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NPS DISCOVERY

Novel Psychoactive Substances (NPS): Up-To-Date Emerging Drug Trends

Alex J Krotulski, PhD – Associate Director (CFSRE)

The Tail Wagging the Dog - Staying on Top of Emerging Drug Trends / Sunday August 15, 2021, 1:00-2:00 PM

2021 IACP Training Conference on Drugs, Alcohol, and Impaired Driving (DAID)

Brief Introduction

- **Alex J Krotulski, PhD**
  - Associate Director – CFSRE
  - Program Manager – NPS Discovery
  - Forensic Toxicologist / Chemist

- 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.

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Background

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Novel Psychoactive Substances (NPS)

- Can be a **natural, synthetic, or semi-synthetic substance** in pure form, mixture, or preparation:

  A. Discovered or synthesized for the first time since the mid-2000's *(Example: MDMB-4en-PINACA)*

  B. Previously discovered, synthesized, or reported but has now been observed for the first time in more than 10 years *(Example: Isotonitazene)*

  C. Used in a novel way or differing manner from its original intended us *(Example: Fentanyl)*

  D. Not-well described or studied but now presents significant challenges or threats due to an altered toxicological effect profile *(Example: Mitragynine)*

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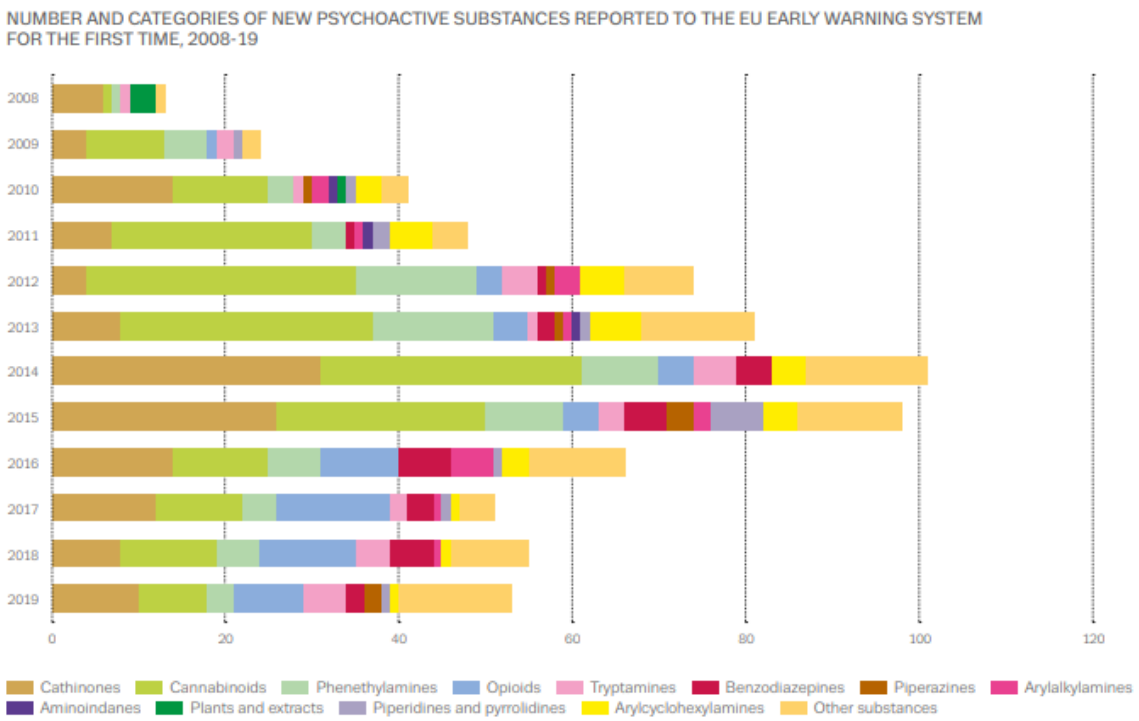
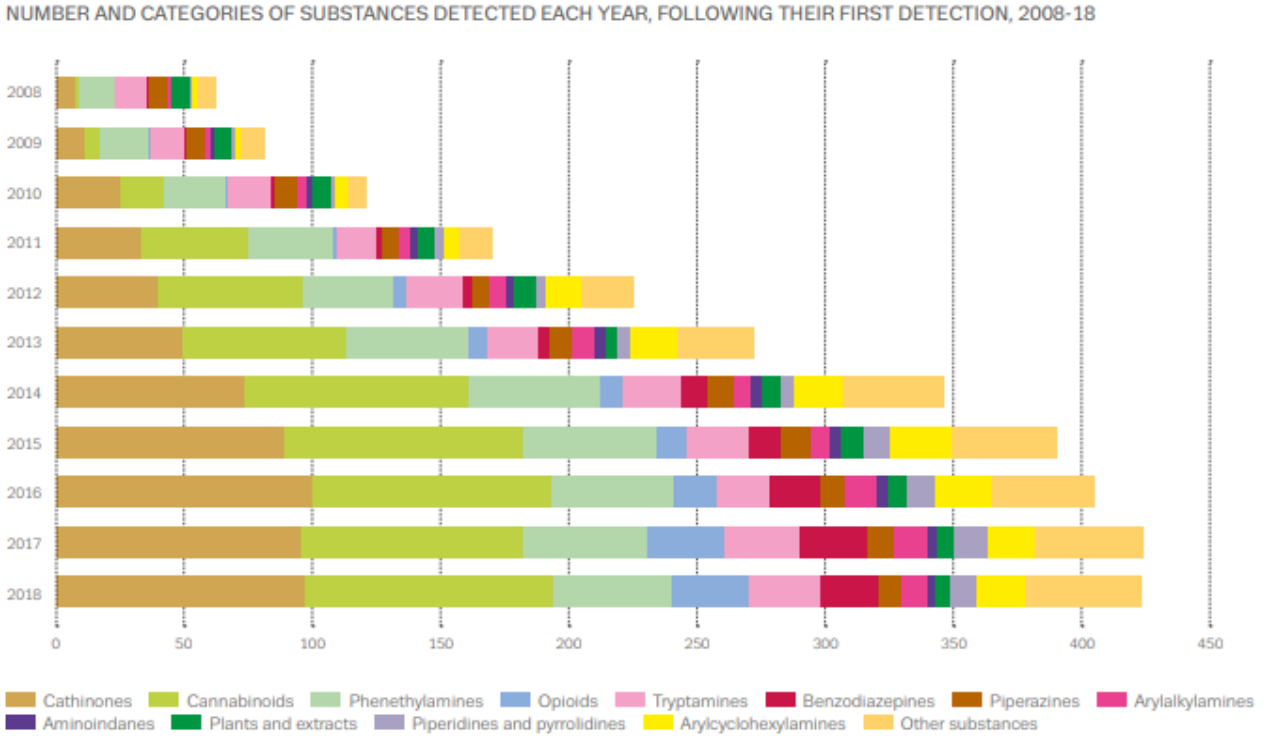
The Vast Universe of NPS





Source: www.emcdda.europe.eu

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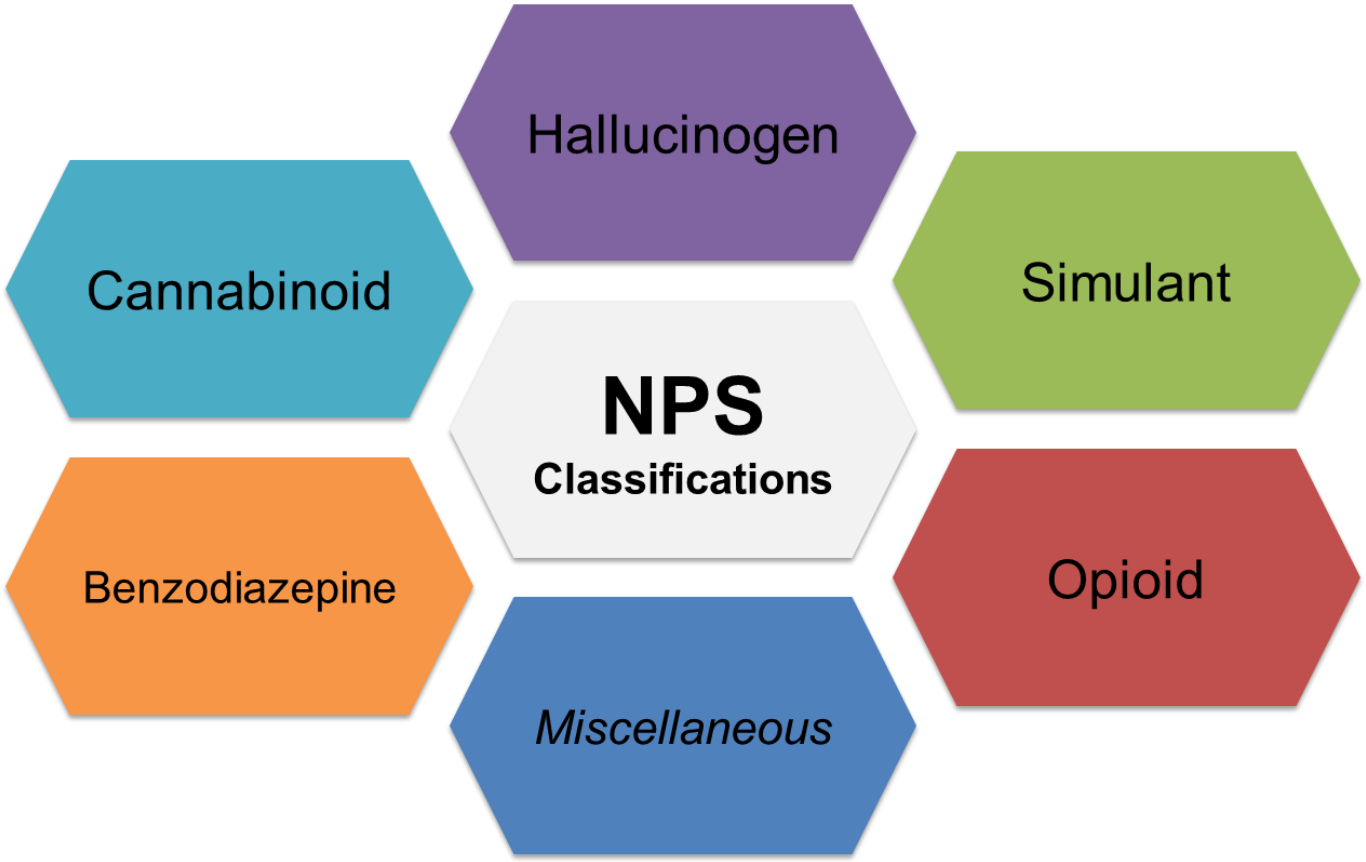
NPS Classes and Sub-Classes



- **NPS Opioids:**
  - Fentanyl Analogues
    - Carfentanil
  - Diaminocyclohexane Benzamides
    - U-47700
  - Benzimidazoles
    - Isotonitazene
  - Cinnamylpiperazines
    - 2-Methyl AP-237
  - Thiambutenes
    - Piperidylthiambutene
  - Piperidine Benzimidazolones
    - Brorphine
  - Etc.

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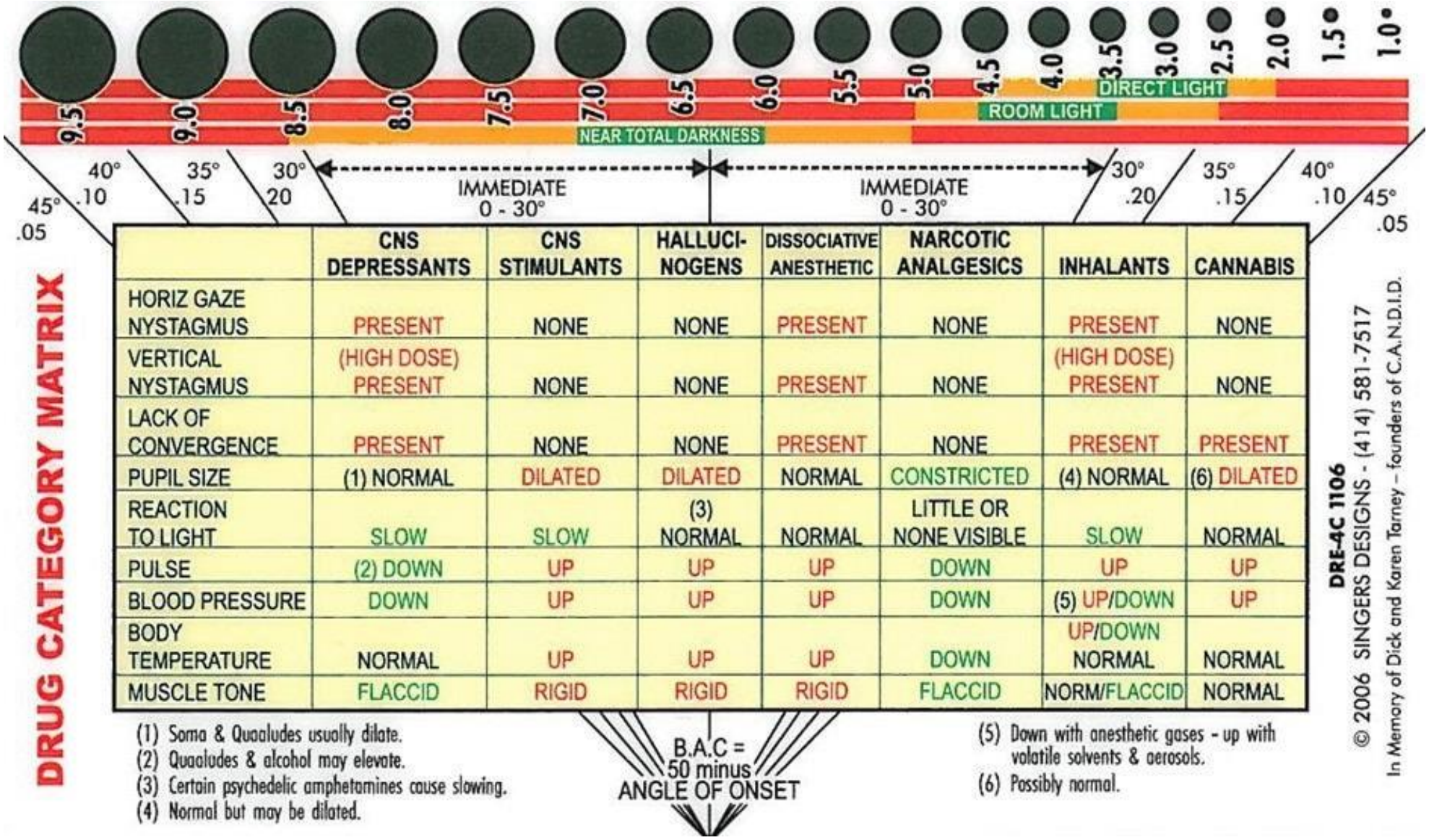

	CNS DEPRESSANTS	CNS STIMULANTS	HALLUCI-NOGENS	DISSOCIATIVE ANESTHETIC	NARCOTIC ANALGESICS	INHALANTS	CANNABIS
HORIZ GAZE NYSTAGMUS	PRESENT	NONE	NONE	PRESENT	NONE	PRESENT	NONE
VERTICAL NYSTAGMUS	(HIGH DOSE) PRESENT	NONE	NONE	PRESENT	NONE	(HIGH DOSE) PRESENT	NONE
LACK OF CONVERGENCE	PRESENT	NONE	NONE	PRESENT	NONE	PRESENT	PRESENT
PUPIL SIZE	(1) NORMAL	DILATED	DILATED	NORMAL	CONSTRICTED	(4) NORMAL	(6) DILATED
REACTION TO LIGHT	SLOW	SLOW	(3) NORMAL	NORMAL	LITTLE OR NONE VISIBLE	SLOW	NORMAL
PULSE	(2) DOWN	UP	UP	UP	DOWN	UP	UP
BLOOD PRESSURE	DOWN	UP	UP	UP	DOWN	(5) UP/DOWN	UP
BODY TEMPERATURE	NORMAL	UP	UP	UP	DOWN	UP/DOWN NORMAL	NORMAL
MUSCLE TONE	FLACCID	RIGID	RIGID	RIGID	FLACCID	NORM/FLACCID	NORMAL

(1) Soma & Quaaludes usually dilate.
(2) Quaaludes & alcohol may elevate.
(3) Certain psychedelic amphetamines cause slowing.
(4) Normal but may be dilated.

B.A.C = 50 minus ANGLE OF ONSET

(5) Down with anesthetic gases - up with volatile solvents & aerosols.
(6) Possibly normal.

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In Memory of Dick and Karen Tarney – founders of C.A.N.D.I.D.

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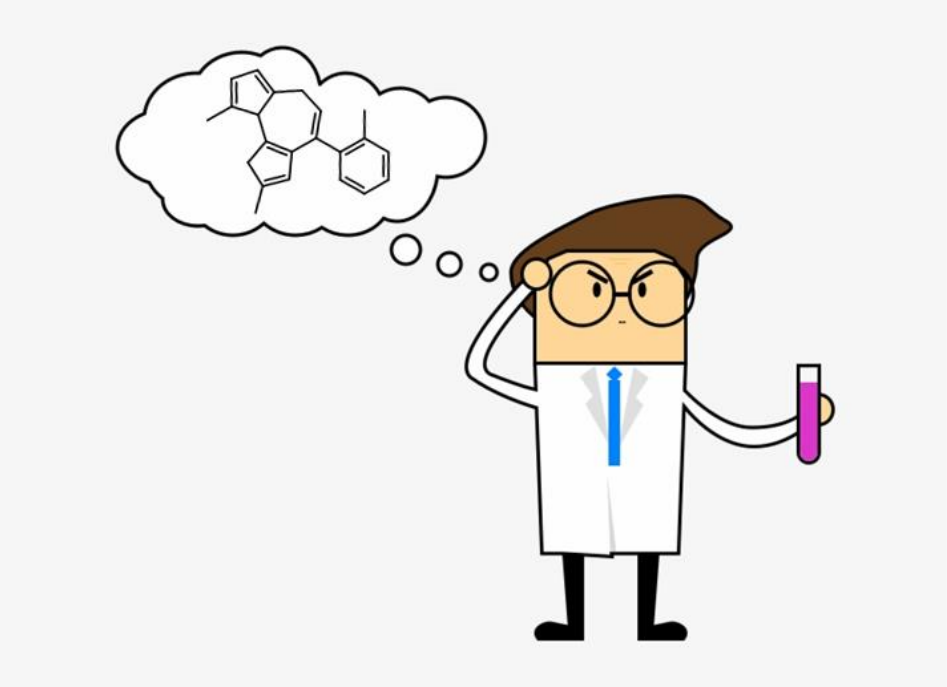
NPS Challenges

- Synthetic drugs present in forensically relevant samples often remain **unidentified** due to scope of analysis and analyst experience/expertise
  - But… what do you do with a positive finding?
- First identification are often **lagging or delayed**
  - Analytical capabilities, testing performed
  - Standard reference material
- Historically, there had been **no centralized reporting system** within the United States



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Resources For Emerging Drug Information

- NPS Discovery
  - www.npsdiscovery.org
- Cayman Chemical
  - www.caymanchem.com
- Drug Enforcement Administration
  - www.dea.gov
  - www.nflis.deadiversion.usdoj.gov
- EMCDDA
  - www.emcdda.europa.eu
- UNDOC
  - www.unodc.org/LSS/Home/NPS
- World Health Organization
  - www.who.int

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- Open-access drug early warning system with a national perspective

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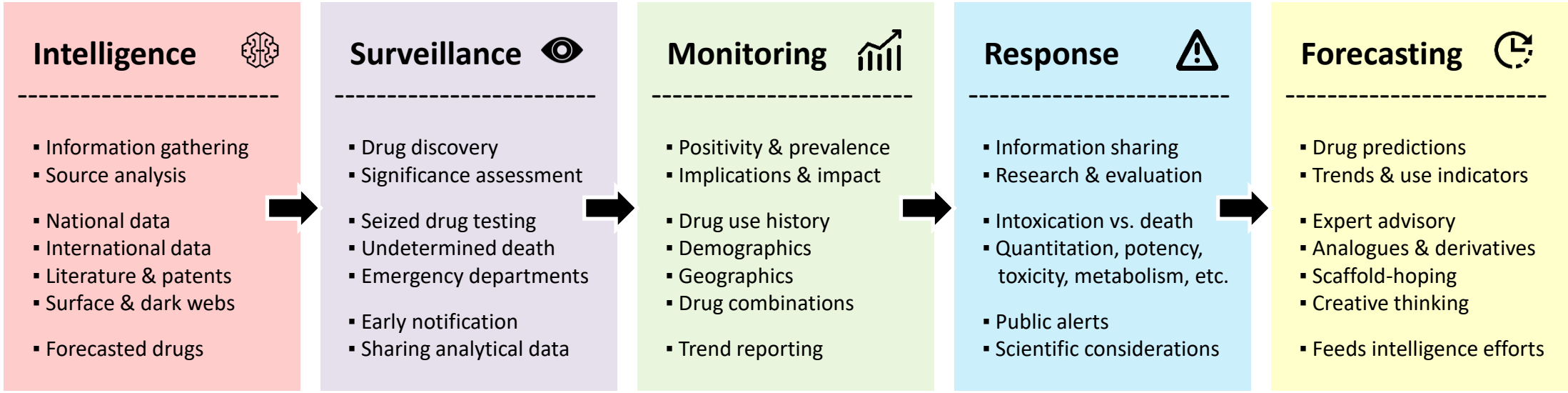
NPS Discovery Iniatives



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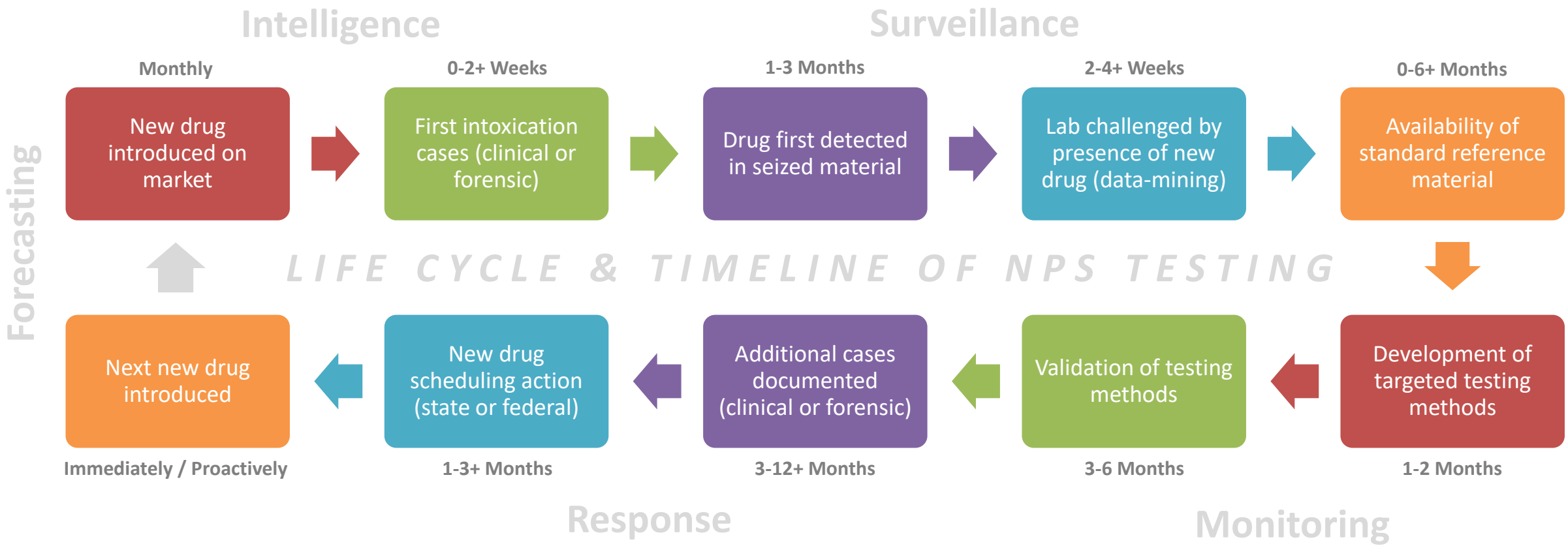
Timeline for an Emerging NPS



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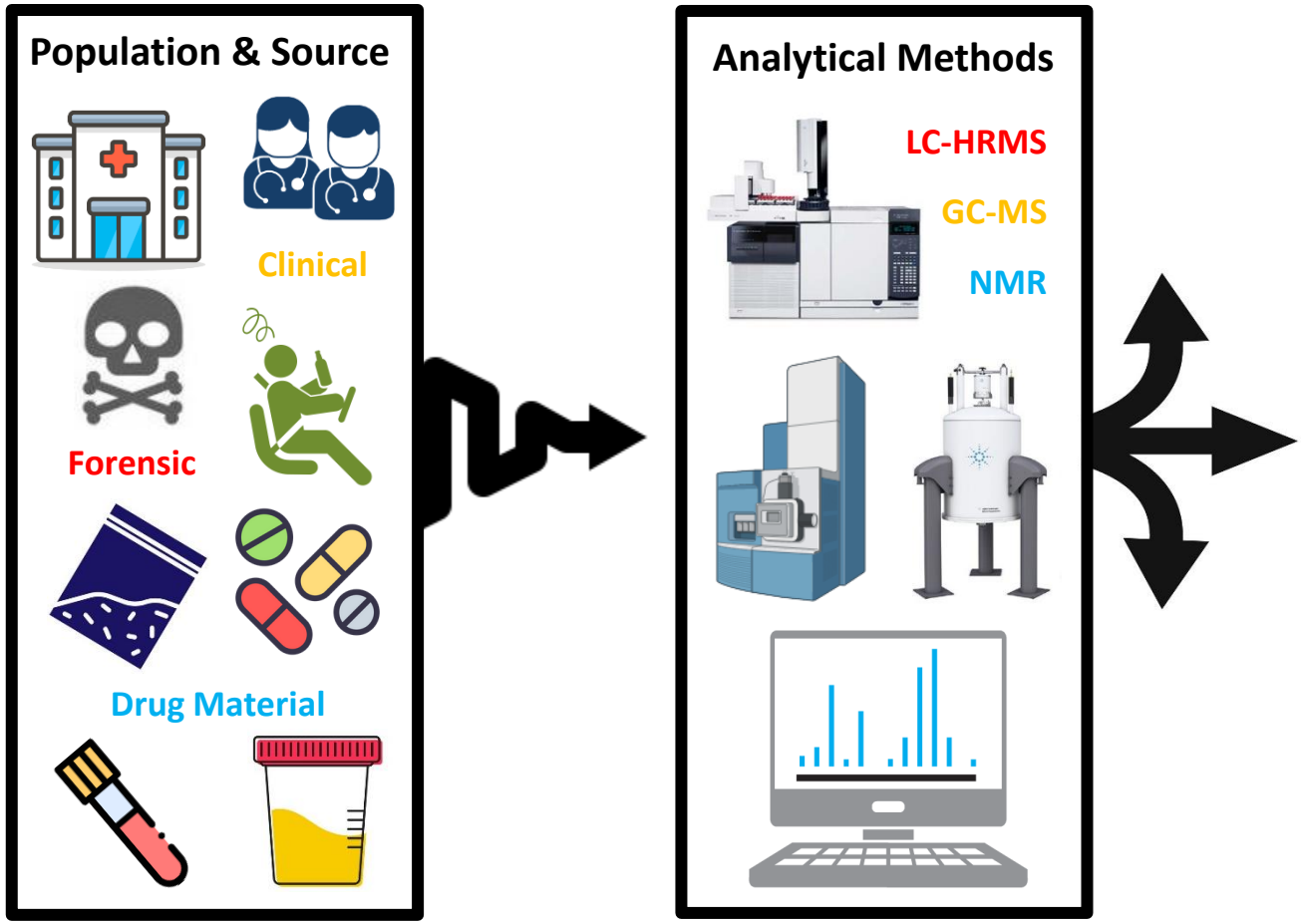
Testing Workflows for NPS



- **Model Scenarios:**
  - Unknown powder found near decedent
  - Suspected drugs overdose with no identifiable cause of death
  - Individuals acting / driving erratically with negative toxicology
  - Patients presenting to emergency department with adverse effects

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Current NPS Trends *(UPDATED)*

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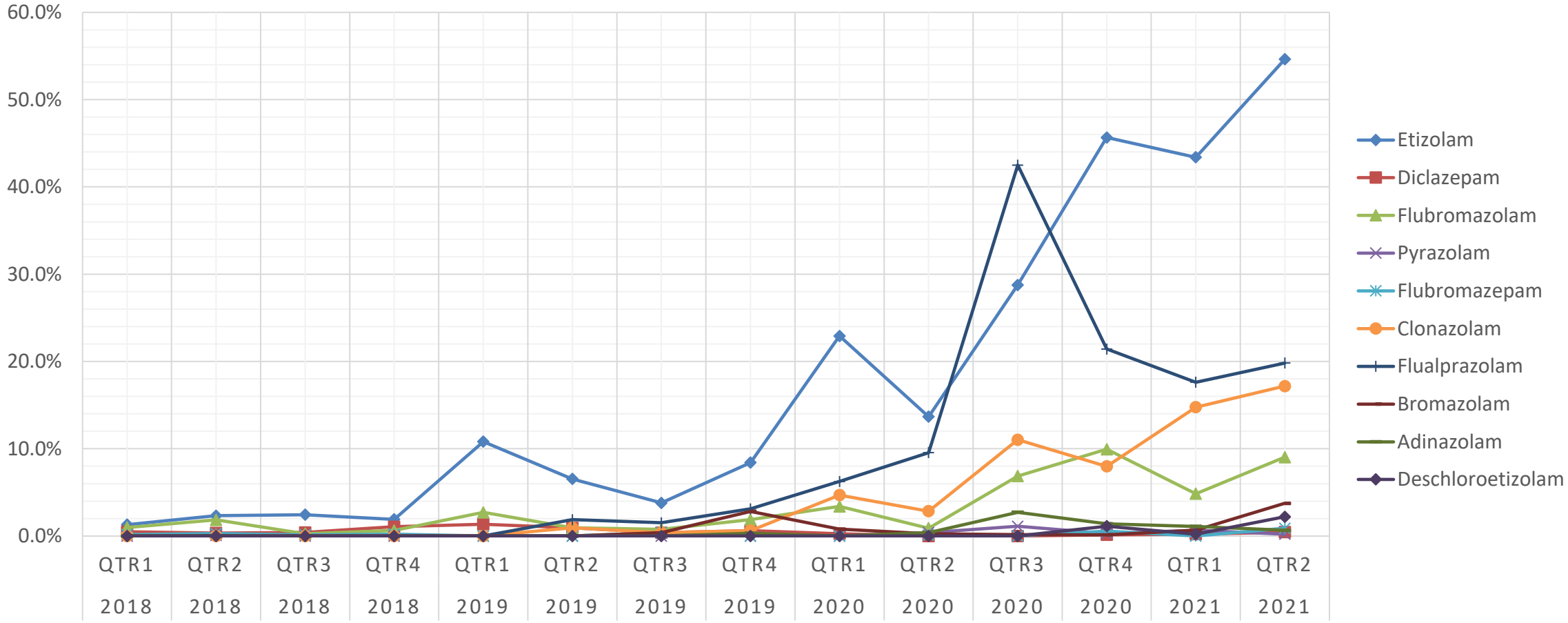
NPS Benzodiazepines



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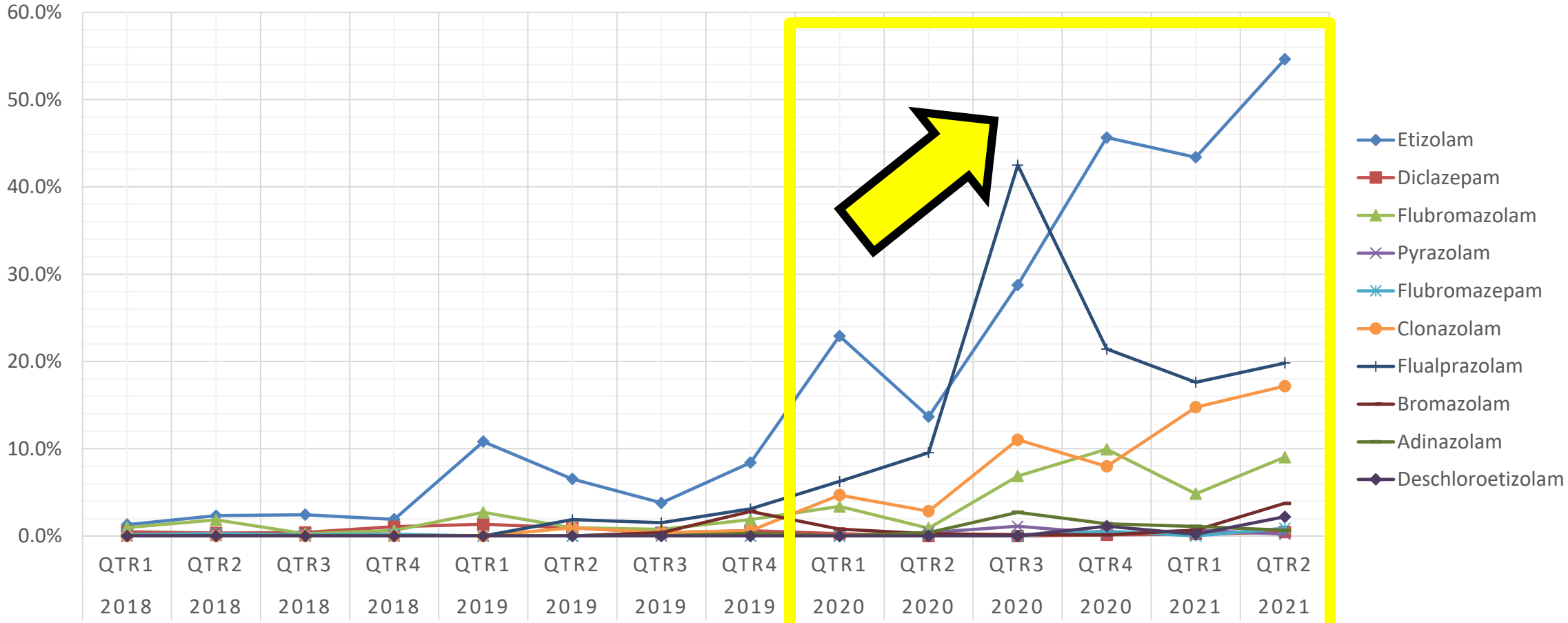
NPS Benzodiazepines



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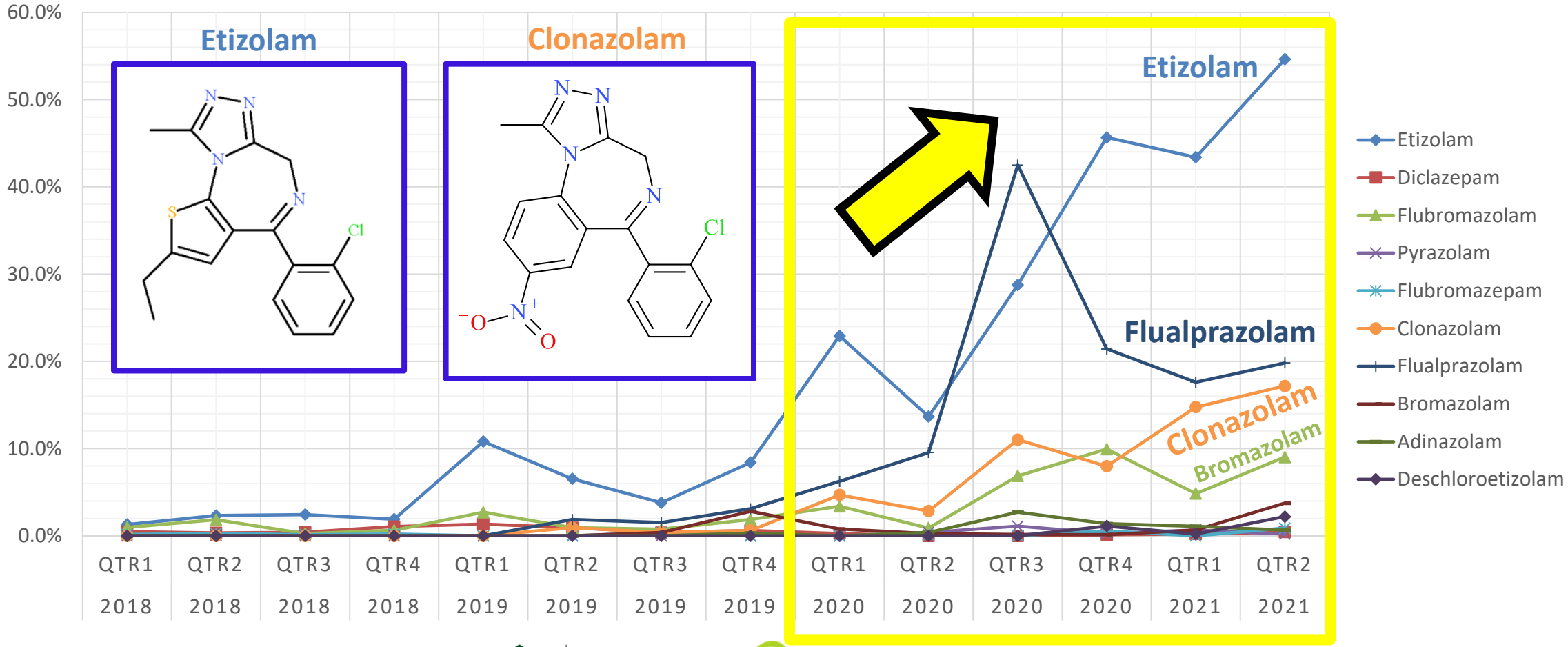
NPS Benzodiazepines



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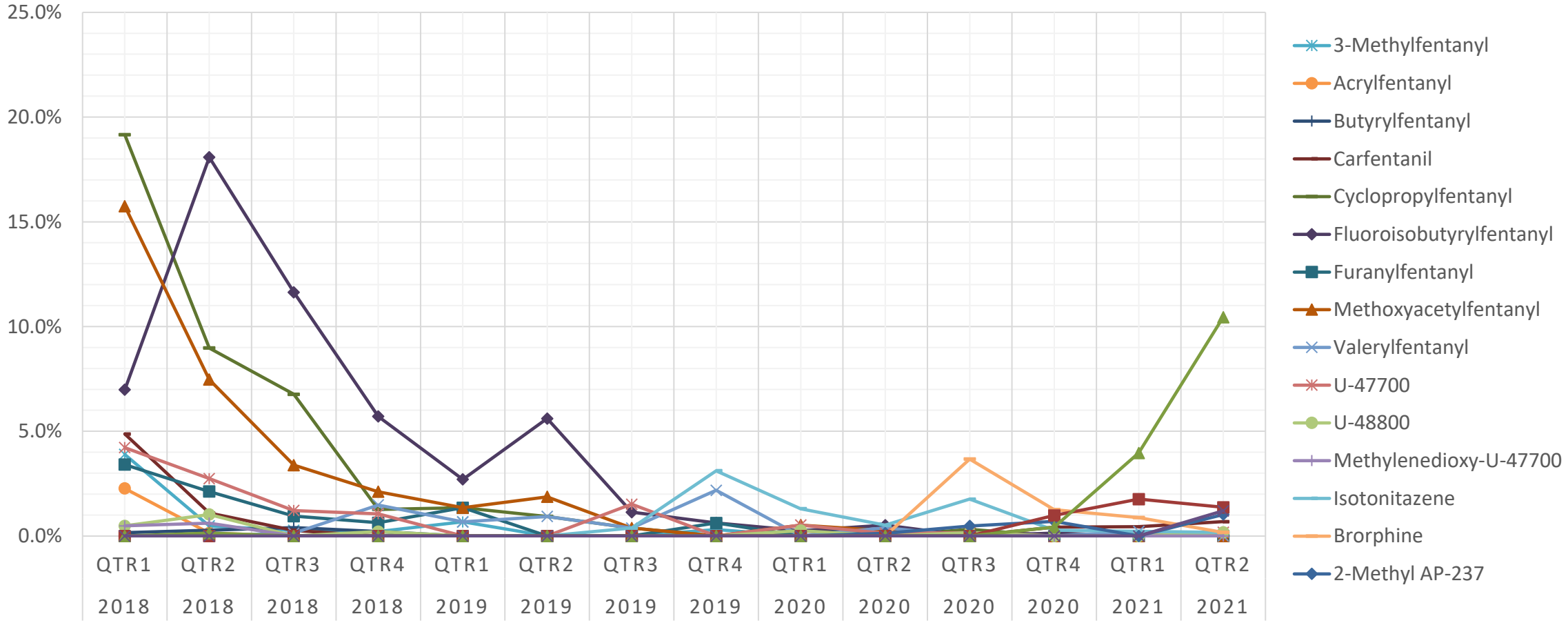
NPS Opioids



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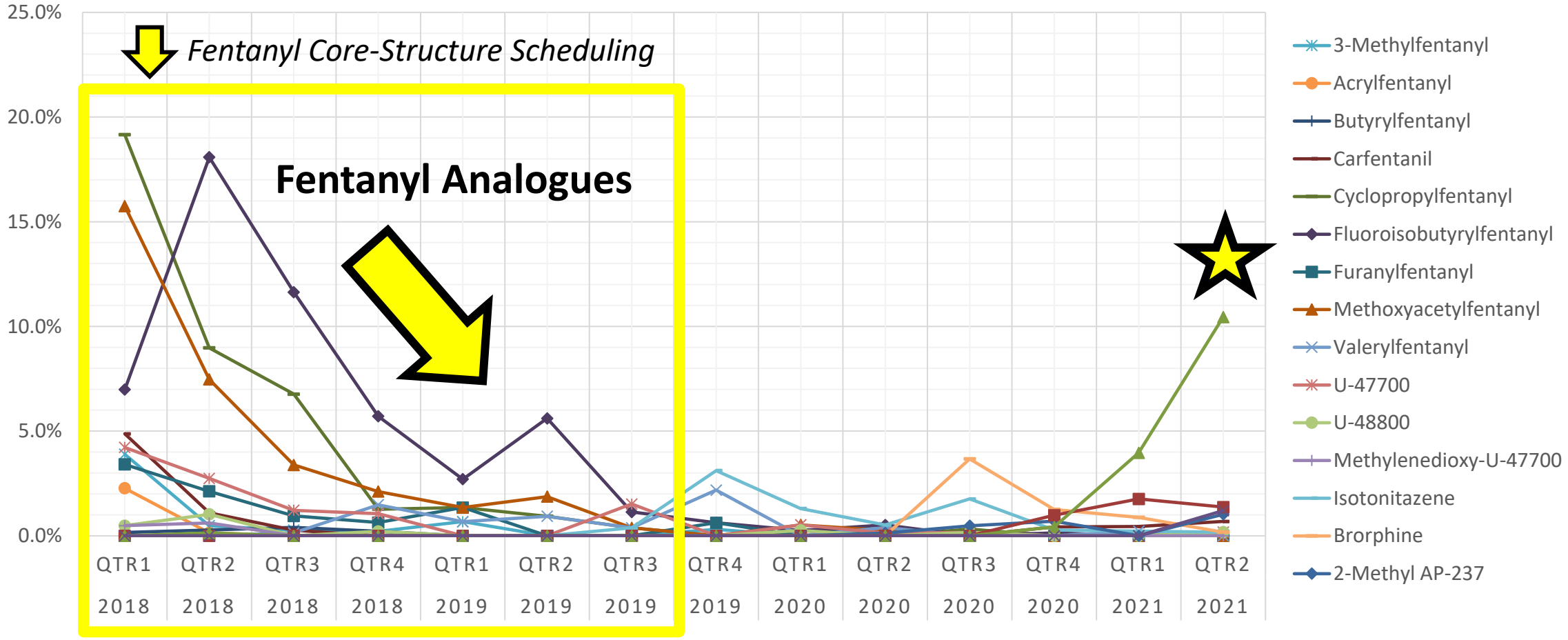
NPS Opioids



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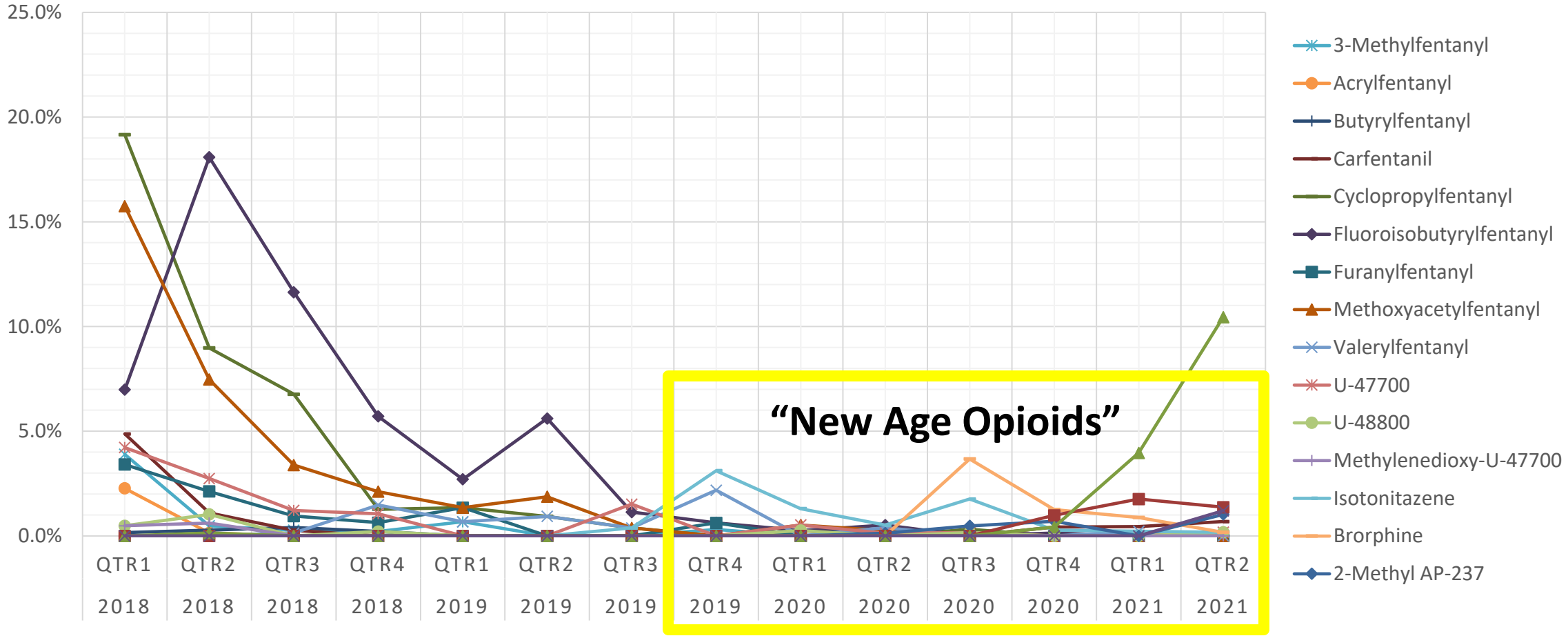
NPS Opioids



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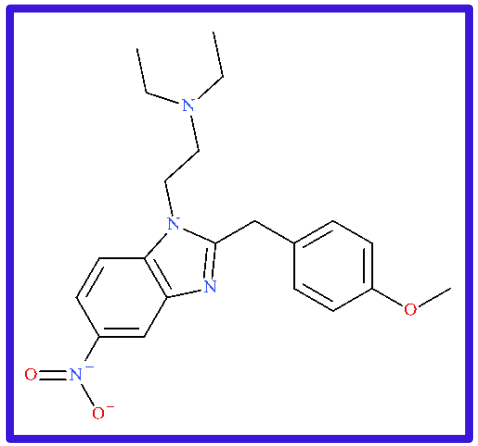
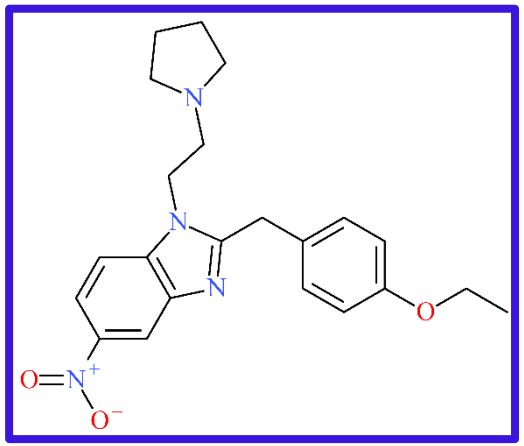
**Rapid Turnover*

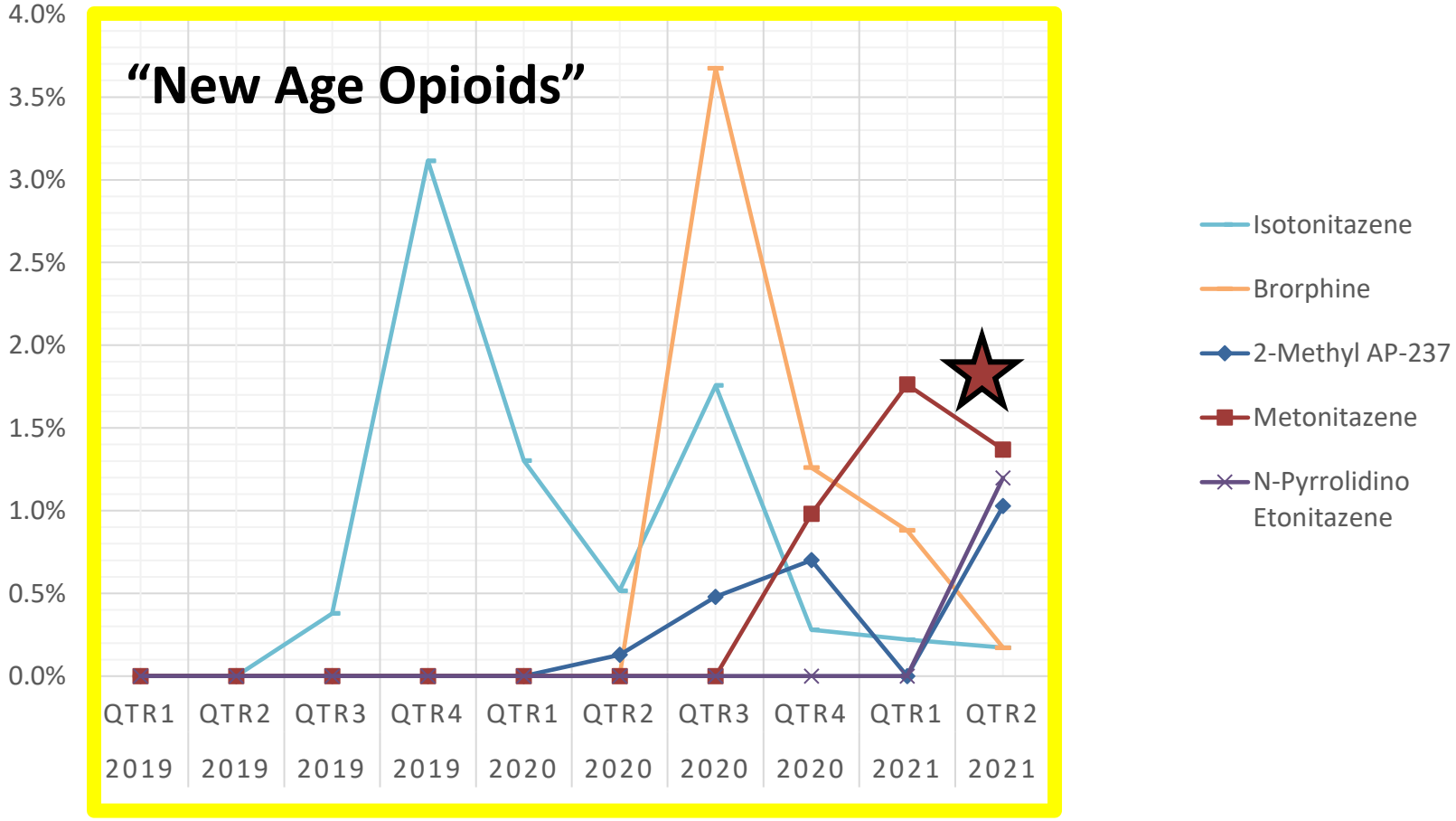
NPS Opioids

Metonitazene



***N*-Pyrrolidino Etonitazene**





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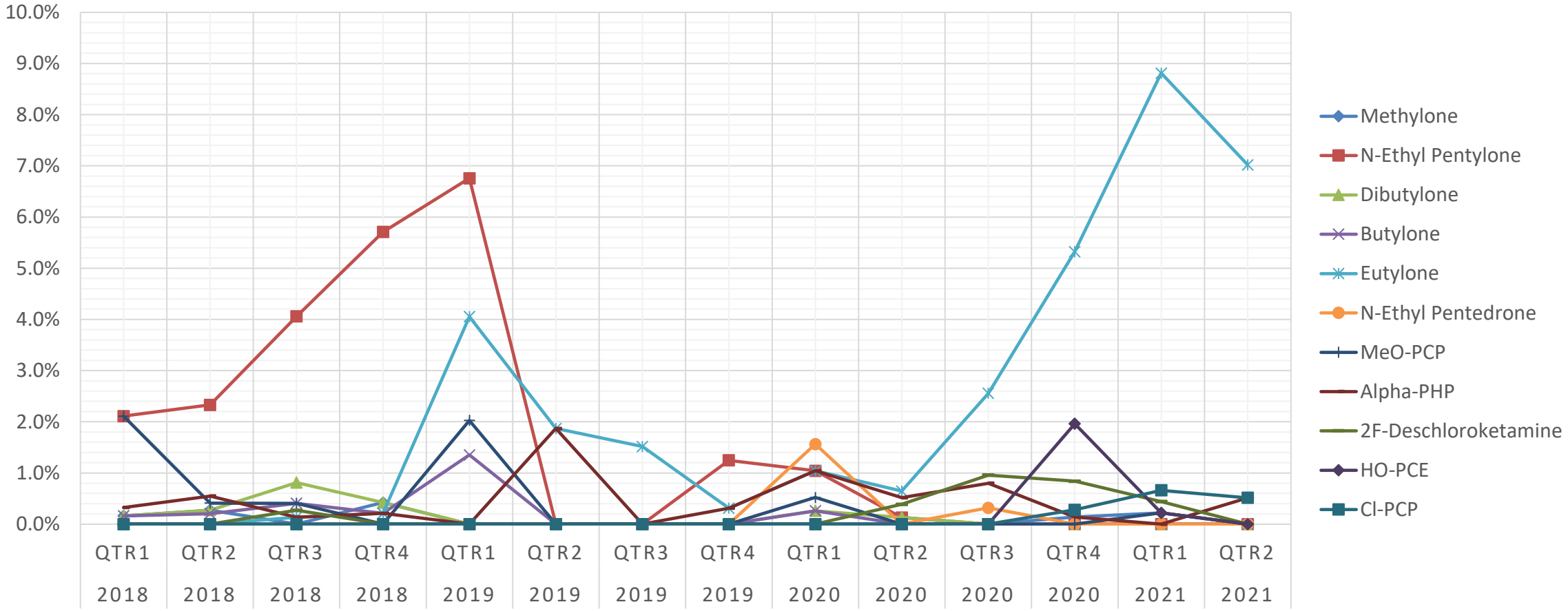
**Rapid Turnover*

NPS Stimulants and Hallucinogens



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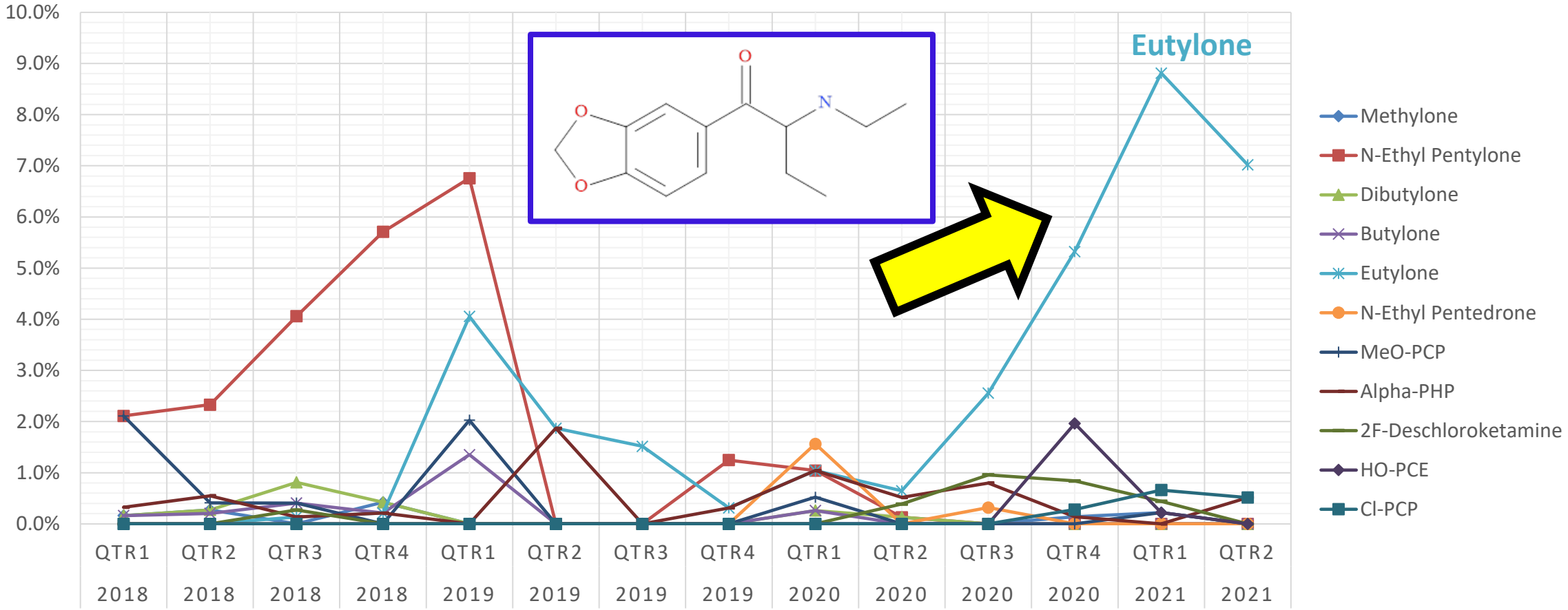
NPS Stimulants and Hallucinogens



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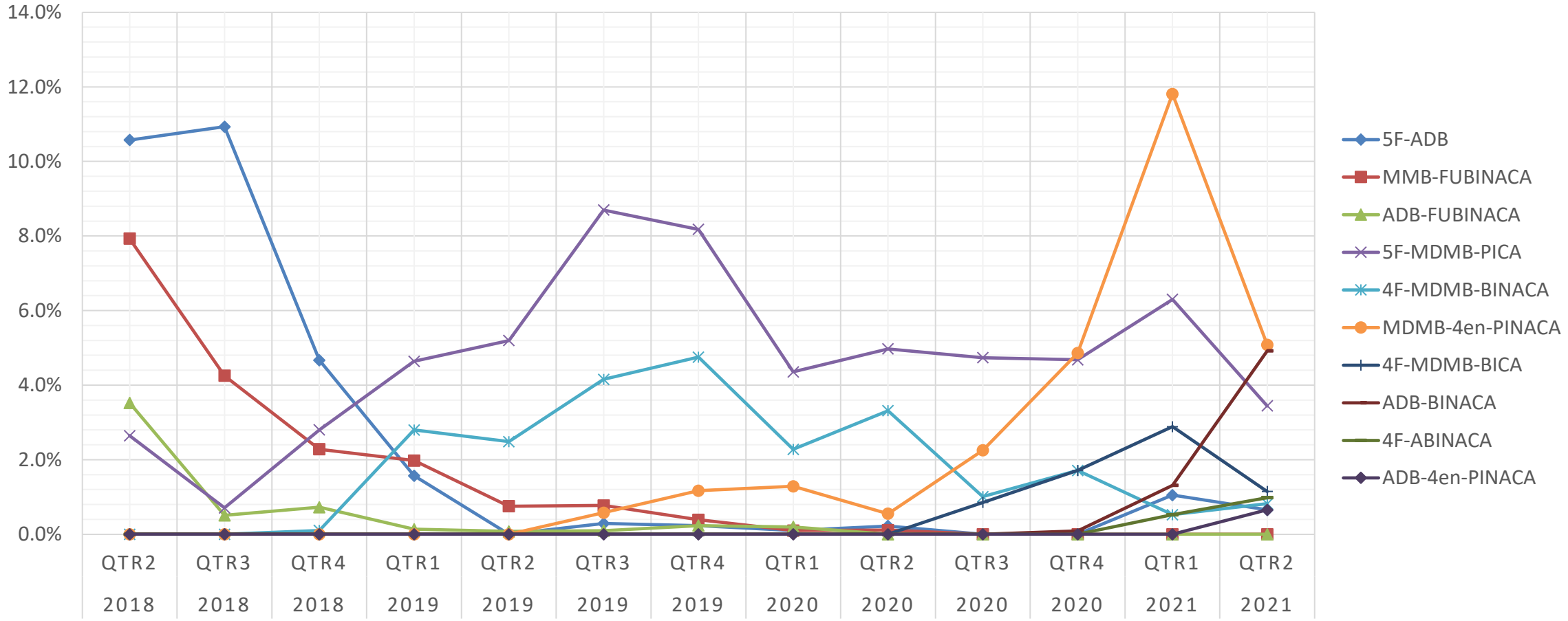
Synthetic Cannabinoids



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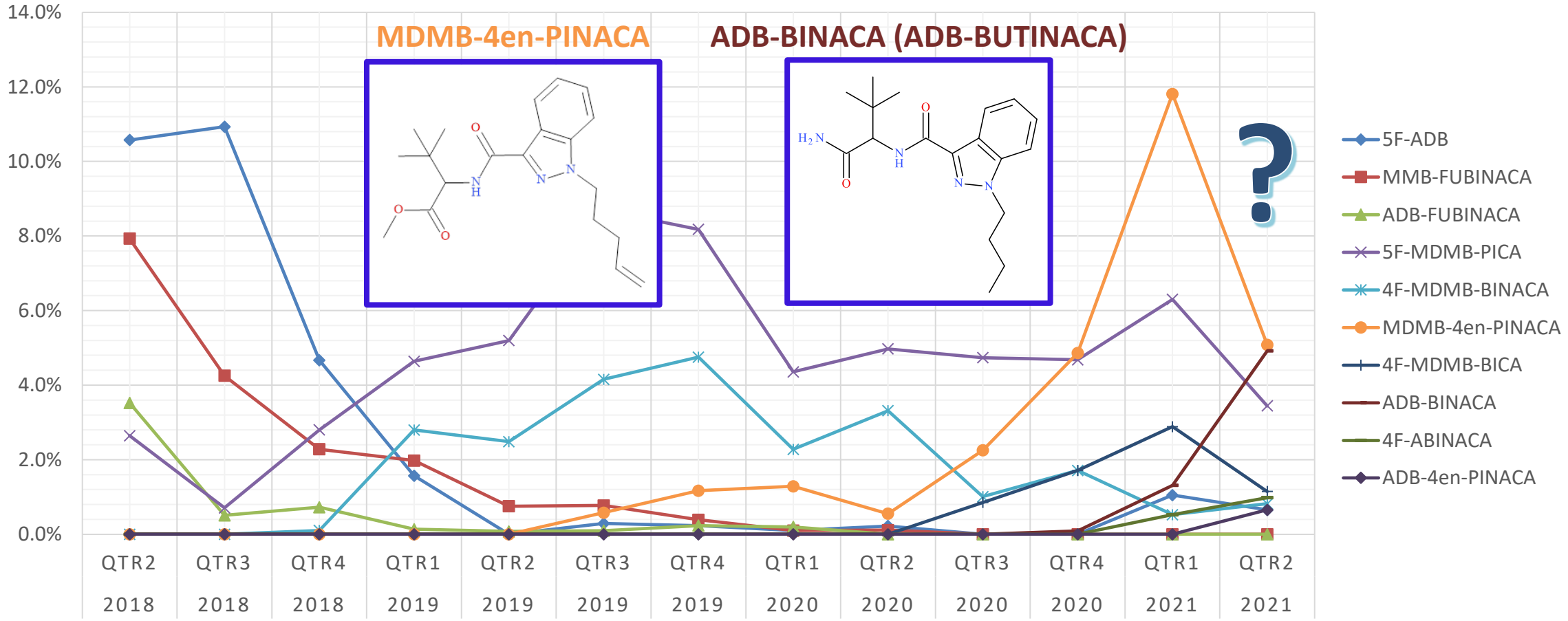
Synthetic Cannabinoids



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Emerging Market Trends

- **NPS Benzodiazepines**
  - New drugs continue to appear, more so than in previous years
  - Retain simple chemistry but can vary in potency and effects
  - “-lams” are most common (etizolam)

- **NPS Stimulants and Hallucinogens**
  - Same stimulant, little turnover
  - New hallucinogens
    - PCP and ketamine analogues

- **NPS Opioids**
  - Increased potency → challenging
  - Rapid emergence and turnover
  - Increased sub-class variety
  - “Nitazene” analogues and AP series

- **Synthetic Cannabinoids**
  - Less structural variety in recent years***
  - Retaining high potency
  - More “ADB-” variants emerging

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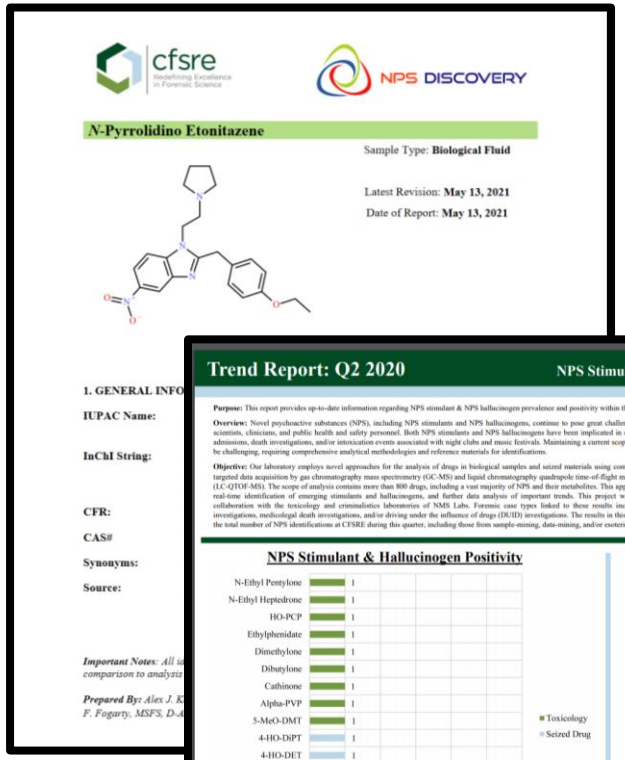
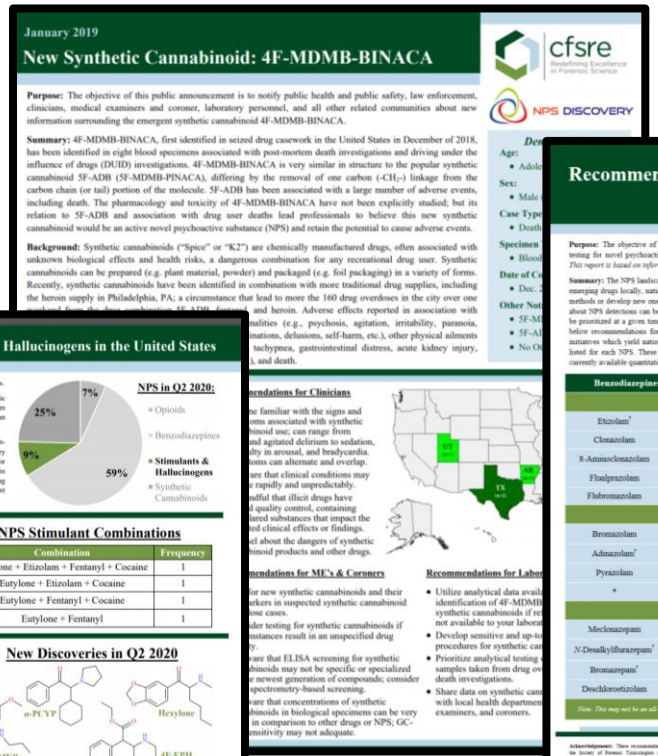
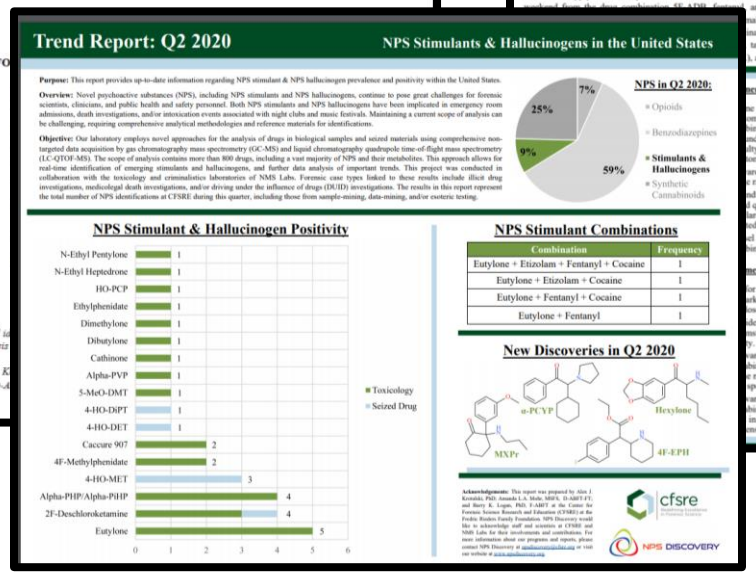
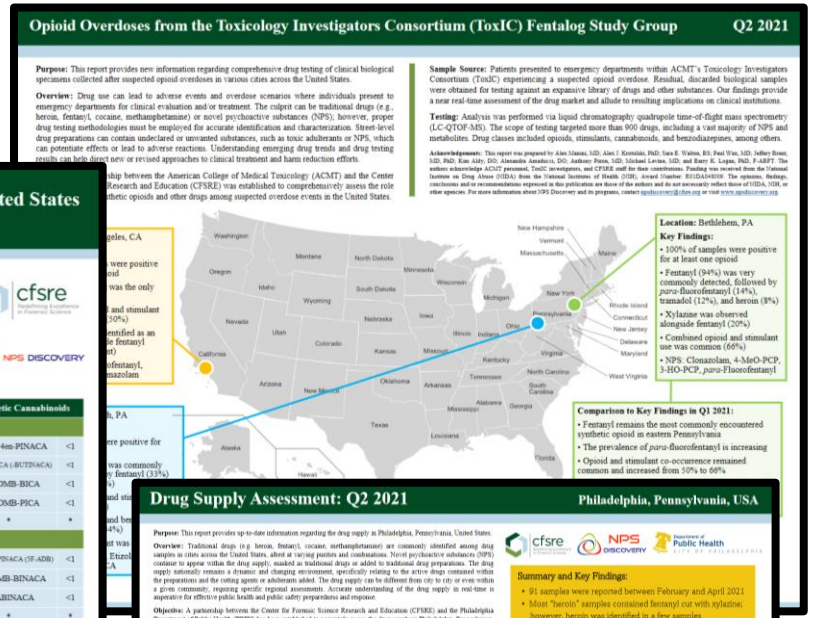
NPS Discovery Reports → www.npsdiscovery.org









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Thank You!

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