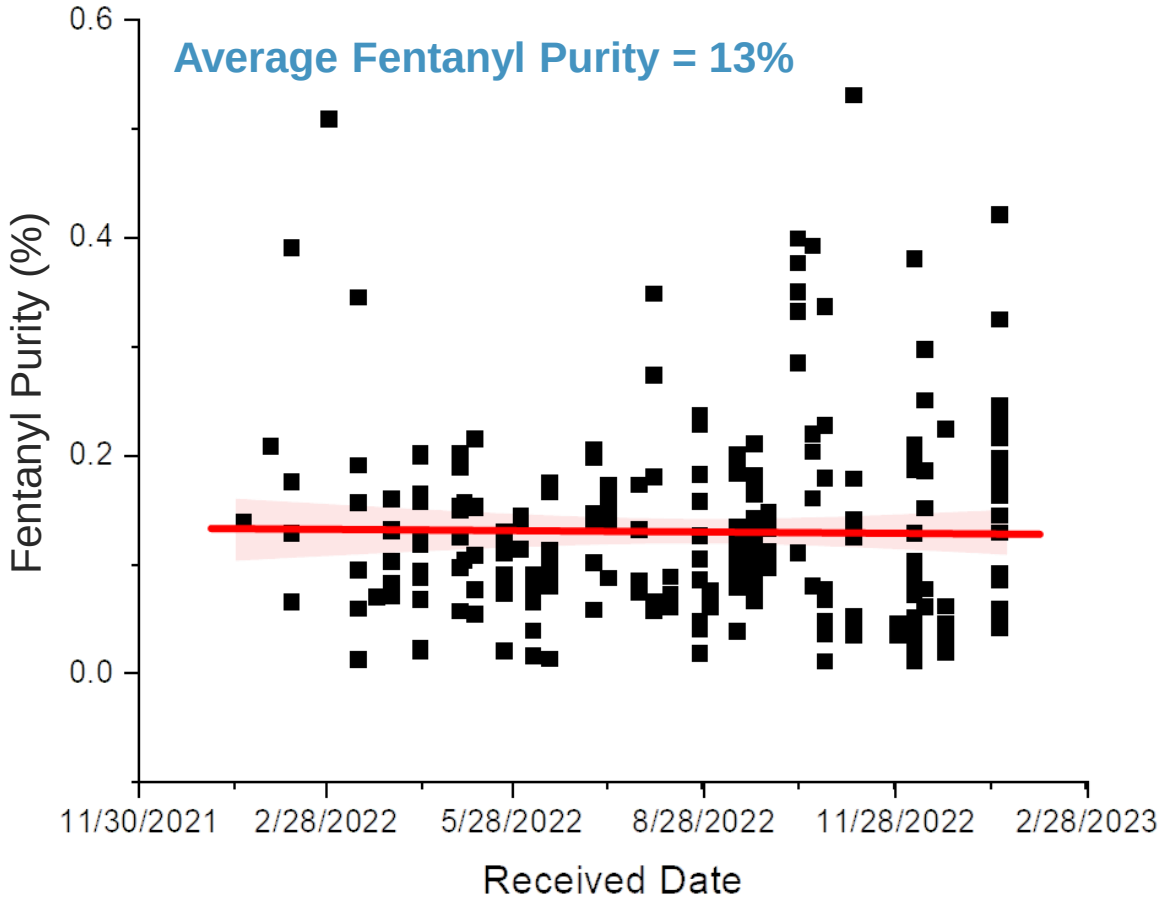
- **2020** → Partnership formally launched

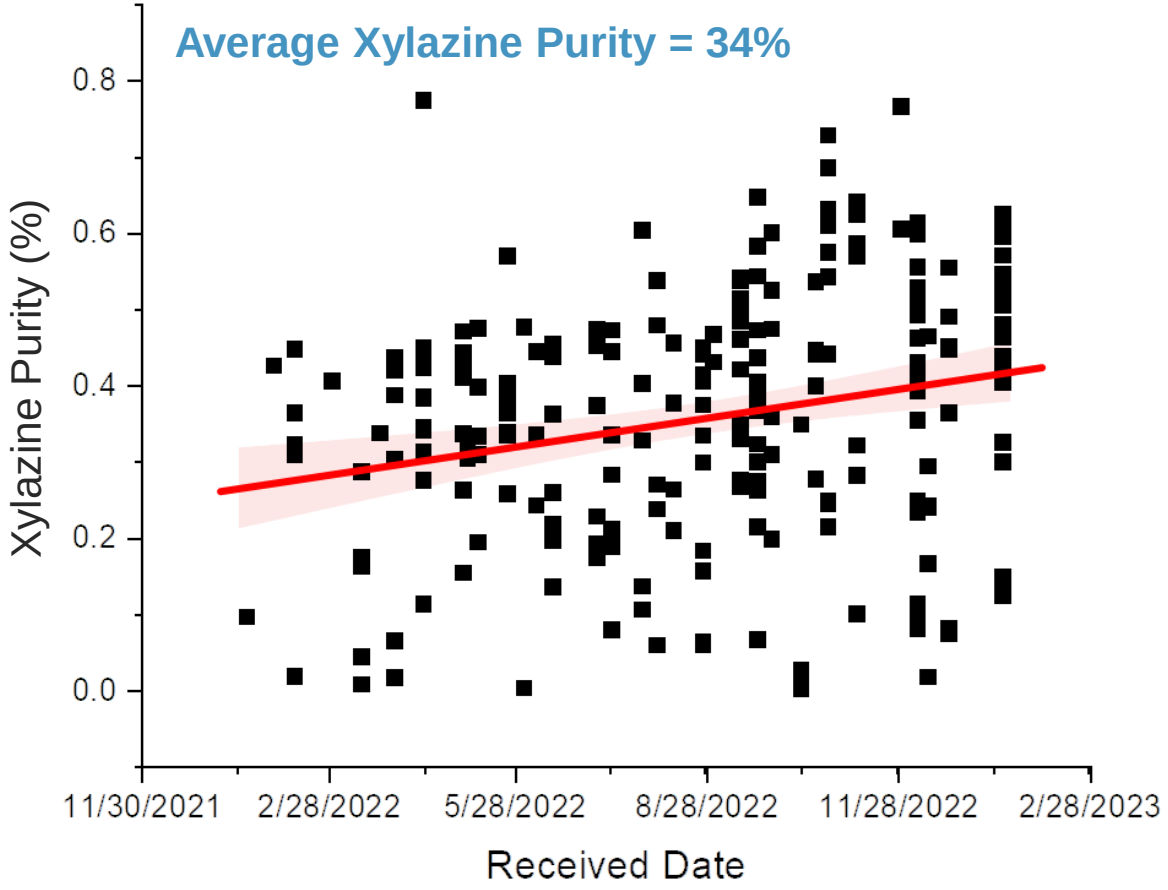
- **Sample Analyzed**
  - 950+ samples received since 2020
  - Variety of sample types (suspected contents) →
  - Paired FTIR and test strip results***

- **Key Findings**
  - "Dope": 99% contain fentanyl and ~90% contain xylazine
  - Methamphetamine – rarely adulterated or substituted
  - Cocaine – "coke" samples sometimes test positive for trace fentanyl
  - K2 – revolving door of synthetic cannabinoids

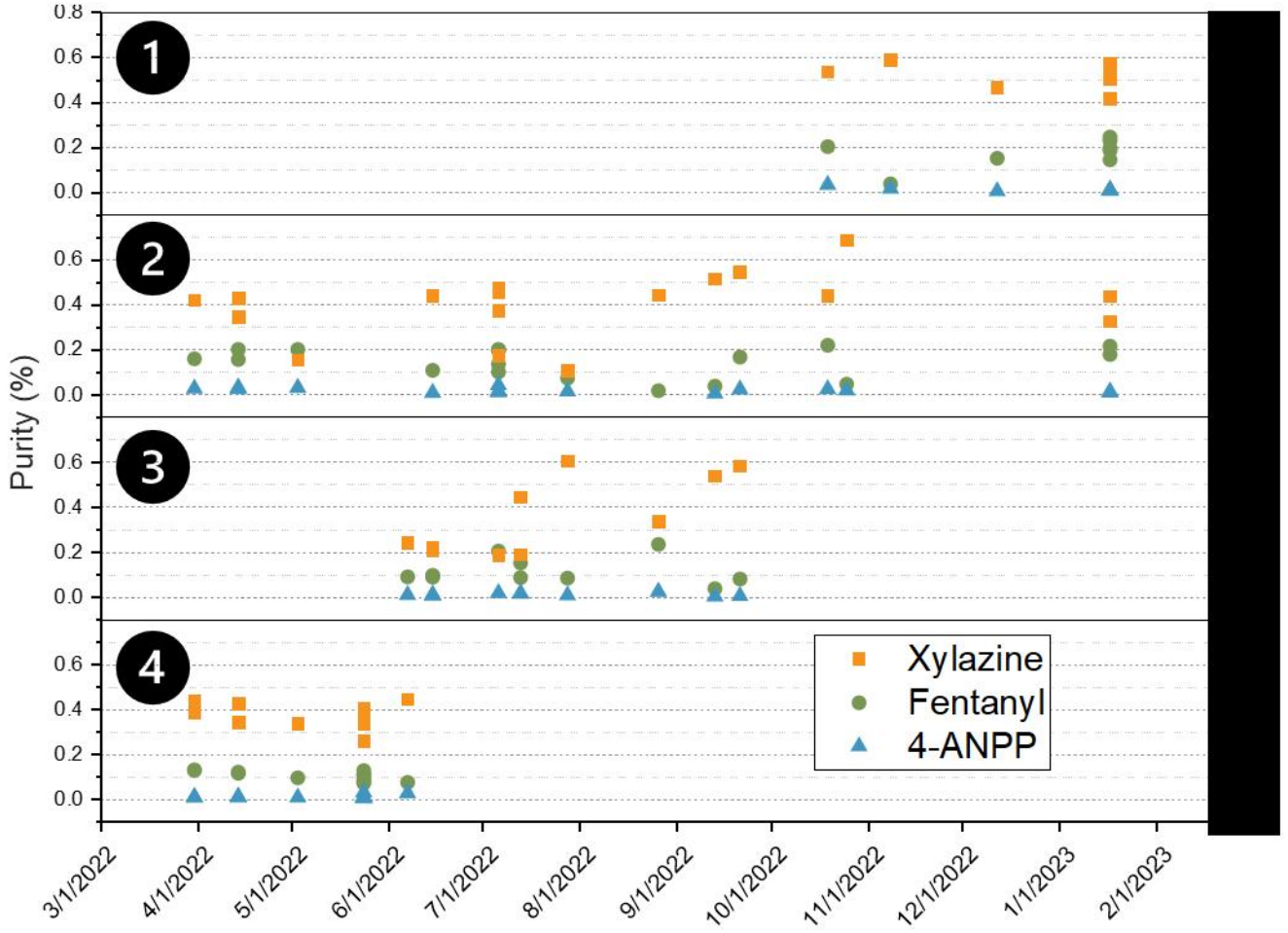


TEMPORAL CHANGES IN PURITY (2022)

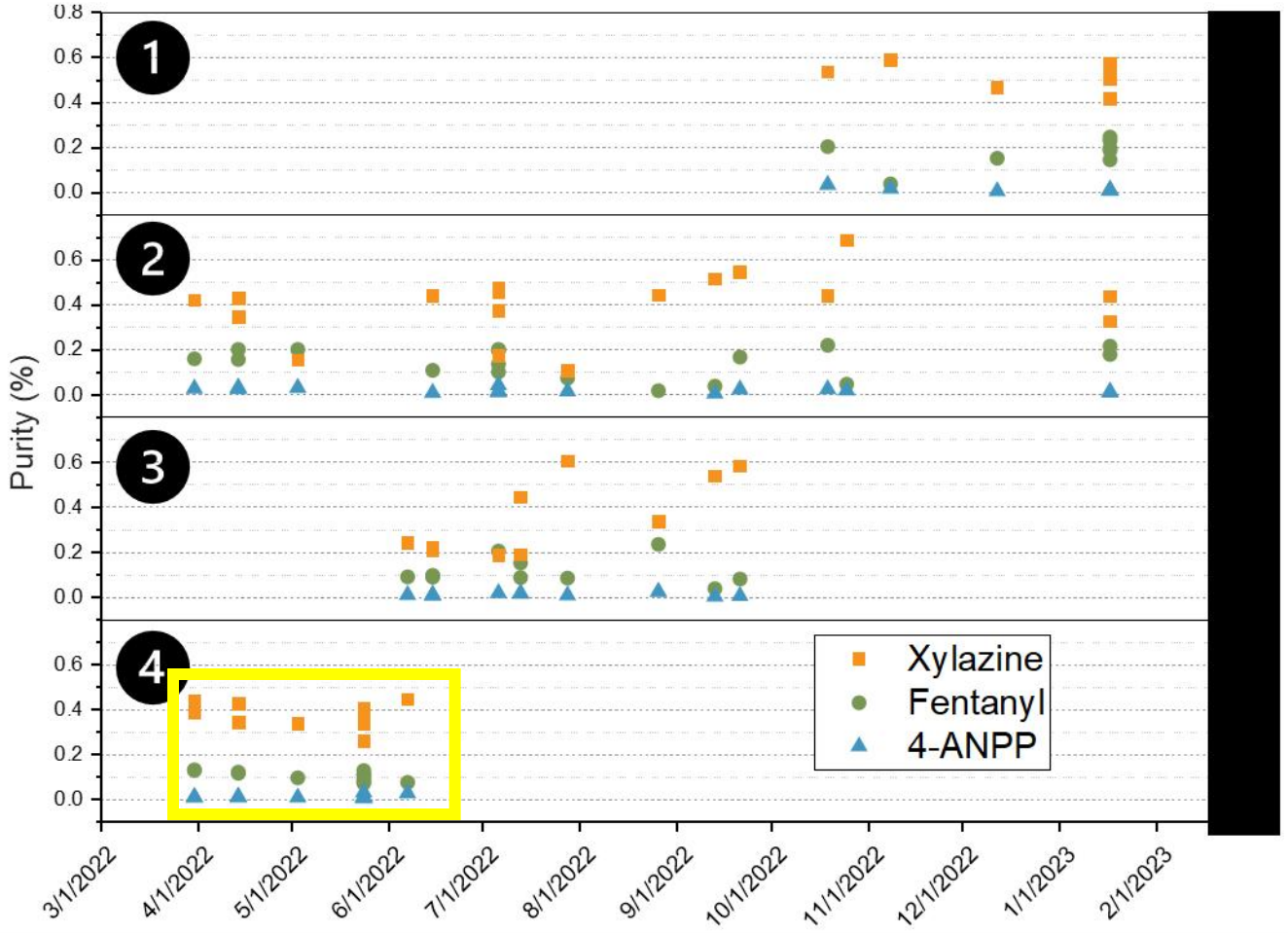




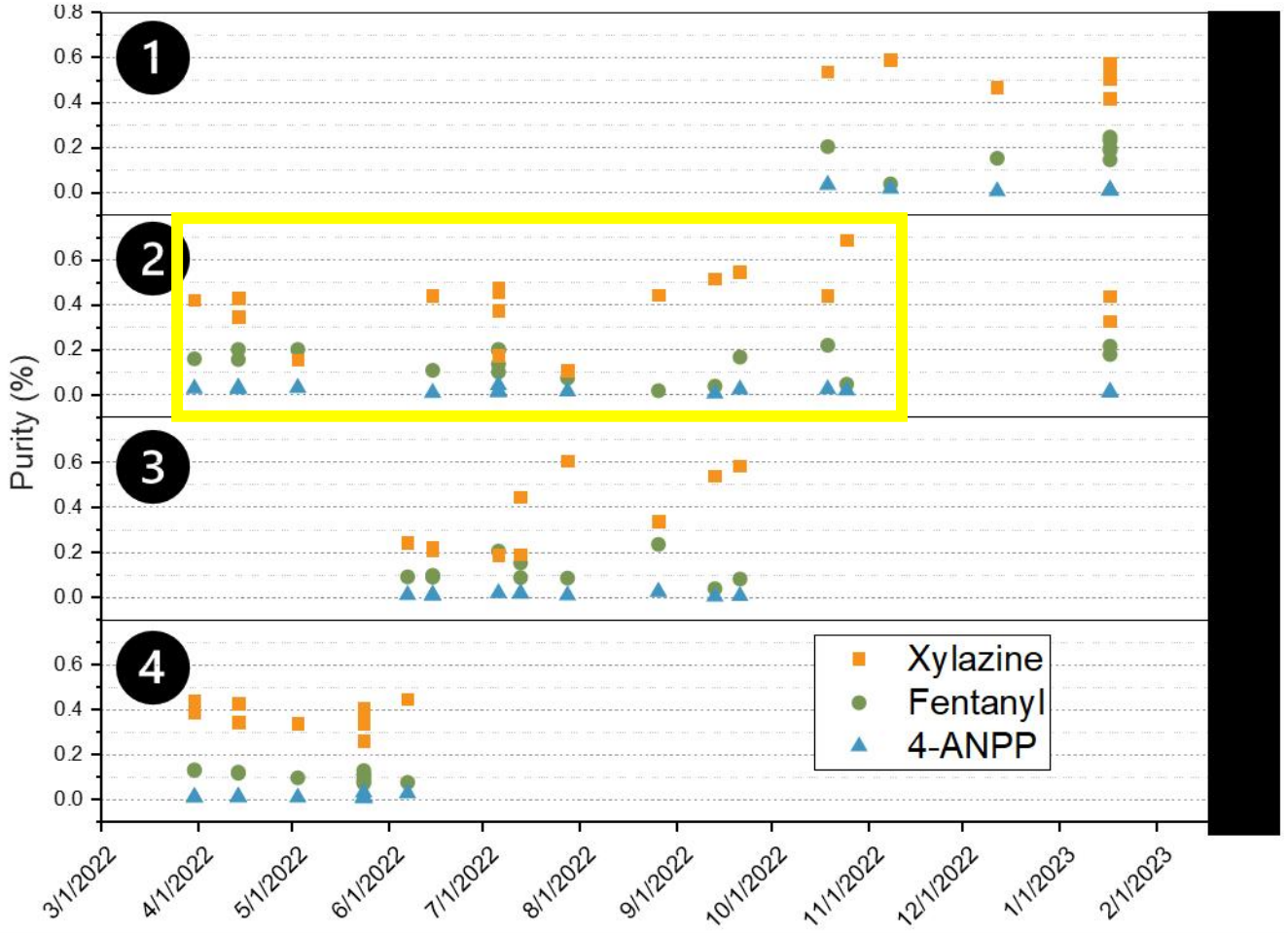
LONGITUDINAL ASSESSMENT OF DRUG PRODUCTS



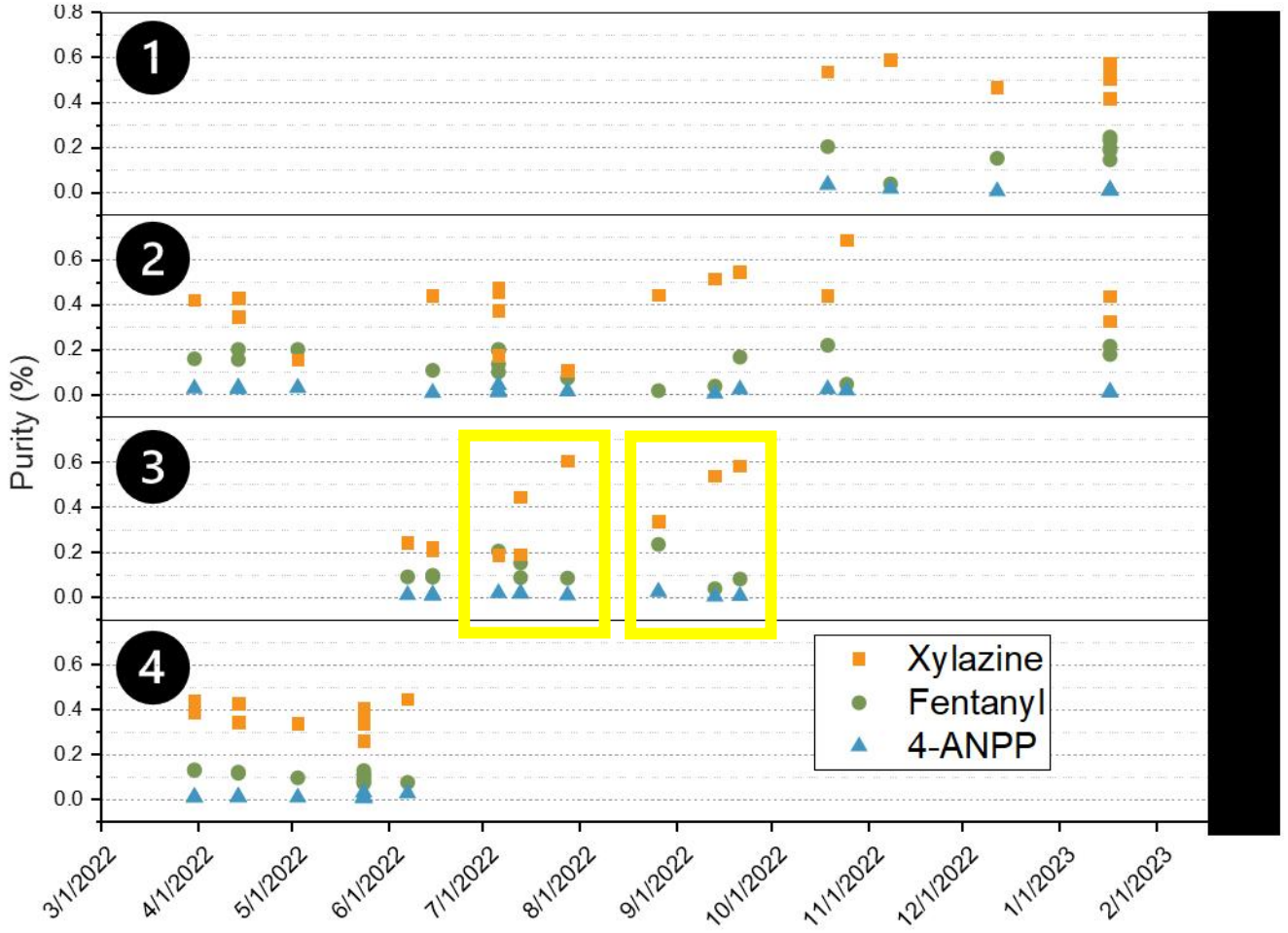
LONGITUDINAL ASSESSMENT OF DRUG PRODUCTS



LONGITUDINAL ASSESSMENT OF DRUG PRODUCTS



LONGITUDINAL ASSESSMENT OF DRUG PRODUCTS



ACCESS NPS DISCOVERY & JOIN LISTSERV

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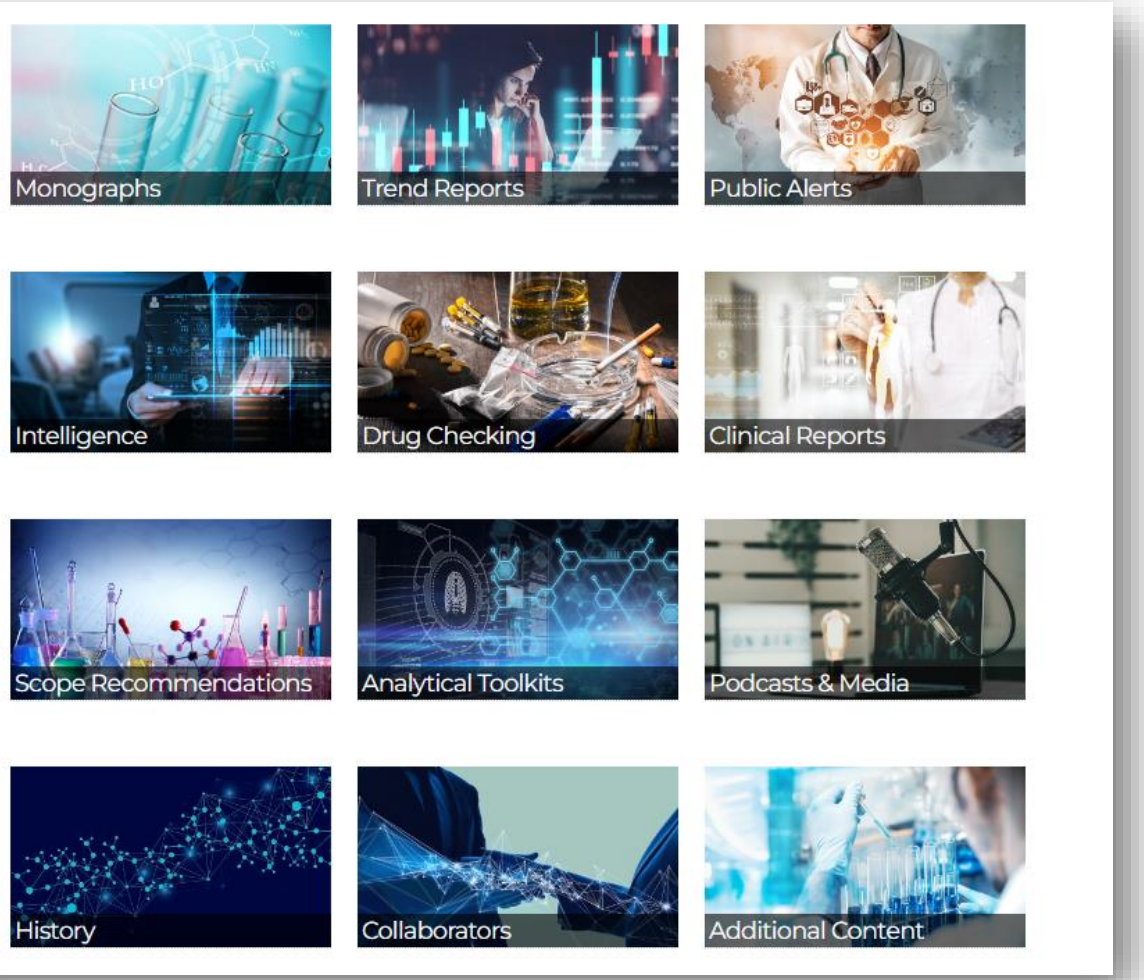
WEBSITE ▸ WWW.NPSDISCOVERY.ORG



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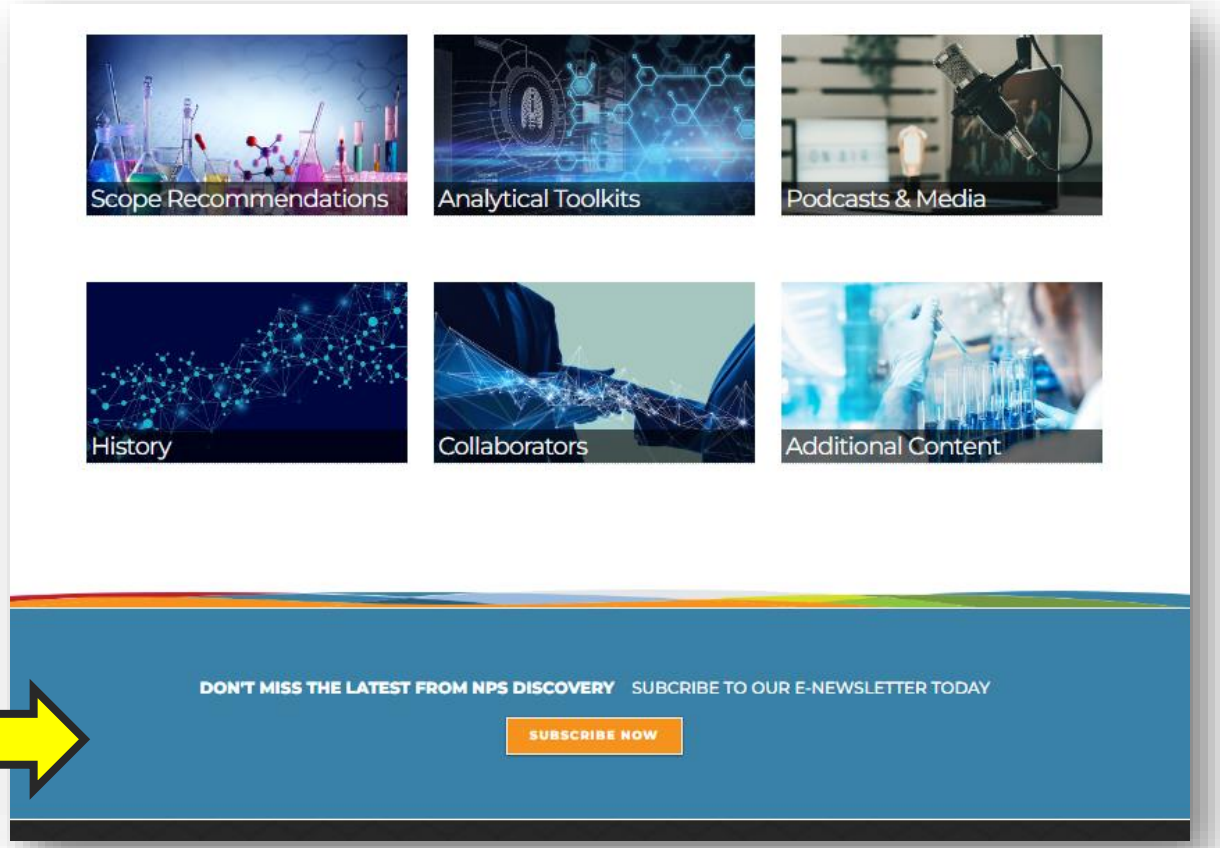

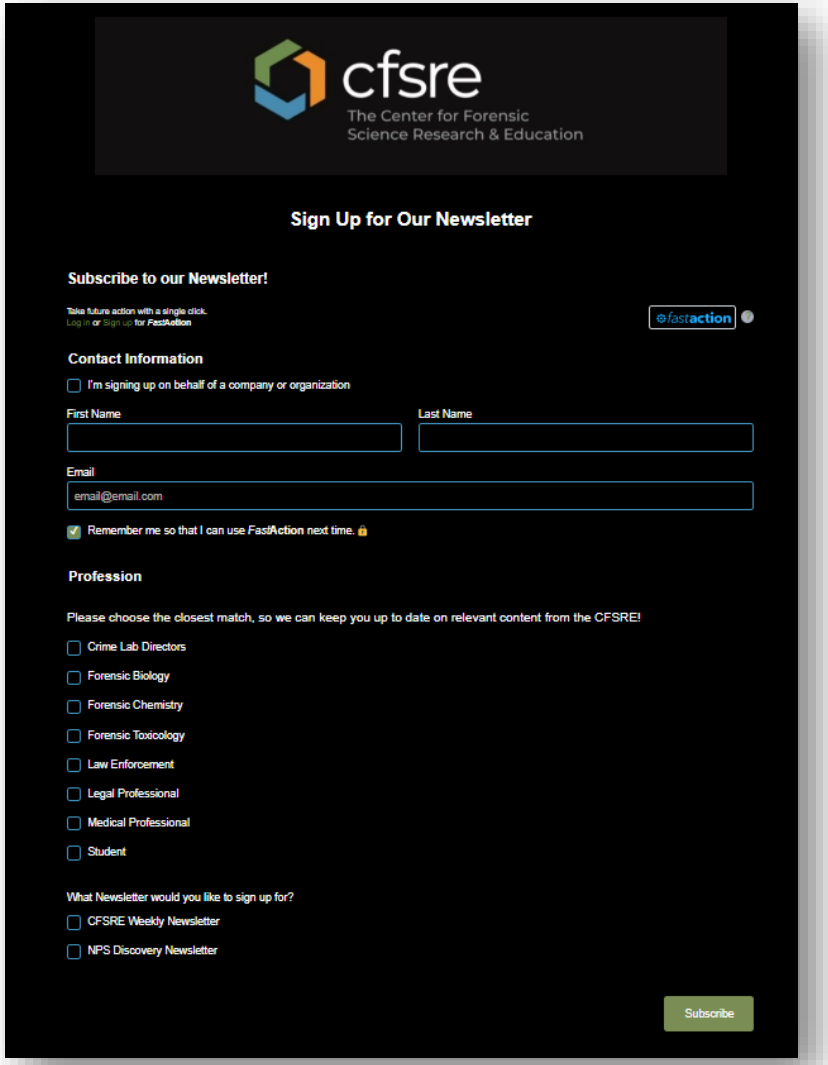

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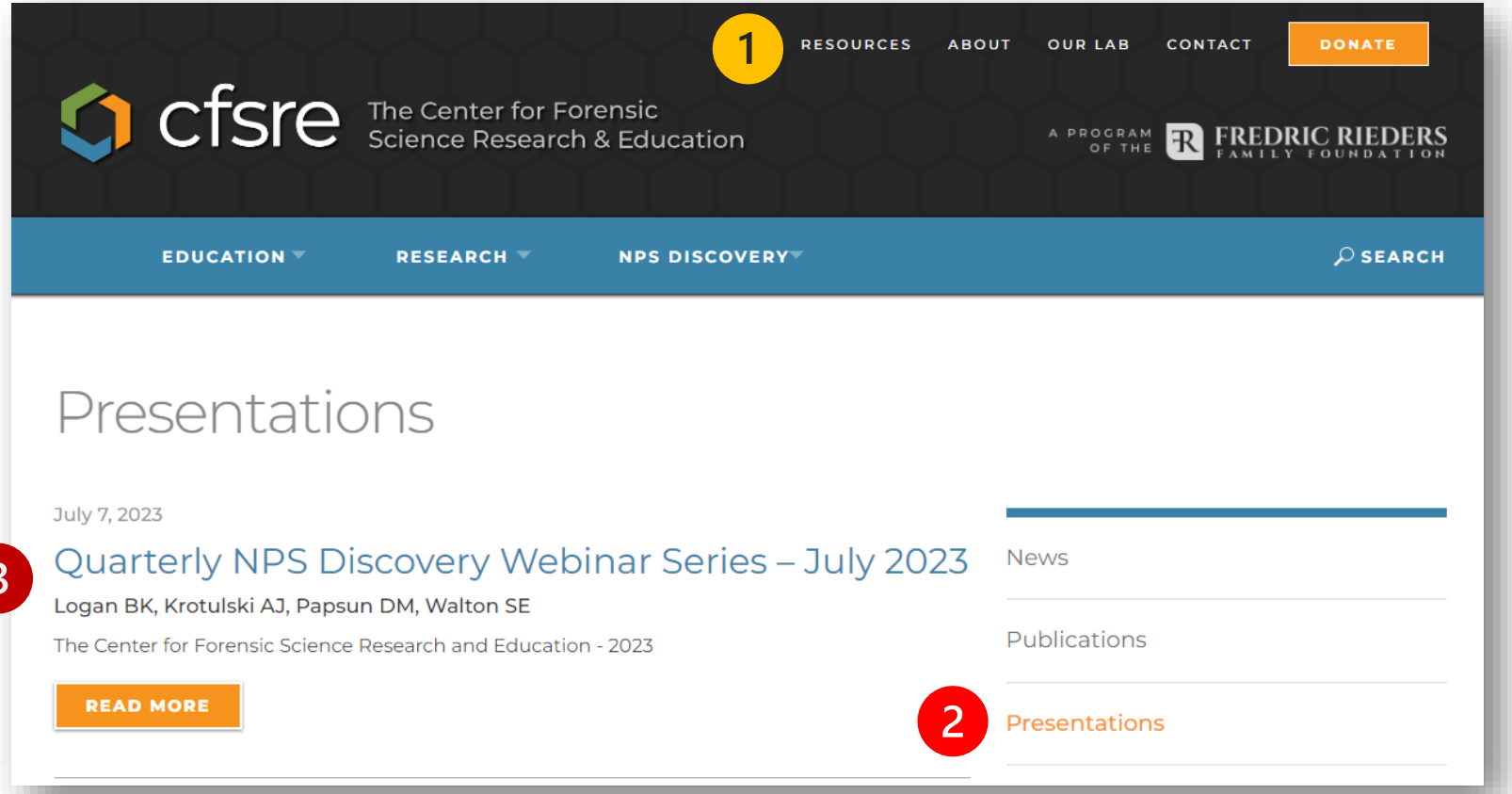

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SCAN ME

COLLABORATE WITH CFSRE & NPS DISCOVERY

- We accept toxicology samples and drug materials for NPS testing
- Contact Alex Krotulski for more information ▸ alex.krotulski@cfsre.org

BENEFITS OF TOXICOLOGY TESTING AT THE CFSRE:

- Perform routine testing for all NPS subclasses, including opioids, benzodiazepines, stimulants, hallucinogens, and cannabinoids.
- Assist medical examiners and coroners with determining cause of death when prior toxicology testing is negative or inconclusive.
- Analysis by state-of-the-art instrumentation and methodologies.
- Regularly updated, comprehensive in-house library database containing more than 1,000 drugs.
- Sample handling and analysis performed under chain of custody.
- Forensic quality data and individual reports generated per case.
- World-leading forensic toxicologists, chemists, and scientists.
- Laboratory follows forensic toxicology industry best practices.

TESTING CATALOG

NPS Opioids	Fentanyl Analogues, Nitazene Analogues, U-Series, AP-Series, Other Novel Opioids
NPS Benzodiazepines	Etizolam, Flualprazolam, Flubromazepam, Clonazolam, Bromazolam, Flubromazolam
NPS Stimulants	Empathogens, Cathinones, Amphetamines, Phenethylamines, Pyrrolidines
NPS Hallucinogens	Psychedelics, Dissociatives, PCP Analogues, Ketamine Analogues, LSD Analogues
Synthetic Cannabinoids	Classical, Indoles, Indazoles, Miscellaneous, Newly Emergent, & Many More!

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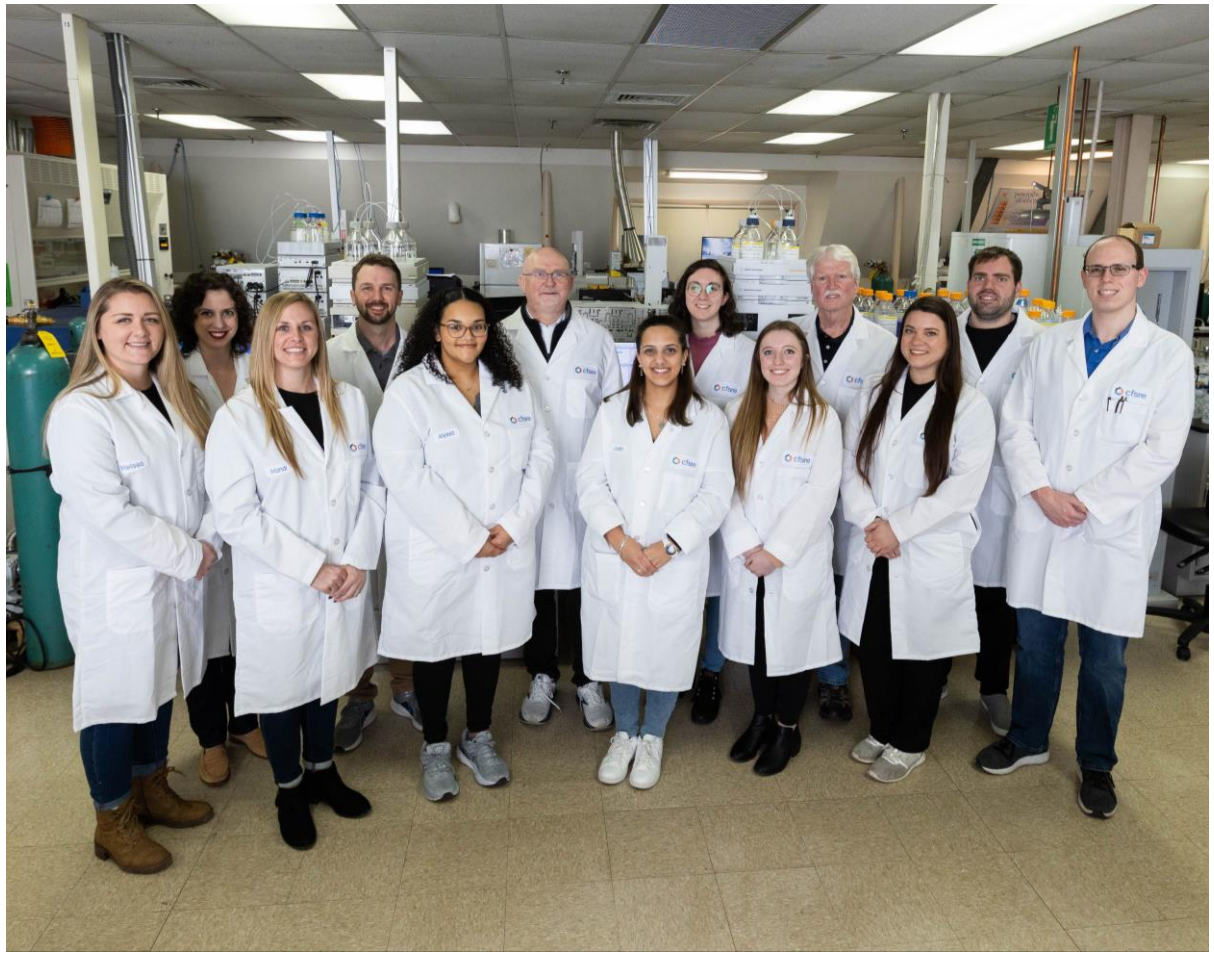
  - Brianna Stang
  - Lindsey Domonoski
  - Natasha Cunningham
  - Many others!
- **NMS Labs**
  - Donna Papsun
- **Funding Agencies**
  - NIJ, CDC, NIH, etc.
- **Collaborators & Partners**
  - Forensic
  - Clinical
  - Medical Examiners
  - Coroners
  - Crime Labs
  - Etc.



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THANK YOU! QUESTIONS?

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