



Updated Trend Reports and Positivity Plots

NPS Discovery Webinar Series – Friday July 7, 2023

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



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).
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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.



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CFSRE'S NPS DISCOVERY



BRIEF HISTORY & TIMELINE



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 CFSRE logo is on the left, and the text 'The Center for Forensic Science Research & Education' is next to it. On the right, it says '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 features 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). Another paragraph explains the collaboration with forensic science, public health, emergency medicine, and criminal justice agencies. A final paragraph mentions an email listserve for stakeholders.

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



Scope Recommendations



Analytical Toolkits



Podcasts & Media



History




Collaborators



Additional Content

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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

COLLABORATE WITH OUR TEAM

- 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!



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.

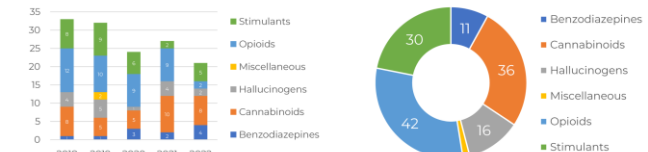


Figure 1: Newly discovered NPS reported for the first time since 2018.

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).

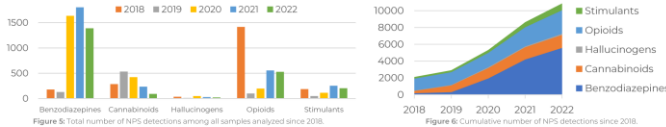


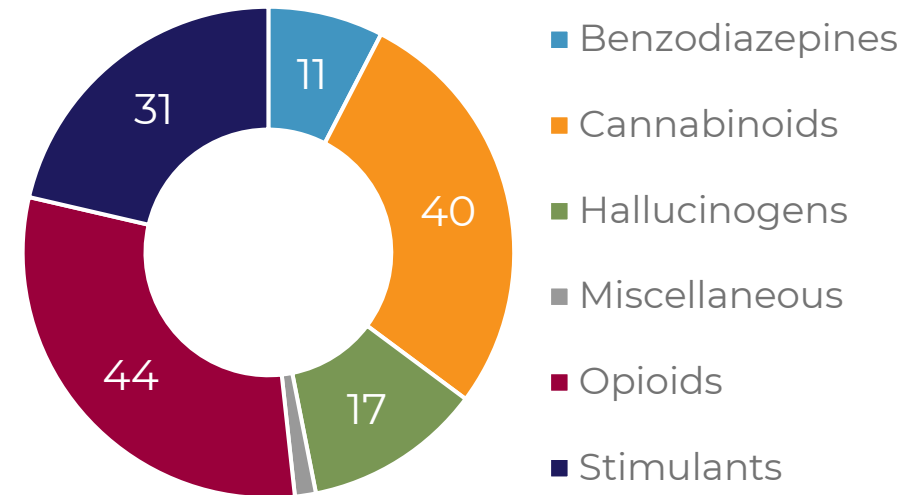
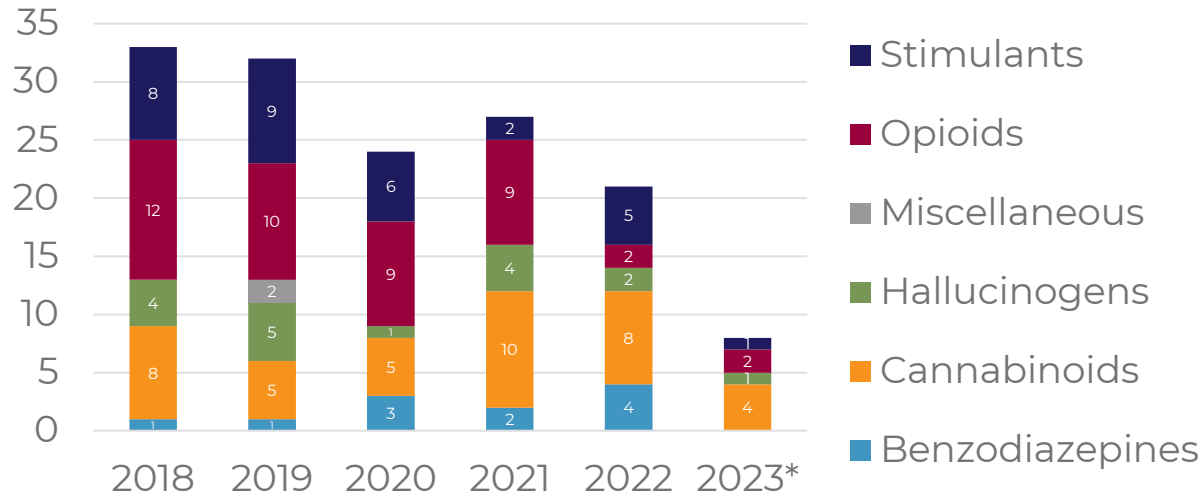
Figure 5: Total number of NPS detections among all samples analyzed since 2018.

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 CFSRE. It is not intended to be used for legal or medical purposes. The information provided is for informational purposes only and does not constitute an offer of any financial product or service. The information provided is for informational purposes only and does not constitute an offer of any financial product or service.

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	<i>N</i>-Pyrrolidino Metonitazene	C ₂₁ H ₂₄ N ₄ O ₃	380	381.1921
06/22/2023	Opioid	<i>N</i>-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

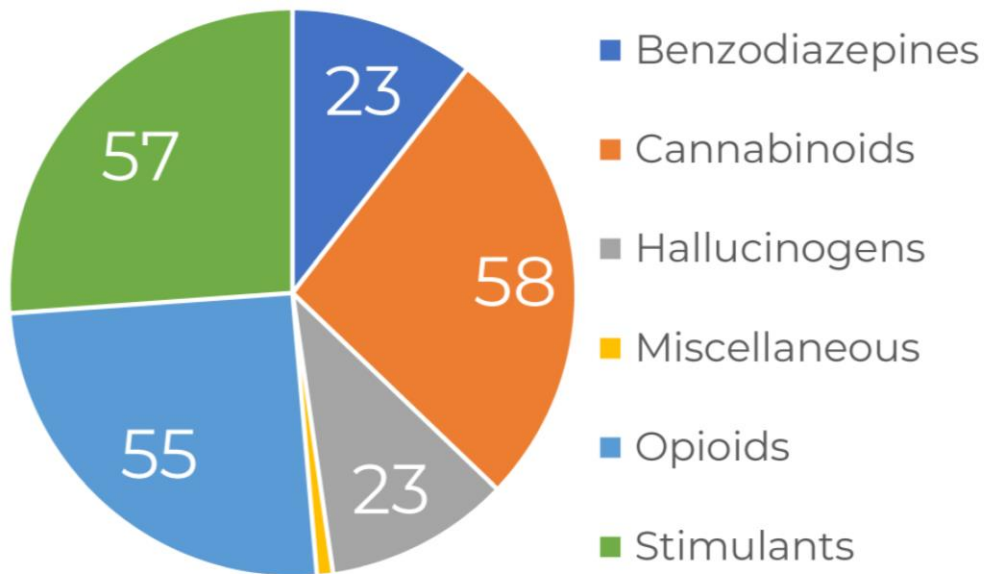


Figure 3: Breakdown by subclass of individual NPS detected, 2018-2022.

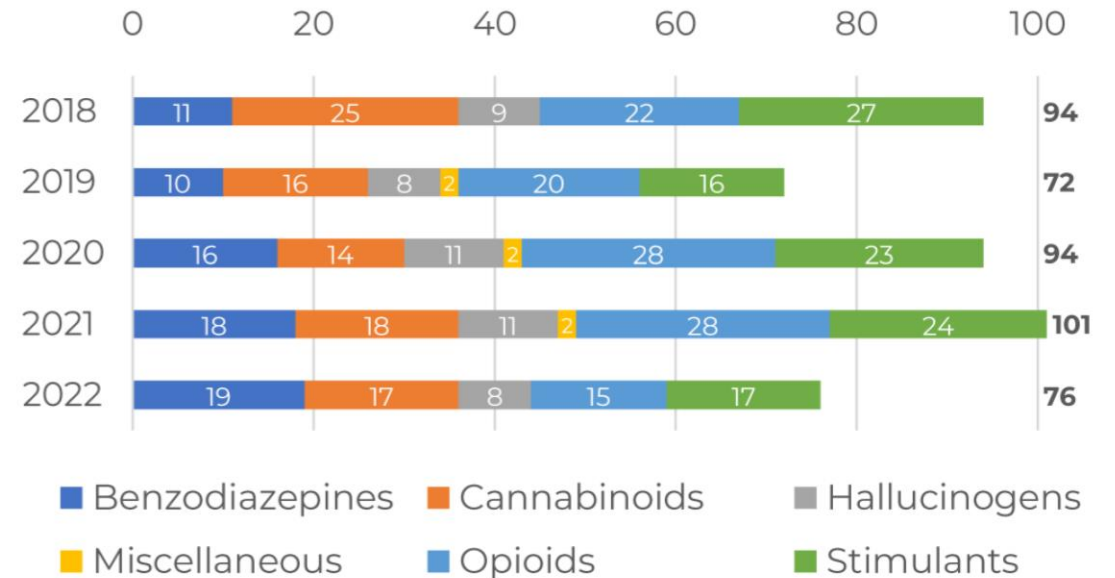


Figure 4: Individual NPS detected each year, cumulative since 2018.



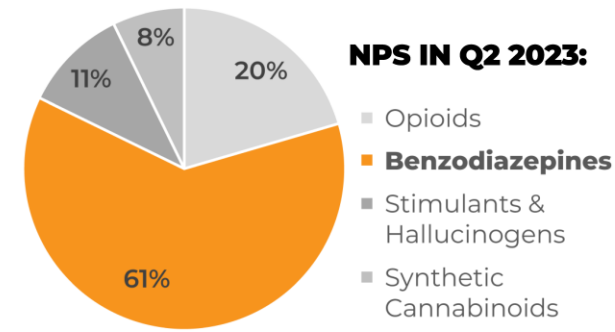
Q2 2023 NPS TREND REPORTS



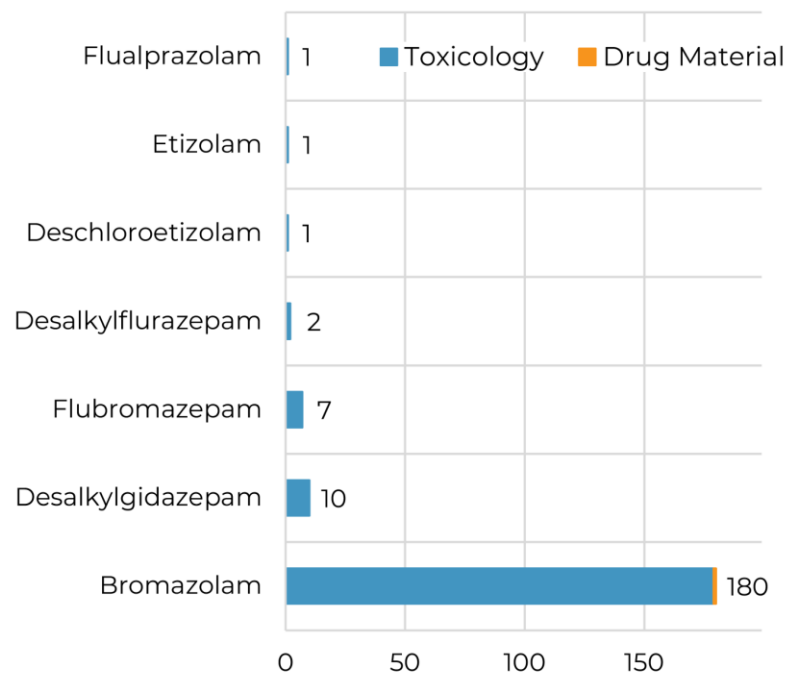
PURPOSE: This report provides up-to-date information regarding the status of NPS benzodiazepine prevalence and positivity in the United States.

OVERVIEW: Novel psychoactive substances (NPS), including NPS benzodiazepines, continue to pose great challenges for forensic scientists, clinicians, and public health and safety personnel. NPS benzodiazepines have been implicated in an increasing number of adverse health events, marked by emergency room admissions and death investigations, especially when ingested in combination with opioids. Maintaining a current scope of analysis can be challenging, requiring comprehensive analytical methodologies and reference materials for identification(s).

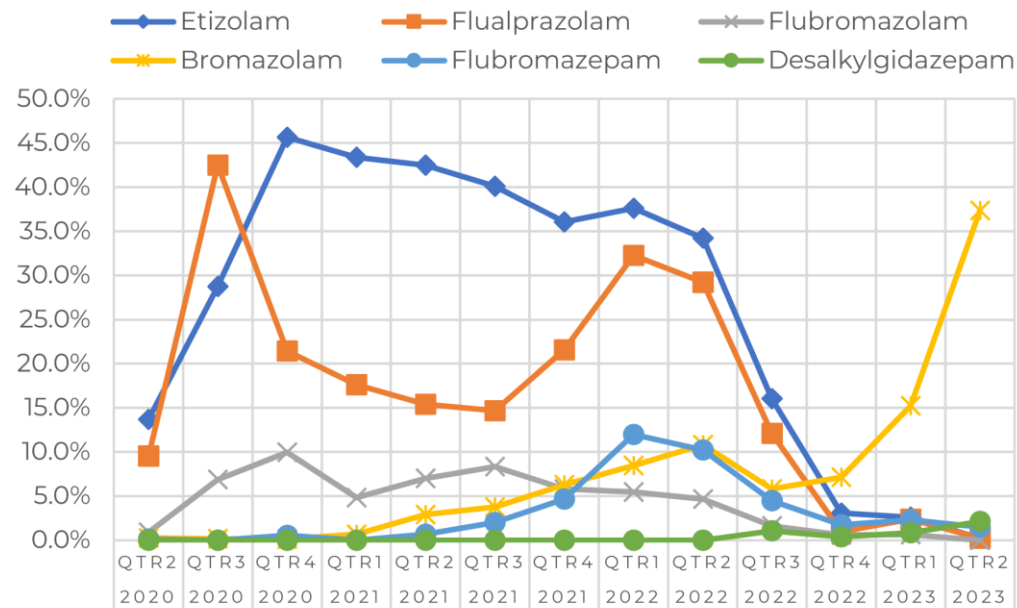
OBJECTIVE: Our laboratory utilizes novel approaches for the analysis of drugs in biological samples and seized materials using comprehensive non-targeted data acquisition by gas chromatography mass spectrometry (GC-MS) and liquid chromatography quadrupole time-of-flight mass spectrometry (LC-QTOF-MS). The scope of analysis contains more than 1,000 drugs, including a vast majority of NPS and their metabolites. This approach allows for real-time identification of new benzodiazepines and further data analysis of important trends. This project was conducted in collaboration with the toxicology and criminalistics laboratories of NMS Labs. Forensic case types linked to these results include illicit drug investigations, medicolegal death investigations, and/or driving under the influence of drugs (DUID) investigations. The results in this report represent the total number of NPS identifications at the CFSRE during this quarter, including those from sample-mining, data-mining, and/or esoteric testing.



NPS BENZODIAZEPINES IDENTIFIED



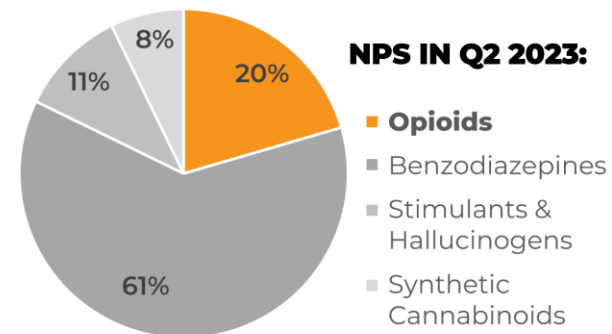
SELECT POSITIVITY: Q2 2020 to Q2 2023



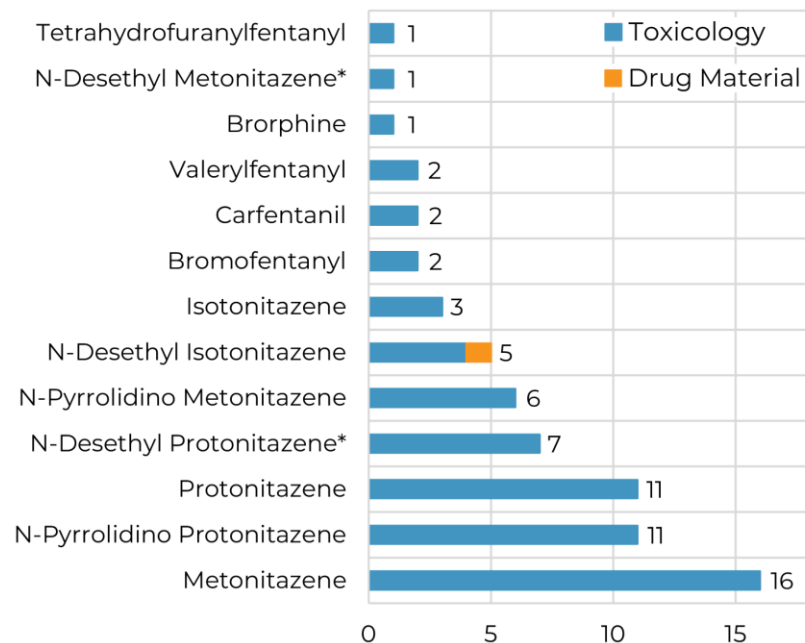
PURPOSE: This report provides up-to-date information regarding the status of NPS opioid prevalence and positivity in the United States.

OVERVIEW: Novel psychoactive substances (NPS), including NPS opioids, continue to pose great challenges for forensic scientists, clinicians, and public health and safety personnel. NPS opioids have been implicated in an increasing number of emergency room admissions, death investigations, and mass intoxication events, and often appear in combination with other illicit opioids (e.g. fentanyl, heroin). Maintaining a current scope of analysis can be challenging, requiring comprehensive analytical methodologies and reference materials for identification(s).

OBJECTIVE: Our laboratory utilizes novel approaches for the analysis of drugs in biological samples and seized materials using comprehensive non-targeted data acquisition by gas chromatography mass spectrometry (GC-MS) and liquid chromatography quadrupole time-of-flight mass spectrometry (LC-QTOF-MS). The scope of analysis contains more than 1,000 drugs, including a vast majority of NPS and their metabolites. This approach allows for real-time identification of novel opioids and further data analysis of important trends. This project was conducted in collaboration with the toxicology and criminalistics laboratories of NMS Labs. Forensic case types linked to these results include illicit drug investigations, medicolegal death investigations, and/or driving under the influence of drugs (DUID) investigations. The results in this report represent the total number of NPS identifications at the CFSRE during this quarter, including those from sample-mining, data-mining, and/or esoteric testing.

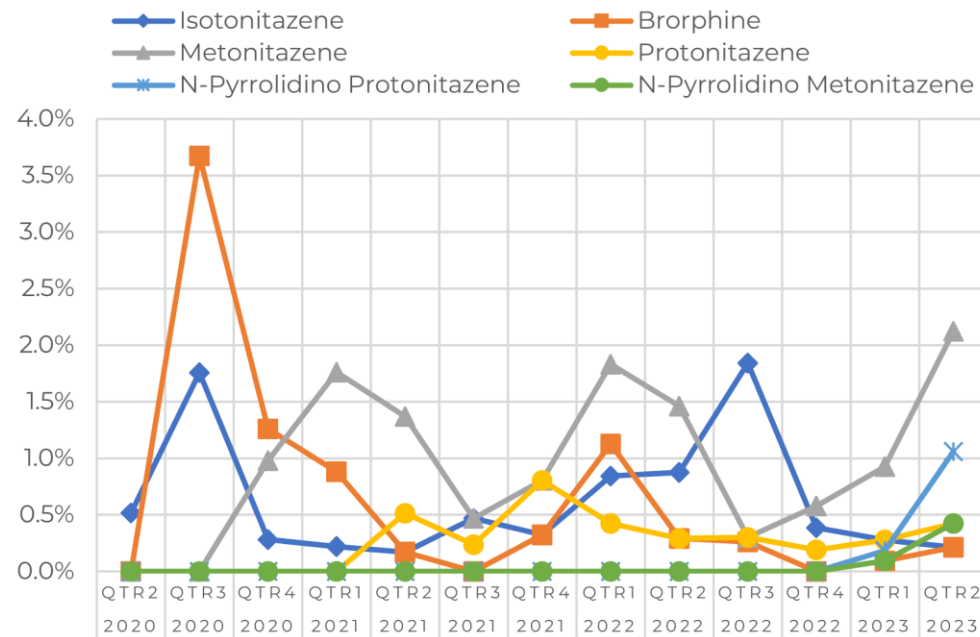


NPS OPIOIDS IDENTIFIED



*Detected only as metabolites to date. — For Reference: Fentanyl (n=316) & Fluorofentanyl (n=215) [Toxicology]

SELECT POSITIVITY: Q2 2020 to Q2 2023



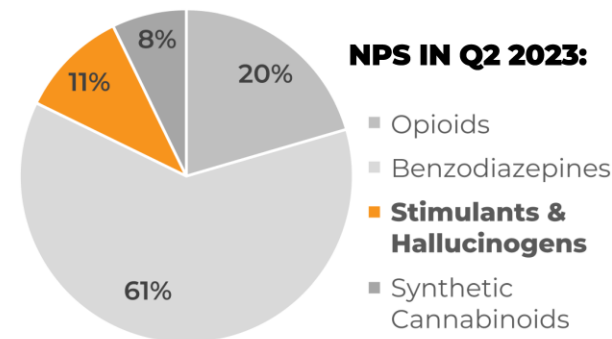
ACKNOWLEDGEMENTS: This report was prepared by Alex J. Krotulski, PhD; Sara E. Walton, MS; Amanda LA. Mohr, MSFS, D-ABFT-FT; and Barry K. Logan, PhD, F-ABFT at the Center for Forensic Science Research and Education (CFSRE) at the Fredric Rieders Family Foundation. CFSRE's NPS Discovery program acknowledges scientists at the CFSRE and NMS Labs for their involvements and contributions. For more information about our programs and reports, please contact NPS Discovery at npsdiscovery@cfsre.org or visit our website at www.npsdiscovery.org.

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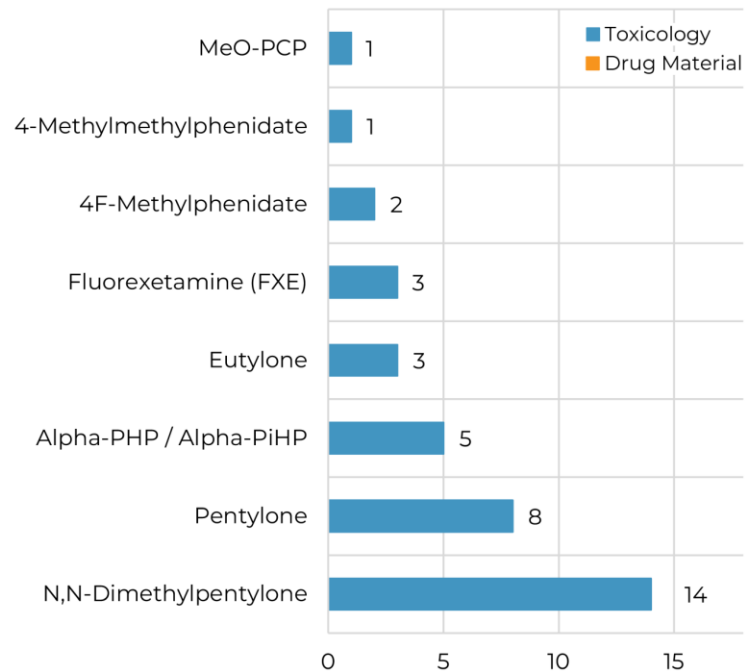
PURPOSE: This report provides up-to-date information regarding NPS stimulant & NPS hallucinogen prevalence and positivity in the United States.

OVERVIEW: Novel psychoactive substances (NPS), including NPS stimulants and NPS hallucinogens, continue to pose great challenges for forensic scientists, clinicians, and public health and safety personnel. Both NPS stimulants and NPS hallucinogens have been implicated in emergency room admissions, death investigations, and/or intoxication events associated with night clubs and music festivals. Maintaining a current scope of analysis can be challenging, requiring comprehensive analytical methodologies and reference materials for identification(s).

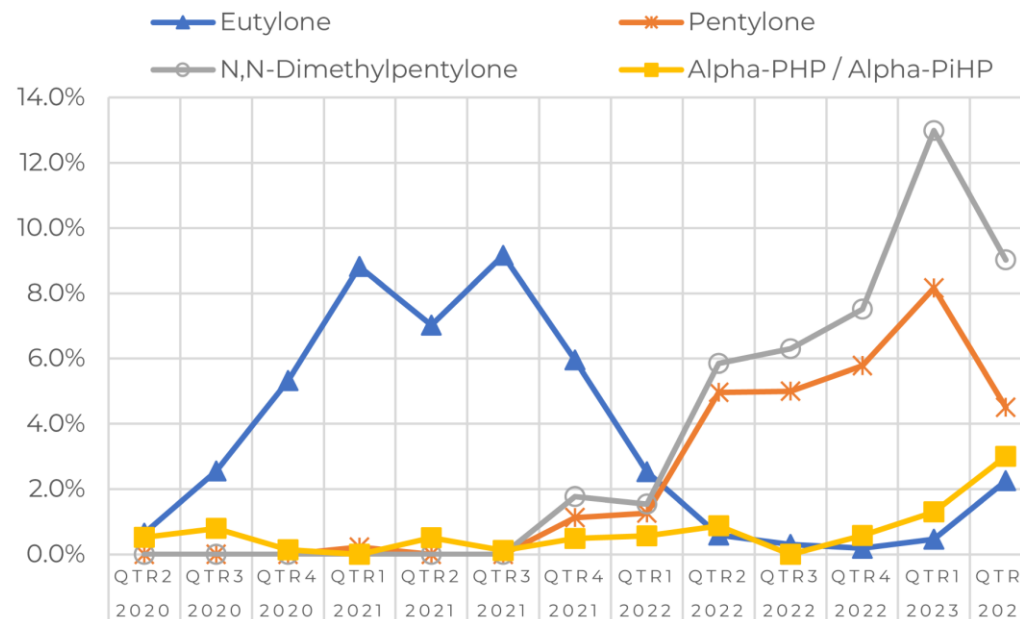
OBJECTIVE: Our laboratory utilizes novel approaches for the analysis of drugs in biological samples and seized materials using comprehensive non-targeted data acquisition by gas chromatography mass spectrometry (GC-MS) and liquid chromatography quadrupole time-of-flight mass spectrometry (LC-QTOF-MS). The scope of analysis contains more than 1,000 drugs, including a vast majority of NPS and their metabolites. This approach allows for real-time identification of emerging stimulants and hallucinogens, and further data analysis of important trends. This project was conducted in collaboration with the toxicology and criminalistics laboratories of NMS Labs. Forensic case types linked to these results include illicit drug investigations, medicolegal death investigations, and/or driving under the influence of drugs (DUID) investigations. The results in this report represent the total number of NPS identifications at the CFSRE during this quarter, including those from sample-mining, data-mining, and/or esoteric testing.



NPS STIMULANTS & HALLUCINOGENS IDENTIFIED



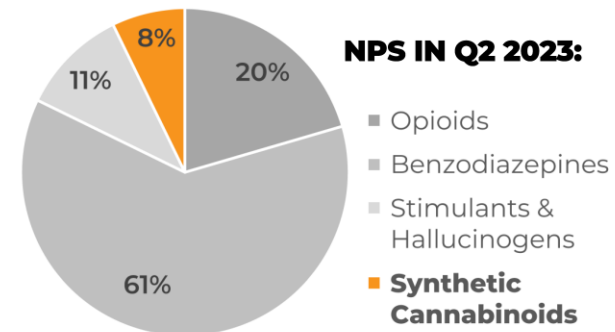
SELECT POSITIVITY: Q2 2020 to Q2 2023



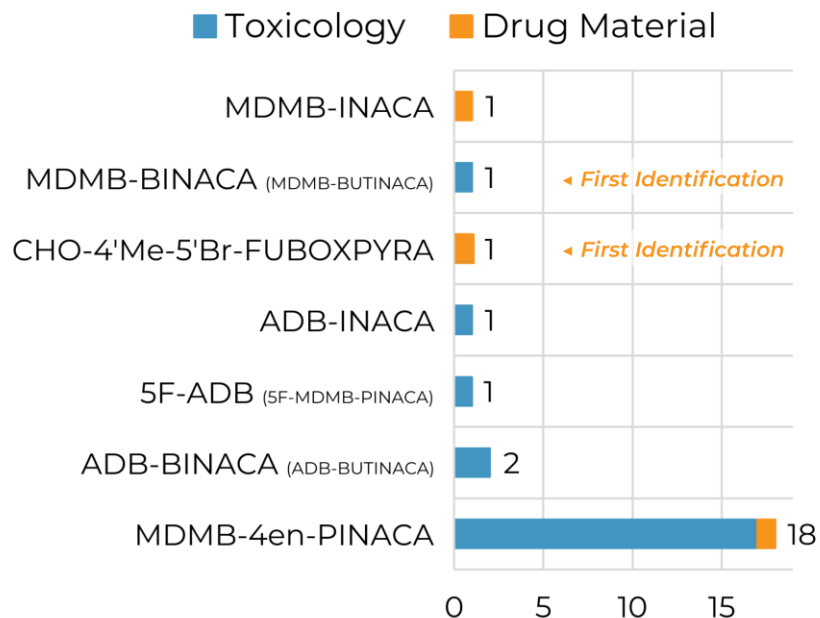
PURPOSE: This report provides up-to-date information regarding the status of synthetic cannabinoid prevalence and positivity in the United States.

OVERVIEW: Novel psychoactive substances (NPS), including synthetic cannabinoids, continue to pose great challenges for forensic scientists, clinicians, and public health and safety personnel. Synthetic cannabinoids have been implicated in an increasing number of emergency room admissions, death investigations, and intoxication events in corrections populations. Maintaining a current scope of analysis can be challenging, requiring comprehensive analytical methodologies and reference materials for identification(s).

OBJECTIVE: Our laboratory utilizes novel approaches for the analysis of drugs in biological samples and seized materials using comprehensive non-targeted data acquisition by gas chromatography mass spectrometry (GC-MS) and liquid chromatography quadrupole time-of-flight mass spectrometry (LC-QTOF-MS). The scope of analysis contains more than 1,000 drugs, including a vast majority of NPS and their metabolites. This approach allows for real-time identification of novel synthetic cannabinoids and further data analysis of important trends. This project was conducted in collaboration with the toxicology and criminalistics laboratories of NMS Labs. Forensic case types linked to these results include illicit drug investigations, medicolegal death investigations, and/or driving under the influence of drugs (DUID) investigations. The results in this report represent the total number of NPS identifications at the CFSRE during this quarter, including those from sample-mining, data-mining, and/or esoteric testing.

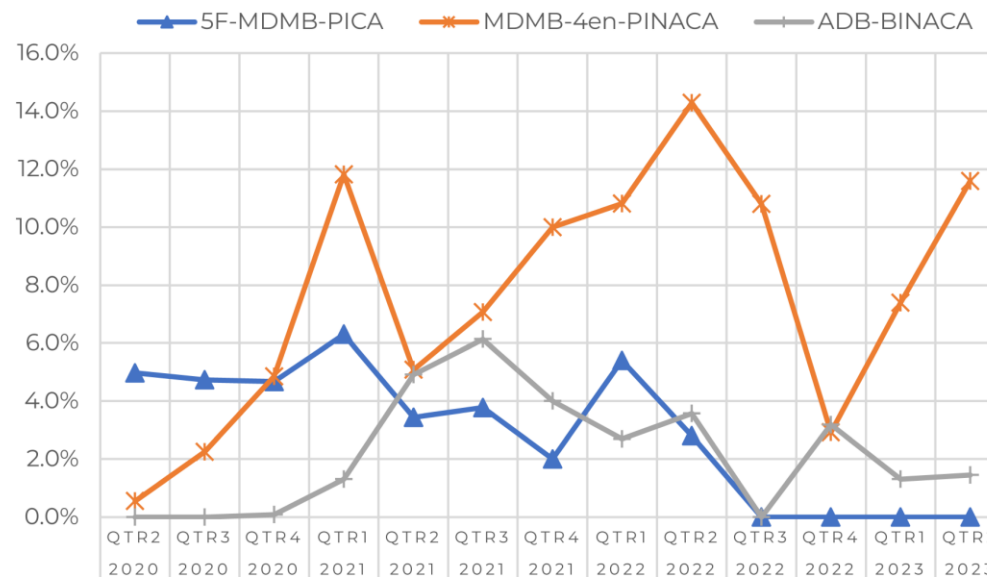


SYNTHETIC CANNABINOIDS IDENTIFIED



Note: MDMB-INACA and ADB-INACA are synthetic cannabinoid precursors.

SELECT POSITIVITY: Q2 2020 to Q2 2023

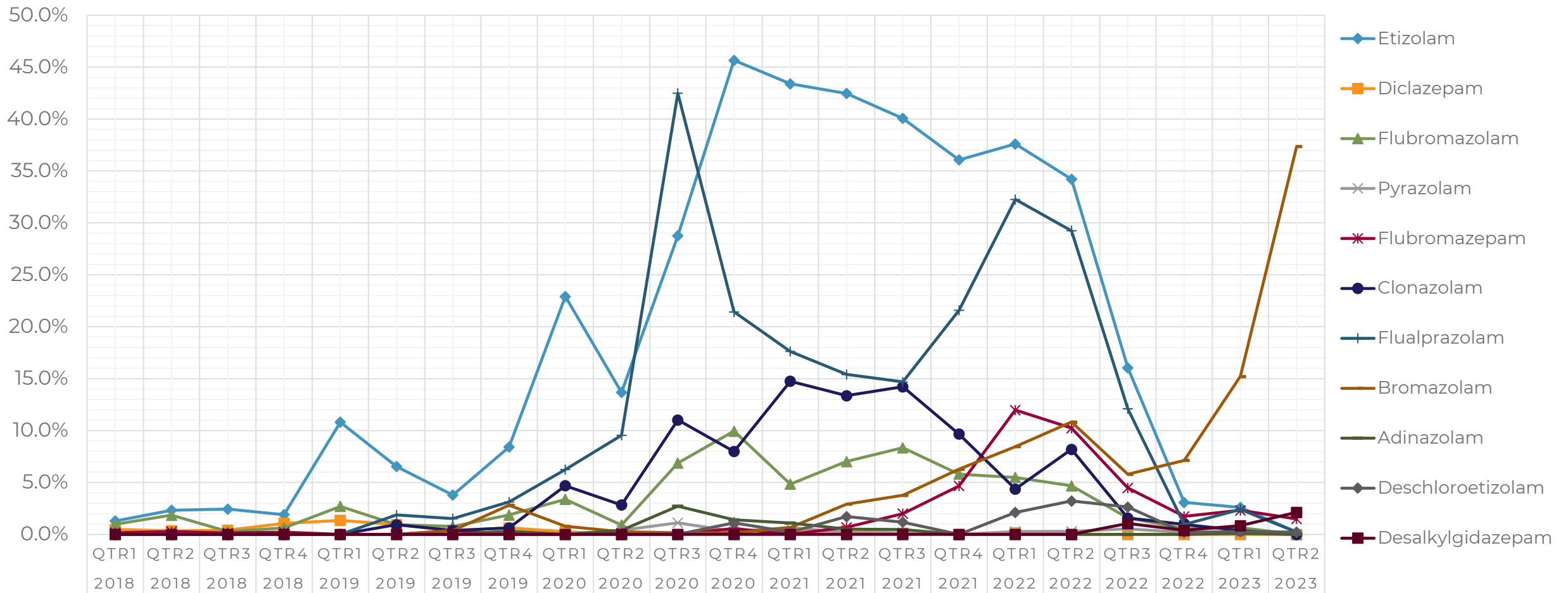




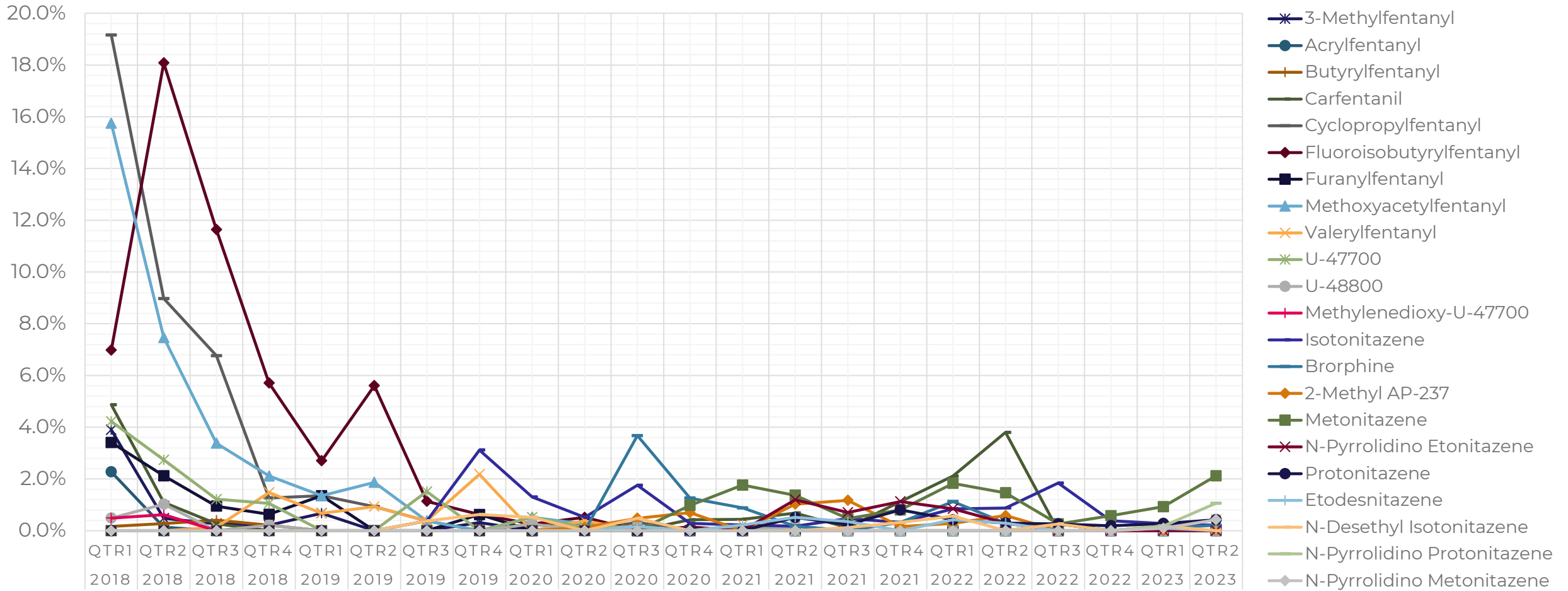
POSITIVITY PLOTS SINCE 2018



POSITIVITY PLOTS – NPS BENZODIAZEPINES

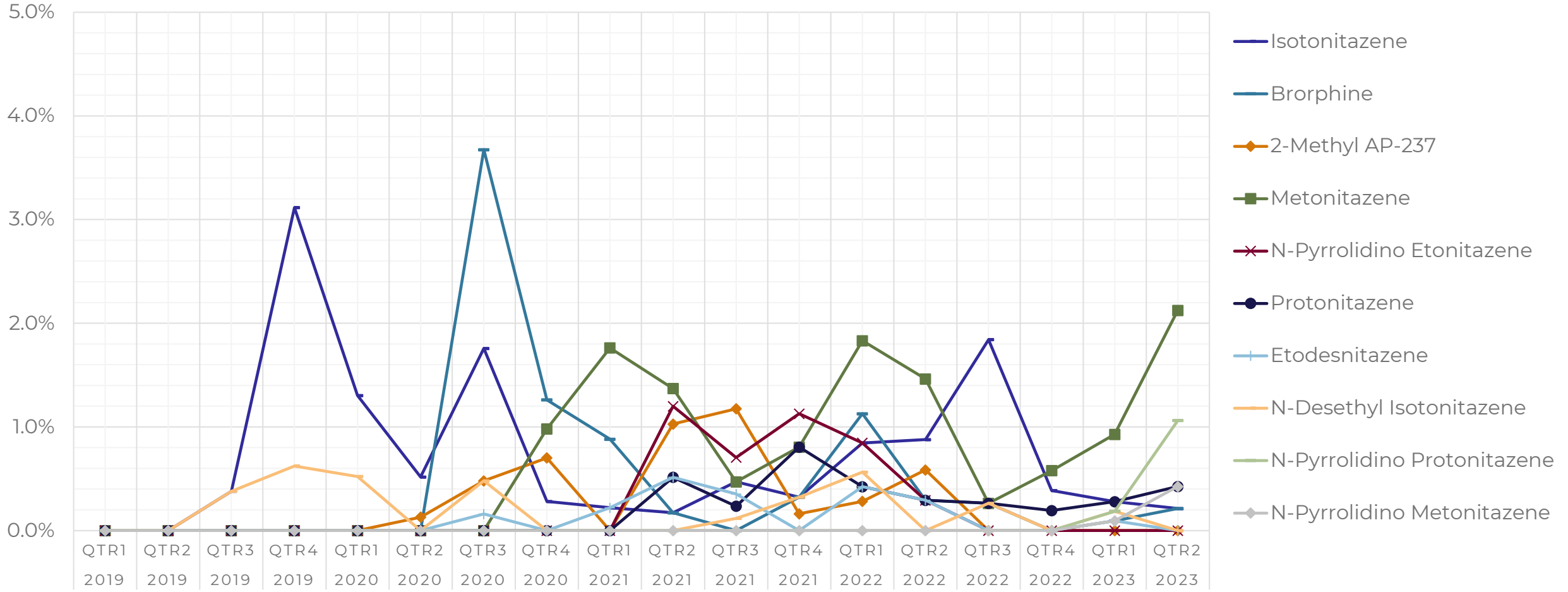


POSITIVITY PLOTS – NPS OPIOIDS

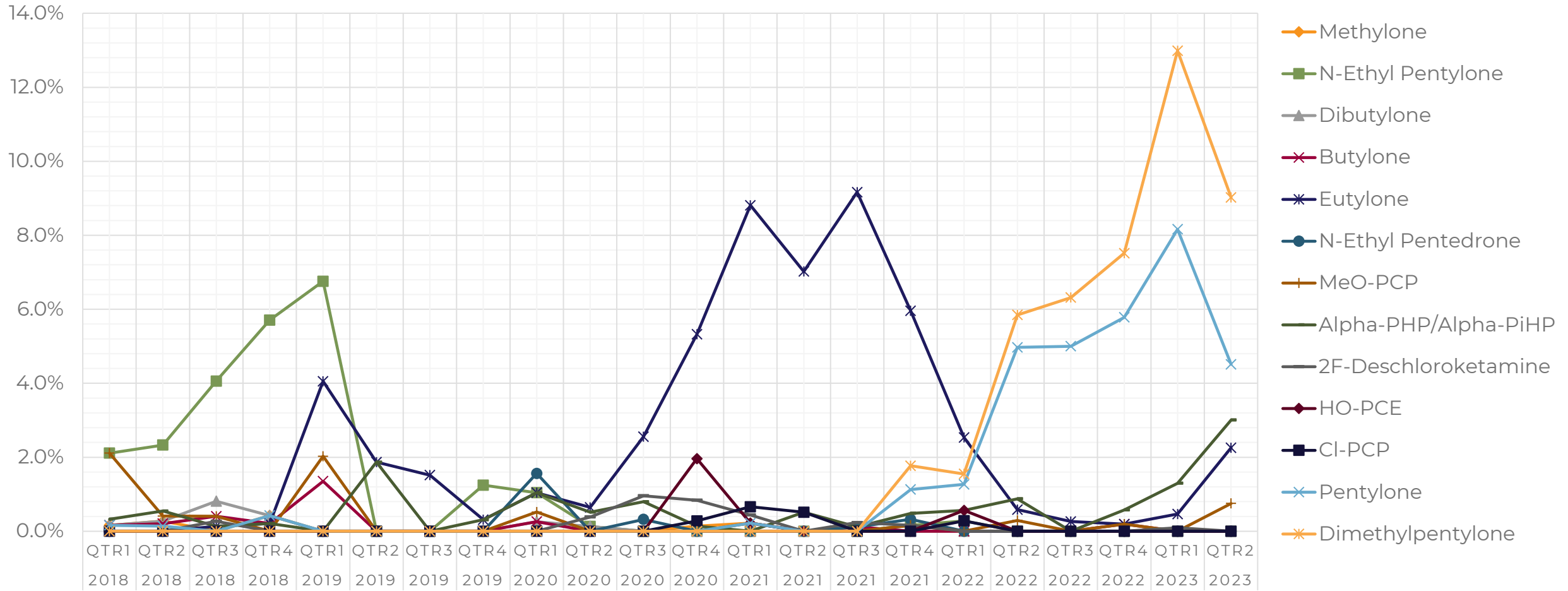


Note: Fluorofentanyl Excluded

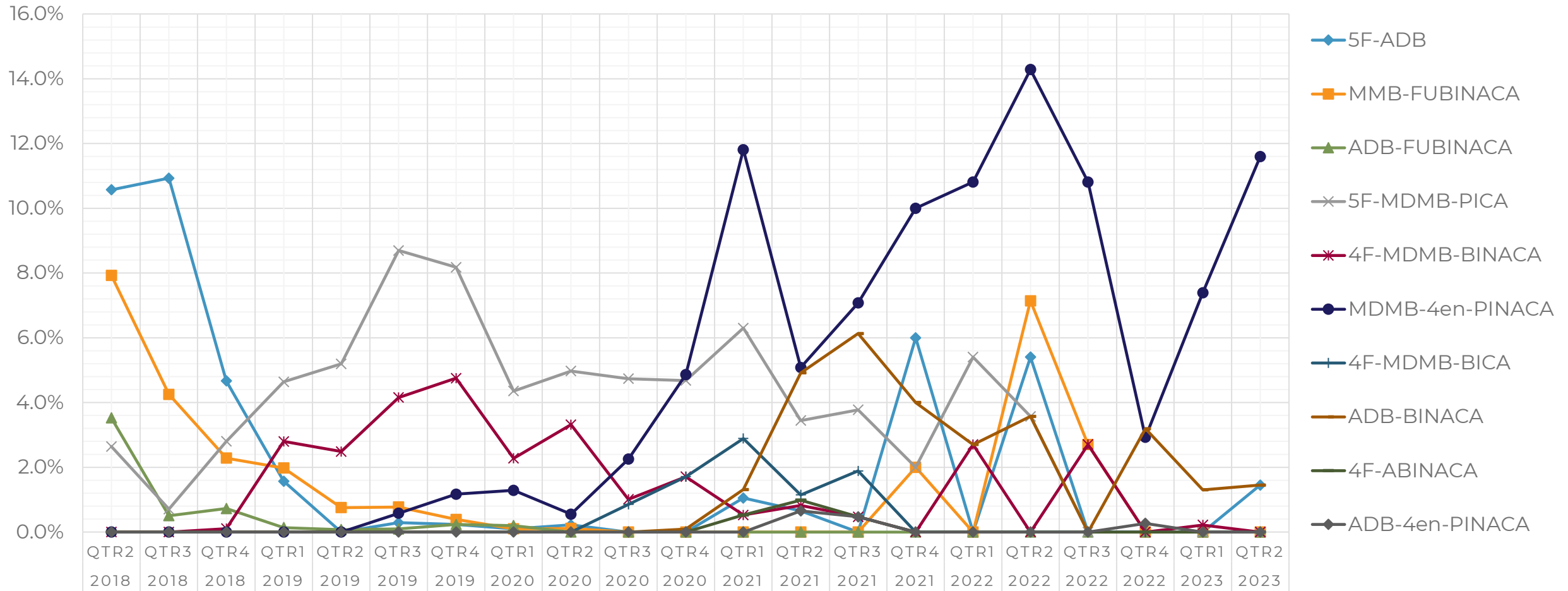
POSITIVITY PLOTS – NPS OPIOIDS (NEW GENERATION ONLY)



POSITIVITY PLOTS – NPS STIMULANTS & HALLUCINOGENS

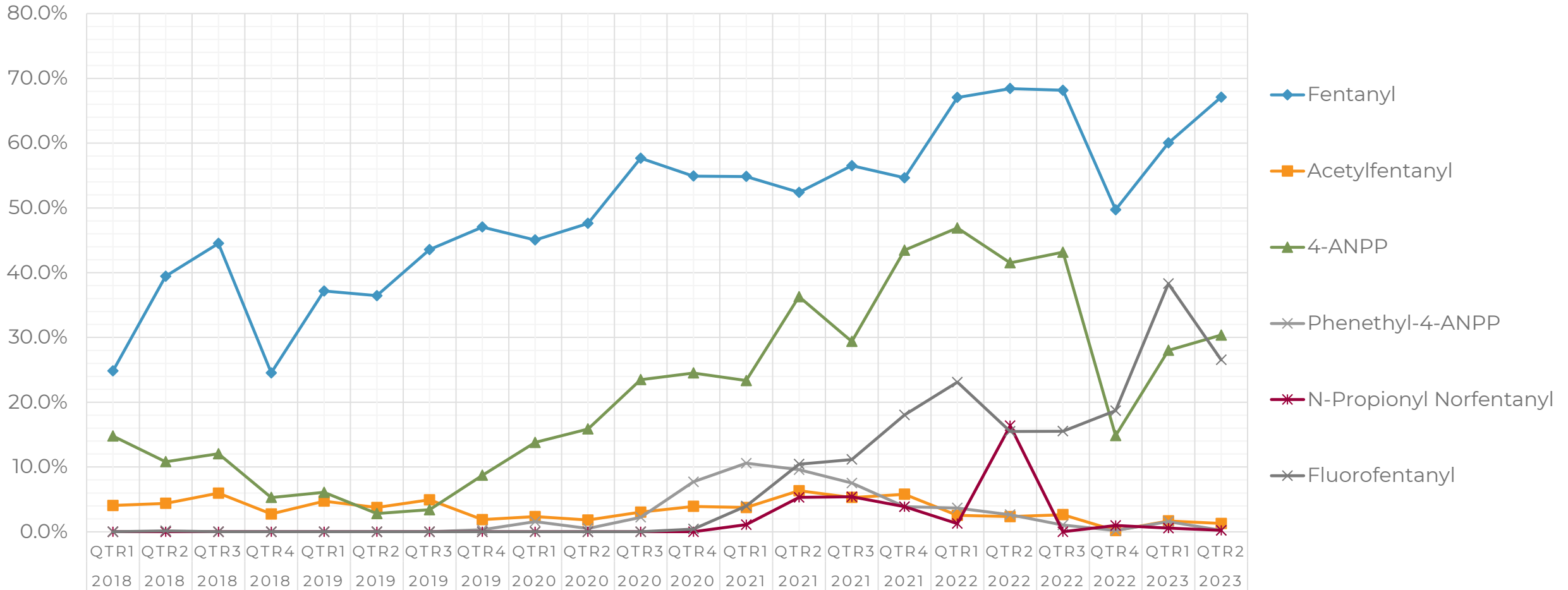


POSITIVITY PLOTS – SYNTHETIC CANNABINOIDS

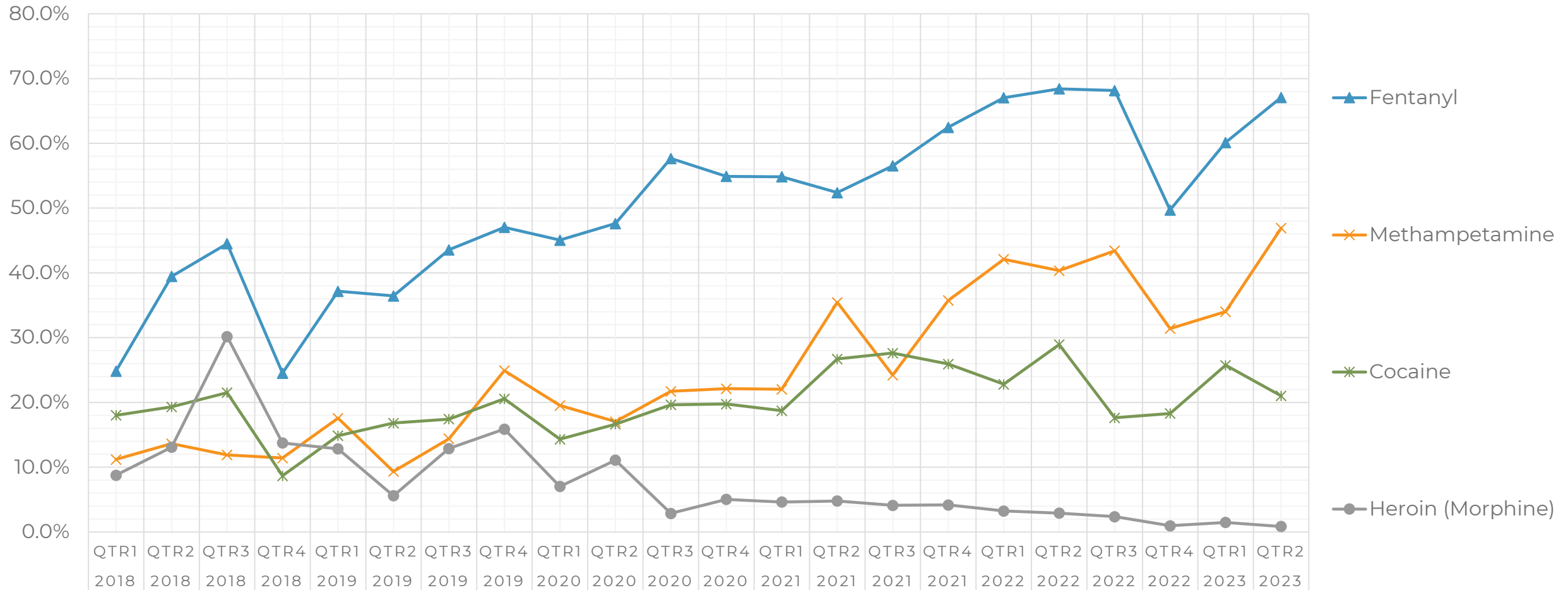


Note: Some quarters may be skewed due to low sample volume

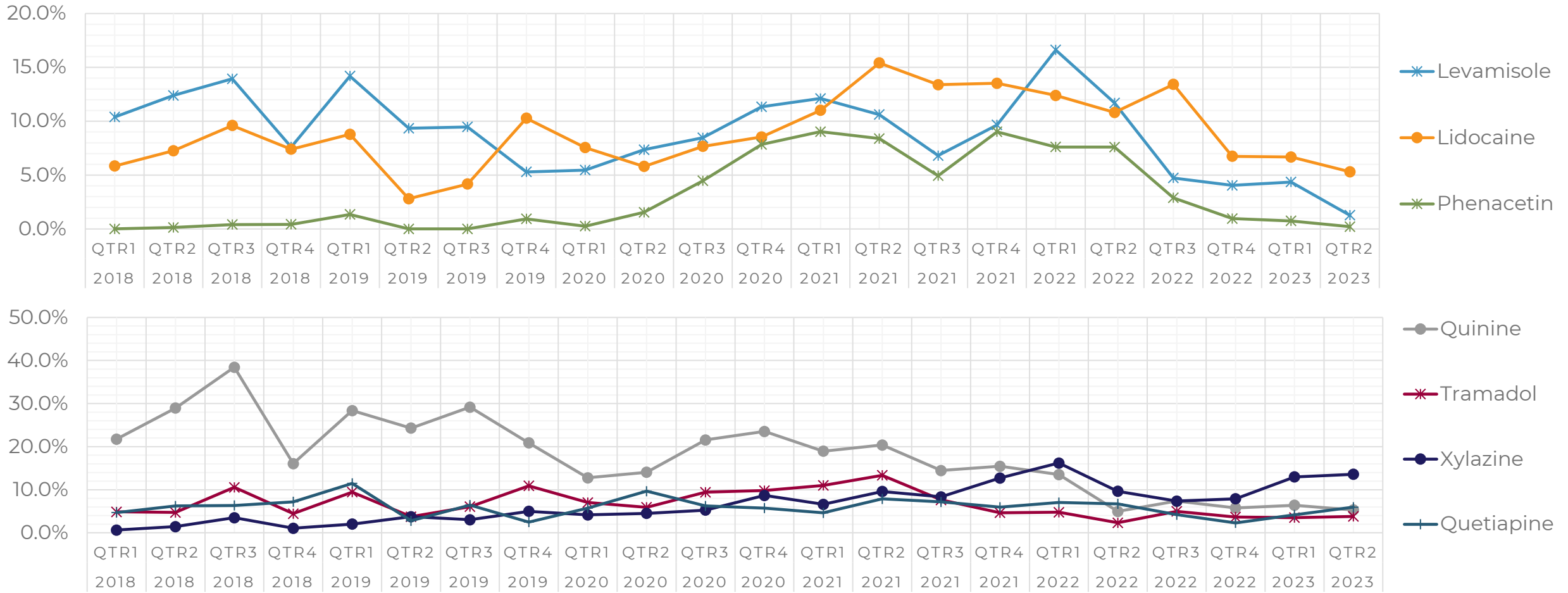
POSITIVITY PLOTS – FENTANYL & FLUOROFENTANYL



POSITIVITY PLOTS – TRADITIONAL DRUGS



POSITIVITY PLOTS – ADULTERANTS



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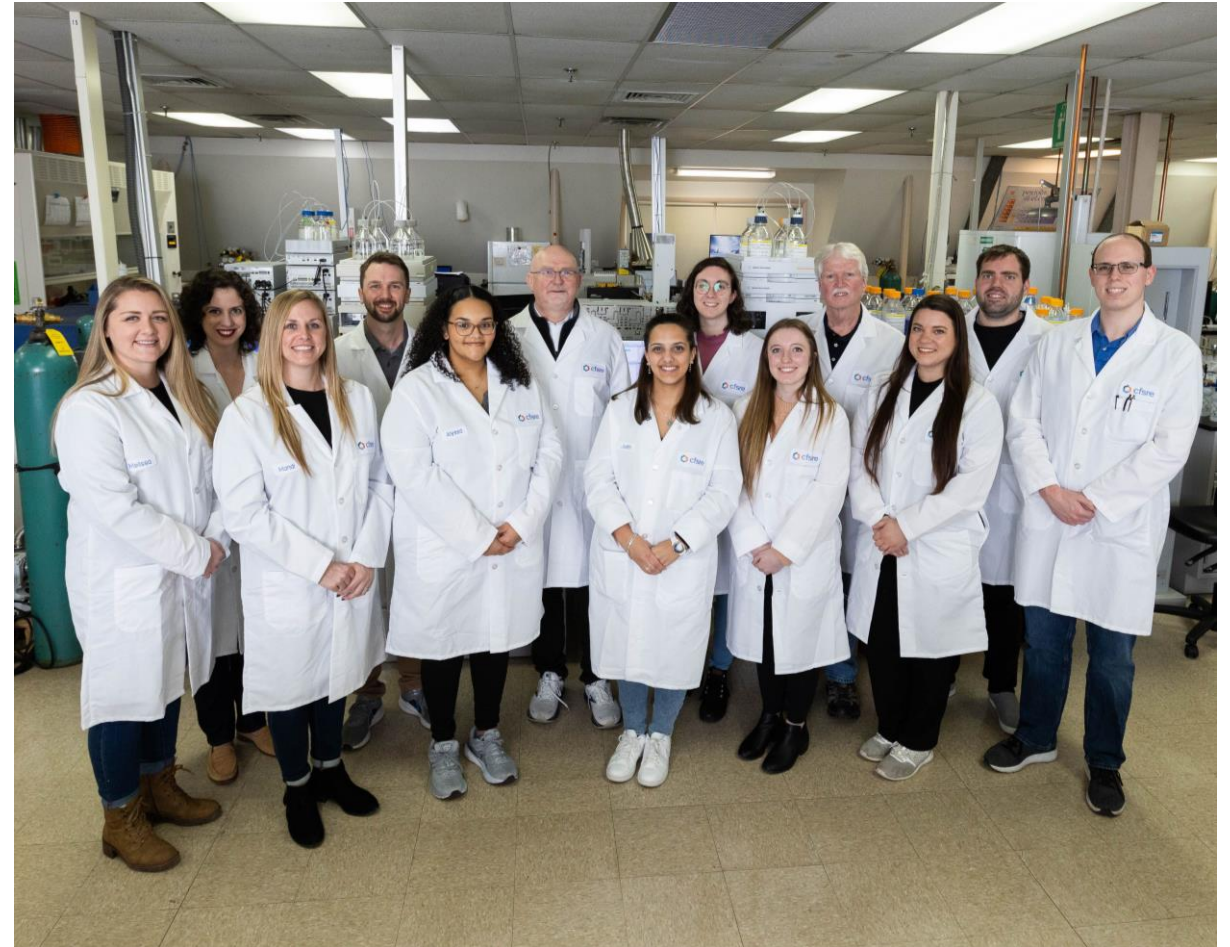
- Donna Papsun

- **Funding Agencies**

- National Institute of Justice (NIJ)

- **Collaborators & Partners**

- Forensic
- Clinical
- Medical Examiner
- Coroner
- Crime Lab
- Etc.





THANK YOU! **QUESTIONS?**



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