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).
  - 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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CFSRE'S NPS DISCOVERY

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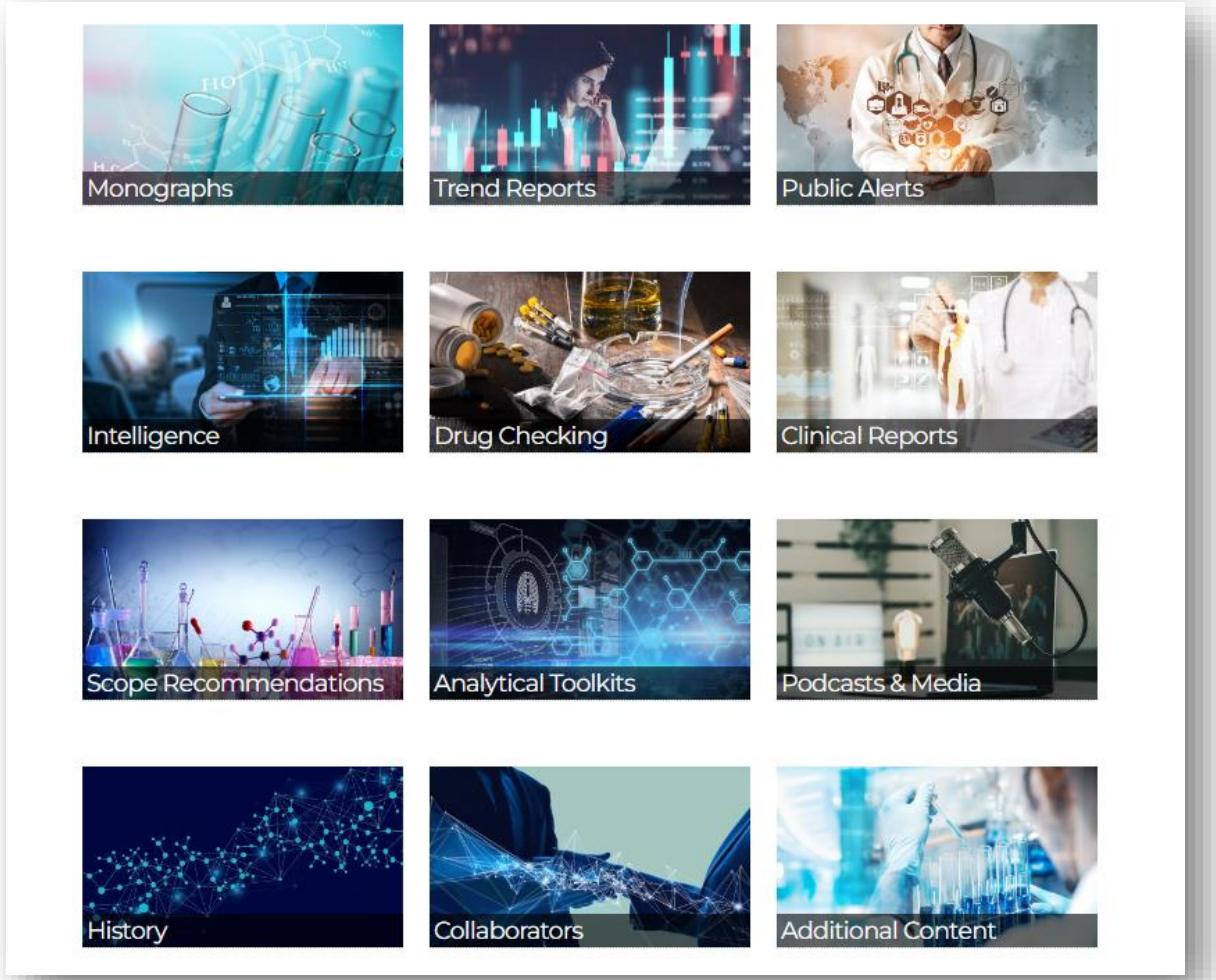
BRIEF HISTORY & TIMELINE

2017

WEBSITE ▸ WWW.NPSDISCOVERY.ORG



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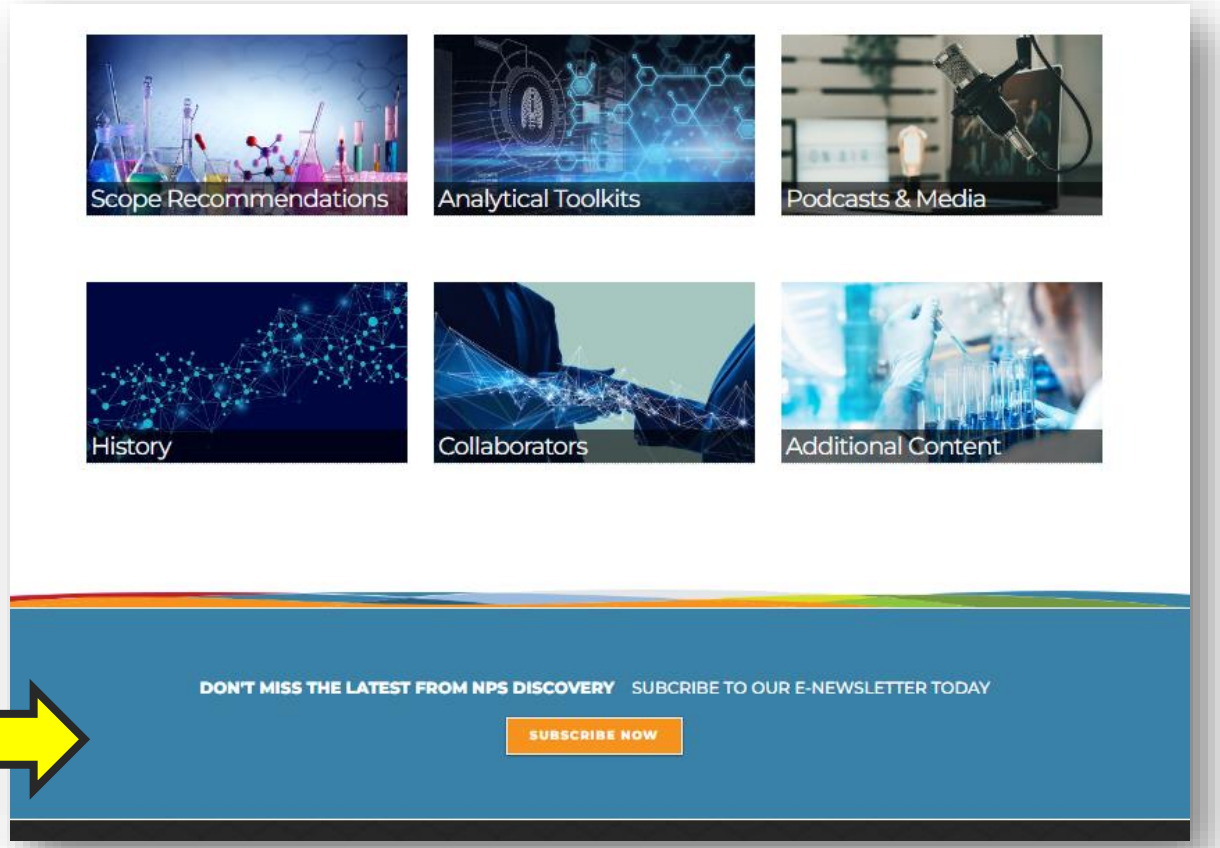

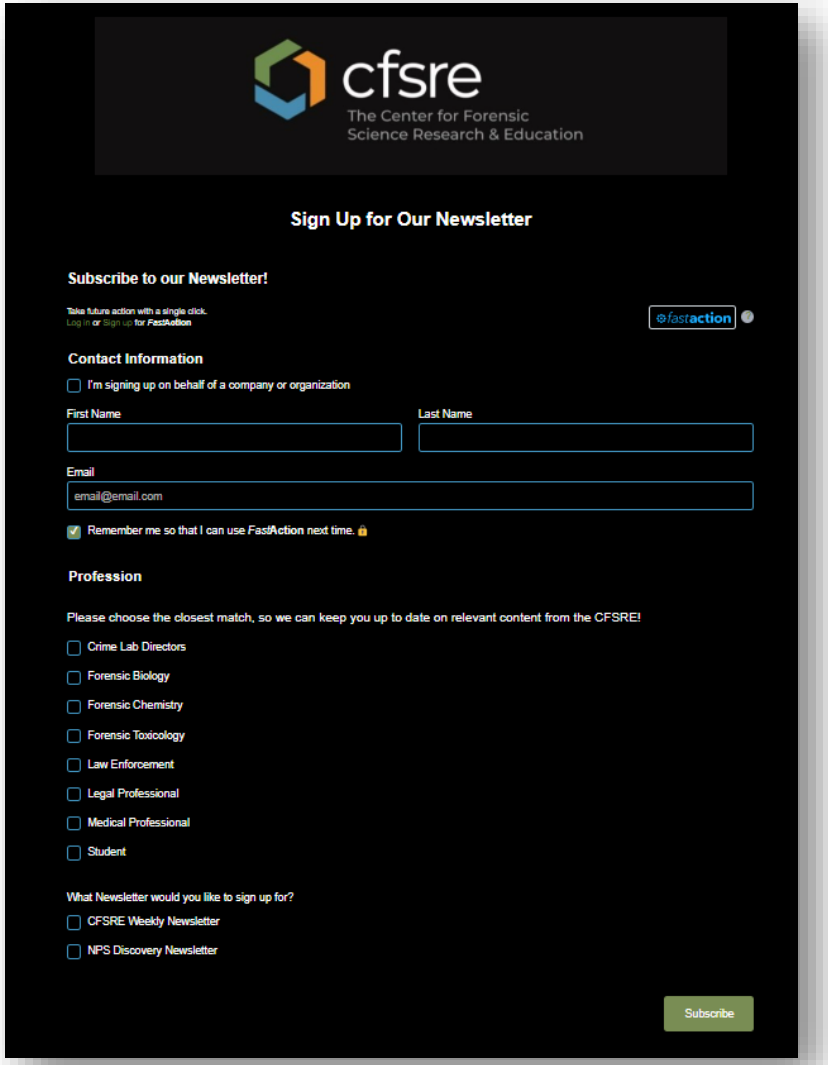

COLLABORATE WITH OUR TEAM

- 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 ▸

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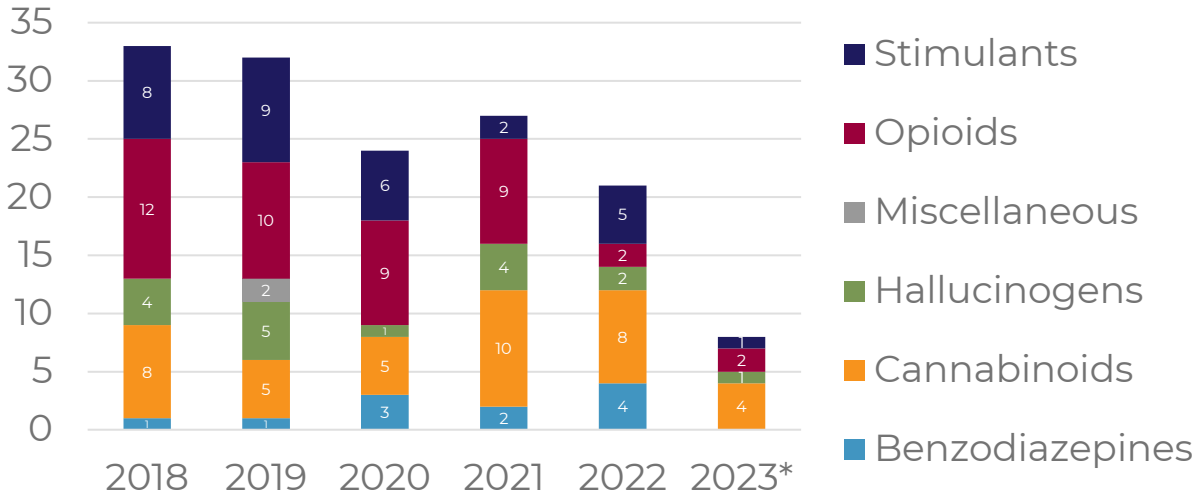
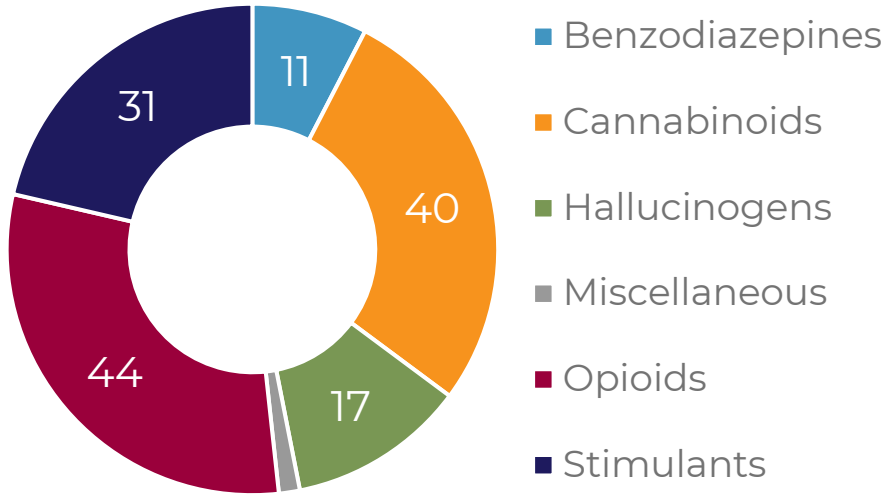
EMERGENCE OF NPS IN THE U.S.

- 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

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

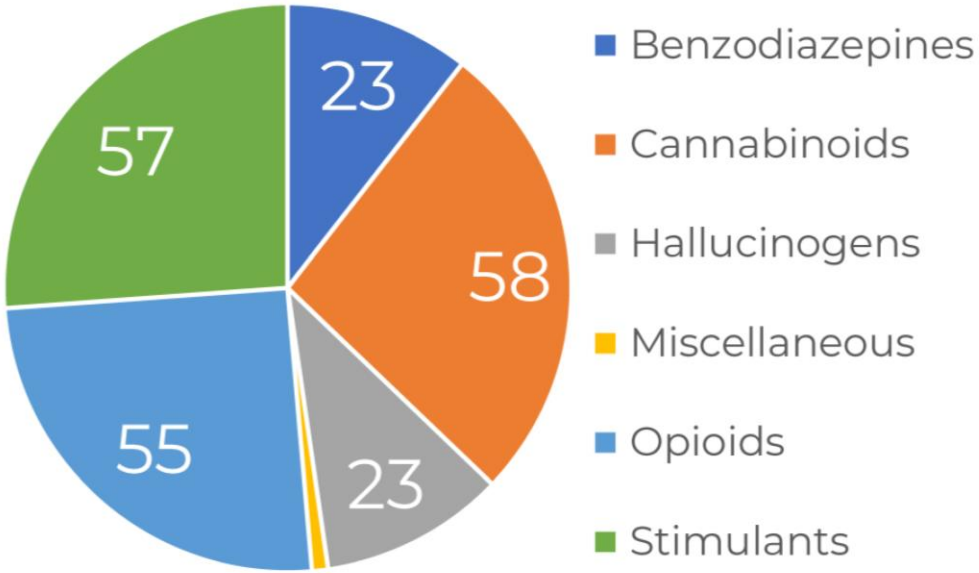


Figure 3: Breakdown by subclass of individual NPS detected, 2018-2022.

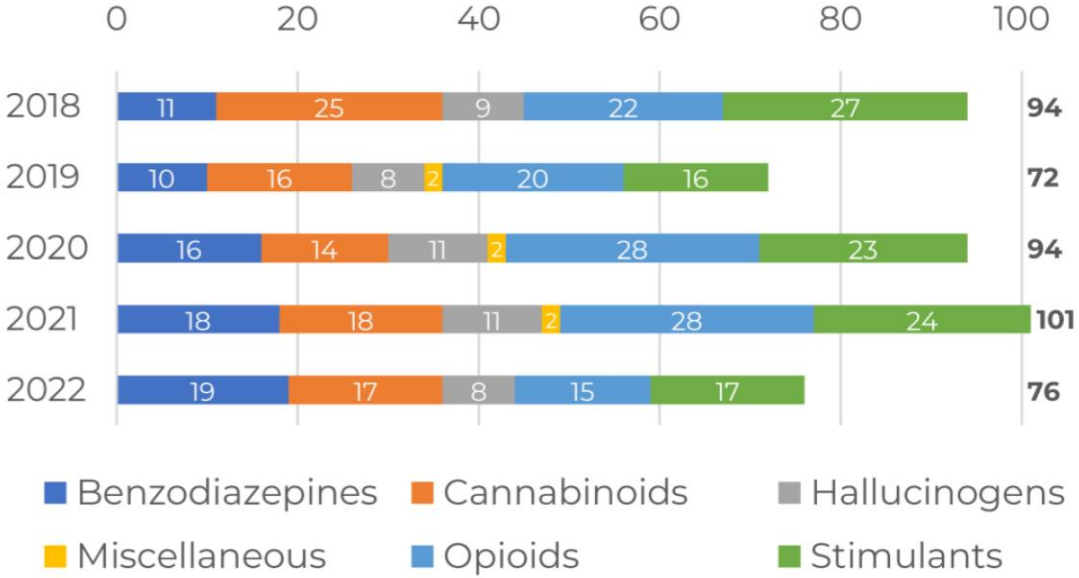


Figure 4: Individual NPS detected each year, cumulative since 2018.

Q2 2023 NPS TREND REPORTS

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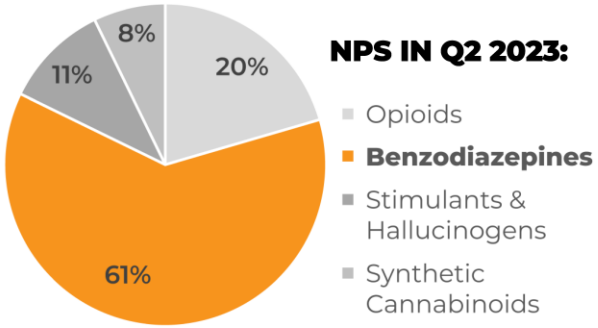
NPS Benzodiazepines in the United States

TREND REPORT | Q2 2023

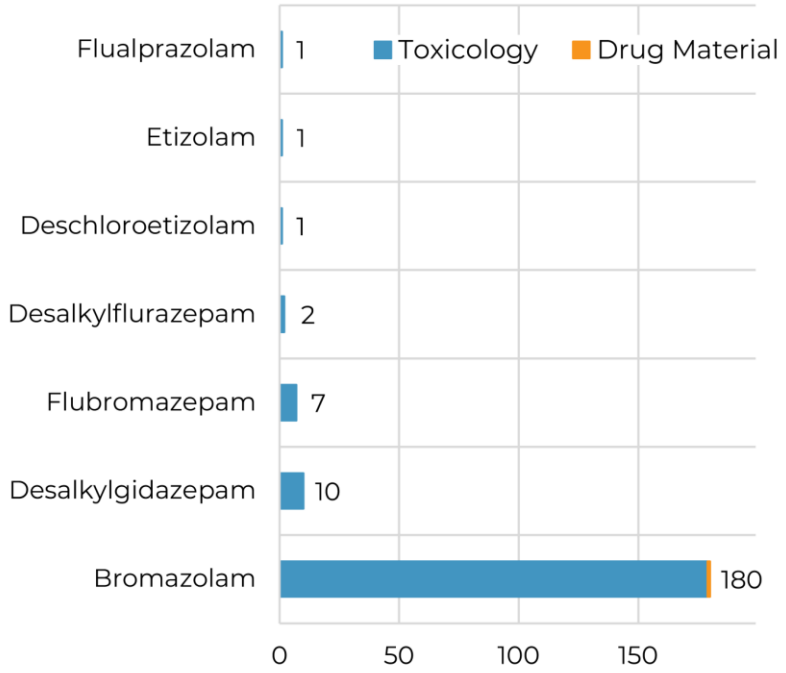
PURPOSE: This report provides up-to-date information regarding the status of NPS benzodiazepine prevalence and positivity in the United States.

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).

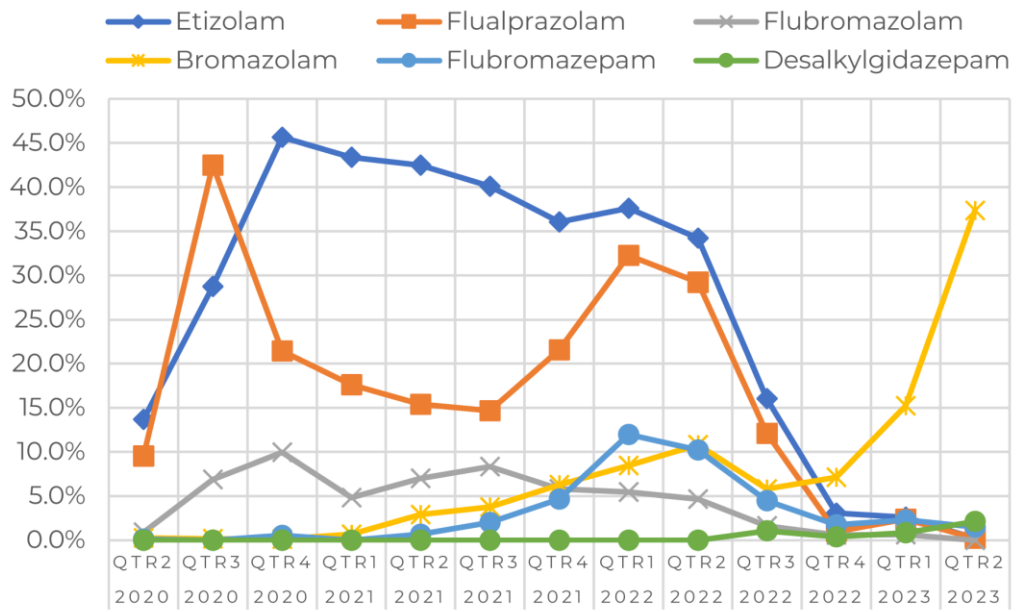
OBJECTIVE: Our laboratory utilizes novel approaches for the analysis of drugs in biological samples and seized materials using comprehensive non-targeted data acquisition by gas chromatography mass spectrometry (GC-MS) and liquid chromatography quadrupole time-of-flight mass spectrometry (LC-QTOF-MS). 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



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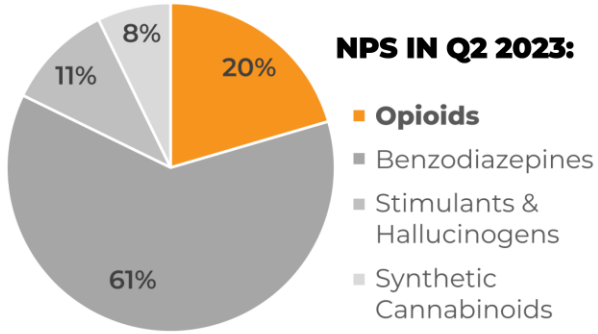
NPS Opioids in the United States

TREND REPORT | **Q2 2023**

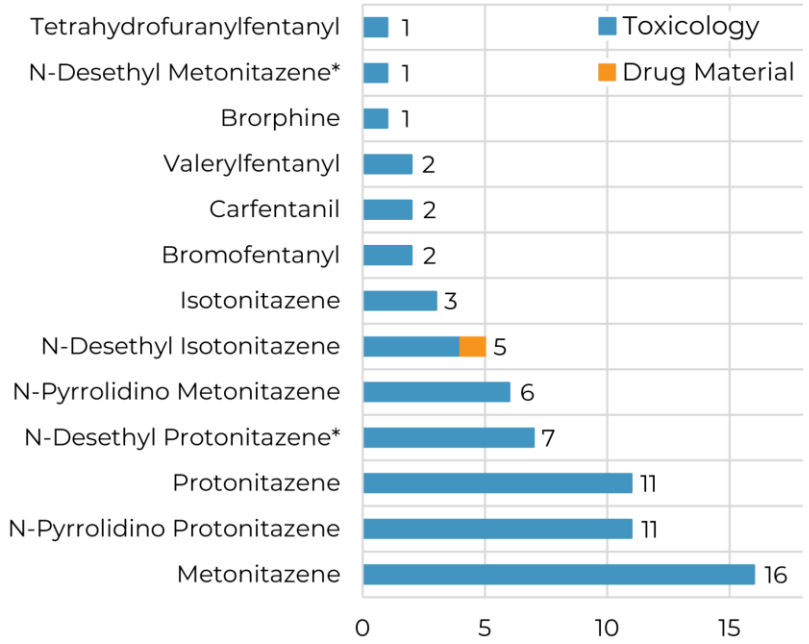
PURPOSE: This report provides up-to-date information regarding the status of NPS opioid prevalence and positivity in the United States.

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.

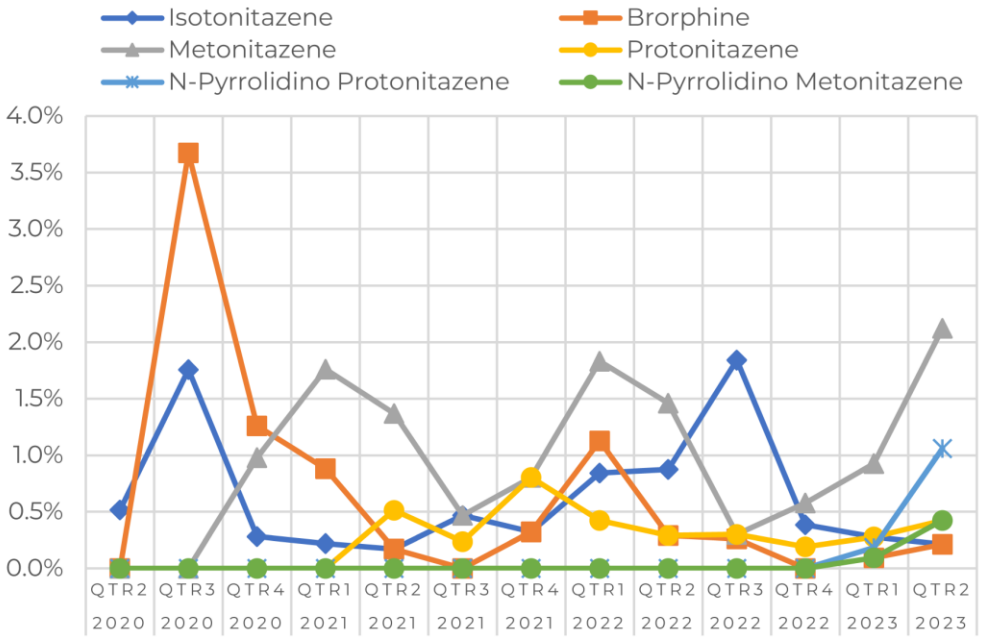


NPS OPIOIDS IDENTIFIED



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

SELECT POSITIVITY: Q2 2020 to Q2 2023



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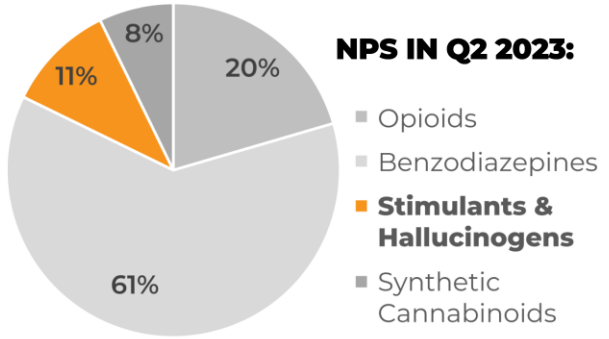
NPS Stimulants & Hallucinogens in the United States

TREND REPORT | **Q2 2023**

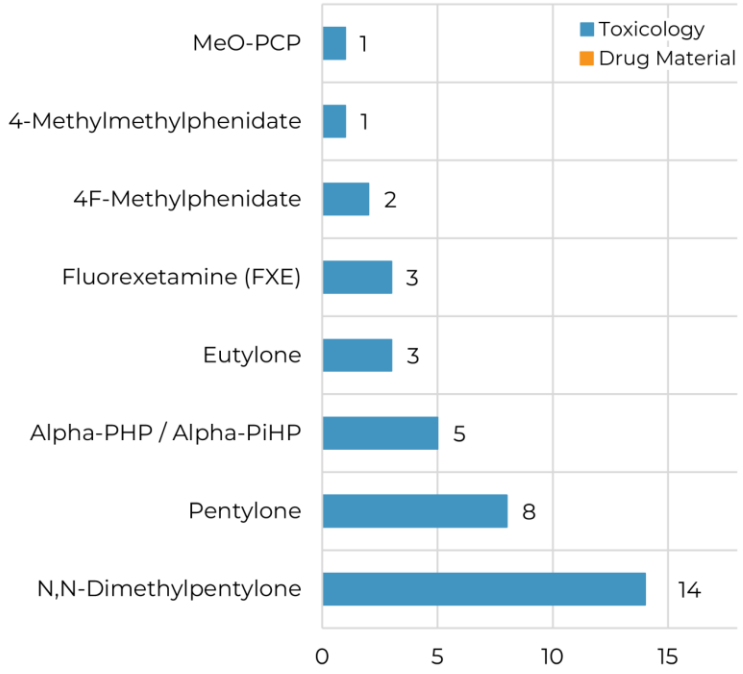
PURPOSE: This report provides up-to-date information regarding NPS stimulant & NPS hallucinogen prevalence and positivity in the United States.

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



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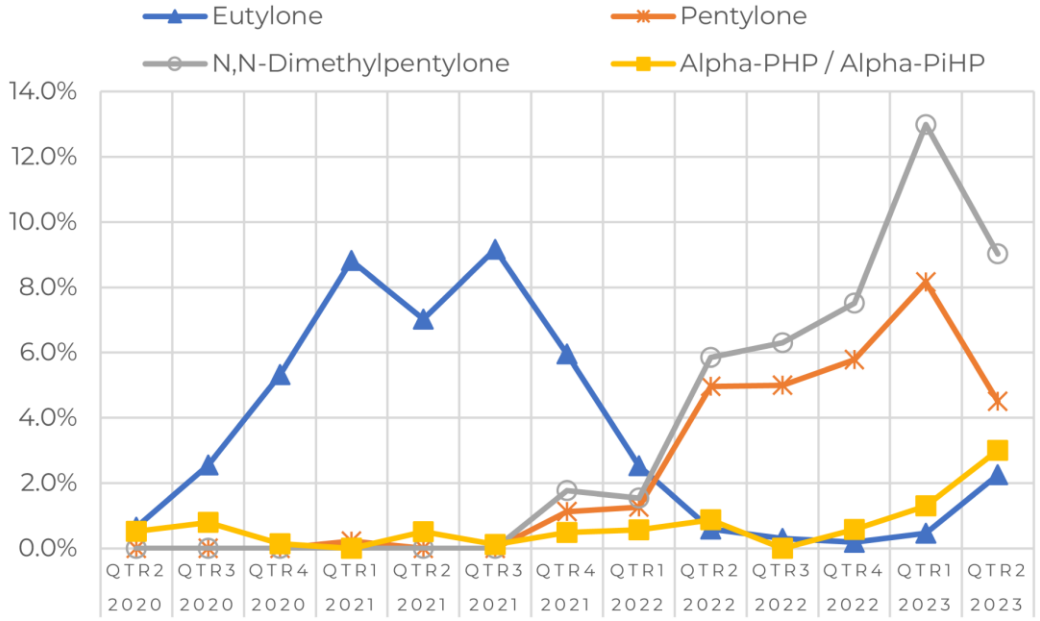

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Synthetic Cannabinoids in the United States

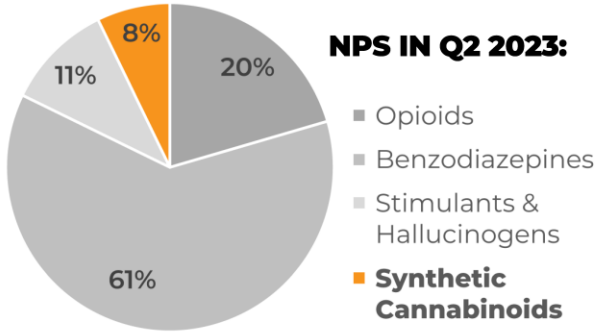
TREND REPORT | **Q2 2023**

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

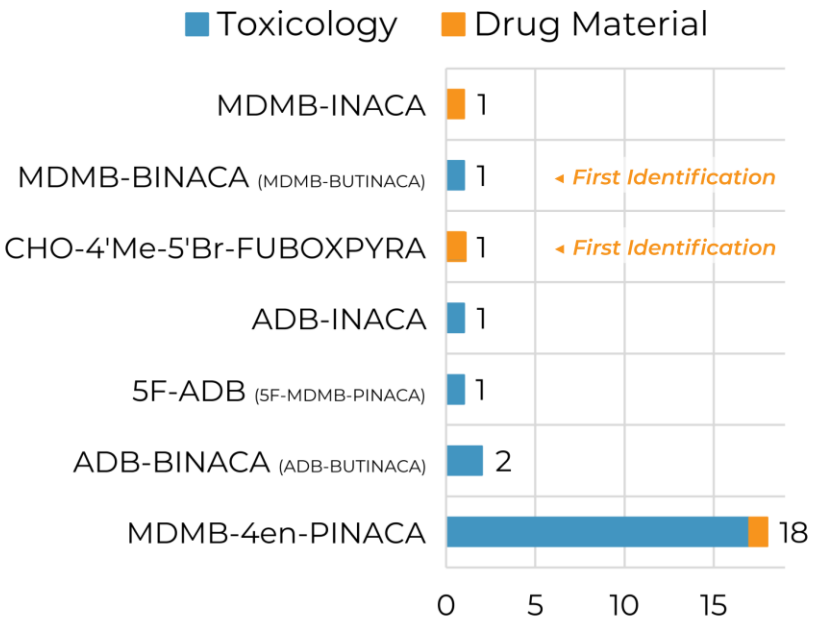
OVERVIEW: Novel psychoactive substances (NPS), including synthetic cannabinoids, continue to pose great challenges for forensic scientists, clinicians, and public health and safety personnel. Synthetic cannabinoids have been implicated in an increasing number of emergency room admissions, death investigations, 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.

NPS IN Q2 2023:

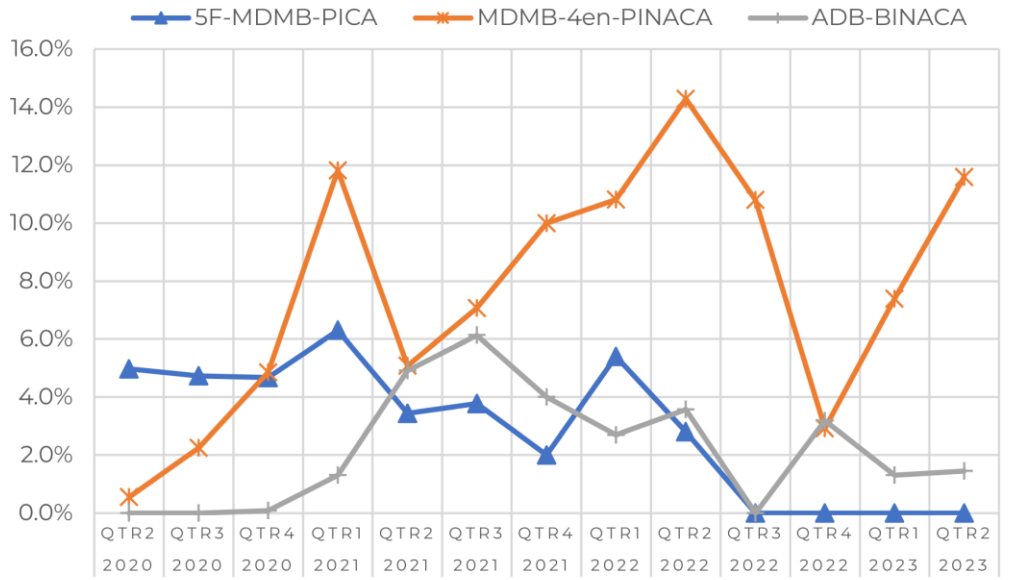


SYNTHETIC CANNABINOIDS IDENTIFIED



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

SELECT POSITIVITY: Q2 2020 to Q2 2023



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POSITIVITY PLOTS SINCE 2018

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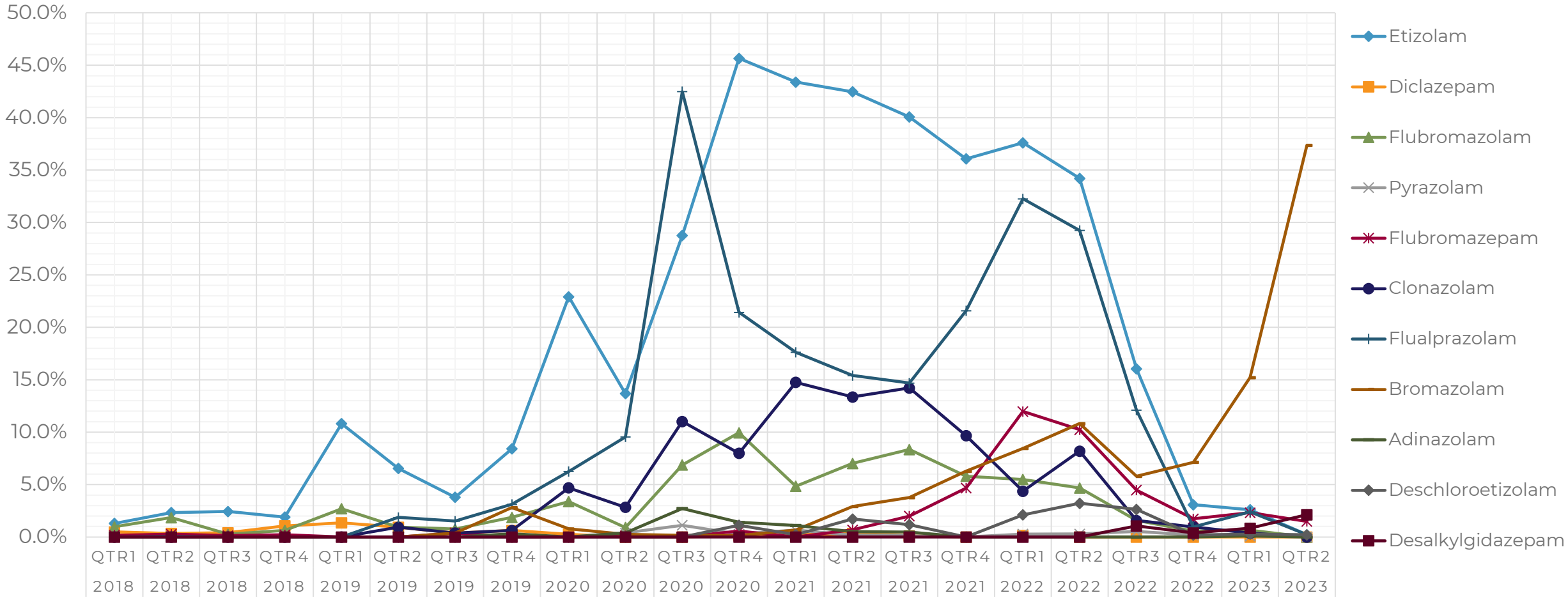
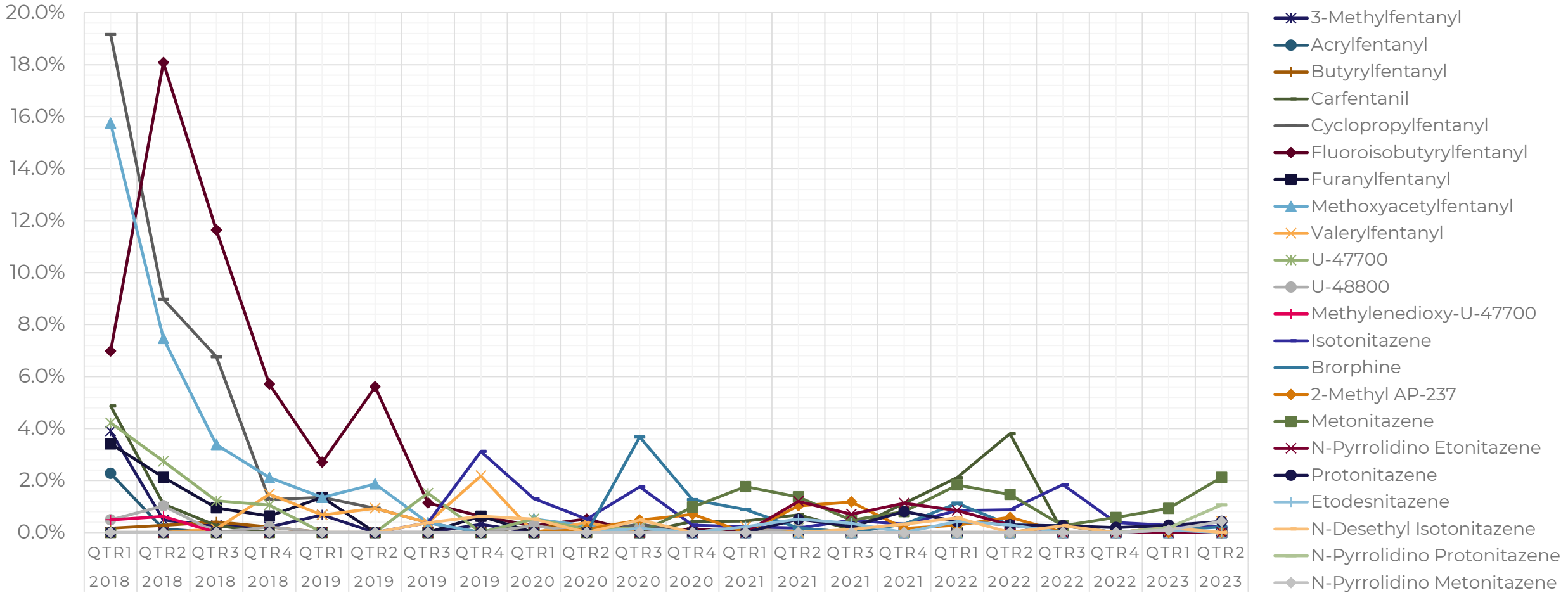
POSITIVITY PLOTS – NPS BENZODIAZEPINES

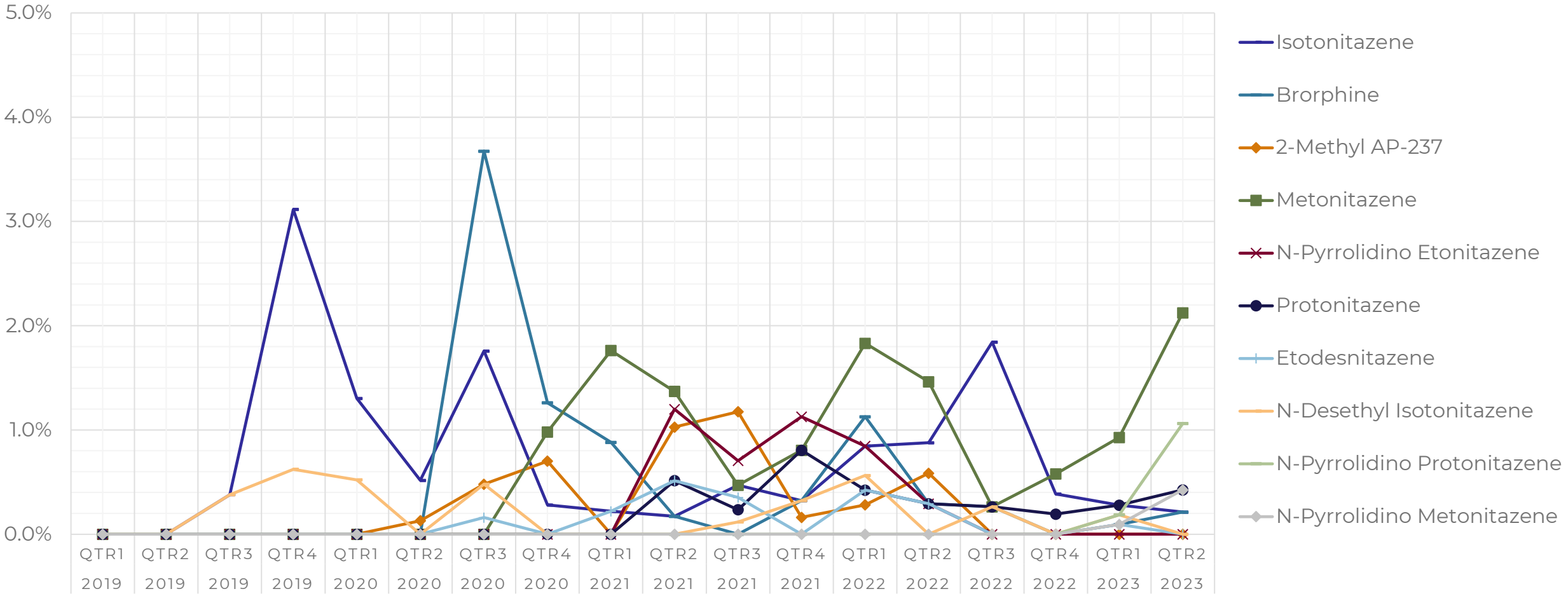


POSITIVITY PLOTS – NPS OPIOIDS

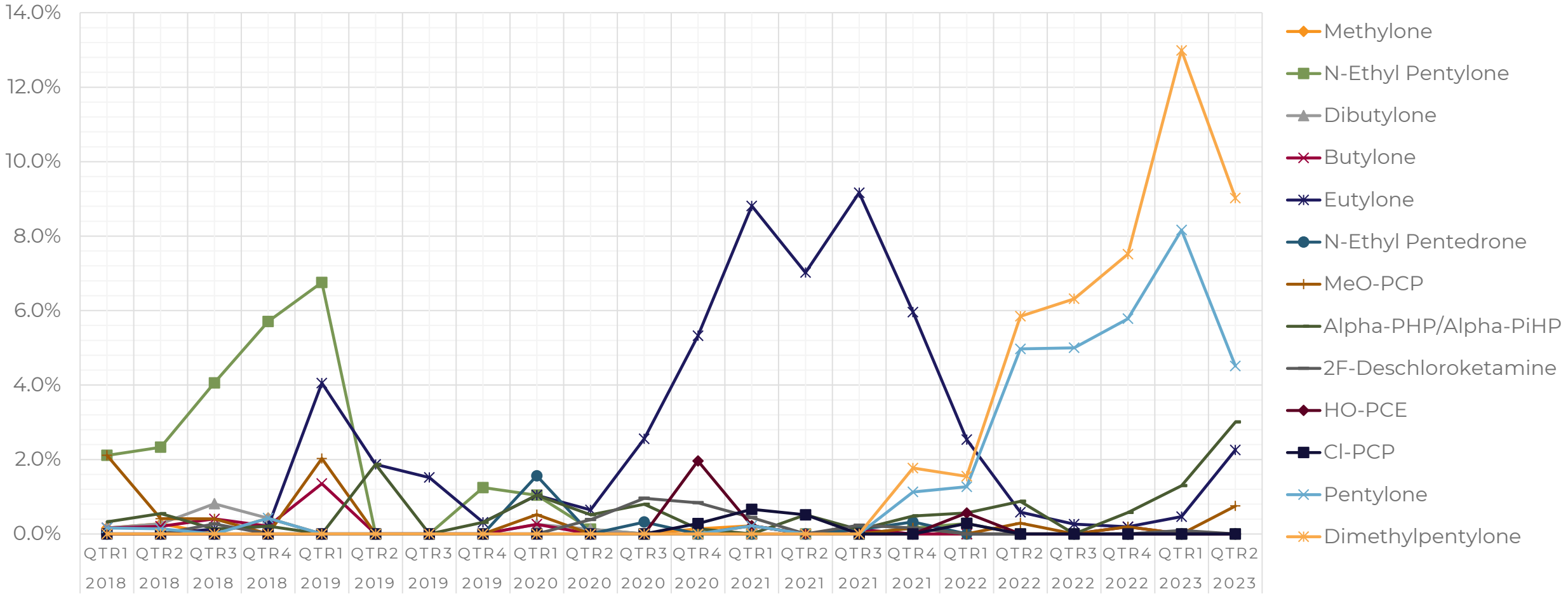


Note: Fluorofentanyl Excluded

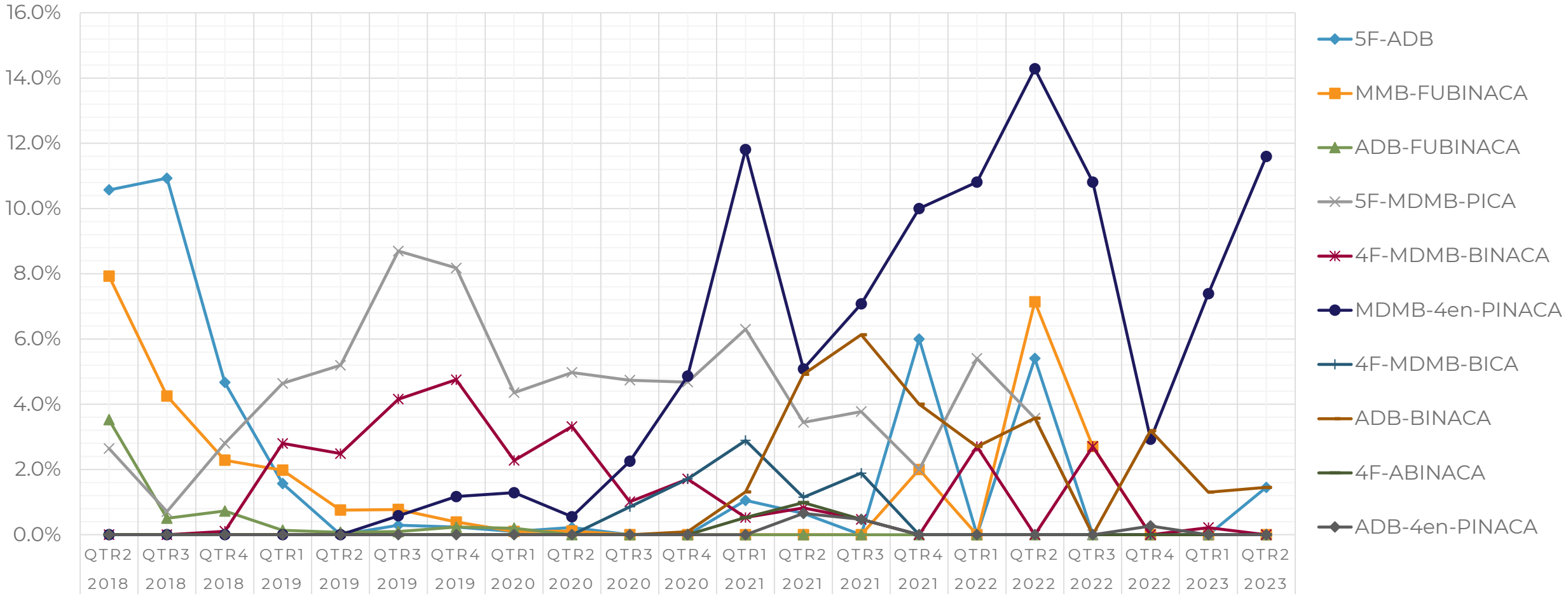
POSITIVITY PLOTS – NPS OPIOIDS (NEW GENERATION ONLY)



POSITIVITY PLOTS – NPS STIMULANTS & HALLUCINOGENS

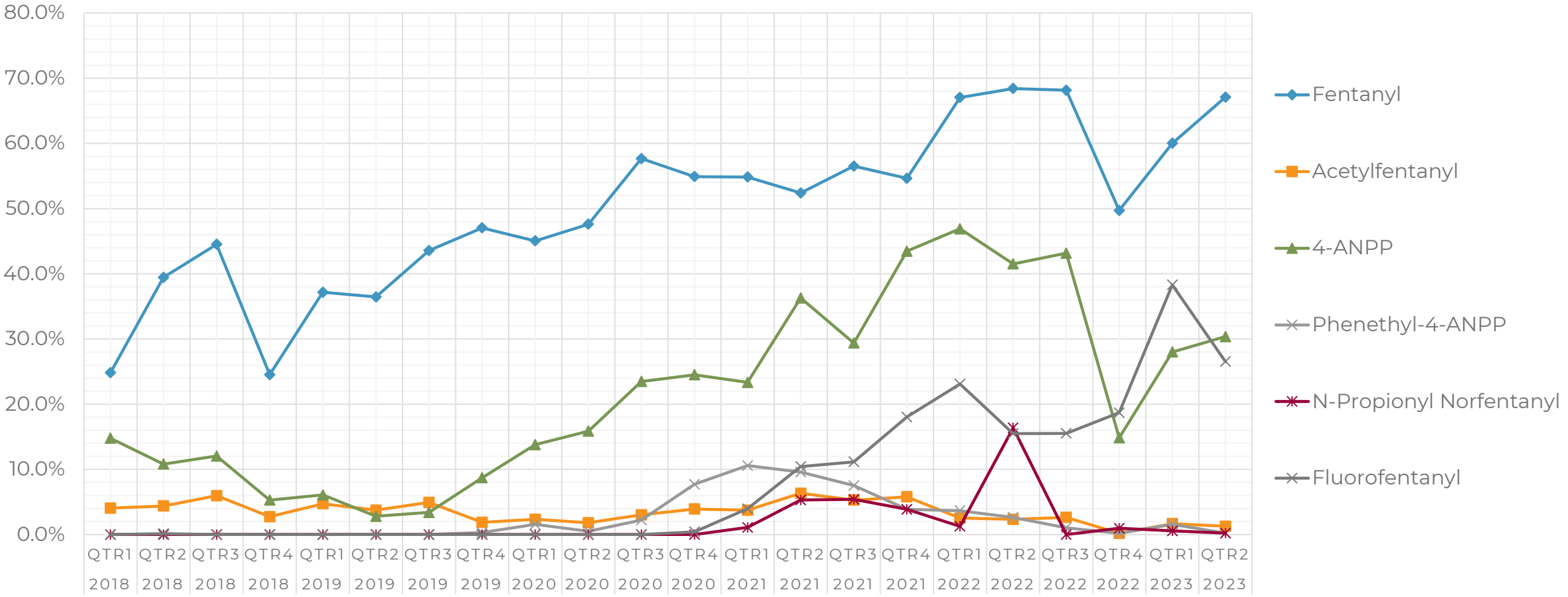


POSITIVITY PLOTS – SYNTHETIC CANNABINOIDS

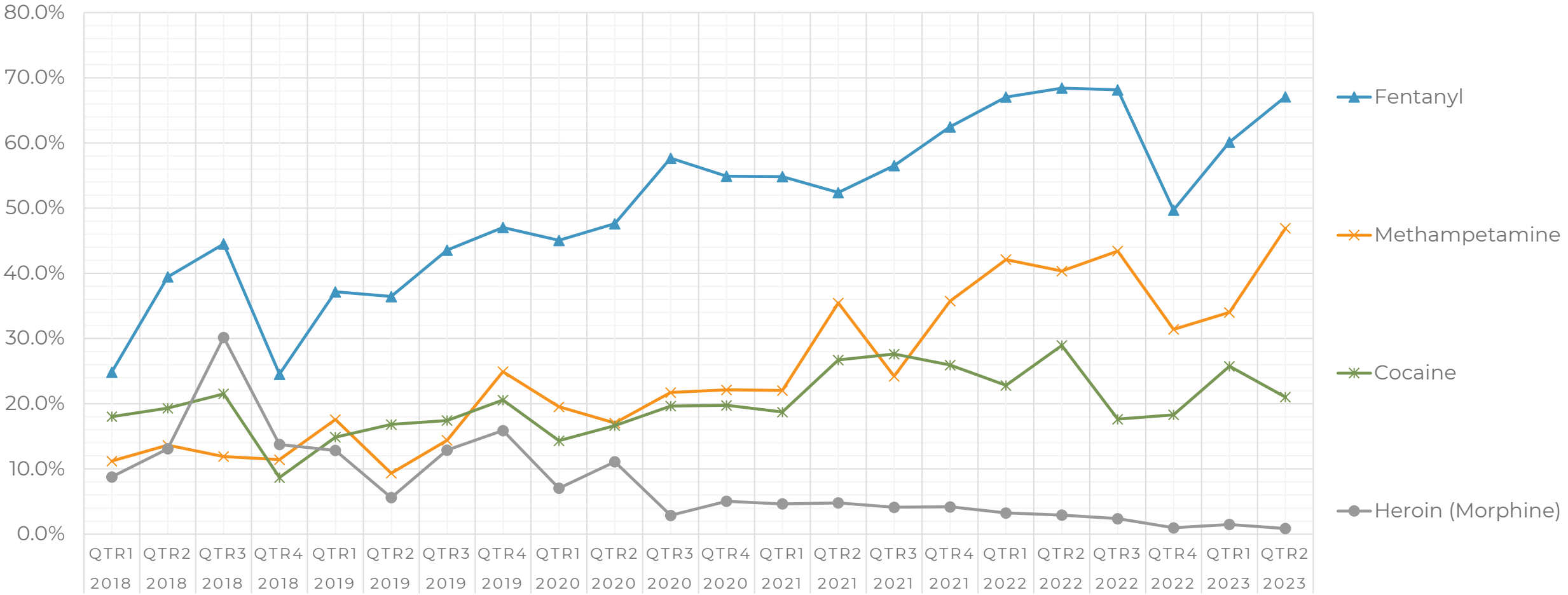


Note: Some quarters may be skewed due to low sample volume

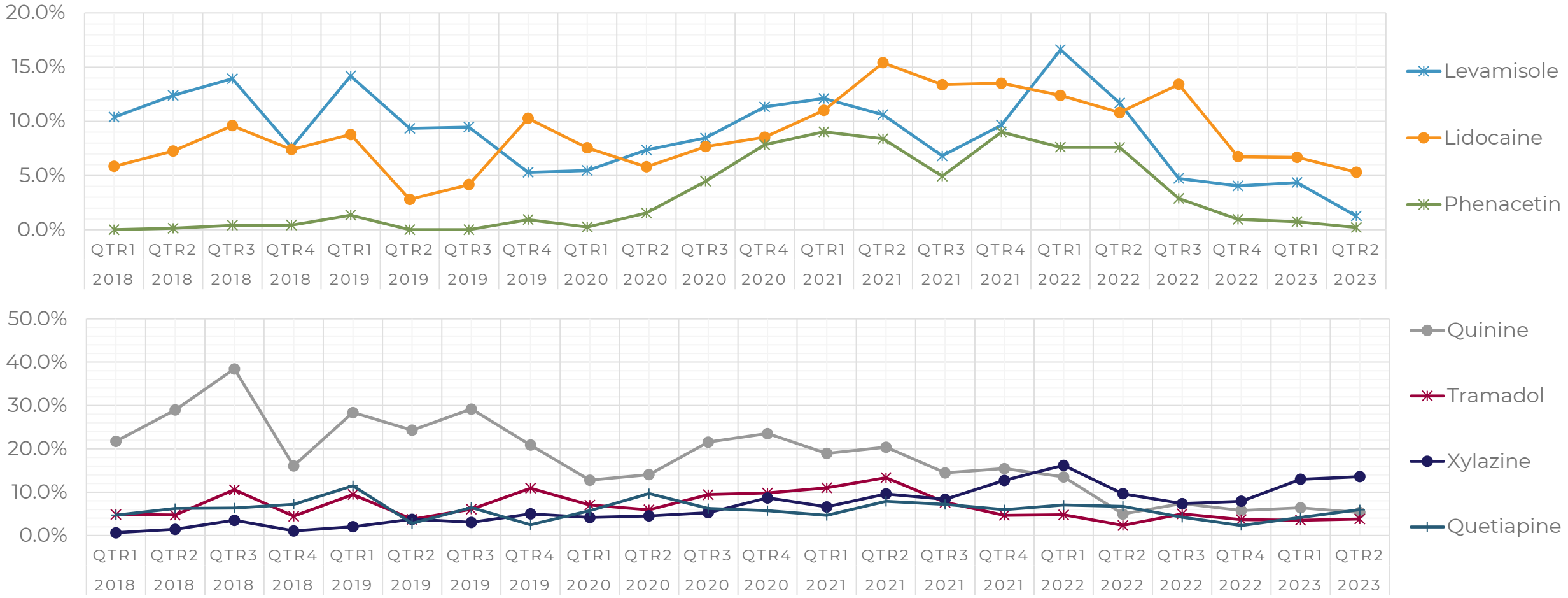
POSITIVITY PLOTS – FENTANYL & FLUOROFENTANYL



POSITIVITY PLOTS – TRADITIONAL DRUGS



POSITIVITY PLOTS – ADULTERANTS



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  - Natasha Cunningham
  - Many others!
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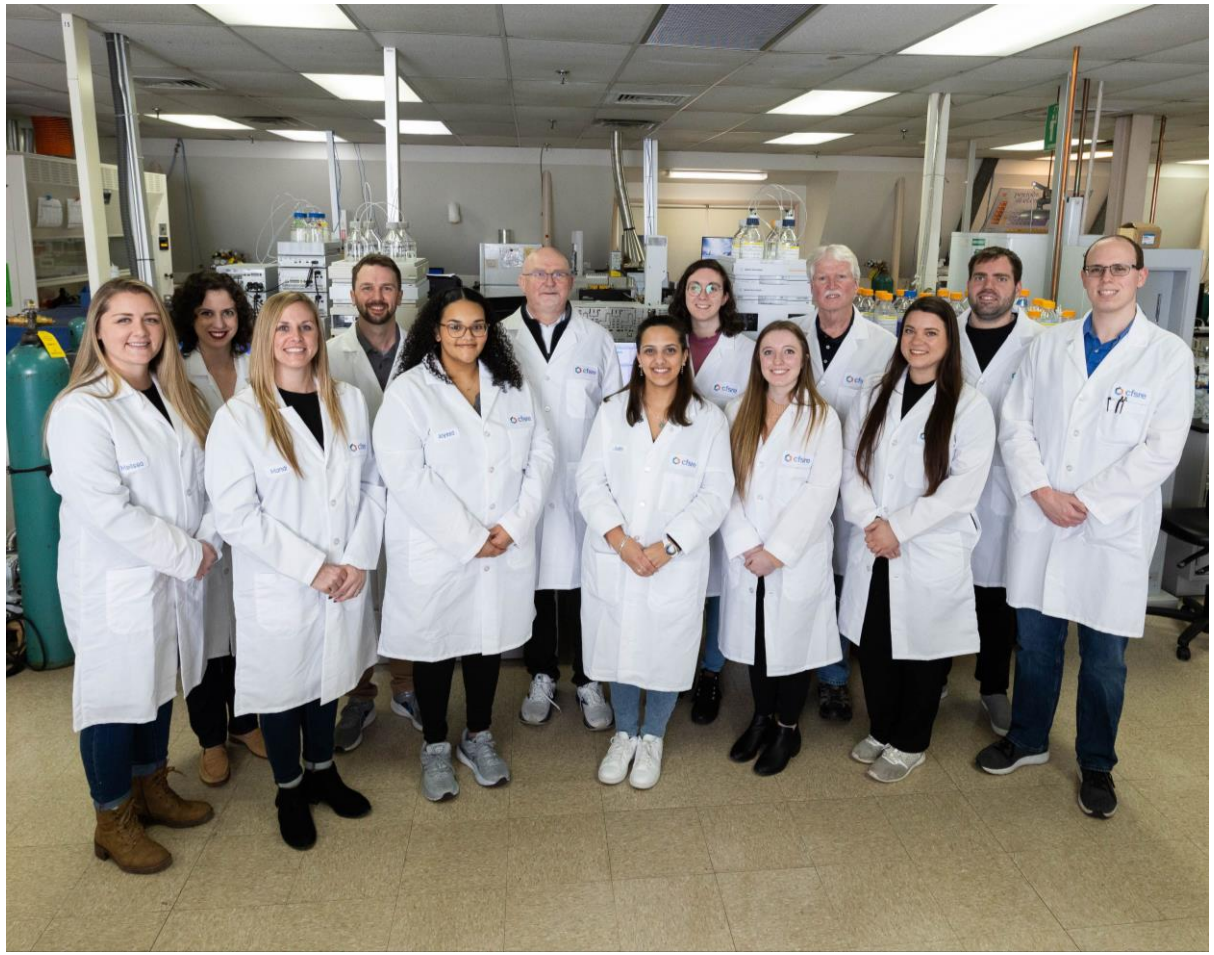
  - Donna Papsun
- **Funding Agencies**
  - National Institute of Justice (NIJ)
- **Collaborators & Partners**
  - Forensic
  - Clinical
  - Medical Examiner
  - Coroner
  - Crime Lab
  - Etc.



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THANK YOU! QUESTIONS?

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Program Manager – NPS Discovery
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