Background and Prevalence

- Invented in 2003 in China
- Introduced to the US in 2006
- Generally produced in China, few regulations exist
- Adult use is rare, less than cigarettes
  - 8.5%-12.6% ever used
  - 2.4%-5.5% current use
  - Many also smoke cigarettes

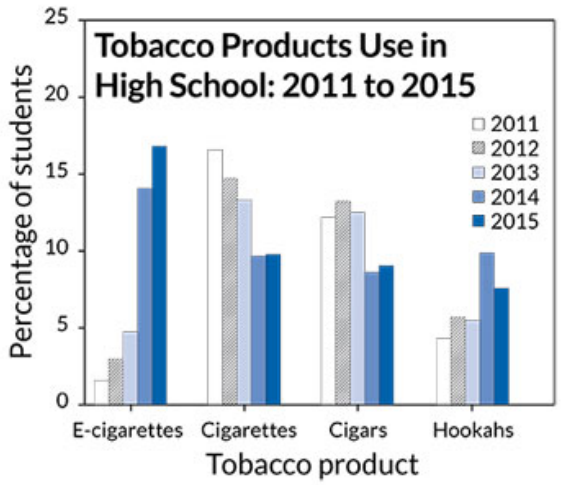
(NAS, 2018)

Youth Use Trends

TABLE 1-1 Percentage of High School and Middle School Students Who Have Ever Used E-Cigarettes; National Youth Tobacco Survey (NYTS) 2011-2016

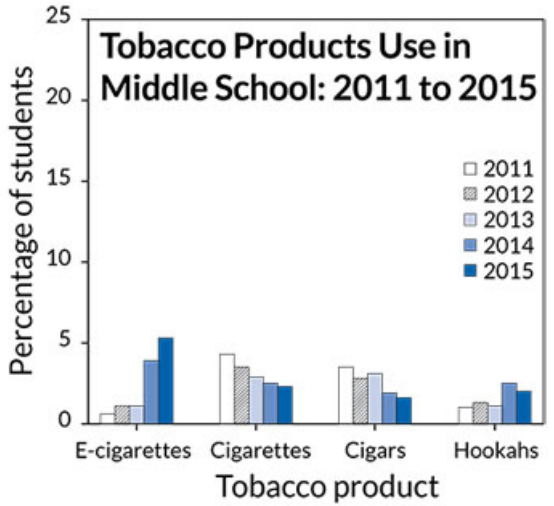
	2011	2012	2013	2014	2015	2016
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
High School	1.5 (1.2-2.0)	2.8 (2.3-3.5)	4.5 (3.8-5.3)	13.4 (11.2-16.1)	16.0 (14.1-18.0)	11.3 (9.9-12.9)
Middle School	0.6 (0.4-0.9)	1.1 (0.9-1.5)	1.1 (0.8-1.5)	3.9 (3.0-5.0)	5.3 (4.6-6.2)	4.3 (3.7-4.9)

SOURCES: HHS, 2016b; Jamal et al., 2017.



This graph shows recent trends in tobacco-product use by high school students. The bars represent the percent of students who said they'd used each product in the past 30 days.

ADAPTED FROM T. SINGH ET AL, APRIL 15, 2016, MMWR



This graph shows recent trends in tobacco-product use by middle school students. The bars represent the percent of students who said they'd used each product in the past 30 days.

ADAPTED FROM T. SINGH ET AL, APRIL 15, 2016, MMWR

(NAS, 2018) (Raloff, 2016)

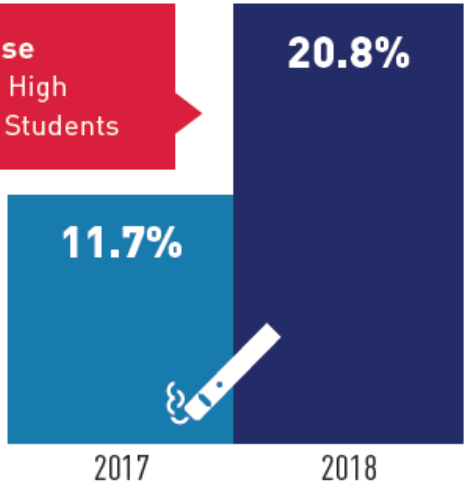
2018 NATIONAL YOUTH TOBACCO SURVEY FINDS CAUSE FOR CONCERN

Current e-cigarette use among middle and high school students increased alarmingly between 2017 and 2018.

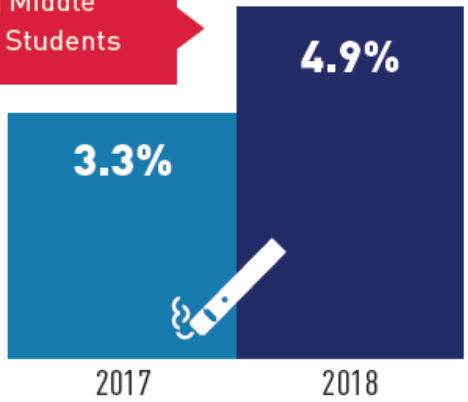
Here is a breakdown of the recent findings:

SURGE IN YOUTH CURRENT E-CIGARETTE USE — 1.5 Million More Students Used E-Cigarettes in 2018 vs 2017

78% Increase Among High School Students



48% Increase Among Middle School Students

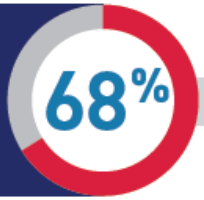


AMONG HIGH SCHOOL CURRENT E-CIGARETTE USERS — Rise in Frequency and Use of Flavors

More Used E-Cigarettes on 20 or More Days

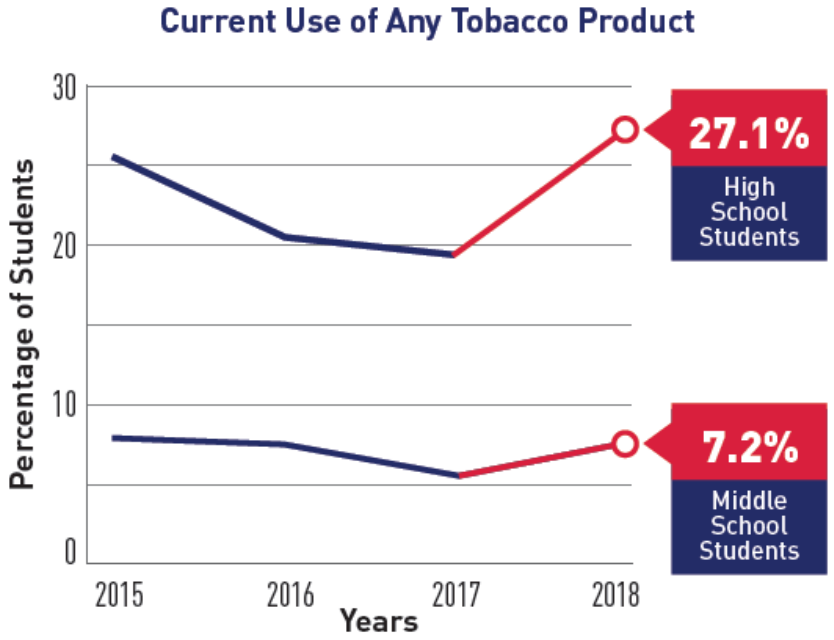
in 2018
vs
20% in 2017

More Used Flavored E-Cigarettes



in 2018
vs
61% in 2017

E-CIGARETTE USE SURGE LED TO UPTICK IN OVERALL TOBACCO USE — Reversing Previous Declines



Why do people vape?

- Perceived as healthier than regular cigarettes
  - PG and VG based solutions are viewed as "natural"
  - "Vapor" sounds like water
- Smoking cessation
  - Easy to change dosages
- Adolescents
  - Flavors
  - It "looks cool"
  - Entry into a social group/identity

Vaping and Health: What We Know

The National Academies of SCIENCES ENGINEERING MEDICINE

THE NATIONAL ACADEMIES PRESS

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

Conclusion 5-4. 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 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.

BERKELEY LAB

31

number of toxic chemicals Berkeley Lab researchers found at significant levels in e-cigarette vapor

235

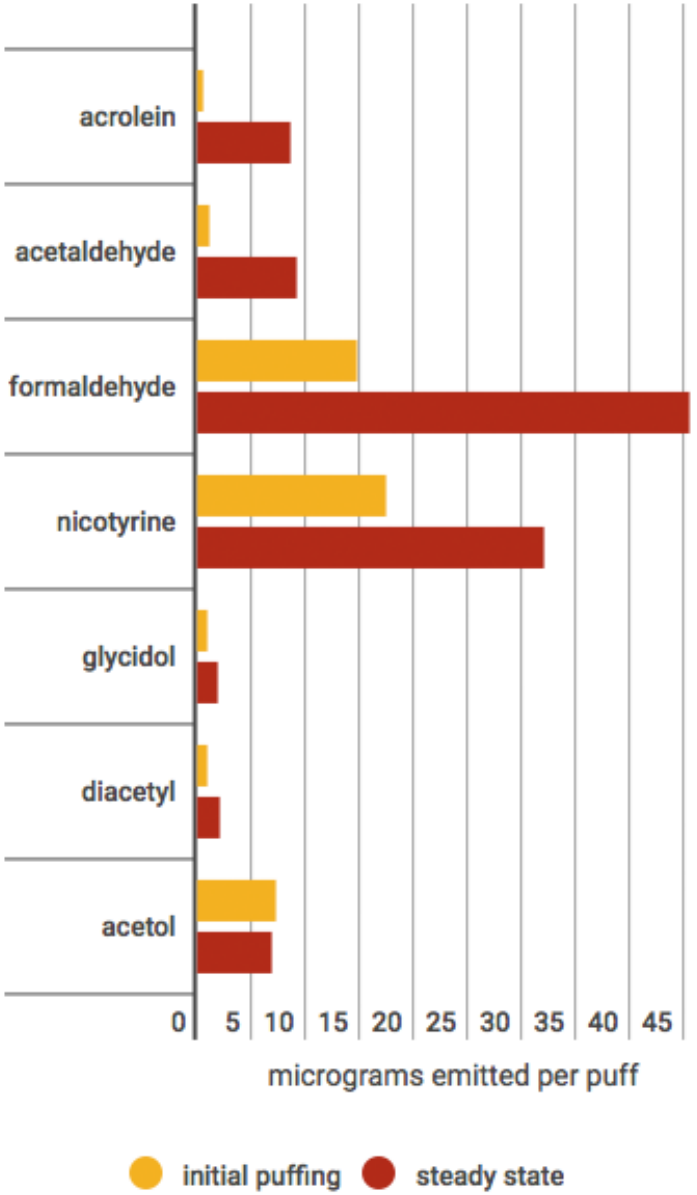
maximum number of puffs per day, on average (survey of 983 vapers)

Cancer-causing chemicals in e-cigarette vapor

CENTER FOR TOBACCO CONTROL RESEARCH & EDUCATION

1. Benzene
2. Cadmium
3. Isoprene
4. Lead
5. Nickel
6. Formaldehyde
7. Acetaldehyde
8. Toluene
9. N-Nitrosonornicotine
10. Nicotine

EMISSIONS OF TOXIC CHEMICALS FROM SINGLE-COIL E-CIGARETTE



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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.

Conclusion 8-1. There is *substantial evidence* that e-cigarette use results in symptoms of dependence on e-cigarettes.

Vaping appears to be making hundreds of people sick. No one knows exactly why.

Vox

The mysterious spike in respiratory illnesses is a reminder that e-cigarettes may be more dangerous than they seem.

By Julia Belluz | @juliaoftoronto | julia.belluz@voxmedia.com | Sep 3, 2019, 2:20pm EDT

City of Milwaukee urges residents to stop vaping 'immediately'; 89% of Wisconsin sick cite THC

abc NEWS

First death linked to vaping reported in Illinois

BBC

24 August 2019

The New York Times

The Washington Post

Bronx Teenager's Death Is the Youngest Vaping Fatality in U.S.

The 17-year-old who died last week is the youngest of 23 people to die nationwide of a vaping-related lung illness.

Health

Vaping lung injuries top 1,000 cases as deaths rise to 18

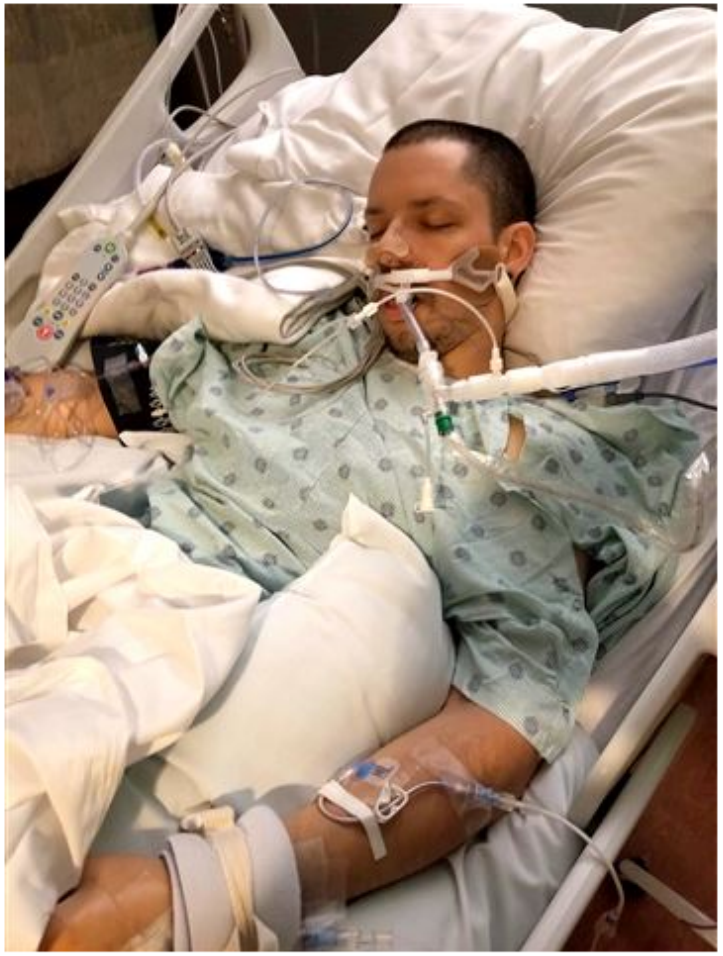
Health officials are amplifying their recommendation that people refrain from using e-cigarettes or vaping, particularly products containing THC

LIFESTYLES

‘It’s going to attack your lungs’: Gurnee teen hospitalized for vaping has message for his peers

By KATE THAYER
CHICAGO TRIBUNE | SEP 04, 2019 | 12:32 PM

NEWS



“

You literally don't know what you're inhaling into your body.

Dylan Nelson, 26, of Burlington, Wisconsin, was

Concerns for Children and Adolescents

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

Conclusion 16-2. Among youth and young adult e-cigarette users who ever use combustible tobacco cigarettes, there is *moderate evidence* that e-cigarette use increases the frequency and intensity of subsequent combustible tobacco cigarette smoking.

Areas of Benefit – Current Smokers

Conclusion 5-3. There is *substantial evidence* that except for nicotine, under typical conditions of use, exposure to potentially toxic substances from e-cigarettes is significantly lower compared with combustible tobacco cigarettes.

Conclusion 18-5. There is *moderate evidence* that second-hand exposure to nicotine and particulates is lower from e-cigarettes compared with combustible tobacco cigarettes.

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.

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.

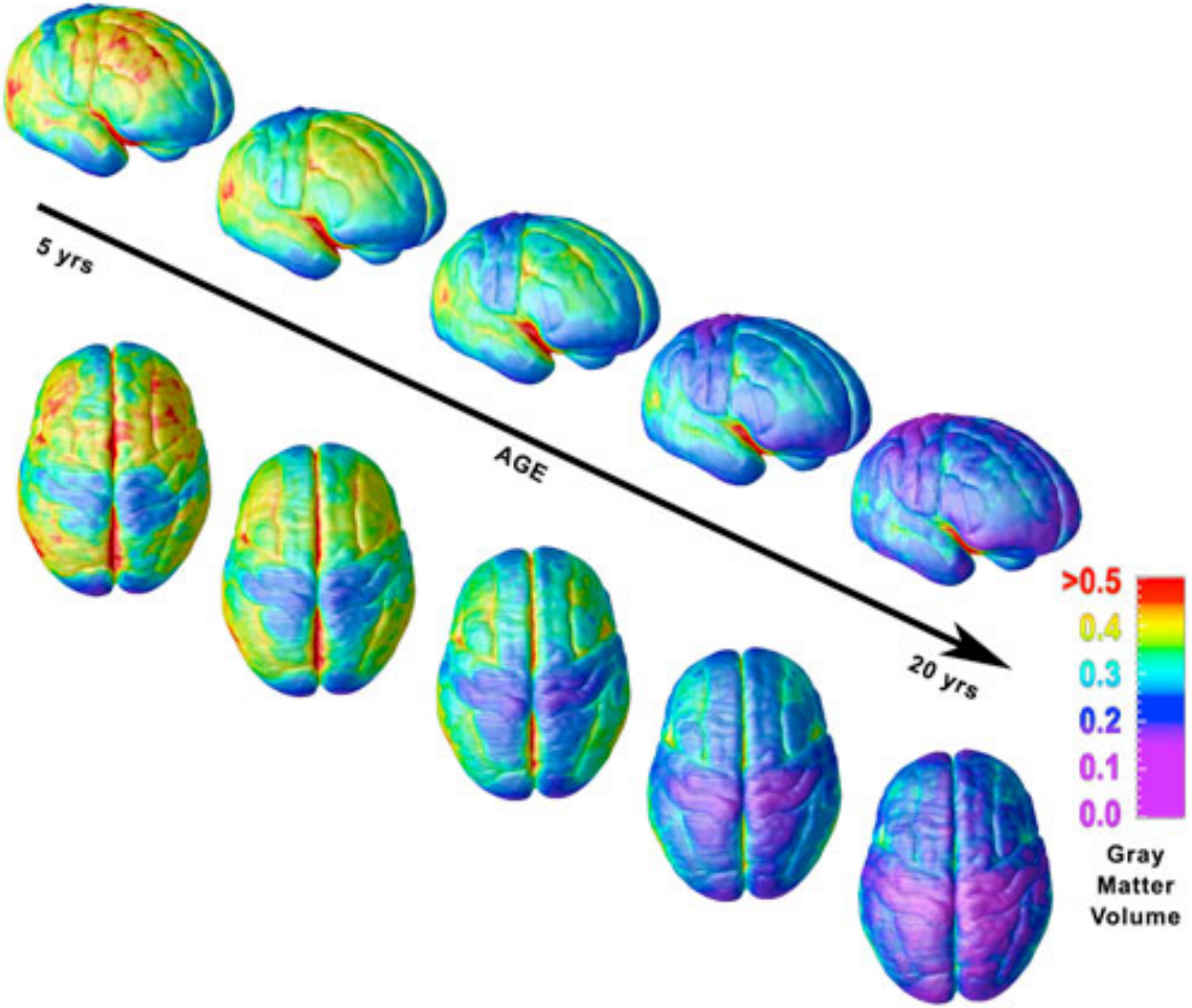
Conclusion 8-2. There is *moderate evidence* that risk and severity of dependence are lower for e-cigarettes than combustible tobacco cigarettes.

Conclusion 17-4. While the overall evidence from observational trials is mixed, there is *moderate evidence* from observational studies that more frequent use of e-cigarettes is associated with increased likelihood of cessation.

Cannabis – A Particularly Bad Idea for Kids

- Increased risk for addiction

(Volkow, 2014)

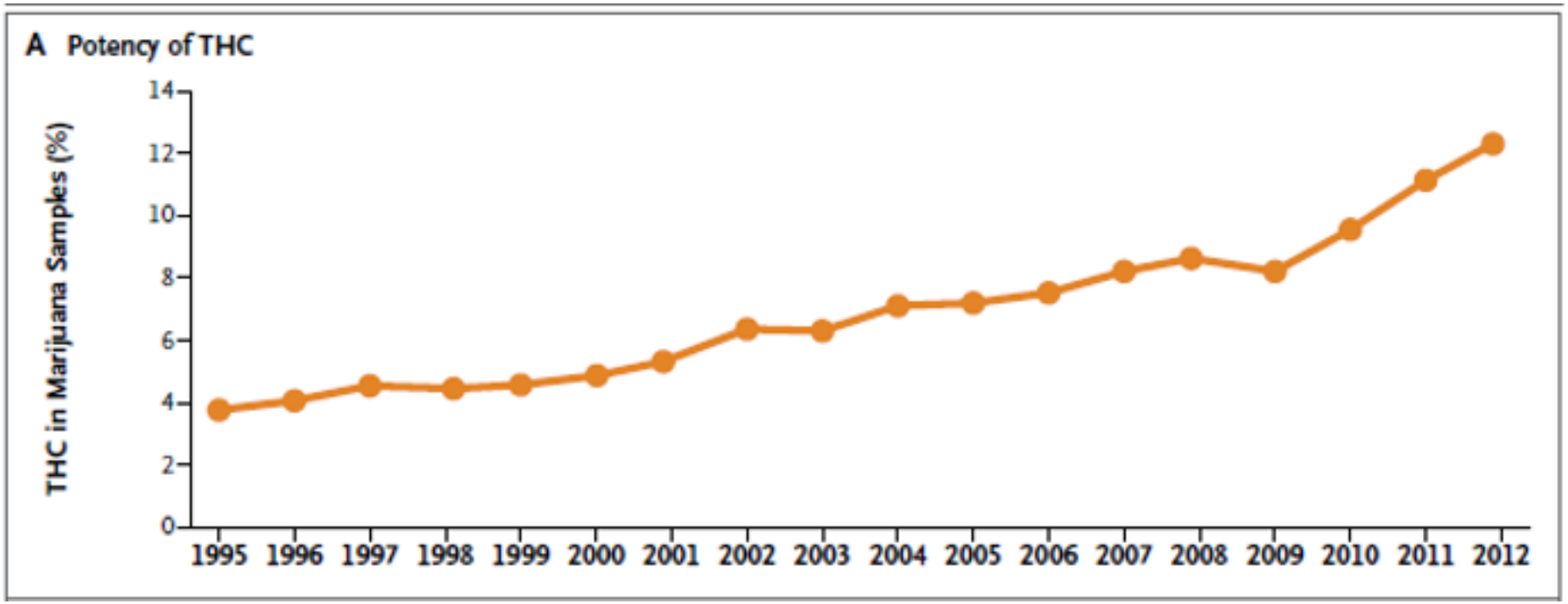

5 yrs
AGE
20 yrs
>0.5
0.4
0.3
0.2
0.1
0.0
Gray
Matter
Volume

Cannabis – A Particularly Bad Idea for Kids

- Increased risk for addiction
- This isn't Woodstock pot anymore – much stronger

(Volkow, 2014)

Marijuana Potency



(Volkow, 2014)

Cannabis – A Particularly Bad Idea for Kids

- Increased risk for addiction
- This isn't Woodstock pot anymore – much stronger
- Negative academic and vocational outcomes

(Volkow, 2014)

Academic and Vocational Outcomes

- High School
  - Lower grades, higher dropout rates, increased school disciplinary problems
    - May be social/functional, may be cognitive, may be both
    - Earlier use = worse outcomes
    - Greater frequency = worse outcomes
- College
  - Increased chance to skip class
  - Lower GPA
  - Potentially longer time to graduate
- Decreased lifetime earning potential

Cannabis – A Particularly Bad Idea for Kids

- Increased risk for addiction
- This isn't Woodstock pot anymore – much stronger
- Negative academic and vocational outcomes
- Brain morphology changes
  - Residual impairment in memory, processing speed, and decision-making

(Volkow, 2014)

Biological Psychiatry

The Role of Cannabinoids in Neuroanatomic Alterations in Cannabis Users

Valentina Lorenzetti, Nadia Solowij, and Murat Yücel

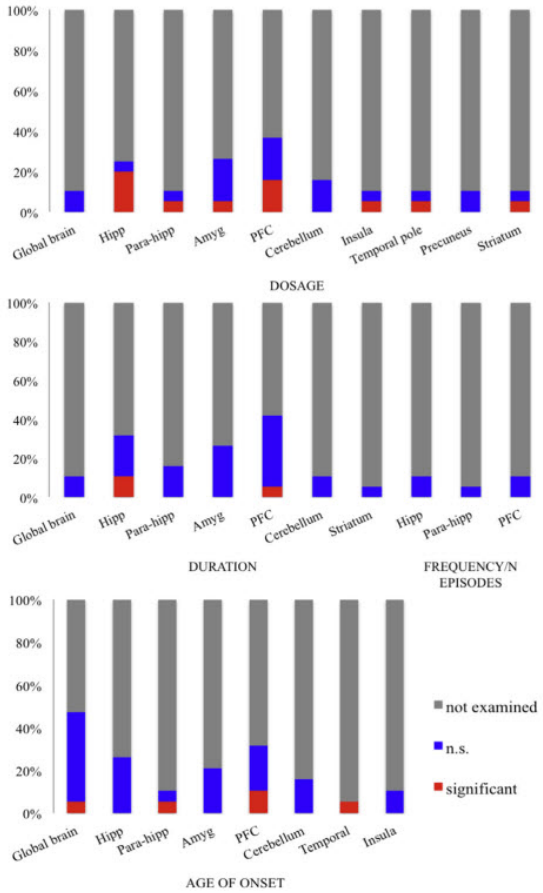
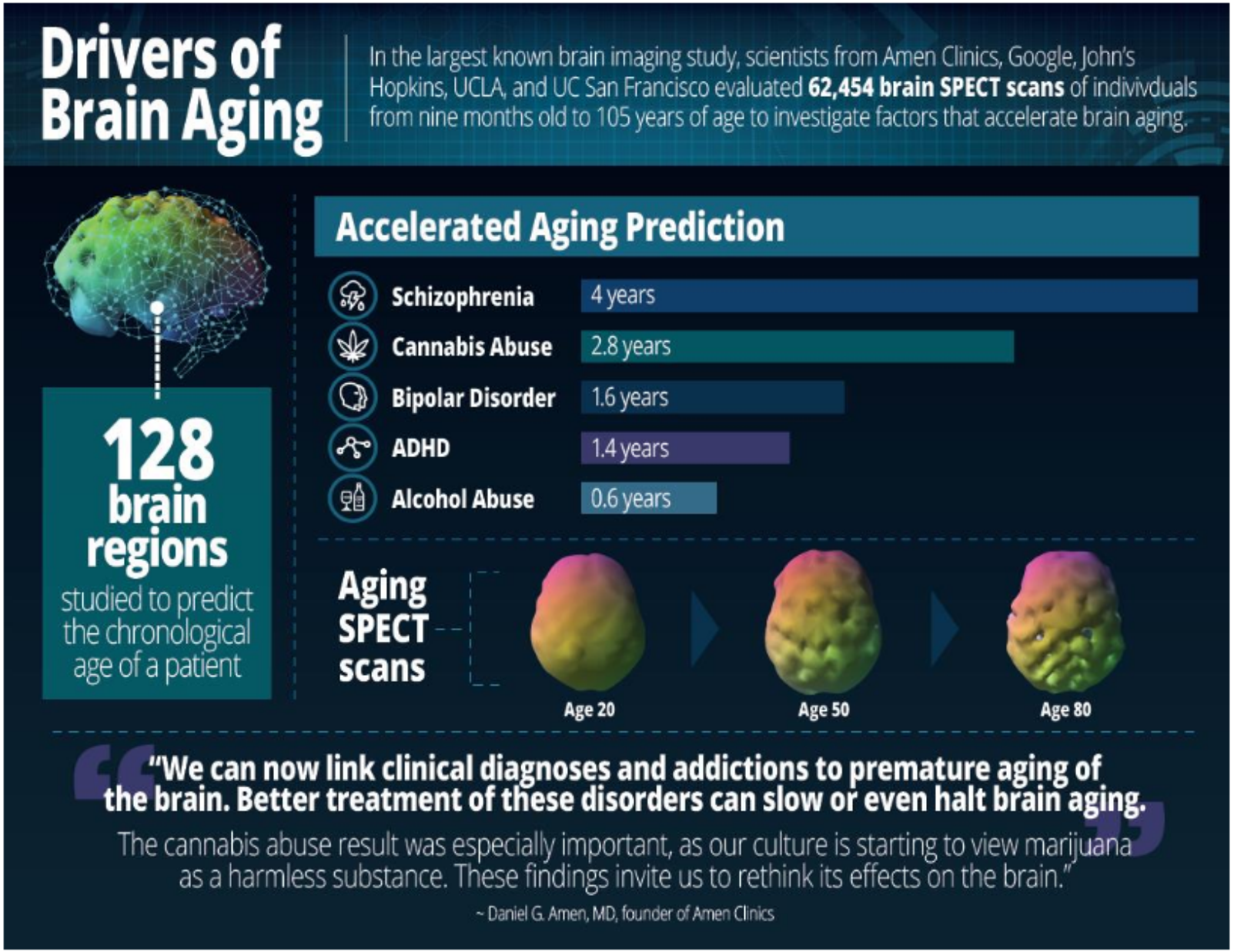


Figure 4. Percentage of studies reporting associations between regional neuroanatomy and cannabis use measures. Significant associations (red), nonsignificant associations (n.s.; blue), and associations unexamined (gray). Amyg, amygdala; Hipp, hippocampus; Para-hipp, parahippocampal gyrus; PFC, prefrontal cortex.

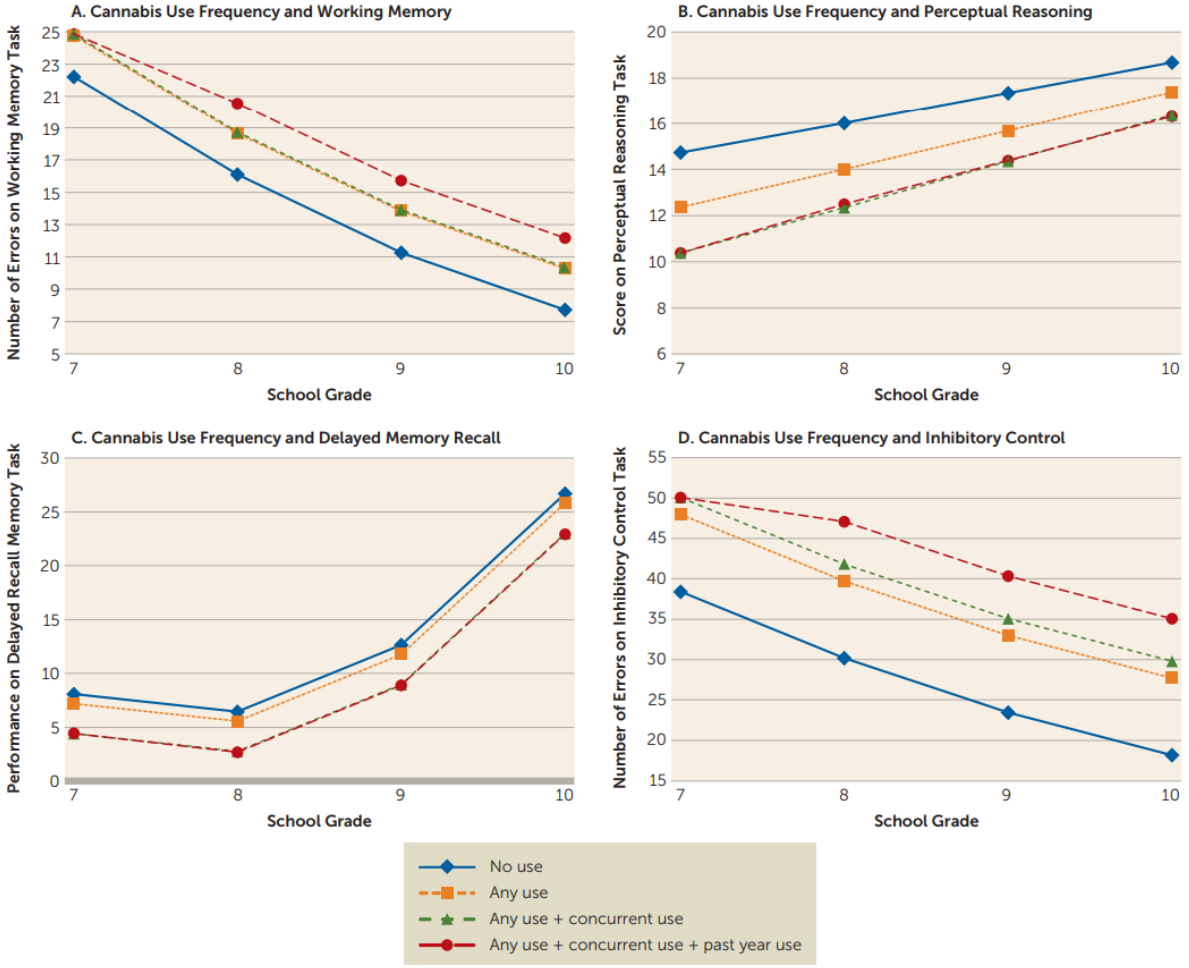


Caption: Drivers of Brain Aging. Credit: Daniel G. Amen

A Population-Based Analysis of the Relationship Between Substance Use and Adolescent Cognitive Development

Jean-François G. Morin, B.A., Mohammad H. Afzali, Ph.D., Josiane Bourque, M.Sc., Sherry H. Stewart, Ph.D., Jean R. Séguin, Ph.D., Maeve O'Leary-Barrett, Ph.D., Patricia J. Conrod, Ph.D.

FIGURE 2. Between-Subject and Within-Subject (Concurrent and Lagged) Relationships Between Cannabis Use Frequency and Working Memory Errors, Perceptual Reasoning Performance, Delayed Memory Recall Performance, and Inhibitory Control Errors[a]



Cannabis – A Particularly Bad Idea for Kids

- Increased risk for addiction
- This isn't Woodstock pot anymore – much stronger
- Negative academic and vocational outcomes
- Brain morphology changes
  - Residual impairment in memory, processing speed, and decision-making
- Impaired judgement
  - Increased risky sexual behavior
- Psychotic breaks
  - Increases with higher % THC

(Volkow, 2014)

Smoking strong marijuana daily increases risk of psychosis, study finds

CBS NEWS

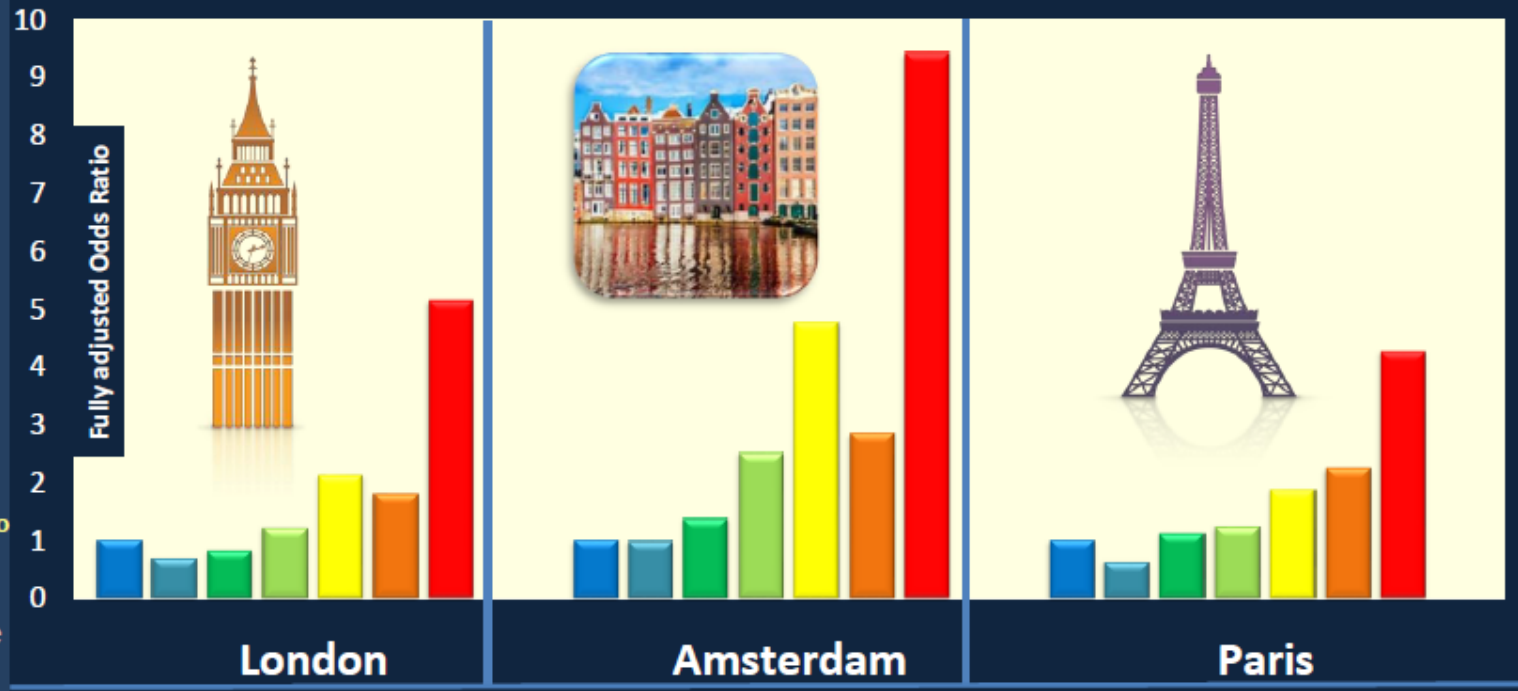
MARCH 20, 2019 / 11:44 AM / CBS/AP

Psychotic Disorders as Function of THC dose, Frequency of Use
11 Sites, 6 Nations in Europe, Brazil: 3 of the cities

The contribution of cannabis use to variation in the incidence of psychotic disorder across Europe (EU-GEI):A multicentre case control study

Di Forti et al

www.thelancet.com/psychiatry
Published online March 19, 2019



If high-potency cannabis were no longer available:

- 12·2% of cases of first-episode psychosis could be prevented across 11 cities
- 30·3% prevented London
- 50·3% prevented Amsterdam

ER visits linked to marijuana rose at Colorado hospital after legalization, study finds

People who consume marijuana edibles may be ingesting unsafe levels because they don't feel the immediate high, researcher says.

March 25, 2019, 4:30 PM CDT

By Shamard Charles, M.D.

NEWS

He loved weed. Then the vomiting began. Months later, he died

Shari Rudavsky, Indianapolis Star Published 2:48 p.m. ET Sept. 20, 2019 | Updated 4:00 p.m. ET Sept. 20, 2019

Cannabis – A Particularly Bad Idea for Kids

- Increased risk for addiction
- This isn't Woodstock pot anymore – much stronger
- Negative academic and vocational outcomes
- Brain morphology changes
  - Residual impairment in memory, processing speed, and decision-making
- Impaired judgement
  - Increased risky sexual behavior
- Psychotic breaks
  - Increases with higher % THC
- Drugged driving

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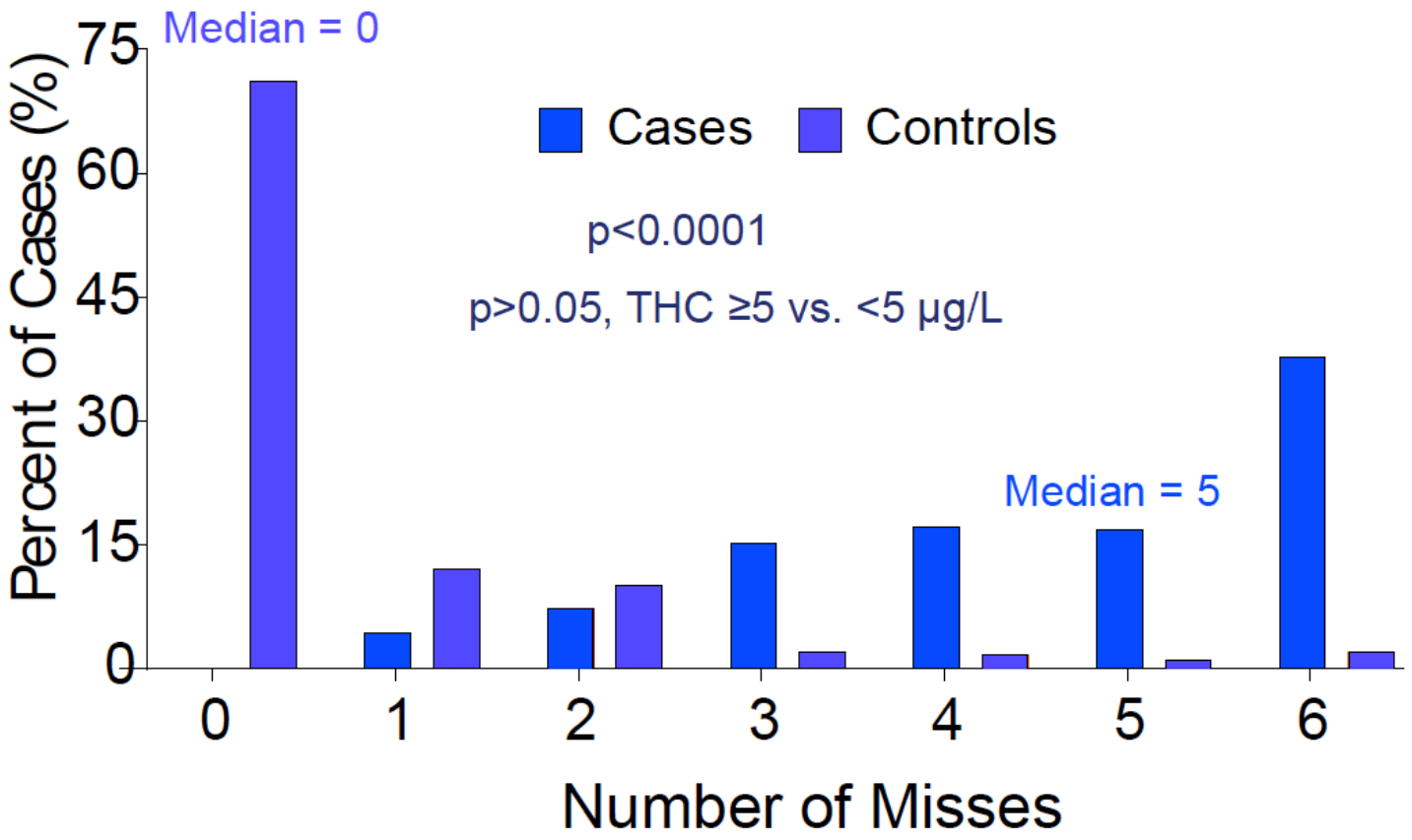
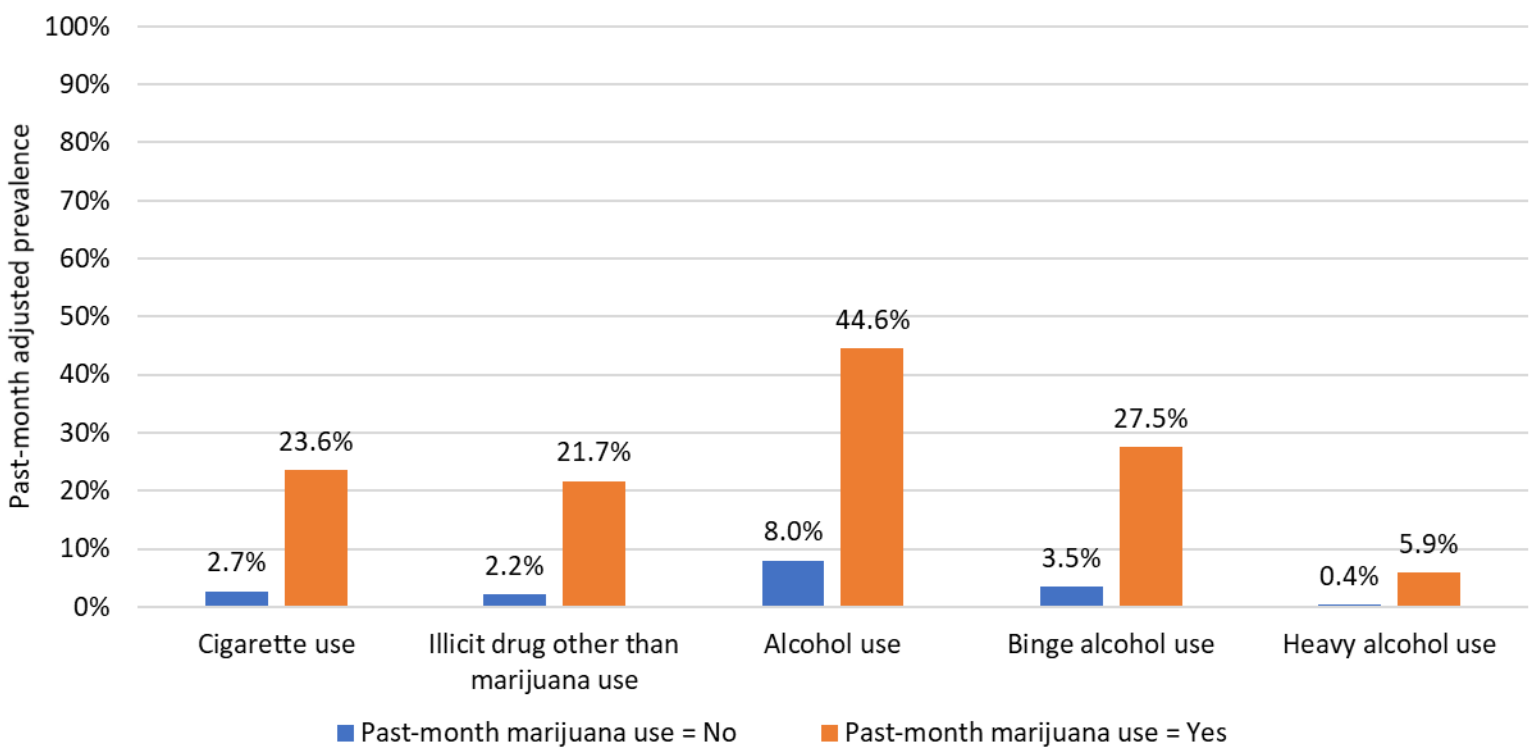
(Volkow, 2014)

Number of Finger To Nose Misses



Gateway Drug?



* Substance Abuse and Mental Health Services Administration (SAMHSA) requires that any description of overall sample sizes based on the restricted-use data files has to be rounded to the nearest 100 to minimize potential disclosure risk.

Source: DuPont, Robert L., et al. "Drug use among youth: National survey data support a common liability of all drug use." *Preventive Medicine*, vol. 113, 11 May 2018, pp. 68-73

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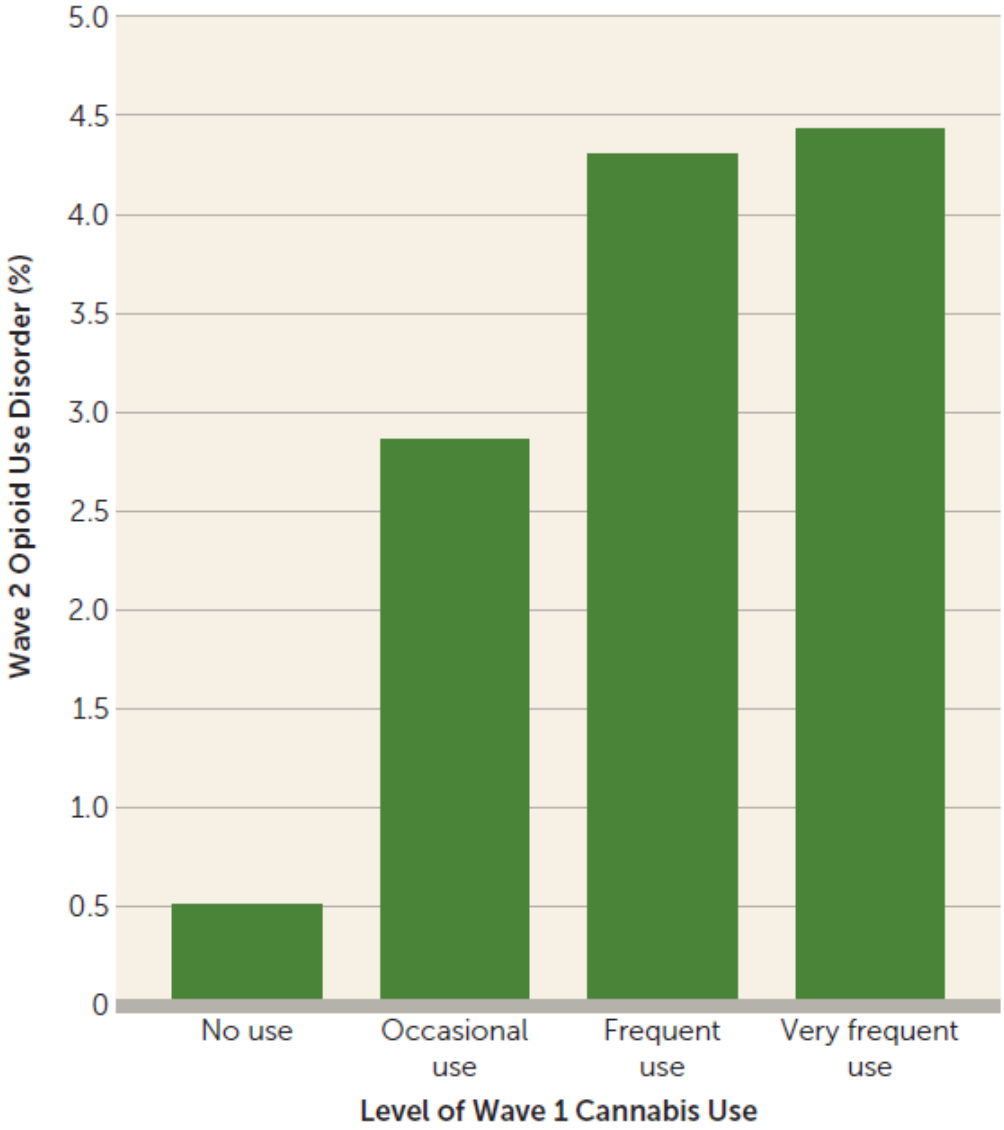
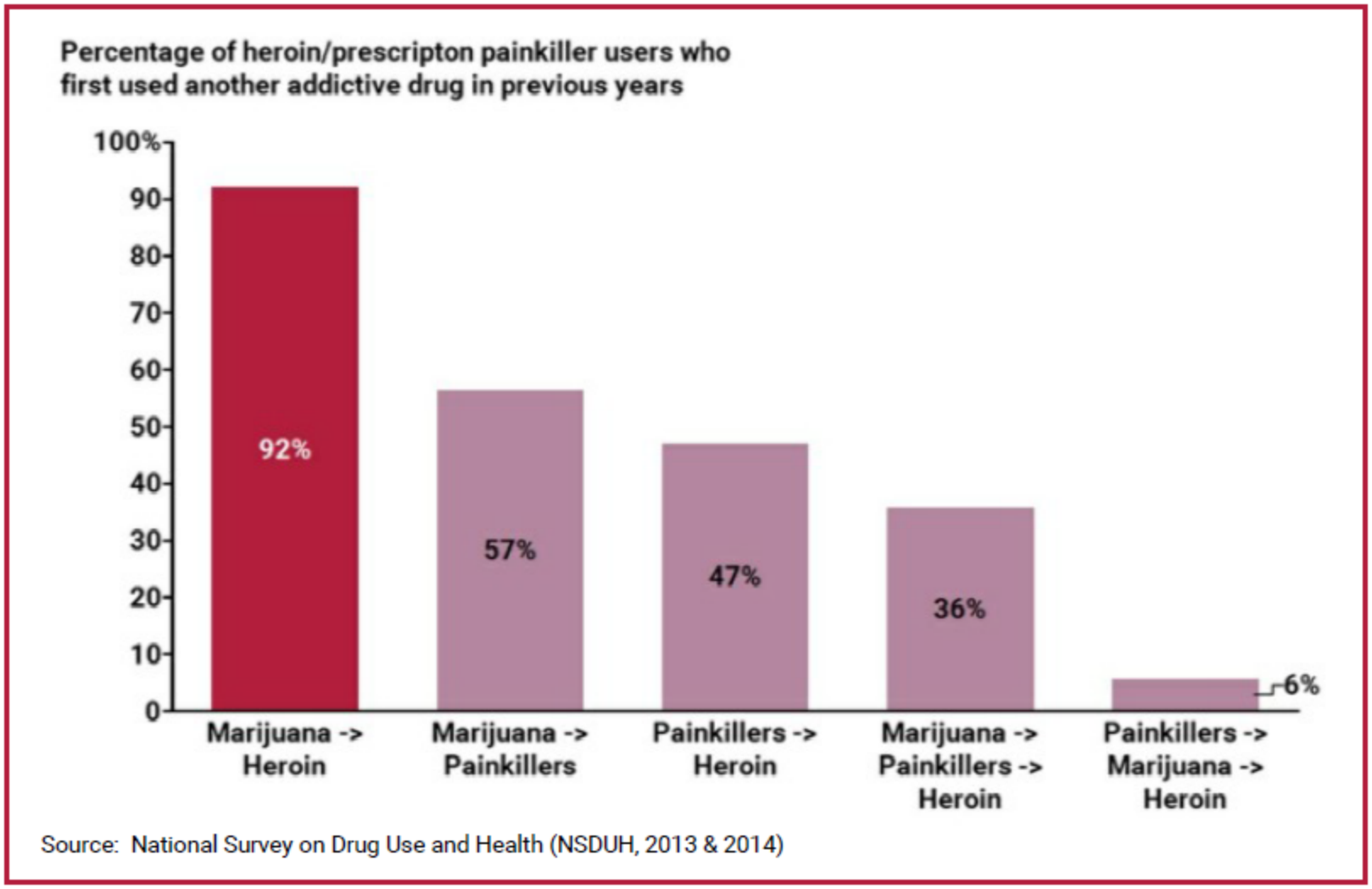
FIGURE 1. Level of Wave 1 Cannabis Use and Incident Wave 2 Prescription Opioid Use Disorder in the NESARC[a]



[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.


Percentage of heroin/prescripton painkiller users who first used another addictive drug in previous years
100%
90
80
70
60
50
40
30
20
10
0
92%
57%
47%
36%
6%
Marijuana -> Heroin
Marijuana -> Painkillers
Painkillers -> Heroin
Marijuana -> Painkillers -> Heroin
Painkillers -> Marijuana -> Heroin
Source: National Survey on Drug Use and Health (NSDUH, 2013 & 2014)

Youth – Target Demographic

- 90% of addictions start in adolescence
- Current practices

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LOL EDIBLES
CAP'N MUNCH
400 MG THC
LOL EDIBLES
Chronic Toast Crunch
400 MG THC
LOL EDIBLES
FROOTY LOOPYS
400 MG THC


Rastaleers
Twixed
Munchy Way
Rasta Reeses
KeefKat
Puff-A-Mike Pattie
DOUBLE PUFF OEO
Buddahfinger
Tri-Chrome CRUNCH


GANJAEATS
MAPLE SYRUP
WWW.GANJAEATS.ORG

Youth – Target Demographic

- 90% of addictions start in adolescence
- Current practices

- Local Example / Another Local Example
  - For comparison: Colorado
    - Flowers Edibles

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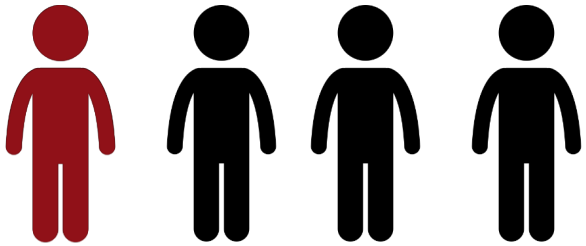

- One in four 12th graders indicated they would try marijuana, or increase their current use more, **if it were legalized** (Monitoring the Future, 2018)

CNN health

Vaping linked to marijuana use in young people, research says

By Arman Azad, CNN

Updated 11:09 AM ET, Mon August 12, 2019

Findings In this systematic review and meta-analysis, the odds of past or current marijuana use among youth who used e-cigarettes were 3.5 times higher than for those who denied e-cigarette use; this association was significant in both cross-sectional and longitudinal studies. Studies conducted in adolescents aged 12 to 17 years (vs young adults aged 18 to 24 years) showed a stronger association between e-cigarette and marijuana use.

So, what can parents do?

- Stay connected, and know the signs

Signs of Adolescent Substance Use

- No one sign, or even combination, is hard proof of a problem.
  - School functioning
    - Truancy, missed appointments/homework
    - Fewer extracurricular activities
  - Peer group
    - Old friends fade away
    - New friends, but you have never met them
    - Social media – what are they following? Posting?
  - Family dynamics
    - Strained relationships
    - Avoidance
    - Moody
    - Breaks curfew

Signs of Adolescent Substance Use

- Personal appearance and habits
  - Decline in hygiene
  - Burns on fingers or lips
  - Dilated or red eyes
  - Long sleeves in warm weather
  - Wardrobe changes – what are they communicating?
  - Money irregularities – too little or too much
  - Secretive phone calls
  - Changes in sleep habits, energy
  - “Munchies” or sudden appetite
  - Unusual smells, or overuse of scents and gum/mouthwash

Signs of Adolescent Substance Use

- For substance use, multiple areas are generally impacted
- Concealing activities involved in obtaining, using, and recovering takes **considerable time and effort.**
  - This time has to come from somewhere…and have an impact on other areas of functioning
- **Know what normal looks like**, so you can know when it changes

So, what can parents do?

- Stay connected, and know the signs
- Provide prosocial activities and peer groups for your children to identify with
- Reward positive behavior
  - Rather than (just) punishing poor behavior
  - Behaviors serve a purpose – understand and replace them
- Have access to phones and mobile devices
- Consider home drug testing

Summary

- Vaping and marijuana are both chronically misunderstood…and this isn't an accident
- From a health perspective, nobody should vape if they aren't already smoking cigarettes
  - Heavy metals, carcinogens, addictive nature
- Marijuana is far from a benign substance, and is particularly harmful for youth
- Marijuana and THC extracts can be vaped, and higher potency is associated with more severe side effects
- Staying connected to your child is the most important step a parent can take

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Thank You!