



The Current Landscape of Novel Psychoactive Substances (NPS) in the United States

Florida Association of Medical Examiners (FAME) Annual Education Conference
Wednesday July 19, 2023 – 3:00 to 4:00 PM ET

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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



DISCLOSURES

- I have no conflicts of interest to disclose.
- I am a scientist and employee of FRFF / CFSRE, a 501(c)(3) non-profit research and educational facility.
- 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).
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 - 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.

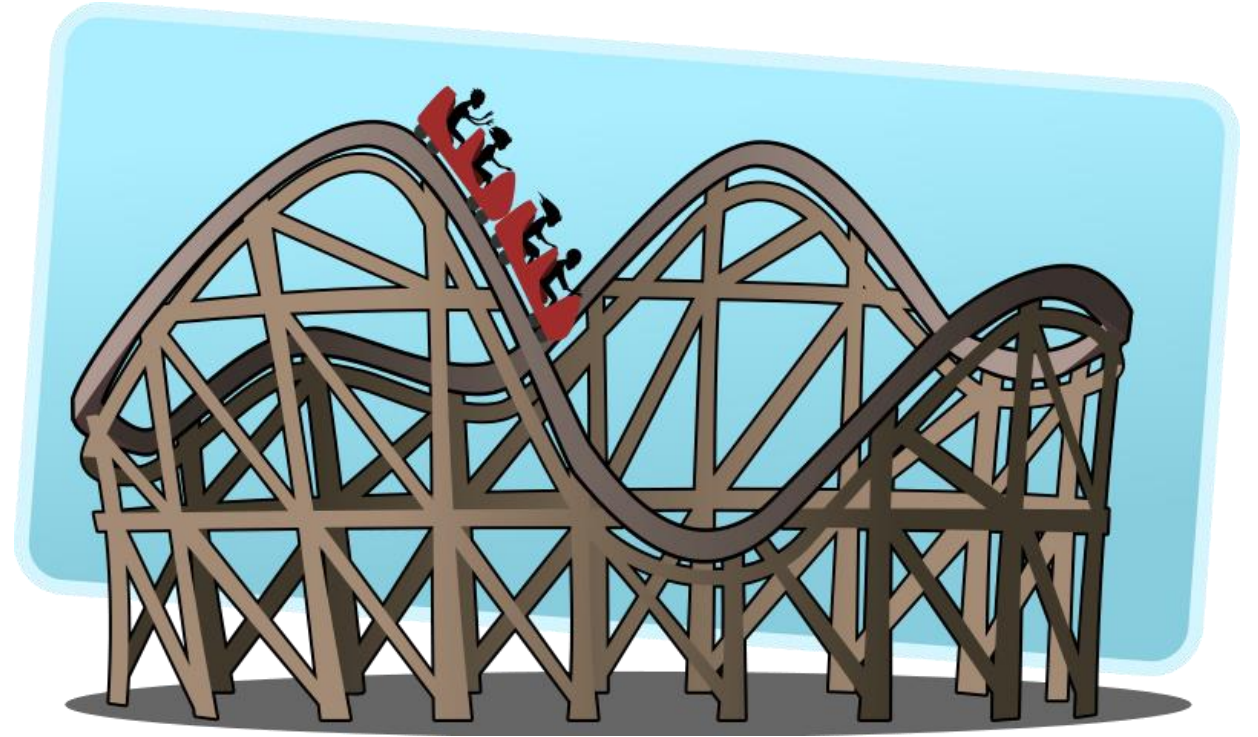


NIJ | *National Institute
of Justice*

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



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



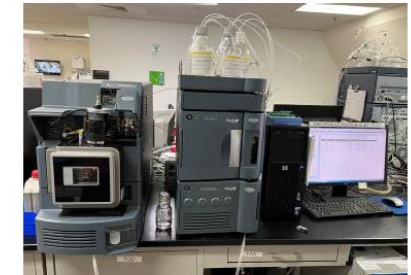
Sciex TripleTOF® 5600+ LC-TOF-MS



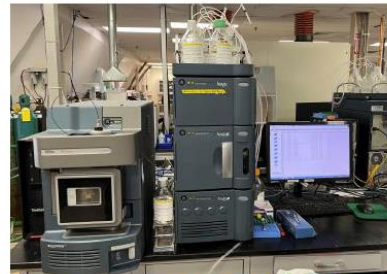
Agilent 6495 LC-QQQ-MS



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):

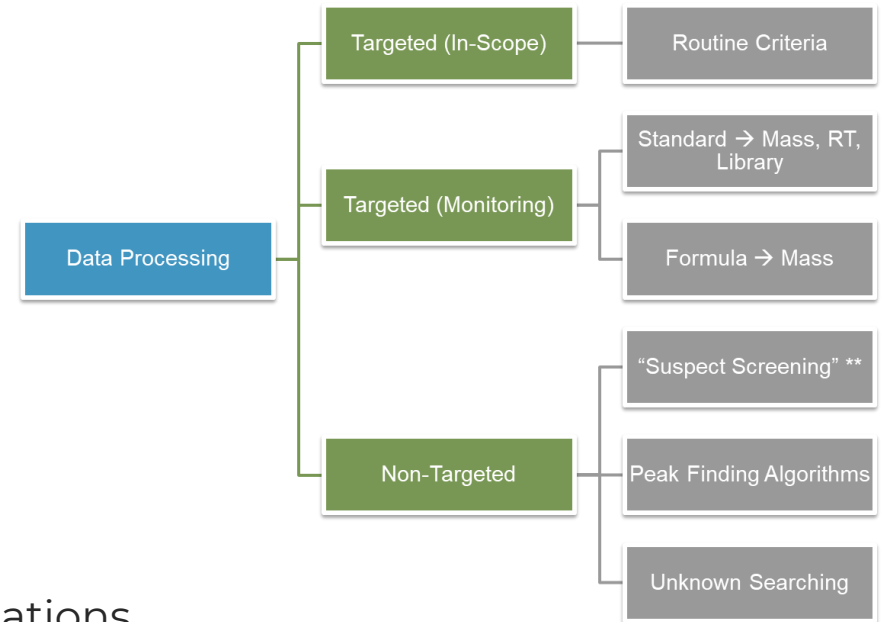
- Use of discarded authentic sample extract vials
- High-*ish* volume, higher rate of incidence
- Best for trend data (consistency)

▪ Data-Mining (Retrospective):

- Use of electronic datafiles
- Gives historical perspective
- Not ideal way to discover NPS

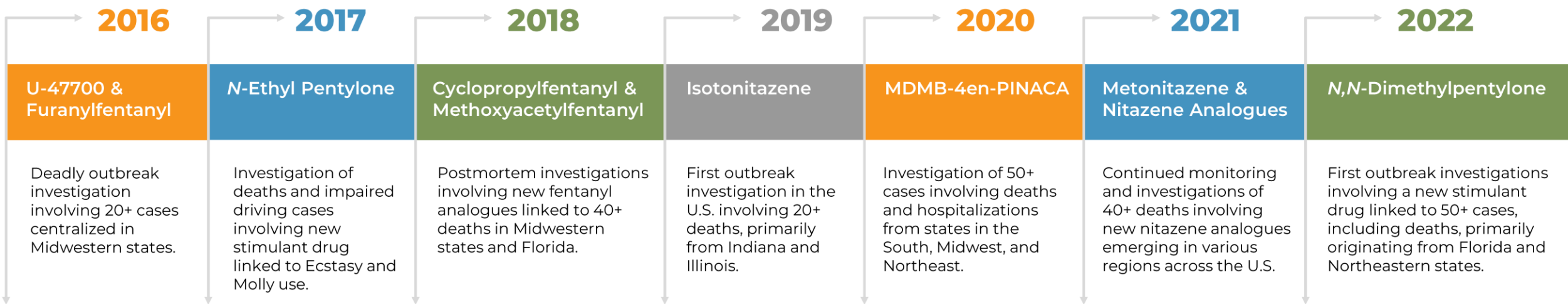
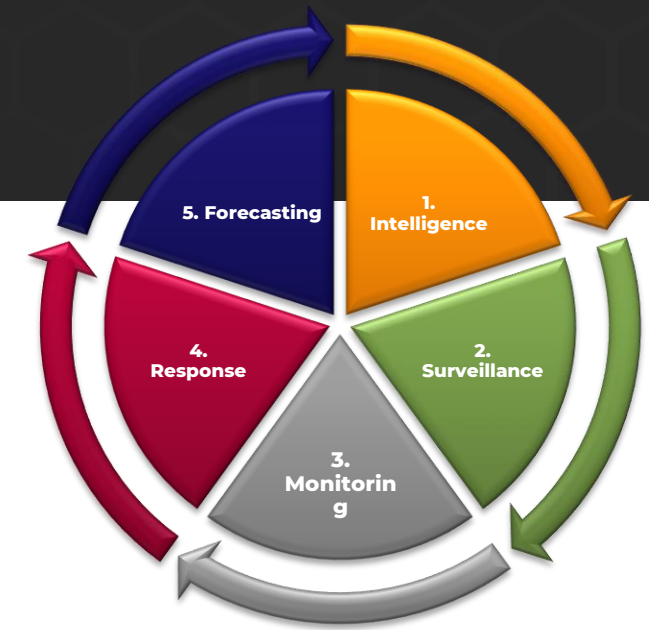
▪ Real-Time Surveillance / Case Analysis:

- 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



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 charactering 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 *Clinical/NPS* investigations (database >1,100 drugs)
 - Launch of *NPS Discovery Quarterly Webinar Series*



NEW POTENT SYNTHETIC OPIOID—N-DESETHYL ISOTONITAZENE—PROLIFERATING AMONG RECREATIONAL DRUG SUPPLY IN USA

PURPOSE: The objective of this announcement is to notify public health and safety law enforcement, first responders, clinicians, medical examiners and coroners, forensic and clinical laboratory personnel, and all other related construction about new information surrounding the emergent synthetic opioid **N-Desethyl Isotonitazene**.

BACKGROUND: Synthetic opioids (e.g., heroin) having enhanced analgesic effects and abuse potential have become a major public health concern. In addition, synthetic opioids are frequently mixed with more traditional opioids, heroin and other drugs to enhance drug potency, increase addiction risk and danger for people who use recreational drugs. Synthetic opioids may be distributed in powder, tablet form, in the United States (USA), an emerging concern for the presence of **N-Desethyl Isotonitazene** in a new opioid drug has been reported. The first public case finding in December 2022, **N-Desethyl Isotonitazene** was first reported by **NPS Discovery Florida**. However, first identification was obtained in early September 2022. To date, seven drug material samples ("drug") isolated (collected from the illicit drug supply) have been reported for **N-Desethyl Isotonitazene** in December 2022, in the **Pennsylvania Department of Health** report on drug reporting the discovery of this new isolate analogue in the USA drug supply. The toxicity of **N-Desethyl Isotonitazene** has not been confirmed in reported but recent association with overdose among people who use drug has led professionals to believe this synthetic isolate may be potential to harm and lead to high public health concerns.

TIMELINE — N-DESETHYL ISOTONITAZENE ...

Identified in urine specimen from a drug treatment program in Florida (September 2022)

Identified in oral fluid specimen collected from people who use drugs (October 2022)

Identified in a commercial "NPS" (recreational drug) sample (November 2022)

Identified in "street" samples among Florida, Michigan, and Pennsylvania drug supply (December 2022)

Confirmed to be identified in "street" samples among Pennsylvania drug supply (January 2023)

LOCATION PENNSYLVANIA, PA, USA

FLORIDA - PENNSYLVANIA

RECOMMENDATIONS FOR PUBLIC HEALTH

RECOMMENDATIONS FOR LABORATORIES

RECOMMENDATIONS FOR MEDICAL CLINICIANS & CORONERS

NPS Discovery — New Drug Monograph **2023**

ADB-5'Br-PINACA

NPS SUBCLASS
Synthetic Cannabinoid

REPORT DATE
May 1, 2023

SAMPLE RECEIVED
March 3, 2023

SAMPLE TYPE
Drug Material

Preferred Name ADB-5'Br-PINACA

Synonyms ADB-P-5Br-INACA, ADB-P-5Br-INACA, 5'Br-ADB-PINACA, ADB-5'Br-PINACA

Formal Name 5-bromo-N-[p-carbamoyl-2,2-dimethyl-propyl]-1-pentyl-indazole-3-carboxamide

InChI Key CUV9BTCKLMBRLT LHMFFACVSA-N

CAS Number Not Available

Chemical Formula C₂₁H₂₈BrN₂O₂

Molecular Weight 423.35

Molecular Ion [M] 422

Exact Mass [M+H]⁺ 423.1390



NPS DISCOVERY REPORTS

NPS Discovery — New Drug Monograph 2023

ADB-5r-B-PINACA

NPS SUBCLASS
Synthetic Cannabinoid

REPORT DATE
May 1, 2023

SAMPLE RECEIVED
March 3, 2023

SAMPLE TYPE
Drug Material

Preferred Name	ADB-5r-B-PINACA
Synonyms	ADB-P-5r-B-PINACA, ADB-P-5r-B-PINACA, 5r-B-ADB-PINACA, ADB-5r-B-PINACA
Formal Name	5-Torono-N-[1-carbamoyl-2-(2-dimethylpropyl)propyl]-pentyl-indole-3-carboxamide
ICHI Key	OUVETRELMBELTAFYACRYADYN
CAS Number	Not Available
Chemical Formula	C ₂₄ H ₃₄ N ₂ O ₂
Molecular Weight	413.56
Molecular Ion (M ⁺)	422
Exact Mass [M+H] ⁺	413.190

NPS Benzodiazepines in the United States

PURPOSE: This report provides up-to-date information regarding the status of NPS benzodiazepine prevalence and positivity within the United States.

OVERVIEW: Most synthetic benzodiazepines (NPS) are not included in the current schedule of controlled substances. However, some are, and others are not. This report provides information on the prevalence and positivity of these substances in the United States.

OBJECTIVE: Our laboratory utilizes a novel approach for the analysis of drugs in forensic samples and applied materials using comprehensive non-targeted MS/MS detection for gas chromatography/mass spectrometry (GC-MS) and liquid chromatography/mass spectrometry (LC-MS/MS) methods. This approach allows for the identification of new benzodiazepines and further data analysis of important trends. This project was completed in collaboration with the toxicology and confirmation laboratories of HHS Labs. Forensic case types linked to these results include illicit drug investigations, investigation of death investigations, and other drug-related investigations. The results of this report represent the total number of NPS benzodiazepines identified in the United States during the quarter, including those from sample mining, data mining, and/or generic testing.

TREND REPORT

Q4 2022

NPS in Q4 2022:

- Opioids: 32%
- Benzodiazepines: 33%
- Stimulants & Hallucinogens: 27%
- Synthetic Cannabinoids: 9%

NPS BENZODIAZEPINES IDENTIFIED

Substance	Toxicology	Drug Material
Desethylfurazepam	2	2
Flumazenil	3	3
Desethylclonazepam	3	3
4-CI-Deschlorazepam	3	3
Fluazepam	5	5
Clonazepam	6	6
Flurazepam	9	9
Etizolam	16	16
Bromazolam	39	39

SELECT POSITIVITY: Q4 2019 to Q4 2022

April 2022 Synthetic Stimulant Market Rapidly Changing as N,N-Dimethylpiperazine Replaces Bupropion in Drug Supply

Purpose: The objective of this assessment is to identify public health and safety, law enforcement, and regulatory concerns related to the current market for synthetic stimulants. This report provides information on the prevalence and positivity of these substances in the United States.

Background: Synthetic stimulants are chemically synthesized drugs that are used to treat attention deficit hyperactivity disorder (ADHD) and narcolepsy. They are also used for recreational purposes. The current market for synthetic stimulants is rapidly changing as N,N-dimethylpiperazine (N,N-DMP) replaces bupropion in drug supply.

Summary: In 2020 and 2021, the substituted cathinone class has been the most commonly reported synthetic stimulant. However, in 2022, N,N-DMP has emerged as a significant player in the market. This report provides information on the prevalence and positivity of these substances in the United States.

Recommended Scope for NPS Testing in the United States

PURPOSE: The objective of this report is to provide updated guidance in developing an appropriate analytical scope of testing for most psychotropic substances (NPS) in the United States based on current trends and emerging data. This report is based on information available in Q2 2022 and is subject to change along with the drug market.

BACKGROUND: The NPS market is changing rapidly, requiring laboratories to constantly remain abreast of new and emerging drug trends, nomenclature, and nomenclature. To meet these needs, laboratories should update methods or develop new ones for detection and confirmation. This can be challenging for laboratories as information about NPS detection can be regional and/or state-specific. This report provides updated guidance on the current market for NPS in the United States.

BENZODIAZEPINES	OPIOIDS	STIMULANTS & HALLUCINOGENS	SYNTHETIC CANNABINOIDS
Flunitrazepam	1/2	1/2	1/2
Flurazepam	1/2	1/2	1/2
Fluazepam	1/2	1/2	1/2
Clonazepam	1/2	1/2	1/2

Toxic Fentanyl Study Group — Quarterly NPS Report

PURPOSE: This report provides an overview of the quarterly NPS report for the Toxic Fentanyl Study Group. The report provides information on the prevalence and positivity of these substances in the United States.

OVERVIEW: The Toxic Fentanyl Study Group is a collaborative effort between forensic toxicologists and law enforcement agencies to identify and track the prevalence of synthetic fentanyl in the United States.

OBJECTIVE: The objective of this report is to provide updated information on the prevalence and positivity of synthetic fentanyl in the United States.

Summary: This report provides information on the prevalence and positivity of synthetic fentanyl in the United States. The report is divided into four sections: Pittsburgh, PA; New York, NY; Newark, NJ; and St. Louis, MO.

Location	Prevalence	Positivity
Pittsburgh, PA	136	49
New York, NY	10	24
Newark, NJ	10	24
St. Louis, MO	10	24

QUARTERLY REPORT — PHILADELPHIA, PA

PURPOSE: This report provides an overview of the quarterly NPS report for Philadelphia, PA. The report provides information on the prevalence and positivity of these substances in the United States.

OVERVIEW: This report provides information on the prevalence and positivity of synthetic fentanyl in Philadelphia, PA. The report is divided into four sections: Fentanyl (NPS) commonly detected; Fentanyl (NPS) commonly detected; Fentanyl (NPS) commonly detected; and Fentanyl (NPS) commonly detected.

Summary: This report provides information on the prevalence and positivity of synthetic fentanyl in Philadelphia, PA. The report is divided into four sections: Fentanyl (NPS) commonly detected; Fentanyl (NPS) commonly detected; Fentanyl (NPS) commonly detected; and Fentanyl (NPS) commonly detected.

Fentanyl Purity, Potency, & Synthesis

WHAT IS FENTANYL? Fentanyl is a synthetic opioid analgesic that is used to treat pain. It is a potent painkiller and is often used in combination with other painkillers. Fentanyl is also used for recreational purposes.

WHAT ARE FENTANYL PRECURSORS, INTERMEDIATES, AND BYPRODUCTS? Fentanyl is synthesized from a variety of precursors, intermediates, and byproducts. These substances are often used in the synthesis of fentanyl.

WHAT ARE PURITY AND POTENCY? Purity and potency are important factors in the synthesis of fentanyl. Purity refers to the amount of fentanyl in a sample, while potency refers to the strength of the fentanyl.

HOW IS PURITY DETERMINED? Purity is determined using a variety of methods, including gas chromatography/mass spectrometry (GC-MS) and liquid chromatography/mass spectrometry (LC-MS/MS).

HOW DOES PURITY TESTING SUPPORT HARM REDUCTION? Purity testing is an important tool for harm reduction. It allows individuals to know the strength of the fentanyl they are using, which can help them avoid overdose.

NPS Discovery Toolkit

N,N-Pyrrolidino Etizolam

Stamp™

Stamp™ is a new tool for identifying synthetic stimulants. It is a small, portable device that can be used to identify synthetic stimulants in the field.

Stamp™

Stamp™ is a new tool for identifying synthetic stimulants. It is a small, portable device that can be used to identify synthetic stimulants in the field.

YEAR IN REVIEW 2022

PURPOSE: This report provides an overview of the year in review for NPS Discovery in 2022. The report provides information on the prevalence and positivity of these substances in the United States.

OVERVIEW: This report provides information on the prevalence and positivity of synthetic fentanyl in the United States. The report is divided into four sections: Synthetic Stimulants; Benzodiazepines; Opioids; and Synthetic Cannabinoids.

Summary: This report provides information on the prevalence and positivity of synthetic fentanyl in the United States. The report is divided into four sections: Synthetic Stimulants; Benzodiazepines; Opioids; and Synthetic Cannabinoids.



YEAR IN REVIEW ▶

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.

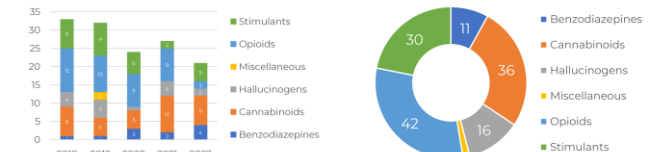


Figure 1: Newly discovered NPS reported for the first time since 2018.

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).

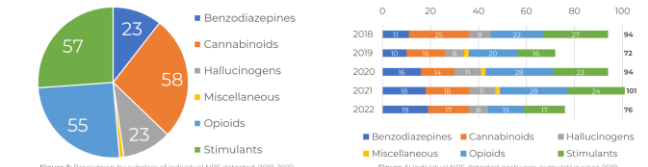


Figure 3: Breakdown by subclass of individual NPS detected, 2018-2022.

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).

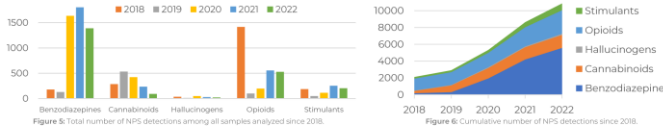


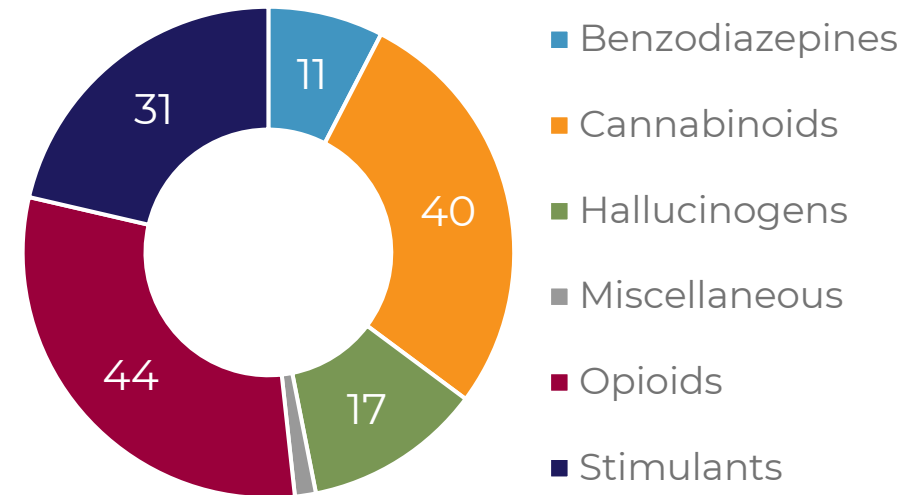
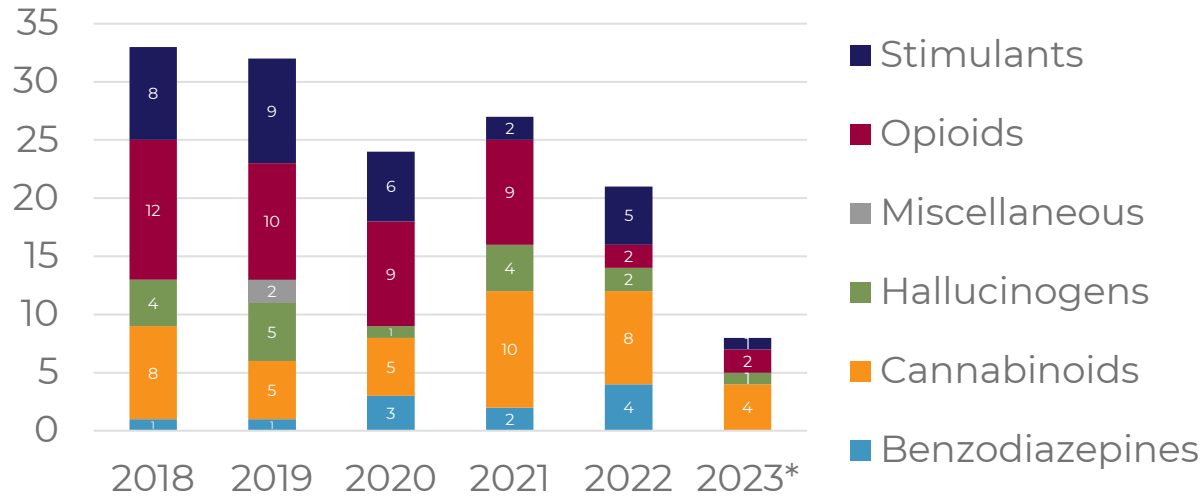
Figure 5: Total number of NPS detections among all samples analyzed since 2018.

Figure 6: Cumulative number of NPS detections since 2018.

ACKNOWLEDGMENTS: The report was prepared by the Center for Forensic Science Research and Education (CFSRE) at the University of North Carolina at Charlotte. The authors would like to thank the following individuals for their contributions: [List of names].
DISCLAIMER: NPS Discovery is a service provided by the Center for Forensic Science Research and Education (CFSRE) at the University of North Carolina at Charlotte. The information provided is for informational purposes only and does not constitute an offer of any financial product or service. The information provided is not intended to be used as a substitute for professional advice from a qualified professional.

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	C ₂₀ H ₂₂ BrFN ₂ O ₂	420	421.0921
06/27/2023	Cannabinoid	MDMB-BINACA	C ₁₉ H ₂₇ N ₃ O ₃	345	346.2125
06/26/2023	Cannabinoid	MDMB-INACA	C ₁₅ H ₁₉ N ₃ O ₃	289	290.1499
06/23/2023	Opioid	N-Pyrrolidino Metonitazene	C ₂₁ H ₂₄ N ₄ O ₃	380	381.1921
06/22/2023	Opioid	N-Pyrrolidino Protonitazene	C ₂₃ H ₂₈ N ₄ O ₃	408	409.2234
06/21/2023	Hallucinogen	25B-NBOH	C ₁₇ H ₂₀ BrNO ₃	365	366.0699
06/20/2023	Stimulant	4-Methylmethylphenidate	C ₁₅ H ₂₁ NO ₂	247	248.1645
05/01/2023	Cannabinoid	ADB-5'Br-PINACA	C ₁₉ H ₂₇ BrN ₄ O ₂	422	423.1390

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

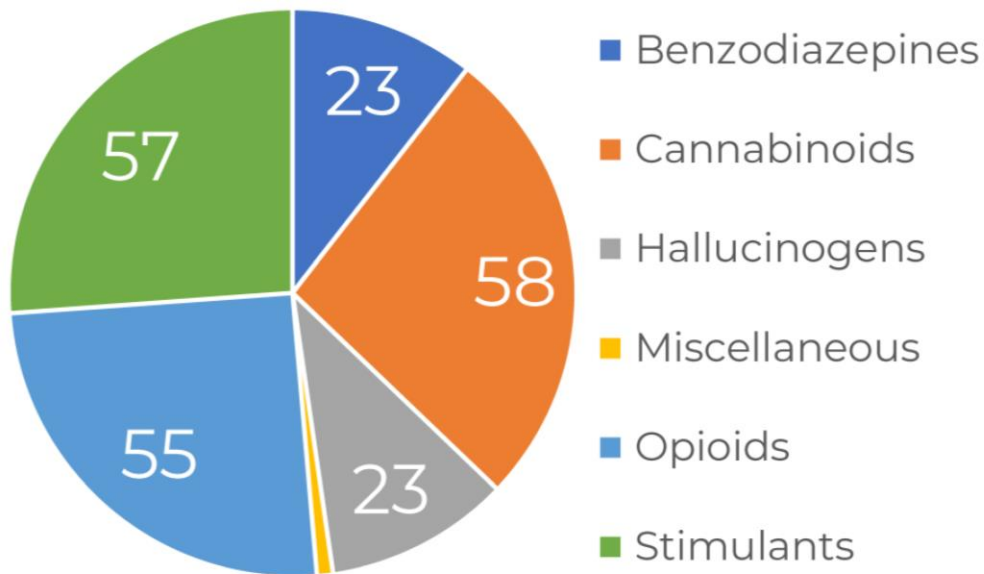


Figure 3: Breakdown by subclass of individual NPS detected, 2018-2022.

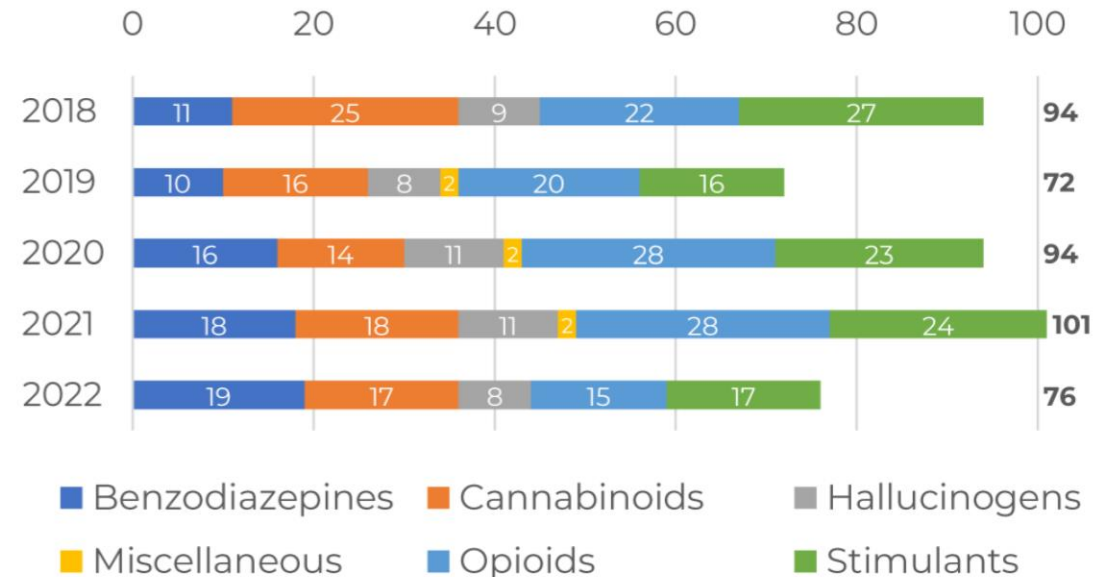


Figure 4: Individual NPS detected each year, cumulative since 2018.

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

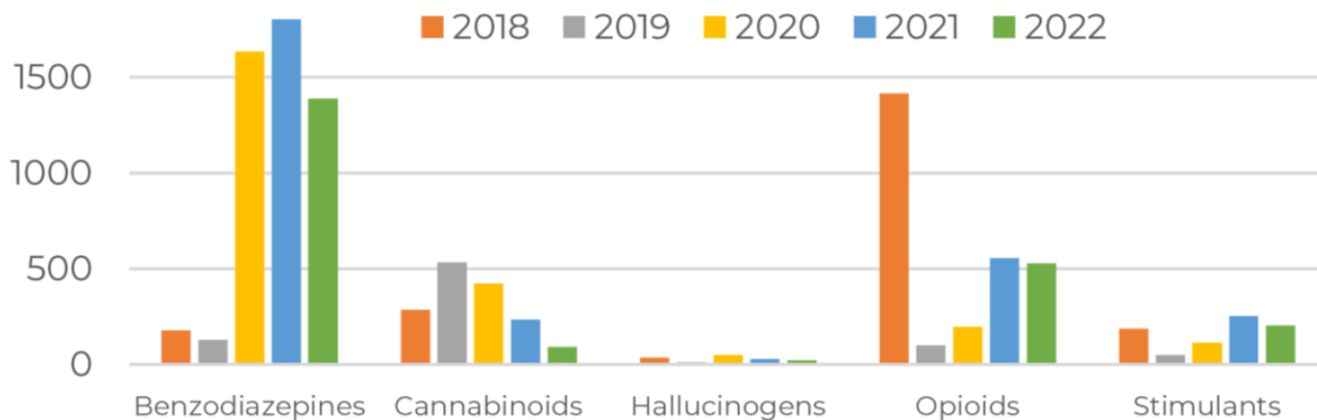


Figure 5: Total number of NPS detections among all samples analyzed since 2018.

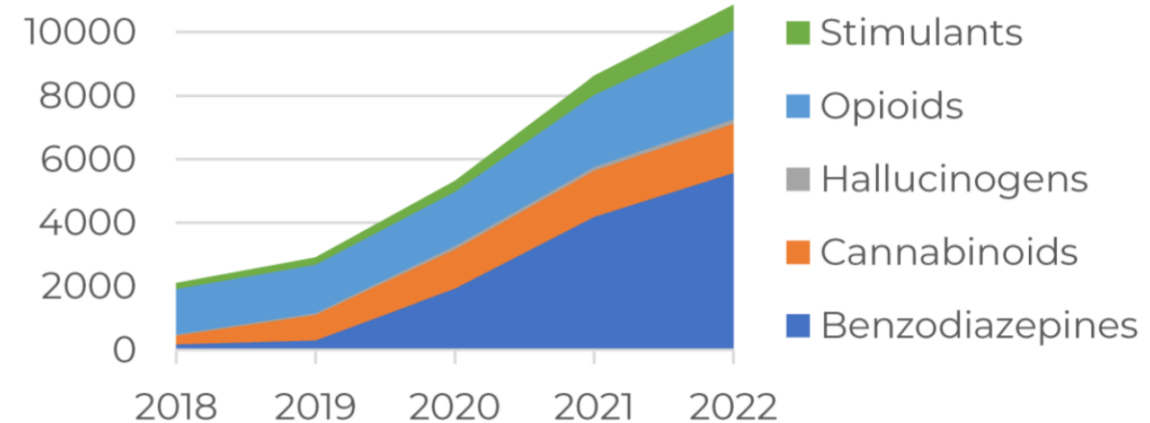


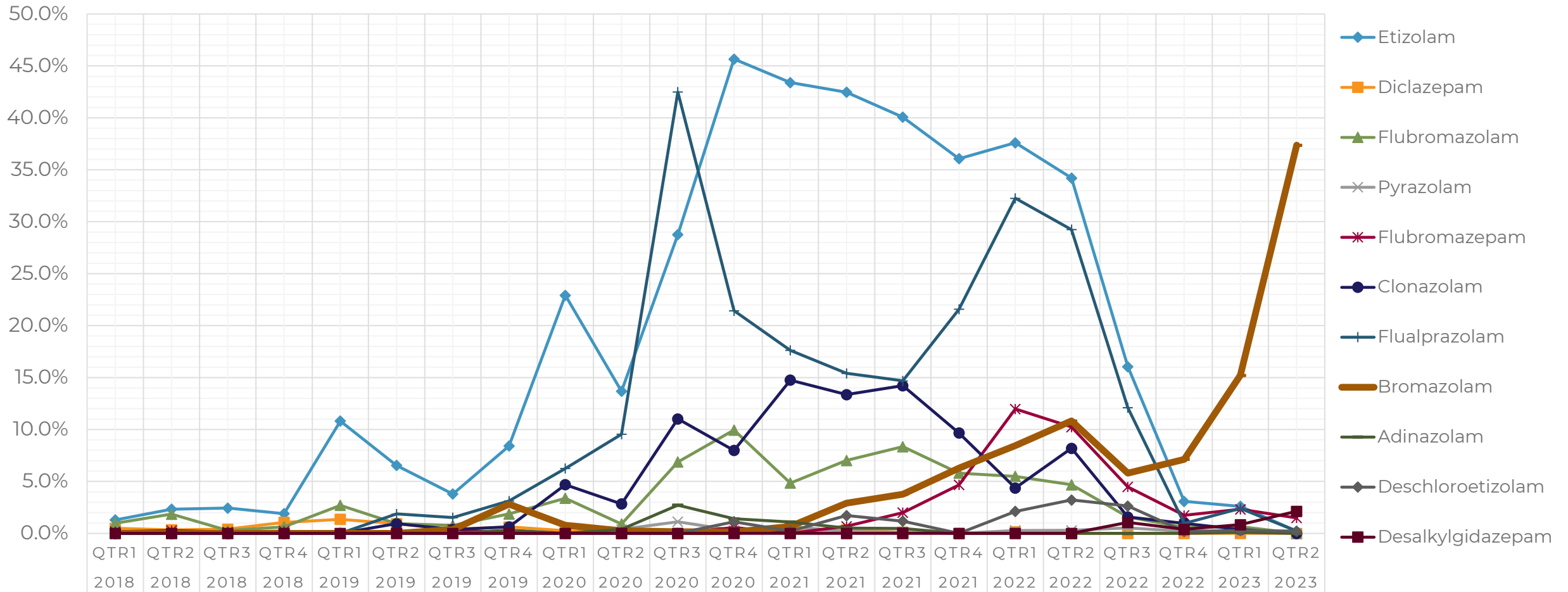
Figure 6: Cumulative number of NPS detections since 2018.



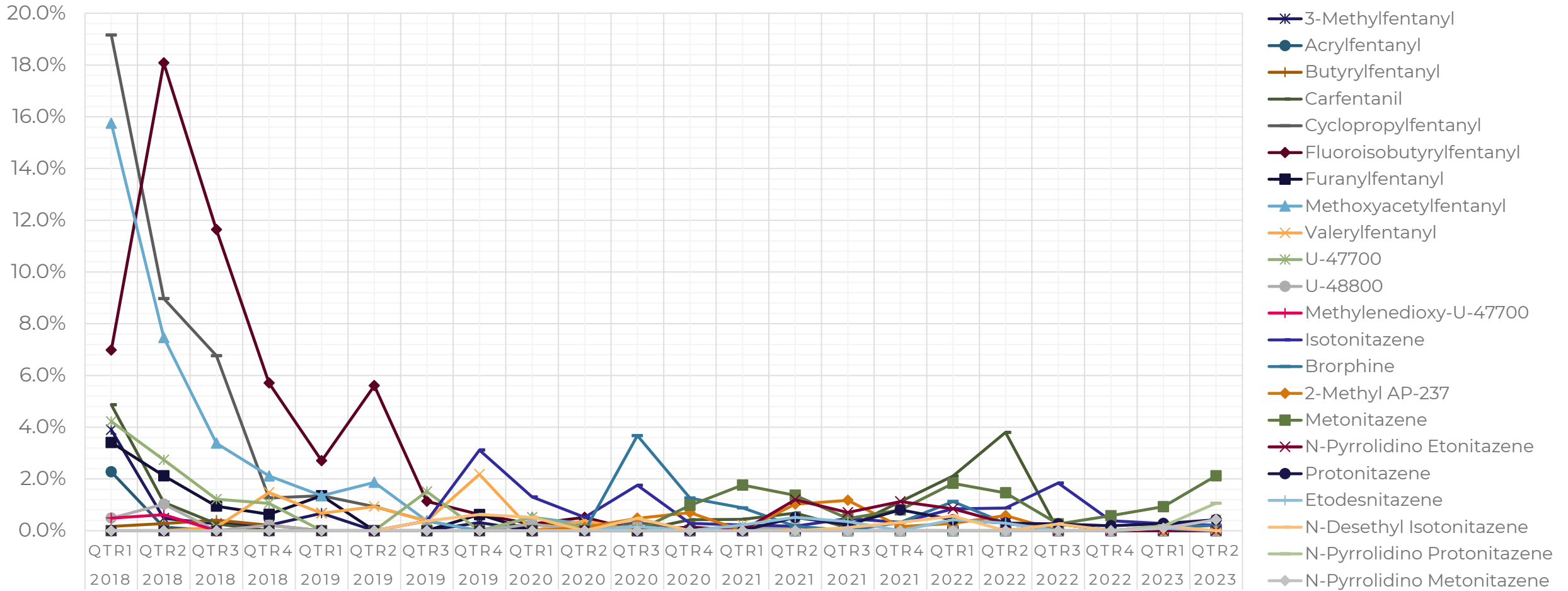
POSITIVITY PLOTS SINCE 2018



POSITIVITY PLOTS – NPS BENZODIAZEPINES

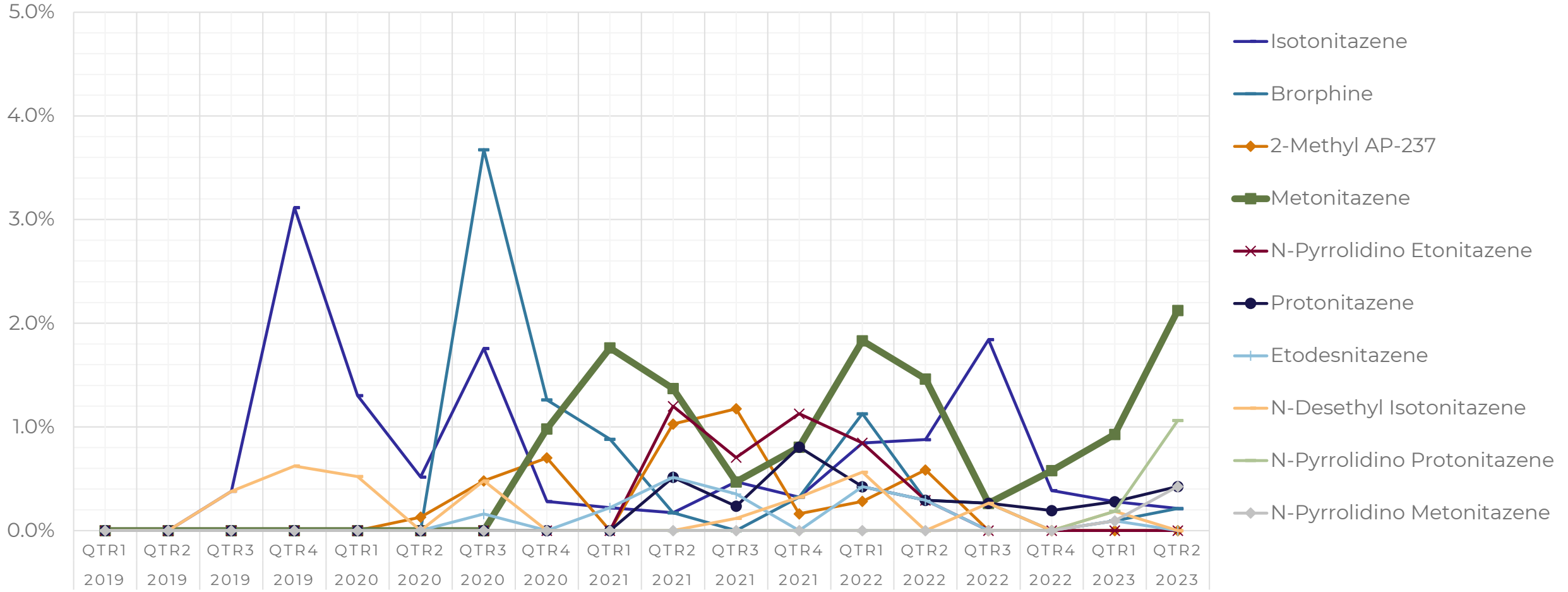


POSITIVITY PLOTS – NPS OPIOIDS

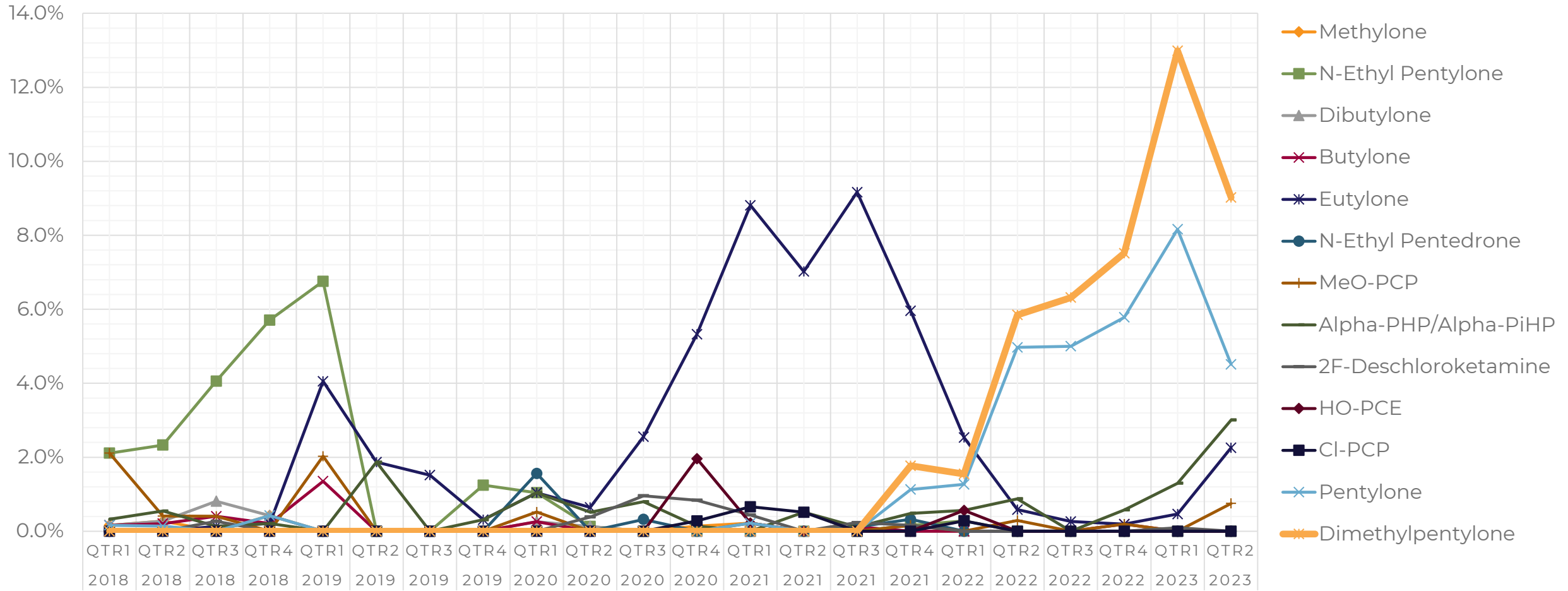


Note: Fluorofentanyl Excluded

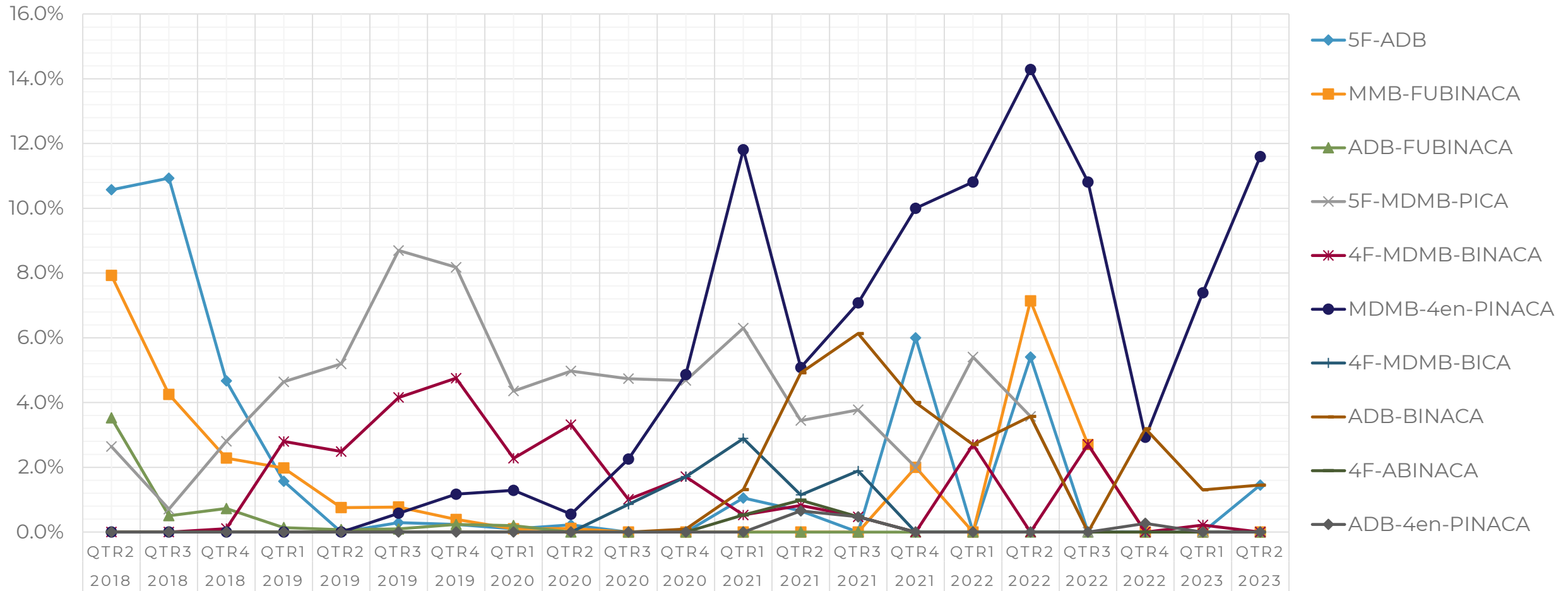
POSITIVITY PLOTS – NPS OPIOIDS (NEW GENERATION ONLY)



POSITIVITY PLOTS – NPS STIMULANTS & HALLUCINOGENS

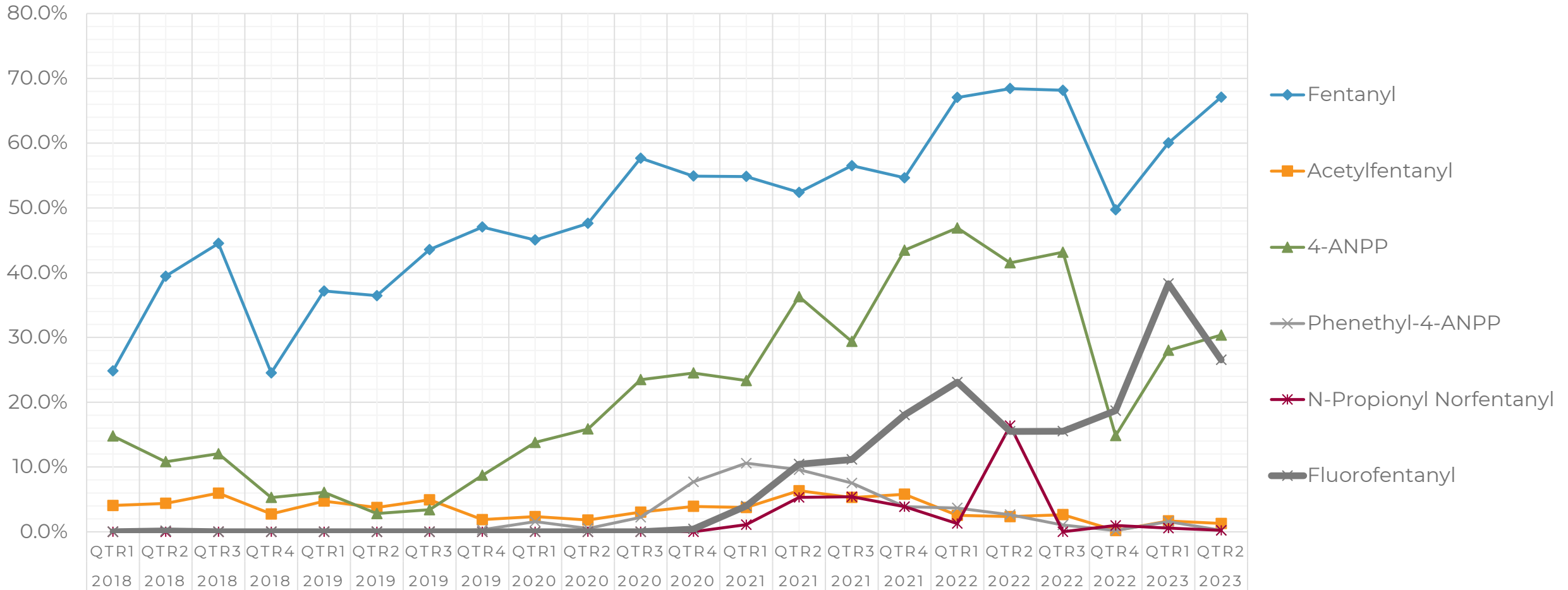


POSITIVITY PLOTS – SYNTHETIC CANNABINOIDS

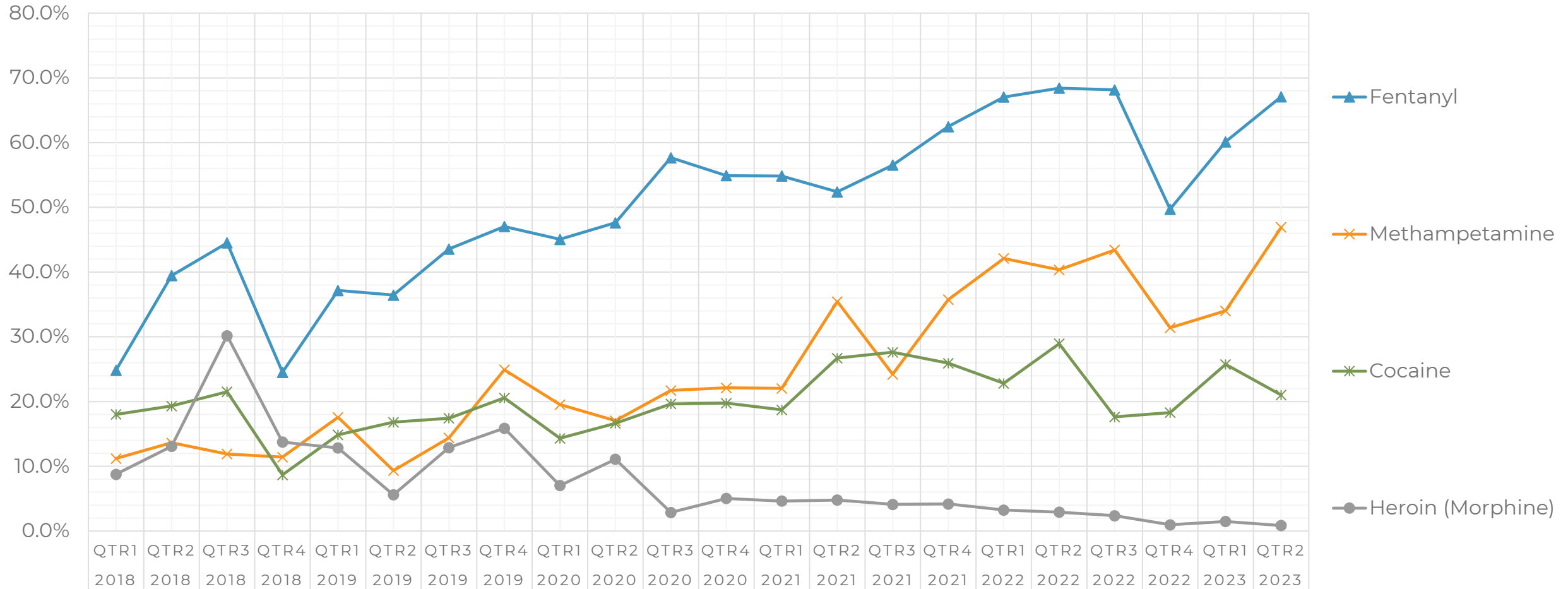


Note: Some quarters may be skewed due to low sample volume

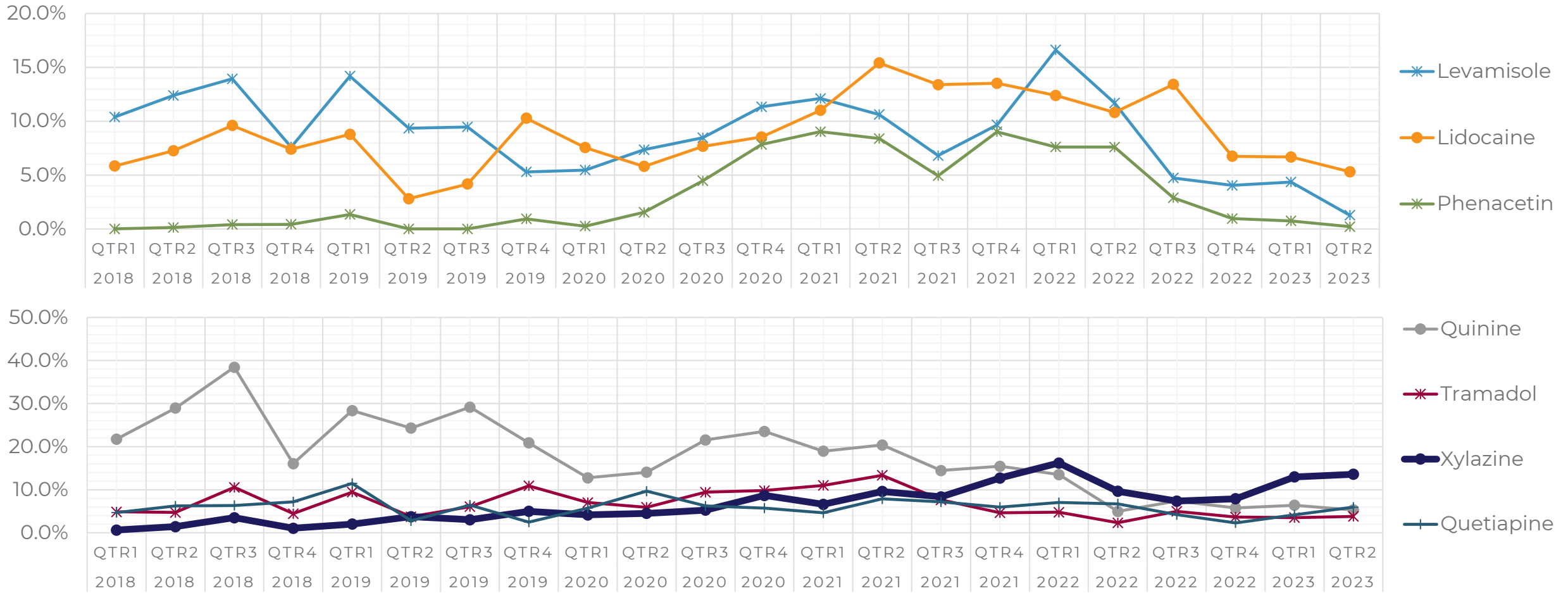
POSITIVITY PLOTS – FENTANYL & FLUOROFENTANYL



POSITIVITY PLOTS – TRADITIONAL DRUGS

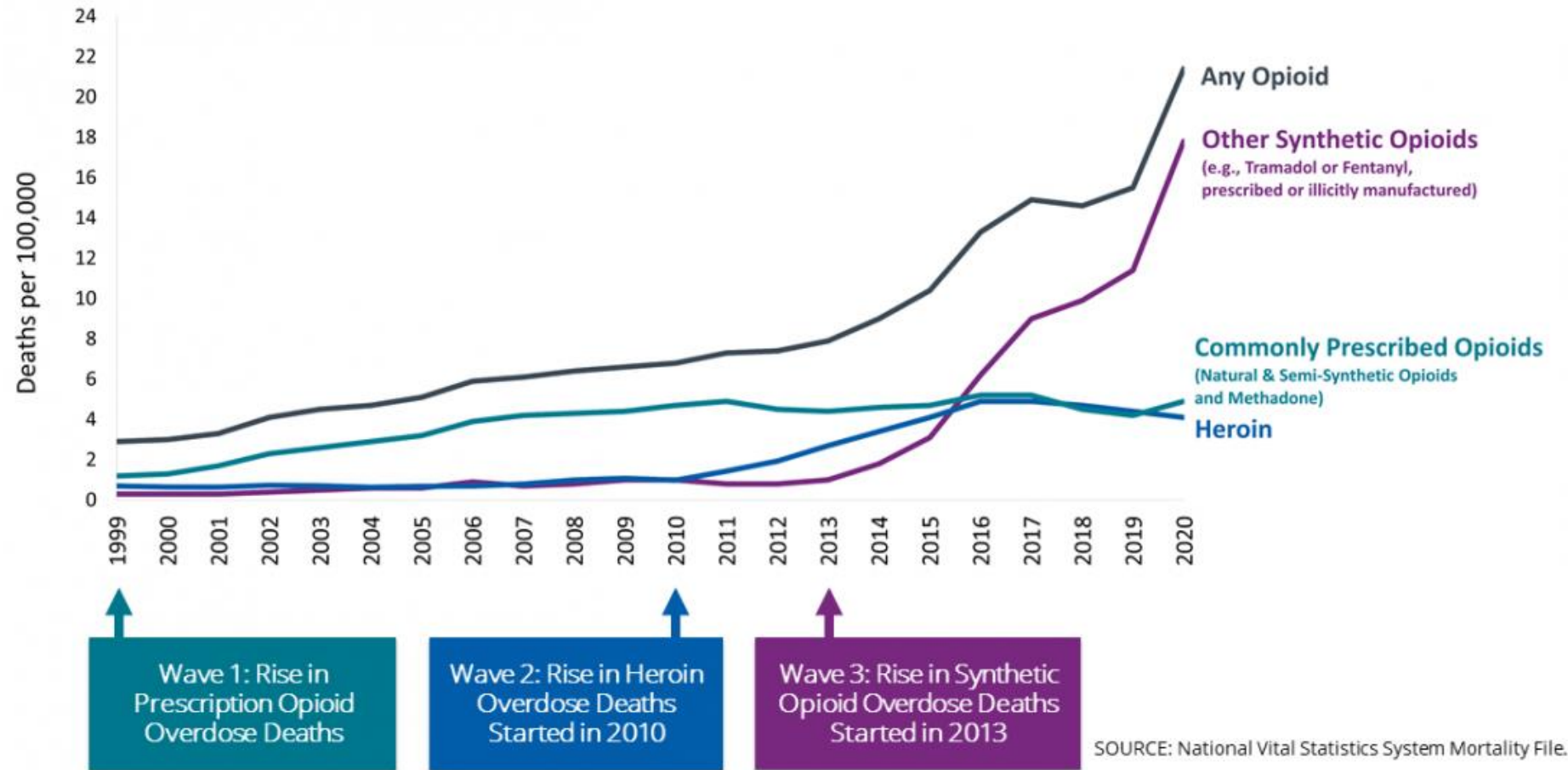


POSITIVITY PLOTS – ADULTERANTS



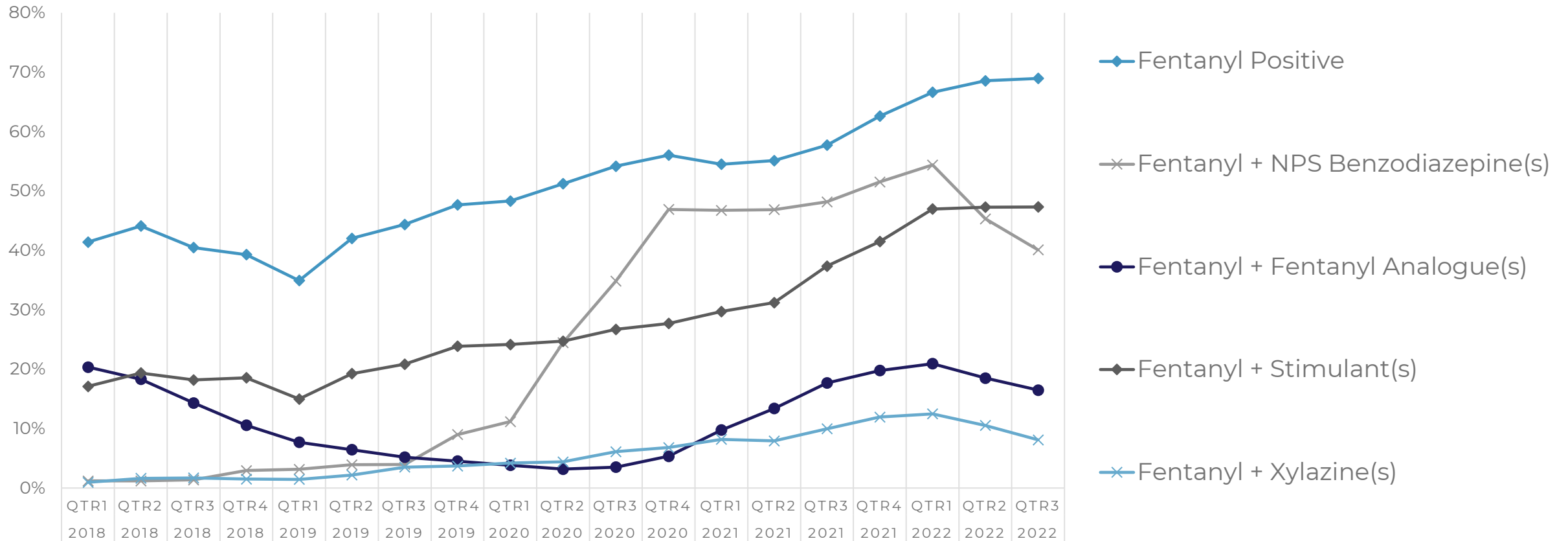
THREE WAVES OF OPIOID OVERDOSE DEATHS (CDC)

- **Wave 1:**
 - Prescription Opioids
- **Wave 2:**
 - Heroin
- **Wave 3:**
 - Fentanyl
- **Wave 4: (???)**
 - “Nested Waves”
 - Polydrug Overdoses
 - Fentanyl + XYZ



ENTERING THE POLYDRUG STAGE OF OPIOID EPIDEMIC

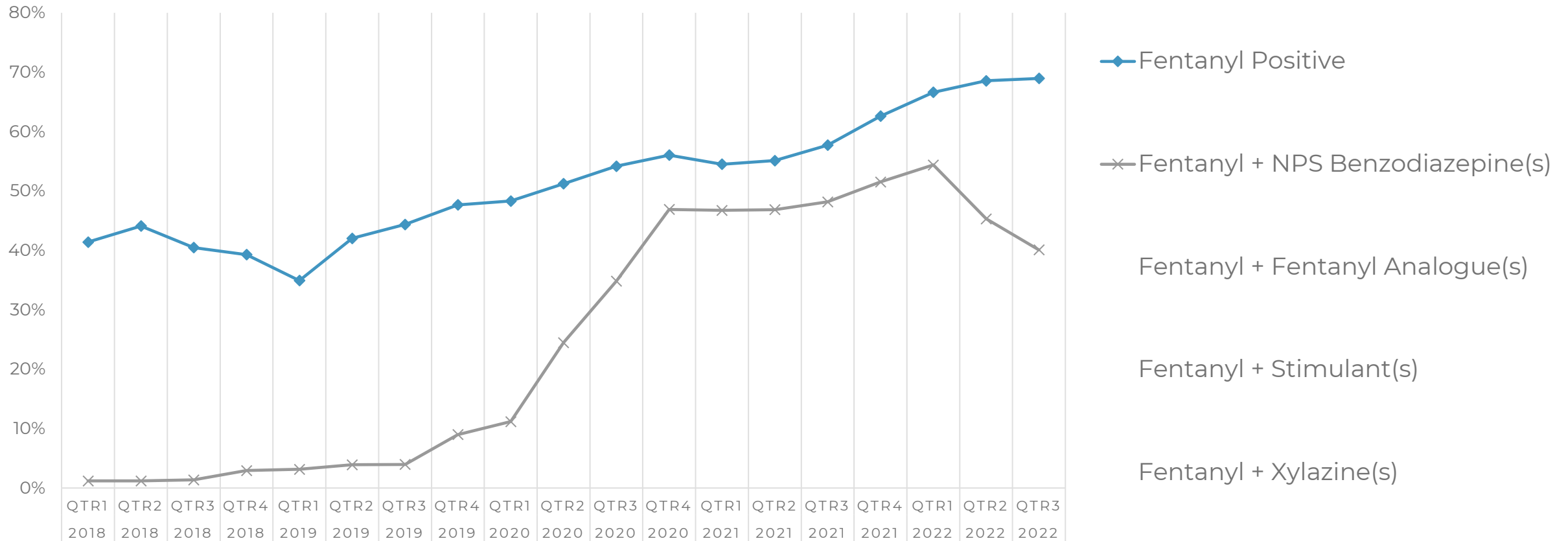
Fentanyl Co-Positivity – the “Nested Waves” Underlying Positivity and Prevalence



Note: Data plotted as 3-month rolling average.

ENTERING THE POLYDRUG STAGE OF OPIOID EPIDEMIC

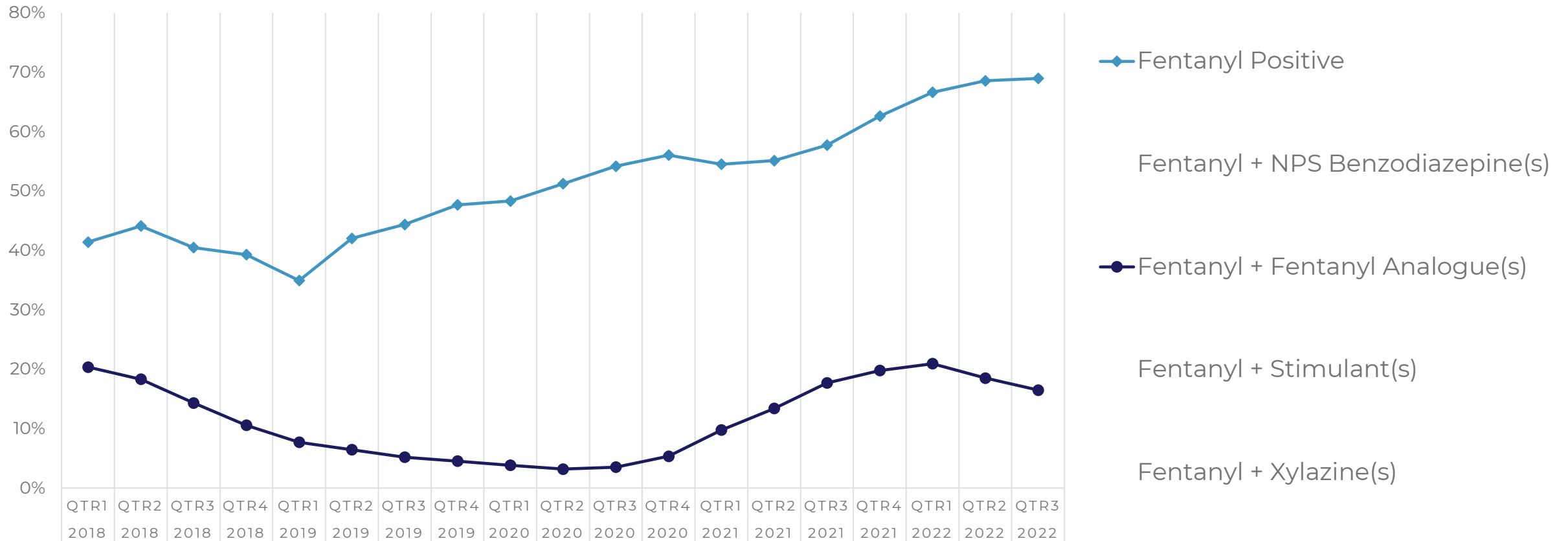
Fentanyl Co-Positivity – the “Nested Waves” Underlying Positivity and Prevalence



Note: Data plotted as 3-month rolling average.

ENTERING THE POLYDRUG STAGE OF OPIOID EPIDEMIC

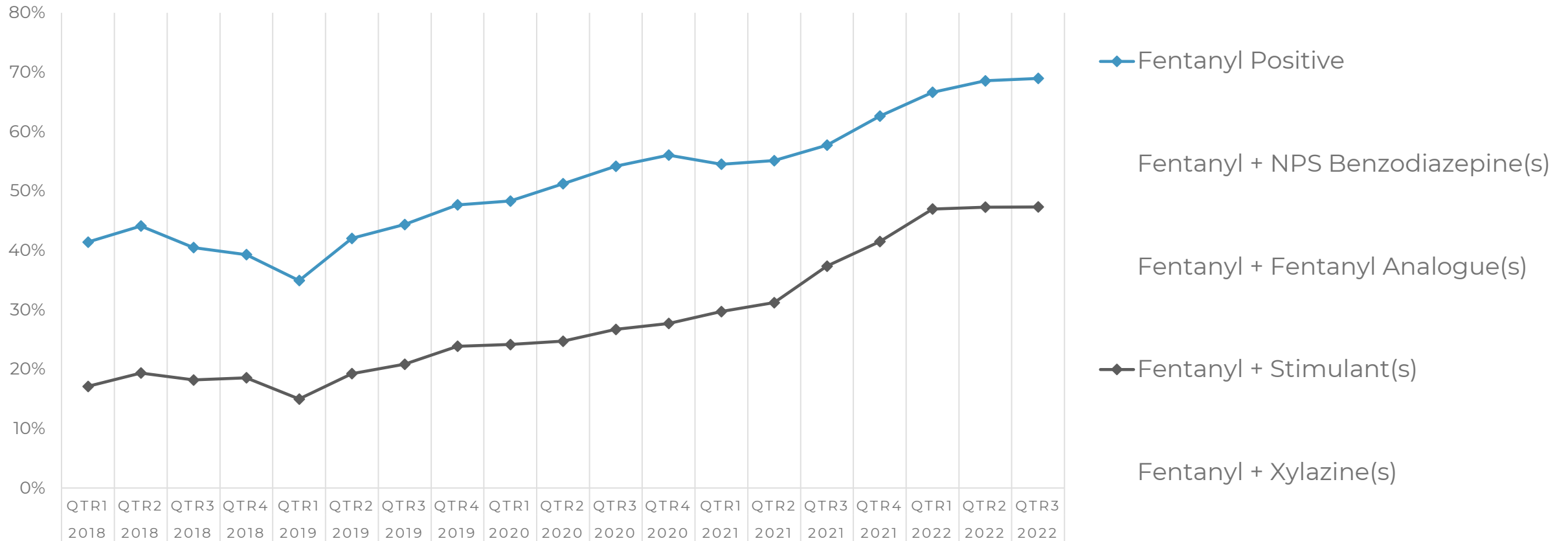
Fentanyl Co-Positivity – the “Nested Waves” Underlying Positivity and Prevalence



Note: Data plotted as 3-month rolling average.

ENTERING THE POLYDRUG STAGE OF OPIOID EPIDEMIC

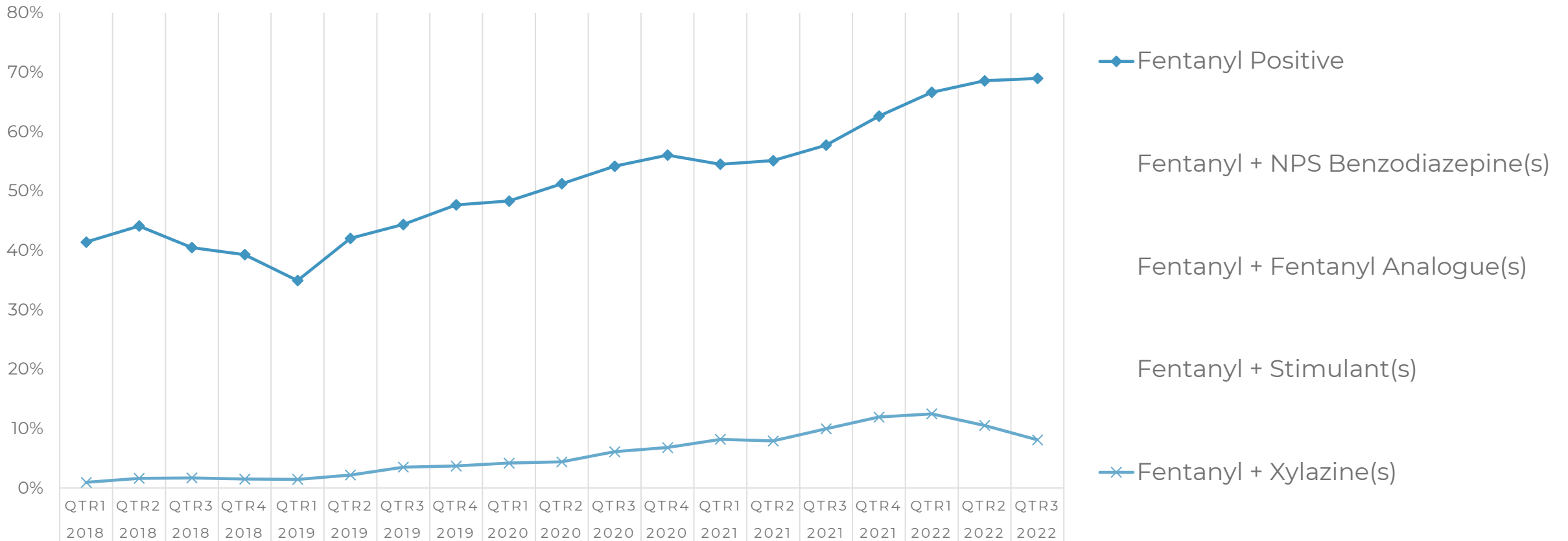
Fentanyl Co-Positivity – the “Nested Waves” Underlying Positivity and Prevalence



Note: Data plotted as 3-month rolling average.

ENTERING THE POLYDRUG STAGE OF OPIOID EPIDEMIC

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



Note: Data plotted as 3-month rolling average.

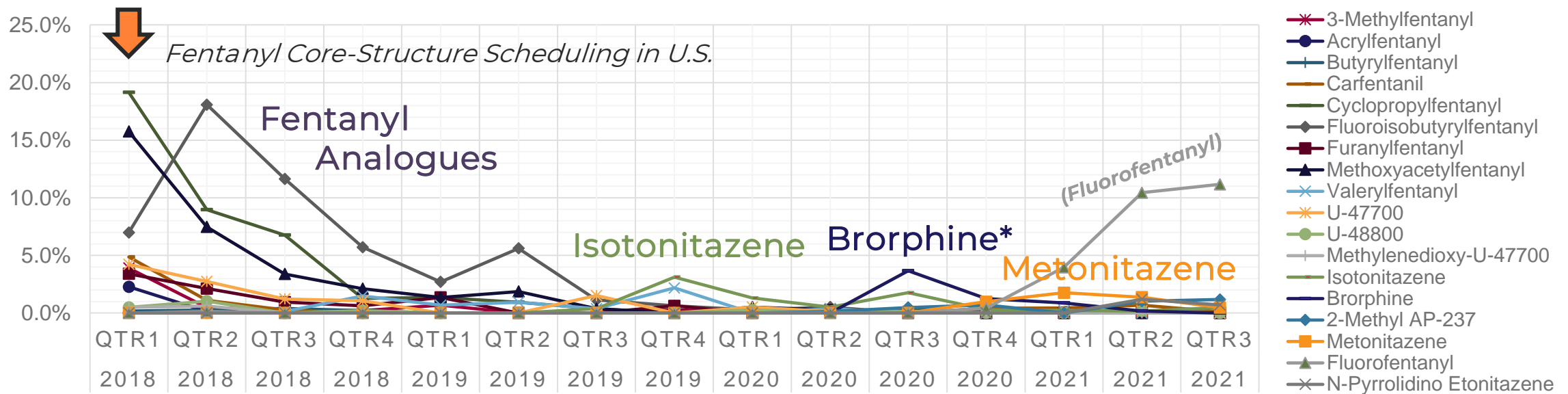


NPS OPIOIDS



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**

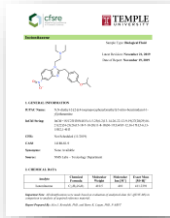
2022

- 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)

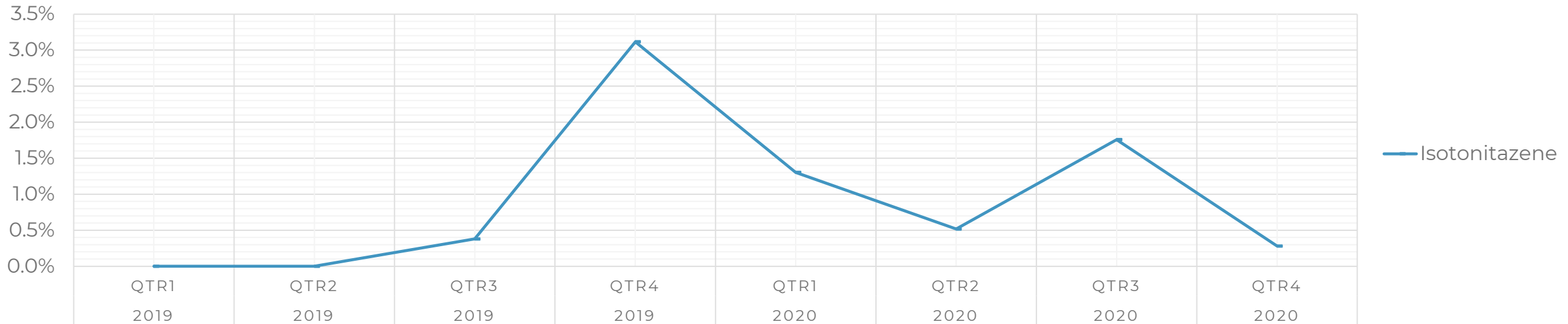
Public alert issued
for isotonitazene (CFSRE)
(Nov. 2019)



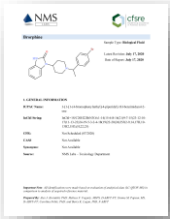
Notice of intent
to schedule (DEA)
(June 2020)



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



EWS IMPACT – NITAZENE ANALOGUE TIMELINES



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

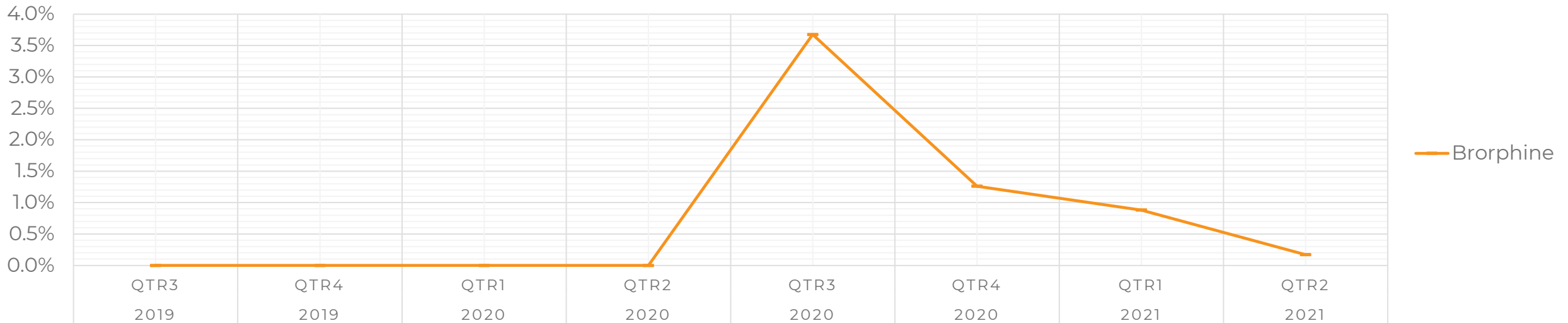
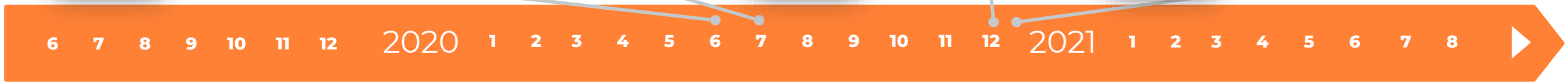
Public alert issued
for brorphine (CFSRE)
(July 2020)



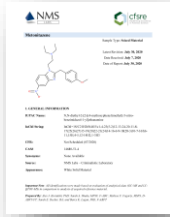
Notice of intent
to schedule (DEA)
(Dec. 2020)



Brorphine waning
in positivity (CFSRE)
(Q4 2020)



EWS IMPACT – NITAZENE ANALOGUE TIMELINES



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

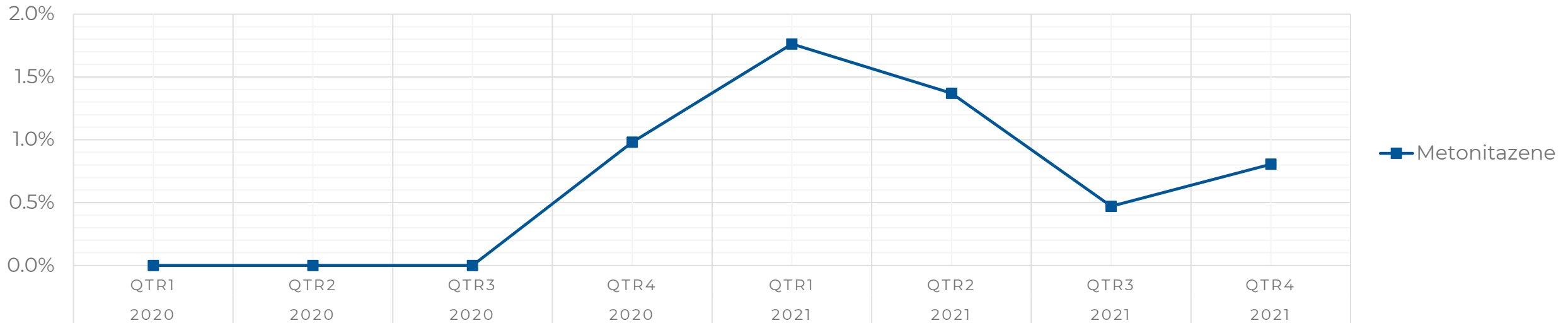
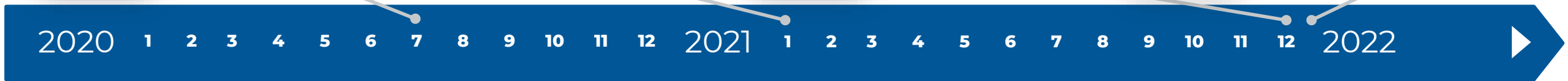
Public alert issued
for metonitazene (CFSRE)
(Jan. 2021)



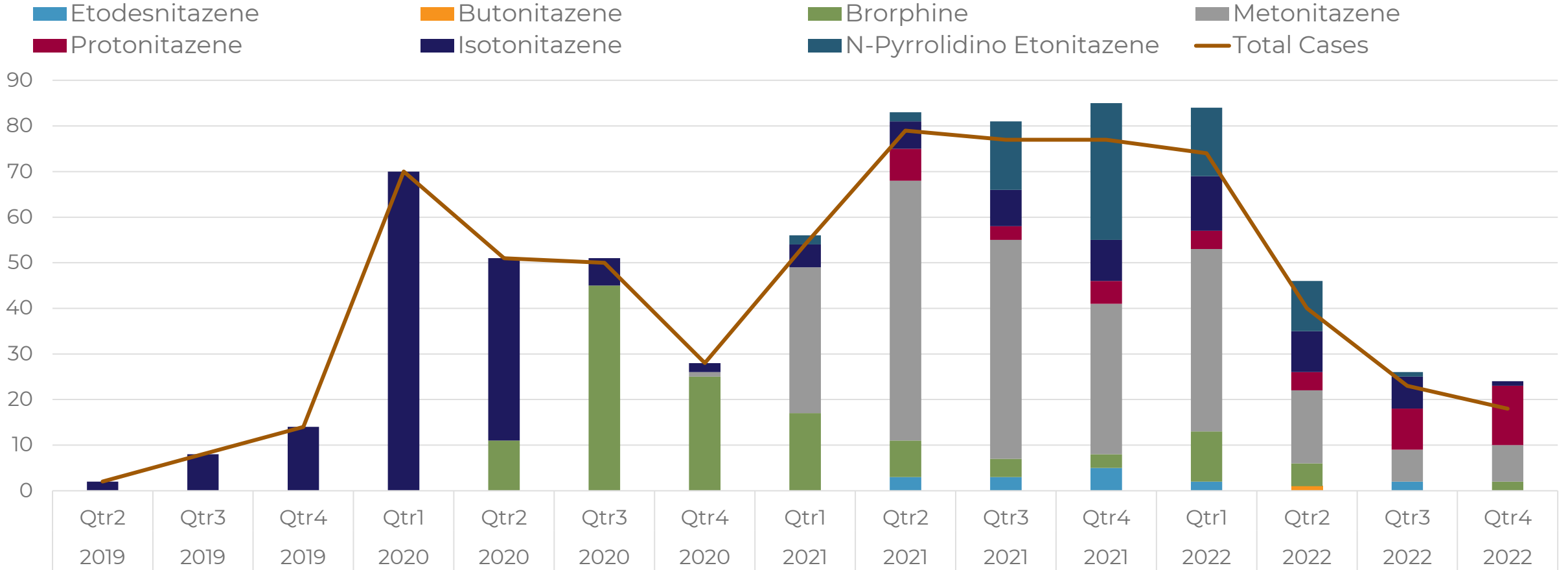
Notice of intent
to schedule (DEA)
(Dec. 2021)



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

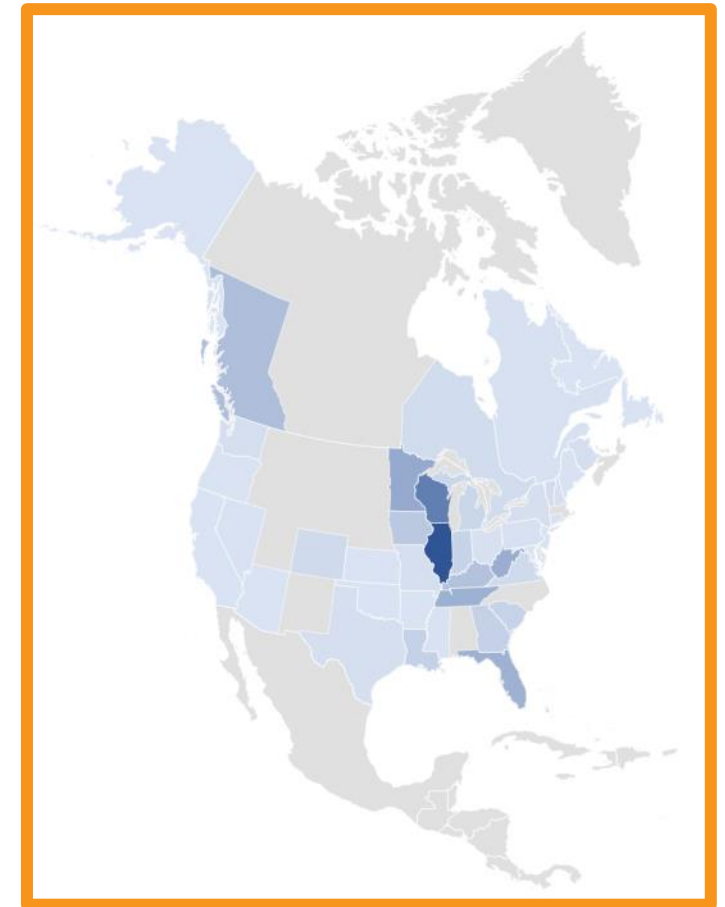
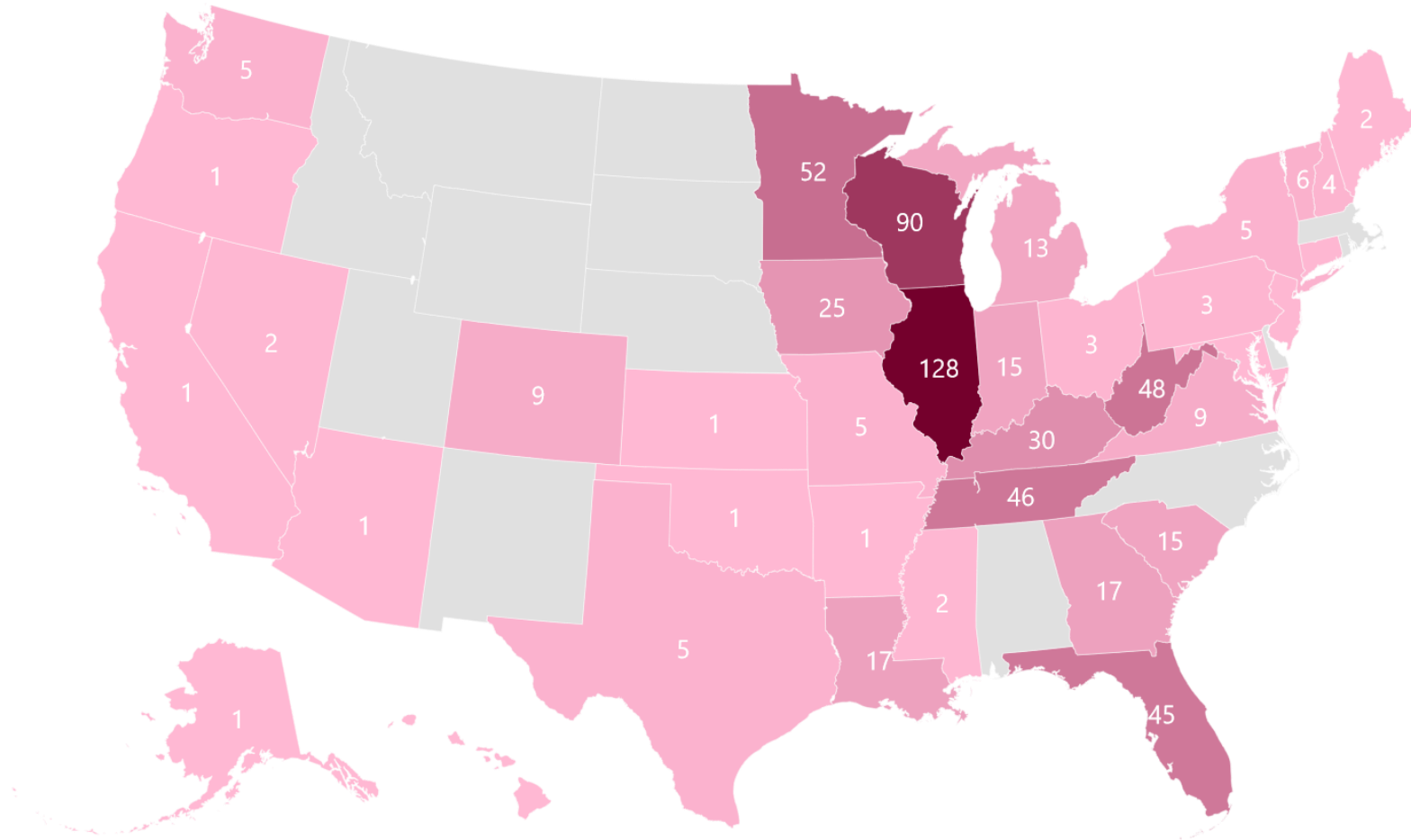


DIVERSIFICATION OF NITAZENE ANALOGUES



*Forensic toxicology cases. Data from NMS Labs & CFSRE

PROLIFERATION OF NITAZENE ANALOGUES



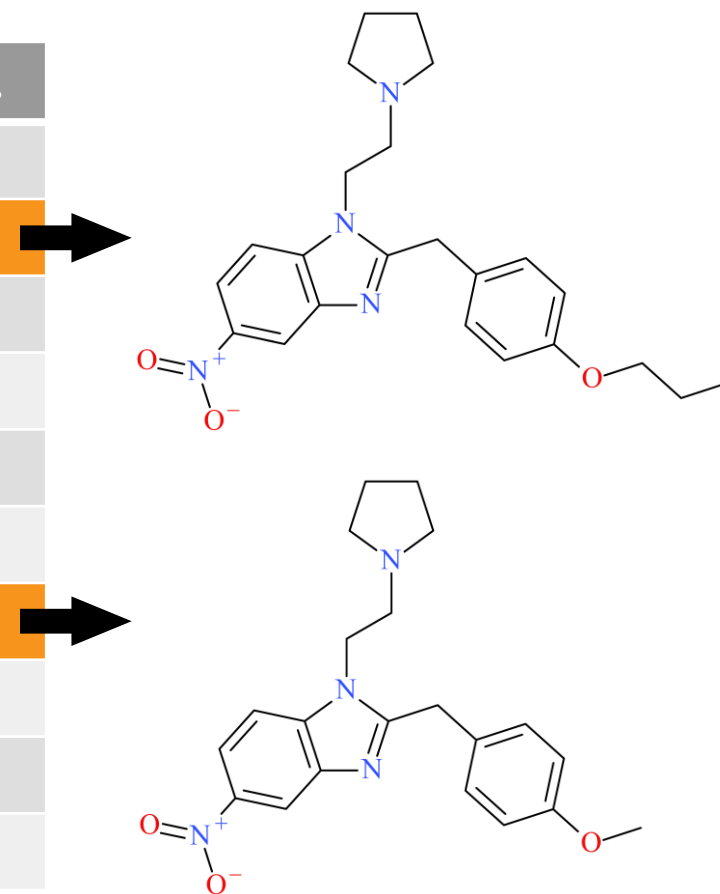
IN COMBINATION WITH OTHER DRUGS

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	Cases	Potency Comp. to Fent.
<i>N</i> -Pyrrolidino Etonitazene	15	43x more
<i>N</i>-Pyrrolidino Protonitazene	9	25x more
<i>N</i> -Desethyl Isotonitazene	10	20x more
Isotonitazene	69	9x more
Protonitazene	3	4x more
Metonitazene	18	2x more
<i>N</i>-Pyrrolidino Metonitazene	5	2x more
<i>Fentanyl</i>	-	-
Butonitazene	1	2x less
Etodesnitazene	15	4x less



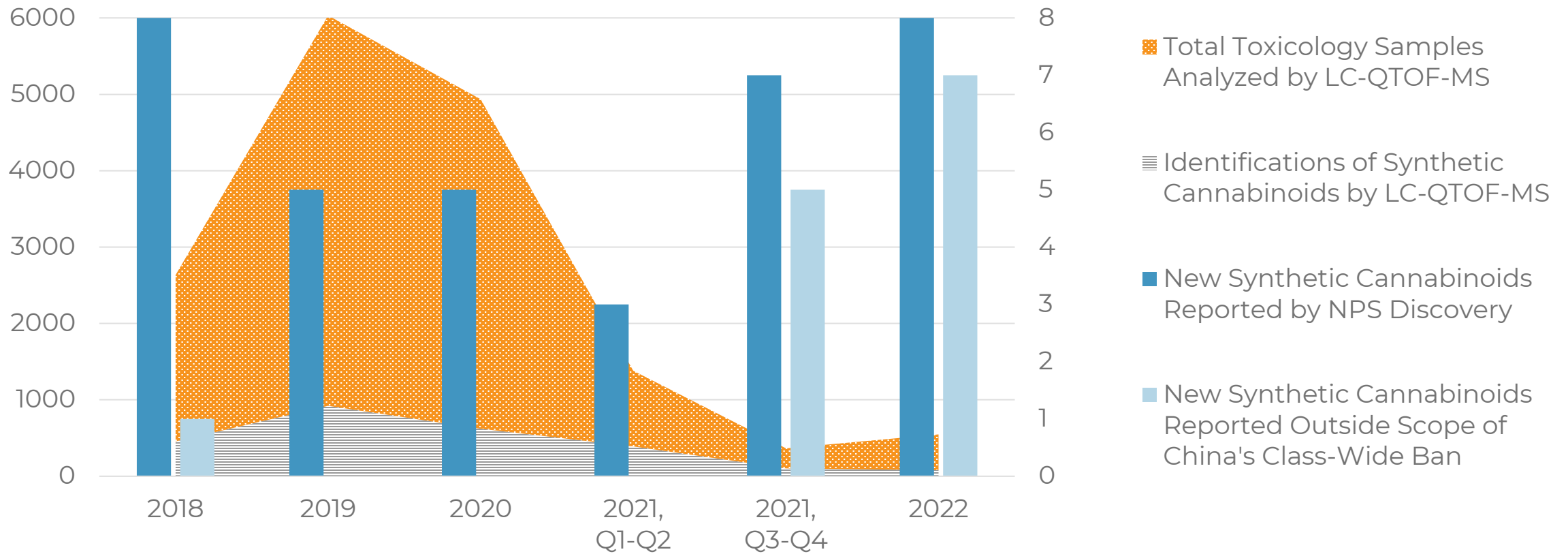


SYNTHETIC CANNABINOIDS



WHAT'S HAPPENING WITH SYNTHETIC CANNABINOIDS?

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



CHINA IMPOSES CLASS-WIDE BAN

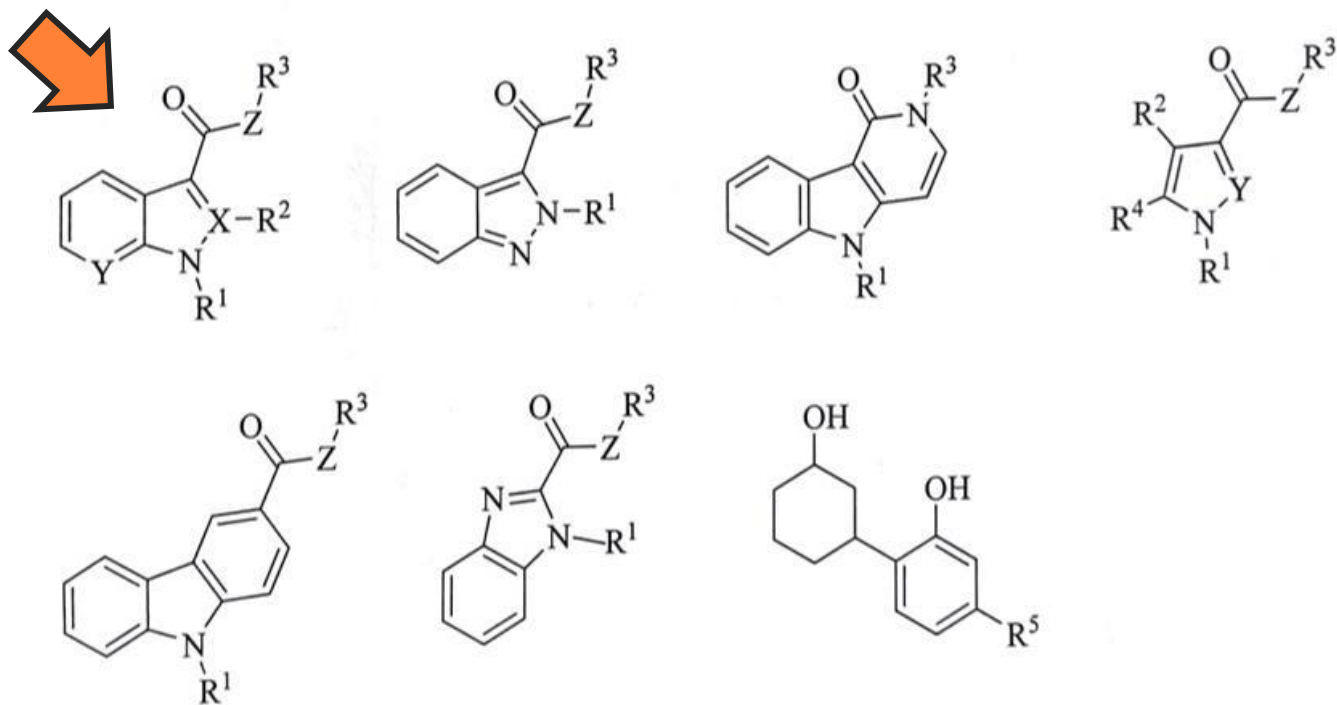


The Questions:

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

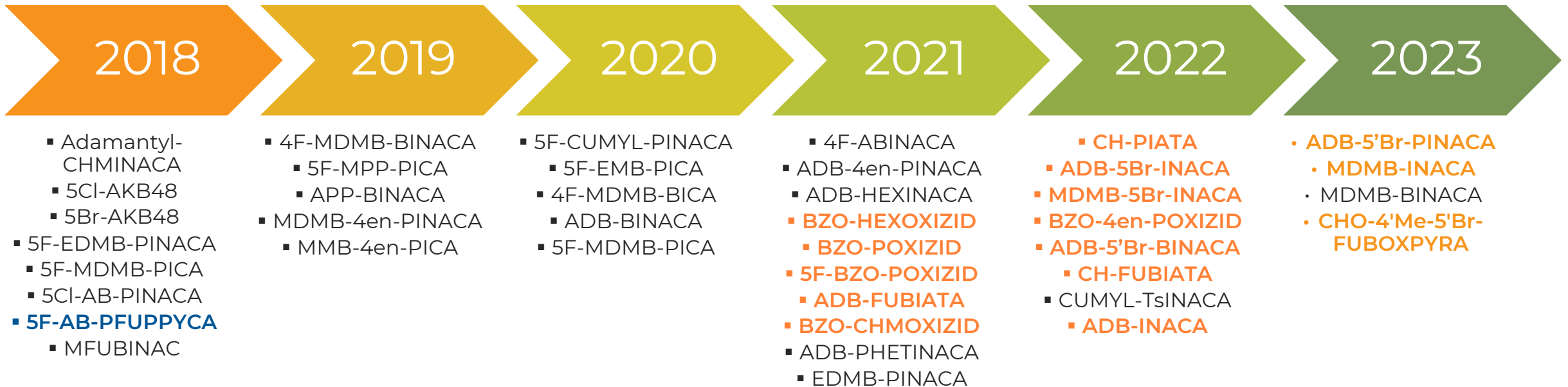


- **Summary – This included previously prevalent indoles (-ICA's) and indazoles (-INACA's)**

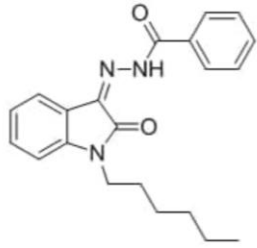
- R¹ represents substituted or unsubstituted C3-C8 **alkyl** group; substituted or unsubstituted heterocyclic group containing 1-3 heteroatoms; substituted or unsubstituted methyl or ethyl group substituted by heterocyclic group containing 1-3 heteroatoms.
- R² represents hydrogen or methyl or no atom.
- 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).



MONITORING GRAY MARKET SITES



MDA-19

MDA-19 is a drug that acts as a potent and selective agonist for the cannabinoid CB1 receptor.

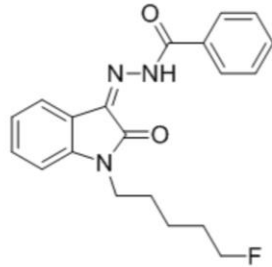
\$1.70



4C-ADB

4C-ADB is the best analog of 5F-ADB...

\$28.00



5F-MDA-19

5F-MDA-19 is a drug that acts as a potent and selective agonist for the cannabinoid CB1 receptor.

\$1.70

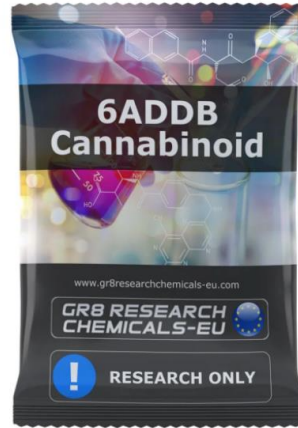


7-ADD

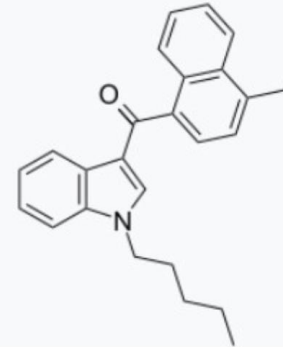
On 19.10.2021 By ADMIN

Cannabinoids New Chemicals

7-ADD is a new synthetic cannabinoid, synthesized as one of...



NEW



JWH-210



ADB-Butinaca, ADBB

On 05.06.2021 By ADMIN

Cannabinoids New Chemicals

ADB-Butinaca or ADBB synthetic is a designer cannabinoid created on...



5F-MDA-19

On 05.06.2021 By ADMIN

Cannabinoids New Chemicals

5F-MDA-19 is a cannabinoid drug, a structural analog of MDA-19



AZ-037 (5F-AB-FUPPYCA)

On 20.05.2021 By ADMIN

Cannabinoids New Chemicals

AZ-037 or 5F-AB-FUBINACA is a new designer cannabinoid based on...



5F-MDA-19 (new legal noid!)

5F-MDA-19 is a drug that acts as a potent and selective agonist for the cannabinoid..

\$30.00

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)

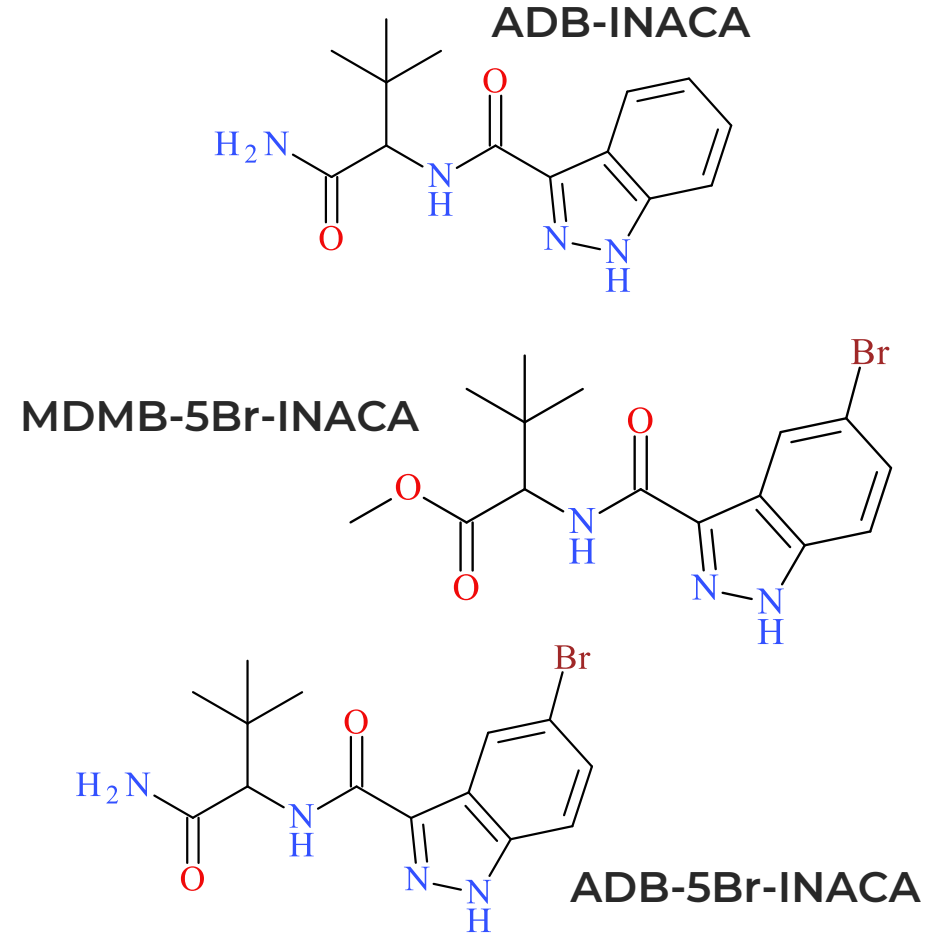
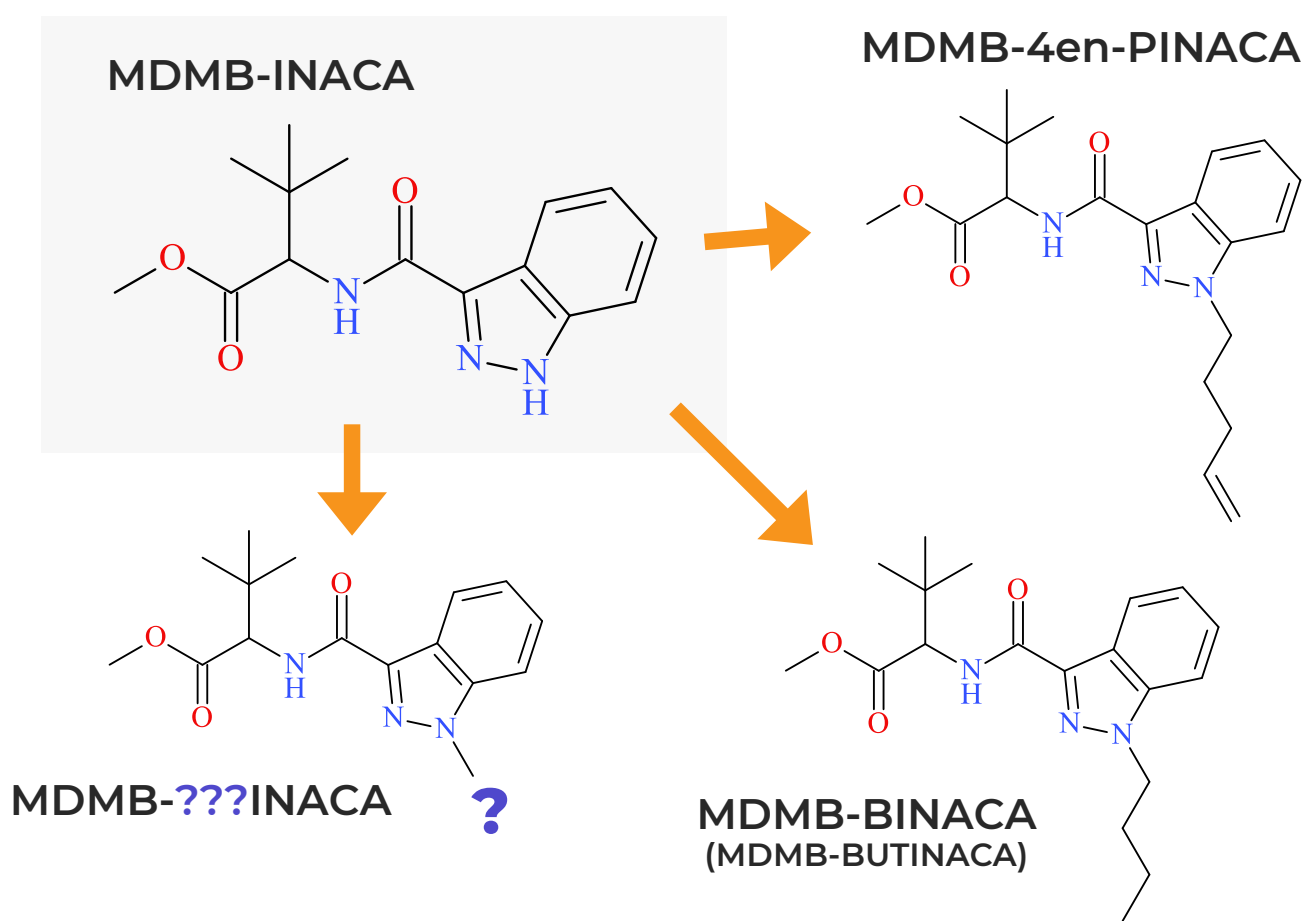
850g anhydrous potassium carbonate (CAS: 584-08-7)

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°C 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

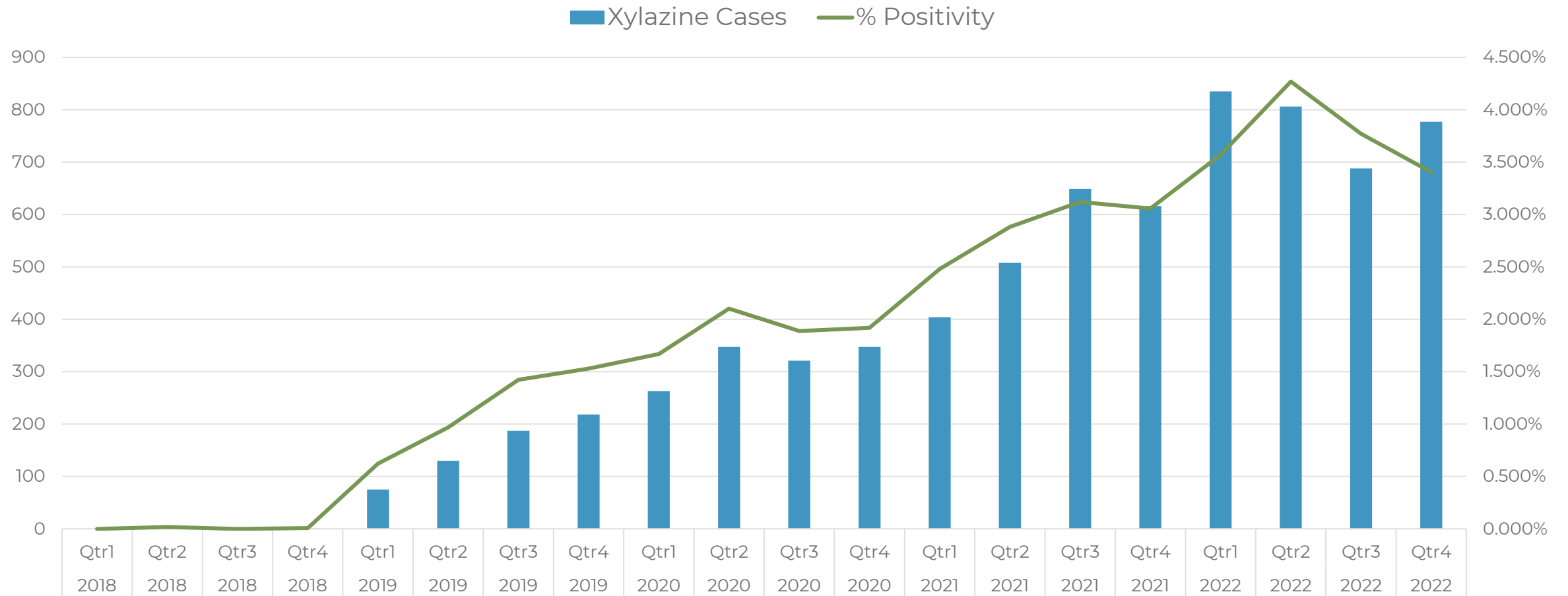




XYLAZINE

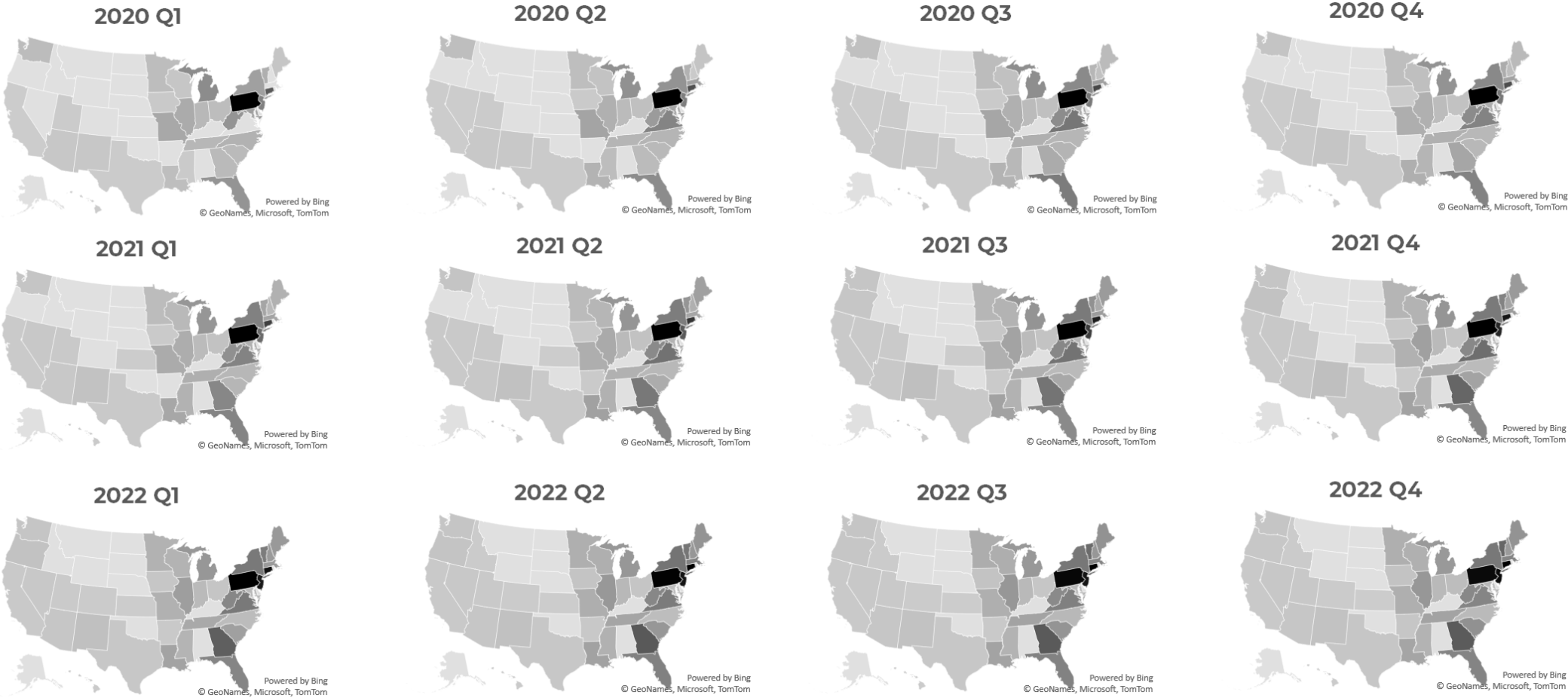


PREVALENCE OF XYLAZINE IN THE U.S.



**Data from NMS Labs / Not final numbers*

SPREAD OF XYLAZINE ACROSS THE U.S.



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



DRUG CHECKING SURVEILLANCE



cfsre



NPS DISCOVERY

DRUG CHECKING RESULTS

Clonazolam	Etizolam	Etizolam	Desalkylflurazepam
Fentanyl, Gabapentin	<i>para</i> -Fluorofentanyl, Gabapentin	Methamphetamine	
Cocaine, Lidocaine	Cocaine, Lidocaine	Methamphetamine, Caffeine	Methamphetamine



MDA



Methamphetamine



ADB-5'Br-IANCA



Methamphetamine



ADB-5'Br-IANCA



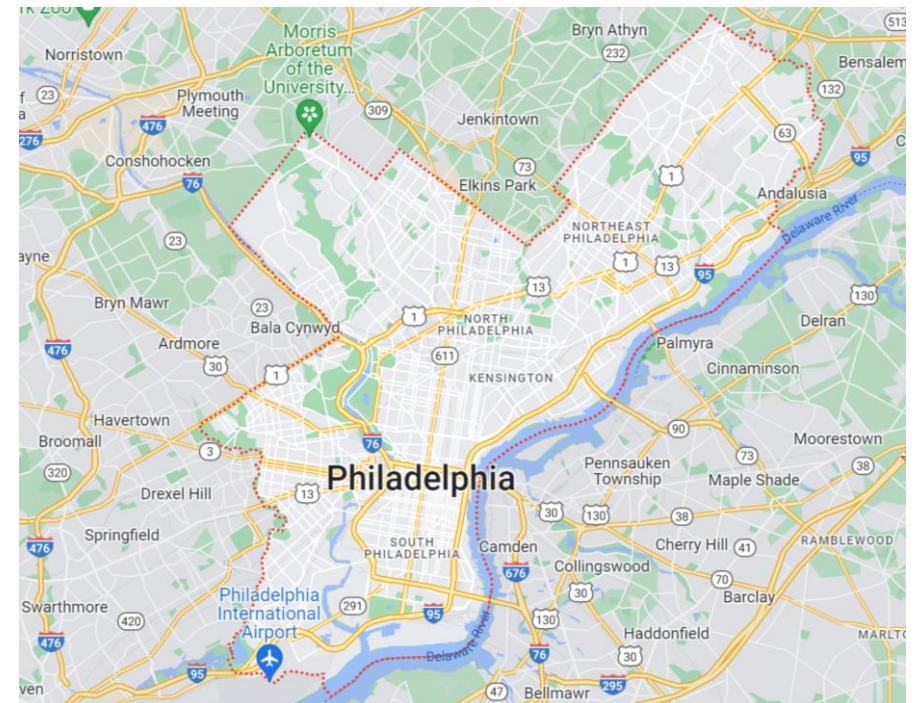
ADB-BINACA



ADB-BINACA

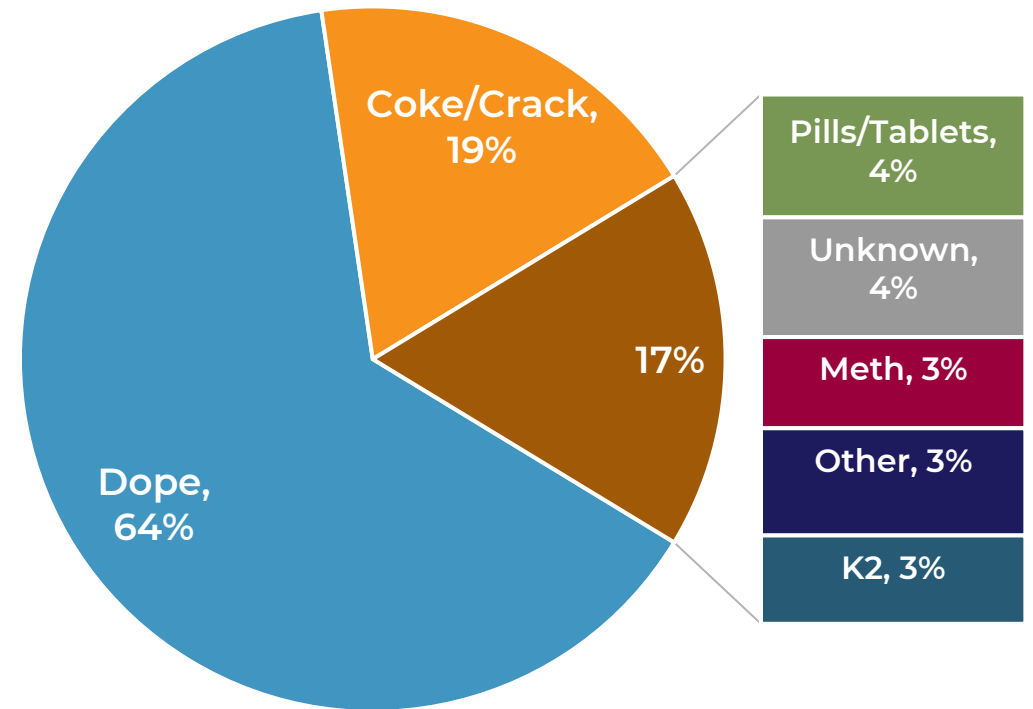
PHILADELPHIA & ITS DRUG SUPPLY

- 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)**

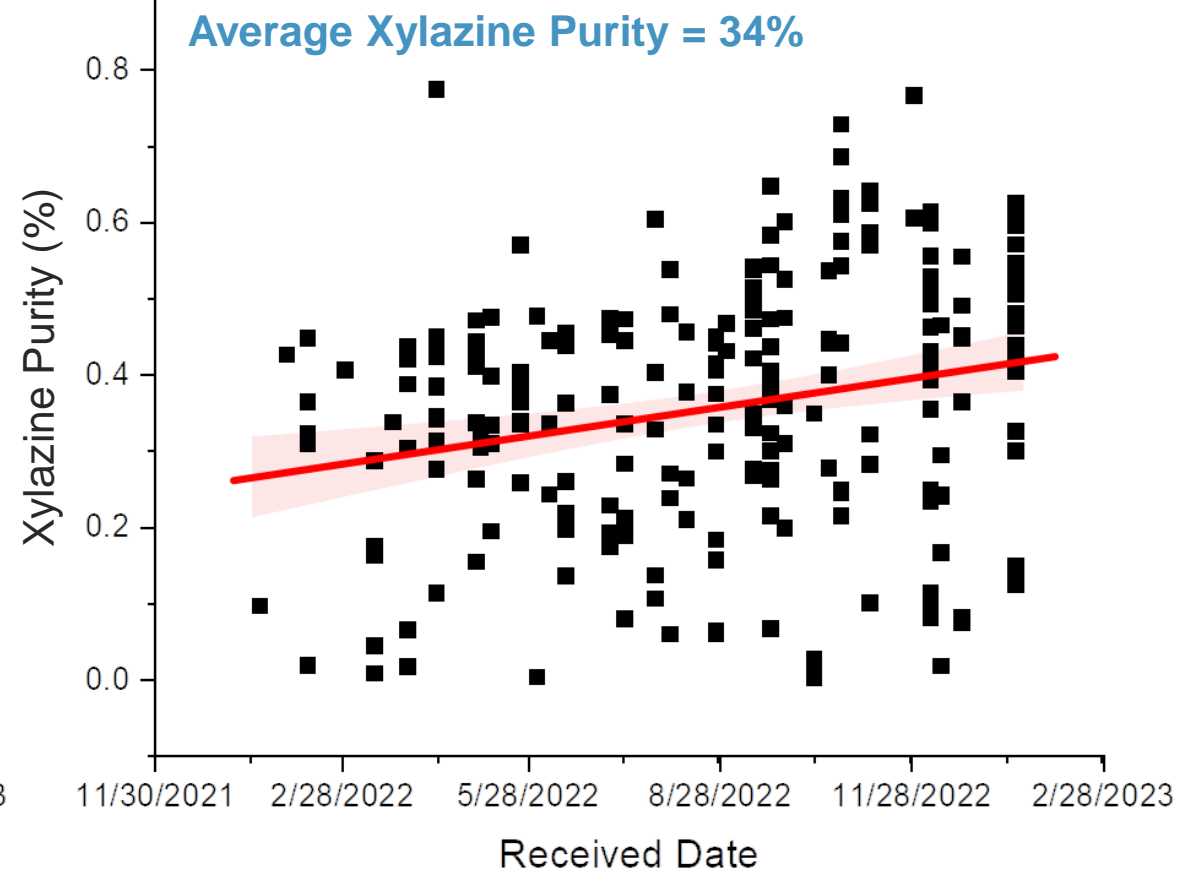
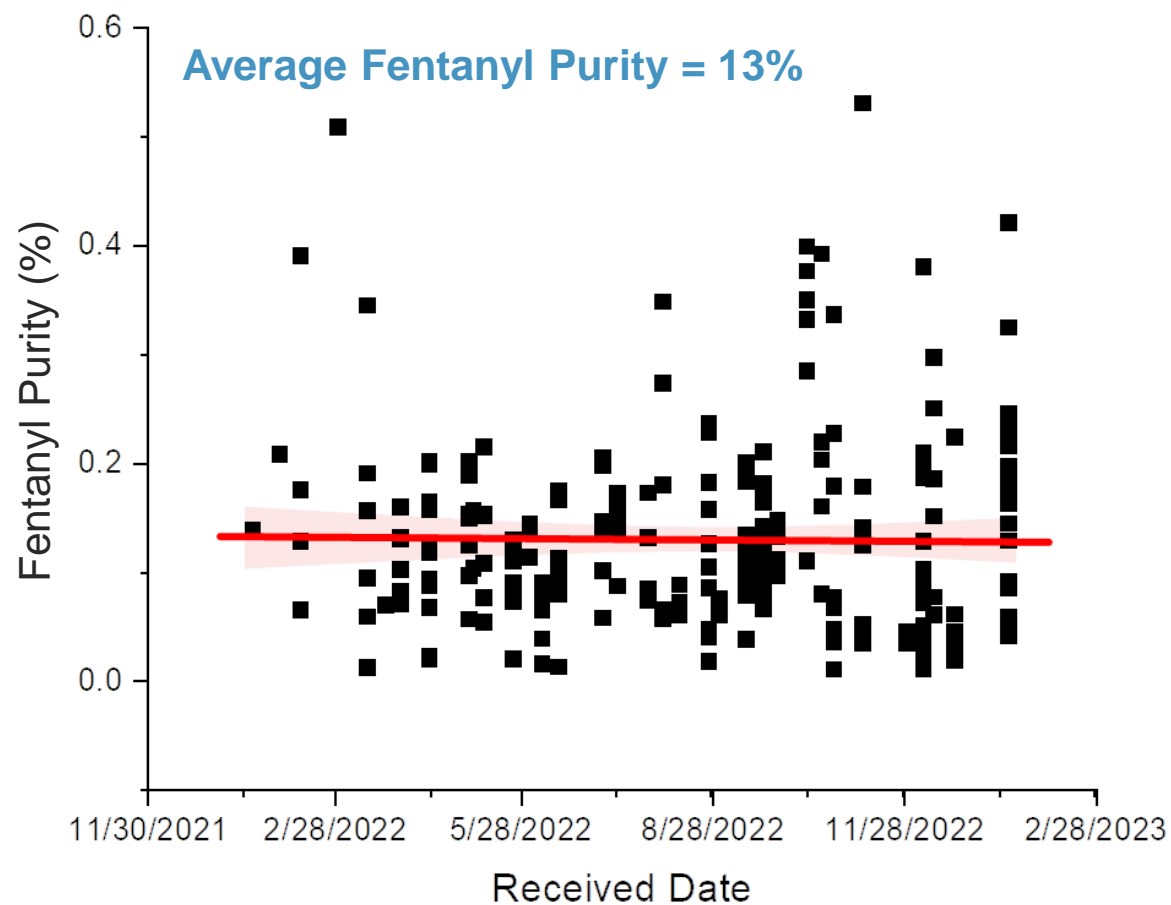


PDPH/CFSRE DRUG CHECKING

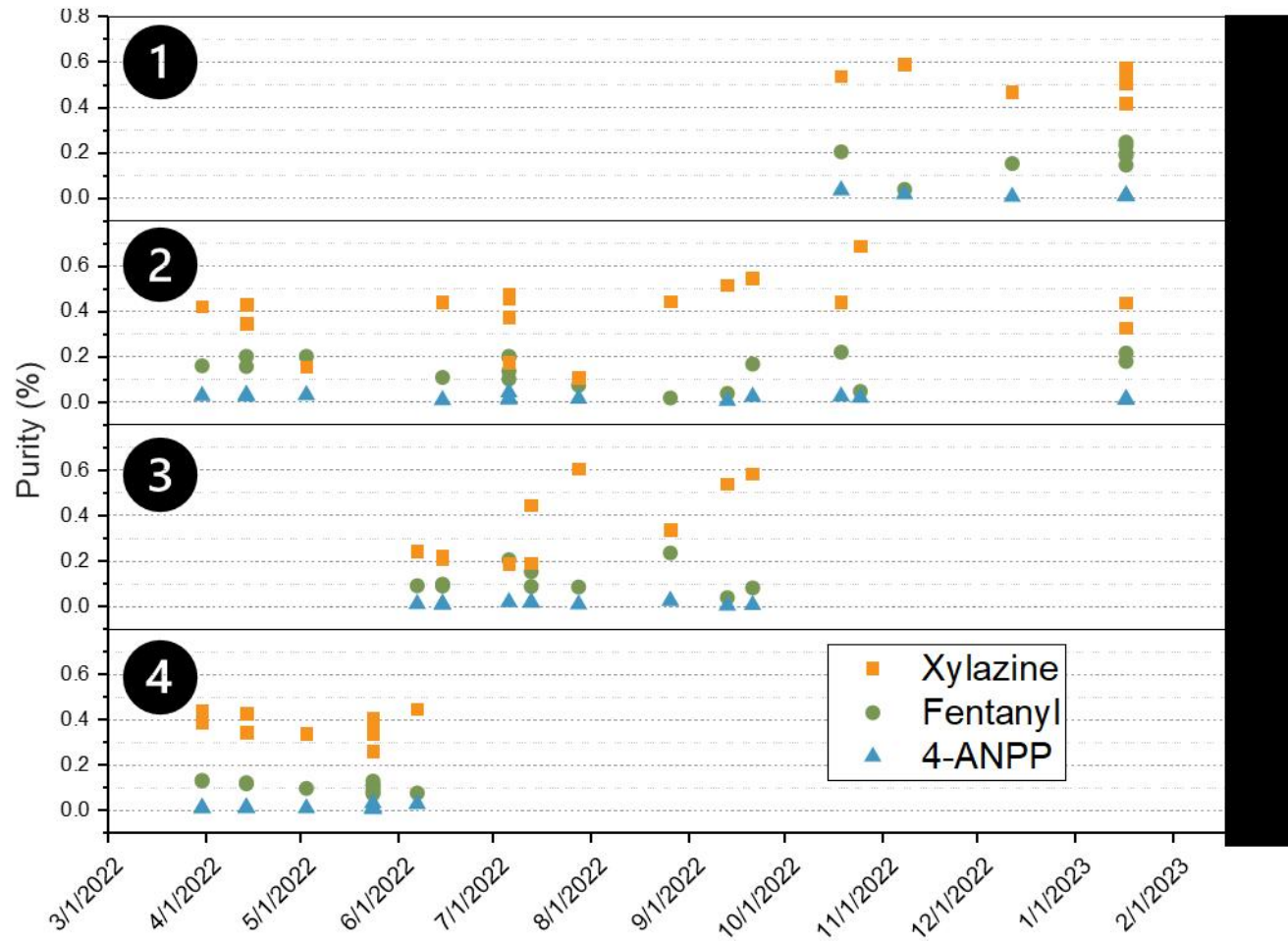
- **2020** → Partnership formally launched
- **Sample Analyzed**
 - 950+ samples received since 2020
 - Variety of sample types (suspected contents) →
 - Paired FTIR and test strip results***
- **Key Findings**
 - “Dope”: 99% contain fentanyl and ~90% contain xylazine
 - Methamphetamine – rarely adulterated or substituted
 - Cocaine – “coke” samples sometimes test positive for trace fentanyl
 - K2 – revolving door of synthetic cannabinoids



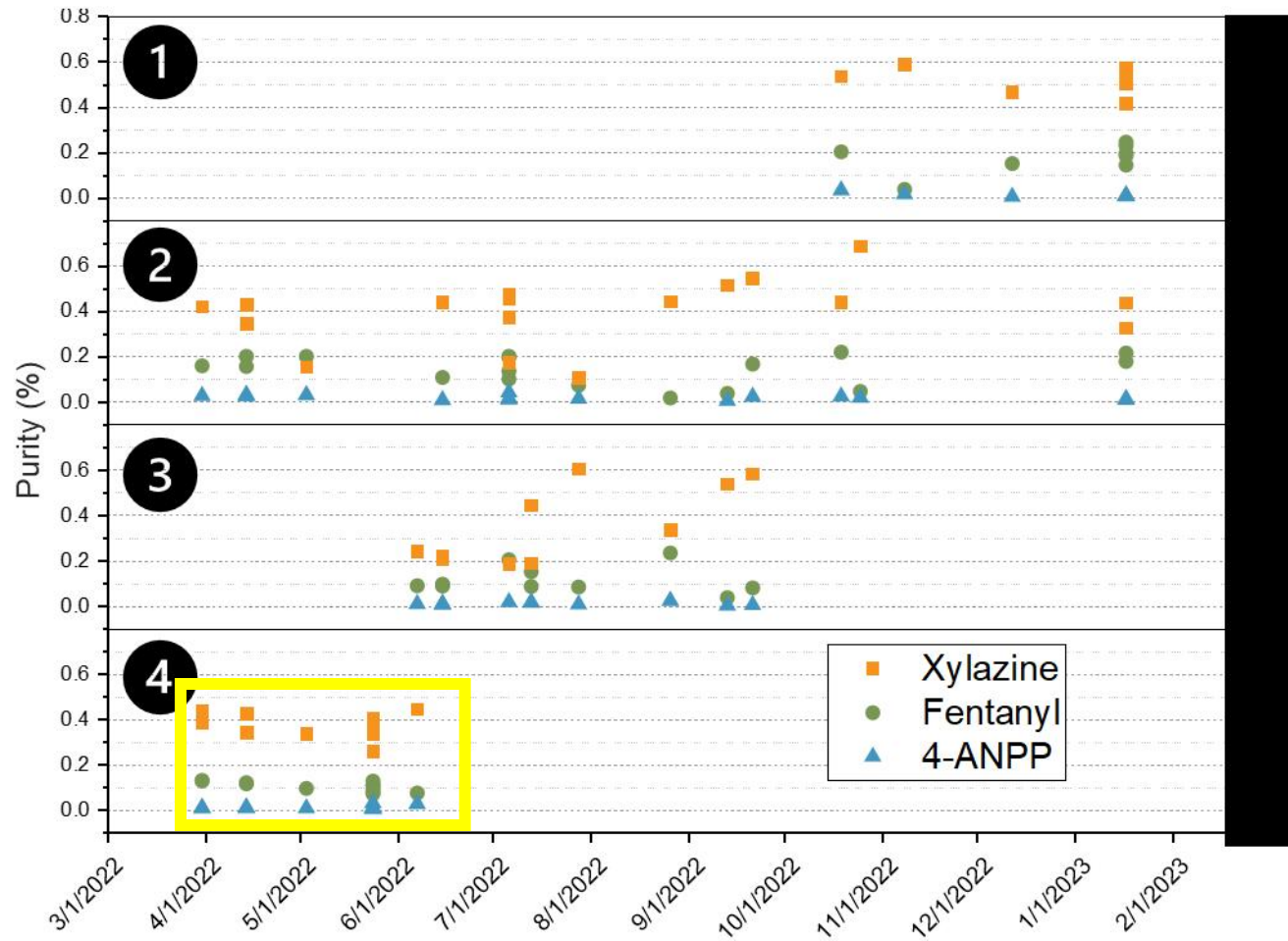
TEMPORAL CHANGES IN PURITY (2022)



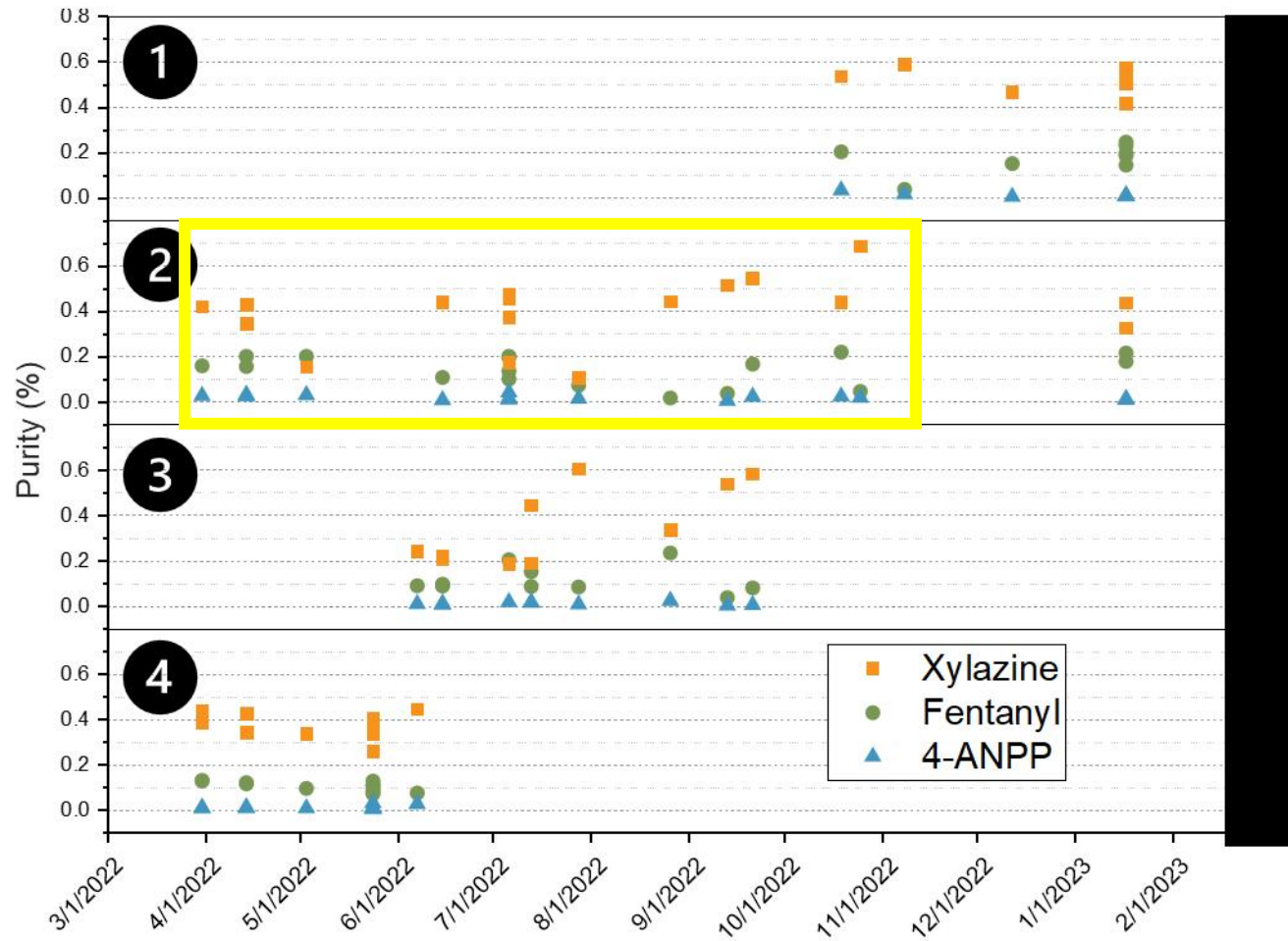
LONGITUDINAL ASSESSMENT OF DRUG PRODUCTS



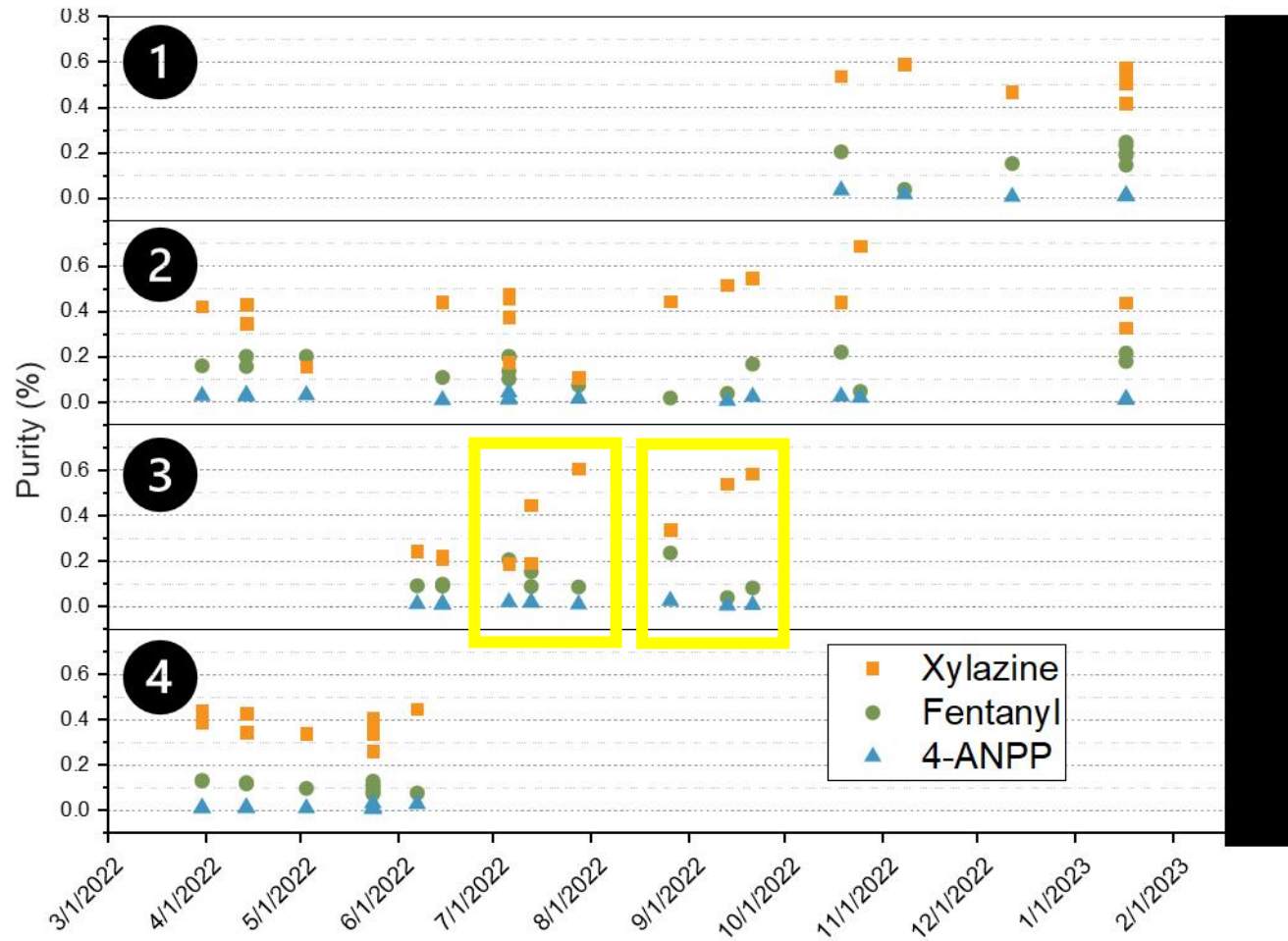
LONGITUDINAL ASSESSMENT OF DRUG PRODUCTS



LONGITUDINAL ASSESSMENT OF DRUG PRODUCTS



LONGITUDINAL ASSESSMENT OF DRUG PRODUCTS





ACCESS NPS DISCOVERY & JOIN LISTSERV



WEBSITE ► WWW.NPSDISCOVERY.ORG



The screenshot shows the homepage of the NPS Discovery website. At the top, there is a navigation bar with links for RESOURCES, ABOUT, OUR LAB, CONTACT, and a DONATE button. The main header features the cfsre logo and the text "The Center for Forensic Science Research & Education" and "A PROGRAM OF THE FREDRIC RIEDERS FAMILY FOUNDATION". Below the navigation bar, there are tabs for EDUCATION, RESEARCH, and NPS DISCOVERY, along with a SEARCH button. The main content area has a large image of a laboratory with the text "NPS DISCOVERY" overlaid. Below this, there is a sub-header "NPS DISCOVERY" and a paragraph describing the program as an open-access drug early warning system (EWS) operating in the United States. A second paragraph explains the program's goal to identify emerging drugs (NPS) and disseminate information. A third paragraph provides information on how to join the email listserve.

RESOURCES ABOUT OUR LAB CONTACT DONATE

cfsre The Center for Forensic Science Research & Education

A PROGRAM OF THE FREDRIC RIEDERS FAMILY FOUNDATION

EDUCATION RESEARCH NPS DISCOVERY SEARCH

NPS DISCOVERY

NPS DISCOVERY

The CFSRE's NPS Discovery program is an open-access drug early warning system (EWS) operating in the United States. Our evidence-based approach leads the development of high impact reports for real-time action among public health and safety stakeholders.

We are working in collaboration with forensic science, public health, emergency medicine, and criminal justice agencies to rapidly identify emerging drugs, also known as Novel Psychoactive Substances (NPS), associated with intoxications and adverse events. Our data and results are consolidated into reports and resources to allow for the rapid dissemination of information to colleagues and affected communities.

Stakeholders interested in receiving up-to-date information and notifications can join our [email listserve](#) (be sure to select the NPS Discovery check box at the bottom).




JOIN OUR LISTSERV & NEWSLETTER



DON'T MISS THE LATEST FROM NPS DISCOVERY SUBSCRIBE TO OUR E-NEWSLETTER TODAY

SUBSCRIBE NOW




The Center for Forensic Science Research & Education

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Take future action with a single click. Log in or sign up for FastAction




Contact Information

I'm signing up on behalf of a company or organization

First Name Last Name

Email

Remember me so that I can use FastAction next time. 

Profession

Please choose the closest match, so we can keep you up to date on relevant content from the CFSRE!

- Crime Lab Directors
- Forensic Biology
- Forensic Chemistry
- Forensic Toxicology
- Law Enforcement
- Legal Professional
- Medical Professional
- Student

What Newsletter would you like to sign up for?

- CFSRE Weekly Newsletter
- NPS Discovery Newsletter

DOWNLOAD MORE PRESENTATIONS FROM THE CFSRE

1 RESOURCES ABOUT OUR LAB CONTACT DONATE

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A PROGRAM OF THE FREDRIC RIEDERS FAMILY FOUNDATION

EDUCATION RESEARCH NPS DISCOVERY SEARCH

Presentations

July 7, 2023

Quarterly NPS Discovery Webinar Series – July 2023

Logan BK, Krotulski AJ, Papsun DM, Walton SE

The Center for Forensic Science Research and Education - 2023

READ MORE

2 Presentations

■ Visit www.cfsre.org

1 Select → *Resources*

2 Select → *Presentations*

3 Browse & Download



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!

ACKNOWLEDGEMENTS

- **CFSRE Team**

- Barry Logan
- Alex Krotulski
- Sara Walton
- Josh DeBord
- Mandi Mohr
- Melissa Fogarty
- Alyssa Reyes
- Brianna Stang
- Lindsey Domonoski
- Natasha Cunningham
- Many others!

- **NMS Labs**

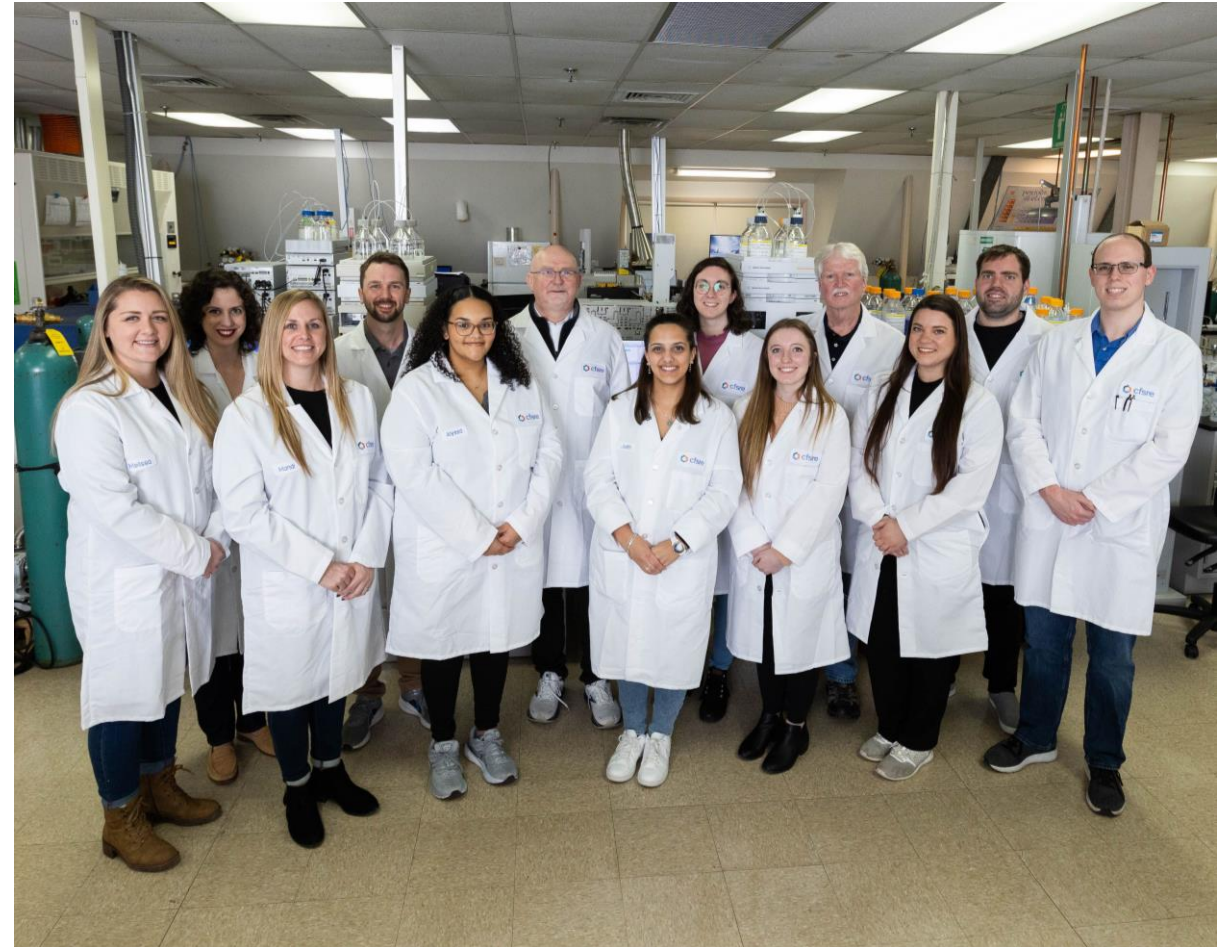
- Donna Papsun

- **Funding Agencies**

- NIJ, CDC, NIH, etc.

- **Collaborators & Partners**

- Forensic
- Clinical
- Medical Examiners
- Coroners
- Crime Labs
- Etc.





THANK YOU! **QUESTIONS?**



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Program Manager – NPS Discovery
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