THE NATURAL PROGRESSION OF VAPING TO MARIJUANA TO OPIATE ABUSE: A RECIPE FOR DISASTER

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VAPING:

Our Future Going Up in Smoke!

Electronic Nicotine Delivery Systems (ENDS)

E-Cigarettes

Hookah Pens

E-Cigars

Vape Pens

E-Pipes

E-Hookahs

At least 450 brands

E-CIGS ON THE MARKET

First Generation – "Ciga-like"

- looks like real cigarettes
- simplest make-up (battery, coil, and filling)
- low single voltage
- can contain a cartomizer
- appeal to visual users trying to quit traditional cigarettes

Second Generation – "Mid-size"

- looks like a pen
- larger than cigalikes and are more customizable
- commonly called a clearomizer
- rechargeable battery and refillable tank decreases cost

E-CIGS ON THE MARKET

Third Generation – "Advanced Personal Vaporizers"

- stronger batteries and various settings
- rebuildable atomizer
- smoked by advanced vapers because of the endless modification possibilities

Fourth Generation – "Alternative Vaping Products"

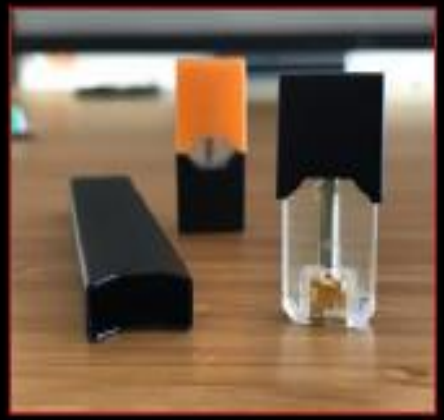
- Liquid with particulates
- Non-liquid vaping material

With permission 11/4/19 from MR Peace PhD. Virginia Commonwealth University

E-CIGS ON THE MARKET

Fifth Generation?

- Heat Not Burn
- Salt Vapors



With permission 11/4/19 from MR Peace PhD. Virginia Commonwealth University

JUUL: By Design to Use Cannabis?

JUUL e-cigarettes

Some e-cigarette critics are calling the JUUL e-cigarette the "Apple of vaping" or the "iPhone of vaping." With its relatively low entry price, sleek portable design, ease of use, and nicotine head rush it generates for users, JUULS are catching on with younger people.

JUUL flavor pods

The juice-flavored pods contain 50 milligrams of nicotine, roughly equivalent to a pack of cigarettes.

Design

The design of the e-cigarette is about the same size as a cigarette and weighs a couple of grams.

Charging dock

It looks like a USB thumb drive

Body

USB charging dock

The battery is charged by dropping the body on a magnetic USB adapter. It takes an hour to fully charge and will last up to 200 puffs, a full day of regular use.

Mouthpiece

Flavor element

Body

Most of the e-cigarette's body is designed to contain a built-in battery.

SOURCE: juulvapor.com

JAMES ABUNDIS / GLOBE STAFF

PAX Era

The effortless pen-and-pod system for oil.
Control temperature, flavor and potency and achieve session predictability.
Experience a new era.

Price: $14.20 for device

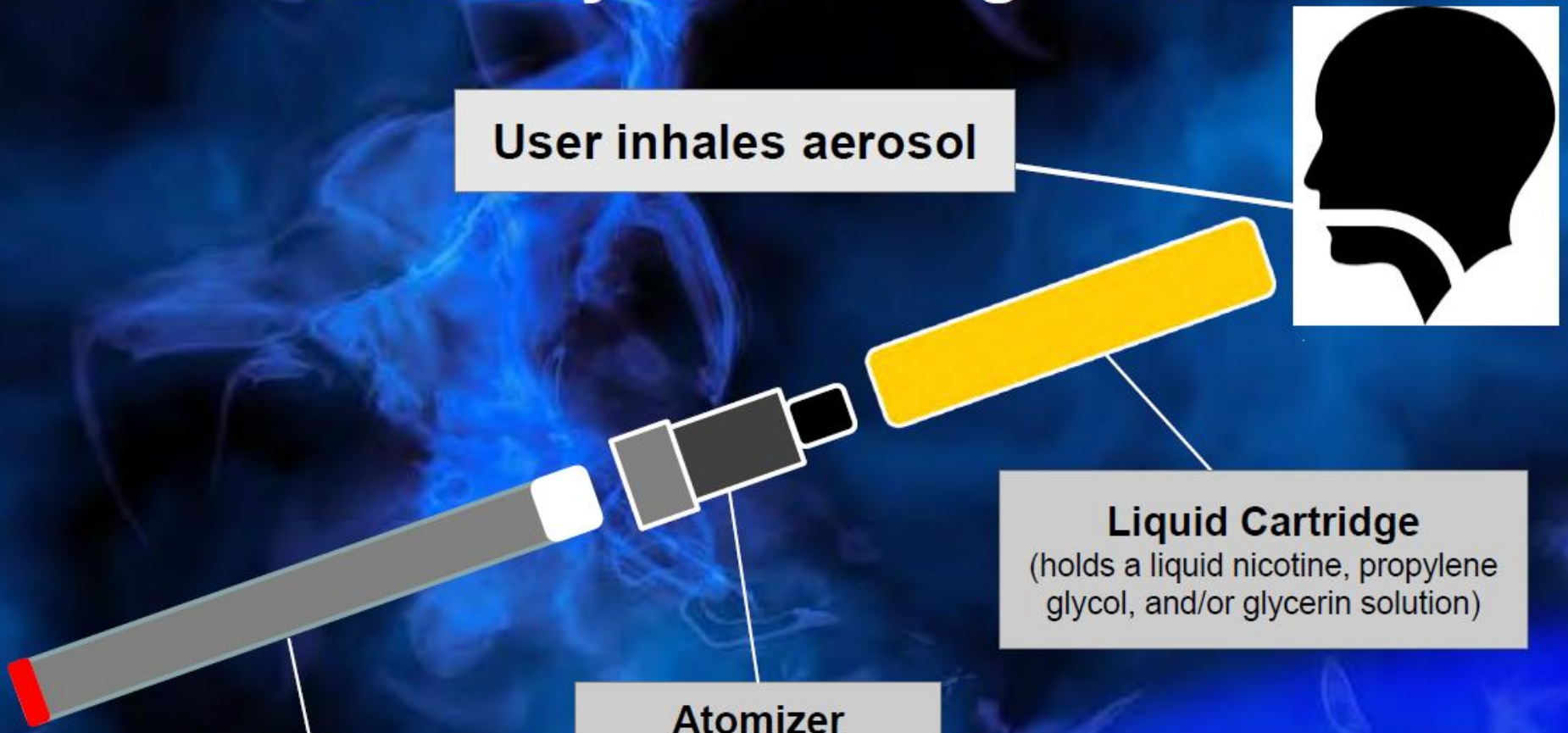
SimpleClick™ Pods: 250+ strains and 50+ extract partners means there is a pod for you
Browse Pods for: Strain Type, Desired Effect, Price, Potency, Brand, Terpene Level

Pod Price Range: $30-39 to $80-89
https://www.paxvapor.com/era

"Hacking the JUUL"

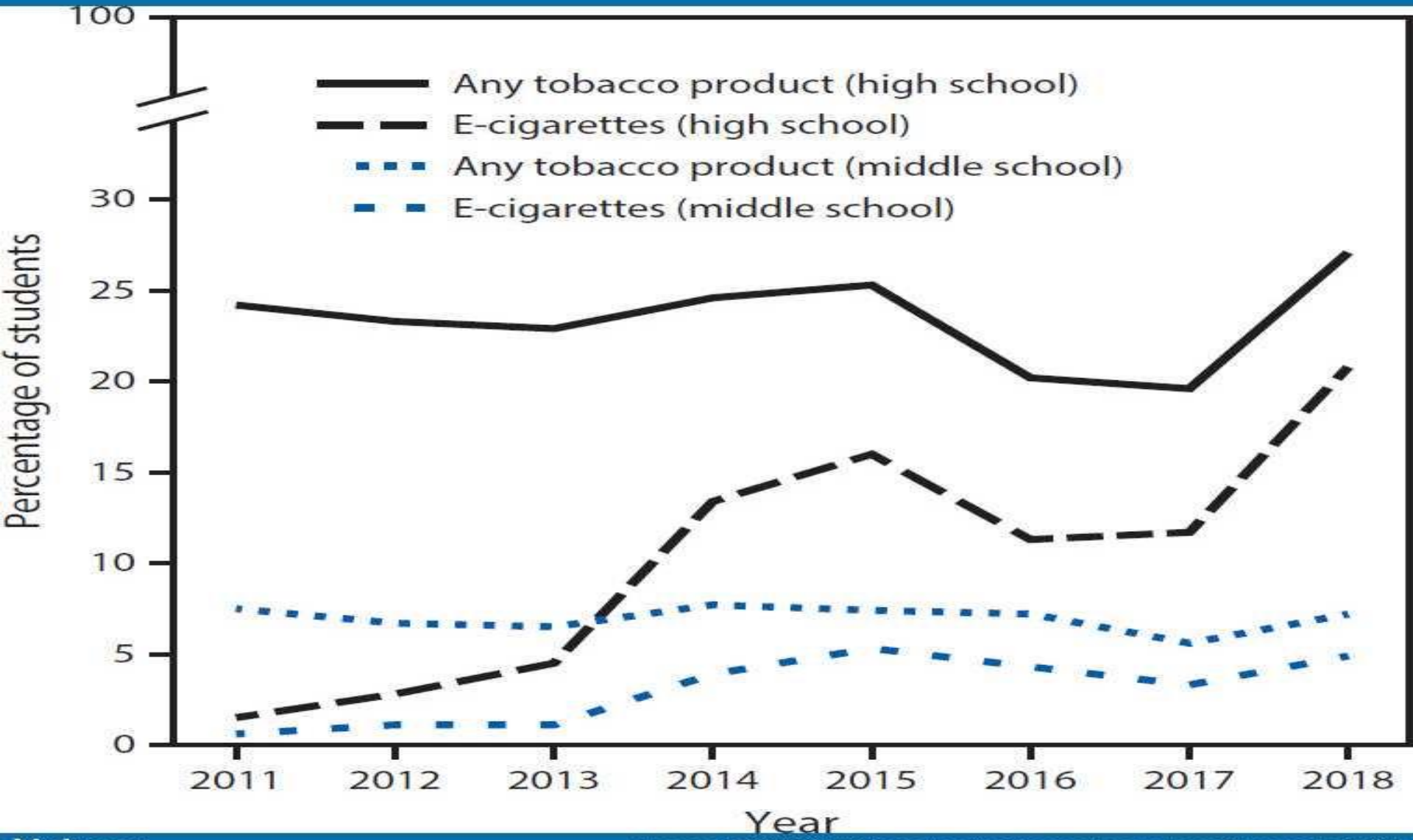
- Instructions on how to "hack"/modify the JUUL device
- For use of JUUL device with DIY juices/cannabis oil
- https://www.youtube.com/watch?v=5a9NjklJxYE
- Instructions on YouTube
  - Duration: 90 seconds
- Another YouTube Video with Instructions:
  - Whack it
  - No Bubbles
  - Block the coil for a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

Anatomy of an E-Cigarette

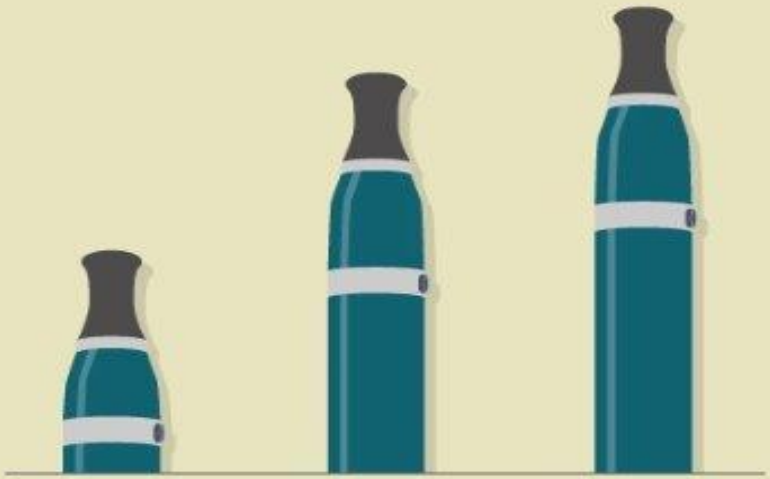


Percentage of middle and high school students who currently use e-cigarettes* and any tobacco product† — National Youth Tobacco Survey, United States, 2011–2018

CDC MMWR 12.14.18

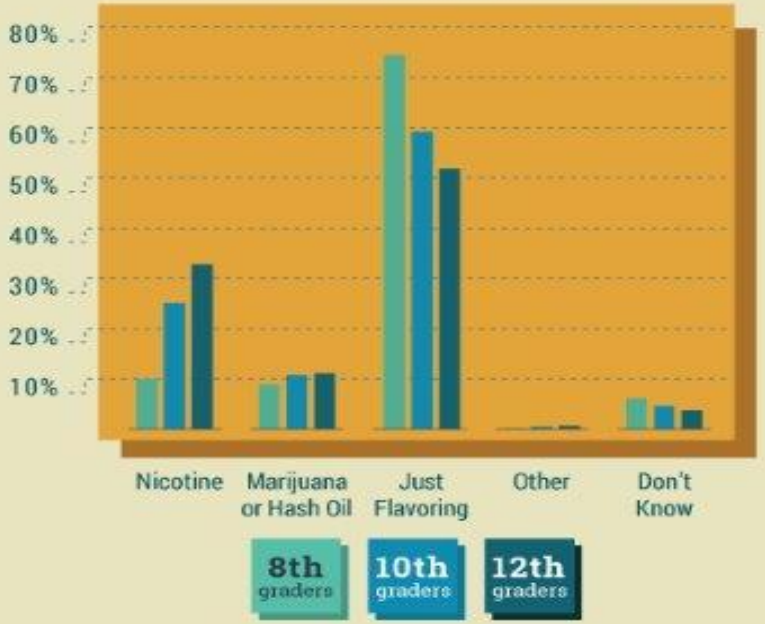


PAST-YEAR E-VAPORIZER USE AND WHAT TEENS ARE INHALING



8th graders	10th graders	12th graders
13.3%	23.9%	27.8%

When asked what they thought was in the e-vaporizer mist students inhaled the last time they smoked, these were their responses:



NEARLY 1 IN 3 STUDENTS IN 12TH GRADE REPORT PAST-YEAR USE OF E-VAPORIZERS, RAISING CONCERNS ABOUT THE IMPACT ON THEIR LONG-TERM HEALTH.

NIH National Institute on Drug Abuse

DRUGABUSE.GOV

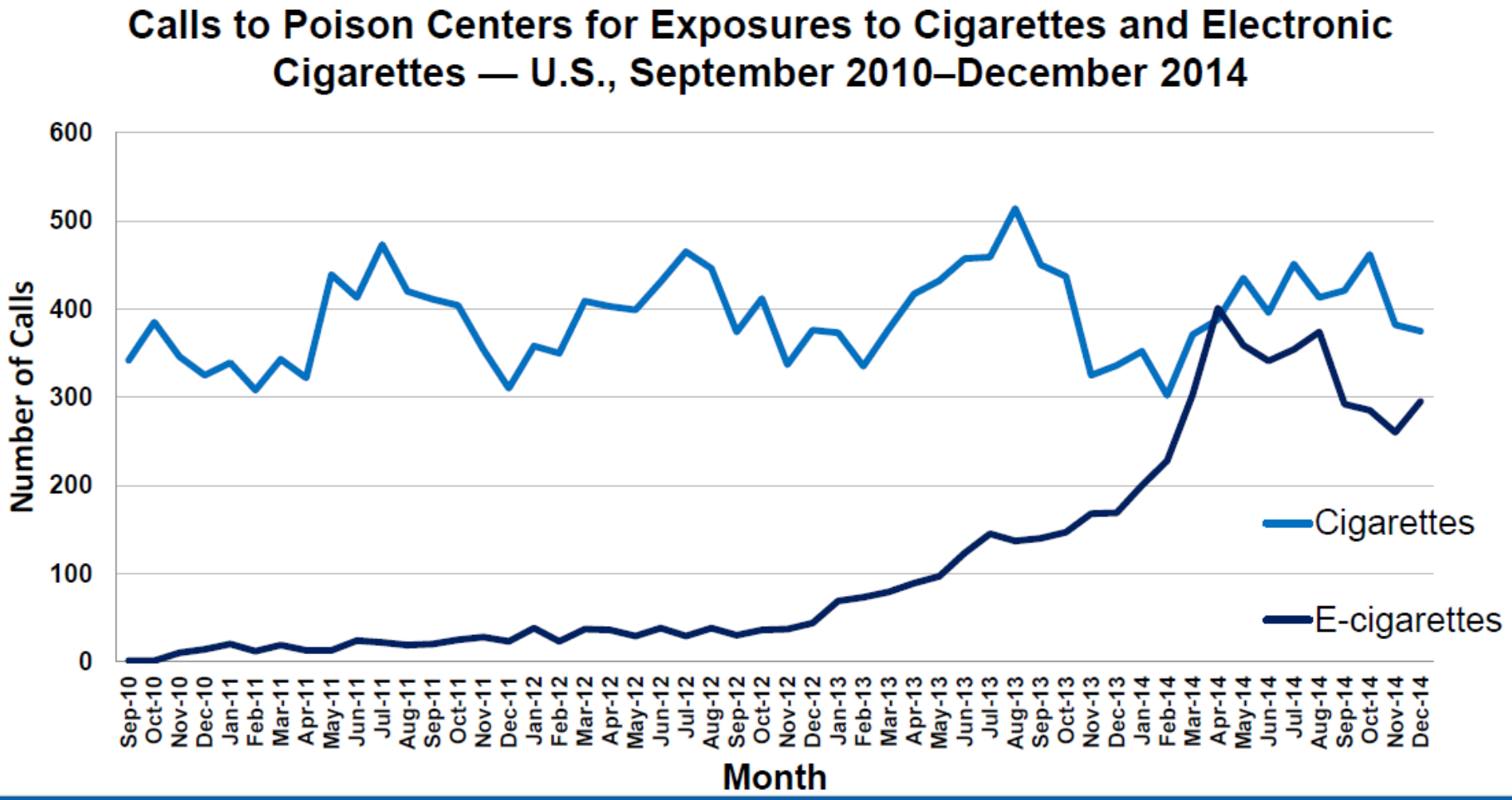
Student Respondents to National Youth Tobacco Survey Reporting Ever Using E-cigarettes in 2016

Most commonly selected reasons for use were:

- Used by “friend or family member” (39%)
- Availability of “flavors such as mint, candy, fruit, or chocolate” (31%)
- Belief that “they are less harmful than other forms of tobacco such as cigarettes” (17%)

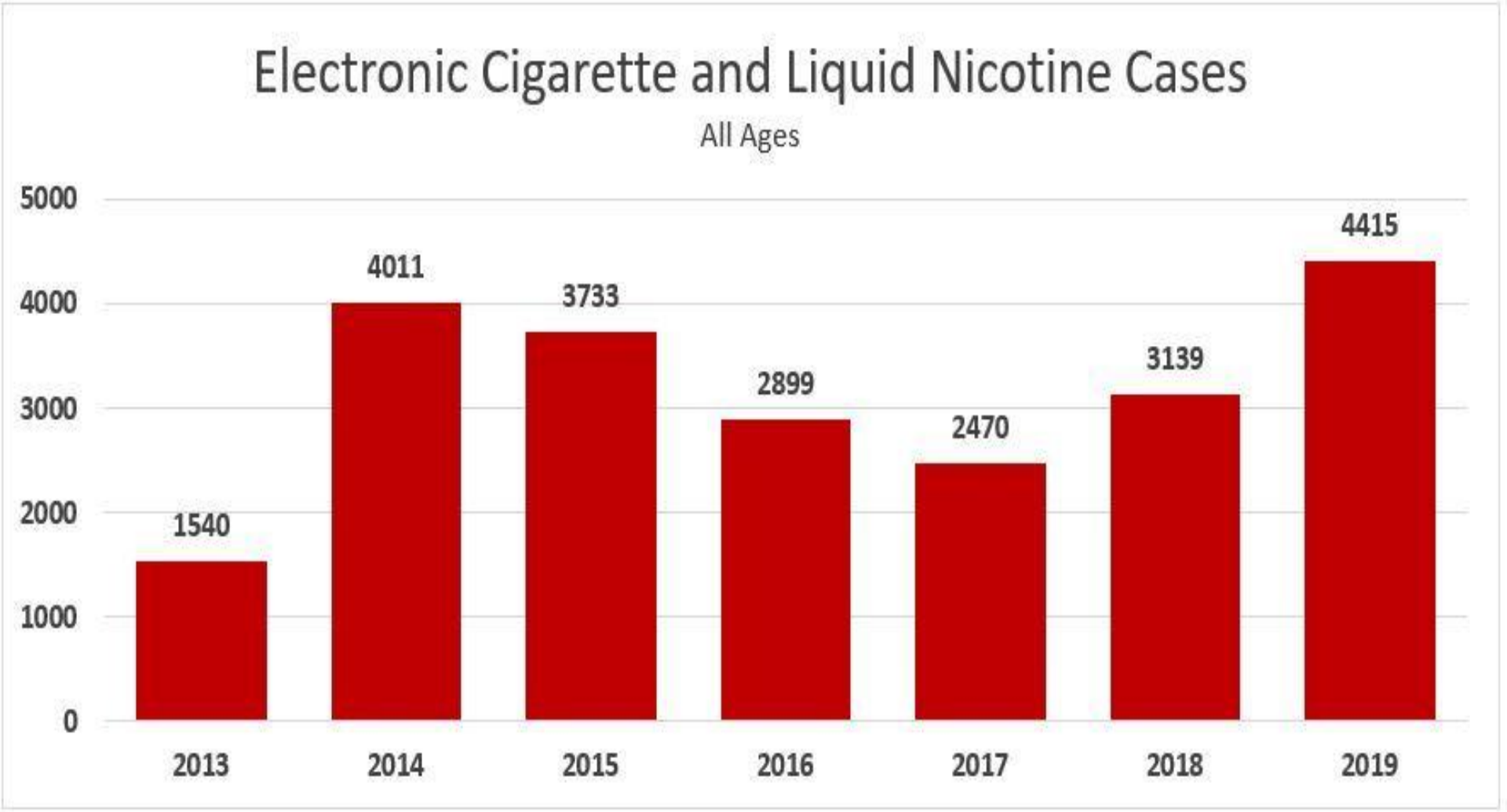
Tsai J, et al. *Reasons for Electronic Cigarette Use Among Middle and High School Students-National Youth Tobacco Survey, United States, 2016*. US Department of Health and Human Services/Centers for Disease Control and Prevention MMWR / February 16, 2018 / Vol. 67 / No. 6. p. 194-200. https://www.cdc.gov/mmwr/volumes/67/wr/pdfs/mm6706-H.pdf

Nicotine Poisoning Has Risen



www.cdc.gov/mmwr/preview/mmwrhtml/mm6313a4.htm and aapcc.org unpublished data

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



https://aapcc.org/track/ecigarettes-liquid-nicotine as of 10/31/19

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

American Association of Poison Control Centers

Electronic Cigarettes and Liquid Nicotine Data
October 31, 2019

These numbers reflect the closed human exposures to e-cigarettes and liquid nicotine reported to poison centers as of October 31, 2019. The numbers may change as cases are closed and additional information is received.

Year	Number of Cases
2011	269
2012	459
2013	1,540
2014	4,011
2015	3,733
2016	2,899
2017	2,470
2018	3,139
2019 YTD	**4,415**

2019 by Month	Number of Cases
January 2019	341
February 2019	297
March 2019	331
April 2019	330
May 2019	428
June 2019	382
July 2019	354
August 2019	558
September 2019	849
October 2019	**545**
November 2019	
December 2019	
Total YTD	**4,415**

2018 by Month	Number of Cases
January 2018	240
February 2018	212
March 2018	229
April 2018	243
May 2018	278
June 2018	239
July 2018	244
August 2018	257
September 2018	282
October 2018	329
November 2018	279
December 2018	307
Total	**3,139**

https://aapcc.org/track/ecigarettes-liquid-nicotine as of 10/31/19

Flavorings

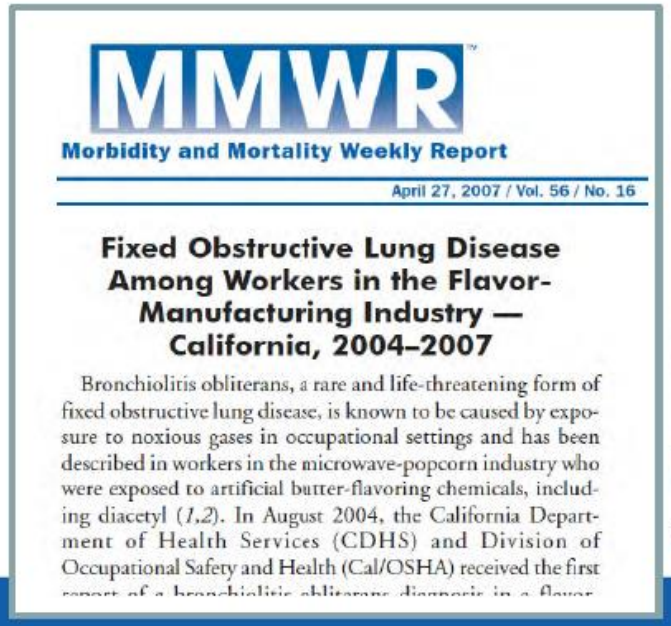
- Numerous flavorings used in electronic cigarettes
- The flavorings are GRAS for ingestion, but not for inhalation

GRAS: "Generally recognized as safe" is U.S. Food and Drug Administration (FDA) designation that a substance added to food is considered safe by qualified experts, and so is exempted from the usual Federal Food, Drug, and Cosmetic Act (FFDCA) food additive tolerance requirements

www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ucm061846.htm

Flavoring Is Linked to Permanent Scarring of the Airways in the Lungs

- **One flavoring, diacetyl, is linked to bronchiolitis obliterans**
  - Scarring of the bronchioles
- **Some flavorings in use are structurally similar to diacetyl**



MMWR

Morbidity and Mortality Weekly Report

April 27, 2007 / Vol. 56 / No. 16

Fixed Obstructive Lung Disease Among Workers in the Flavor-Manufacturing Industry — California, 2004–2007

Bronchiolitis obliterans, a rare and life-threatening form of fixed obstructive lung disease, is known to be caused by exposure to noxious gases in occupational settings and has been described in workers in the microwave-popcorn industry who were exposed to artificial butter-flavoring chemicals, including diacetyl (*1,2*). In August 2004, the California Department of Health Services (CDHS) and Division of Occupational Safety and Health (Cal/OSHA) received the first

Current employee protective wear for working with diacetyl

MMWR, 2007 Apr 27;56(16)

Dangers of E-Cigarettes

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

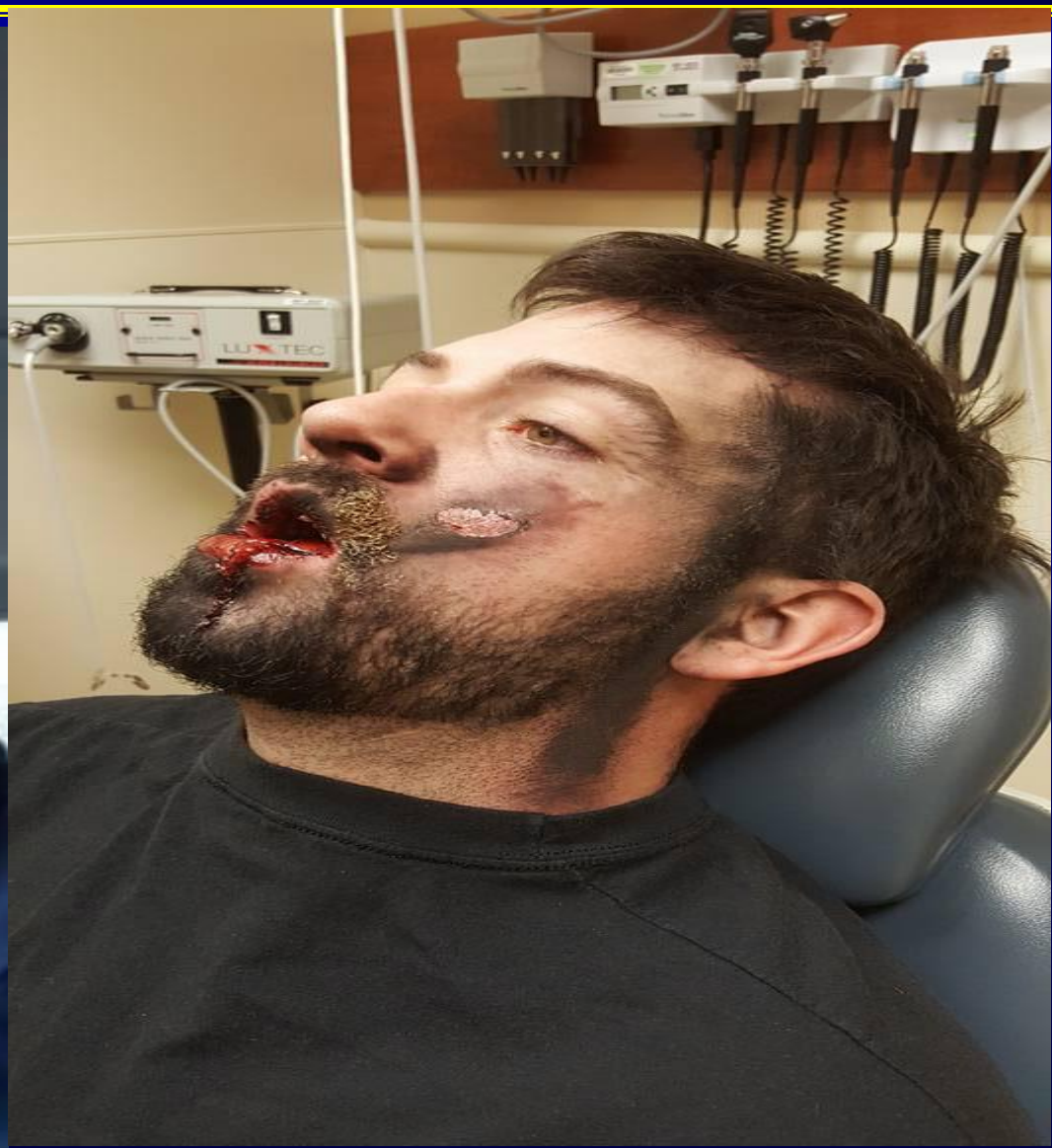
- "Seizures or convulsions are known potential side effects of nicotine toxicity"
- "Seizures have been reported as occurring after a few puffs or up to one day after use"

https://www.fda.gov/news-events/fda-brief/fda-brief-fda-encourages-continued-submission-reports-related-seizures-following-e-cigarette-use

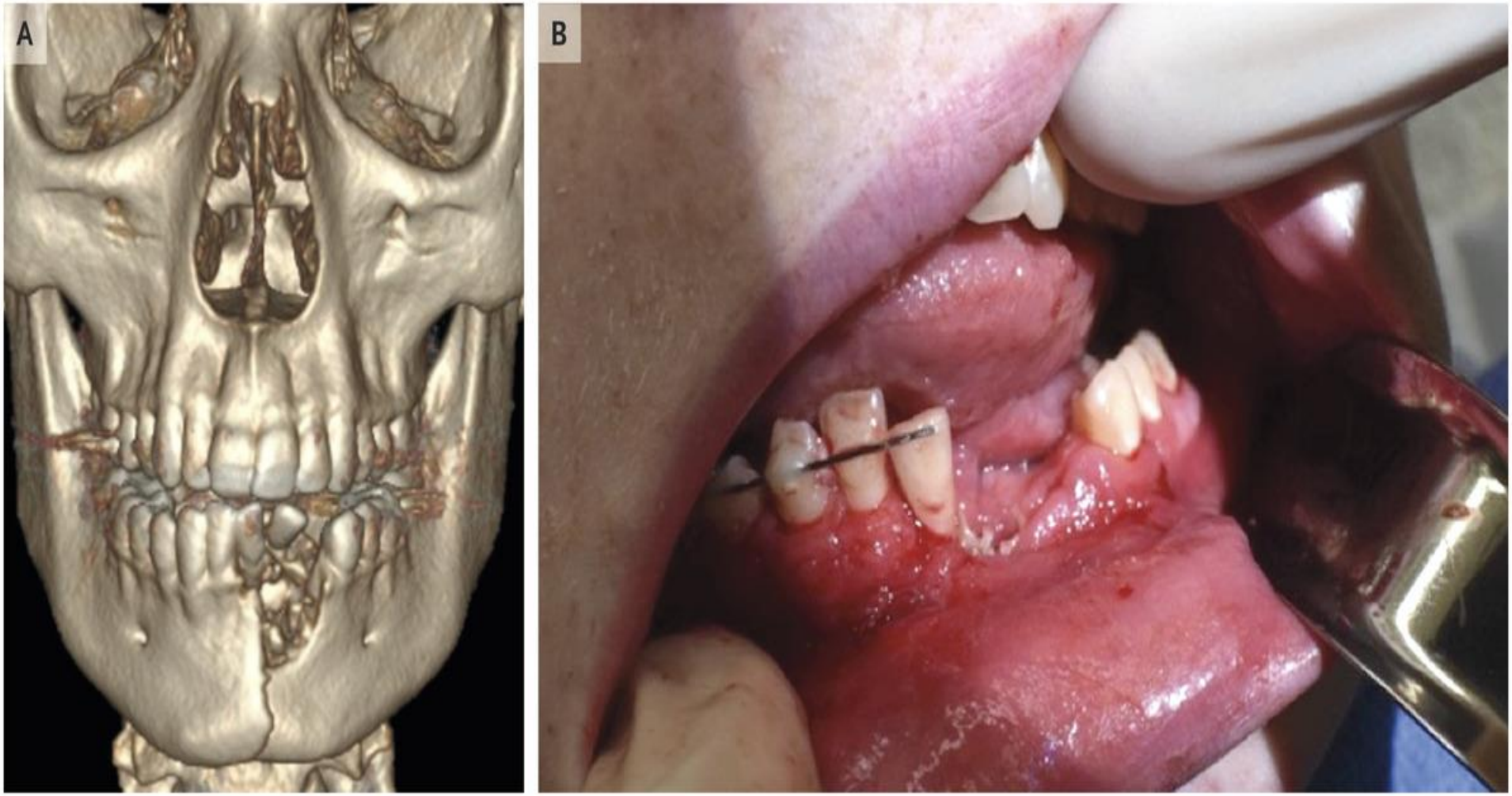
Dangers of E-Cigarettes

Dangers of E-Cigarettes: Burns

Dangers of E-Cigarettes



Injury From E-Cigarette Explosion



A 17-year-old boy presented to the ED with pain and swelling in his jaw 2 hours after an e-cigarette exploded during use. He had extensive lacerations in his mouth, multiple disrupted lower incisors, and bony incongruity of his left mandible.

Katz, MG. Russell, KW. N Engl J Med 2019; 380:2460 June 20, 2019 DOI: 10.1056/NEJMicm1813769

Florida man dies in e-cigarette explosion, police say. 5/15/18

An explosion from an electronic cigarette has killed a man in St. Petersburg, Florida, according to authorities who are investigating the circumstances surrounding his death.

Tallmadge D'Elia, 38, was found dead this month after a fire alarm went off at his home and officers arrived on the scene, according to his autopsy report. Officials found him with a wound to his top lip area and areas of burns to his body. His death has been ruled accidental.

The cause of death is identified as a projectile wound to the head, Bill Pellan, director of investigations at the Pinellas County Medical Examiner's Office, said Tuesday.

The projectile was from a section of an e-cigarette. The autopsy noted that the e-cigarette was manufactured by Smok-E Mountain and was a "mod" type device.

https://www.cnn.com/2018/05/15/health/electronic-cigarette-explosion-death-bn/index.html

Electronic Cigarette Explosion and Burn Injuries, US Emergency Departments 2015–2017 Abstract

- **Background** Electronic cigarette (e-cigarette) battery failure can result in explosions and burn injuries. Current surveillance methods likely underestimate actual occurrences.
- **Methods** Analyses were conducted on cross-sectional data from the US Consumer Product Safety Commission's (CPSC) National Electronic Injury Surveillance System (NEISS). A keyword search of case narrative text was used to identify e-cigarette-related explosion and burn injuries presenting to US emergency departments from 2015 to 2017.
- **Results** From 2015 to 2017, there were an estimated 2035 e-cigarette explosion and burn injuries presenting to US hospital emergency departments (95% CI 1107 to 2964).
- **Conclusions** There are more e-cigarette explosion and burn injuries in the USA than estimated in the past reports. Improved surveillance of e-cigarette injuries and regulation of e-cigarette devices is urgently needed.

Rossheim, ME et al. Electronic Cigarette Explosion & Burn Injuries, US Emergency Departments 2015–2017
https://tobaccocontrol.bmj.com/content/early/2018/09/15/tobaccocontrol-2018-054518

1 = 1

=

1 JUUL pod = 1 pack of cigarettes

Each = 59 mg of nicotine

High School Students' Use of Electronic Cigarettes to Vaporize Cannabis

BACKGROUND AND OBJECTIVES: Electronic cigarette (e-cigarette) use is increasing rapidly among high school (HS) students. Of concern, e-cigarettes can be used to vaporize cannabis, although use rates among adolescents are unknown. We evaluated lifetime rates of using e-cigarettes to vaporize cannabis among all lifetime e-cigarette users (27.9%), all lifetime cannabis users (29.2%), and lifetime users of both e-cigarettes and cannabis (18.8%); common means of vaporizing cannabis including hash oil, wax infused with Δ-9-tetrahydrocannabinol (THC), and dried cannabis; and demographic predictors of using e-cigarettes to vaporize cannabis.

METHODS: In the spring of 2014, 3847 Connecticut HS students completed an anonymous survey assessing e-cigarette and cannabis use.

RESULTS: Vaporizing cannabis using e-cigarettes was common among lifetime e-cigarette users, lifetime cannabis users, and lifetime dual users (e-cigarette 18.0%, cannabis 18.4%, dual users 26.5%). Students reported using e-cigarettes to vaporize hash oil (e-cigarette 15.4%, cannabis 15.5%, dual users 22.9%) and wax infused with THC (e-cigarette 10.0%, cannabis 10.2%, dual users 14.8%) and using portable electronic vaporizers to vaporize dried cannabis leaves (e-cigarette 19.6%, lifetime cannabis 23.1%, lifetime dual users 29.1%). Binary logistic regression indicated that male students (odds ratio [OR] = 2.05), younger students (OR = 0.64), lifetime e-cigarette users (OR = 5.27), and lifetime cannabis users (OR = 40.89) were most likely to vaporize cannabis using e-cigarettes. Rates also differed by HS attended.

CONCLUSIONS: Rates of vaporizing cannabis using e-cigarettes were high. These findings raise concerns about the lack of e-cigarette regulations and the potential use of e-cigarettes for purposes other than vaping nicotine.

Morean ME, Kong G, Camenga DR, Cavallo DA, Krishnan-sarin S. High School Students' Use of Electronic Cigarettes to Vaporize Cannabis. Pediatrics. 2015;136(4):611-6. https://www.ncbi.nlm.nih.gov/pubmed/26347431

TABLE 1 Product Use Rates and Type of Cannabis Vaped Within the Total Sample and Among All Lifetime E-Cigarette Users, All Lifetime Cannabis Users, and Lifetime Dual Users

	Total Sample, %, N = 3847	All Lifetime E-Cigarette Users, %, n = 1075	All Lifetime Cannabis Users, %, n = 1123	Lifetime Dual Users (E-Cigarettes and Cannabis), %, n = 724
Lifetime product use				
E-cigarettes	27.9	100.0	64.5	100.0
Cannabis	29.2	67.3	100.0	100.0
Vaporizing cannabis via e-cigarettes	5.4	18.0	18.4	26.5
Type of cannabis being vaped				
E-cigarettes (hash oil)	4.5	15.4	15.5	22.9
E-cigarettes (THC wax)	3.0	10.0	10.2	14.8
Portable vaporizers (dried leaves)	6.7	19.6	23.1	29.1

Morean ME, Kong G, Camenga DR, Cavallo DA, Krishnan-sarin S. High School Students' Use of Electronic Cigarettes to Vaporize Cannabis. Pediatrics. 2015;136(4):611-6. https://www.ncbi.nlm.nih.gov/pubmed/26347431

Association Between Electronic Cigarette Use and Marijuana Use Among Adolescents and Young Adults: A Systematic Review and Meta-analysis

Chadi N, Schroeder R, Jensen JW, Levy S. Association Between Electronic Cigarette Use and Marijuana Use Among Adolescents and Young Adults: A Systematic Review and Meta-analysis. JAMA Pediatr. 2019;e192574.
https://www.ncbi.nlm.nih.gov/pubmed/31403684

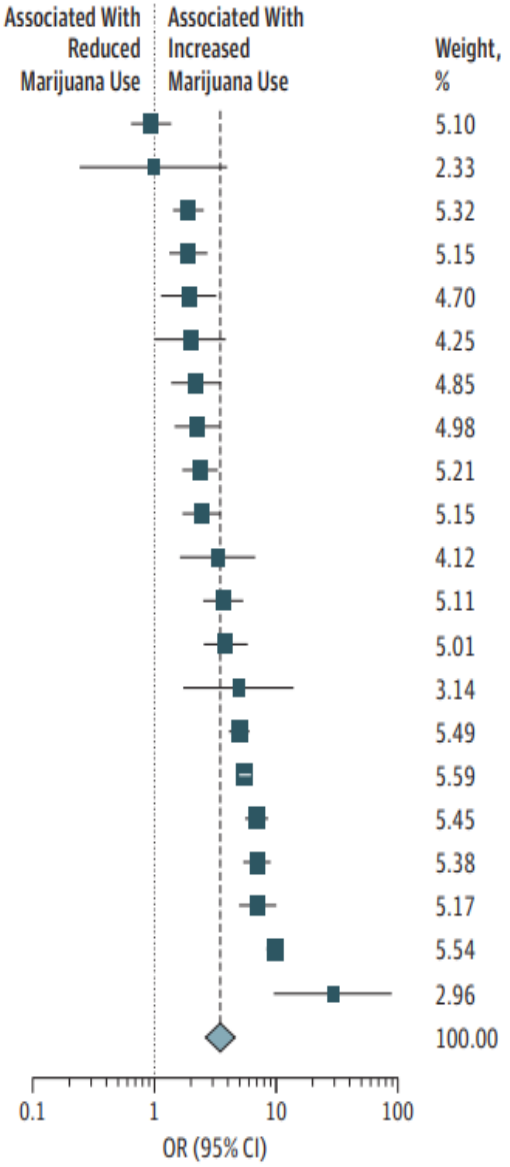
Trial Background

- 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.

Chadi N, Schroeder R, Jensen JW, Levy S. Association Between Electronic Cigarette Use and Marijuana Use Among Adolescents and Young Adults: A Systematic Review and Meta-analysis. JAMA Pediatr. 2019;e192574. https://www.ncbi.nlm.nih.gov/pubmed/31403684

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

Study	Adjusted Odds Ratio (95% CI)	Weight, %
Sutfin et al,[43] 2013	0.94 (0.64-1.38)	5.10
Kong et al,[39] 2017	0.98 (0.24-3.26)	2.33
Dai et al,[6] 2018	1.90 (1.42-2.54)	5.32
Dautzenberg et al,[37] 2015	1.90 (1.32-2.73)	5.15
Bluestein,[33] 2017	1.91 (1.13-3.22)	4.70
Unger et al,[45] 2016	1.97 (1.01-3.85)	4.25
Fotiou et al,[38] 2015	2.20 (1.37-3.53)	4.85
White et al,[46] 2015	2.24 (1.46-3.43)	4.98
Saddleson et al,[42] 2015	2.37 (1.69-3.32)	5.21
Tavolacci et al,[44] 2016	2.44 (1.70-3.51)	5.15
Cohn et al,[35] 2015	3.30 (1.62-6.73)	4.12
Audrain-McGovern et al,[7] 2018	3.67 (2.51-5.36)	5.11
Kristjansson et al,[40] 2017	3.85 (2.54-5.83)	5.01
Williams and White,[47] 2018	4.89 (1.72-13.89)	3.14
McCabe et al,[31] 2017	4.97 (4.09-6.04)	5.49
Milicic and Leatherdale,[41] 2017	5.55 (4.96-6.21)	5.59
Curran et al,[5] 2018	6.90 (5.55-8.58)	5.45
Dunbar et al,[23] 2017	6.95 (5.36-9.01)	5.38
Azagba,[32] 2018	7.05 (4.96-10.03)	5.17
Conway et al,[36] 2018	9.70 (8.31-11.32)	5.54
Camenga et al,[34] 2014	29.14 (9.55-88.93)	2.96
Overall: $I^2 = 94.0\%$ ($P < .001$)	3.47 (2.63-4.59)	100.00



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https://www.ncbi.nlm.nih.gov/pubmed/31403684

Figure 2. Marijuana Use in Youth With e-Cigarette Use by Study Design in Individual Studies

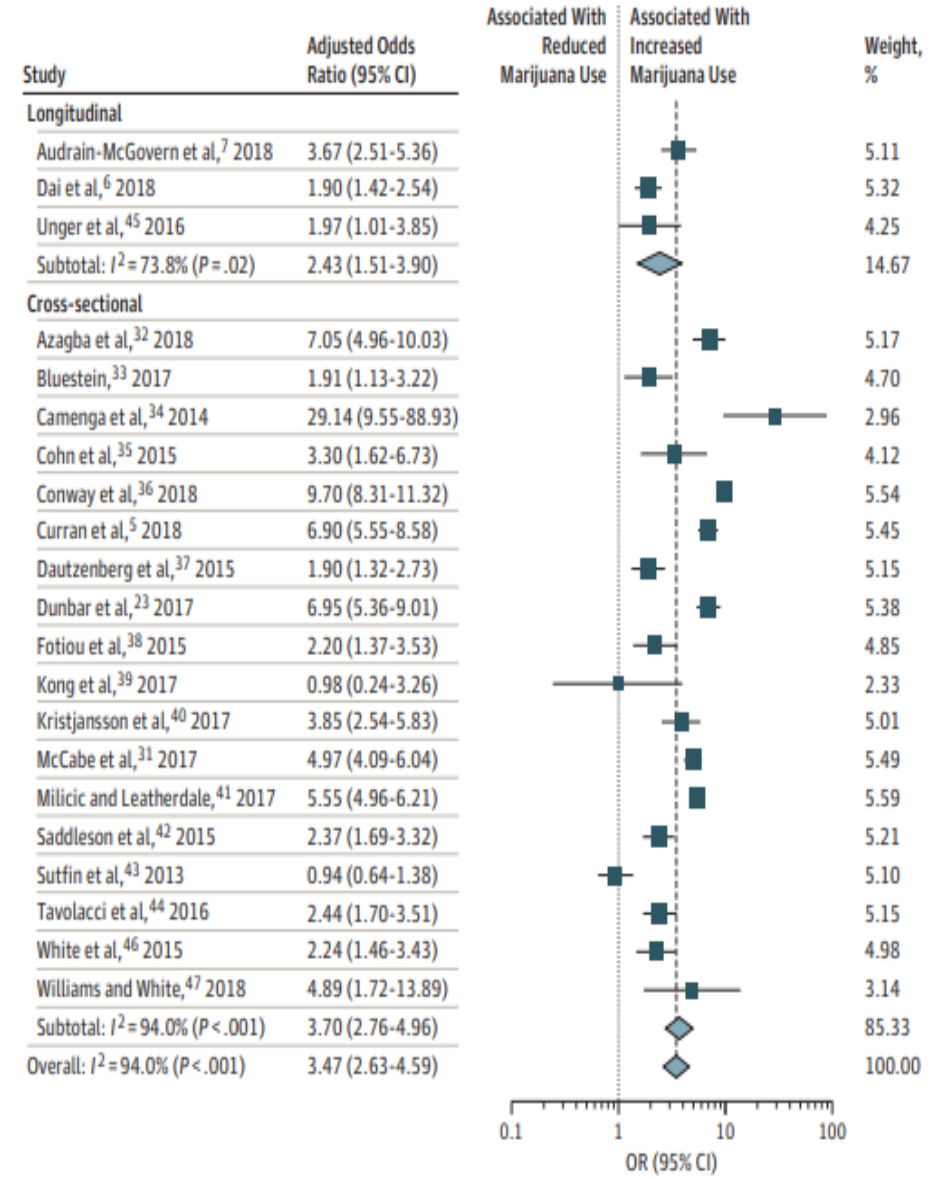

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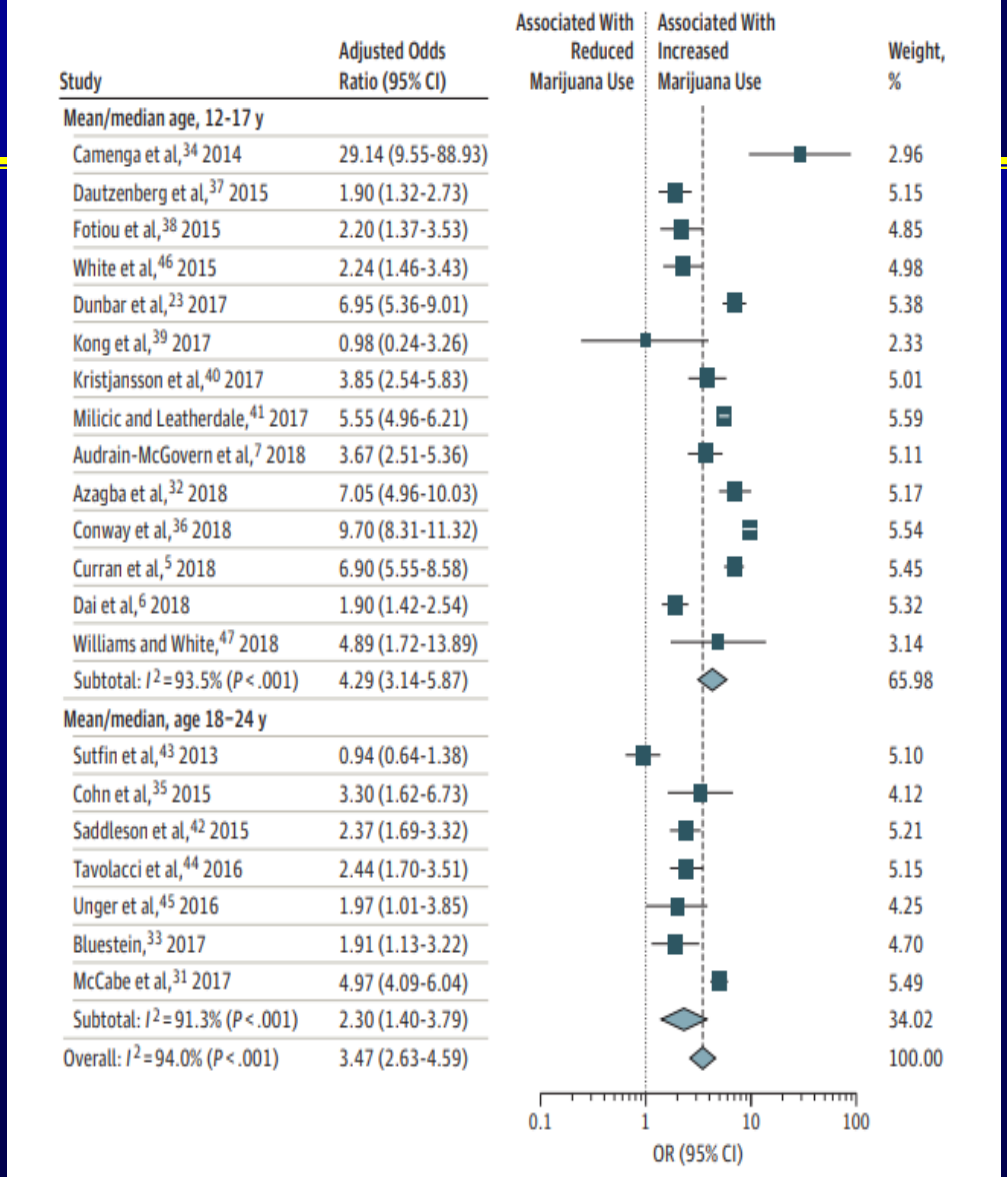
Figure 3. Marijuana Use in Youth With e-Cigarette Use by Mean/Median Participant Age in Individual Studies



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Trend Results

- ENDS use is associated with an increased risk of marijuana use from pooled data
  - AOR=3.47 (95% CI, 2.63-4.59) I^2=94%
- ENDS use is associated with a significantly increased risk of marijuana use from subgroup analysis
  - Cross sectional studies: AOR=3.70 (95% CI, 2.76-4.96) I^2=73.8%
  - Longitudinal studies: AOR=2.43 (95% CI, 1.51-3.90) I^2=94%
- Stronger association between ENDS and marijuana use in studies with participants with a mean/median age under 18 years old compared to a mean/median age over 18 years old
  - Under 18 y/o: AOR=4.29 (95% CI, 3.14-5.87) I^2=93.5%
  - Over 18 y/o: AOR=2.30 (95% CI, 1.40-3.79) I^2=91%

Chadi N, Schroeder R, Jensen JW, Levy S. Association Between Electronic Cigarette Use and Marijuana Use Among Adolescents and Young Adults: A Systematic Review and Meta-analysis. JAMA Pediatr. 2019;e192574. https://www.ncbi.nlm.nih.gov/pubmed/31403684

Trend Results

- Stronger association between ENDS and marijuana use in youth with dual use compared to single use from subgroup analysis
  - Dual use: AOR = 5.93 (95% CI, 3.53-8.24) I^2=97.6%
  - Single use: AOR= 3.10 (95% CI, 2.22-4.34) I^2=94.6%
- Stronger association between ENDS and marijuana use in studies after 2017 compared to studies before 2017
  - After 2017: AOR= 4.57 (95% CI, 3.47-6.03)
  - Before 2017: AOR= 2.39 (95% CI, 1.67-3.40)

Chadi N, Schroeder R, Jensen JW, Levy S. Association Between Electronic Cigarette Use and Marijuana Use Among Adolescents and Young Adults: A Systematic Review and Meta-analysis. JAMA Pediatr. 2019;e192574. https://www.ncbi.nlm.nih.gov/pubmed/31403684

E-Liquid Flavor Concentrations

Resemblance to liquid candy products:

Vaping Terminology

- Vaping Daily The Voice of Vaping
  - Atomizer – Also called “atty” for short, this is the part of an e-cig that houses the coil and wick that is heated to produce vapor from e-liquid
  - Drip Tip – An accessory used to replace the stock mouthpieces of atomizers with a large hole to allow dripping without their removal
  - Juice – A shorthand term for e-liquid
  - Steeping – A term used by DIY e-juice makers to describe the act of letting newly mixed e-juice sit open to the air for at least six hours to let the ingredients settle
  - Tailpiping – Direct dripping and inhaling without a drip tip
  - Throat Hit – The sensation after vapor hits the throat. Many vapers look to simulate the harsh throat hit of cigarettes, while some prefer a smoother throat hit
  - Toot – A slang term for a draw from an electronic cigarette
  - Vaper’s Tongue – A sensation felt when a user uses too much of one flavor, causing the tongue to become desensitized. It can also refer to the tickling sensation on the tongue after a long vape session

https://vapingdaily.com/what-is-vaping/vaping-glossary-terminology/

The National Academies of
SCIENCES · ENGINEERING · MEDICINE

CONSENSUS STUDY REPORT

Public Health Consequences of E-Cigarettes

Conclusive Evidence

- **Conclusion 3-1.** There is **conclusive evidence** that e-cigarette use increases airborne concentrations of particulate matter and nicotine in indoor environments compared with background levels.

- **Conclusion 4-1.** There is **conclusive evidence** that exposure to nicotine from e-cigarettes is highly variable and depends on product characteristics (including device and e-liquid characteristics) and how the device is operated.

- **Conclusion 5-1.** There is **conclusive evidence** that in addition to nicotine, most e-cigarette products contain and emit numerous potentially toxic substances.*

- **Conclusion 5-2.** There is **conclusive evidence** that, other than nicotine, the number, quantity, and characteristics of potentially toxic substances emitted from e-cigarettes is highly variable and depends on product characteristics (including device and e-liquid characteristics) and how the device is operated.*

National Academies of Sciences, Engineering, and Medicine. 2018. Public health consequences of e-cigarettes. Washington, DC: The National Academies Press. doi: https://doi.org/10.17226/24952. http://nap.edu/24952

Conclusive Evidence

- Conclusion 14-1. There is **conclusive evidence** that e-cigarette devices can explode and cause burns and projectile injuries. Such risk is significantly increased when batteries are of poor quality, stored improperly or are being modified by users.*

- Conclusion 14-2. There is **conclusive evidence** that intentional or accidental exposure to e-liquids (from drinking, eye contact, or dermal contact) can result in adverse health effects, including but not limited to seizures, anoxic brain injury, vomiting, and lactic acidosis.*

- Conclusion 14-3. There is **conclusive evidence** that intentionally or unintentionally drinking or injecting e-liquids can be fatal.*

- Conclusion 18-1. There is **conclusive evidence** that completely substituting e-cigarettes for combustible tobacco cigarettes reduces users' exposure to numerous toxicants and carcinogens present in combustible tobacco cigarettes.

National Academies of Sciences, Engineering, and Medicine. 2018. Public health consequences of e-cigarettes. Washington, DC: The National Academies Press. doi: https://doi.org/10.17226/24952. http://nap.edu/24952

Substantial Evidence

- Conclusion 5-4. There is **substantial evidence** that e-cigarette aerosol contains metals. The origin of the metals could be the metallic coil used to heat the e-liquid, other parts of the e-cigarette device, or e-liquids. Product characteristics and use-patterns may contribute to differences in the actual metals and metal concentrations measured in e-cigarette aerosol.*

- Conclusion 7-1. There is **substantial evidence** that e-cigarette aerosols can induce acute endothelial cell dysfunction, although the long-term consequences and outcomes on these parameters with long-term exposure to e-cigarette aerosol are uncertain.*

National Academies of Sciences, Engineering, and Medicine. 2018. Public health consequences of e-cigarettes. Washington, DC: The National Academies Press. doi: https://doi.org/10.17226/24952. http://nap.edu/24952

Substantial Evidence

- Conclusion 9-2. There is **substantial evidence** that heart rate increases after nicotine intake from e-cigarettes.*

- Conclusion 10-4. There is **substantial evidence** that some chemicals present in e-cigarette aerosols (e.g., formaldehyde, acrolein) are capable of causing DNA damage and mutagenesis. This supports the biological plausibility that long-term exposure to e-cigarette aerosols could increase risk of cancer and adverse reproductive outcomes. Whether or not the levels of exposure are high enough to contribute to human carcinogenesis remains to be determined.*

National Academies of Sciences, Engineering, and Medicine. 2018. Public health consequences of e-cigarettes. Washington, DC: The National Academies Press. doi: https://doi.org/10.17226/24952. http://nap.edu/24952

Substantial Evidence

- Conclusion 16-1. There is **substantial evidence** that e-cigarette use increases risk of ever using combustible tobacco cigarettes among youth and young adults.**

- Conclusion 18-2. There is **substantial evidence** that completely switching from regular use of combustible tobacco cigarettes to e-cigarettes results in reduced short term adverse health outcomes in several organ systems.

National Academies of Sciences, Engineering, and Medicine. 2018. Public health consequences of e-cigarettes. Washington, DC: The National Academies Press. doi: https://doi.org/10.17226/24952. http://nap.edu/24952

Vaping Leads to Heart Disease

- New study out of Stanford University shows the flavoring liquid used in popular electronic cigarettes may increase the risk of heart disease when inhaled.

- Journal of the American College of Cardiology, investigates the effect on e-liquids on the cells that line the interior of blood of blood vessels, called endothelial cells.

- Result was the cells are "less viable" and show "significantly increased levels" of molecules implicated in DNA damage and cell death. The cells were less able to move throughout the body and heal themselves.

- Scientists looked at six different popular e-cig flavors: fruit, tobacco, sweet tobacco with caramel and vanilla, sweet butterscotch, cinnamon and menthol.

Lee WH, Ong SG, Zhou Y, Tian L, Bae HR, Baker N,Whitlatch A, Mohammadi L, Guo H, Nadeau KC, Springer ML, Schick SF, Bhatnagar A , Wu JC. *Modeling Cardiovascular Risks of E-Cigarettes With Human-Induced Pluripotent Stem Cell–Derived Endothelial Cells*. Journal of the American College of Cardiology. Vol 73.Issue 21. June 2019. DOI: 10.1016/j.jacc.2019.03.476

Vaping Leads to Heart Disease

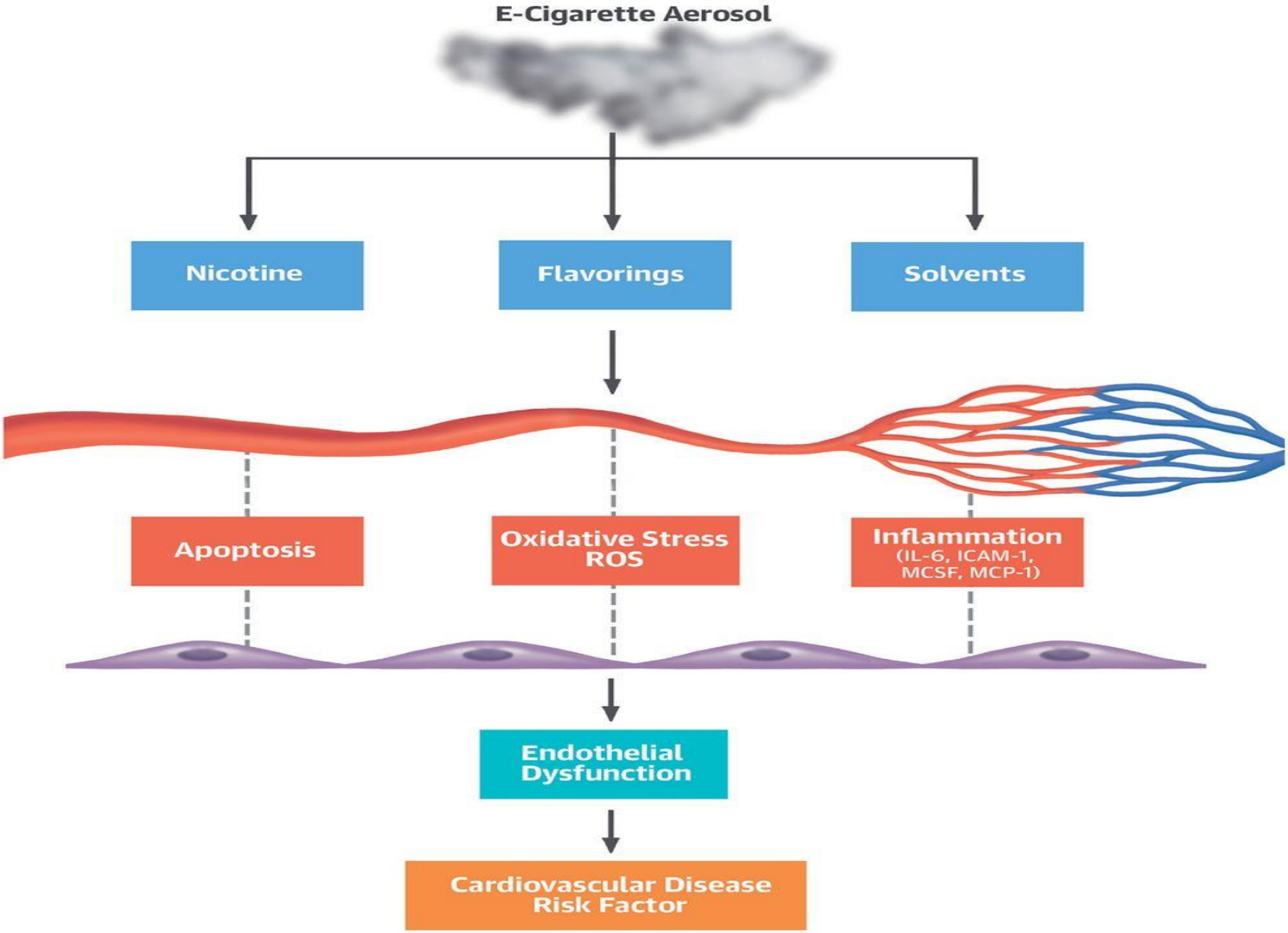
- Cinnamon & menthol were deemed "particularly harmful".

- Professor Joseph Wu, of Stanford University School of Medicine, says the results held strong even after they accounted for other potential risk factors, such as age, excess weight, diabetes and smoking.

- "But e-cigarettes can be deceptive. It's much easier to expose yourself to a much higher level of nicotine over a shorter time period. And now we know that e-cigarettes are likely to have other significantly toxic effects on vascular function as well."

Lee WH, Ong SG, Zhou Y, Tian L, Bae HR, Baker N,Whitlatch A, Mohammadi L, Guo H, Nadeau KC, Springer ML, Schick SF, Bhatnagar A , Wu JC. *Modeling Cardiovascular Risks of E-Cigarettes With Human-Induced Pluripotent Stem Cell–Derived Endothelial Cells*. Journal of the American College of Cardiology. Vol 73.Issue 21. June 2019. DOI: 10.1016/j.jacc.2019.03.476

CENTRAL ILLUSTRATION: Human-Induced Pluripotent Stem Cell-Derived Endothelial Cells for Evaluating E-Cigarette Risk



Lee, W.H. et al. J Am Coll Cardiol. 2019;73(21):2722–37.

Youth Getting Drunk….by Vaping

- Drunk in the ER-have not drank a drop of alcohol
- Flavorings in certain diluents
- Not listed as an ingredient
- Love Vanilla Flavoring!
- Is 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

Acute Effects of Smoking and Vaporizing Cannabis in Healthy Adults Who Infrequently Use Cannabis

IMPORTANCE Vaporization is an increasingly popular method for cannabis administration, and policy changes have increased adult access to cannabis drastically. Controlled examinations of cannabis vaporization among adults with infrequent current cannabis use patterns (>30 days since last use) are needed.

OBJECTIVE To evaluate the acute dose effects of smoked and vaporized cannabis using controlled administration methods.

DESIGN, SETTING, AND PARTICIPANTS This within-participant, double-blind, crossover study was conducted from June 2016 to January 2017 at the Behavioral Pharmacology Research Unit, Johns Hopkins University School of Medicine, and included 17 healthy adults. Six smoked and vaporized outpatient experimental sessions (1-week washout between sessions) were completed in clusters (order counterbalanced across participants); dose order was randomized within each cluster.

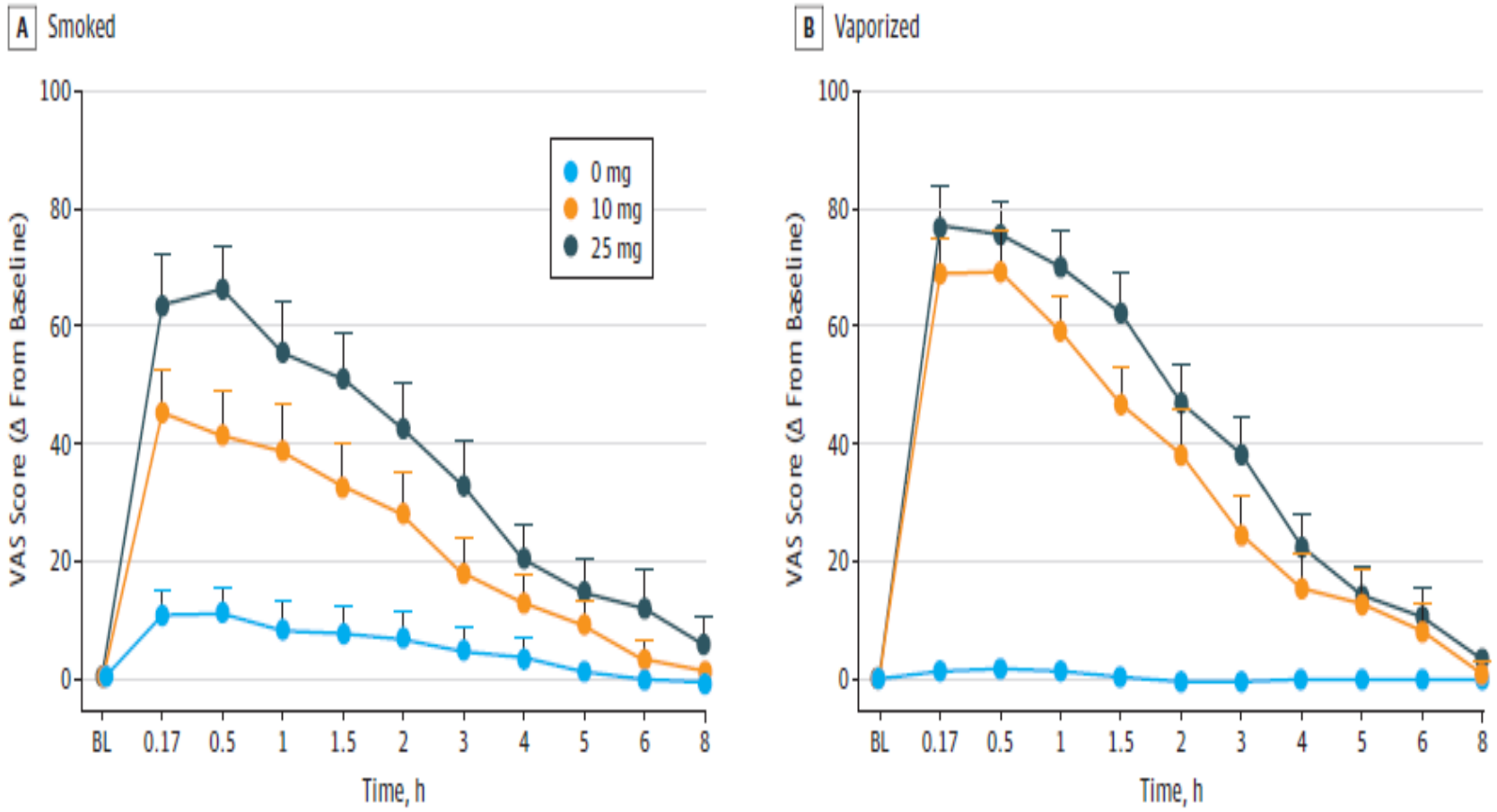
INTERVENTIONS Cannabis containing Δ9-tetrahydrocannabinol (THC) doses of 0 mg, 10 mg, and 25 mg was vaporized and smoked by each participant.

MAIN OUTCOMES AND MEASURES Change from baseline scores for subjective drug effects, cognitive and psychomotor performance, vital signs, and blood THC concentration.

RESULTS The sample included 17 healthy adults (mean [SD] age, 27.3 [5.7] years; 9 men and 8 women) with no cannabis use in the prior month (mean [SD] days since last cannabis use, 398 [437] days). Inhalation of cannabis containing 10 mg of THC produced discriminative drug effects (mean [SD] ratings on a 100-point visual analog scale, smoked: 46 [26]; vaporized: 69 [26]) and modest impairment of cognitive functioning. The 25-mg dose produced significant drug effects (mean [SD] ratings, smoked: 66 [29]; vaporized: 78 [24]), increased incidence of adverse effects, and pronounced impairment of cognitive and psychomotor ability (eg, significant decreased task performance compared with placebo in vaporized conditions). Vaporized cannabis resulted in qualitatively stronger drug effects for most pharmacodynamic outcomes and higher peak concentrations of THC in blood, compared with equal doses of smoked cannabis (25-mg dose: smoked, 10.2 ng/mL; vaporized, 14.4 ng/mL). Blood THC concentrations and heart rate peaked within 30 minutes after cannabis administration and returned to baseline within 3 to 4 hours. Several subjective drug effects and observed cognitive and psychomotor impairments persisted for up to 6 hours on average.

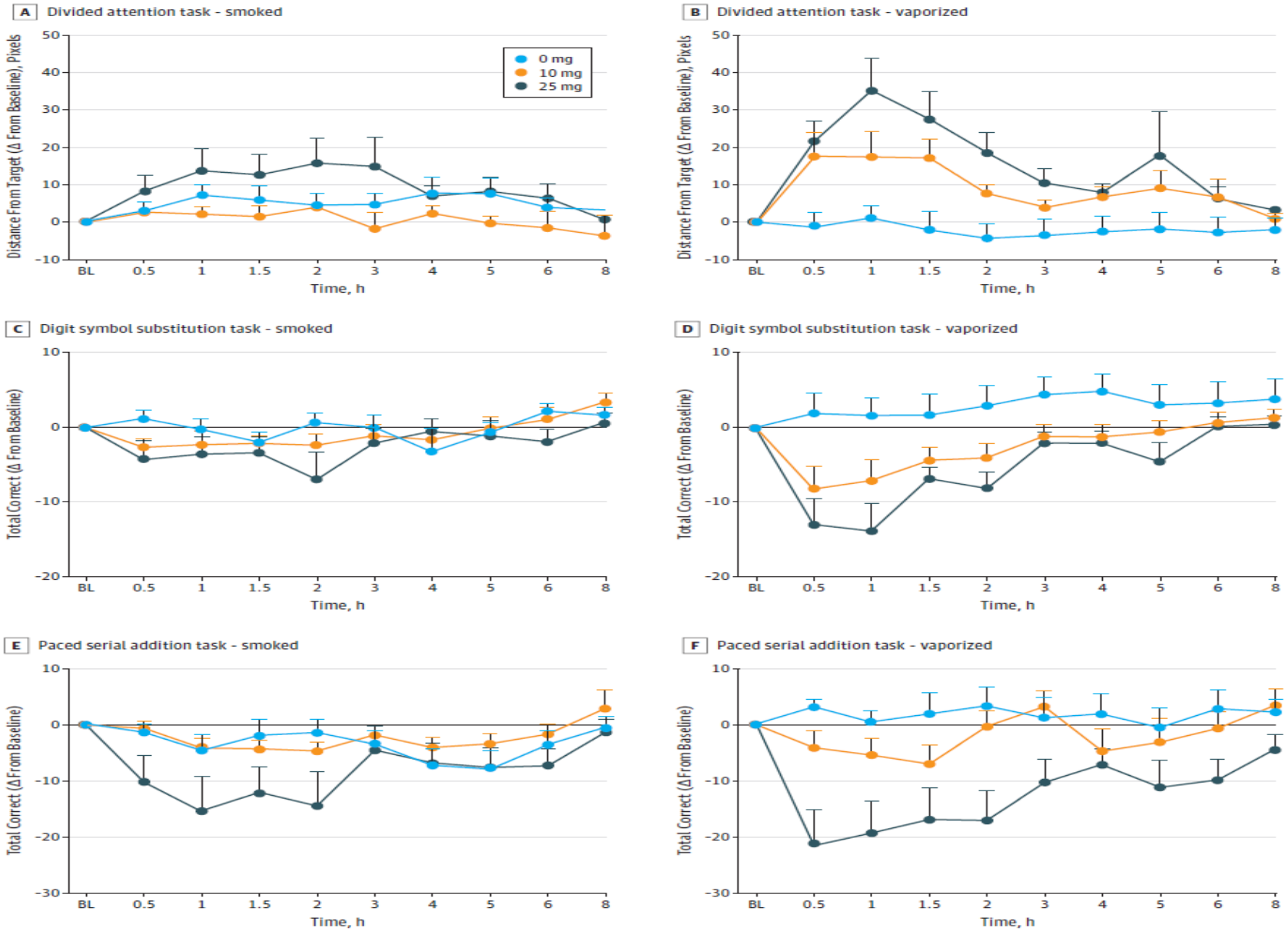
Spindle TR, Cone EJ, Schlienz NJ, et al. Acute Effects of Smoked and Vaporized Cannabis in Healthy Adults Who Infrequently Use Cannabis: A Crossover Trial. *JAMA Netw Open*. 2018;1(7):e184841. Published 2018 Nov 2. doi:10.1001/jamanetworkopen.2018.4841 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6324384/

Figure 2. Mean Ratings for Visual Analog Scale (VAS) Item Drug Effect From the Drug Effect Questionnaire Displayed Over Time and Across Δ9-Tetrahydrocannabinol Dose for Smoked and Vaporized Conditions



Scores ranged from 0 (not at all) to 100 (extremely). Error bars indicate SEM. Horizontal axes are not accurate time scales and represent the time points at which subjective drug effects were assessed. BL indicates baseline time point; and Δ, difference or change.

Figure 3. Mean Change From Baseline Scores for Average Distance From Central Stimulus From Divided Attention Task, Total Correct on Digit Symbol Substitution Task, and Total Correct on Paced Auditory Serial Addition Task



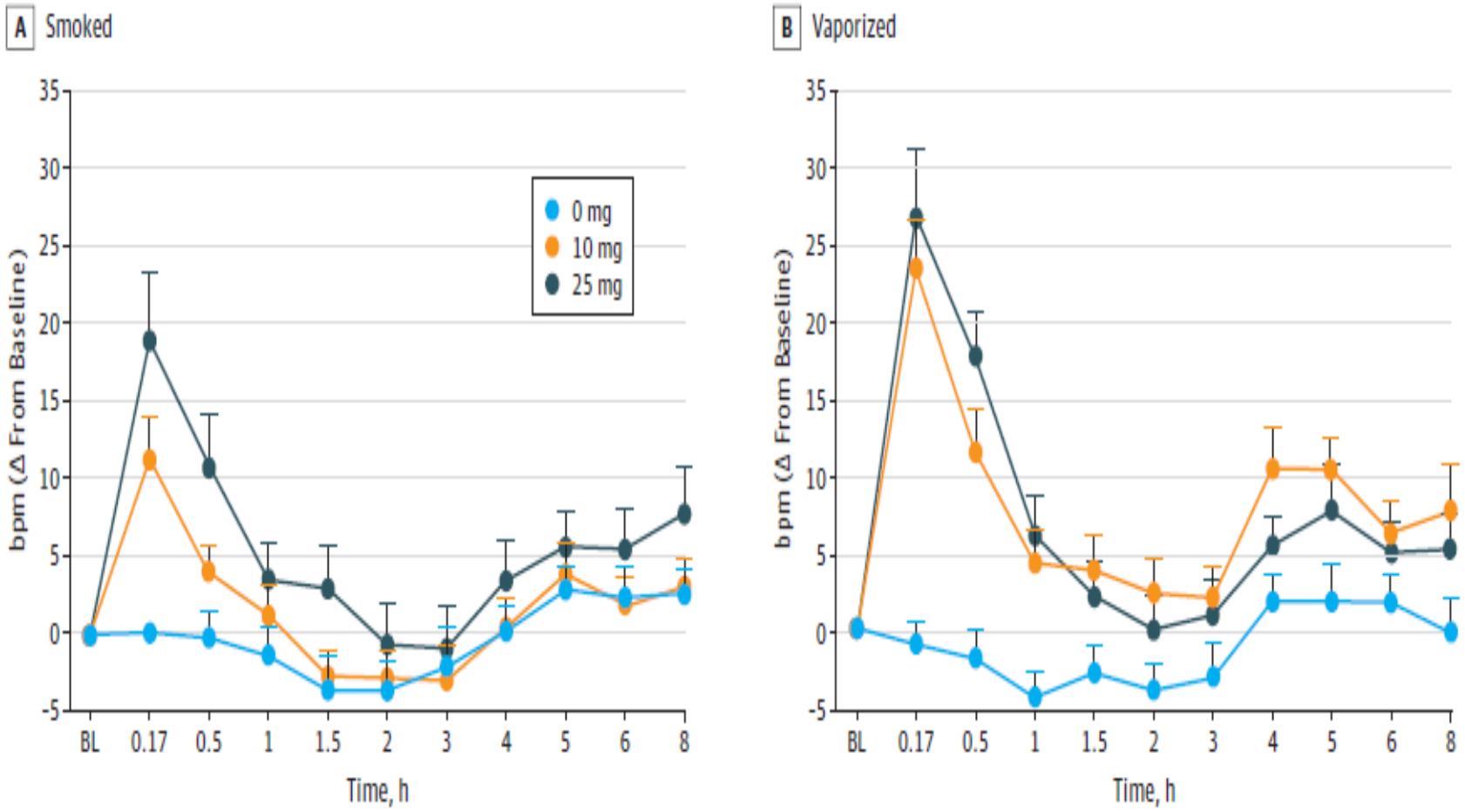
A and B, Higher scores indicate poorer performance relative to baseline. C-F, Lower scores indicate worse performance relative to baseline. Error bars indicate SEM. All scores are shown over time and are displayed by Δ9-tetrahydrocannabinol dose and inhalation method. Horizontal axes are not accurate time scales and represent the time points at which cognitive and psychomotor performance was measured. BL indicates baseline time point; and Δ, difference or change.

Amount: THC 25mg = 13.4% THC

in the 30 days prior to enrollment. After inhaling smoked and vaporized cannabis containing 25 mg of THC, participants experienced pronounced drug effects, substantial impairment of cognitive and psychomotor functioning, and marked increases in HR. Notably, the highest dose of cannabis administered in this study (25 mg of THC: 0.19 g; 13.4% THC) is substantially smaller and has a lower THC concentration than what is typically contained in prerolled cannabis cigarettes available for purchase in cannabis dispensaries, which commonly contain roughly 1.0 g of cannabis with THC concentrations often exceeding 18%.[28] Thus, individuals who initiate cannabis use can readily access products that contain far greater amounts of cannabis, with higher THC concentrations, than administered in this study. Regulatory and clinical entities should consider these results in decisions involving cannabis accessibility, dosing recommendations, and education for novice cannabis users.

Spindle TR, Cone EJ, Schlienz NJ, et al. Acute Effects of Smoked and Vaporized Cannabis in Healthy Adults Who Infrequently Use Cannabis: A Crossover Trial. *JAMA Netw Open*. 2018;1(7):e184841. Published 2018 Nov 2. doi:10.1001/jamanetworkopen.2018.4841 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6324384/

Figure 4. Mean Change From Baseline Score for Heart Rate Over Time, Displayed by Δ9-Tetrahydrocannabinol Dose for Smoked and Vaporized Conditions



Error bars indicate SEM. Horizontal axes are not accurate time scales and represent the time points at which heart rate was measured. BL indicates baseline time point; bpm, beats per minute; and Δ, difference or change.

Continued Impairment after Blood THC Levels Below LOQ

Interestingly, the time course of effects differed across outcome measures such that increases in blood THC concentrations and HR returned to baseline more rapidly than subjective drug effects and cognitive and psychomotor impairment. In several instances, cannabis-induced effects and/or impairments persisted for several hours after blood THC concentrations had fallen below the LOQ. Additionally, blood THC concentrations were only moderately correlated with subjective drug effects and weakly correlated, or not correlated at all, with cognitive and psychomotor performance.

Collectively, findings from this study and others[16,29,30] indicate that blood THC concentrations are not a valid indicator of a user's intoxication and/or impairment from cannabis use and highlight the need to explore other biological and behavioral means of detecting acute cannabis impairment.

Spindle TR, Cone EJ, Schlienz NJ, et al. Acute Effects of Smoked and Vaporized Cannabis in Healthy Adults Who Infrequently Use Cannabis: A Crossover Trial. *JAMA Netw Open*. 2018;1(7):e184841. Published 2018 Nov 2. doi:10.1001/jamanetworkopen.2018.4841 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6324384/

Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products per CDC

- As of October 29th, 2019, 1888 confirmed cases of lung injury associated with the use of e-cigarette products have been reported to CDC from the following 49 states, DC and 1 U.S. territory (all except Alaska)
  - AL, AR, AZ, CA, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, ME, MD, MI, MN, MO, MT, MS, NC, ND, NE, NJ, NH, NM, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VA, VT, WA, WI, WV, WY, and USVI
- 37 deaths have been confirmed in 24 states:
  - Alabama, California (3), Connecticut, Delaware, Florida, Georgia (3), Illinois (2), Indiana (3), Kansas (2), Massachusetts, Michigan, Minnesota (3), Mississippi, Missouri, Montana, Nebraska, New Jersey, New York, Oregon (2), Pennsylvania, Tennessee (2), Texas, Utah and Virginia
- More deaths are under investigation
- Median age of deceased: 53
- Age Range of deceased: 17 to 75

Center for Disease Control and Prevention. Outbreak of Lung Injury Associated with E-cigarette Use, or Vaping https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html Accessed October 31, 2019

Demographics

- Sex Breakdown:
  - 70% of patients are male (among 1378 cases 10/15/19)
- Patient Age Breakdown (among 1364 cases 10/15/19)
  - Median age: 24 years old Range: 13 to 75 years old
  - 79% are under 35
  - 14% are under 18
  - 40% are 18 to 24
  - 25% are 25 to 34
  - 21% are 35 years old or older
- Most cases have reported a history of e-cigarette products containing THC

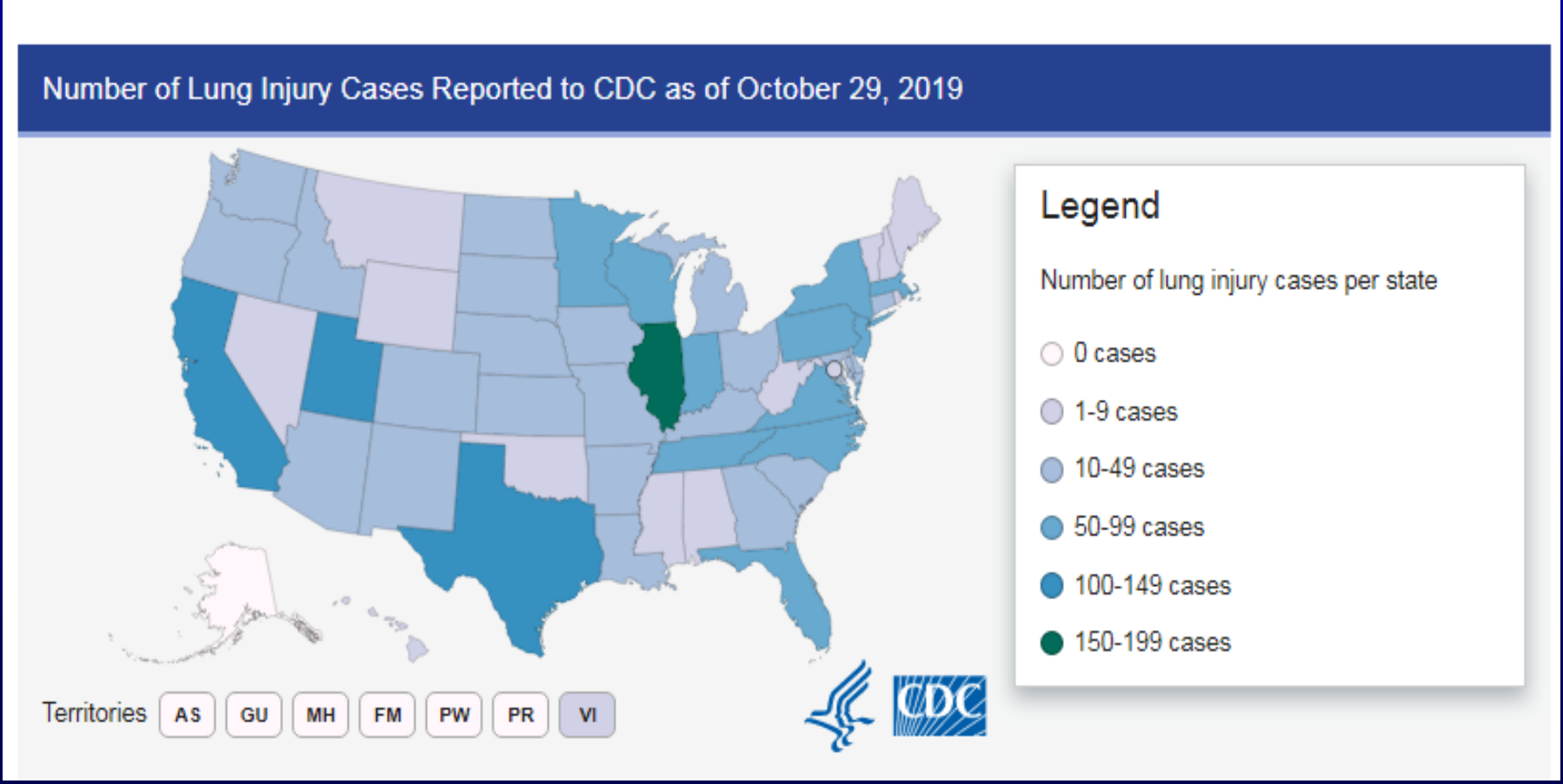
Center for Disease Control and Prevention. Outbreak of Lung Injury Associated with E-cigarette Use, or Vaping https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html Accessed October 31, 2019

Demographics

- Latest findings from the investigation into lung injuries associated with e-cigarette use, or vaping, suggest products containing THC play a role in the outbreak
- Among 867 patients with information on substances used in e-cigarette, or vaping, products in the 3 months prior to symptom onset (as of 10/15/19):
- 86% reported using THC-containing products
- 34% reported exclusive use of THC-containing products
- 64% reported using nicotine-containing products
- 11% reported exclusive use of nicotine-containing products

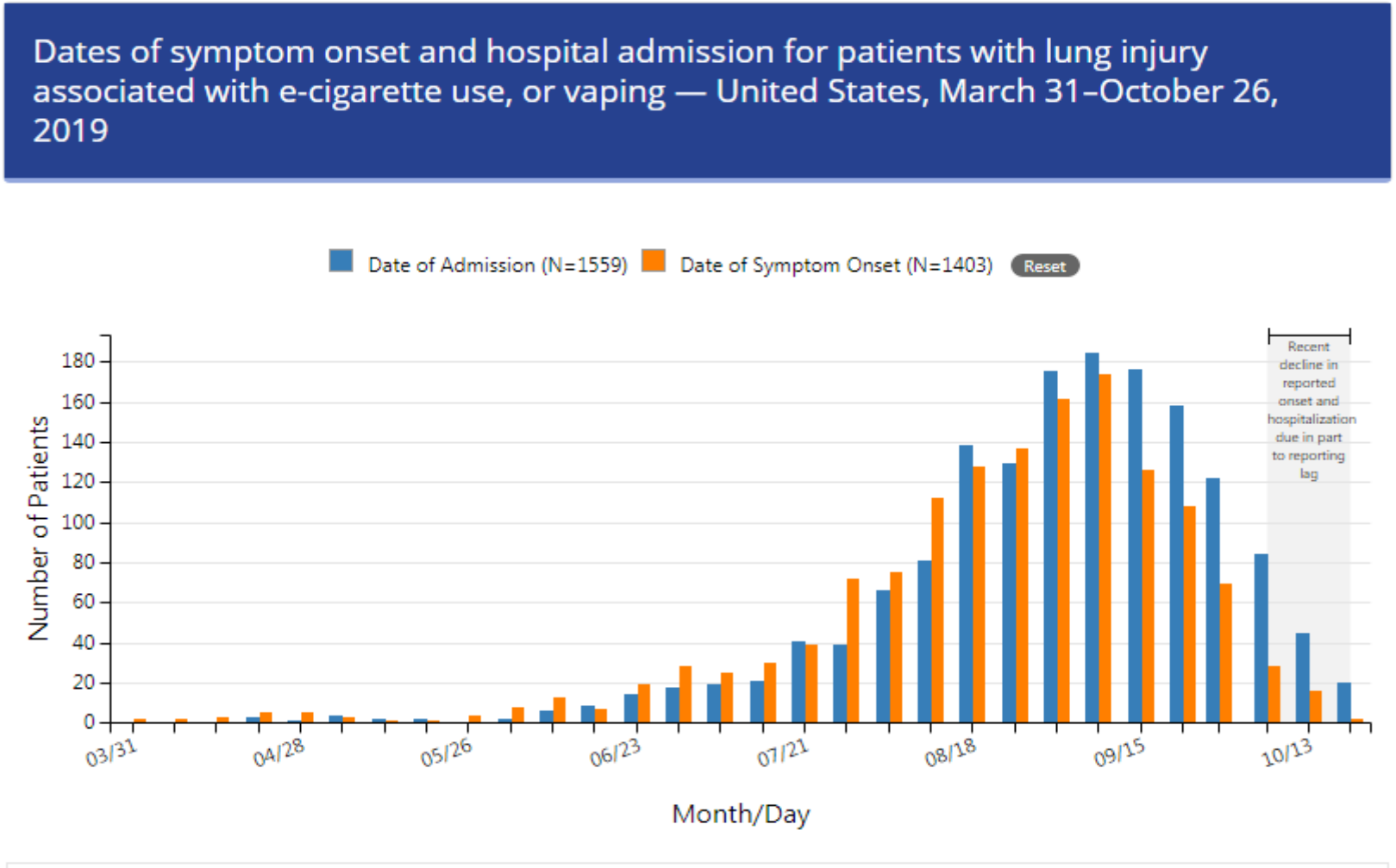
Center for Disease Control and Prevention. Outbreak of Lung Injury Associated with E-cigarette Use, or Vaping
https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html
Accessed October 31, 2019

Map of Vaping Lung Injury Reported Cases



Center for Disease Control and Prevention. Outbreak of Lung Injury Associated with E-cigarette Use, or Vaping https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html Accessed October 31, 2019

Dates of symptom onset and hospital admission for patients with lung injury associated with e-cigarette use, or vaping — United States, March 31–October 26, 2019



Center for Disease Control and Prevention. Outbreak of Lung Injury Associated with E-cigarette Use, or Vaping https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html Accessed October 31, 2019

Pulmonary Illness Related to E-Cigarette Use in Illinois and Wisconsin — Preliminary Report

Layden JE, Ghinai I, Pray I, et al. Pulmonary Illness Related to E-Cigarette Use in Illinois and Wisconsin - Preliminary Report. N Engl J Med. 2019; doi: 10.1056/NEJMoa1911614.
https://www.nejm.org/doi/full/10.1056/NEJMoa1911614

Background

- Population: 53 total cases met classification criteria for e-cigarette related pulmonary illness
- Wisconsin: 28 Illinois: 25
- Data taken from April 21st 2019 to August 20th 2019

Demographic	Percentage
Age (Year)	19 (16-53)
Sex (Male)	44/53 (83%)
History of Asthma	16/52 (30%)
History of Mood Disorder	18/53 (34%)

Layden JE, Ghinai I, Pray I, et al. Pulmonary Illness Related to E-Cigarette Use in Illinois and Wisconsin - Preliminary Report. N Engl J Med. 2019; doi: 10.1056/NEJMoa1911614. https://www.nejm.org/doi/full/10.1056/NEJMoa1911614

Patient History of Use

- 41 patients extensively interviewed regarding history of use

Usage History	Percentage
Overall Nicotine Use	24/41 (61%)
Overall THC Use	33/41 (80%)
Overall CBD Use	3/41 (7%)
THC Use Alone	15/41 (37%)
Nicotine Use Alone	7/41 (17%)
Nicotine and THC Together	18/41 (44%)
E-cigarette Daily Use	36/41 (88%)

Layden JE, Ghinai I, Pray I, et al. Pulmonary Illness Related to E-Cigarette Use in Illinois and Wisconsin - Preliminary Report N Engl J Med. 2019; doi: 10.1056/NEJMoa1911614. https://www.nejm.org/doi/full/10.1056/NEJMoa1911614

Patient Presentation

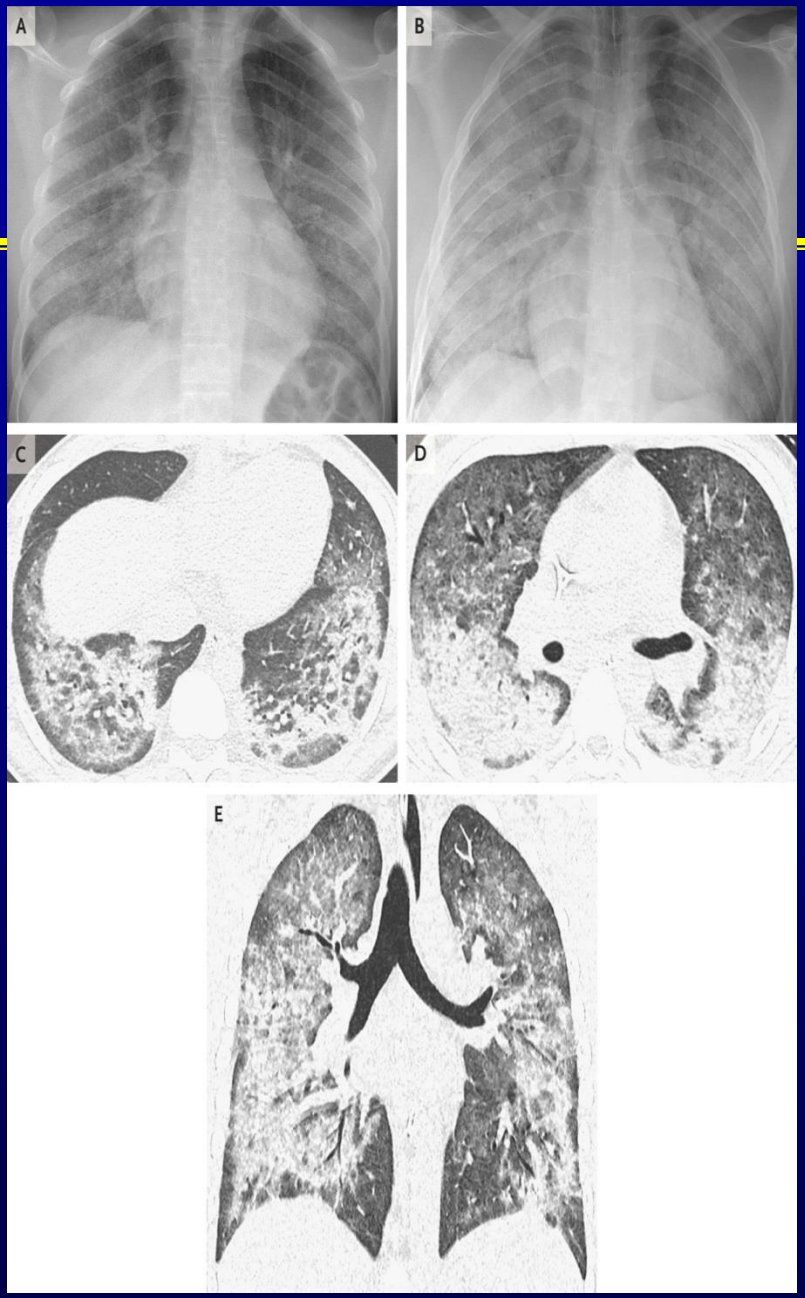
Patient Presentation	Percentage
Respiratory Symptoms	52/53 (98%)
Eg. SOB, Chest pain, Cough, Coughing blood	
GI Symptoms	43/53 (70%)
Eg. Nausea, Vomiting, Diarrhea, Abdominal pain	
Constitutional Symptoms	53/53 (100%)
Eg. Fever, Chills, Weight loss, Fatigue	
Headache	21/53 (40%)
High Heart Rate (>100BPM)	34/53 (64%)
High White Count (>11,000/mm^3)	45/52 (87%)
O_2sat 89-94%	20/52 (38%)
O_2sat <88%	16/52 (31%)

Layden JE, Ghinai I, Pray I, et al. Pulmonary Illness Related to E-Cigarette Use in Illinois and Wisconsin - Preliminary Report. N Engl J Med. 2019; doi: 10.1056/NEJMoa1911614. https://www.nejm.org/doi/full/10.1056/NEJMoa1911614

Patient Outcomes

Patient Condition	Percentage
Hospitalization	50/53 (94%)
Outpatient or ED visit before hospitalization	36/50 (72%)
Improvement with Glucocorticoids	30/46 (65%)
ICU Admission	31/53 (58%)
Intubation	17/53 (32%)
Death	1/53 (2%)

Layden JE, Ghinai I, Pray I, et al. Pulmonary Illness Related to E-Cigarette Use in Illinois and Wisconsin - Preliminary Report. N Engl J Med. 2019; doi: 10.1056/NEJMoa1911614. https://www.nejm.org/doi/full/10.1056/NEJMoa1911614



Chest Radiographs and High-Resolution Computed Tomographic Imaging in a 17-Year-Old Male Patient with Diffuse Lung Disease

Layden JE, Ghinai I, Pray I, et al. Pulmonary Illness Related to E-Cigarette Use in Illinois and Wisconsin - Preliminary Report. N Engl J Med. 2019; doi: 10.1056/NEJMoa1911614. https://www.nejm.org/doi/full/10.1056/NEJMoa1911614

Microbial Testing

Microbial Test	Number of Positive Results
Influenza	0/47 (0%)
Respiratory	1/34 (3%) *Not deemed clinically significant.
Mycoplasma	0/30 (0%)
Legionella (Urine Antigen)	0/38 (0%)
Streptococcus (Urinary Antigen)	0/25 (0%)
Blastomyces (Urinary Antigen)	0/16 (0%)
Histoplasma (Urinary Antigen)	0/20 (0%)
HIV	0/27 (0%)
PCP	0/16 (0%)
Blood Culture	0/37 (0%)
Sputum Culture	1/24 (0%) *Not deemed clinically significant. Growth of Strep Viridans.
Urine Culture	0/6 (0%)
Bronchoalveolar lavage culture	3/18 (0%)* Not deemed clinically significant. Growth of Strep group F, cryptococcus and candida albicans.

Layden JE, Ghinai I, Pray I, et al. Pulmonary Illness Related to E-Cigarette Use in Illinois and Wisconsin - Preliminary Report. N Engl J Med. 2019; doi: 10.1056/NEJMoa1911614. https://www.nejm.org/doi/full/10.1056/NEJMoa1911614

Tree-in-Bloom: Severe Acute Lung Injury Induced by Vaping Cannabis Oil

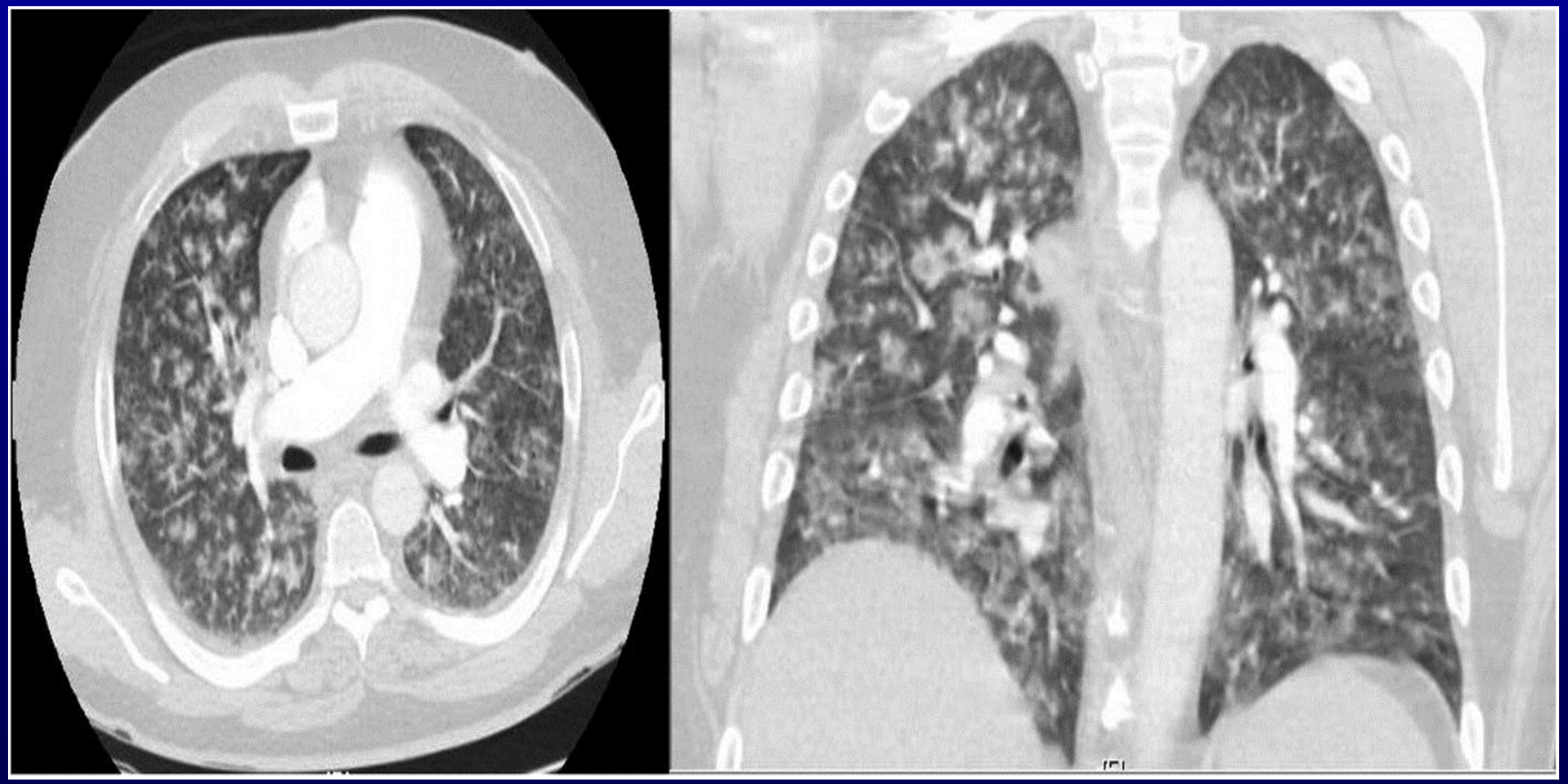
He T, Oks M, Esposito M, Steinberg H, Makaryus M. "Tree-in-Bloom": Severe Acute Lung Injury Induced by Vaping Cannabis Oil. Ann Am Thorac Soc. 2017;14(3):468-470.
https://www.atsjournals.org/doi/full/10.1513/AnnalsATS.201612-974LE

Background

- 54 y/o male admitted to the hospital for dyspnea & hemoptysis one day post vaping cannabis oil
- Patient had developed dyspnea 6 hours post vaping, which did not resolve the following day
- Patient then coughed up blood tinged sputum which progressed to pure blood
- Patient has no history of cigarettes but has history of vaping cannabis oil weekly for several years
- Patient reported use of “pure cannabis oil” containing 32-40% THC with no additives

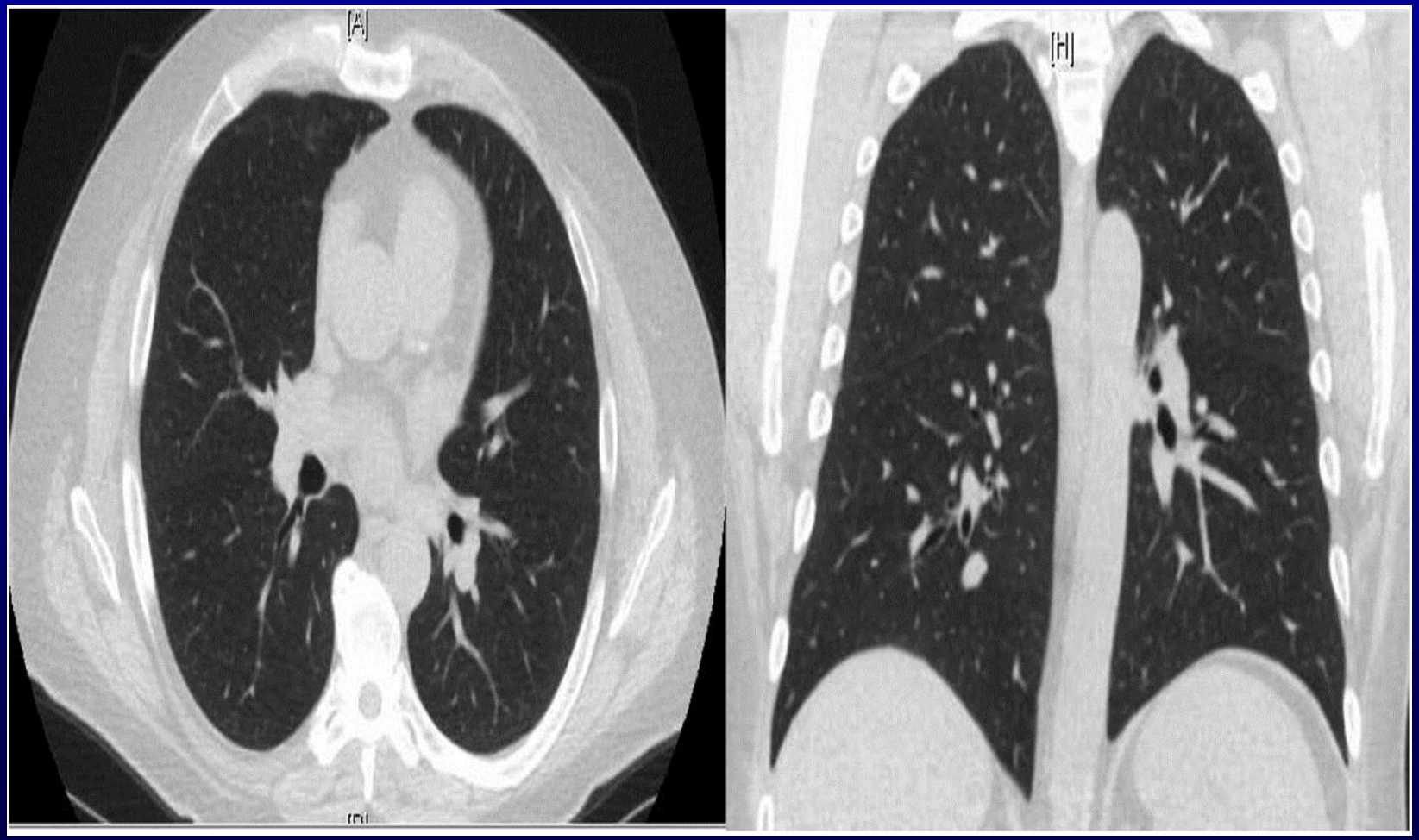
He T, Oks M, Esposito M, Steinberg H, Makaryus M. "Tree-in-Bloom": Severe Acute Lung Injury Induced by Vaping Cannabis Oil. Ann Am Thorac Soc. 2017;14(3):468-470. https://www.atsjournals.org/doi/full/10.1513/AnnalsATS.201612-974LE

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

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

Update: Interim Guidance for Health Care Providers Evaluating and Caring for Patients with Suspected E-cigarette, or Vaping, Product Use Associated Lung Injury — United States, October 2019

Center for Disease Control and Prevention. Update: Interim Guidance for Health Care Providers Evaluating and Caring for Patients with Suspected E-cigarette, or Vaping, Product Use Associated Lung Injury https://www.cdc.gov/mmwr/volumes/68/wr/mm6841e3.htm

Accessed October 11th, 2019

CDC Confirmed Primary Case Definition

- Using an e-cigarette ("vaping") or dabbing* in 90 days prior to symptom onset

AND

- Pulmonary infiltrate on plain film chest radiograph or opacities on chest computed tomography (CT)

AND

- Absence of pulmonary infection on initial work-up. **Minimum criteria** are
  - A negative respiratory viral panel ***and***
  - A negative influenza PCR or rapid test, if local epidemiology supports influenza testing; ***and***
  - All other clinically-indicated respiratory ID testing are negative

AND

- No evidence in medical record of alternative plausible diagnoses (e.g., cardiac, rheumatologic, or neoplastic process)

* Using an electronic device (e.g., electronic nicotine delivery system (ENDS), electronic cigarette, e-cigarette, vaporizer, vape(s), vape pen, dab pen, or other device) or dabbing to inhale substances (e.g., nicotine, marijuana, THC, THC concentrates, CBD, synthetic cannabinoids, flavorings, or other substances) Dabbing is superheating substances containing high concentrations of THC or other cannabinoids.

Website for case definition

(as of September 18, 2019)

CDC Probable Primary Case Definition

- Using an e-cigarette ("vaping") or dabbing in 90 days prior to symptom onset

AND

- Pulmonary infiltrate, such as opacities, on plain film chest radiograph or ground-glass opacities on chest CT

AND

- Infection identified via culture or PCR, but clinical team* believes this is not the sole cause of the underlying respiratory disease process ***OR*** **Minimum criteria** to rule out pulmonary infection not met (testing not performed) and clinical team* believes this is not the sole cause of the underlying respiratory disease process

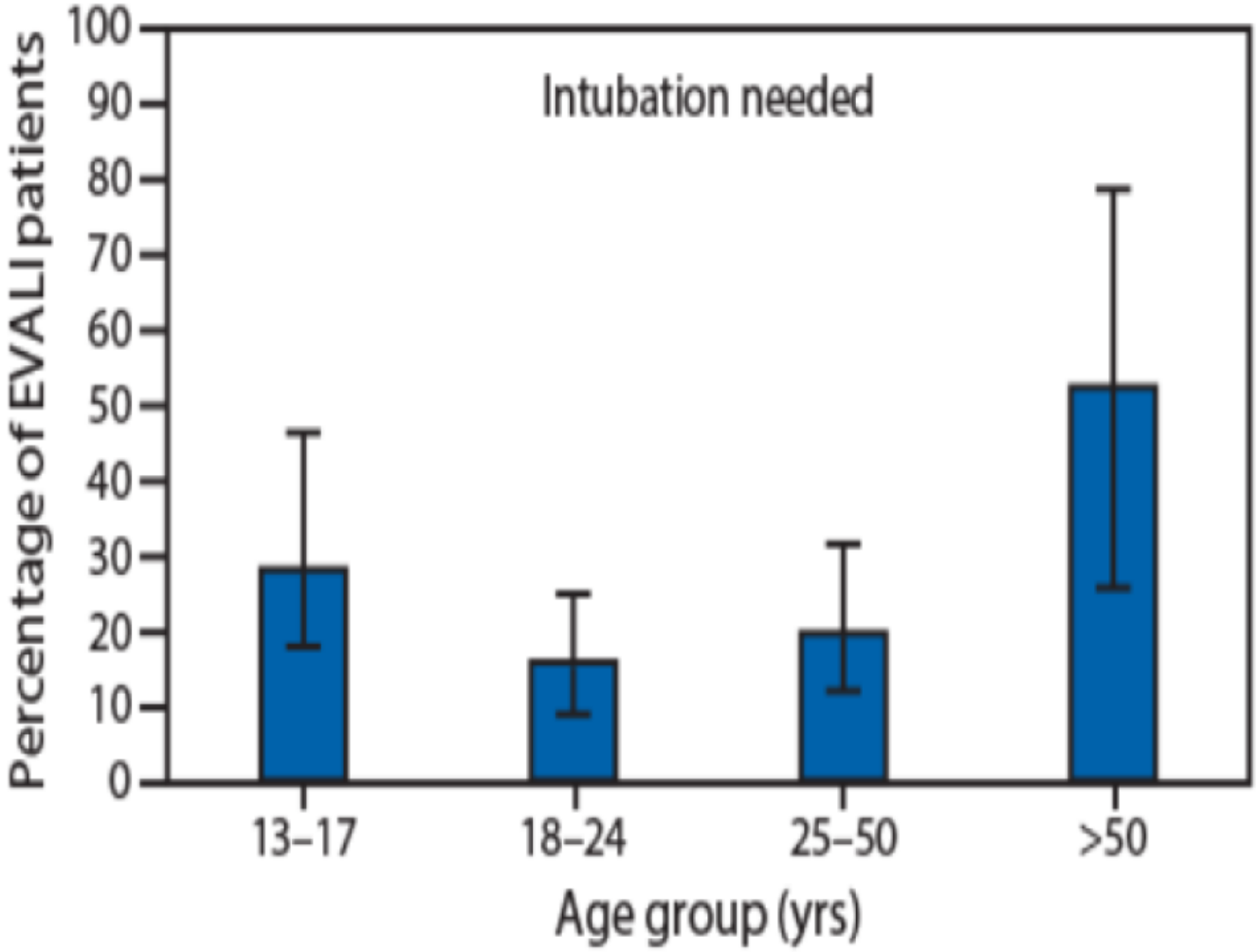
AND

- No evidence in medical record of alternative plausible diagnoses (e.g., cardiac, rheumatologic, or neoplastic process)

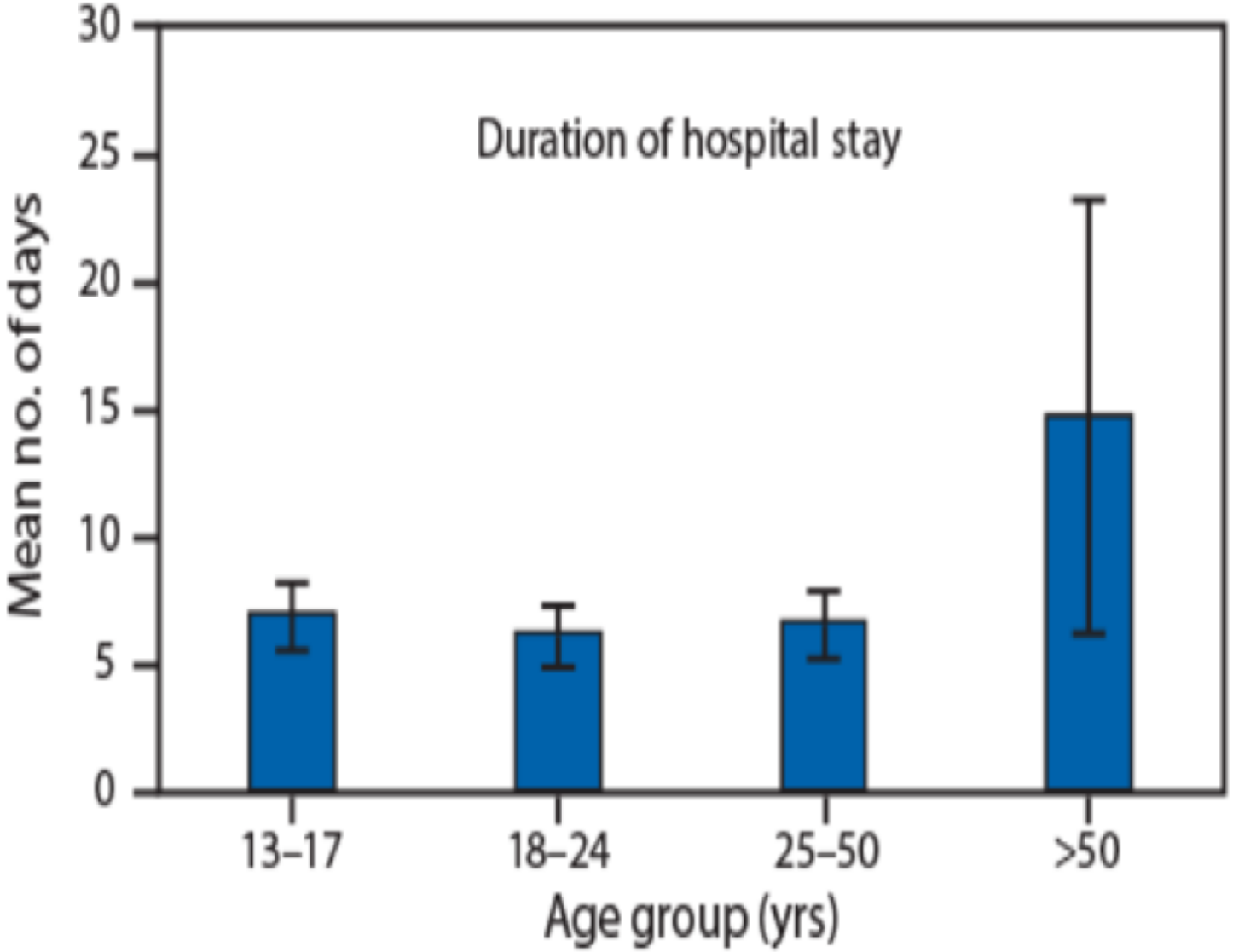
*Clinical team caring for the patient.

Website for case definition
(as of September 18, 2019)

EVALI Patients Needing Intubation, by Age (N=338)



Duration of Hospitalization, by Age (N=242)



EVALI Patient Presentation

Characteristics	Value	Total Individuals in Calculation
Median Age	22 (13-71)	338
Symptoms		
Respiratory Symptoms	323 (95%)	339
Gastrointestinal Symptoms	262 (77%)	339
Constitutional Symptoms	289 (85%)	339
Vital Signs		
Oxygen Saturation <95%	143 (57%)	252
Tachycardia (HR>100 BPM)	169 (55%)	310
Tachypnea (RR>20 BPM)	77 (45%)	172

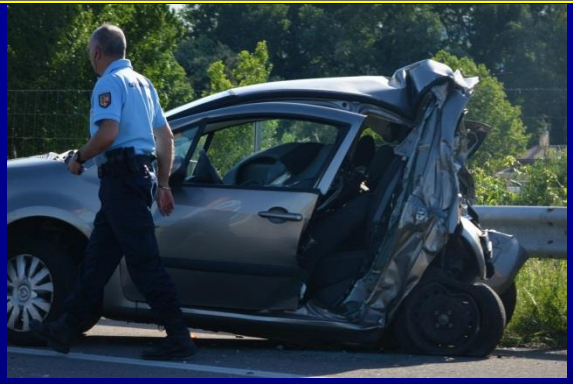
Center for Disease Control and Prevention. Update: Interim Guidance for Health Care Providers Evaluating and Caring for Patients with Suspected E-cigarette, or Vaping, Product Use Associated Lung Injury. https://www.cdc.gov/mmwr/volumes/68/wr/mm6841e3.htm Accessed October 11th, 2019.

EVALI Patient Course

Characteristics	Value	Total Individuals in Calculation
Admission to ICU	159 (47%)	342
Intubation/Mechanical Ventilation	74 (22%)	338
Corticosteroid Treatment	252 (88%)	287
Improvement with Corticosteroids	115 (82%)	140
Average Hospital Stay	6.7 days (Median=5)	Range= 0-40

Center for Disease Control and Prevention. Update: Interim Guidance for Health Care Providers Evaluating and Caring for Patients with Suspected E-cigarette, or Vaping, Product Use Associated Lung Injury. https://www.cdc.gov/mmwr/volumes/68/wr/mm6841e3.htm Accessed October 11th, 2019.

What Has Research Over the Past Two Decades Revealed About the Adverse Heath Effects of Recreational Cannabis Use?



Results: Research from the past 20 years has shown:

- Driving cannabis-impaired doubles car crash risk
- 1 in 10 regular cannabis users develop dependence
  - *1 in 6 who start in adolescence*
- Regular adolescence cannabis use 2x risks of early school-leaving, cognitive impairment & psychoses/schizophrenia in adulthood
- Regular adolescence cannabis associated strongly w/use of other illicit drugs
- Cannabis smoking increases middle age cardiovascular disease risk 3-4x
- Cannabis effects on respiratory function/cancer remains unclear
  - most cannabis smokers have smoked/still smoke tobacco
- Regular cannabis use in adolescent males associated strongly with 2-3x risk of developing testicular cancer
  - 3 definitive studies, one with 70% increase

What has research over the past two decades revealed about the adverse health effects of recreational cannabis use? Hall, Wayne. Society for the Study of Addiction. Addiction doi:10.1111/add.12703 10.7.2014 https://www.ncbi.nlm.nih.gov/pubmed/25287883

But I Don't Have a Problem with Marijuana… You Do if Two or More are True (in 12 months)

1. Taken in larger amounts/over longer period than intended
2. Persistent desire/unsuccessful efforts to cut down/control use
3. Great deal of time spent to obtain/ use/recover from effects
4. Craving/strong desire/urge to use
5. Recurrent use result in failure to fulfill major obligations at work/school/ home
6. Continued use despite persistent/ recurrent social/interpersonal problems caused/by cannabis effects
7. Important social/occupational/ recreational activities given up/ reduced from use
8. Recurrent use in physically hazardous situations
9. Continued use despite knowledge of persistent/recurrent physical/psychological problems caused/exacerbated by use
10. Tolerance: Need for markedly increased amounts to achieve intoxication/desired effect. Markedly diminished effect with continued use of same amount
11. Withdrawal: Characteristic withdrawal syndrome from cannabis. Cannabis taken to relieve/avoid withdrawal[13]

Cannabis Use Disorder Diagnostic and statistical manual of mental disorders. American Psychiatric Publishing; 5th edition. 2013.

American Academy of Pediatrics: Counseling Parents &Teens About Marijuana Use

1. Marijuana is not a benign drug for teens. The teen brain is still developing, and marijuana may cause abnormal brain development.
2. Teens who use marijuana regularly may develop serious mental health disorders, including addiction, depression, and psychosis.
3. There are no research studies on the use of medical marijuana in teens, so actual indications, appropriate dosing, effects, and side effects are unknown. The only data available on medical marijuana in the pediatric population are limited to its use in children with severe refractory seizures.

Ryan SA. Ammerman SD, AAP Committee on Substance Abuse and Prevention. Counseling Parents and Teens About Marijuana Use in the Era of Legalization of Marijuana. Pediatrics. March 2017;139(3):e20164069 DOI: 10.1542/PEDS2016-4069
http://pediatrics.aappublications.org/content/pediatrics/139/3/e20164069.full.pdf

American Academy of Pediatrics: Counseling Parents &Teens About Marijuana Use

4. Marijuana smoke is toxic, similar to secondhand tobacco smoke. The use of vaporizers or hookahs does not eliminate the toxic chemicals in marijuana smoke.
5. For parents: You are role models for your children, and actions speak louder than words. So if you use marijuana in front of your teens, they are more likely to use it themselves, regardless of whether you tell them not to.

Ryan SA. Ammerman SD, AAP Committee on Substance Abuse and Prevention. Counseling Parents and Teens About Marijuana Use in the Era of Legalization of Marijuana. Pediatrics. March 2017;139(3):e20164069 DOI: 10.1542/PEDS2016-4069
http://pediatrics.aappublications.org/content/pediatrics/139/3/e20164069.full.pdf

“But it’s just a plant…”

(80-90% THC) Concentrates

“Green Crack” wax

“Ear Wax”

Butane Hash Oil (BHO)

Hash Oil Capsules

“Budder”

“Shatter”

Cort, B. *Marijuana in the 21st Century. The Reality from Colorado Post A64*. Smart Approaches to Marijuana Meeting. April 9, 2015. Atlanta, GA

Similar Vaping Cartridges

With permission 5/31/18 from Chief Harry Earle, Gloucester Township NJ Police Department

Seizure of “Pendemic”

- Gloucester Twp. Police motor vehicle stop 5/21/18
- 3,000 cartridges for vape pens seized
- Each contained 0.5 grams liquid THC
- Honeydew, Mango, Zkittlez, Sour Diesel, Mango Kush, Pineapple Express, Wedding Cake flavors
- 88.94% THC in each cartridge
- $38/cartridge; $113,962 total seizure

Gloucester Township NJ Police Department Press Conference.
Large Quantity of Marijuana Laced Vapes. Media Package. May 31, 2018

Teen Cannabis Use Tied to Harmful Substance Use Later

- Teens who use cannabis even occasionally are more likely to misuse other drugs & alcohol in early adulthood
- Over 5300 U.K. adolescents answered questions on cannabis use several times between ages 13 & 18 and then were followed up at age 21
  - 80% were cannabis nonusers as teens
  - 17% were occasional users
  - 3% were regular users (at least once weekly)
- After adjustment for demographics, conduct problems, early alcohol & tobacco use, cannabis use in adolescence was associated with harmful substance use later

Taylor M, Collin SM, Munafò MR, *et al*. *Patterns of cannabis use during adolescence and their association with harmful substance use behaviour: findings from a UK birth cohort* . *J Epidemiol Community Health* Published Online First: 07 June 2017 doi: 10.1136/jech-2016-208503

Teen Cannabis Use Tied to Harmful Substance Use Later

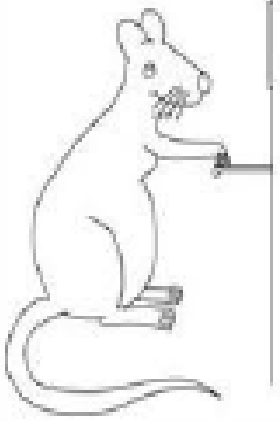
Substance use rates at age 21 according to teen cannabis use were:

- Nicotine dependence:
  - 1% of cannabis nonusers
  - 5% of occasional users
  - 21% of regular users
- Harmful alcohol consumption
  - 8% of cannabis nonusers
  - 28%–43% of occasional users
  - 24% of regular users
- Other illicit drug use
  - 14% of cannabis nonusers
  - 83% of occasional users
  - 94% of regular users
- **Conclusion** :One-fifth of the adolescents in our sample followed a pattern of occasional or regular cannabis use, and these young people were more likely to progress to harmful substance use behaviours in early adulthood.

Taylor M, Collin SM, Munafò MR, *et al*. *Patterns of cannabis use during adolescence and their association with harmful substance use behaviour: findings from a UK birth cohort* . *J Epidemiol Community Health* Published Online First: 07 June 2017 doi: 10.1136/jech-2016-208503

Prenatal cannabis exposure increases heroin seeking in adult rats

- THC exposed rats exhibited shorter latency to the first active lever press for heroin and had higher heroin-seeking during mild stress and drug extinction than animals not exposed to THC – and exhibited allostatic changes in limbic enkephalin systems in adulthood
- Sapano et al. Biol Psychiatry 2007;61:554-56



With permission per Libby Stuyt, MD. Addiction Psychiatrist Pueblo Colorado. 2/7/19

Prenatal exposure of cannabis alters opioid gene function in humans

- Aborted fetus brains from women using marijuana compared to those from women not using marijuana during pregnancy
- Discovered impaired opioid-related genes in distinct brain circuits that may have long term effects on cognitive and emotional behaviors
- Wang et al. Pharmacogenomics J, 2006;6:255-264

With permission per Libby Stuyt, MD. Addiction Psychiatrist Pueblo Colorado. 2/7/19

Cannabis Use and Risk of Prescription Opioid Use Disorder in the United States

Mark Olfson, M.D., M.P.H., Melanie M. Wall, Ph.D., Shang-Min Liu, M.S., Carlos Blanco, M.D., Ph.D.

Objective: The authors sought to determine whether cannabis use is associated with a change in the risk of incident nonmedical prescription opioid use and opioid use disorder at 3-year follow-up.

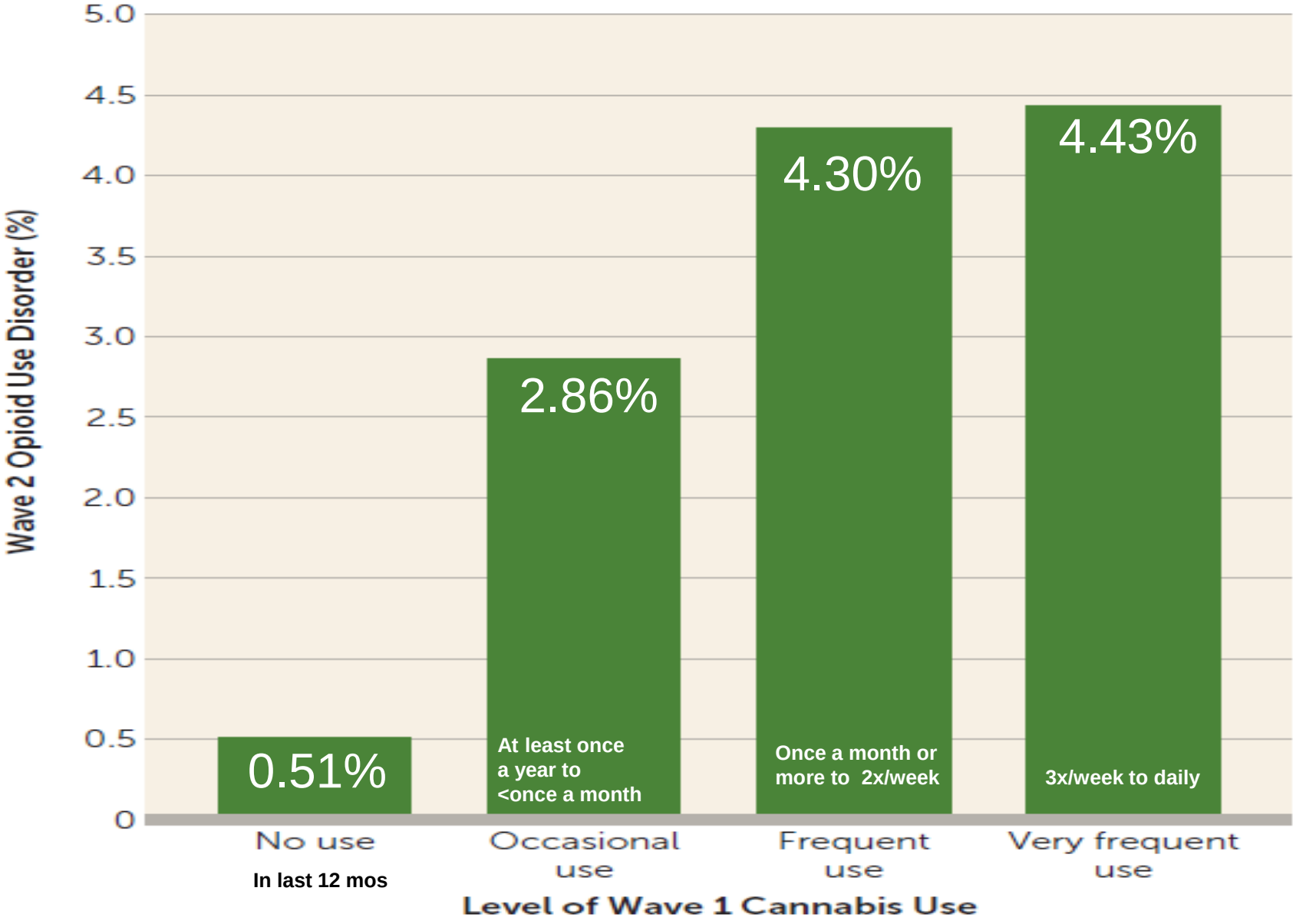
Method: The authors used logistic regression models to assess prospective associations between cannabis use at wave 1 (2001–2002) and nonmedical prescription opioid use and prescription opioid use disorder at wave 2 (2004–2005) of the National Epidemiologic Survey on Alcohol and Related Conditions. Corresponding analyses were performed among adults with moderate or more severe pain and with nonmedical opioid use at wave 1. Cannabis and prescription opioid use were measured with a structured interview (the Alcohol Use Disorder and Associated Disabilities Interview Schedule–DSM-IV version). Other covariates included age, sex, race/ethnicity, anxiety or mood disorders, family history of drug, alcohol, and behavioral problems, and, in opioid use disorder analyses, nonmedical opioid use.

Results: In logistic regression models, cannabis use at wave 1 was associated with increased incident nonmedical prescription opioid use (odds ratio=5.78, 95% CI=4.23–7.90) and opioid use disorder (odds ratio=7.76, 95% CI=4.95–12.16) at wave 2. These associations remained significant after adjustment for background characteristics (nonmedical opioid use: adjusted odds ratio=2.62, 95% CI=1.86–3.69; opioid use disorder: adjusted odds ratio=2.18, 95% CI=1.14–4.14). Among adults with pain at wave 1, cannabis use was also associated with increased incident nonmedical opioid use (adjusted odds ratio=2.99, 95% CI=1.63–5.47) at wave 2; it was also associated with increased incident prescription opioid use disorder, although the association fell short of significance (adjusted odds ratio=2.14, 95% CI=0.95–4.83). Among adults with nonmedical opioid use at wave 1, cannabis use was also associated with an increase in nonmedical opioid use (adjusted odds ratio=3.13, 95% CI=1.19–8.23).

Conclusions: Cannabis use appears to increase rather than decrease the risk of developing nonmedical prescription opioid use and opioid use disorder.

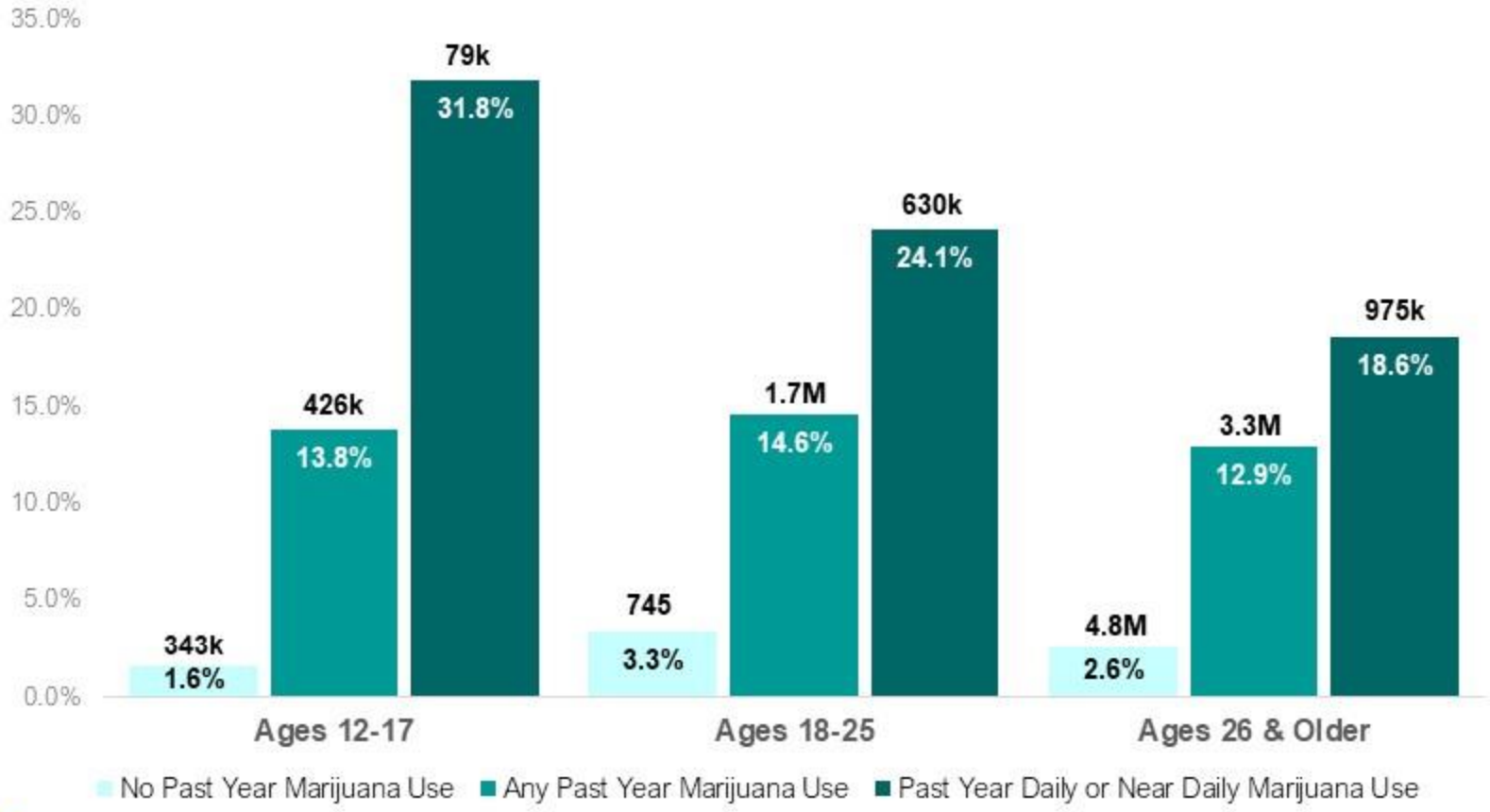
AJP in Advance (doi: 10.1176/appi.ajp.2017.17040413)

FIGURE 1. Level of Wave 1 Cannabis Use and Incident Wave 2 Prescription Opioid Use Disorder in the NESARC[a]



[a] NESARC=National Epidemiological Survey on Alcohol and Related Conditions; wave 1 was conducted in 2001 and 2002, and wave 2 in 2004 and 2005.

Marijuana's link to opioid misuse



National Families in Action

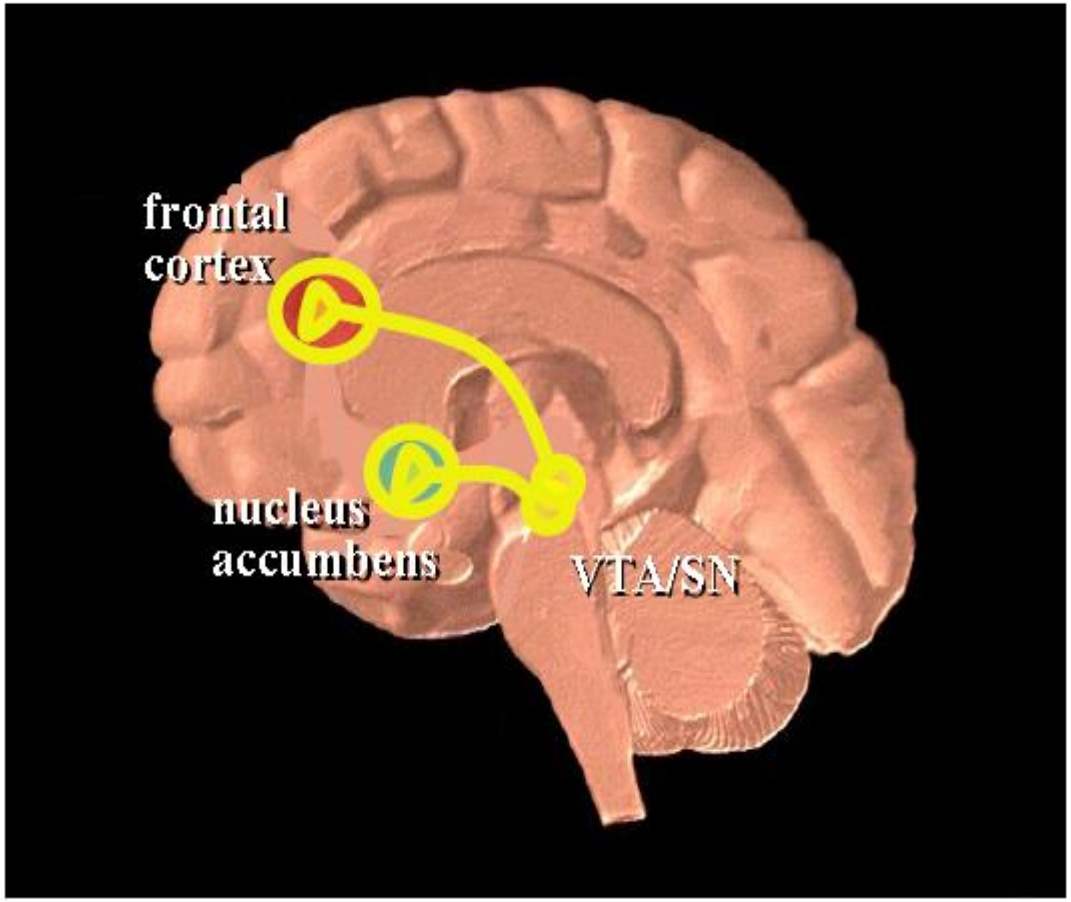
Source: 2017 National Survey on Drug Use and Health

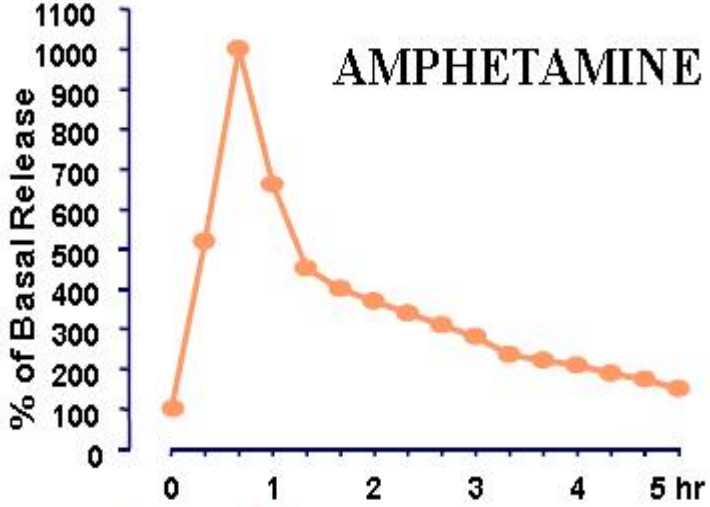
Naltrexone maintenance decreases cannabis self-administration and subjective effects of daily cannabis use

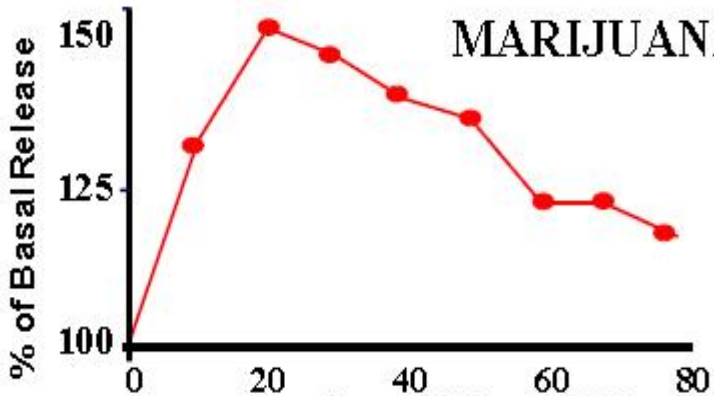
- Randomized double-blind, placebo controlled trial of naltrexone in non-treatment seeking cannabis smokers
- In a laboratory setting those receiving the placebo had 7.6 times the odds of self-administering active cannabis compared with those receiving daily naltrexone
- Haney et al. Neuropsychopharmacology 2015

With permission per Libby Stuyt, MD. Addiction Psychiatrist Pueblo Colorado. 2/7/19

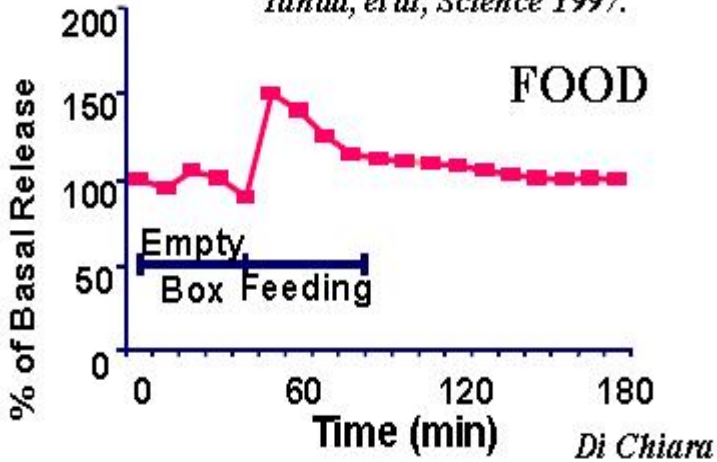
Natural and Drug Reinforcers Increase Dopamine in NAc







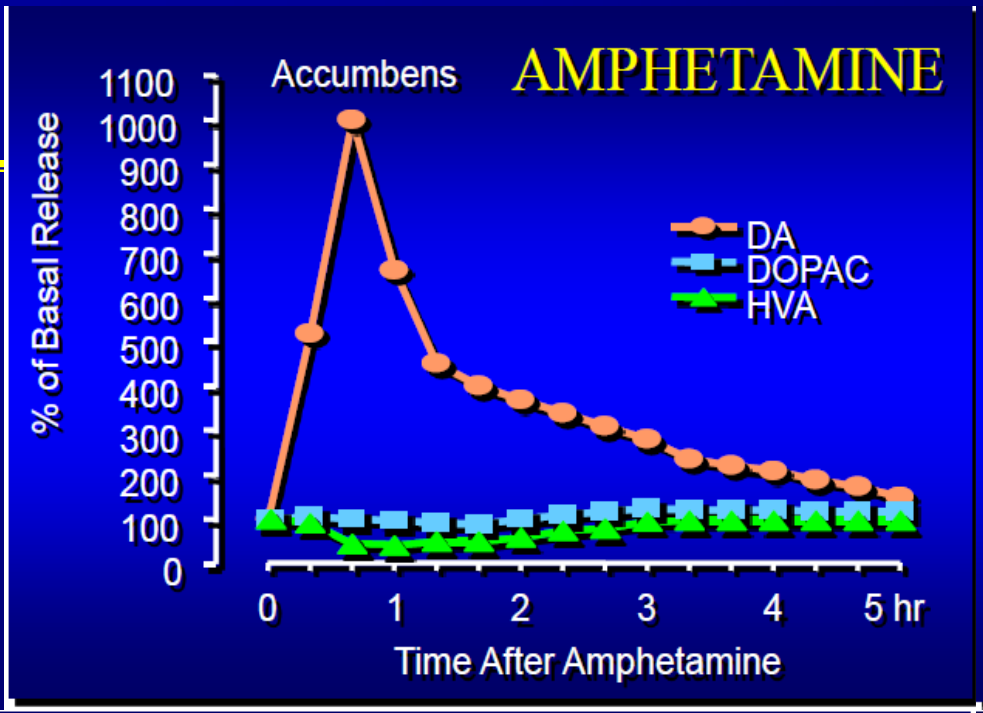
Tanda, et al, Science 1997.

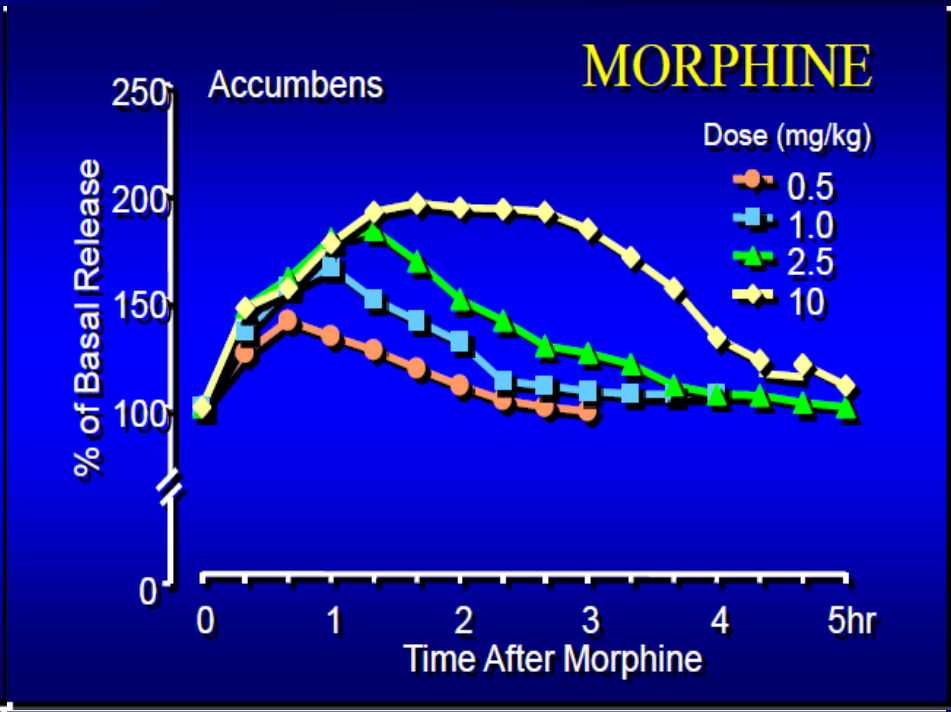


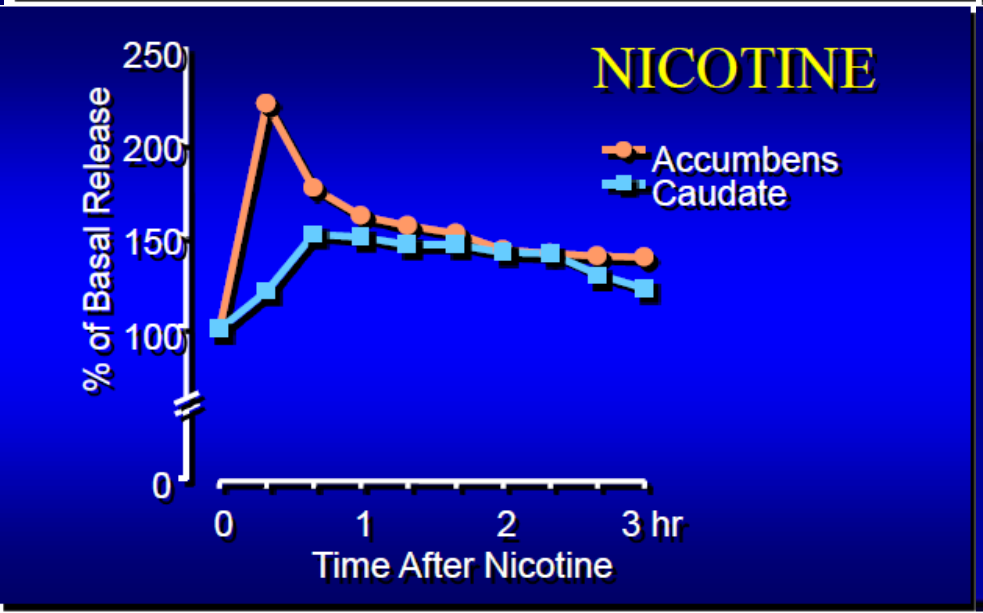
Di Chiara et al.

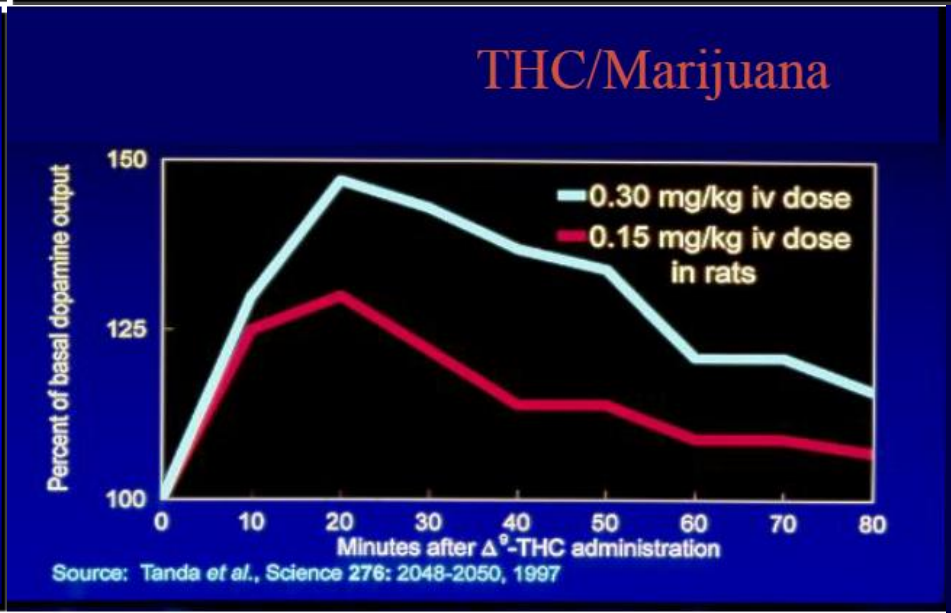
Drugs of abuse increase DA in the Nucleus Accumbens, which is believed to trigger the neuroadaptions that result in addiction

Effect of Drugs on Dopamine Levels









Vaping Leads To…

MARIJUANA

FIRST,

HEROIN

LAST!

Heroin use is part of a larger substance abuse problem.

Nearly all people who used heroin also used at least 1 other drug.

Most used at least 3 other drugs.

Heroin is a highly addictive opioid drug with a high risk of overdose and **death** for users.

People who are addicted to...

ALCOHOL

are

2x

MARIJUANA

are

3x

COCAINE

are

15x

Rx OPIOID PAINKILLERS

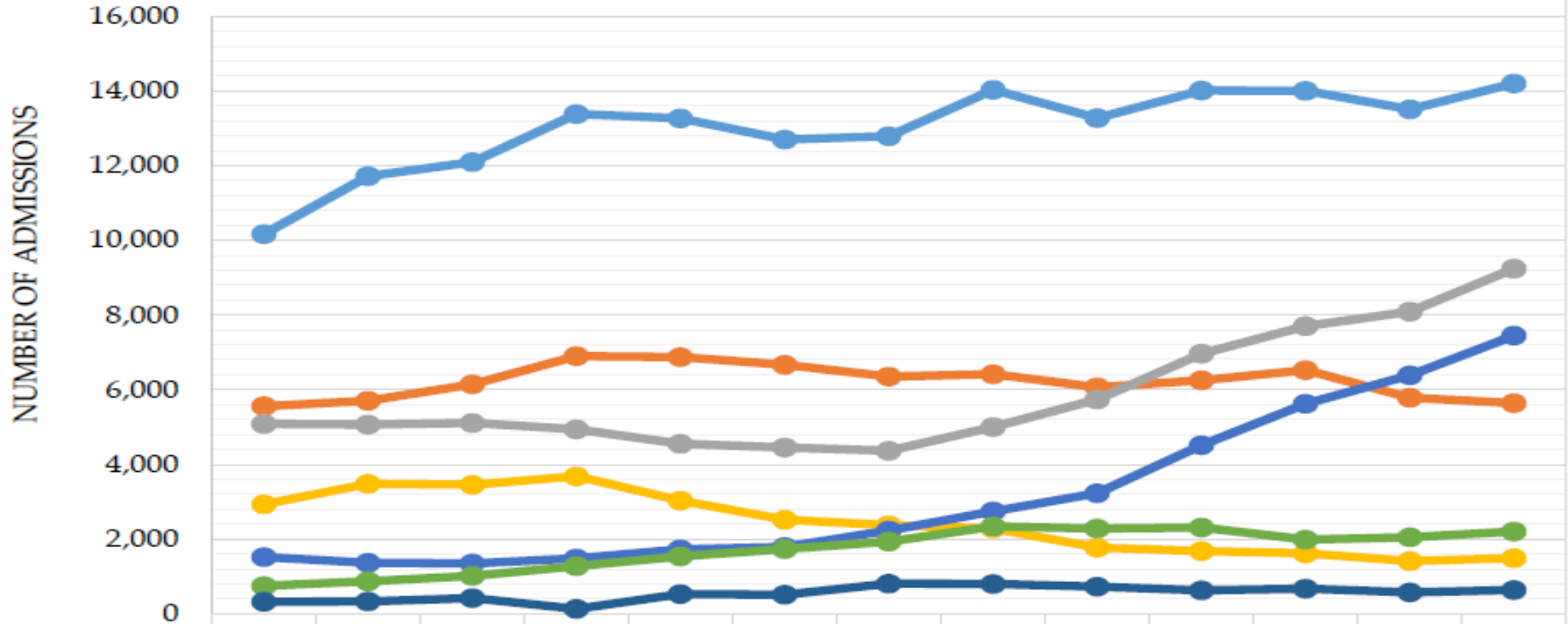
are

40x

...more likely to be addicted to heroin.

SOURCE: National Survey on Drug Use and Health (NSDUH), 2011-2013.

Drug Type for Treatment Admissions, All Ages

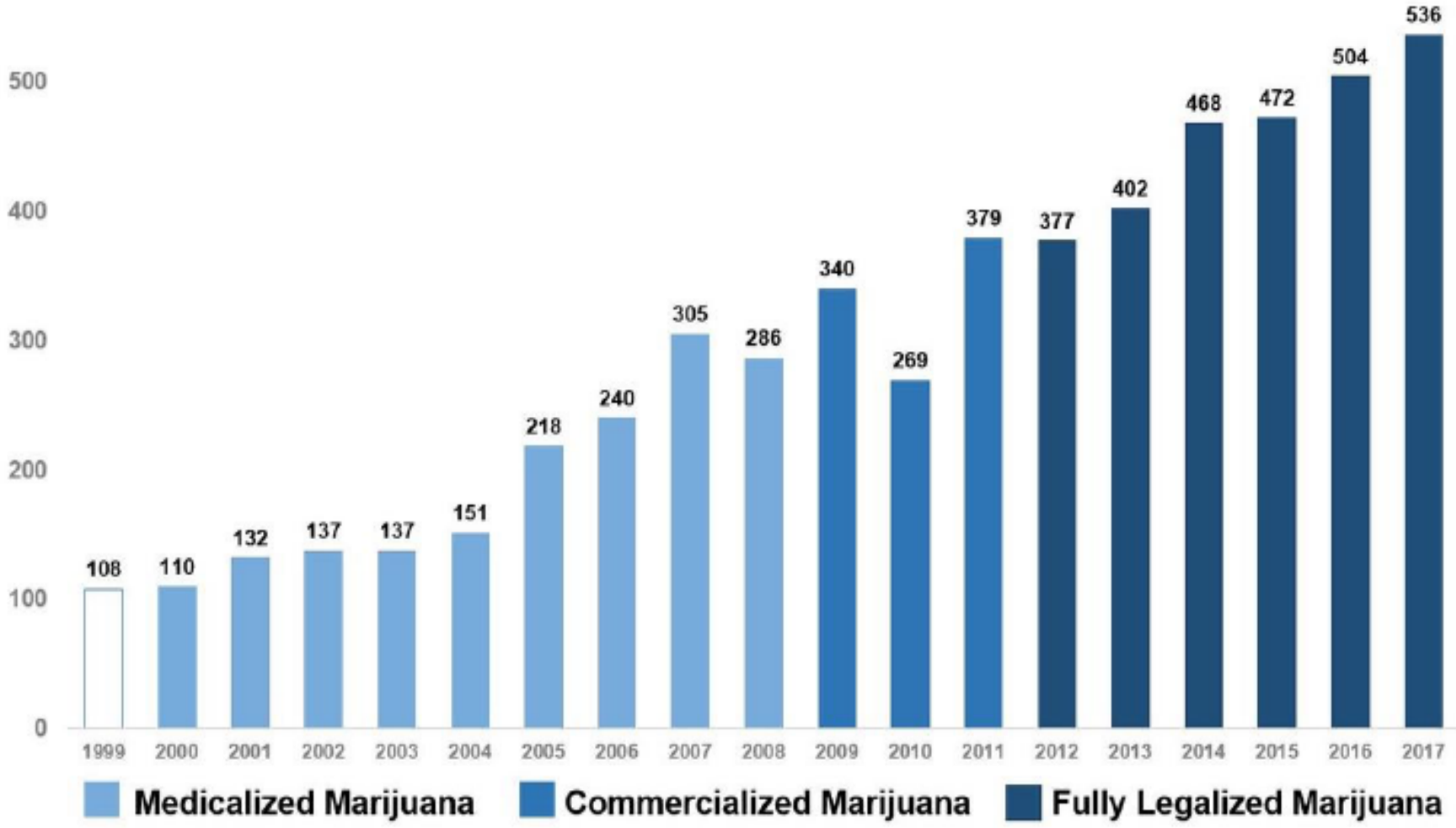


	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Alcohol	10,168	11,721	12,094	13,382	13,270	12,701	12,787	14,032	13,275	14,015	14,004	13,514	14,206
Marijuana	5,558	5,708	6,144	6,900	6,872	6,669	6,350	6,413	6,069	6,253	6,525	5,784	5,644
Meth	5,081	5,066	5,109	4,939	4,557	4,451	4,367	5,007	5,745	6,970	7,706	8,094	9,246
Cocaine	2,934	3,481	3,459	3,685	3,035	2,522	2,377	2,288	1,775	1,683	1,616	1,412	1,496
Heroin	1,519	1,369	1,349	1,487	1,731	1,789	2,234	2,746	3,228	4,521	5,627	6,390	7,450
Rx Opioids	749	875	1,014	1,274	1,536	1,736	1,931	2,341	2,282	2,309	1,989	2,053	2,207
Other	324	330	420	131	531	516	810	801	727	632	676	577	636

Data beginning 2009 has been revised using a new methodology for improved accuracy. Treatment categories include residential, outpatient, and intensive outpatient record counts.

SOURCE: **Colorado Department of Health Services, Office of Behavioral Health, 2005-2017**

Opioid Overdose Deaths in Colorado



https://www.colorado.gov/pacific/cdphe/vital-statistics-program

Association Between Medical Cannabis Laws and Opioid Overdose Mortality Has Reversed Over Time

Medical cannabis has been touted as a solution to the US opioid overdose crisis since Bachhuber et al. [M. A. Bachhuber, B. Saloner, C. O. Cunningham, C. L. Barry, *JAMA Intern. Med.* 174, 1668–1673] found that from 1999 to 2010 states with medical cannabis laws experienced slower increases in opioid analgesic overdose mortality. That research received substantial attention in the scientific literature and popular press and served as a talking point for the cannabis industry and its advocates, despite caveats from the authors and others to exercise caution when using ecological correlations to draw causal, individual-level conclusions. In this study, we used the same methods to extend Bachhuber et al.'s analysis through 2017. Not only did findings from the original analysis not hold over the longer period, but the association between state medical cannabis laws and opioid overdose mortality reversed direction from −21% to +23% and remained positive after accounting for recreational cannabis laws. We also uncovered no evidence that either broader (recreational) or more restrictive (low-tetrahydrocannabinol) cannabis laws were associated with changes in opioid overdose mortality. We find it unlikely that medical cannabis—used by about 2.5% of the US population—has exerted large conflicting effects on opioid overdose mortality. A more plausible interpretation is that this association is spurious. Moreover, if such relationships do exist, they cannot be rigorously discerned with aggregate data. Research into therapeutic potential of cannabis should continue, but the claim that enacting medical cannabis laws will reduce opioid overdose death should be met with skepticism.

"In this study, we used the same methods to extend Bachhuber et al.'s analysis through 2017. Not only did findings from the original analysis not hold over the longer period, but the association between state medical cannabis laws and opioid overdose mortality reversed direction from -21% to +23% and remained positive after accounting for recreational cannabis laws."

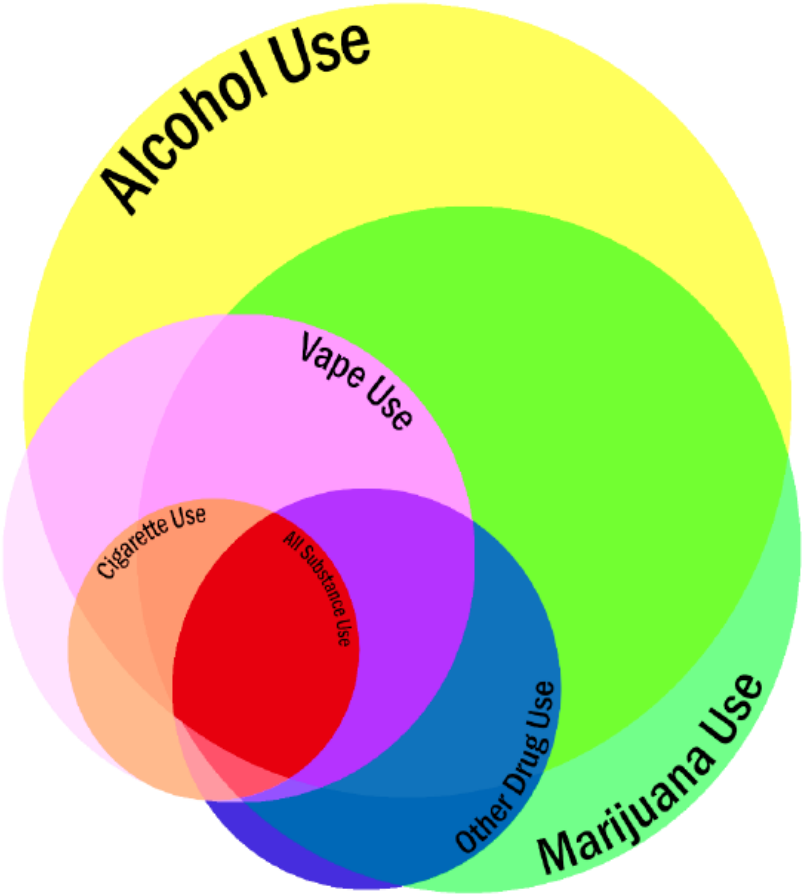
Shover CL, Davis CS, Gordon SC, Humphreys K. Association between medical cannabis laws and opioid overdose mortality has reversed over time. Proc Natl Acad Sci USA. 2019;116(26):12624-12626. https://www.ncbi.nlm.nih.gov/pubmed/31182592

Number of pediatric patients…

- Testing positive for opioid addiction or dependency in the US Emergency Rooms increased from 32,235 in 2008 to 49,626 in 2013
- With 2013 data, 135 patients 21 years of age or younger tested positive for opioid addiction or dependency EVERY DAY in our country's emergency rooms.
- 135 pediatric patients per day
- 92% did not have any chronic co-morbid condition
- A pediatric public health crisis

Allareddy, V. et al. *Opioid Abuse in Children: An Emerging Public Health Crisis.* American Academy of Pediatrics 2017 National Conference. 9/15/17

Polysubstance use among 11th grade students



This venn diagram illustrates the prevalence of past year polysubstance use among 11th grade students in Delaware. Each circle has been scaled relative to the number of students who report using that substance in the past year, and the areas where circles overlap are accurate to the proportion of students who reported using multiple substances. Overall, 55% of students report using at least one substance in the past year, meaning that 45% of students did not report past year substance use.

As in previous years, alcohol remains the most commonly used substance, with marijuana as the second most used substance. Most students who reported using a different substance were also using alcohol or marijuana, if not both. Also of note, every student who reported smoking cigarettes also reported the use of an e-cigarette or vaping device. Two percent of students reported using substances from all five categories of drugs here.

Substance	% reporting past year use
Alcohol	45%
Marijuana	34%
E-cigarette/Vape	17%
Cigarettes	7%
At least one other drug[a]	12%
All of the above categories	2%

Note: [a]This includes ecstasy, hallucinogens, steroids, over-the-counter drugs, amphetamines, crack, cocaine, heroin, synthetic marijuana, and/or any prescription medication used in ways other than prescribed.

Source: "2018 Delaware School Survey." Center for Drug and Health Studies, University of Delaware.

ISSUE BRIEF

PAIN IN THE NATION:
Building a National Resilience Strategy

Alcohol and Drug Misuse and Suicide and the Millennial Generation — a Devastating Impact

Trust for America's Health
TFAH.ORG

WELL BEING TRUST

JUNE 2019

Millennial Generation Mortality 2007 to 2017

SOURCE: Trust for America's Health and Well Being Trust analysis of National Center for Health Statistics, CDC data

Reason To Pause…

- What if 50% of this data is true?
- Why this rush to judgement?
- Research! Research! Research!
- Get the data-answer the questions.
- ***Let us not confuse the truth with the facts!***

Acknowledgements: Thank You!

THANK YOU

FOR YOUR

SERVICE!!!

Acknowledgements: Thank You!

TAKE BEST OF CARE!!!

BE SAFE OUT THERE!!!

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302-218-7703 (cell)