

# *Vaping Illicit Substances: What is REALLY in There?*

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# VAPES

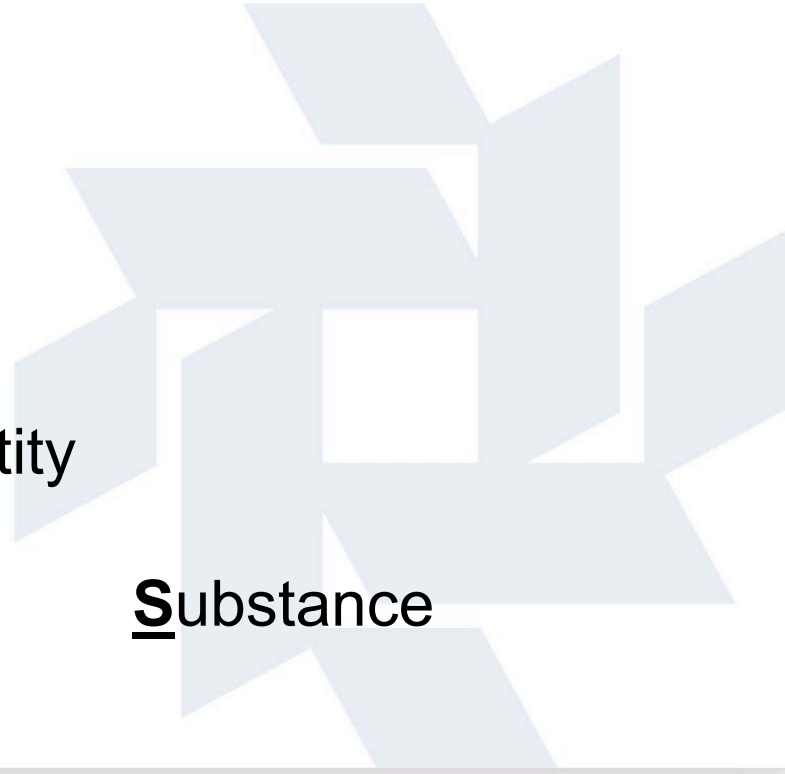
Vaping

Any

Potential

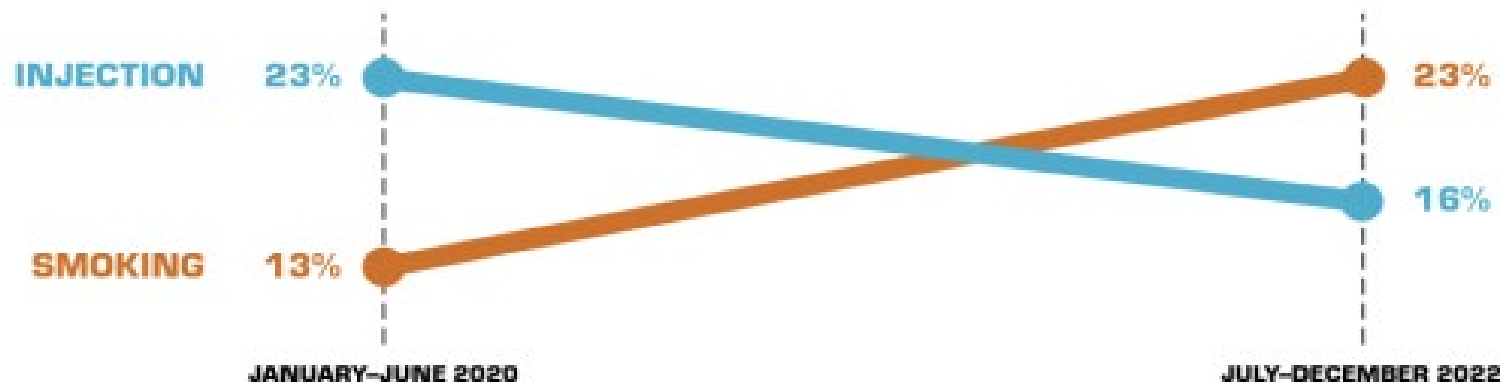
Entity

Substance





# In the U.S., the leading route of drug use involved in overdose deaths changed from injection to smoking\*



Consider enhancing harm reduction services to reach people who use drugs by smoking

Provide naloxone and  
fentanyl test strips

Conduct peer outreach

Emphasize risk of overdose  
when drugs are smoked



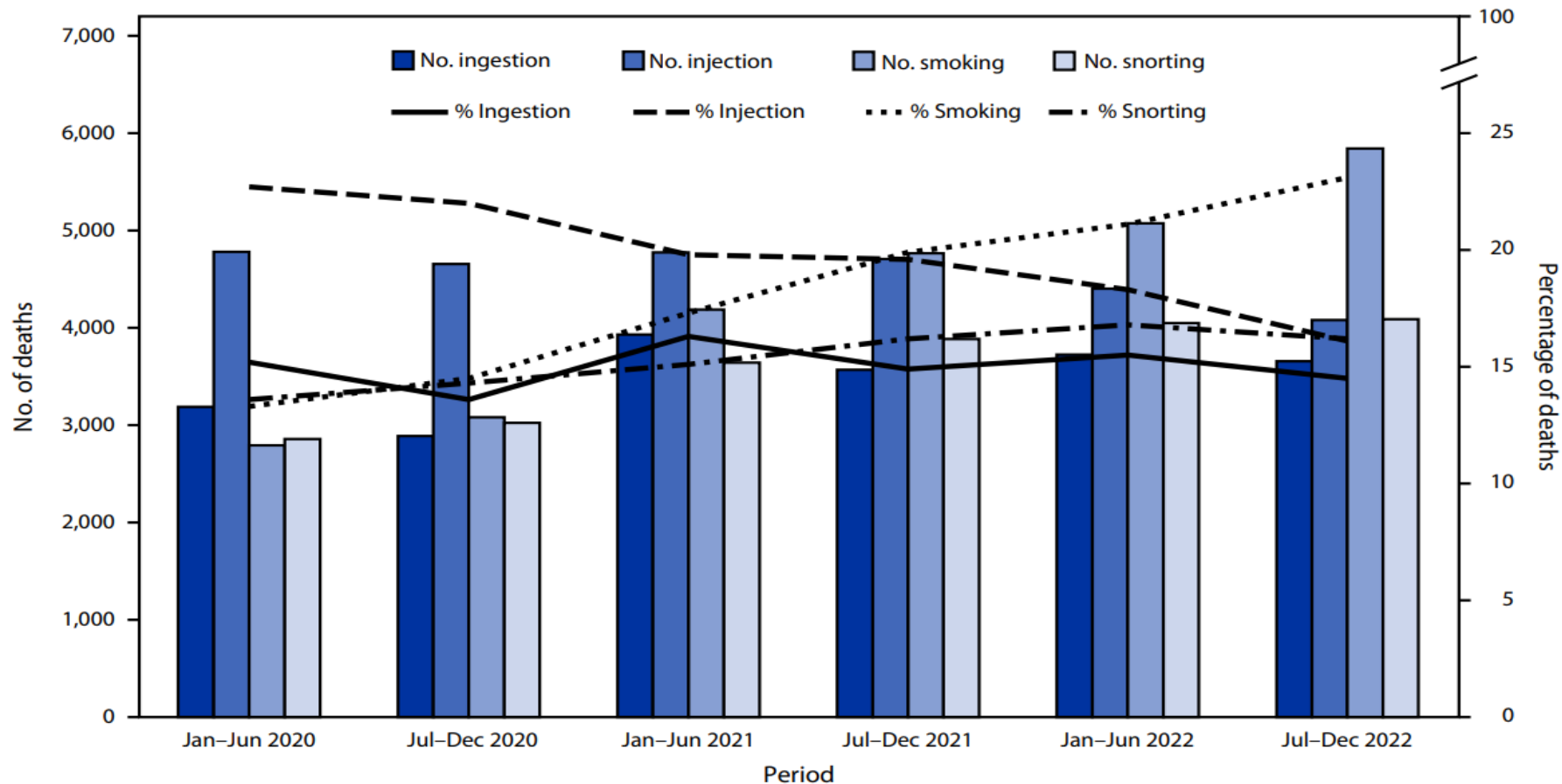
\*CDC's State Unintentional Drug Overdose Reporting System (SUDORS)

[bit.ly/mm7306a4](https://bit.ly/mm7306a4)

FEBRUARY 15, 2024

MMWR

**FIGURE 1. Number and percentage of drug overdose deaths with evidence of selected routes of drug use,<sup>\*,†</sup> by 6-month period of death (N = 139,740) — State Unintentional Drug Overdose Reporting System, 28 jurisdictions,<sup>§,¶</sup> January 2020–December 2022**



# Technology's “Iatrogenic” Effect

***“Technology is making it easier  
for people to die.”***

*Captain Jason M. Piotrowski  
New Jersey State Police*

*3/21/24*

*Phone & Vapes*

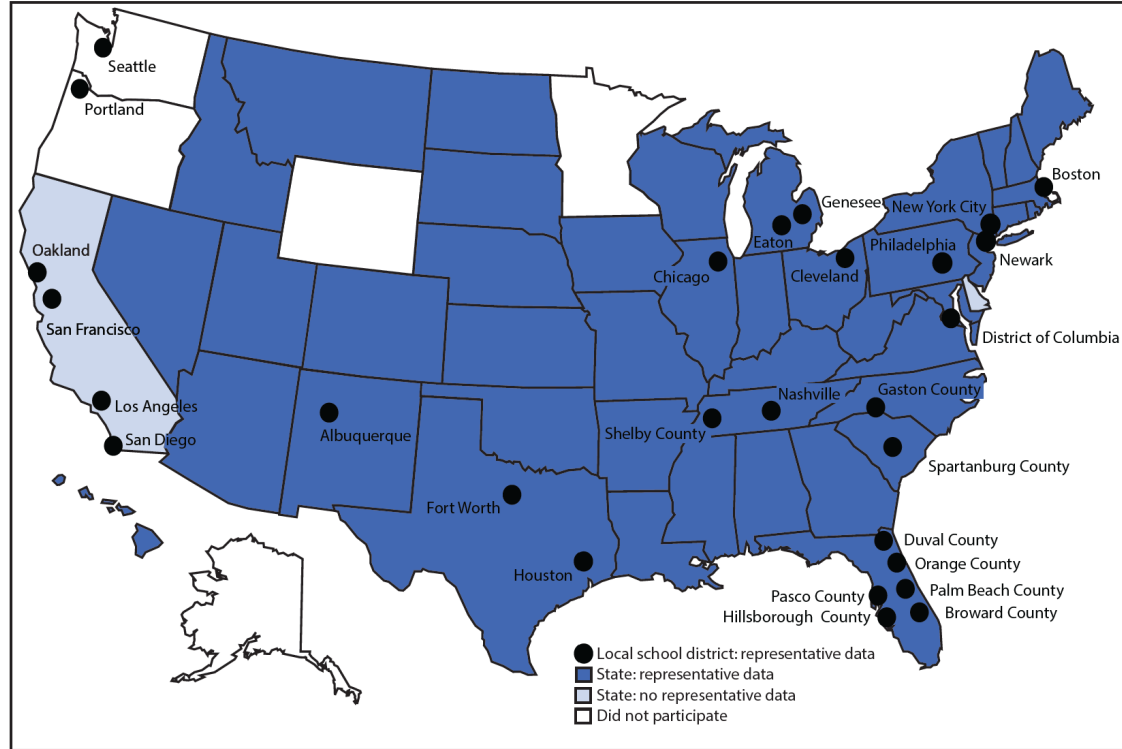
# Electronic Vapor Product – National DATA

**Survey Data**

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# Electronic Vapor Product Use Among High School Students — Youth Risk Behavior Survey, United States, 2021

FIGURE 1. State, tribal government, territorial, and local school district Youth Risk Behavior Surveys — selected U.S. sites, 2021



Oliver BE, Jones SE, Hops ED, Ashley CL, Miech R, Mpofu JJ. Electronic Vapor Product Use Among High School Students — Youth Risk Behavior Survey, United States, 2021. *MMWR Suppl* 2023;72(Suppl-1):93–99. DOI: <http://dx.doi.org/10.15585/mmwr.su7201a11>

# Electronic Vapor Product Use Among High School Students — Youth Risk Behavior Survey, United States, 2021

TABLE 2. Prevalence of electronic vapor product\* use among high school students, by sex, race and ethnicity, and sexual identity — Youth Risk Behavior Survey, United States, 2021

Behavior	Ever used an electronic vapor product <sup>†</sup>	Currently used electronic vapor products <sup>§</sup>	Daily use of electronic vapor products <sup>¶</sup>
	% (95% CI)**	% (95% CI)	% (95% CI)
<b>Total</b>	36.2 (33.7–38.8)	18.0 (16.3–19.8)	5.0 (4.4–5.7)
<b>Sex</b>			
Female	40.9 (37.6–44.2)	21.4 (19.2–23.8)	5.6 (4.6–6.8)
Male	32.1 (29.7–34.5)	14.9 (13.3–16.7)	4.5 (3.9–5.2)
<b>Race and ethnicity<sup>††</sup></b>			
American Indian or Alaska Native	33.5 (23.8–44.8)	23.2 (16.5–31.7)	4.4 (1.7–10.7)
Asian	19.5 (14.1–26.5)	5.5 (4.2–7.2)	1.2 (0.5–2.8)
Black	33.6 (30.4–37.0)	14.0 (12.3–16.0)	3.1 (2.0–4.7)
Native Hawaiian or other Pacific Islander	36.1 (29.2–43.7)	24.7 (17.2–34.3)	8.0 (3.6–16.8)
White	36.7 (34.2–39.3)	20.3 (18.4–22.2)	6.5 (5.6–7.6)
Hispanic/Latino	40.4 (36.7–44.2)	17.8 (15.3–20.5)	3.4 (2.9–4.1)
Multiracial	36.8 (30.9–43.2)	17.1 (13.4–21.5)	5.3 (4.0–6.8)
<b>Sexual identity</b>			
Heterosexual	34.7 (32.4–37.1)	16.4 (15.1–17.8)	4.4 (3.8–5.1)
Gay or lesbian	34.4 (25.5–44.6)	15.8 (11.1–22.0)	5.0 (2.9–8.6)
Bisexual	48.9 (44.2–53.6)	29.0 (25.4–32.8)	7.5 (5.7–9.9)
Other or questioning <sup>§§</sup>	33.5 (29.2–38.0)	15.7 (12.9–18.9)	4.6 (3.3–6.3)

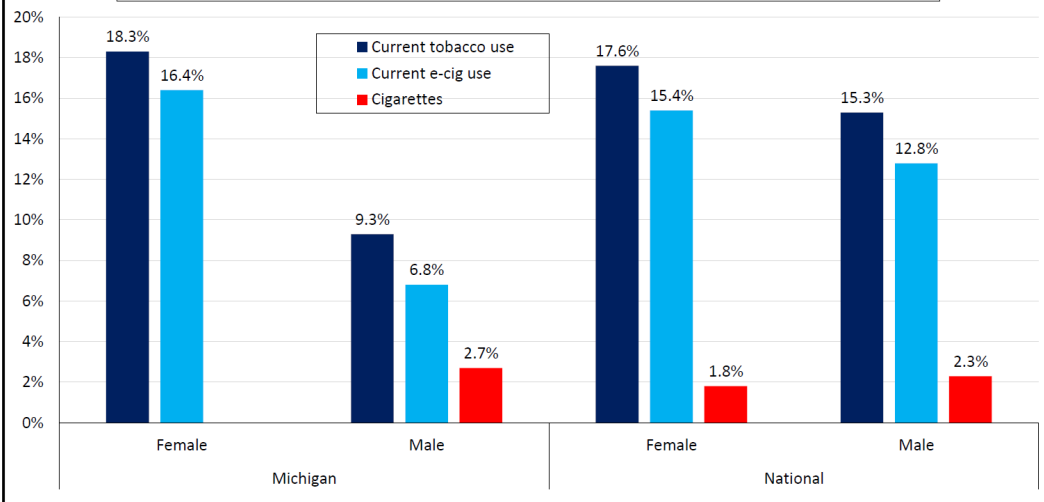
# Electronic Vapor Product – State Level Data

**Survey Data**

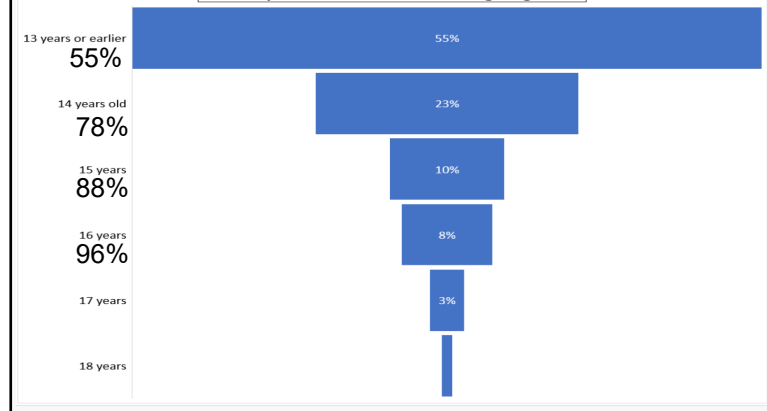
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# Electronic Vapor Product Use in Michigan Among Youth

Current tobacco use, e-cigarette use and cigarette smoking rates among HS students in Michigan compared to the national average by gender, 2023

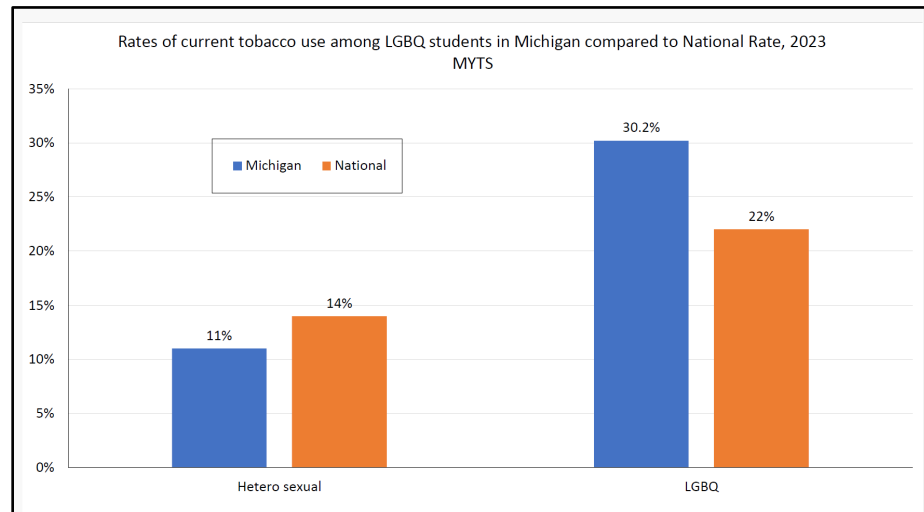
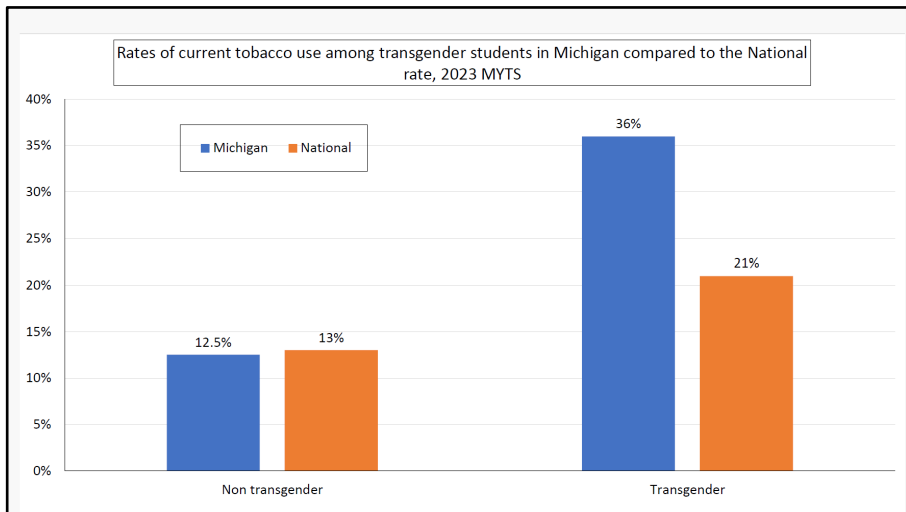


How old you were when first tried using e-cigarette?



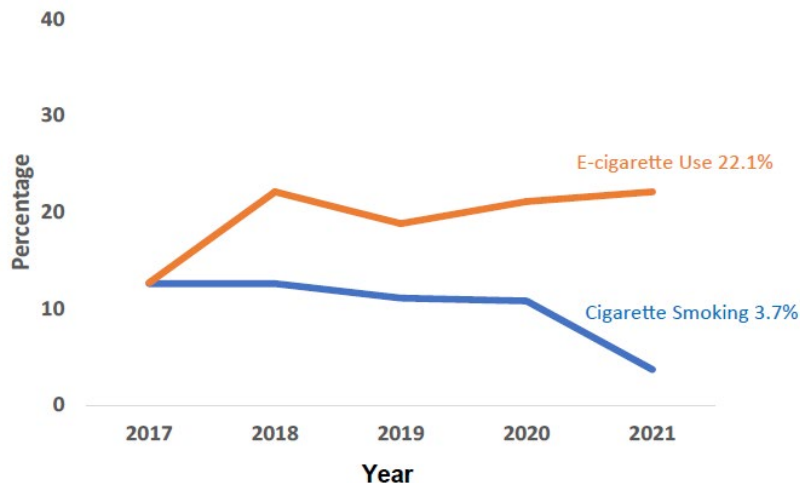


# Electronic Vapor Product Use in Michigan Among Youth



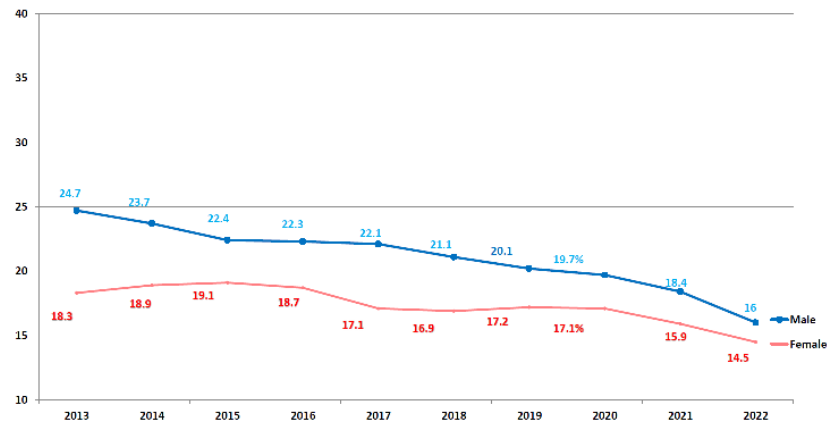
# Electronic Vapor Product Use in Michigan Among Adults

Percentage of Young Adults Ages 18-24 Who Currently Smoke Cigarettes\* or Who Currently Use E-Cigarettes,\*\* Michigan, 2017-2021.



In 2021, approximately 7.6% of Michigan adults reported currently using e-cigarettes or other electronic vaping products

State from BRFSS... Adult Current Smoking Rate by Gender, Michigan-  
BRFSS 2013-2022



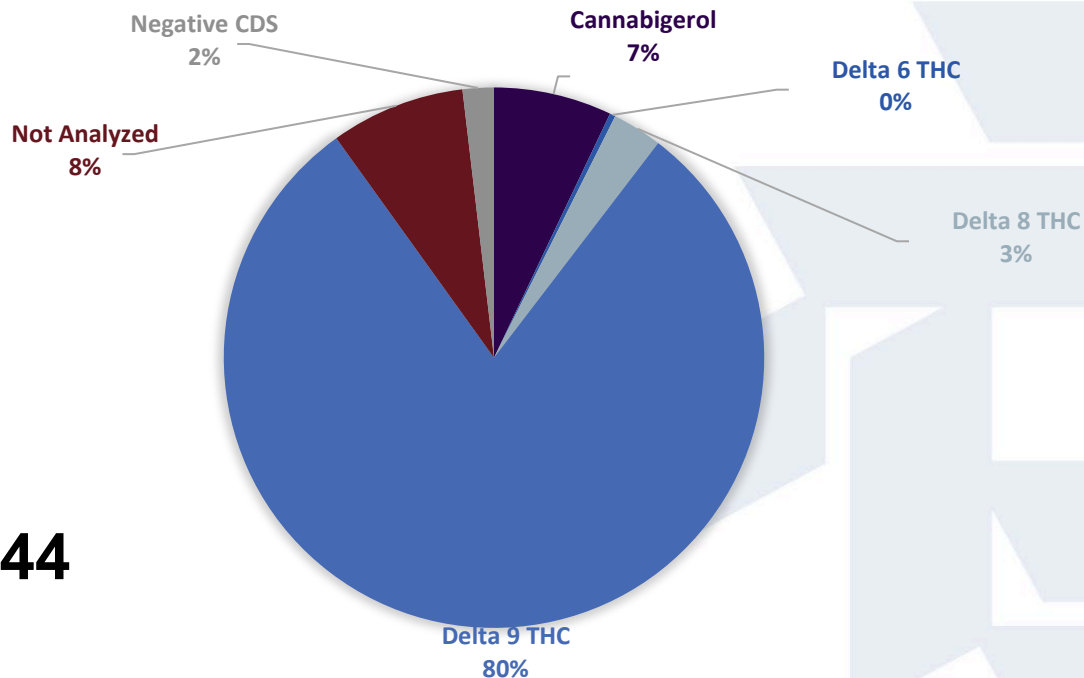
# Electronic Vapor Product – State Level Data

**Illicit Substances, Overdoses & Dangers**

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# NJ State Police Office of Forensic Sciences Substances Identified in Vaping Instruments 2014-2023

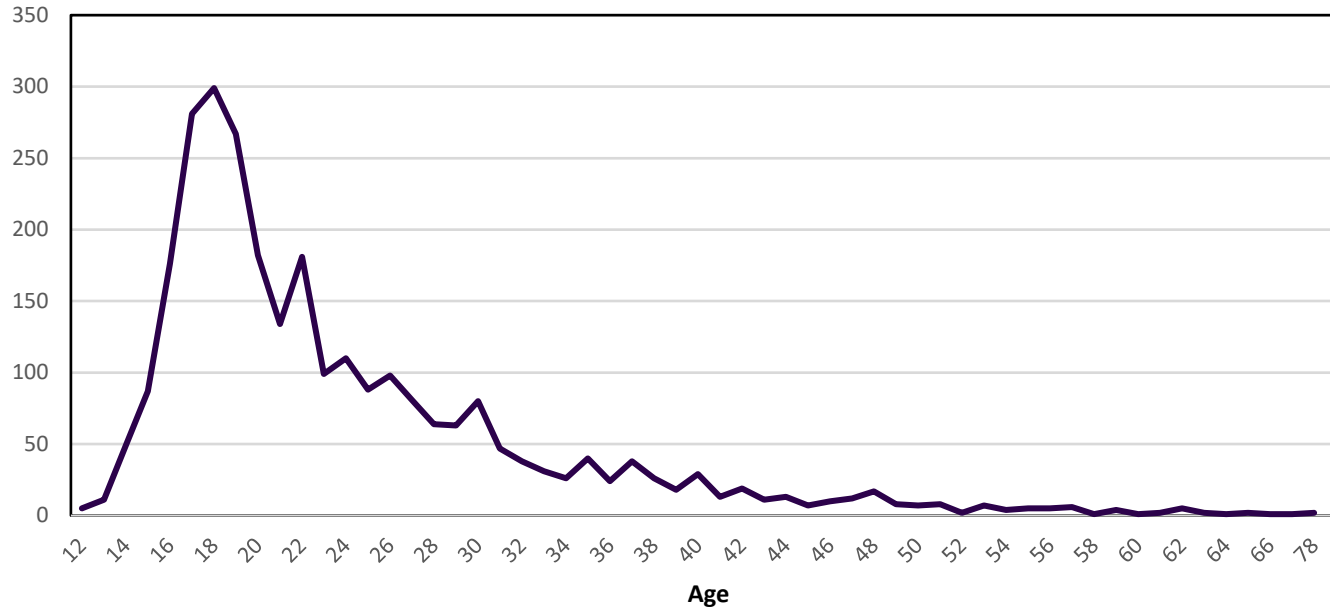
## VAPING SUBSTANCES IDENTIFIED



**Total: 2,944**

# Possession of Illicit Substances in Vape Pens: Demographics

Age Distribution

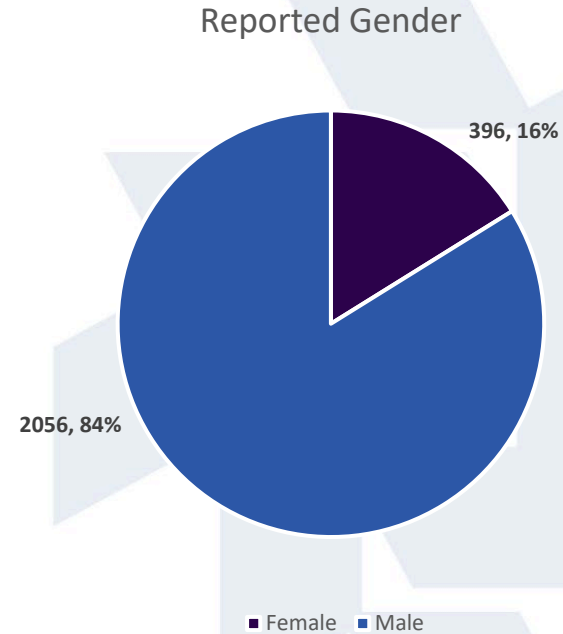
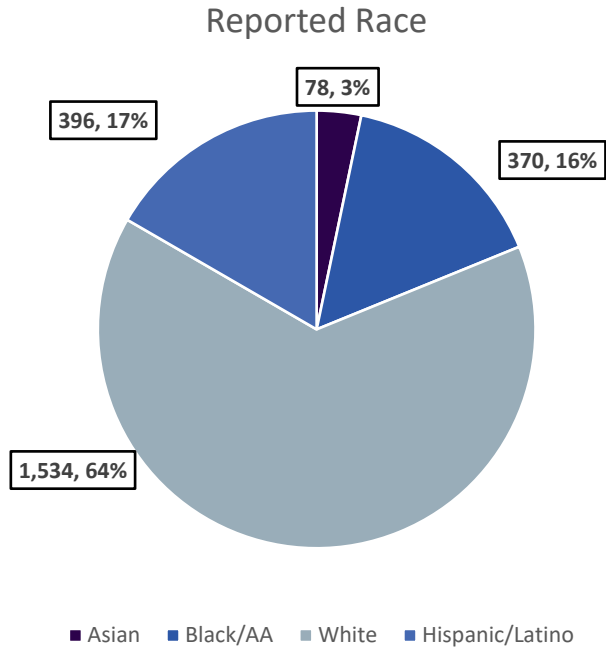


**Total People: 2,849**

**Median Age: 23**

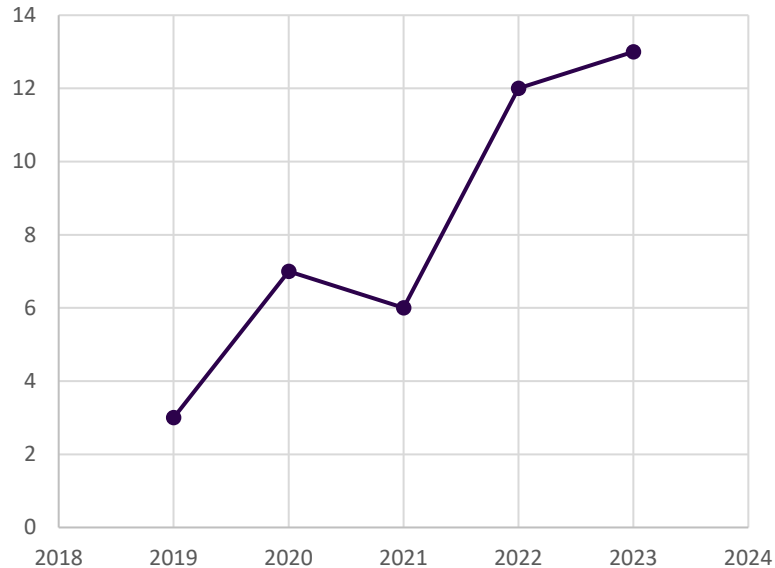
**Peak Age: 18**

# Possession of Illicit Substances in Vape Pens: Demographics

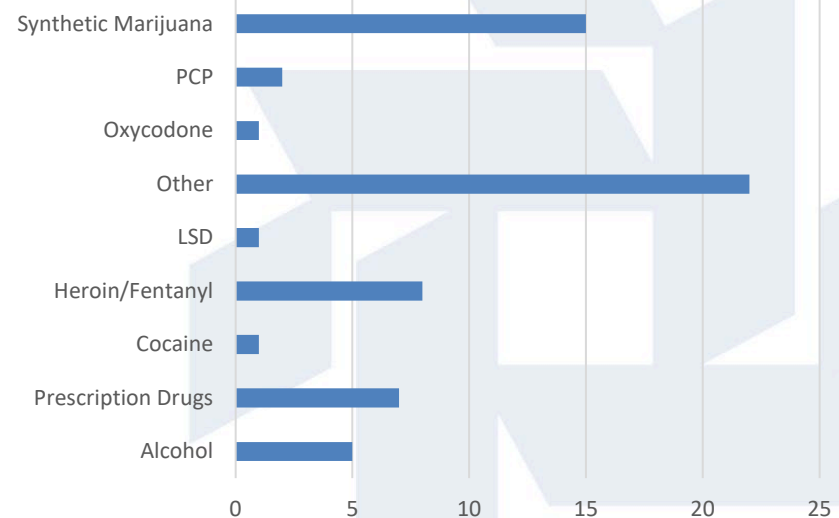


# Electronic Vapor Product Overdose Incidents in NJ ODMAP

Vaping Related Overdoses in ODMAP by Year

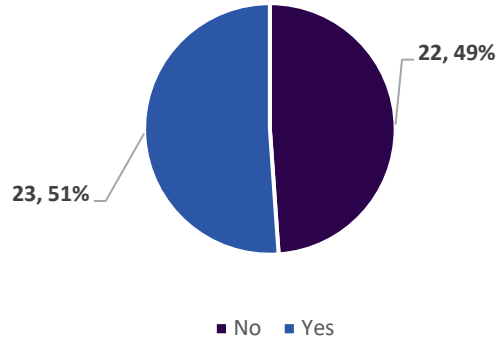


Reported Drugs At Scene of Vaping Involved Overdose

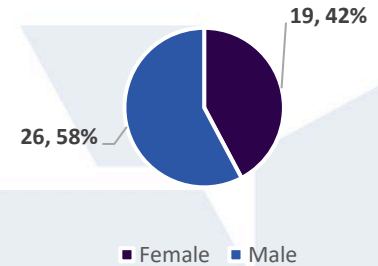


# Electronic Vapor Product Overdose Incidents in NJ ODMAP

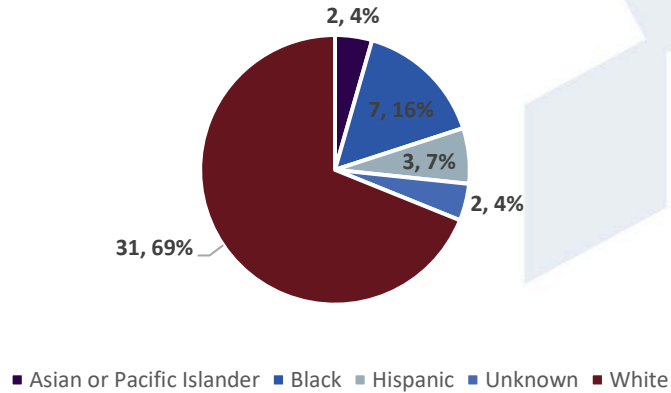
## Naloxone Administered



## Vaping Related Overdoses by Gender



## Vaping Related Overdoses by Race





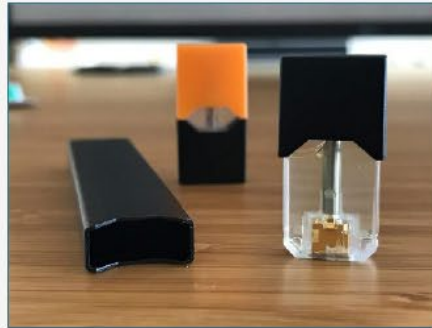
# Delivery Systems

***A Vaping Device is a Delivery System***

***Just Like a Syringe***



## Fifth Generation



## DELIVERY SYSTEM

- POD MODS
  - "Ultra-portable" = Easy to Conceal
  - Nic-Salts
  - EtOH Content?

## ***“Hacking the JUUL”***

- Instructions on how to “hack”/modify the JUUL device
- For use of JUUL device with DIY juices/cannabis oil
- <https://www.youtube.com/watch?v=5a9NjklJxYE>
- Instructions on YouTube
- Duration: 90 seconds
- Another YouTube Video with Instructions:
- Whack it
- No Bubbles
- Block the coil for a bigger hit



**ENDS = EDDS**

Electronic Nicotine Delivery System

is now an

Electronic Drug Delivery System



# ***The New Kids in Town...***

## ***Nicotine Analogues***

An abstract graphic composed of several light blue, semi-transparent geometric shapes, including squares and rectangles, arranged in a complex, overlapping pattern on the right side of the slide.



# Non-Tobacco Nicotine Analogues in Vapes

William J Lynch Jr Clinical Pharmacist

Salina Doan PharmD Candidate 2025



# Introduction

- In February 2021, PuffBar started selling disposable e-cigarettes in USA containing synthetic nicotine<sup>1</sup>
  - Claiming to be exempt from federal & state laws regulating tobacco-derived nicotine
- As of April 2022, FDA has been authorized to regulate tobacco products containing nicotine from any source, including laboratory synthesis
  - Requiring manufacturers to submit premarket tobacco product application (PMTA)
- Recent WHO report warned that non-nicotine tobacco alkaloids or synthetic nicotine analogues found being used by manufacturers to bypass regulatory schemes
  - Non-nicotine tobacco alkaloids such as anabasine, nornicotine, natabine, & myosmine have well-known addictive & reinforcing effects
- Since 1970s, tobacco companies also developed various synthetic nicotine analogues whether they could be used to dissociate nicotine's central & peripheral effect
  - Have never been used in commercial products until now



# Nicotinamide

- Form of vitamin B3 with no known pharmacological activity at nicotinic receptor<sup>2</sup>
  - In rodent studies, nicotinamide administration demonstrated to have sedative effects, in contrast to nicotine's stimulatory effects
  - Nicotinamide doses used in these studies were several-fold higher than nicotine's median lethal dose (LD50), suggesting nicotinamide lacks stimulatory & toxic effects through nAChRs
- No published reports have demonstrated that nicotinamide is either nicotinic acetylcholine receptor (nAChR) agonist or is metabolized to form nicotine
- Products that contain nicotinamide:
  - Nixamide (Nic-Safe), proprietary blend of nicotinamide (CAS Reg. No. 98-92-0) & either vegetable glycerin ("VG"), propylene glycol ("PG"), or combinations thereof<sup>3</sup>
  - Nixodine, unique blend of nicotinamide & other carefully selected proprietary ingredients<sup>4</sup>
  - Nixotine, flavored Nixodine





# Nicotinamide

- Vendors may claim that their nicotinamide-containing products should be regulated as foods or supplements, with nicotinamide designated as 'Generally Recognized as Safe' (GRAS) as food additive<sup>2</sup>
  - GRAS designation does only apply for conditions of intended use scenario as food additive & does not apply to inhalational intake through an e-cigarette
- Inhalation toxicity data is not available
- Chemical safety documentation materials warn that exposure to nicotinamide powder may cause respiratory irritation, recommending to avoid formation of dust & aerosols



# 6-Methylnicotine (6-MN)

- 3x more potent in binding to nAChRs & more toxic (1.5x to 3x lower LD50 dose) based on in vivo study in rats<sup>2</sup>
  - No toxicological data in humans available
- Analogs have never been commercialized & brought to market until now
- Study show increased cytotoxicity compared with nicotine in permanent human bronchial epithelial cell lines (BEAS-2B)<sup>1</sup>
  - Milder effects on upregulation of lung cancer-related proteins



# 6-Methylnicotine (6-MN)

- Products that contain 6-MN
  - Spree Bar uses Metatine, patented non-nicotine compound that provides adult users with a strong sense of satisfaction that is largely indistinguishable from traditional vape products<sup>5</sup>
  - Imotine, benzoic acid salt of 6-MN<sup>6</sup>
- Products containing Metatine & other no tobacco-derived material or nicotine do not meet 'tobacco product' definition & do not require PMTA to be sold in USA<sup>1</sup>
- Manufacturer-sponsored study claimed that 6-MN may be less addictive than nicotine

# Letters

## RESEARCH LETTER

### Variability in Constituents of E-Cigarette Products Containing Nicotine Analogues

Although the Food and Drug Administration (FDA) is authorized to regulate tobacco products and nicotine content, this authority does not extend to chemical analogues of



Multimedia



Supplemental content

nicotine.<sup>1</sup> The manufacturer of a recently introduced e-cigarette (Spree Bar [product 1]; Charlie's Holdings) containing 5% 6-methylnicotine (6MN), a nicotine analogue with an added methyl group, claims it is exempt from FDA tobacco-product regulations, thereby allowing marketing with youth-appealing flavors and avoiding tobacco product taxes.<sup>1</sup> A similar strategy is pursued by vendors of recently introduced e-cigarette liquids containing nicotinamide, marketed as Nixotine, Nixodine, Nixamide, and Nic-Safe (product 2),

that claim to be “carefully designed to target the same nicotinic acetylcholine receptors that traditional nicotine stimulates.”<sup>2</sup> In rodents, 6MN is more toxic and pharmacologically more potent than nicotine, whereas nicotinamide has no known nicotinic receptor activity.<sup>1,3</sup> Human pharmacologic and toxicologic data for nicotine analogues are lacking, raising concerns about their addictive potential and adverse effects. This study characterized and quantified constituents in both products to assess product consistency and inform future risk assessments.

**Methods** | All 9 available flavors of product 1 labeled as containing 5% 6MN and 2 flavors of product 2 at 4 concentrations of nicotinamide (0, 12, 24, and 36 mg/mL) were purchased between November 2023 and February 2024 from 3 major online retailers (VaporFi, Westside Vapor, and ECBlend). Extracted e-cigarette liquids were characterized via untargeted gas chromatography-mass spectroscopy analysis and all detected compounds were identified with

# Variability in Constituents of E-cigarette Containing Nicotine Analogues



- Characterized & quantified constituents in both products to assess product consistency & inform future risk assessment
- Tested products purchased from 2023 & February 2024 from 3 major online retailers:
  - VaporFi
  - Westside Vapor
  - ECBlend
- All 9 available of product 1 label to contain 5% 6MN
  - Blood orange peach
  - Blue razz ice
  - Creamy melon
  - Pineapple coconut
  - Rainbow fruit
  - Strawberry apple melon
  - Strawberry mango
  - Sweet spearmint
  - Watermelon grape
- 2 flavors of product 2 at four concentrations of nicotinamide (0, 12, 24, & 36 mg/mL)
  - Unflavored
  - Cherry

# Results



- 6MN presence was confirmed in all product 1 flavors (9 of 9)
- Both nicotinamide & 6MN were detected in product 2 samples labeled as containing nicotinamide (6 of 8)
- No samples contained nicotine
- Product 1 sampled labeled as containing 5% 6MN (50 mg/g) contained only 5.8-6.3 mg/g (87%-88%) less than labeled
- Product 2 samples contained 7% to 46% less than labeled nicotinamide contents
  - With discrepancies largest in product with highest labeled concentration
- Product 2 labels did not list 6MN as ingredient
  - 6MN was detected if nicotinamide was present

Table. Discrepancy in Labeled and Measured Nicotine Analogue Content in E-Cigarettes and E-Cigarette Liquids, Solvent Ratio, and Content of Artificial Sweeteners, Synthetic Coolants, and Other Flavor Compound Presence

Product	Label nicotine alternative content	Measured nicotine alternative content, mg/g <sup>a</sup>		Discrepancy in label and content (6MN for product 1, NA for product 2), %	Measured PG:GL ratio	Measured, mg/g <sup>a</sup>		Other flavor compounds detected	
		6MN	NA			Neotame content	WS-23 content		
Product 1 (labeled to contain 6MN) <sup>b</sup>									
Blood orange peach	5% (50 mg/g)	6.27 (0.49)	ND	-87	60:40	0.56 (0.03)	4.44 (0.04)	Yes	
Blue razz ice	5% (50 mg/g)	5.82 (0.46)	ND	-88	60:40	0.86 (0.12)	16.39 (0.11)	Yes	
Creamy melon	5% (50 mg/g)	6.09 (0.12)	ND	-88	60:40	0.21 (0.01)	5.74 (0.15)	Yes	
Pineapple coconut	5% (50 mg/g)	5.97 (0.26)	ND	-88	60:40	0.60 (0.03)	4.47 (0.03)	Yes	
Rainbow fruit	5% (50 mg/g)	6.17 (0.09)	ND	-88	60:40	0.65 (0.02)	4.34 (0.07)	Yes	
Strawberry apple melon	5% (50 mg/g)	6.06 (0.47)	ND	-88	60:40	0.20 (0.02)	14.01 (0.18)	Yes	
Strawberry mango	5% (50 mg/g)	5.94 (0.35)	ND	-88	60:40	0.25 (0.01)	9.81 (0.07)	Yes	
Sweet spearmint	5% (50 mg/g)	6.11 (0.26)	ND	-88	55:45	0.56 (0.01)	16.18 (0.17)	Yes	
Watermelon grape	5% (50 mg/g)	6.20 (0.67)	ND	-88	60:40	0.51 (0.11)	4.81 (0.05)	Yes	
Product 2 (labeled to contain nicotinamide), mg/mL <sup>c</sup>									
Unflavored	0	ND	ND	ND	40:60	ND	ND	No	
Unflavored	12	0.09 (0.02)	9.74 (0.09)	-7 <sup>d</sup>	45:55	ND	ND	No	
Unflavored	24	0.16 (0.04)	14.44 (0.01)	-31 <sup>d</sup>	45:55	ND	ND	No	
Unflavored	36	0.17 (0.03)	16.63 (0.11)	-46 <sup>d</sup>	40:60	ND	ND	No	
Cherry	0	ND	ND	ND	25:75	ND	ND	Yes	
Cherry	12	0.06 (0.01)	8.32 (0.13)	-18 <sup>d</sup>	30:70	ND	ND	Yes	
Cherry	24	0.10 (0.02)	12.95 (0.07)	-35 <sup>d</sup>	25:75	ND	ND	Yes	
Cherry	36	0.11 (0.04)	16.47 (0.13)	-46 <sup>d</sup>	30:70	ND	ND	Yes	

Abbreviations: GL, glycerol; NA, nicotinamide; ND, not detected; PG, propylene glycol; WS-23, 2-isopropyl-N-2,3-trimethylbutyramide; 6MN, 6-methylnicotine.

<sup>a</sup> Values shown as mean (SD); all N = 3 except for 6MN (N = 5).

<sup>b</sup> Spree Bar (e-cigarette) products.

<sup>c</sup> Nicotine (e-cigarette liquid) products.

<sup>d</sup> For Nicotine products, µg/mg was converted to µg/mL using an estimated density of 1.15 to 1.2 g/mL, based on measured PG:GL ratios.

# Results

- Product 1 samples contained only (S)-6MN stereoisomer
  - More potent & addictive than (R) form
- All product 1 samples contained
  - Artificial sweetener neotame
  - Synthetic coolant 2-isopropyl-N-2,3-trimethylbutyramine
  - Various flavorants
- Product 2 samples did not contain sweeteners or coolants



Table. Discrepancy in Labeled and Measured Nicotine Analogue Content in E-Cigarettes and E-Cigarette Liquids, Solvent Ratio, and Content of Artificial Sweeteners, Synthetic Coolants, and Other Flavor Compound Presence

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		6MN	NA			Neotame content	WS-23 content	
Product 1 (labeled to contain 6MN) <sup>b</sup>								
Blood orange peach	5% (50 mg/g)	6.27 (0.49)	ND	-87	60:40	0.56 (0.03)	4.44 (0.04)	Yes
Blue razz ice	5% (50 mg/g)	5.82 (0.46)	ND	-88	60:40	0.86 (0.12)	16.39 (0.11)	Yes
Creamy melon	5% (50 mg/g)	6.09 (0.12)	ND	-88	60:40	0.21 (0.01)	5.74 (0.15)	Yes
Pineapple coconut	5% (50 mg/g)	5.97 (0.26)	ND	-88	60:40	0.60 (0.03)	4.47 (0.03)	Yes
Rainbow fruit	5% (50 mg/g)	6.17 (0.09)	ND	-88	60:40	0.65 (0.02)	4.34 (0.07)	Yes
Strawberry apple melon	5% (50 mg/g)	6.06 (0.47)	ND	-88	60:40	0.20 (0.02)	14.01 (0.18)	Yes
Strawberry mango	5% (50 mg/g)	5.94 (0.35)	ND	-88	60:40	0.25 (0.01)	9.81 (0.07)	Yes
Sweet spearmint	5% (50 mg/g)	6.11 (0.26)	ND	-88	55:45	0.56 (0.01)	16.18 (0.17)	Yes
Watermelon grape	5% (50 mg/g)	6.20 (0.67)	ND	-88	60:40	0.51 (0.11)	4.81 (0.05)	Yes
Product 2 (labeled to contain nicotinamide), mg/mL <sup>c</sup>								
Unflavored	0	ND	ND	ND	40:60	ND	ND	No
Unflavored	12	0.09 (0.02)	9.74 (0.09)	-7 <sup>d</sup>	45:55	ND	ND	No
Unflavored	24	0.16 (0.04)	14.44 (0.01)	-31 <sup>d</sup>	45:55	ND	ND	No
Unflavored	36	0.17 (0.03)	16.63 (0.11)	-46 <sup>d</sup>	40:60	ND	ND	No
Cherry	0	ND	ND	ND	25:75	ND	ND	Yes
Cherry	12	0.06 (0.01)	8.32 (0.13)	-18 <sup>d</sup>	30:70	ND	ND	Yes
Cherry	24	0.10 (0.02)	12.95 (0.07)	-35 <sup>d</sup>	25:75	ND	ND	Yes
Cherry	36	0.11 (0.04)	16.47 (0.13)	-46 <sup>d</sup>	30:70	ND	ND	Yes

Abbreviations: GL, glycerol; NA, nicotineamide; ND, not detected; PG, propylene glycol; WS-23, 2-isopropyl-N-2,3-trimethylbutyramide; 6MN, 6-methylnicotine.

<sup>a</sup> Values shown as mean (SD); all N = 3 except for 6MN (N = 5).

<sup>b</sup> Spree Bar (e-cigarette) products.

<sup>c</sup> Nicotine (e-cigarette liquid) products.

<sup>d</sup> For Nicotine products, µg/mg was converted to µg/mL using an estimated density of 1.15 to 1.2 g/mL, based on measured PG:GL ratios.



# Discussion

- Discrepancies observed between labeled & measured concentrations of nicotine analogues in e-cigarettes & e-cigarette liquids marketed as nicotine replacements & exempt from FDA's regulatory purview
  - May lead to uncertainty about user exposure
- Largely unknown acute & chronic inhalation hazards & addictive potential of nicotine analogues
  - Assessing product risk based on exposure becomes challenging from clinical & regulatory standpoint
- With e-cigarettes increasingly considered for smoking cessation, advent of nicotine analogue-containing products with unknown health risks raises concern
- Along with several youth-appealing flavors, product 1 samples contained neotame, high intensity sweetener 7000-13,000 times sweeter than sucrose
  - With high heat stability that has not previously been reported in US-marketed e-cigarettes
- WS-23, odorless synthetic coolant ubiquitous in disposable e-cigarettes
- Both compound classes concerning because increase appeal to first-time users, yet inhalational risk remains unknown





# Discussion

- Limitations
  - Testing of only 2 product lines, products were chosen that were prominently marketed as containing nicotine analogues
  - Health risks could not be assessed because no human exposure studies exist
- Nicotine analogues should be urgently addressed by lawmakers & regulators
- FDA should be granted authority to regulate products containing them as tobacco products



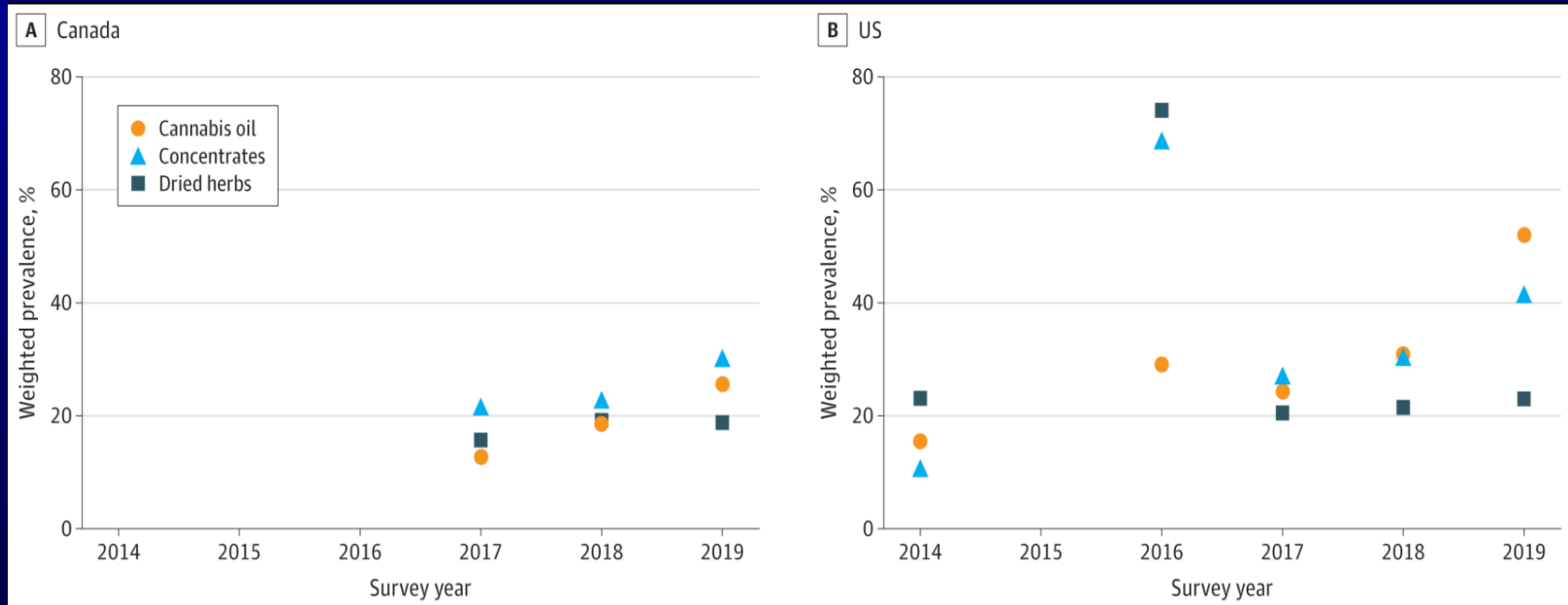
# Conclusion

- If FDA concludes that 6-MN is a 'complex' of nicotine & take enforcement action against products containing 6-MN, then manufacturers would challenge in court<sup>1</sup>
- Article 2 of EU's Tobacco Products Directive (TPD) states: '(19) 'nicotine' means nicotinic alkaloids'
  - Denotes both natural & synthetic nicotine ligands, thus 6-MN would fall within scope of EU's TPD
- If FDA determines that 6-MN is being marketed as drug intended to produce particular physiological effects, then it would not be possible for it to be sold legally without manufacturer first obtaining FDA approval
  - FDCA defines drugs in part as 'article (other than food) intended to affect the structure or any function of the body
- Companies that market products like Spree Bar as exempt from FDA regulation reduces confidence in FDA's regulatory scheme & undermines FDA's efforts to protect public health

# Prevalence of Adolescent Cannabis Vaping

## A Systematic Review and Meta-analysis of US & Canadian Studies

Observed Prevalence by Cannabis Product & Survey Year for Canada & US



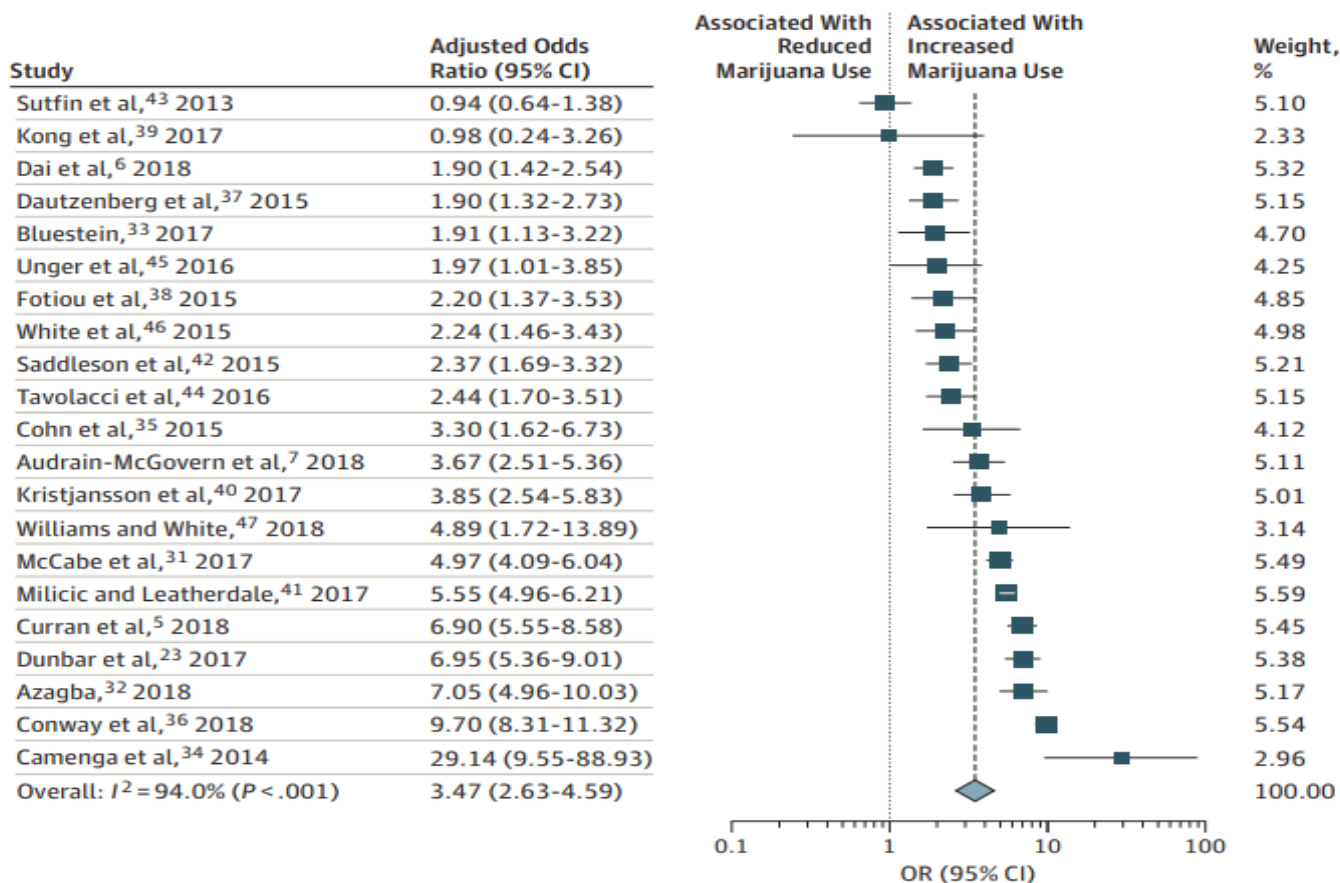
# Vape Devices for Marijuana & Oils



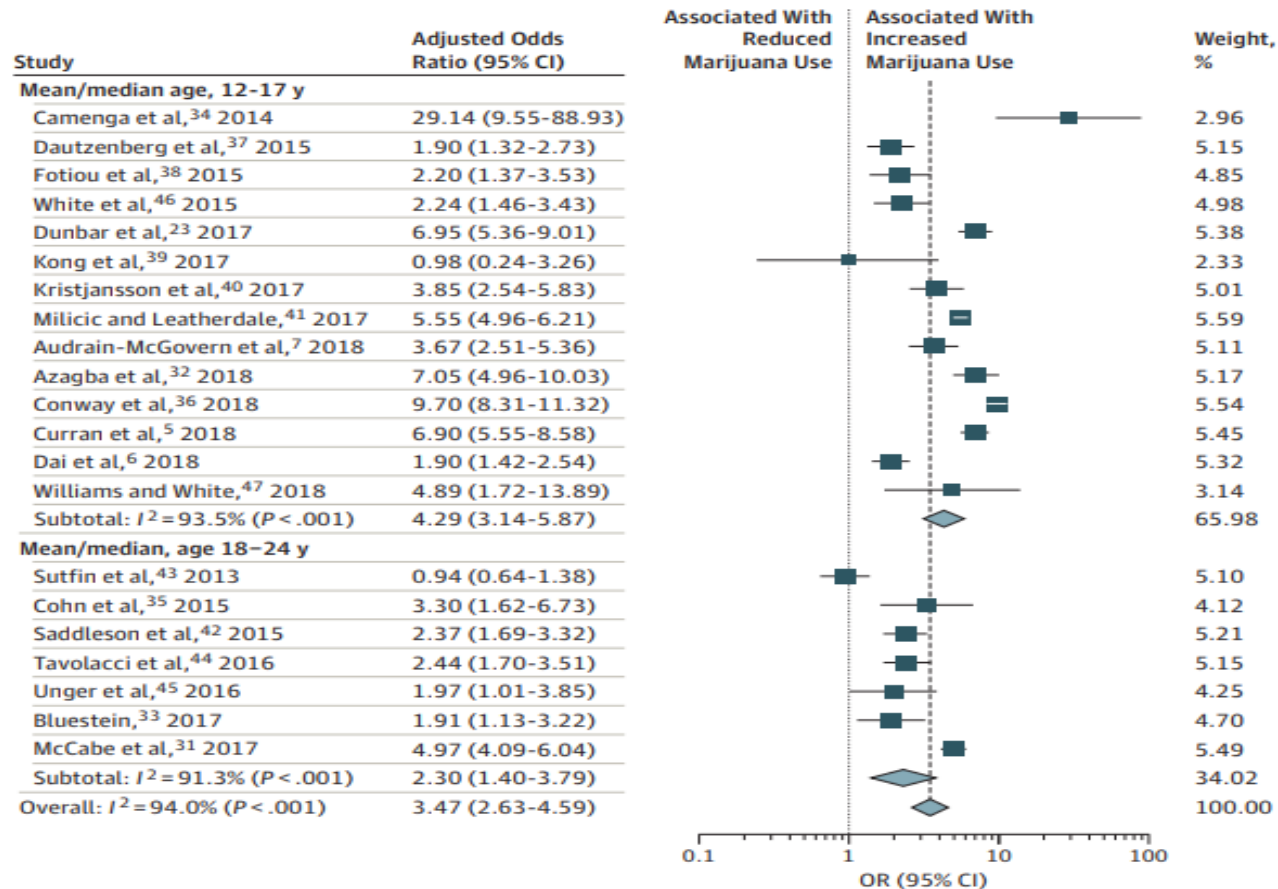
# Trial Background

- Of the 835 studies that were reviewed, **21 studies** met inclusion criteria
  - Study must include participants between the age of **10-24 y/o**
  - Study must **compare rates of marijuana use with vs without history of ENDS**
  - Study must provide actual or calculable **adjusted odds ratios** of the **association between ENDS use and co-occurring marijuana use or subsequent marijuana use**
- All 21 studies were observational studies with 3 studies being longitudinal
- A total of **113,863 total patients** were represented

**Figure 1. Marijuana Use in Youth With e-Cigarette Use in Individual Studies**



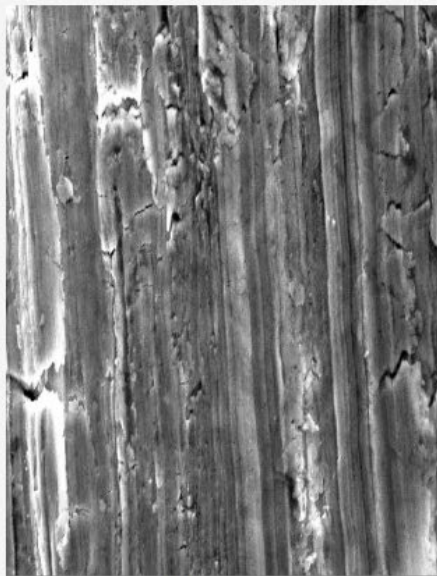
**Figure 3. Marijuana Use in Youth With e-Cigarette Use by Mean/Median Participant Age in Individual Studies**



## E-Cigarette Deterioration?

Kanthal Wire.

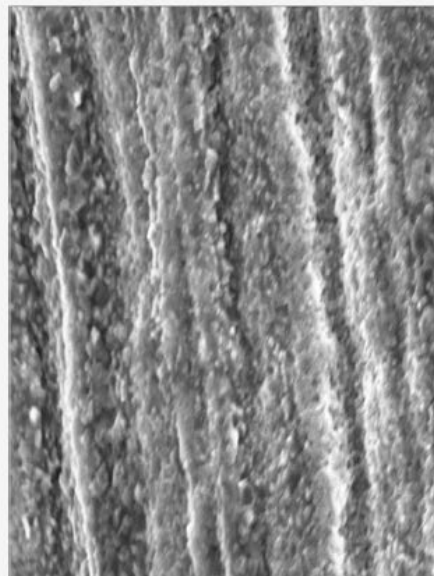
All pictures taken at 2000x magnification



New



1 Burn



50 Burns



150 Burns

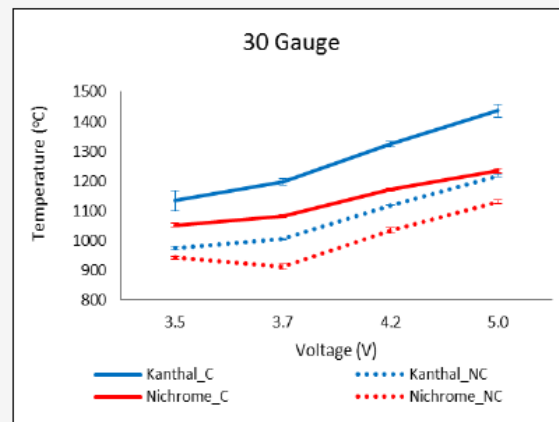
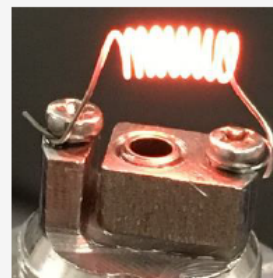
Peace, et.al. Preparing for publication



## E-Cigarette Deterioration?

Kanthal A-1 Wire Composition					
C	Si	Mn	Cr	Al	Fe
0.08%	0.70%	0.40%	23.5%	5.80%	68.32%

Nichrome Wire Composition		
Fe	Ni	Cr
24%	60%	16%

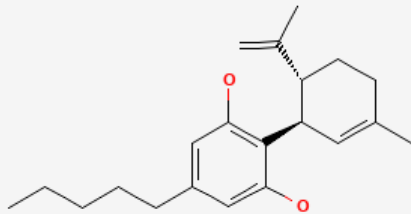


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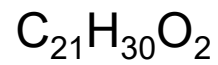
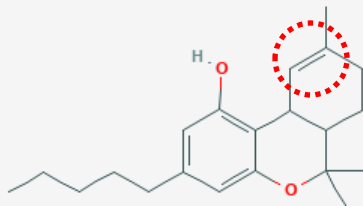
# Conversion to Delta-9 THC

- Delta-8 THC
- Delta-10 THC
- THC-O
- CBD
- *CBD + Heat/Acid = Delta-8*
- Add significant heat
- ***Can Covert ALL to Delta-9 THC***
- Potential to convert via VAPING (**HOT!**)

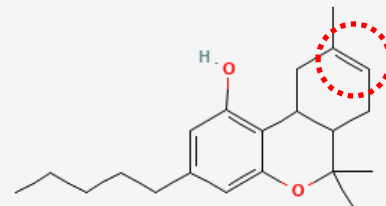
CBD



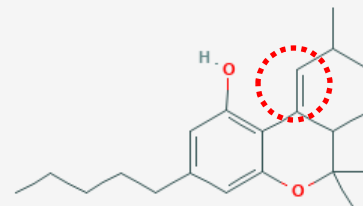
Delta-9-THC



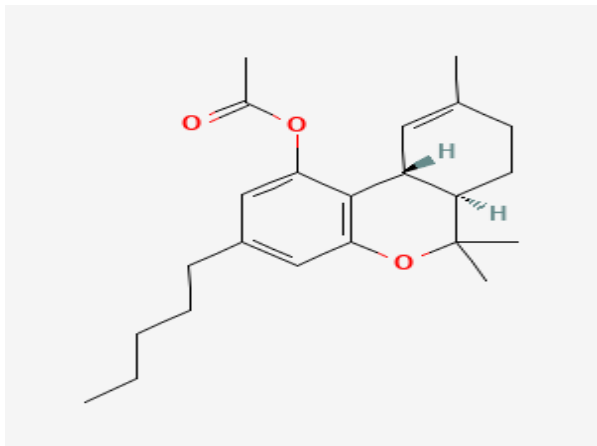
Delta-8-THC



Delta-10-THC



# THC Variants...



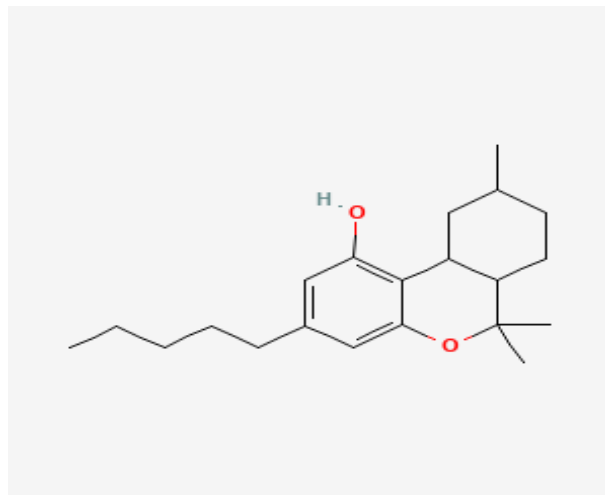
pubchem.ncbi.nlm.nih.gov

## THC-O Acetate (C<sub>23</sub>H<sub>32</sub>O<sub>3</sub>)

- THC with an **added acetyl group**
- Similar chemical process used to convert **morphine into heroin** or **salicylic acid into aspirin**
- Increases potency by approximately 3X**
- Can also be derived from hemp-based Delta-8-THC
- Tested as a **chemical warfare agent** by US Army in mid-to late-1940's

<https://www.hempgrower.com/article/thc-o-acetate-q-and-a-dr-ethan-russo-credo-science/>

<https://www.nap.edu/download/9136>



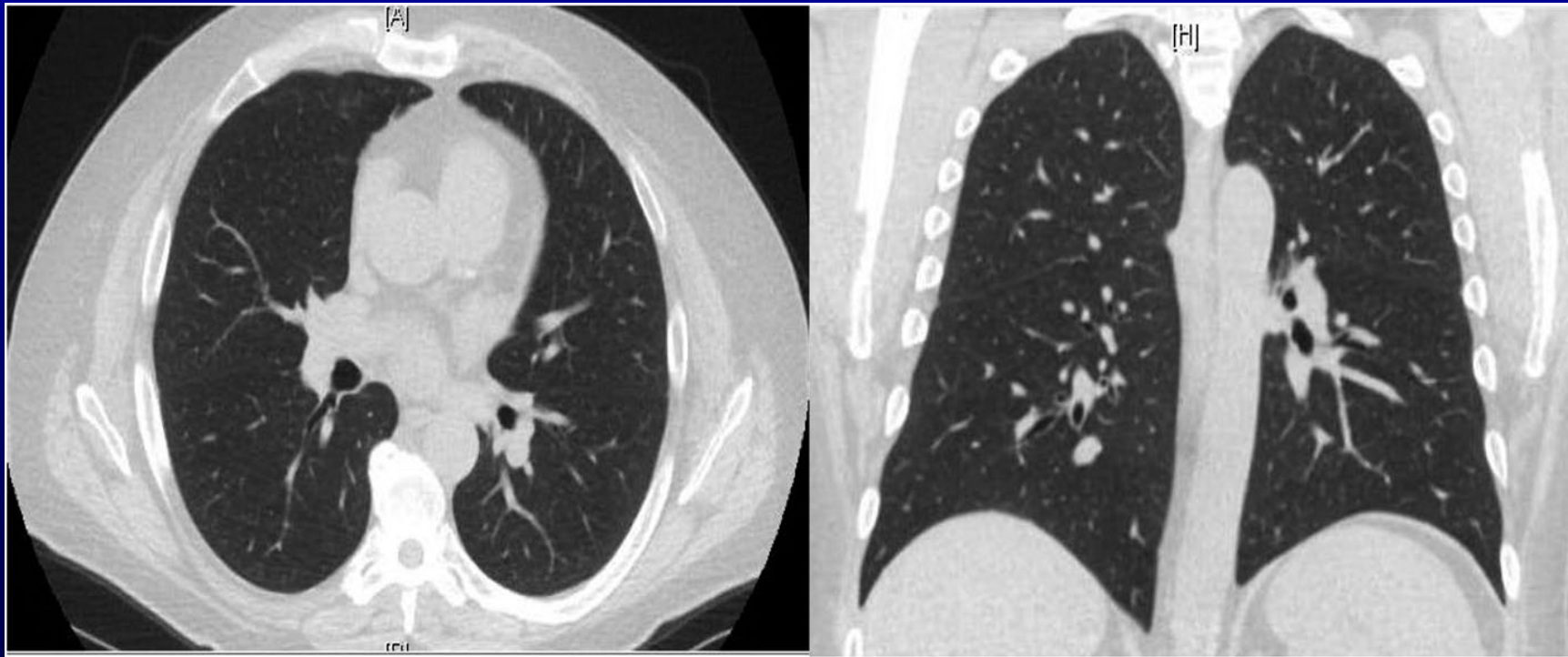
## Hexahydrocannabinol (C<sub>21</sub>H<sub>32</sub>O<sub>2</sub>) - HHC

- “Hydrogenated”** THC - extends its shelf-life
- Similar chemical process used to make **margarine**
- Potency is reported to be **~80% of THC**
- Hemp-derived HHC is available online**

<https://dailycbd.com/en/hhc/>

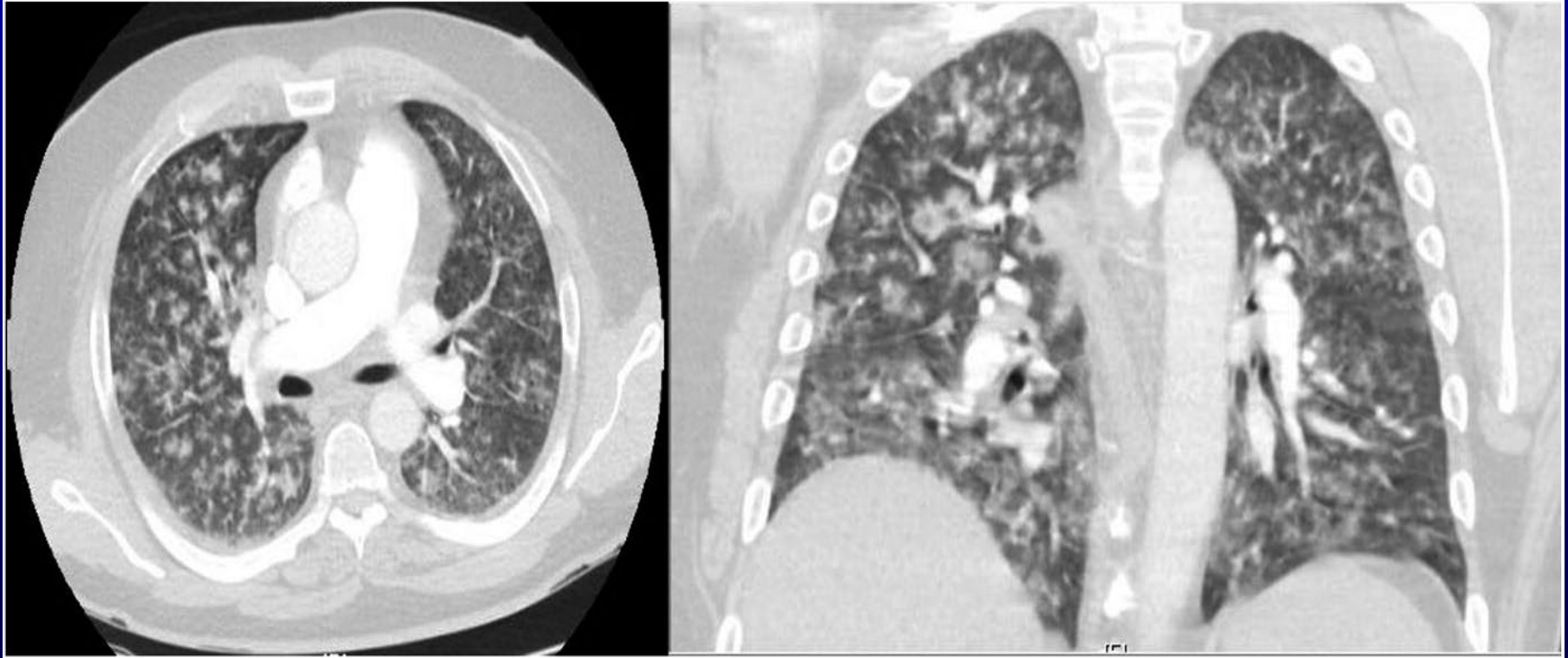
<https://www.binoidcbd.com/collections/hhc-products>

## Repeated chest tomographic scan at week 2 showing complete resolution after stopping use



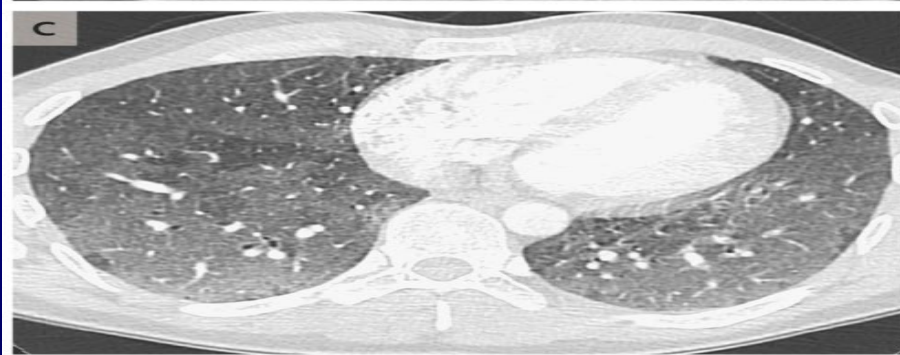
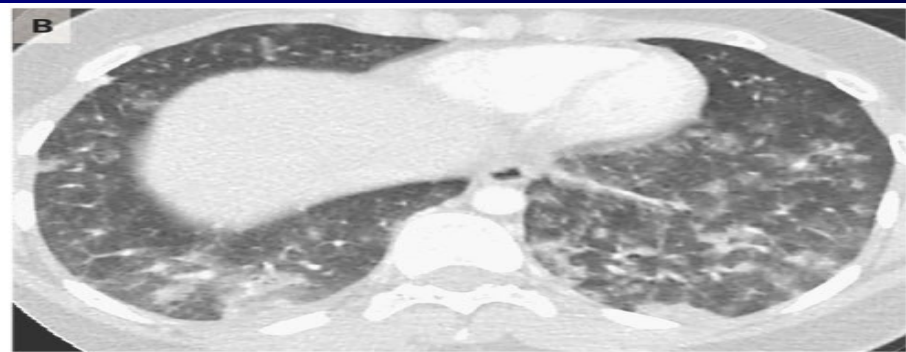
He T, Oks M, Esposito M, Steinberg H, Makaryus M. "Tree-in-Bloom": Severe Acute Lung Injury Induced by Vaping Cannabis Oil. *Ann Am Thorac Soc*. 2017;14(3):468-470. <https://www.atsjournals.org/doi/full/10.1513/AnnalsATS.201612-974LE>

# Chest tomographic scan of 54 y/o male with “Tree-In-Bloom” presentation post vaping of cannabis oil



He T, Oks M, Esposito M, Steinberg H, Makaryus M. "Tree-in-Bloom": Severe Acute Lung Injury Induced by Vaping Cannabis Oil. *Ann Am Thorac Soc*. 2017;14(3):468-470. <https://www.atsjournals.org/doi/full/10.1513/AnnalsATS.201612-974LE>





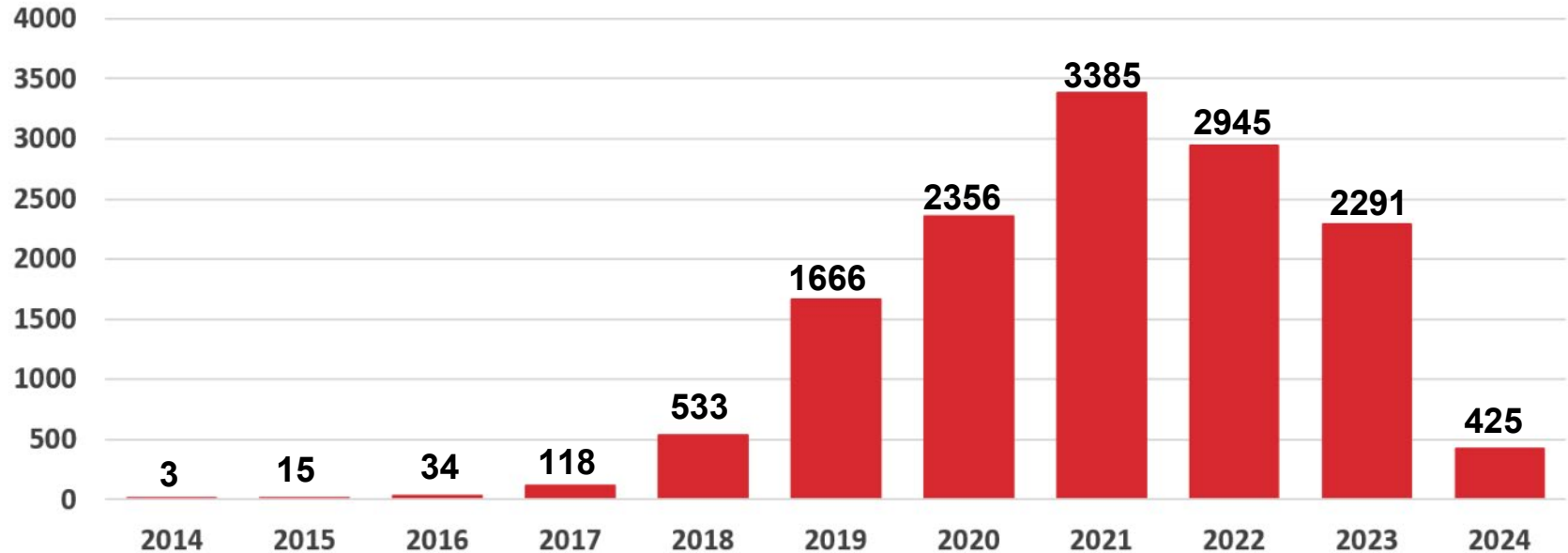
- A: 20y/o male with diffuse alveolar damage (cleared with glucocorticoids)
- B: 19y/o female with eosinophilic pneumonia (cleared with glucocorticoids)
- C: 35y/o male with hypersensitivity pneumonitis
- D: 49y/o female with giant cell interstitial pneumonia (from cobalt)

# CBD Cases Reported by American Association of Poison Control Centers

## Cannabidiol Cases

All Ages

*Canna-BENIGN-ol?!?*





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CBD oil in electronic cigarettes or vaporizing pens might be driving users to emergency rooms, North Carolina health authorities say. Nam Y. Huh - AP

LOCAL

## CBD oil in your e-cig or vape pen might send you to the ER, NC says

BY BRUCE HENDERSON  
bhenderson@charlotteobserver.com

March 06, 2018 01:33 PM  
Updated March 06, 2018 03:38 PM

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Health Effects of Vape Oils Containing Unknown Substances

Last Updated: April 25, 2018

APHC Home / Topics / Healthy Living / Tobacco-Free Living / Health Effects of Vape Oils Containing Unknown Substances

**PUBLIC HEALTH ALERT**

PUBLIC HEALTH ALERT: Users of e-cigarettes and/or vaporizer pens must ensure that the products they purchase do not contain Cannabidiol (CBD) oil, CBD, tetrahydrocannabinol (THC) or synthetic cannabinoids.

[CLICK HERE TO VIEW THE ALARCT ON AKA \(CAC REQUIRED\)](#) @

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## Fake CBD Poisoned At Least 52 People In Utah Last Winter, Officials Say

Janet Burns Senior Contributor @  
Consumer Tech  
I cover AI, cybersecurity, culture, drugs, and more.

Shutterstock

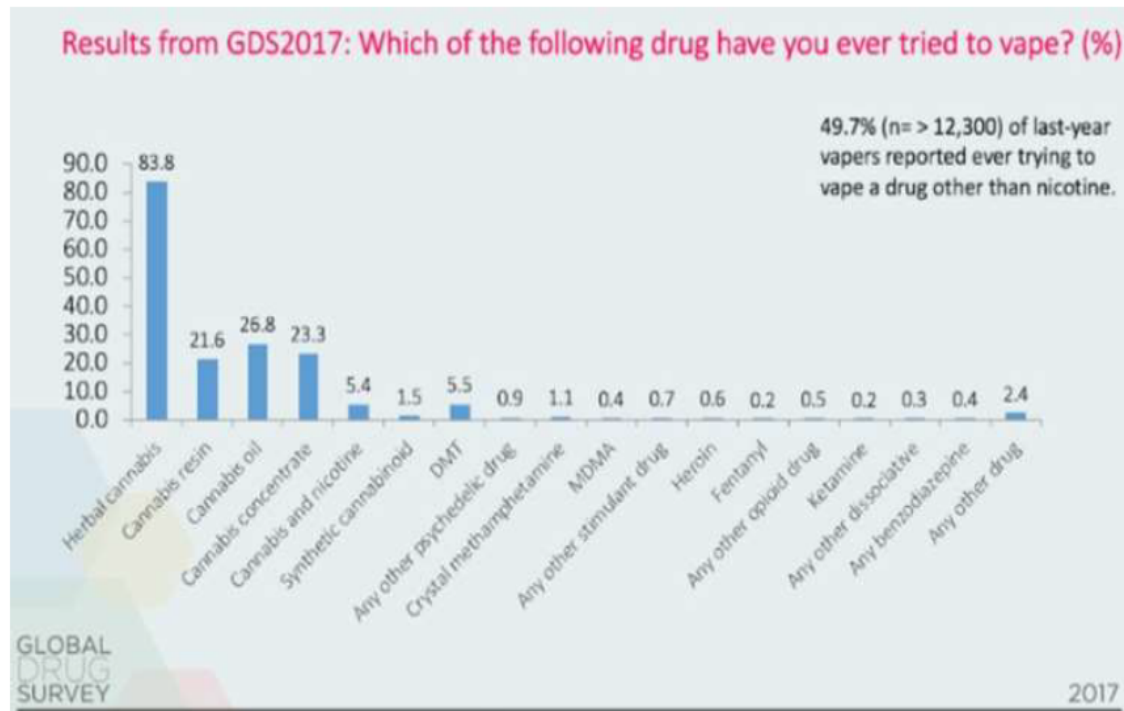
Virginia Commonwealth University

MRPeace. September 2019

Case	Location	CBD Present	Unexpected Ingredient
High School Senior	Georgia	No	MEP-Fubinaca
Doctoral Student	Georgia	Yes	5F-ADB & Dextromethorphan
Unknown	Unknown	Yes	5F-EDMP-Pinaca
Unknown	Unknown	No	4F-MDMB-Butinaca
Immigrant	California	No	MMB-Fubica
72 yo female	Florida	Yes	SynCannabinoid
79 yo female	Missouri	Yes	SynCannabinoid
Nurse	New Jersey	Yes	SynCannabinoid

# Drugs Other Than Nicotine

- Ethanol\*
  - Intoxication without calories
- THC/CBD
  - Hash oil (dabs)
  - Plant material in newer vapes
- Synthetic Cannabinoids
  - Liquid form
- Opioids
- Novel Psychoactive Substances
  - Stimulants
  - Hallucinogens



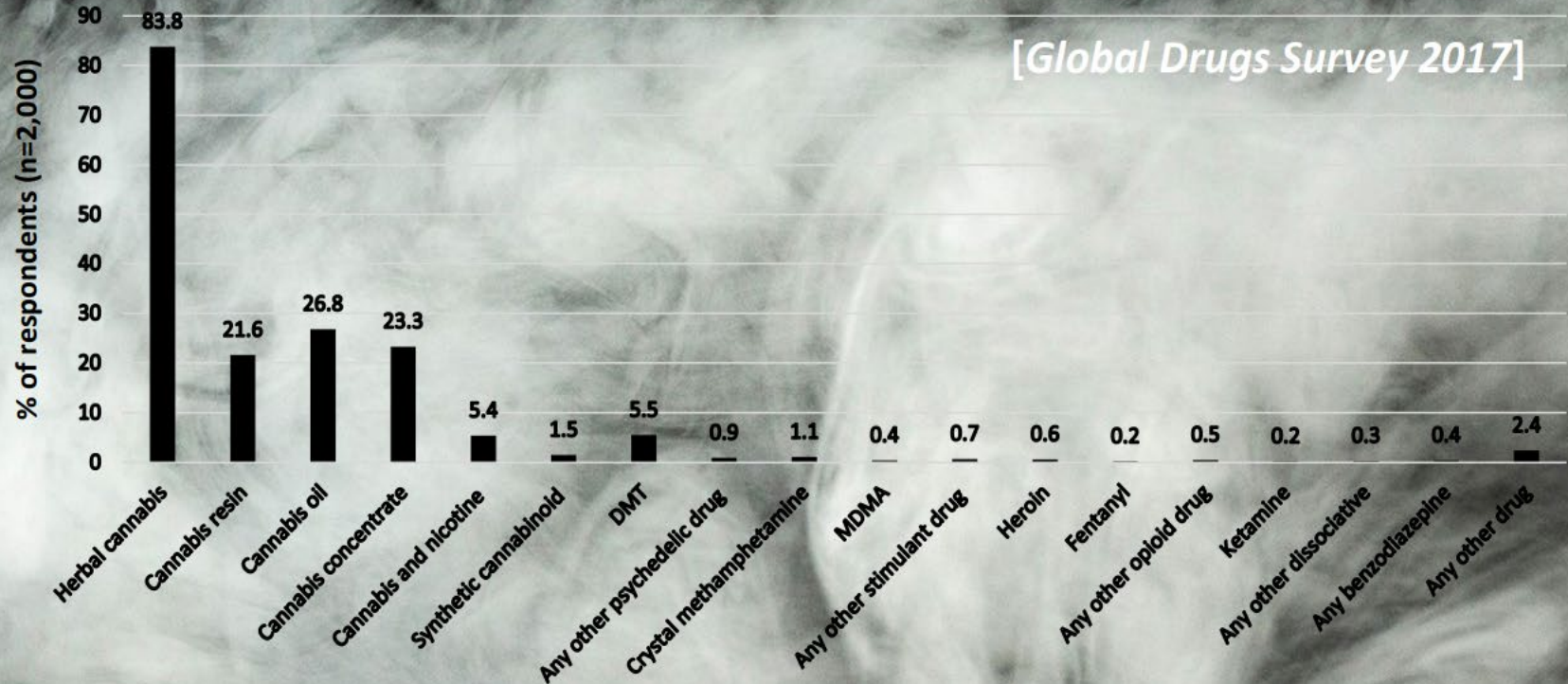
# Getting Drunk....by Vaping

- Drunk in the ER-have not drank a drop of alcohol
- Flavorings in certain diluents
- Love Vanilla Flavoring!
- Vanilla extract in your home?
- Vanilla extract diluent?
- Alcohol 70 Proof (35%)
- Vaping bypasses First Pass Liver Metabolism
- Drunk faster & at higher level of intoxication
- Can also drink vanilla extract & get drunk



# What illicit drugs do drug users vape?

*“Which of the following drugs have you ever tried to vape?”*



# Important to ASK: Do You Use...?

- Marijuana
- Cannabis
- THC
- CBD
- For THC
- Do you use
  - Delta- 8
  - Delta-9
  - Delta-10
  - THC-O
  - THC-A
  - **ANY** Other form



# Derived Psychoactive Cannabis Products (DPCPs)

- Delta-8 THC (n = 498)
- THC-P (n = 264)
- Delta-9 THC (n = 181)
- HHC (n = 159)
- THC-A (n = 104)
- Delta-10 THC (n = 98)
- THC-H (n = 78)
- THC-B (n = 65)
- THC-JD (n = 55)
- THC-X (n = 46)
- HHC-P (n = 44)
- Delta-11 THC (n = 37)
- PHC (n = 33)
- THC-V (n = 20)
- THC-O (n = 17)
- Delta-6 THC (n = 16)
- THC-M (n = 14)
- HHC-O (n = 12)
- HXC (n = 7)
- HXCp (n = 4)
- Delta-9o THC (n = 3)
- THCP-O (n = 3)
- THD (n = 3)
- HHC-R (n = 2)
- HCXCo (n = 1)
- HCP (n = 1)

Total: 26 Distinct DPCPs

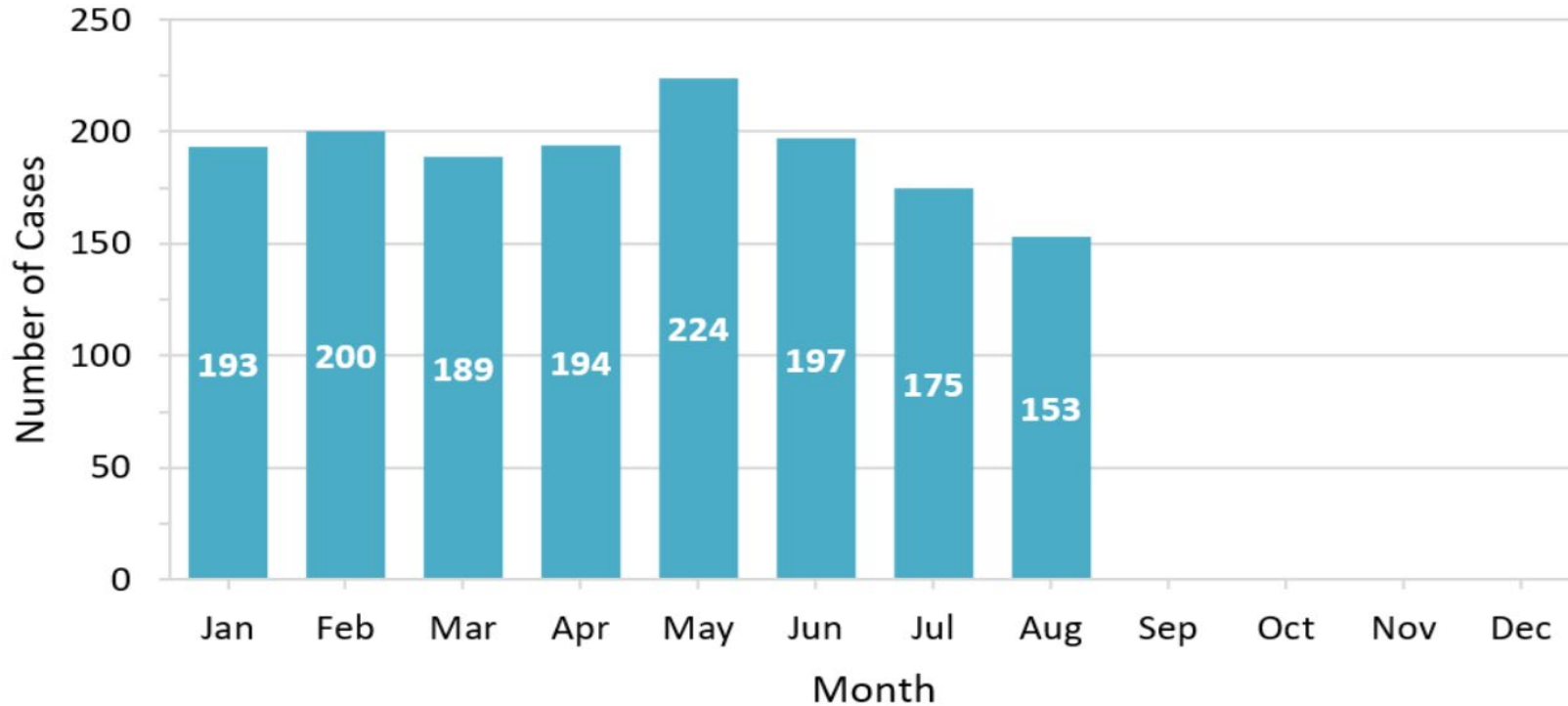
**Table 1. Full Sample and Top 40 Brands: Number of Available Products by Modality**

Brand	Total n=804	Carts n=143	Dabs n=8	Disposables n=347	Edibles n=236	Flower n=13	Pods n=3	Pre-roll n=54
Exhale	41	6	1	8	15	6	—	5
Delta Extrax	40	16	—	14	8	—	—	2
Cake	34	12	—	17	5	—	—	—
URB	33	4	—	10	15	1	—	3
Looper	27	—	—	22	1	—	—	4
TRE House	26	7	—	9	8	—	—	2
Binoid	25	13	—	6	6	—	—	—
ELYXR	25	5	3	6	8	1	—	2
Flying Monkey	23	2	—	10	6	—	—	5
Modus/Medusa	22	2	—	13	5	—	—	2
Mellow Fellow	21	5	—	14	2	—	—	—
Honeyroot	21	8	—	12	1	—	—	—
Maui Labs	20	4	—	3	11	—	—	2
Purlyf	16	5	—	8	3	—	—	—
Torch	14	1	—	7	4	1	—	1
STIIIZY	14	1	—	2	4	—	2	5
HiXotic	14	2	—	8	3	—	—	1
Galaxy Treats	14	1	—	2	11	—	—	—
Kalibloom	12	3	—	9	—	—	—	—
Space Gods	12	—	—	5	7	—	—	—
Wild Orchard	12	2	—	4	4	—	—	2
ZAZA	12	1	—	8	3	—	—	—
Trippy Sugar	12	4	—	3	4	—	—	1
Dimo	11	4	—	2	5	—	—	—
Pacha	11	—	—	11	—	—	—	—
Tyson	10	—	—	2	5	—	—	3
Geek'd	9	—	—	6	3	—	—	—
Ghost	9	—	—	8	1	—	—	—
Hidden Hills	9	2	—	4	2	—	—	1
Ocho Extracts	9	—	—	5	3	—	—	1
Exodus	8	3	—	2	3	—	—	—
HIGH	7	—	—	2	5	—	—	—
Koi	7	—	—	4	3	—	—	—
Packwoods	7	2	—	2	2	1	—	—
Two Hawk	7	—	—	2	5	—	—	—
Astro Eight	6	2	—	4	—	—	—	—
Canna River	6	1	—	1	4	—	—	—
Frozen Fields	6	2	—	2	2	—	—	—
Happi	6	2	—	3	1	—	—	—
Kik	6	—	—	6	—	—	—	—





## YTD Delta-8 THC Exposures



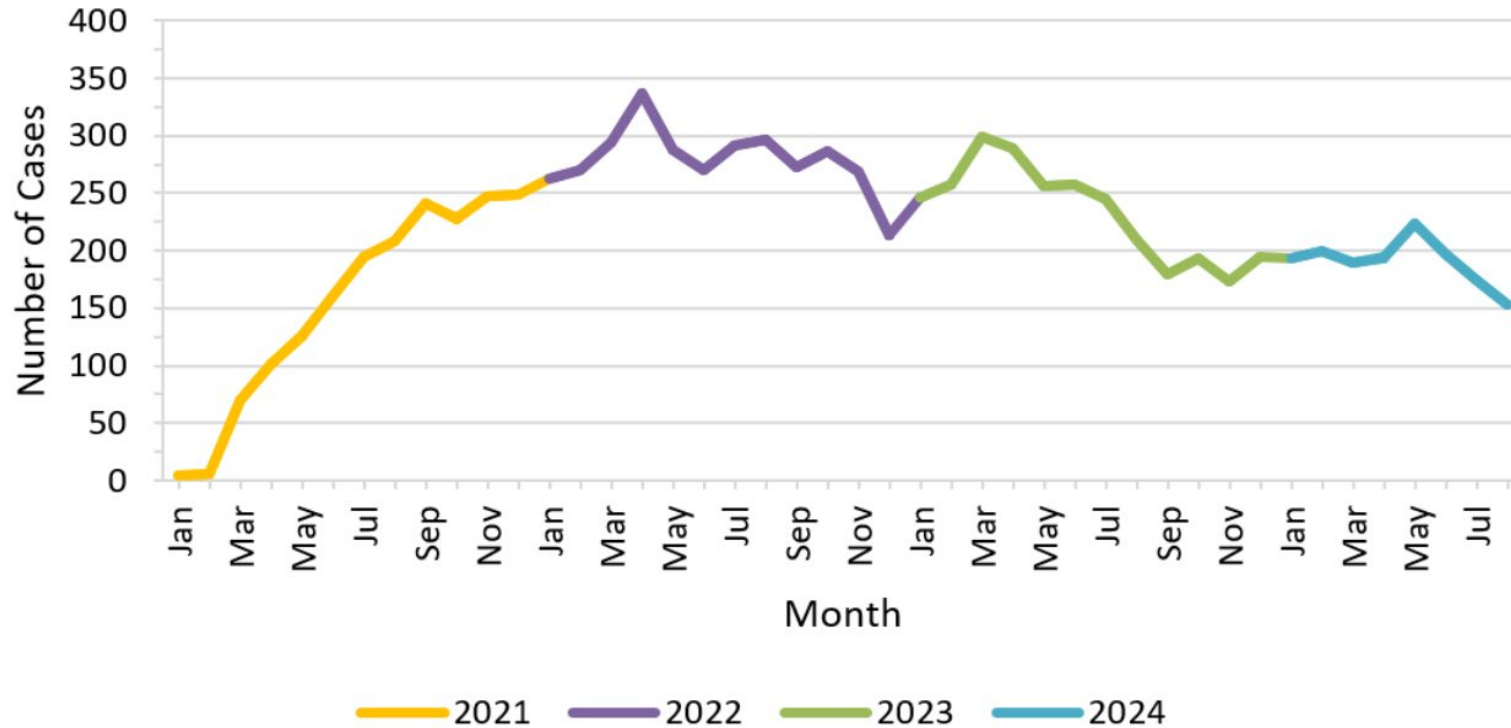
As of August 31, 2024, Poison Centers have managed 1525 Delta-8 THC related exposure cases.

<https://poisoncenters.org/track/delta-8-THC> As of 8/31/24 Accessed 9/26/2024

www.thenmi.org



# Delta-8 THC Exposures



From 2021 to 2024, Poison Centers have managed 9513 Delta-8 THC related exposure cases.

<https://poisoncenters.org/track/delta-8-THC> As of 8/31/24 Accessed 9/26/2024

www.thenmi.org

# Street/Commercial Names Synthetic Cannabinoids

Albino Rhino Buds

Aroma

Barely Legal

Black Mamba

Bliss

Bombay Blue

Caneff 5 Star

Chillin XXX

D-Raw

Dark Matter

Dream

Everlast

Ex-ses (Platinum)

Experience: Chill

Experience: Ignite

Experience: Red Ball

Fake marijuana

Fake Weed

Fusion

Galaxy

Genie

Gorilla

Herb Dream

Herbal Incense

Ice Bud Extra Cold

K2

K3

K3 Legal

Kronic

Krypto Buds

Magic

Mojo

Moon Rocks

Pep Spice

Red Magic

Sence

Skunk

Smoke

Solar Flare

Space

Space Truckin'

Spice

Spice Arctic Synergy

Spice Tropical Synergy

Spice Diamond

Spice Gold

Spice Gold Spirit

Spice Silver

Spicey XXX

SpiceWorld420

Spice99 (Ultra)

Spike99

Smoke

Splice Platinum

Star Fire

Syn

Yucatan Fire

Zohai

Zohai SX

# Representative Sample of Synthetic Cannabinoid Recovered from Intoxicated Patient



An Outbreak of Exposure to a Novel Synthetic Cannabinoid, Monte AA, et al. NEJM 370;4 p.389. 1/23/14







# One Night.....

- 18yoM comes to ER by police w/acute delerium
- +SI/+HI, Incoherent thoughts, disoriented to P/P/T
- BP = 159/88 HR = 93 T = 98.2 R = 18; negative UDS
- + syn cannabis admission/drug induced psychosis
- 5 days ago polite engaging cooperative college student
- Knock neighbor doors late night, Pres=Julius Cesar
- Chased by PD through woods after choking “Lucifer”
- Rip out IV, bizarre/delusional thoughts/conversation
- Drug induced mental status change/grossly psychotic
- Schizophrenia/Bipolar; thorazine, risperdal, lorazepam

## Synthetic Cannabinoid Outbreak in Illinois Spreading to Other States

Other States	Number of Cases
Illinois	164
Wisconsin	86
Maryland	44
Florida	6
Pennsylvania	6
Missouri	5
North Carolina	5
Indiana	5
Kentucky	1
Virginia	1
West Virginia	1
<b>Total</b>	<b>324 (8 deaths)</b>

\*Maryland Poison Center & Maryland Dept. of Health Memorandum, Undifferentiated coagulopathy after synthetic cannabinoid use. 5/18/19

Centers for Disease Control, *Outbreak Alert: Potential Life-Threatening Vitamin K-Dependent Antagonist Coagulopathy Associated with Synthetic Cannabinoid Use*. 4/5/18

<http://content.govdelivery.com/accounts/USCDC/bulletins/1e6dac3>

<http://emergency.cdc.gov/han/han00416.asp> 12/10/19 at 1300

Illinois Department of Public Health, **Synthetic Cannabinoids**

<http://dph.illinois.gov/topics-services/prevention/wellness/medical-cannabis/synthetic-cannabinoids#publications>



## 42 Hospitalized, 2 Dead In Tampa Area After Using Synthetic Pot

Health officials say it's likely the synthetic marijuana was laced with rat poison.



D'Ann Lawrence White, Patch Staff

Posted Mon, Dec 20, 2021 at 5:40 pm ETUpdated Mon, Dec 20, 2021 at 9:06 pm ET



### **ALERT: SYNTHETIC CANNABINOID (SPICE) & SEVERE BLEEDING**

Health officials say it's likely the synthetic marijuana was laced with rat poison. (Florida Poison Information Center )

**TAMPA, FL** — Health officials say they are continuing to see new cases of people being hospitalized with severe bleeding and other life-threatening symptoms after using a synthetic marijuana being sold in Hillsborough County that they believe has been laced with rat poison.

WLUK

**DANGEROUS DRUG TREND**

**TEENS HIDING DANGEROUS DRUGS IN E-CIGS**

**CNN**

NAS -49.58

THE LEAD

# Heroin Vapes?!

***TKO***



# Electronic Vape Pen Dangers



UNCLASSIFIED

## Exposure to Vaping Substance in a NJ School Intelligence Dissemination Report

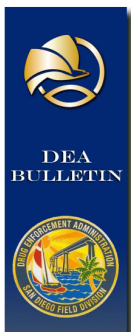
Office of the Regional Operations and Intelligence Center (ROIC) Narcotics Analysis Unit - ROIC20171010731F  
NJ ROIC SIN: NJ CRM-0100 (Geographic) / DHS SIN: HSEC 10 (Illicit Operations)  
20 October 2017

### Key Findings:

On 18 October, 2017, police responded to a New Jersey high school in reference to a report of two students "vaping" in a bathroom. The responding officer and a school employee became ill after exposure to an unknown substance. Forensic lab analysis later determined the substance to be concentrated nicotine.

### Details:

After the exposure, the officer experienced what he described as an "out of body" experience, feeling as though he could not speak, having an overall cloudy perception of his surroundings, nausea, vomiting, headache, dizziness, and respiratory distress.



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## Fentanyl Used in Vape Pens

(U) This DEA Bulletin is based on preliminary reporting and may be subject to updating as additional information becomes available.

DEA SAN BUL-155-20  
SEPTEMBER 2020

### Event

In September 2019, the Drug Enforcement Administration (DEA) San Diego Division was contacted by local authorities in regards to a suspected fentanyl overdose death. The roommate of the deceased, who admitted to vaping fentanyl on a regular basis, told agents there was fentanyl and possibly carfentanil located in their shared residence, as well as fentanyl-laced "vape" tanks.



### Community Awareness Bulletin

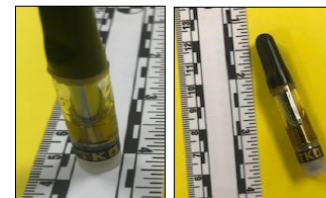
#### (U) Heroin-Laced Vape Pens Lead to Two Overdoses

(U) On October 31, 2019, in separate incidents, two high-school students from Morgantown High School, Morgantown, WV, overdosed, and have been hospitalized as a result of heroin-laced vape pens. Law enforcement officers in Morgantown, WV, also warned of additional overdoses from neighboring University High School in Morgantown, WV, that also occurred as a direct result of heroin-laced vape pens.



(U) Investigations into two overdoses yielded one "TKO" brand vape pen that tested positive for Flubromazolam (a Benzodiazepine derivative), Heroin HCL, Magnesium Chloride, and Sodium Nitrate.

(U) Law Enforcement Officers in the Morgantown, WV area warn of additional heroin-laced vape pens, and other electronic cigarettes, that may be a direct and imminent threat to the public. Any vape pen or electronic cigarette that was not purchased directly from a certified retailer may be laced with illicit and potentially lethal products. Anyone possessing one of these items is highly encouraged to turn them over to law enforcement or throw them away.



gressive

o could

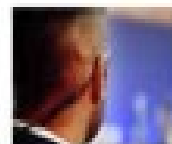
ll



Kavanaugh has least support of any Supreme Court pick in three decades



Trump ignored staff advice before press conference with Putin



Secret Service agent dies after suffering stroke in Scotland



Uber  
alleged  
Repub  
'Welc

safepersonalarm.com

## NEWS

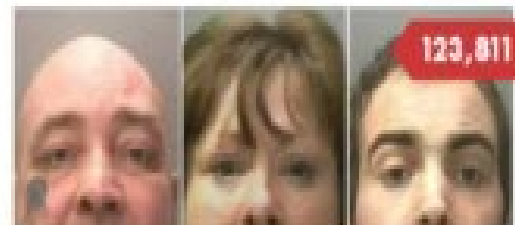


# Man dies after vaping liquid fentanyl

By Joshua Rhett Miller

July 3, 2017 | 3:21pm | Updated

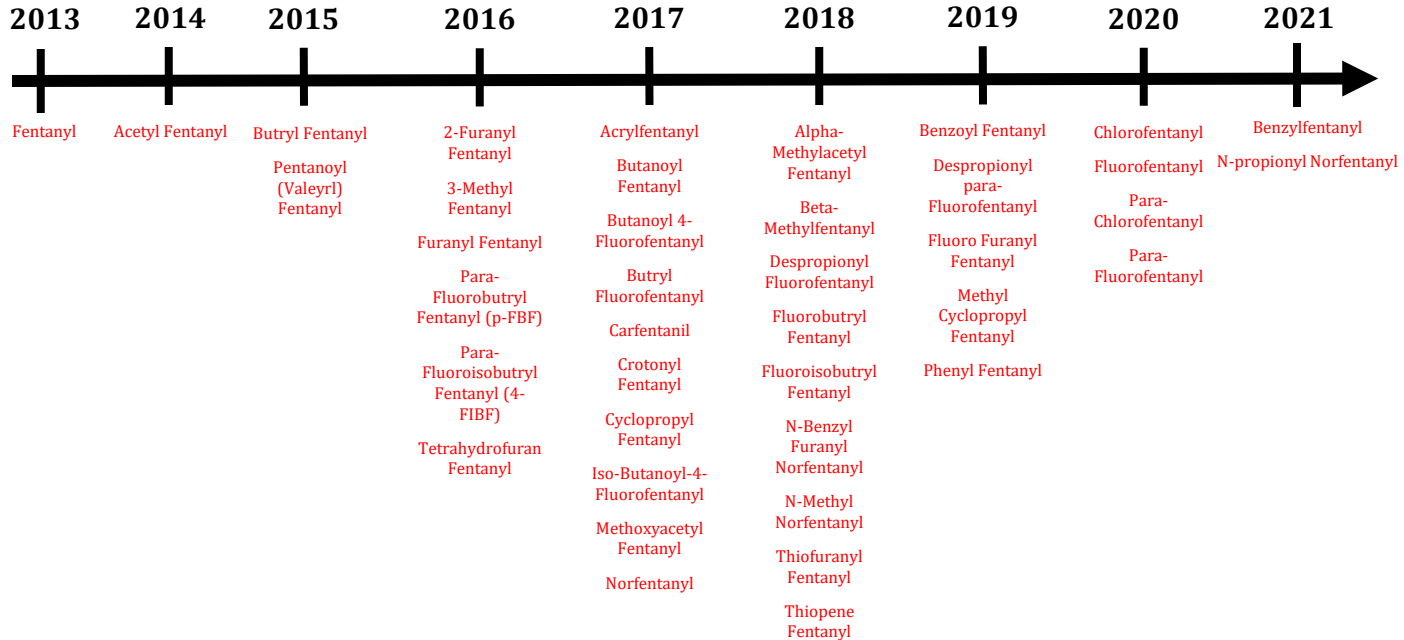
## TRENDING NOW ON NYPOST.COM





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## Fentanyl Analogs Identified in NJ

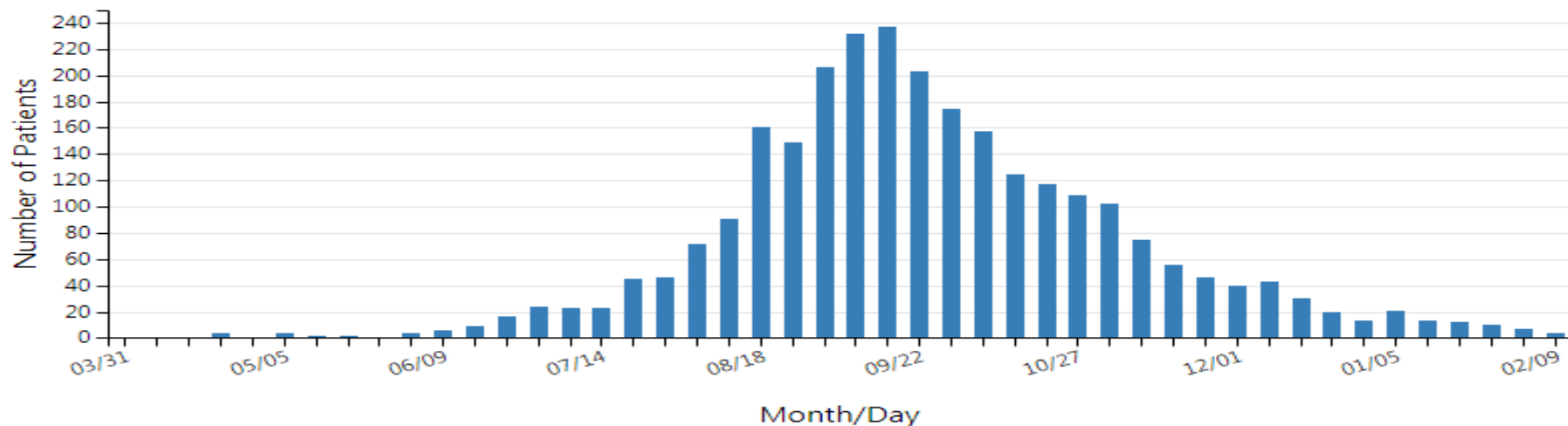


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**Total number of fentanyl class substances identified in NJ: 40**

# Dates of symptom onset and hospital admission for patients with lung injury associated with e-cigarette use, or vaping — United States, March 31, 2019 – February 15, 2020

Dates of symptom onset and hospital admission for patients with lung injury associated with e-cigarette use, or vaping — United States, March 31, 2019–February 15, 2020



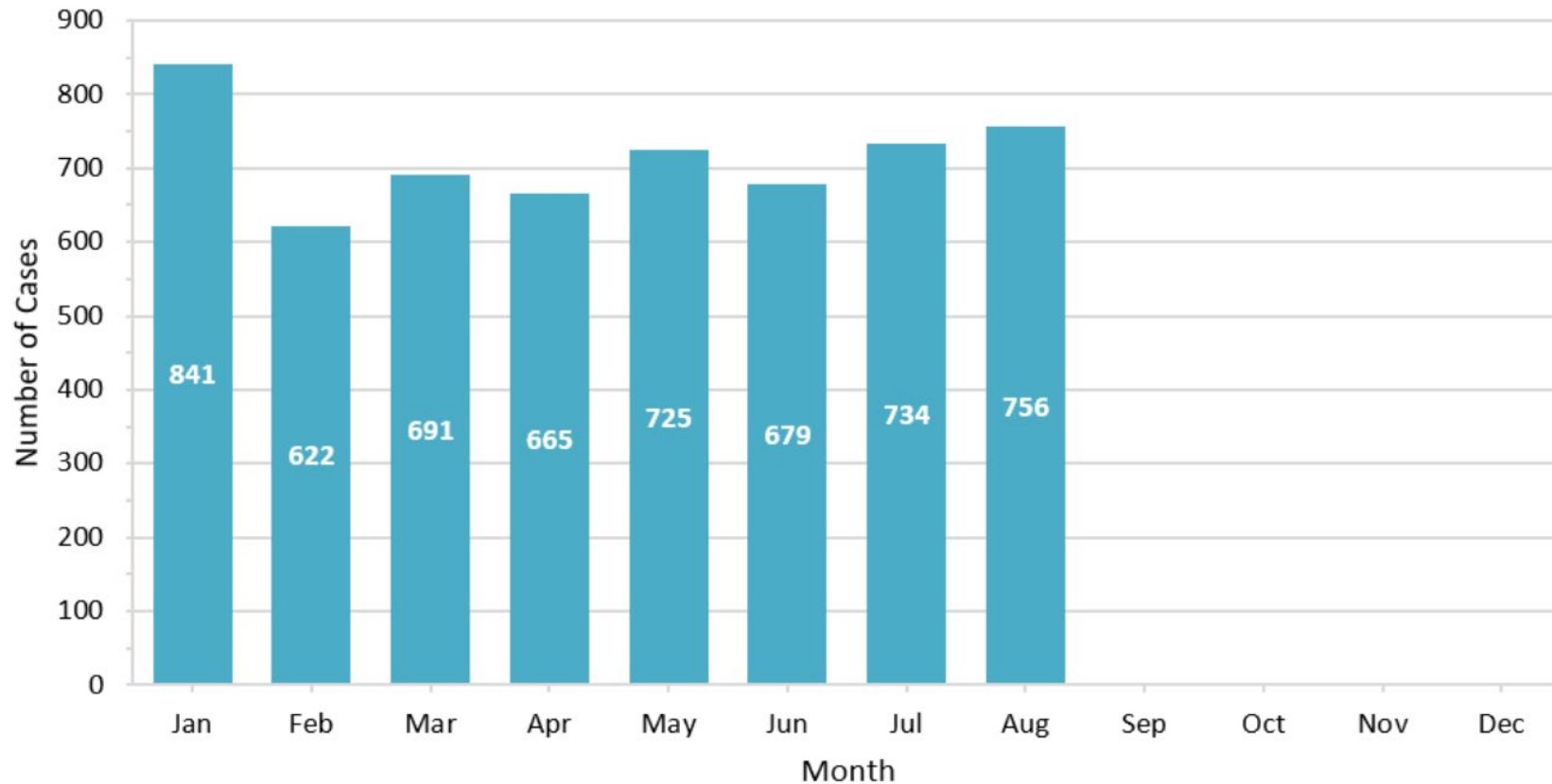
Numbers do not sum to 2,807 due to missing admission dates.

# FDA Reports Seizure Cases with E-Cigarette Use

- Statement from FDA Commissioner Scott Gottlieb, M.D.
- Principal Deputy Commissioner Amy Abernethy, M.D., Ph.D.
- FDA's ongoing scientific investigation **of potential safety issue related to seizures reported following e-cigarette use, particularly in youth and young adults**
- **35 cases initially reported on 4/3/19**
- 92 additional cases reported since then
- **127 cases reported as of 8/7/19**
- *"Seizures or convulsions are known potential side effects of nicotine toxicity"*
- *"Seizures have been reported as occurring after a few puffs or up to one day after use"*



# YTD E-Cigarette and Liquid Nicotine Exposures

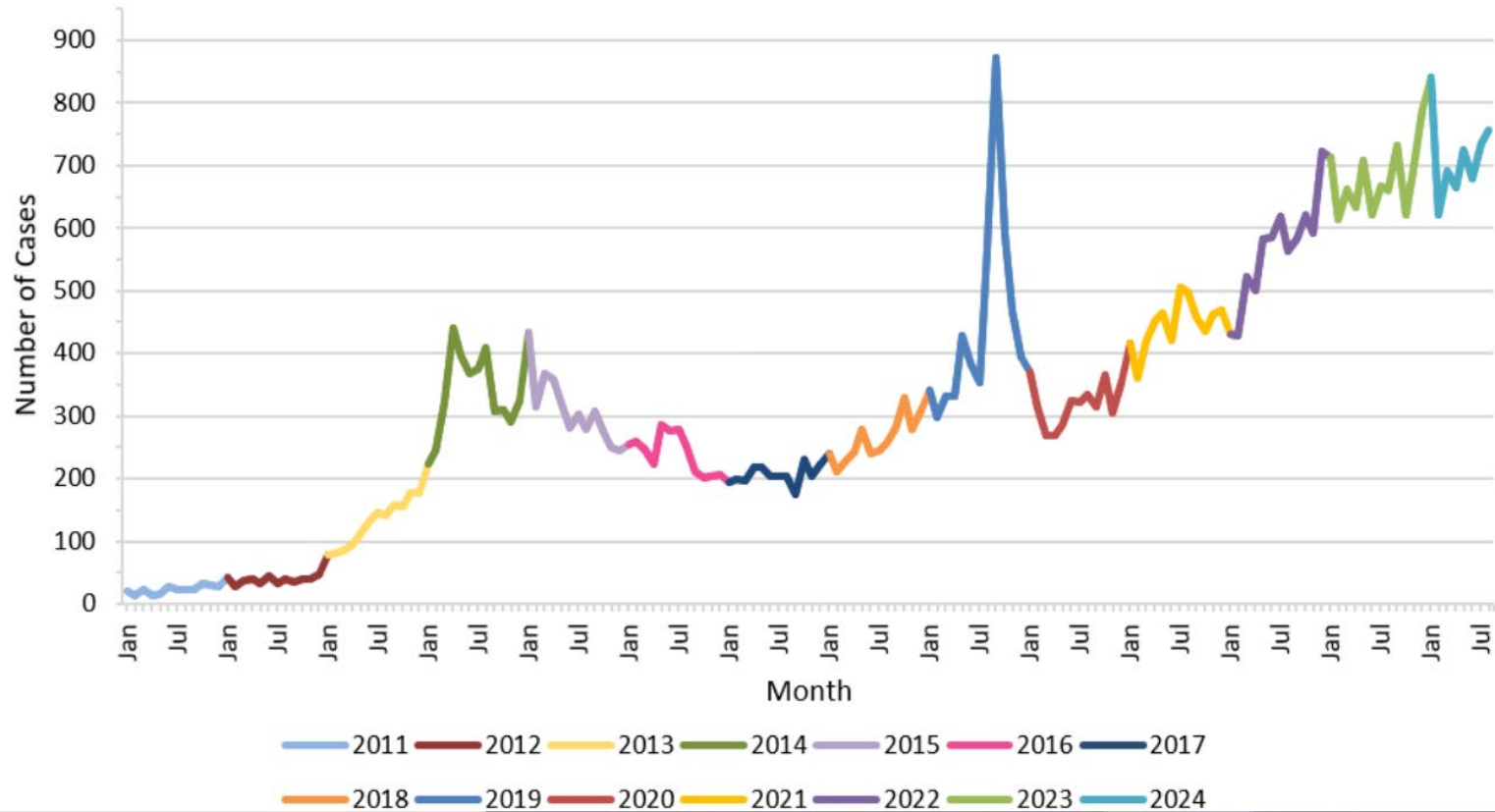


As of August 31, 2024, Poison Centers have managed 5713 e-cigarette and liquid nicotine exposure cases.

<https://poisoncenters.org/track/ecigarettes-liquid-nicotine> As of 8/31/24 Accessed 9/26/2024

www.thenmi.org

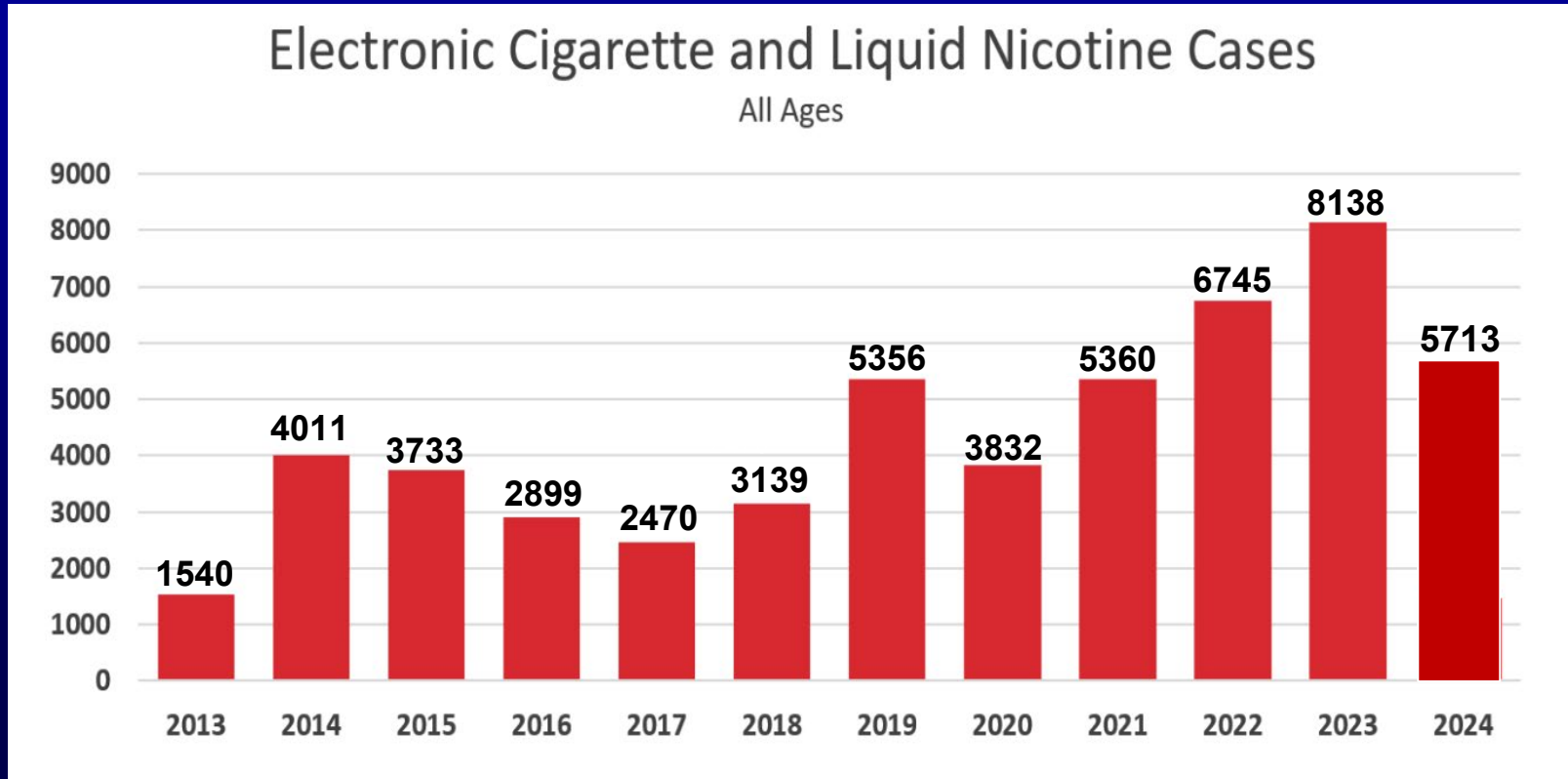
# E-Cigarette and Liquid Nicotine Exposures



From 2021 to 2024, Poison Centers have managed 53,642 e-cigarette and liquid nicotine related exposure cases.

<https://poisoncenters.org/track/ecigarettes-liquid-nicotine> As of 8/31/24 Accessed 9/26/2024

# E-Cigarette & Liquid Nicotine Cases Reported by American Association of Poison Control Centers





# Protonitazene and Isotonitazene?

## NJ Perspective:

- In 2021, 2 cases of confirmed protonitazene in wax folds in NJ.
- To date, no laboratory or toxicology confirmation of isotonitazene.

D.C. Politics

## New opioids, more powerful than fentanyl, are discovered in D.C. amid deadly wave of overdoses

By Peter Jamison

Yesterday at 12:54 p.m. EST



Forensic analysts have identified a new and highly potent family of synthetic opioids in the District's illicit drug supply, a worrisome discovery in a city already struggling with a wave of fatal overdoses that shows no signs of abating.

The opioids, found on used syringes examined by scientists at the D.C. Department of Forensic Sciences in September and October, are called protonitazene and isotonitazene, respectively. Experts estimate that each is at least several times more powerful than fentanyl, the synthetic opioid that has displaced heroin in many parts of the United States and is now responsible for the majority of the country's drug overdoses, including those in the nation's capital.

The identification of the "nitazenes" in D.C., first reported by WTOP, comes as the District is reckoning with an opioid crisis that has never been worse. Centers for Disease Control and Prevention data released this month show that the District saw an estimated 498 fatal overdoses over 12 months during the coronavirus pandemic — an extraordinary figure that eclipses the city's notably high homicide toll and is larger than the number of drug deaths in 13 states.

Source: [https://www.washingtonpost.com/local/dc-politics/new-opioids-more-powerful-than-fentanyl-are-discovered-in-dc-amid-deadly-wave-of-overdoses/2021/11/29/680afb2c-4d43-11ec-94ad-bd85017d58dc\\_story.html](https://www.washingtonpost.com/local/dc-politics/new-opioids-more-powerful-than-fentanyl-are-discovered-in-dc-amid-deadly-wave-of-overdoses/2021/11/29/680afb2c-4d43-11ec-94ad-bd85017d58dc_story.html)

# Nitazenes

- Nitazenes & their analogs are synthetic novel opioids with a potency similar to, or greater than, potency of fentanyl
- Nitazenes can appear in a variety of colors and preparations (**powder, liquid**, counterfeit pills)
- Drug Enforcement Administration (DEA) has classified 10 nitazene analogs as Schedule I drugs
- DEA has warned that nitazene analogs are being used to make drugs more potent and cheaper to produce
- DEA forensic laboratories have identified the mixing of nitazene analogs with fentanyl/heroin and marketed as common street drugs<sup>1</sup>

*What Are Nitazenes?* New Jersey State Police, Office of Drug Monitoring & Analysis. September 2023 ROIC202308-22596D

<sup>1</sup> Drug Enforcement Administration, New, Dangerous Synthetic Opioid in D.C., Emerging in Tri-State Area (June 2022).

# Schedule I Nitazene Analogues

- Butonitazene
- Clonitazene
- Etodesnitazene\*
- Etonitazene
- N-pyrrolidino etonitazene\*
- Isotonitazene\*
- Metodesnitazene
- Metonitazene\*
- Flunitazene
- Protonitazene\*

\* Identified in NJ Drug Supply

# GHB: Gamma-Hydroxybutyrate

- Illegal drug used as
  - muscle builder
  - “party drug”
  - “date-rape” drug
- Available in **liquid form**, **powder form**, or pill
- Linked to many serious illnesses/deaths
- GHB, sodium oxybate, (Xyrem®) for narcolepsy

# Effects of GHB: Gamma-Hydroxybutyrate

- Drowsiness
- Dizziness
- Nausea
- Vomiting
- Loss of coordination
- Changes in blood pressure
- Trouble breathing
- Aggressive behavior
- Impaired judgment
- Hallucinations
- Seizures
- Coma
- Death
- Effects usually appear 10 to 20 minutes after a person takes GHB

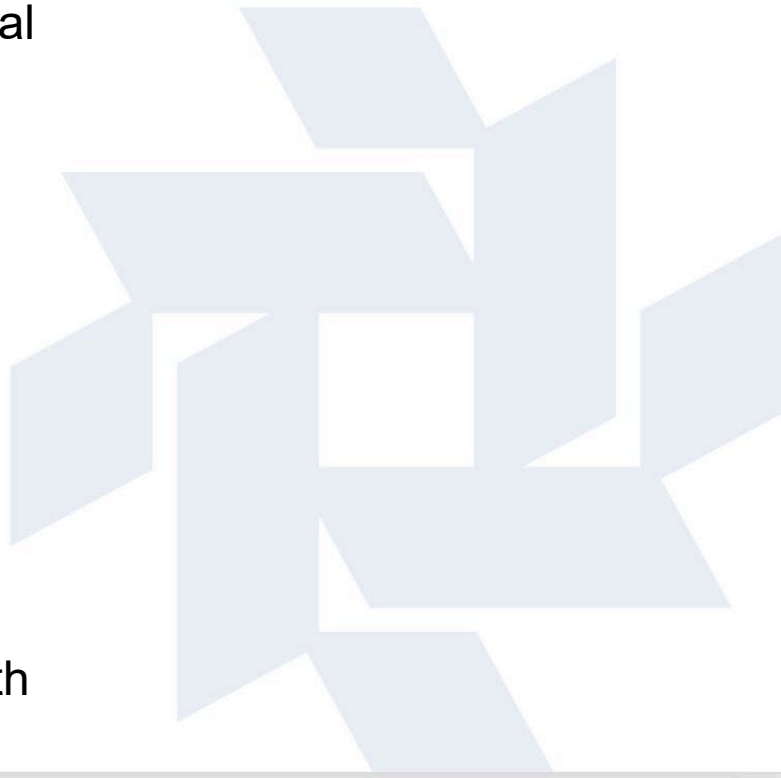


# GHB:Gamma-Hydroxybutyrate

- Blue nitro
- Cherry fX bombs
- Cherry meth
- Easy lay
- Everclear
- Firewater
- Gamma G
- Georgia homeboy
- GHB
- G.H. revitalizer
- Gib
- Goops
- Great hormones at bedtime
- Grievous bodily harm
- G-riffick
- Growth hormone booster
- Insom-X
- Invigorate
- Lemon fX drops
- Liquid ecstasy
- Liquid E
- Liquid X
- Longevity
- Natural sleep-500
- Nature's quaalude
- Orange fX rush
- Organic quaalude
- Oxy-sleep
- Poor man's heroin
- Remforce
- Revivarant
- Salty water
- Scoop
- Soap
- Somatomax PM
- Somsanit
- Vita-G
- Water
- Wolfies
- Zonked

# Designer Drug: One and Done

- 25i, 25-l, 25-NBOMe, “N-Bomb”, Phenethylamine, LSD analogue
- SL, Buccal, **Insufflate-snorted/smoked**, Nasal
- 7 teens, non-fatal OD Richmond, VA 2/28/12
- 3-14yoF non-fatal OD Chesterfield, VA 3/6/12
- one pill crushed/snorted, \$25
- Fatal OD 17yoM, 18yoM in MN 6/15/12
- Fatal OD 21yoM in LA 10/28/12
- One drop nasally, seizure, died
- Fatal OD 16yoM in Sacramento CA
- Near fatal OD 18yoF in NJ 12/12
- 2wk ICU, one drop/nostril x1
- Violence, depressed, unaware P/P/T
- Seizure, HF, HTN, cerebral bleed, coma, death



# 251-NBOMe/NBOMe

- Doses as small as 50 micrograms produce powerful effects (1 grain table salt = 1 mg)
- Cannot tell the dose you are taking, think it is LSD
- \$30 for 100 dose blotter sheet (cheap LSD)
- \$200/kg ordered from China
- LSD used to be \$1/hit (now rarer/more expensive)
- Highly potent full agonist 5-HT-2A receptor-implicated in serotonin syndrome
- **Agitation, delirium, seizures, tachycardia, pyrexia, respiratory & metabolic acidosis, death**

# Bath Salts: Cathinones



# Bath Salts Street Names & “Brands”

- Flakka
- Gravel
- Bloom
- Ivory Wave
- **Vanilla Sky**
- White Lightning
- Red Dove
- Cloud 9
- Cloud Nine
- Bliss
- Blue Silk
- Drone
- Energy-1
- Lunar Wave
- Meow Meow
- Maui Wowie
- Ocean Burst
- Pure Ivory
- Purple Wave
- Snow Leopard
- Stardust
- White Dove
- White Knight
- Cotton Cloud
- Charge Plus
- Snow Day
- Ocean Snow



# Flakka / Gravel

- Tweaked version of bath salts
  - Synthetic cathinone alpha-PVP
  - Crystalline rock form: swallow, snort, **smoke, vape,** inject
  - Addictive: block reuptake transporters of dopamine
- Extremely dose specific: \$5 for 0.1gram
  - Excited delirium: overheated, induced hypothermia, hallucinations, muscle over activate/disintegrate
  - Heart palpitations, aggressive violent behavior, kidney failure, death
- South Florida: hospitals admit 20 patients/day
- Represent 15-20% current treatment program admissions

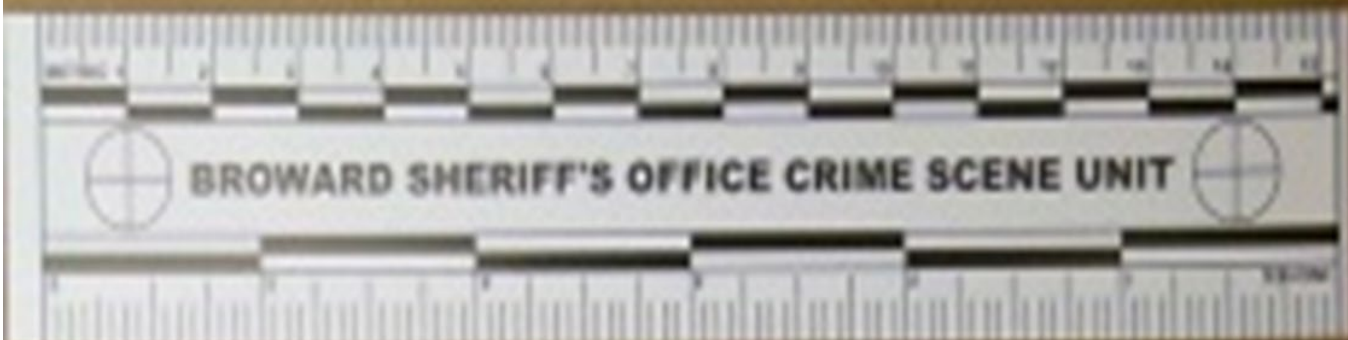


# Flakka

- "Flakka" ( $\alpha$ -pyrrolidinovalerophenone,  $\alpha$ -PVP), a synthetic cathinone, has gained popularity in United States
- Using can lead to agitated delirium & causes
  - Strange behavior
  - Anxiety
  - Aggression
  - Confusion
  - Muscle twitches
  - Seizures
  - Increased sweating
  - Dilated pupils (mydriasis)



Figure 3. Flakka. Adapted from "What is Flakka" The Ranch Pennsylvania, 203. Retrieved from <https://www.recoveryranchpa.com/addiction-blog/what-is-flakka/>





# Blue Flakka/Gravel



# Gray Death/Gray Grey Death/Grey



- Contains: heroin, fentanyl, U47700 (synthetic opioid-pink/U4)
  - With or without carfentanil
- Looks like cement powder/hardened cement (“rock”)
- Taken via ingestion, **insufflation**, **smoking**, injection
- Drug seizures/OD cases in AL, CA, GA, IL, IN, KY, OH, PA
  - Bethlehem, PA drug seizure on 5/10/17
  - GA samples w/butyrylfentanyl & acrylfentanyl
  - Auburn, AL: 1 patient IV/1 patient IN
    - ◆ IN patient tried to revive IV patient w/CPR-both succumbed to overdoses
  - *“Gray Death is one of the scariest combinations that I have ever seen in nearly 20 years of forensic chemistry drug analysis.”*



Deneen Kilcrease, Manager Chemistry Section Georgia Bureau of Investigation

CAN YOU TELL WHICH METH  
IS LACED WITH FENTANYL?  
YOU CAN'T.  
**NOW YOU'RE DEAD.**

*don't die to get high*  
**FENTANYL IS FATAL**

To access Naloxone (Narcan®),  
care, or support, call:  
**(877) 266-8222**

Or the Camden County Office  
of Mental Health and  
Addiction at: **(856) 374-6361**

camden  county

*Making It Better Together*

[CamdenCounty.com/Fentanyl](http://CamdenCounty.com/Fentanyl)



## DMI IDR | Liquid Cocaine Concealed in Liquor Bottles



### Key Finding

Liquid cocaine concealed in liquor bottles has been seized by NJ law enforcement.

### Details

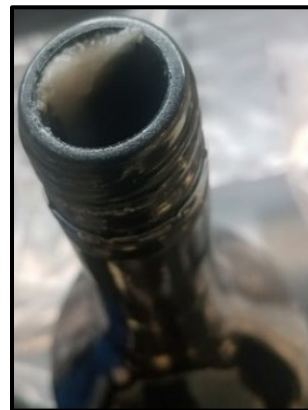
April 2021, NJSP Trafficking South with assistance from Camden County SERT executed a residential search warrant in Camden, NJ where over two kilograms of liquid cocaine, concealed in glass liquor bottles, was seized.

- The bottles had a white crust around the rim and lid area; inside was a yellow tinted oily substance
- HRMU advised that the substance is consistent with **cocaine dissolved in a water-based solution**
- In this method of concealment, the cocaine powder is **dissolved in water and acid**. In an **acidic environment, cocaine will remain in the solution** and be undetectable to the naked eye
- The cocaine can be extracted from the solution by adding a base such as Drano. The powder cocaine will precipitate out of the solution and be filtered

### Recommendations for Law Enforcement

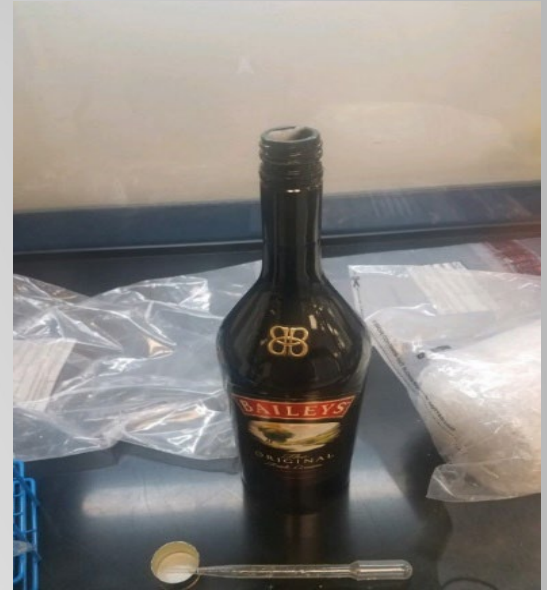
Treat all unidentified substances with caution as authorities have seized several illicit drugs, including cocaine, methamphetamine, and fentanyl, in liquid form, concealed in wide-ranging packaging.

- As many of these items are shipped, parcels should be scrutinized
- Field-testing of suspected drug-related liquids is not recommended; only trained Hazmat personnel with appropriate presumptive instruments and forensic laboratory scientists should conduct testing and confirmation of unknown substances



## Methods of CDS Concealment

- Change the state of matters
  - Solid to liquid
- Intermediate drugs (Prodrugs)
  - 1,4 Butanediol to GHB
  - Cocaine Base

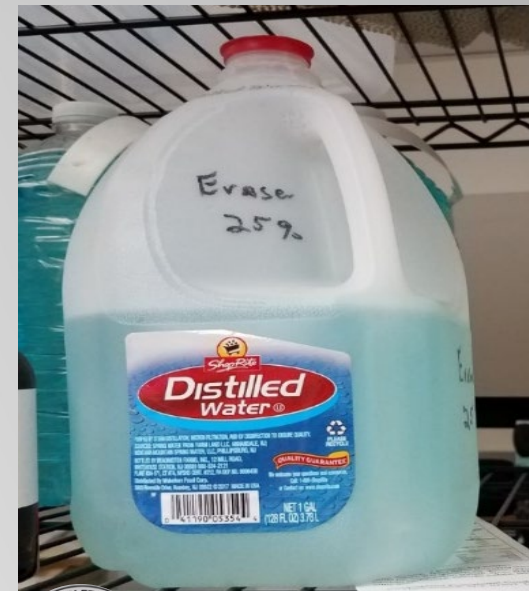


**HMRU**  
NEW JERSEY STATE POLICE



# Cocaine & Methamphetamine

- Either base or salt form
- Base dissolve in organic solvent (oil/paint thinner) in a basic environment
- **Salt form dissolve in water**
- Require usage of organic solvent
- Usage of strong acid or base



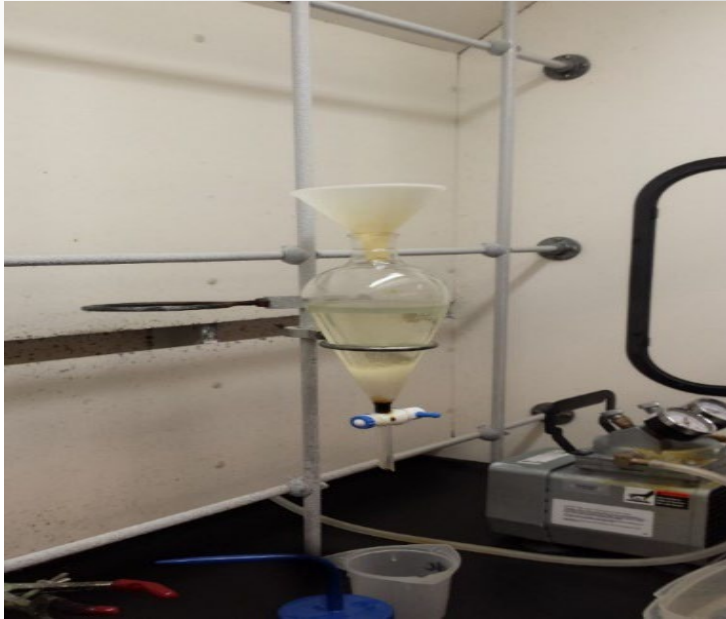
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## Liquid Methamphetamine



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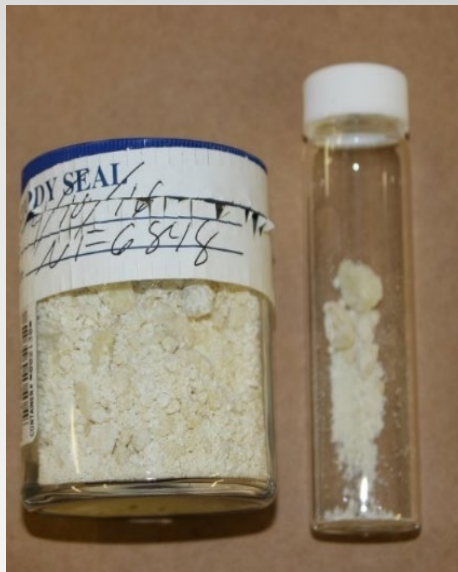


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# Propylene Glycol

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- Food grade anti-freeze (solvent)
- Can dissolve most CDS
- Administered via vape pen or oral micro dosing
- Very common with Research Chemicals



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# Prodrug or CDS Intermediate

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- Prodrug – Chemical(s) that once consumed will be converted into the narcotic substance
- Intermediate – Incomplete/pre-cooked narcotic substance
- Prodrug & intermediate substances are not scheduled drugs
- Can be difficult to detect



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# Xylazine

- Snorted
- Insufflated
- Smoked
- Vaped
- Still Can Get the Wounds

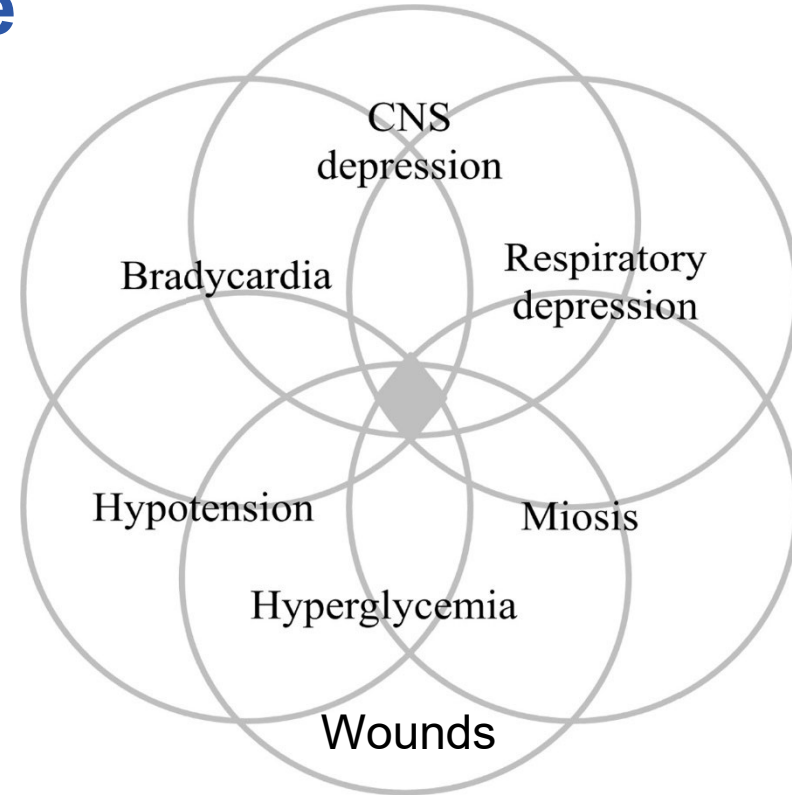


Fig. 2. General Toxidrome for Xylazine

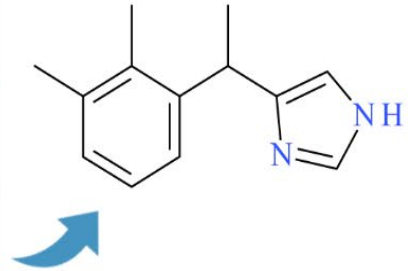
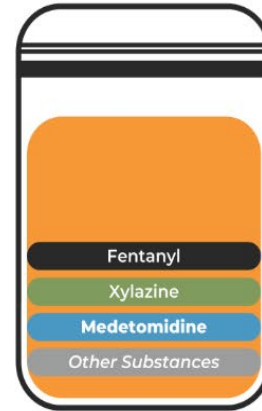
# Xylazine's Cousin... “Mede” / “Rhino Tranq” Already Here!



*Note:* Medetomidine was reported in samples received from additional states (e.g., North Carolina, Ohio) to those mentioned above by a drug checking program.

## ◀ GEOGRAPHICAL DISTRIBUTION OF MEDETOMIDINE EMERGENCE

*Medetomidine has been identified across several states in the U.S. and Canada, and is recently being observed in severe overdose outbreaks in major metropolitan areas.*



**ACKNOWLEDGEMENTS:** This report was prepared by Alex Krotulski, Jen Shinefeld, Chris Moraff, Taylor Wood, Sara Walton, Josh DeBord, Max Denn, Alexis Quintor, and Barry Logan at the Center for Forensic Science Research and Education (CFSRE) at the Fredric Rieders Family Foundation. The authors acknowledge scientists and staff for their involvements and contributions, as well as our many collaborators in public health agencies, clinical institutions, harm reduction organizations, and beyond for their cooperation in assessing drug outbreaks.

**FUNDING:** CFSRE's NPS Discovery is supported in-part by the National Institute of Justice, Office of Justice Programs, U.S. Department of Justice (ISPNJ-22-CG-04434-MUMU). The opinions, findings, conclusions and/or recommendations expressed in this publication are those of the author(s) and do not necessarily represent official position or policies of NIJ/DOJ.

**ADDITIONAL INFORMATION:** Contact [npsdiscovery@cfsre.org](mailto:npsdiscovery@cfsre.org) or visit [www.npsdiscovery.org](http://www.npsdiscovery.org).

**SUGGESTED CITATION:** Krotulski, A.; Shinefeld, J.; Moraff, C.; Wood, T.; Walton, S.E.; DeBord, J.S.; Denn, M.T.; Quintor, A.D.; Logan, B.K. (2024) Medetomidine Rapidly Proliferating Across USA — Implicated in Recreational Opioid Drug Supply & Causing Overdose Outbreaks, Center for Forensic Science Research and Education, United States.



# DRUG MATERIALS CONTAINING MEDETOMIDINE AND OTHER SUBSTANCES

## SUMMARY OF RESULTS:

► To date, medetomidine has been commonly identified alongside fentanyl and xylazine, and the proportion of medetomidine in the drug material varies by sample.

► Medetomidine has been identified alongside heroin, in the absence of xylazine.

► Tetracaine has been identified alongside fentanyl, xylazine, and medetomidine in drug products, but not uniformly or consistently.

► Real-time drug material and toxicological testing are on-going to track the emergence and proliferation of medetomidine.

## PHILADELPHIA, PA

DRUG	RELATIVE PARTS	DRUG	RELATIVE PARTS
Fentanyl	1p	Fentanyl	1p
Xylazine	1.9p	Xylazine	0.4p
Medetomidine	0.8p	Medetomidine	1.9p
Tetracaine	3.9p	<i>para</i> -Fluorofentanyl	0.1p
Other Substances?	Caffeine	Other Substances?	No

## PITTSBURGH, PA

DRUG	RELATIVE PARTS
Fentanyl	1p
Xylazine	1.5p
Medetomidine	0.1p
Tetracaine	0.5p
Other Substances?	pFF, Caffeine

## CHICAGO, IL

DRUG	RELATIVE PARTS	DRUG	RELATIVE PARTS
Fentanyl	1p	Heroin	1p
Xylazine	2p	Fentanyl	Trace
Medetomidine	0.6p	Medetomidine	6.3p
Diphenhydramine	0.5p	Diphenhydramine	2.6p
Other Substances?	pFF, Nitazenes, etc.	Other Substances?	No

# Xylazine < Romifidine < Detomidine < Medetomidine < Dexmedetomidine



MEDETOMIDINE

**100 X**



DETOMIDINE

**50 X**



ROMIFIDINE

**12.5 X**



DEXMEDETOMIDINE

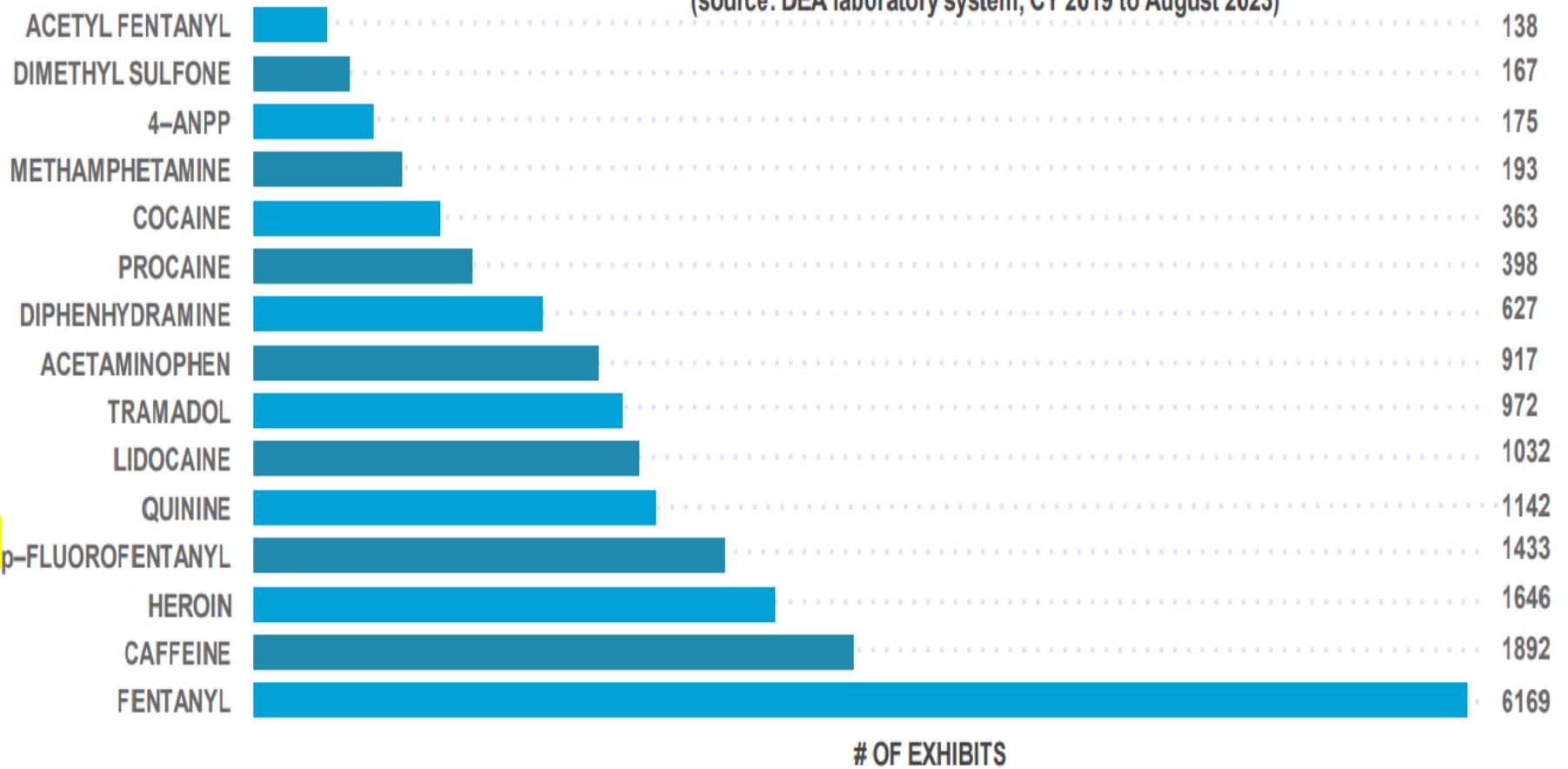
**200 X**

Xylazine Substitutes?  
Iatrogenic Effects??!!

Correspondence with Dr Robert Bassett  
Poison Control CHOP Philadelphia PA 6/4/24

# TOP 15 SUBSTANCES FOUND WITH XYLAZINE

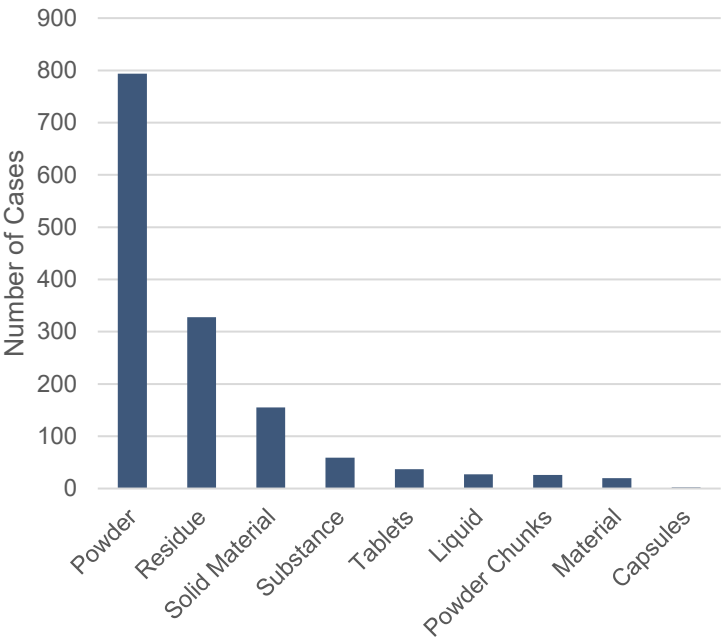
(source: DEA laboratory system, CY 2019 to August 2023)



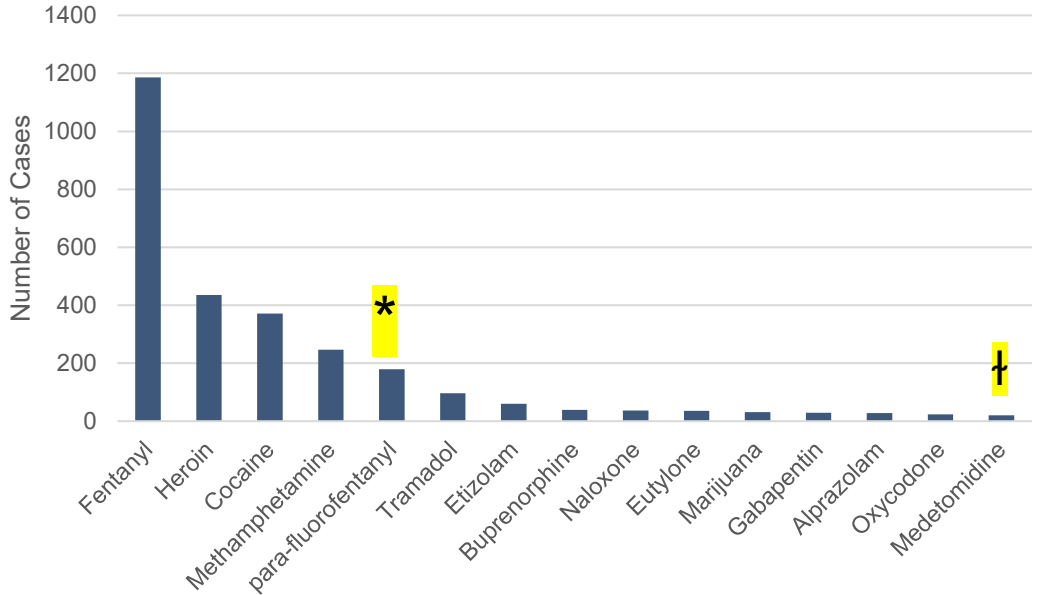
# Substance Details

These visualizations were created using lab analysis results for substances seized by law enforcement where xylazine was involved. The data includes information from 2020-2021 and was provided by the Department of Forensic Sciences (DFS). The Xylazine Cases by Item Form chart indicates that the **substance is most often found in a powder form**. Additionally, the chart on the right highlights the top substances found with xylazine. **The most common substance xylazine is found with is fentanyl, followed by heroin and cocaine.**

Xylazine Cases by Item Form  
2020-2022



Xylazine Cases by Top 15 Co-Occurring  
Substances  
2020-2022







## Presence of PCP (Phencyclidine) in NJ

- PCP (Schedule II) is classified as a hallucinogen. PCP is a “dissociative” drug; it induces distortion of sight and sound and produces feelings of detachment. It can also work as a stimulant, an anesthetic, or a painkiller, depending on how much is ingested
  - Commonly encountered as a bitter-tasting, white crystalline powder that is **easy to dissolve in water or alcohol**
  - May be dyed various colors and often is sold as a tablet, capsule, **liquid**, or powder

COUNTY	2015		2016		2017		2018		2019		2020		TOTAL			
	CASES	SPECIMENS	CASES	SPECIMENS	CASES	SPECIMENS	CASES	SPECIMENS	CASES	SPECIMENS	CASES	SPECIMENS	CASES	SPECIMENS		
ATLANTIC	3	3	4	5	5	5	5	5	12	14	5	16	34	4%	48	2%
BERGEN	9	21	7	9	13	13	6	6	8	18	7	8	50	5%	75	4%
BURLINGTON	1	1	3	15	2	2	1	1	4	6	1	1	12	1%	26	1%
CAMDEN	77	232	59	179	59	186	60	63	80	253	37	126	372	39%	1,039	52%
CAPE MAY	0	0	1	1	0	0	0	0	0	0	0	0	1	0.1%	1	0.1%
CUMBERLAND	5	68	4	4	4	4	3	3	7	7	6	48	29	3%	134	7%
ESSEX	5	5	15	16	12	13	9	9	13	21	11	11	65	7%	75	4%
GLOUCESTER	12	28	14	15	14	14	13	13	22	43	8	9	83	9%	122	6%
HUDSON	1	3	0	0	1	1	1	1	2	2	2	3	7	1%	10	1%
HUNTERDON	1	2	1	1	0	0	1	1	3	3	1	1	7	1%	8	0.4%
MERCER	27	41	2	2	14	28	12	13	4	5	9	12	68	7%	101	5%
MIDDLESEX	4	7	2	2	9	9	9	9	5	5	4	6	33	3%	38	2%
MONMOUTH	5	7	4	8	3	3	4	4	0	0	2	2	18	2%	24	1%
MORRIS	2	4	0	0	1	1	4	4	1	1	6	6	14	1%	16	1%
OCEAN	0	0	0	0	2	2	0	0	0	0	0	0	2	0.2%	2	0.1%
PASSAIC	21	36	11	17	20	20	5	6	18	21	16	90	91	10%	190	10%
SALEM	7	7	6	6	16	20	10	10	7	11	14	20	60	6%	74	4%
SOMERSET	1	2	1	1	0	0	2	3	1	1	0	0	5	1%	7	0.4%
SUSSEX	0	0	0	0	0	0	1	1	0	0	0	0	1	0.1%	1	0.1%
UNION	0	0	0	0	2	2	1	1	0	0	0	0	3	0.3%	3	0.2%
TOTAL	181	467	134	281	177	323	147	153	187	411	129	359	955		1,994	
	19%	23%	14%	14%	19%	16%	15%	8%	20%	21%	14%	18%				

YEAR	CASES	% CHANGE	DIFF	SPECIMENS	% CHANGE	DIFF
2015	181	-	-	467	-	-
2016	134	↓ -26%	-47	281	↓ -40%	-186
2017	177	↑ +32%	+43	323	↑ +15%	+42
2018	147	↓ -17%	-30	153	↓ -53%	-170
2019	187	↑ +27%	+40	411	↑ +169%	+258
2020	129	↓ -31%	-58	359	↓ -13%	-52
TOTAL	955			1,994		

- Total PCP cases decreased 29% from 2015 to 2020; total specimens decreased 23%
- Camden County accounted for 39% of total cases and 52% of total specimens, significantly higher than any other county in the state



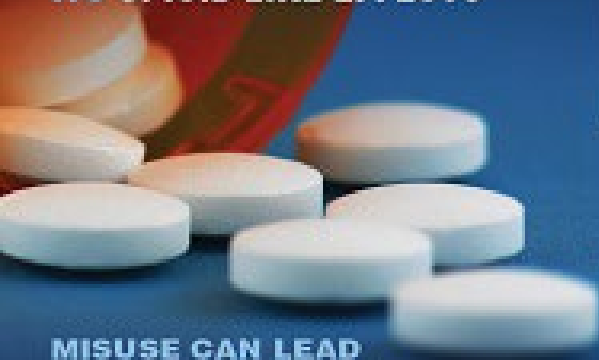
# TCP: Tenocyclidine

- Novel Psychoactive Substance (NPS)
- PCP Analogue
- Suspected 10x more potent than PCP
- Identified in Philadelphia Drug Supply
- Identified in NJ Drug Supply
  - 43 cases in 8 counties since 2021
  - Most, not all, been found in/on cigarettes
  - **Most other forms in plastic vial**
  - 50% of cases involved cigarette dipped in suspected substance
  - **Rest mostly in liquid form**
- *Especially present in South Jersey!!*

# TIANEPTINE, A POSSIBLE PUBLIC HEALTH RISK

## ANTIDEPRESSANT NOT APPROVED IN THE U.S.

PEOPLE MAY BE ABUSING  
TIANEPTINE BECAUSE OF  
ITS OPIOID-LIKE EFFECTS



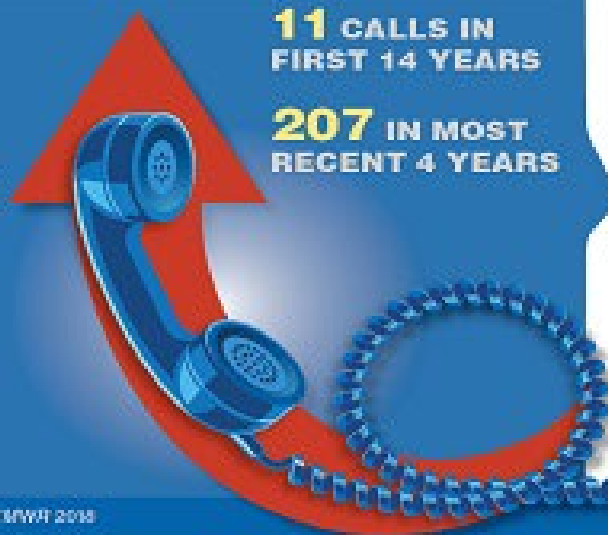
MISUSE CAN LEAD  
TO SEVERE ADVERSE  
EFFECTS, DEPENDENCE,  
AND WITHDRAWAL

## POISON CONTROL CENTER CALLS INCREASING

**218** CALLS FROM  
2000 THROUGH 2017

**11** CALLS IN  
FIRST 14 YEARS

**207** IN MOST  
RECENT 4 YEARS



## TREATING TIANEPTINE MISUSE



CONSIDER  
TIANEPTINE  
MISUSE WHEN  
PATIENTS HAVE  
OPIOID-LIKE  
OVERDOSE OR  
WITHDRAWAL  
SYMPTOMS



CONSULT POISON  
CONTROL CENTERS  
(1-800-222-1222)  
FOR FURTHER  
MANAGEMENT

National Poison Data System data from 2000–2017 as published in El Zahran, *MMWR* 2018.  
<https://go.usa.gva/xUvT4>

[WWW.CDC.GOV](http://WWW.CDC.GOV)

El Zahran T, Schier J, Glidden E, et al. *Characteristics of Tianeptine Exposures Reported to the National Poison Data System — United States, 2000–2017*. *MMWR Morb Mortal Wkly Rep* 2018;67:815–818.

DOI: <http://dx.doi.org/10.15585/mmwr.mm6730a2>. August 3, 2018

**TABLE 1. Characteristics of telephone calls related to tianeptine exposure (N = 218) — National Poison Data System, United States, 2000–2017**

Characteristic (no. with known information)	No.	(%)
<b>Call source (218)</b>		
Health care provider	198	(91.2)
Caller residence	13	(6.0)
Other	7	(3.2)
<b>U.S. Census region (217) *</b>		
South	75	(34.6)
West	54	(24.9)
Midwest	47	(21.6)
Northeast	41	(18.9)
<b>Sex (215)</b>		
Male	177	(82.3)
Female	38	(17.7)
<b>Age group (yrs) (213)</b>		
<20	25	(11.7)
21–40	121	(56.8)
41–60	59	(27.7)
≥61	8	(3.8)
<b>Exposure route (218)</b>		
Ingestion	183	(83.9)
Parenteral	15	(6.9)
Inhalation	4	(1.8)
Unknown/Other	16	(7.4)
<b>Exposure type (218)</b>		
Intentional	119	(54.6)
Unintentional	23	(10.5)
Withdrawal	29	(13.3)
Unknown/Other	47	(21.6)
<b>Coexposure (83)</b>		
Phenibut	26	(31.3)
Ethanol	13	(15.7)
Benzodiazepines	10	(12.0)
Opioids	10	(12.0)

**TABLE 2. Common clinical effects associated with tianeptine exposures (N = 114) and therapies received — National Poison Data System, United States, 2000–2017**

Clinical effect*	No.	(%)
<b>Cardiovascular effect</b>	<b>37</b>	<b>(32.5)</b>
Tachycardia	29	(25.4)
High blood pressure	13	(11.4)
Conduction delays	5	(4.4)
<b>Neurologic effect</b>	<b>55</b>	<b>(48.3)</b>
Agitation	25	(21.9)
Drowsiness	19	(16.7)
Confusion	15	(13.2)
Coma	5	(4.4)
<b>Gastrointestinal effect</b>	<b>12</b>	<b>(10.5)</b>
Nausea	9	(7.9)
Vomiting	5	(4.4)
Diarrhea	3	(2.6)
<b>Dermal effect</b>	<b>10</b>	<b>(8.8)</b>
Pallor	3	(2.6)
Pain	3	(2.6)
Cellulitis	2	(1.8)
<b>Constitutional effect</b>	<b>10</b>	<b>(8.8)</b>
Diaphoresis	8	(7.0)
Fever	3	(2.6)
Pain	1	(0.9)
<b>Respiratory effect</b>	<b>8</b>	<b>(7.0)</b>
Respiratory depression	6	(5.3)
Dyspnea	3	(2.6)
Tachypnea	1	(0.9)
<b>Ocular effect</b>	<b>6</b>	<b>(5.3)</b>
Mydriasis	4	(3.5)
Miosis	2	(1.8)

<b>Renal effect</b>	<b>5</b>	<b>(4.4)</b>
Urinary retention	3	(2.6)
Creatinine abnormality	2	(1.8)
Kidney failure	1	(0.9)
<b>Metabolic effect</b>	<b>5</b>	<b>(4.4)</b>
Electrolyte disturbances	3	(2.6)
Acidosis	2	(1.8)
<b>Musculoskeletal effect</b>	<b>5</b>	<b>(4.4)</b>
Muscle weakness	2	(1.8)
Rigidity	1	(0.9)
<b>Psychiatric effect</b>	<b>2</b>	<b>(1.8)</b>
Delusions	2	(1.8)
<b>Therapy</b>		
Fluids	40	(35.1)
Benzodiazepines	31	(27.2)
Oxygen	12	(10.5)
Naloxone	11	(9.7)
Antibiotics	11	(9.7)
Sedation	9	(7.9)
Antiemetics	7	(6.1)
Intubation	5	(4.4)
Ventilator support	5	(4.4)
Antihistamine	3	(2.6)

\* Patient exhibited one or more type of clinical effect in a category.

El Zahran T, Schier J, Glidden E, et al. *Characteristics of Tianeptine Exposures Reported to the National Poison Data System — United States, 2000–2017*. MMWR Morb Mortal Wkly Rep 2018;67:815–818.

DOI: <http://dx.doi.org/10.15585/mmwr.mm6730a2>. August 3, 2018

# Tianeptine in NJ

- Tianeptine: atypical tricyclic antidepressant
- Pharmacologic effects: enhancement of serotonin reuptake & mu-opioid receptor agonism
- 20 cases of tianeptine ingestion associated with severe clinical effects
- Sharp increase from baseline of  $\leq 2$  exposure calls per year
- 20 with altered mental status
- Tachycardia: 11, hypotension: 10 Seizure: 8, prolonged QT interval 7, prolonged QRS duration 4, cardiac arrest: 1
- Prolonged QT intervals & prolonged QRS durations associated with increased risk for ventricular arrhythmia: 4
- 13 of the 17 patients were admitted to ICU
- 7 of 17 underwent endotracheal intubation
- No Deaths

**TABLE. Substances identified in six samples of Neptune's Fix obtained from two patients reported to the New Jersey Poison Information and Education System's Toxicall database — New Jersey, June 17–November 6, 2023**

Patient and sample description	Compounds identified*
<b>Patient A</b>	
Neptune's Fix, open bottle	Kavain Tianeptine
Neptune's Fix, closed bottle	ADB-4en-PINACA <sup>†</sup> CBD MDMB-4en-PINACA <sup>†</sup> THC Tianeptine
Neptune's Fix, open bottle	Kavain Tianeptine
Neptune's Fix, open bottle	ADB-4en-PINACA <sup>†</sup> CBD MDMB-4en-PINACA <sup>†</sup> THC Tianeptine
<b>Patient B</b>	
Neptune's Fix, open bottle	Kavain Tianeptine
Neptune's Fix, open bottle	Kavain Tianeptine

**Abbreviations:** ADB-4en-PINACA = N-(1-amino-3,3-dimethyl-1-oxobutan-2-yl)-1-(pent-4-en-1-yl)-1H-indazole-3-carboxamide; CBD = cannabidiol; MDMB-4en-PINACA = methyl 3,3-dimethyl-2-(1-(pent-4-en-1-yl)-1H-indazole-3-carboxamido) butanoate; THC = tetrahydrocannabinol.

# Tianeptine: Neptune's Fix







# WHAT IS KRATOM?



## Overview

Kratom is a tropical tree native to Southeast Asia, its leaves are used to produce over-the-counter herbal supplements. According to the Drug Enforcement Administration (DEA), consuming its leaves may result in psychotic symptoms and psychological/physical dependence.<sup>1</sup>



## What is the potential for abuse and addiction to Kratom?

Kratom has become well-known as a natural supplement for pain management, mood enhancement, and as an alternative to opioids. Kratom exhibits stimulant-like properties at lower doses, promoting alertness, while higher doses act as a sedative and produce opioid-like effects.<sup>1</sup> The active ingredients in kratom bind to the brain's opioid receptors, similar to scheduled opioids, and some users report being addicted to kratom.<sup>2</sup>

## Several safety issues related to kratom use have been identified:<sup>3</sup>

- Liver toxicity
- Kratom-related substance use disorder
- Contaminated kratom products (with heavy metals, bacteria)
- Seizures
- Neonatal abstinence syndrome (infants suffering from withdrawal)
- Death (in rare cases, typically when kratom is used alongside other substances)

## Kratom is marketed in many forms

- Tablets/Capsules
- Liquid Extract
- Powder
- Gummies



## Legal Status of Kratom

Kratom is not scheduled under the Controlled Substances Act, however, some states have banned or regulated its use. In New Jersey, kratom is legal to purchase, sell and consume.

The U.S. Food and Drug Administration has warned consumers against using kratom, and the DEA lists kratom as a Drug and Chemical of Concern.

<sup>1</sup> Drug Enforcement Administration, Kratom (October 2022).  
<sup>2</sup> National Institute on Drug Abuse, Kratom Drug Facts (April 2019).  
<sup>3</sup> U.S. Food & Drug Administration, FDA and Kratom (July 2023)

**Request for Information and Contact Information:**  
Any agency with additional information regarding this topic, or with questions about this product, may contact the Drug Monitoring Initiative (DMI), Office of Drug Monitoring & Analysis at [DMI@njsp.gov](mailto:DMI@njsp.gov).

# Common Legal & Illicit Vaporized Substances

- Benzodiazepines
- Cannabis (herbal, resin, oil, concentrate, distillate)
- Cathinones (bath salts)
- CBD
- Crystal Methamphetamine
- Derived Psychoactive Cannabis Products (DPCPs)
- DOTN (drugs other than nicotine)
- Fentanyl
- GBL (gamma butyrolactone liquid/G)
- GHB (gamma hydroxybutyrate)
- Heroin
- Ketamine (Special K)
- Kratom
- MDMA
- Medetomidine
- Nicotine
- N,N-Dimethyltryptamine (DMT or N,N-DMT)
- Nitazenes
- Opiates/Opioids
- Propylene Glycol (PG)
- Psychedelics
- Synthetic Cannabinoids
- THC
- Tianeptine
- Vegetable Glycerin (VG)
- Vitamin E Acetate
- Xylazine
- ***MANY OTHERS..."350 chemicals among 241 products evaluated"*<sup>1</sup>**

<sup>1</sup>Holt AK, Poklis JL, Peace MR. *A Retrospective Analysis of Chemical Constituents in Regulated and Unregulated E-Cigarette Liquids*. *Frontiers in Chemistry* 9:752342. doi: 10.3389/fchem.2021.742342. October 28, 2021



# Contact Poison Control

***1-800-222-1222***



# How to Refuse

- “No thanks, really into my soccer.”
- “No thanks, really trying to get into HS/University.”
- Really into my music/singing/playing instrument
- Trying to get athletic/academic scholarship
- Like going to school at \_\_\_\_\_
- Do not want to upset/disappoint my parents
  - My parents would be pi\*\*ed! My parents drug test.
  - Do not want to get into trouble at home/school/legally
- Not into that stuff/Have a health condition/food allergies
- Do not want to have something bad happen
- Want to be a \_\_\_\_\_, cannot have that on my record



---

*What*  
*is*  
*YOUR*  
*CODE/EMOJI?*

# Research – Educate – Prevent

*For the integrity of your work,*

*You will be recognized,*

*Maybe not with praise or awards*

*But with the lives touched by your life!*

***THANK YOU FOR YOUR DEDICATION & SERVICE!!***



# Contact Information

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# Presentation Survey Voluntary

William “Bill” Lynch

Your feedback, comments and ideas  
for additional topics are important to  
US.

Please tell us what you think.

- Open the camera app or QR Reader on your phone.
- Aim camera or QR Reader at this QR code square
- A secure link to access the survey
- Click on the link to open your survey
- 3 – 4 minutes to complete the survey







# Naloxone and Patient Outcomes in Out-of-Hospital Cardiac Arrests in California

William J Lynch Jr. Clinical Pharmacist

Bethanne Brandstetter, PharmD Candidate 2025





# Naloxone and Patient Outcomes in Out-of-Hospital Cardiac Arrests in California

David G. Dillon, MD, PhD; Juan Carlos C. Montoy, MD, PhD; Daniel K. Nishijima, MD; Sara Niederberger, MD; James J. Menegazzi, PhD; Jeremy Lacocque, DO; Robert M. Rodriguez, MD; Ralph C. Wang, MD

## Abstract

**IMPORTANCE** The incidence of opioid-associated out-of-hospital cardiac arrest (OA-OHCA) has grown from less than 1% of OHCA in 2000 to between 7% and 14% of OHCA in recent years; American Heart Association (AHA) protocols suggest that emergency medical service (EMS) clinicians consider naloxone in OA-OHCA. However, it is unknown whether naloxone improves survival in these patients or in patients with undifferentiated OHCA.

**OBJECTIVE** To evaluate the association of naloxone with clinical outcomes in patients with undifferentiated OHCA.

**DESIGN, SETTING, AND PARTICIPANTS** Retrospective cohort study of EMS-treated patients aged 18 or older who received EMS treatment for nontraumatic OHCA in 3 Northern California counties between 2015 and 2023. Data were analyzed using propensity score-based models from February to April 2024.

**EXPOSURE** EMS administration of naloxone.

**MAIN OUTCOMES AND MEASURES** The primary outcome was survival to hospital discharge; the secondary outcome was sustained return of spontaneous circulation (ROSC). Covariates included patient and cardiac arrest characteristics (eg, age, sex, nonshockable rhythm, any comorbidity, unwitnessed arrest, and EMS agency) and EMS clinician determination of OHCA cause as presumed drug-related.



# Introduction

- Out-of-hospital cardiac arrest (OHCA) is a growing public health problem with a poor prognosis
- Treatment guidelines for OHCA exist, but evidence-based therapies are limited
- **Nearly 90% of the 356 000 cases of OHCA in the US each year are fatal<sup>1</sup>**
  - **n= 320 400 deaths**
- Over past 2 decades, increasing proportion of OHCA has been shown to be secondary to drug overdose<sup>2</sup>



# Introduction

- Naloxone known to be beneficial in drug overdose without concurrent cardiac arrest, **unknown whether naloxone is beneficial to patients with OA-OHCA<sup>2,9</sup>**
- Naloxone reverses opioid associated apnea & altered level of consciousness & has effects on blood pressure & cardiac rhythm that confer biological plausibility for use in OA-OHCA<sup>9-11</sup>
- ***Current leading hypothesis is that naloxone reverses opioid-related myocardial depression & stimulates catecholamine release, with consequent augmentation of heart rate & blood pressure<sup>2,11</sup>***
- Current AHA guidelines for treatment of OHCA recommend EMS clinicians treating patients with known or suspected OA-OHCA should consider naloxone, but do not specifically recommend naloxone administration in these cases



# Results

- Compared with subgroup of nonexposed non–drug related OHCAs, naloxone was associated with improved rates of ROSC in both:
  - Non–drug related OHCAs (OR, 1.61; 95% CI, 1.34-1.94)
  - Drug-related OHCAs (OR, 2.45; 95% CI, 1.56-3.83)
- Naloxone was also associated with increased survival to hospital discharge in:
  - Drug-related OHCAs (OR, 2.48; 95% CI, 1.34-4.58)
  - Non–drug related OHCAs (OR, 1.35; 95% CI, 1.04-1.77)



# Discussion

- In this retrospective cohort study of adult patients with OHCA treated in 3 Northern California counties between 2015 & 2023

EMS administration of naloxone was associated with:

- 11.8 percentage point absolute increase in ROSC
- 3.9 percentage point absolute increase in patient survival to hospital discharge
- **0.039 x 320,400 deaths = 12,495 lives saved annually from OHCA**
- Absolute risk differences translate to a number needed to treat (NNT) with naloxone of 9 for ROSC and 26 for survival to hospital discharge



# Conclusions

## Absolute Risk Difference (ARD):

- Measures the difference in outcomes between the two groups
- Study shows how much more likely patients who received naloxone would achieve a return of spontaneous circulation (ROSC) or survive to hospital discharge than those who did not receive naloxone

## Number Needed to Treat (NNT):

- This is the number of patients who need to be treated with naloxone for one additional patient to benefit
- **NNT of 9 for ROSC means that for every 9 patients treated with naloxone, 1 additional patient achieves ROSC**
- **NNT of 26 for survival to hospital discharge demonstrates that:**
- **For every 26 patients treated with naloxone, 1 additional patient survives to hospital discharge**



# Conclusions

- Data analysis indicated that people not believed to be opiate/opioid exposed appeared to have better outcomes when exposed to naloxone than would be anticipated and expected
- Current leading hypothesis is that naloxone reverses opiate/opioid-related myocardial depression and stimulates catecholamine release, with the return of spontaneous circulation (ROSC) through consequent augmentation of heart rate and blood pressure
- ***Potential benefit is hypothesized to be achieved by reversing endogenous opioids to increase mean arterial blood pressure (MAP) with an endogenous catecholamine surge especially with naloxone exposure in patients without an opiate/opioid drug related injury***
- While not definitive, it is recommended that more extensive & long term research be conducted
- Excitement building around this possible benefit is that because of the catecholamine release and augmentation of heart rate and blood pressure, naloxone could be more widely utilized
  - even outside any drug-related injury
  - ***especially in cardiac arrest patients with asystole and/or pulseless electrical activity (PEA) presentation***
  - reducing the stigmatizing aspect of naloxone availability/possession due to the potential cardiac benefit, etc.



# Conclusions

- Dillon et al<sup>2</sup> found calculated patient number needed to treat was:
  - 1 of 9 for return of pulses (ROSC)
  - 1 of 26 for survival to hospital discharge
- Main limitation of study was selection bias: no clear indication of how treating paramedic made decision of whether to administer naloxone
- ***In contrast, number needed to treat for epinephrine in cardiac arrest is 112<sup>9</sup>***