SUBSTANCE USE AND ADDICTION IN CHILDREN AND ADOLESCENTS

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THE OHIO STATE UNIVERSITY
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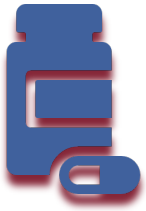
NATIONWIDE CHILDREN'S
When your child needs a hospital, everything matters.℠

DISCLOSURE

- The speaker has no conflicts of interest to disclose.

LEARNING OBJECTIVES



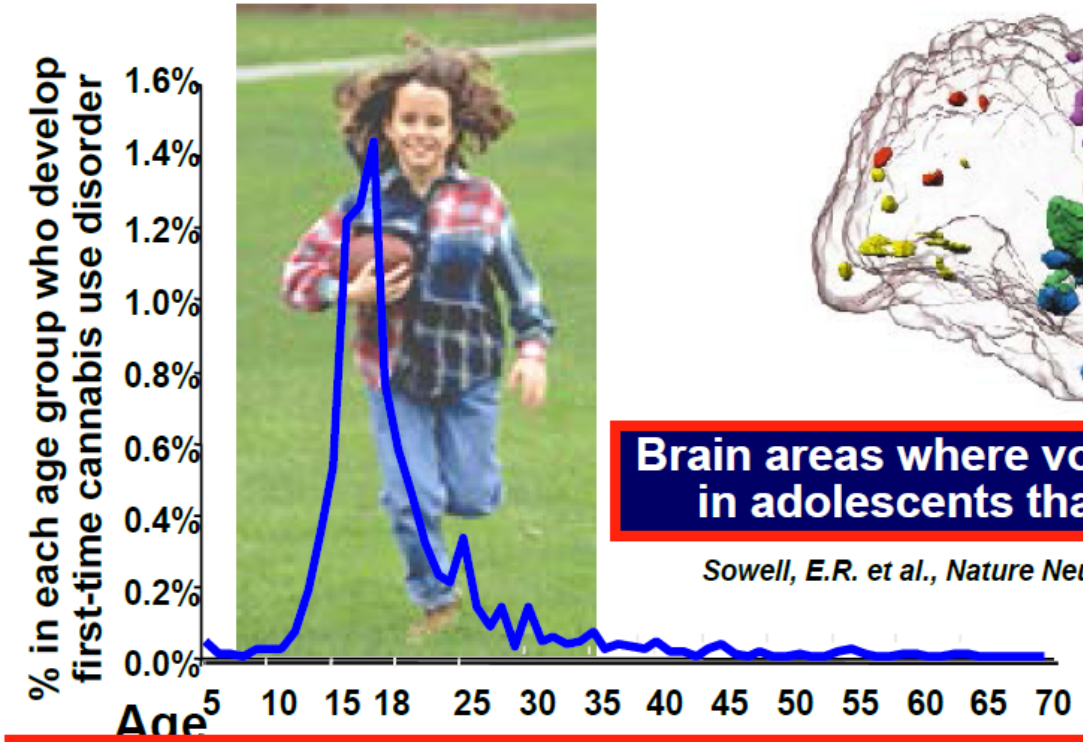
Recognize addiction is a developmental disease that starts in adolescence.

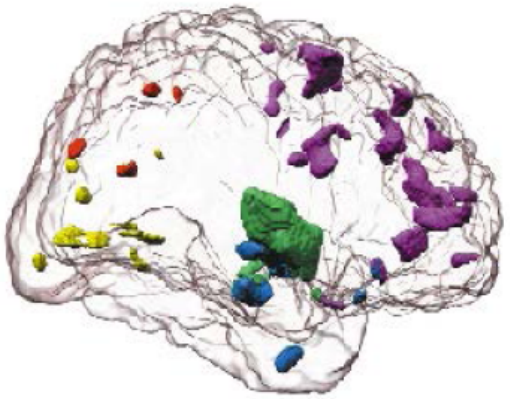
Demonstrate the scope of substance use, particularly e-cigarettes and marijuana, in pediatric populations.

Understand that MAT is under utilized in pediatric populations, but improves healthcare utilization and patient outcomes.

SUBSTANCE USE DISORDER & PEDIATRIC POPULATION RISK

WHY PEDIATRIC CARE PROVIDERS?





Brain areas where volumes are smaller in adolescents than young adults

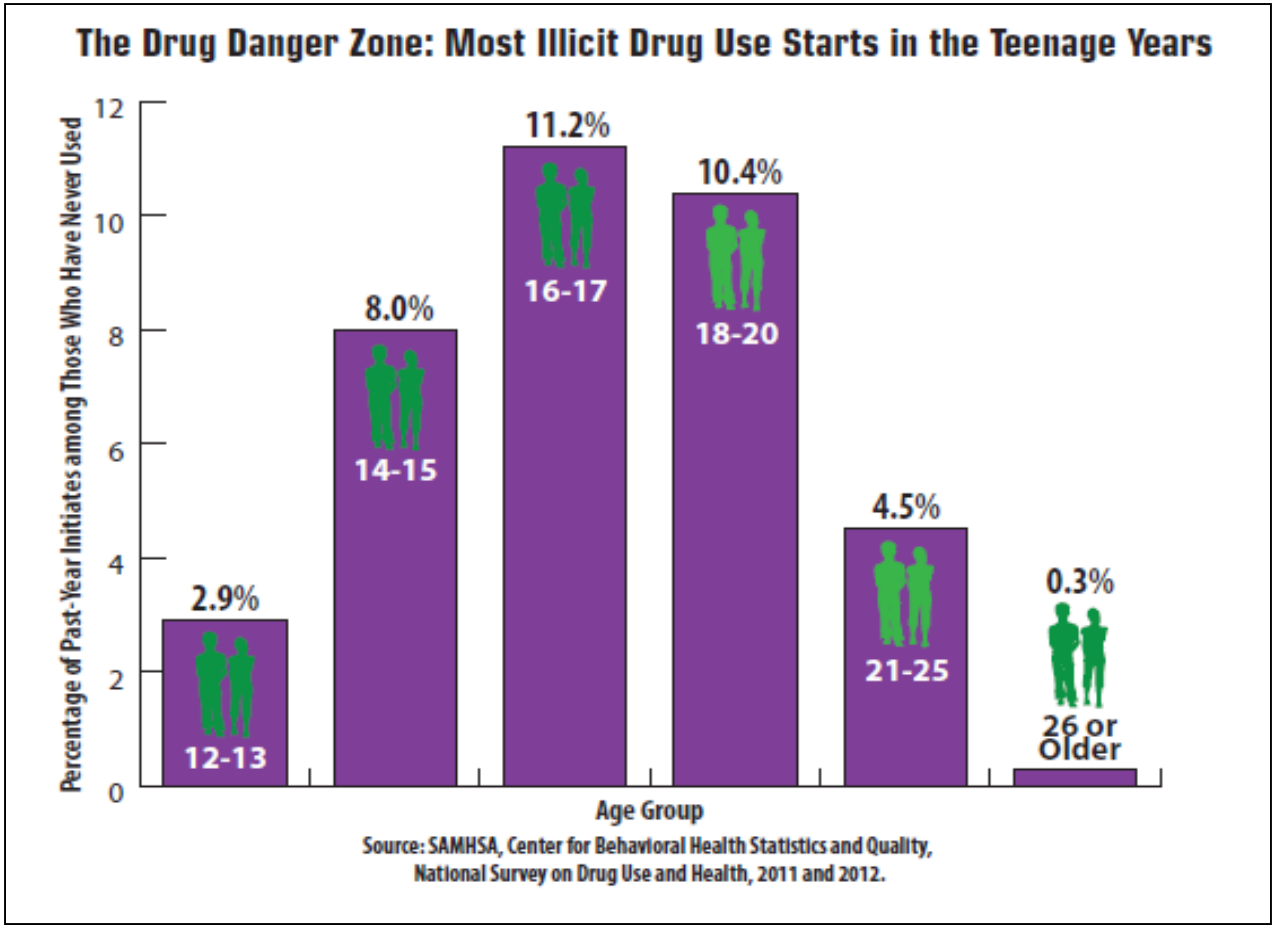
Sowell, E.R. et al., Nature Neuroscience, 2, 859-861, 1999.

Age at cannabis use disorder as per DSM IV

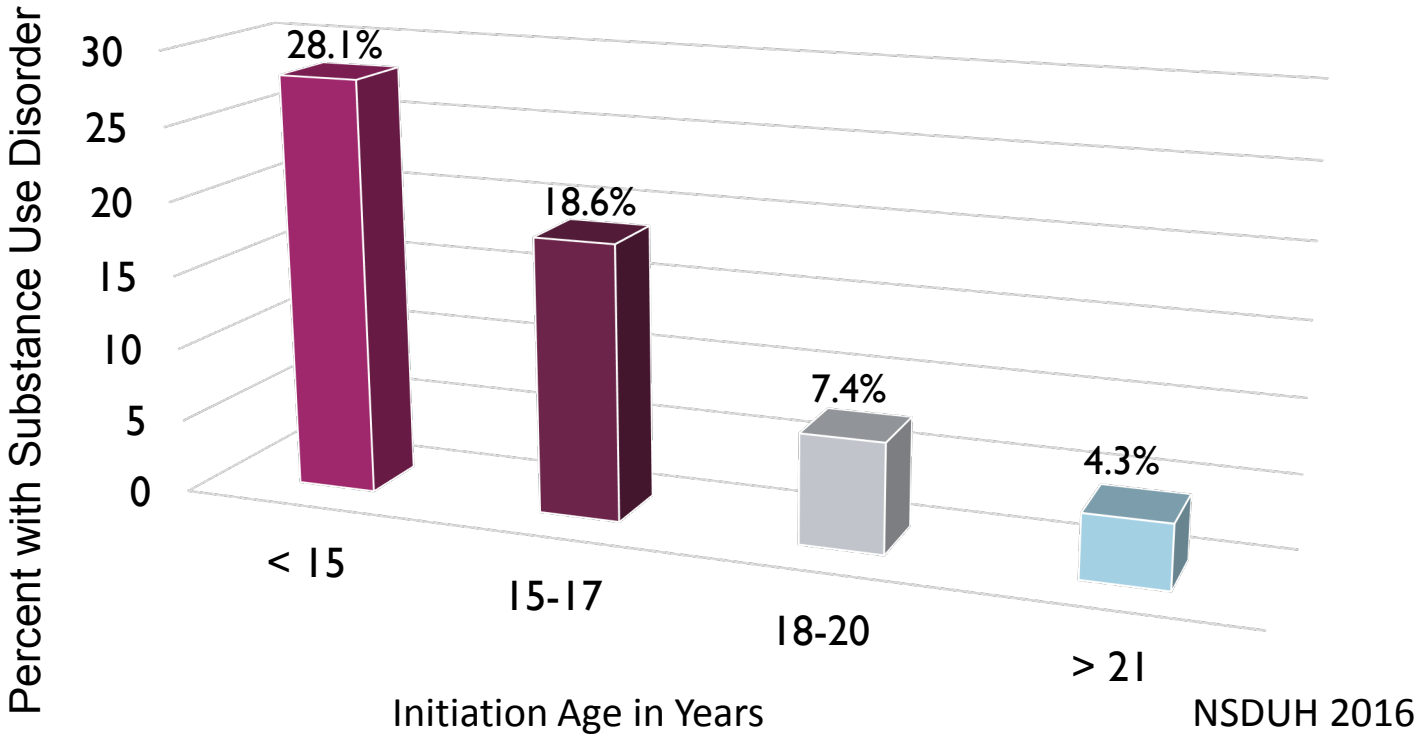
NIAAA National Epidemiologic Survey on Alcohol and Related Conditions, 2003.

NIH

WHY PEDIATRIC CARE PROVIDERS?



RISK OF A SUBSTANCE USE DISORDER



- The earlier teens use drugs the greater the risk of a substance use disorder

WHY PEDIATRIC CARE PROVIDERS?

- 90% of those addicted to alcohol, tobacco, or drugs started prior to age 18.

- Drug initiation age matters
  - 25% of Americans who began using any addictive substance before age 18 are addicted.
  - 4% of Americans who began using at 21 years or older are addicted.

RISK FACTORS

- Chaotic home environment
- Ineffective parenting
- Little mutual attachment and nurturing
- Inappropriate, shy, or aggressive classroom behavior
- Academic failure
- Low academic aspirations
- Poor social coping skills
- Affiliations with deviant peers
- Perceived external approval of drug use (peer, family, community)
- Parental substance abuse or mental illness

PROTECTIVE FACTORS

- Strong family bonds
- Parental engagement in child's life
- Clear parental expectations and consequences
- Academic success
- Strong bonds with pro-social institutions (school, community, church)
- Conventional norms about drugs and alcohol

SOURCE: US Department of Health and Human Services, National Institutes of Health, National Institute on Drug Abuse, (1997) Preventing drug use among children and adolescents: A research-based guide. NIH Publication No. 97 - 4212.

PREVENTION

WHO IS RESPONSIBLE FOR PREVENTION?

- Pervasive, consistent messages to young people about drugs and alcohol can prevent substance abuse.
- The primary goal of prevention is to delay the first use of alcohol or other drugs.
- Adolescents who begin using nicotine, alcohol, or THC ≤ 14 years are likely to develop drug dependence
- Effective prevention requires that the same messages substance abuse be delivered by multiple messengers:
  - Schools, parents, peers, and the community repeatedly throughout childhood and adolescence.

WHO IS RESPONSIBLE FOR PREVENTION?

- Adolescents
  - Peer mentoring and leadership programs mobilize a powerful prevention force and demonstrate the benefits of prevention and the importance of youth as prevention partners.
- Schools
  - Programs that are age-specific, developmentally appropriate, and culturally sensitive should be repeated throughout the grades and re-enforced by youth, parent, and community prevention efforts.
- Parents
  - Parents provide role models, define standards of behavior and achievement, set limits, and provide consequences for risky behaviors. Regarding drug and alcohol abuse, parents must talk early and talk often.
- Communities
  - Even subtle pro-alcohol and drug abuse messages should be examined and countered. There should be ordinances restricting youth access to drugs, tobacco and alcohol. And they should be enforced and balanced with opportunities for positive youth involvement

HOW DO WE FIND YOUTH THAT NEED SUBSTANCE ABUSE INTERVENTION?

SBIRT

Screening

Brief

Intervention

Referral to

Treatment

Screening to Brief Intervention (S2BI)

Developed at Boston Children's Hospital with support from the National Institute on Drug Abuse.

The following questions will ask about your use, if any, of alcohol, tobacco, and other drugs. Please answer every question by checking the box next to your choice.

IN THE PAST YEAR, HOW MANY TIMES HAVE YOU USED:

Tobacco?
- Never
- Once or twice
- Monthly
- Weekly or more

Alcohol?
- Never
- Once or twice
- Monthly
- Weekly or more

Marijuana?
- Never
- Once or twice
- Monthly
- Weekly or more

STOP if answers to all previous questions are "never." Otherwise, continue with questions on the right.

Prescription drugs that were not prescribed for you (such as pain medication or Adderall)?
- Never
- Once or twice
- Monthly
- Weekly or more

Illegal drugs (such as cocaine or Ecstasy)?
- Never
- Once or twice
- Monthly
- Weekly or more

Inhalants (such as nitrous oxide)?
- Never
- Once or twice
- Monthly
- Weekly or more

Herbs or synthetic drugs (such as salvia, "K2", or bath salts)?
- Never
- Once or twice
- Monthly
- Weekly or more

S2BI ALGORITHM
IN THE PAST YEAR, HOW MANY TIMES HAVE YOU USED: TOBACCO? ALCOHOL? MARIJUANA?

S2BI SCREENING RESULT: MONTHLY

CRAFFT Assessment Tool

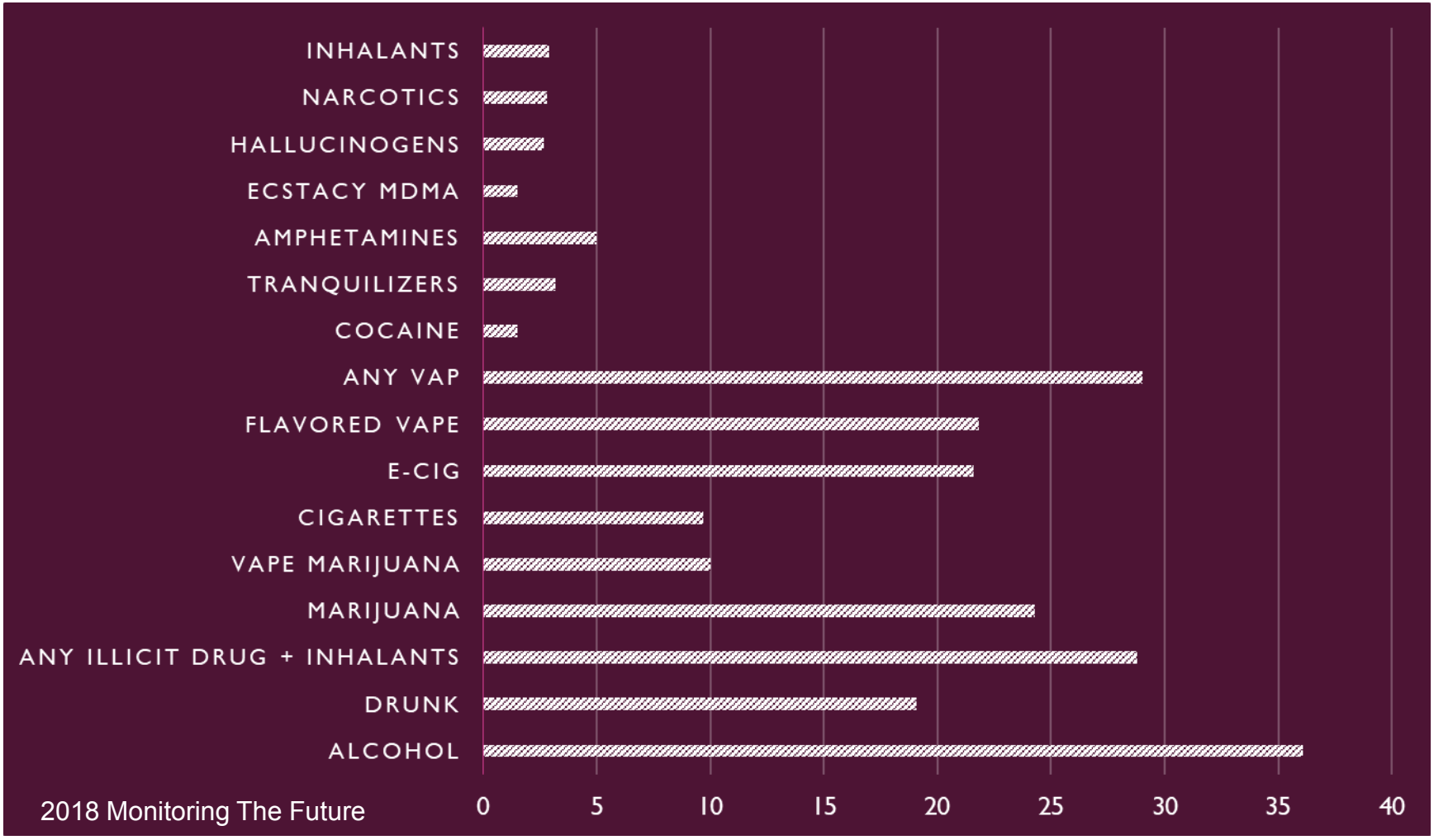
Each positive answer, scores one point.

C	Have you ever ridden in a CAR Driven by someone (including yourself) who was "high" or had been using Alcohol/ Drugs?
R	Do you ever use Alcohol or Drugs to RELAX ,feel better about yourself, or fit in?
A	Do you ever use Alcohol/ Drugs while you are by yourself, ALONE?
F	Do you ever FORGET things you did while using Alcohol or Drugs?
F	Do your FAMILY or FRIENDS ever tell you that you should cut down on your Drinking or Drug Use?
T	Have you ever gotten into TROUBLE while you were using Alcohol or Drugs?

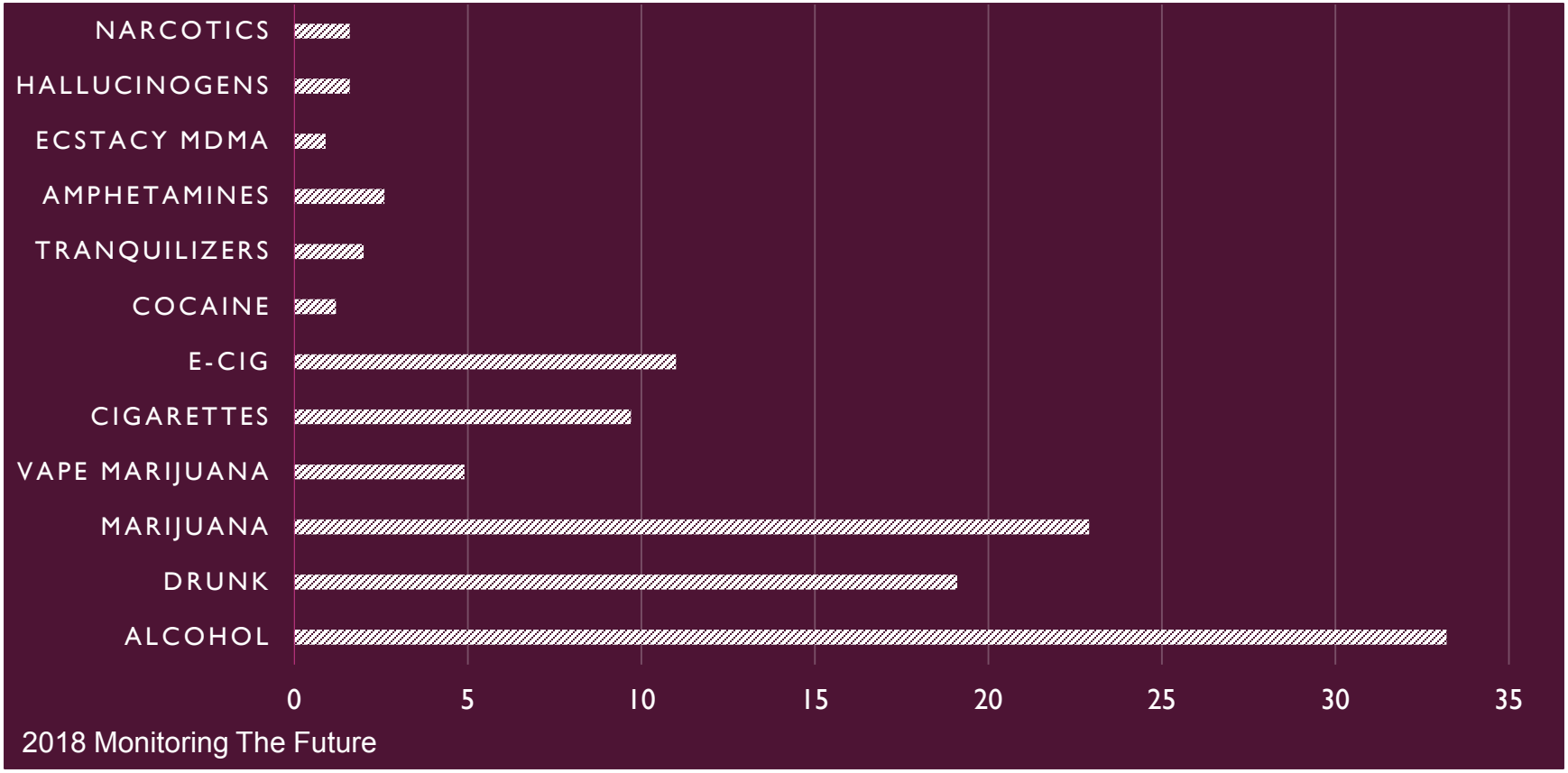
- Complete CRAFFT screening for more information.
- A score of ≥ 2 suggests a serious substance abuse problem that requires a formal assessment

SUBSTANCES

PERCENT HIGH SCHOOL 12TH GRADE USE IN THE PAST YEAR



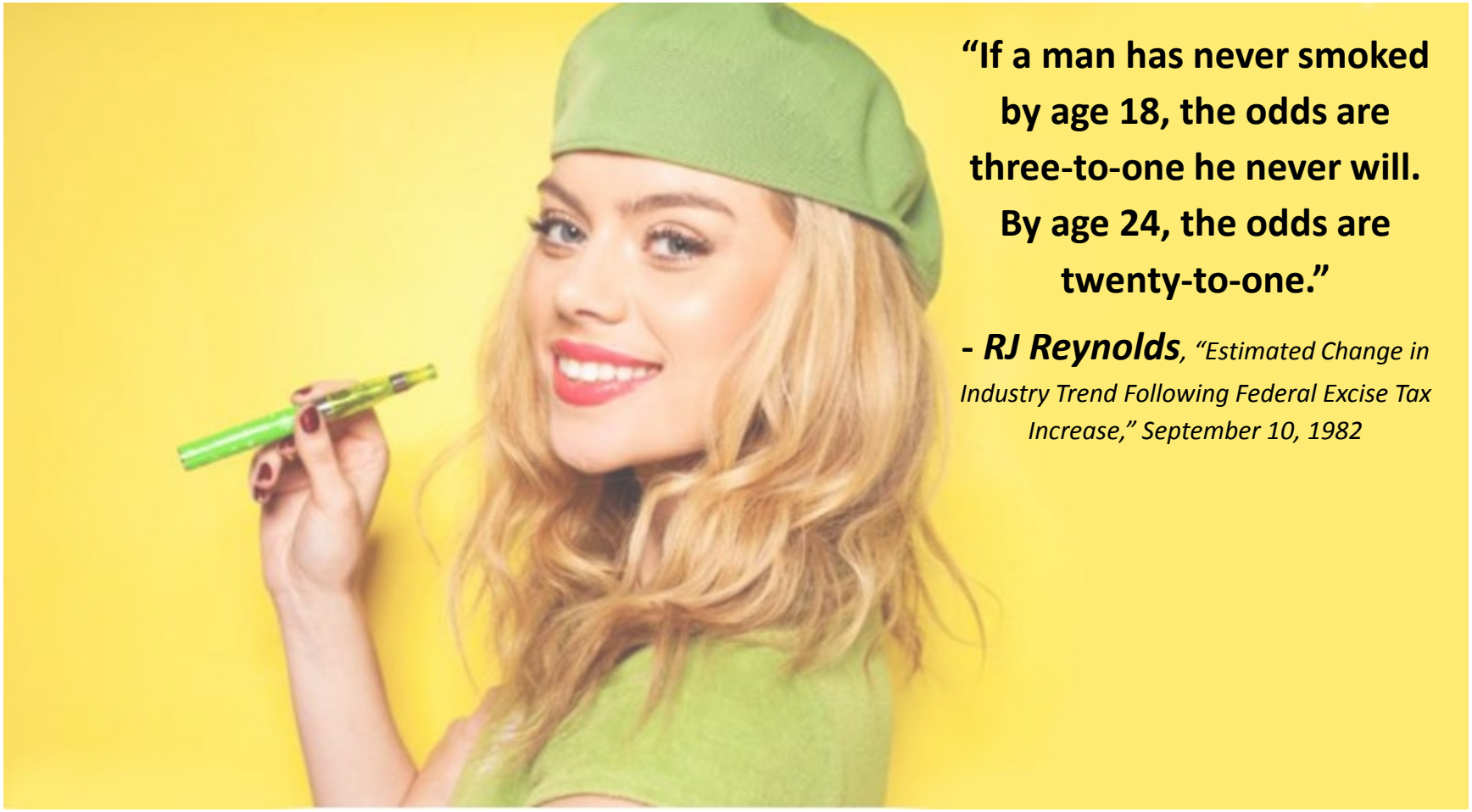
PERCENT HIGH SCHOOL 12TH GRADE USE IN THE PAST MONTH



SUBSTANCE ABUSE IN ADOLESCENCE

- 14% of students report the non-prescription use of opioids.
- Students who report ever using prescription drugs without a doctor's prescription are more likely than other students to have been the victim of physical or sexual dating violence.
- Drug use is associated with sexual risk behavior, experience of violence, and mental health and suicide risks.
- Drug use broadly places youth at risk of overdose.
- Injection drug use places youth at direct risk for HIV and hepatitis.

RISKS AND HARMS OF E-CIGARETTE USE IN YOUTH



"If a man has never smoked by age 18, the odds are three-to-one he never will. By age 24, the odds are twenty-to-one."

- *RJ Reynolds*, *"Estimated Change in Industry Trend Following Federal Excise Tax Increase," September 10, 1982*

NICOTINE

- Primary psychoactive ingredient in tobacco
- Nicotine goes to brain 6 seconds after inhalation
- Occupies 50% of nicotinic receptors in the brain with 1-2 puffs

Physically addictive

- Tolerance develops
- Withdrawal occurs – re-dosing prevents withdrawal

Causes dopaminergic activation and CNS stimulation

Gives sense of well-being

- Boosts mood and may relieve minor depression

Stimulates memory and alertness

- People depend on it to accomplish certain tasks and perform well

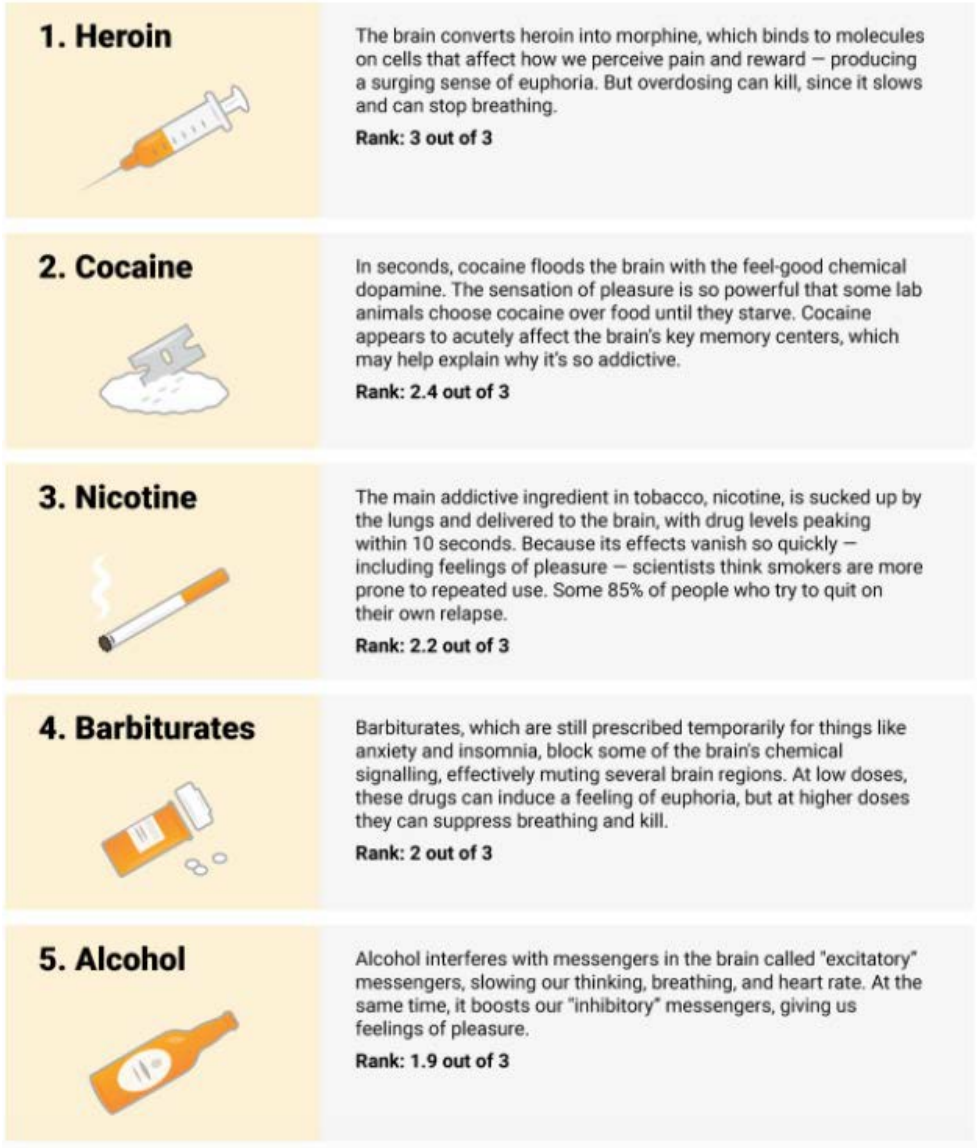
Decreases appetite

Use is reinforced by social cues and habits

NICOTINE IS HIGHLY ADDICTIVE

Withdrawal

- Irritability
- Anger
- Frustration
- Tremors
- Insomnia
- Anxiety
- Depression
- Difficulty concentrating



Business Insider Infographic, October 6, 2016

NICOTINE ADDICTION

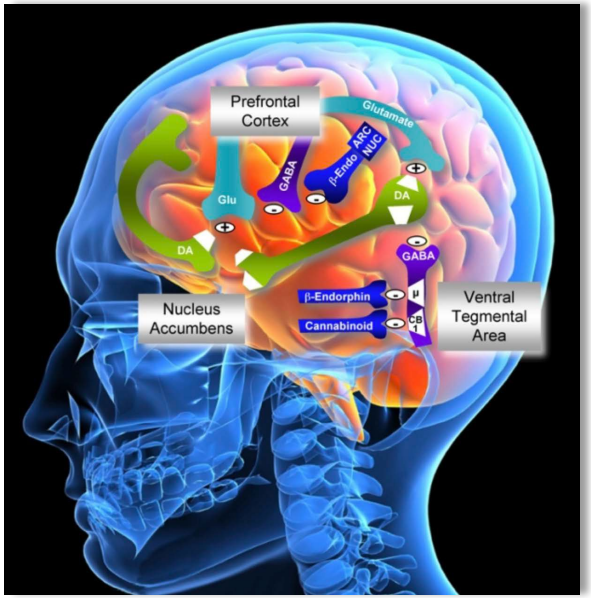
- The adolescent brain is uniquely susceptible to nicotine addiction

- Animal studies show that nicotine exposure during adolescence has long-standing effects in the brain, including cell damage that leads to both immediate and persistent behavior change

  Slottkin, *Neurotox & Teratol* 2002

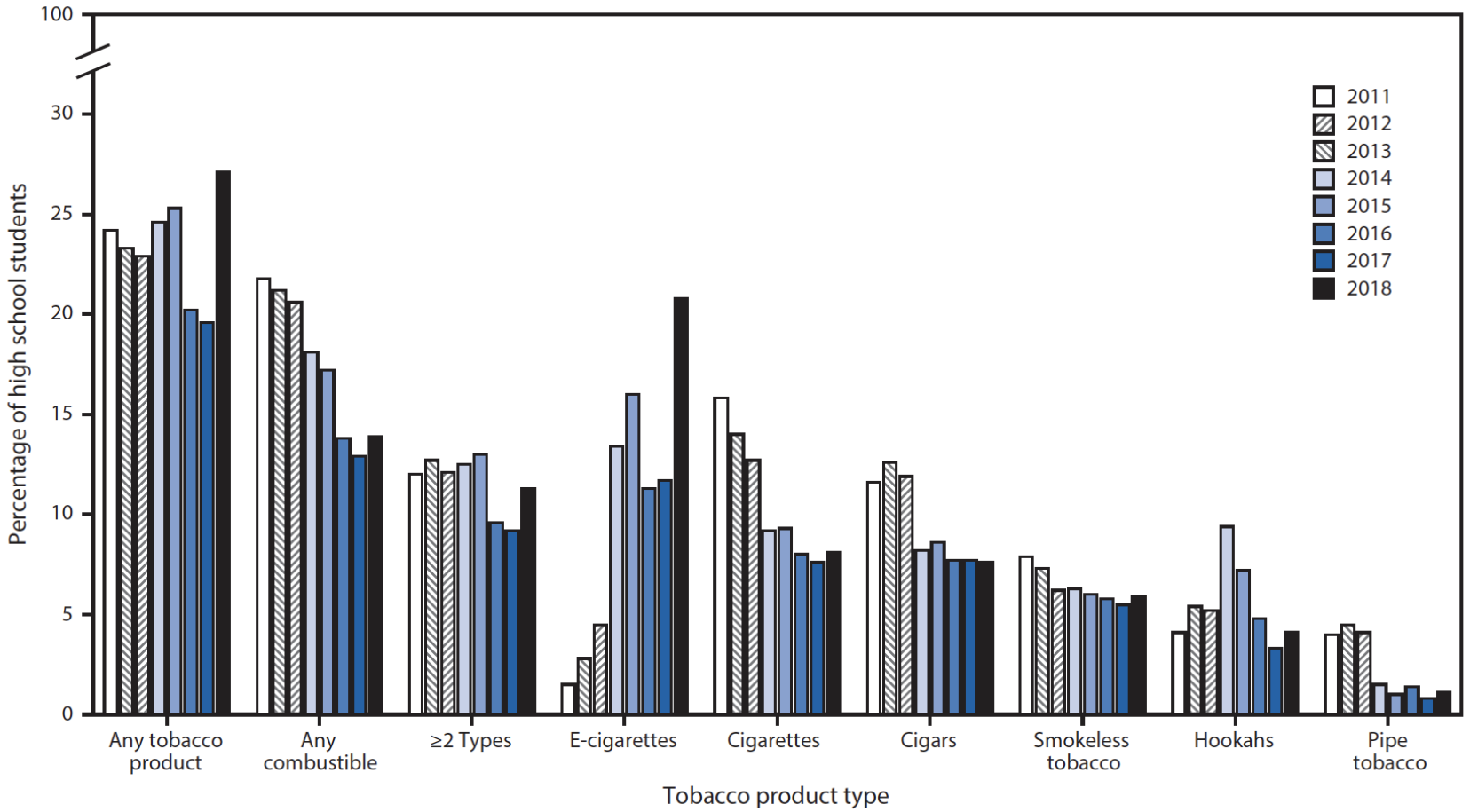
Nicotine affects Brain Stress Response

- STRESS (negative affect) is the #1 reason for relapse
- Those who smoke/vape perceive that smoking relieves stress because abstinence causes stress

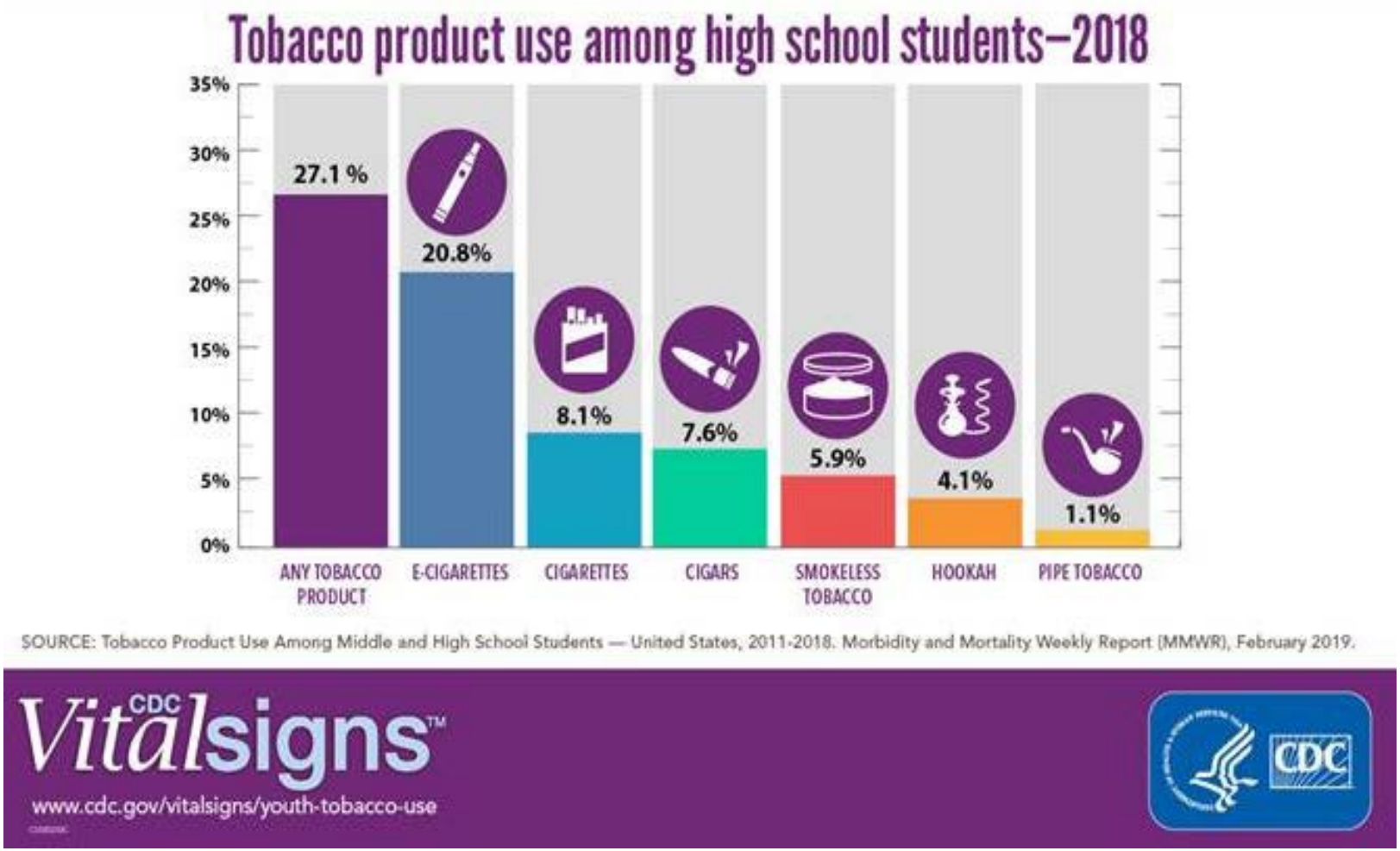


ADOLESCENT NICOTINE USE

FIGURE 2. Estimated percentage of high school students who currently use any tobacco product,* any combustible tobacco product,† ≥2 tobacco product types,§ and selected tobacco products — National Youth Tobacco Survey, 2011–2018¶,,††**



ADOLESCENT NICOTINE USE



TEENS PERCEPTION OF E-CIGS

- 73% believed e-cigs less harmful than cigarettes
- 43% believed e-cigs safer than cigarettes
- 47% believed that e-cigs less addictive that cigarettes
- 23% believed e-cigs aren't a tobacco product

E-cigarette users had significantly more favorable attitudes toward them

Amrock *et al*, Pediatrics, 2016
Gorunkanti *et al,* Prev Med, 2017

E-CIGS GATEWAY TO NICOTINE ADDICTION

- 11% of 10th graders in US reported past 30 day e cig use
- Evidence that youths who vape are more likely to progress to smoking combustible cigarettes
- Longitudinal studies provide evidence
- Use of e–cigs with higher nicotine content was associated with greater levels of combustible & e-cig use at 6 month follow up

PATH study – E-cigs are gateway to future combustible cig use

- Population assessment of Tobacco & Health – longitudinal in waves
- Using e-cigs as first "tobacco product" was associated with 4x odds of ever cigarette use
- 3x odds of current cigarette use of 2 years of follow up
- Association highest among low risk youth
- Risk categorization = 9 variables such as illicit drug/alcohol, sensation seeking & anticipation of smoking in the future

FOUR-FOLD INCREASE IN CIGARETTE SMOKING INITIATION AMONG TEENS

Source	Probability of Cigarette Smoking Initiation, %		Unadjusted OR (95% CI)	Adjusted OR (95% CI)
	Ever e-Cigarette Users	Never e-Cigarette Users		
Miech et al,[10] 2017	31.1	6.8	6.23 (1.57-24.63)	4.78 (1.91-11.96)
Spindle et al,[9] 2017	29.4	10.6	3.50 (2.41-5.09)	3.37 (1.91-5.94)
Primack et al,[22] 2016	37.5	9.0	6.06 (2.15-17.10)	8.80 (2.37-32.69)
Barrington-Trimis et al,[8] 2016	40.4	10.5	5.76 (3.12-10.66)	6.17 (3.29-11.57)
Wills et al,[7] 2016	19.5	5.4	4.25 (2.74-6.61)	2.87 (2.03-4.05)
Primack et al,[6] 2015	37.5	9.6	5.66 (1.99-16.07)	8.30 (1.19-58.00)
Leventhal et al,[5] 2015	31.8	5.6	7.78 (6.15-9.84)	1.75 (1.10-2.78)
Total	**30.4**	**7.9**	**5.12 (4.41-5.95)**	**3.62 (2.42-5.41)**

Heterogeneity: $\tau^2 = 0.15$; $Q_6 = 15.04$; $P = .02$; $I^2 = 60\%$
Test for overall effect: $z = 6.25$; $P < .001$

Soneji et al, JAMA Pediatr. 2017

Youth who used e-cigarettes were more likely to be smoking combustible cigarettes the next time they were observed

Those who smoked combustible cigarettes were not more likely to be smoking e-cigarettes at a later time

NATIONAL ACADEMY OF SCIENCE REPORT: ELECTRONIC CIGARETTES & YOUTH:

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.**

1st Generation

2nd Generation

3rd Generation

Pod Systems & Juul

ELECTRONIC CIGARETTES

- 1st Generation
  - Most similar to traditional cigarettes
- 2nd Generation
  - Larger in size
  - Have reservoir to hold the solution (e-liquid)
  - Vape devices and vape pens
  - Tank system
- 3rd Generation
  - Customizable and modifiable
  - Advanced Personal Vaporizer(APV) or Mods
- Pod Systems & Juul
  - Very diverse
  - Departure from traditional cigarette
  - Hard to recognize as e-cigarette
  - JUUL, Phix, Suorin
  - Sept 2018 JUUL was 72% of e-cigarette market share
  - Uses pods that contain 59 mg/mL nicotine
  - Small "plume" so easy to hide

WHY DO TEENS LIKE JUUL AND E-CIGARETTES?

- Easy to hide
- Vapor hard to detect
- Sweet flavors
- All over social media – in 2016, 78% of middle school and high school students exposed to advertising on FB, Instagram, YouTube, Twitter
- 63% don't know that JUUL always contains nicotine – think just flavor

AAP E-CIGARETTE POLICY: CLINICAL RECOMMENDATIONS

- Screen youth and adults for e-cigarette use and exposure
  - Use the right terminology!!
- Advocate for smoke-free homes and cars – include e-cigarettes
- E-cigarettes should not be recommended for smoking cessation to adults and youth

AAP E-CIGARETTE POLICY: PUBLIC POLICY RECOMMENDATIONS

- Reduce youth access, demand, and exposure to e-cigarettes, e-cigarette solution, and e-cigarette emissions
- FDA should act immediately to regular e-cigs, similar to combustible sigs
- Ban sale to children and youth less than 21
- Ban internet sales of e cigs and solution
- Prohibit all characterizing flavors
- Ban all e-cig advertising accessible to youth
- Tax e-cigs similar to other tobacco products
- Incorporate e-cigs into current tobacco-free laws

HOW UNSAFE IS NICOTINE FOR YOUTH?

- Increases the risk of developing psychiatric disorders and cognitive impairment later in life
- Affects area of the brain responsible for attention, memory, learning and brain plasticity
- Cognitive, self-control, and decision-making portion of the brain is still in development – area largely affected by nicotine
- Forms addictive pathways in the brain that can make youth more susceptible to addiction throughout their life

Source: 2016 SGR – E-Cigarette Use Among Youth and Young Adults
ODH slide

OTHER SUBSTANCE USE

- Adolescents who used e-cigarettes were more likely to
  - Binge drink alcohol
  - Use marijuana
  - Use other illicit drugs
- Of those using e-cigarettes, 9% had used marijuana in the e-cigarette
- Vaping cannabis is viewed as "safer"

ADOLESCENTS USING E-CIGS ARE AT HIGHER RISK TO PROGRESS TO MARIJUANA USE

TABLE 3 Age-Stratified Analysis of the Temporal Association Between E-cigarette Ever Use at Wave 1 and Marijuana Use at Wave 2 Among Baseline Marijuana Never Users, PATH Study, 2013–2015

Marijuana Never Users at Wave 1	E-cigarette Ever Use at Wave 1	Marijuana P12M Use at Wave 2			Marijuana Heavy Use at Wave 2		
		n	Weighted % (95% CI)	aOR[a]	*n*	Weighted % (95% CI)	aOR[a]
Aged 12–14 (*n* = 5901)[b]	No (*n* = 5703)	321	5.5 (4.9–6.2)	REF	107	1.9 (1.5–2.3)	REF
	Yes (*n* = 177)	52	29.2 (23.0–36.2)	2.7 (1.7–43)***	21	12.0 (7.6–18.5)	2.5 (1.2–5.3)*
Aged 15–17 (*n* = 4463)[b]	No (*n* = 4117)	438	10.6 (9.5–11.9)	REF	138	3.4 (2.8–4.2)	REF
	Yes (*n* = 334)	85	25.3 (21.0–30.3)	1.6 (1.2–2.3)**	20	5.9 (3.8–9.1)	0.9 (0.5–1.5)
Interaction between age group and e-cigarette ever use[c]	—	—	—	2.1 (1.3–3.3)**	—	—	3.1 (1.5–6.4)**

not applicable

Dai, Pediatrics, 2018

ADOLESCENTS USING E-CIGS ARE AT HIGHER RISK TO PROGRESS TO MARIJUANA USE

Table 3. Association of Baseline Multiple Tobacco Product Use and Covariates with Multiple Marijuana Product Outcomes at a 24-month Follow-up

	Outcome at 24-Month Follow-Up							
	Combustible Marijuana		Vaping Marijuana		Marijuana Edibles		Any Marijuana Product	
Baseline Regressors Ever Use	Current vs. Never	Past vs. Never	Current vs. Never	Past vs. Never	Current vs. Never	Past vs. Never	Current vs. Never	Past vs. Never
Adjusted models[c]								
Combustible cigarettes	1.90 (1.01, 3.57)*	4.16 (2.70, 6.41)†	1.54 (0.62, 3.87)	2.90 (1.75, 4.79)†	1.06 (0.46, 2.45)	2.77 (1.77, 4.32)†	1.97 (1.05, 3.68)*	4.30 (2.79, 6.63)†
E-cigarettes	3.15 (2.14, 4.64)†	3.42 (2.53, 4.63)†	2.08 (1.12, 3.86)*	2.38 (1.63, 3.47)†	2.99 (1.86, 4.79)†	2.85 (2.08, 3.91)†	3.67 (2.51, 5.36)†	3.63 (2.69, 4.90)†
Hookah	3.91 (2.56, 5.97)†	3.40 (2.37, 4.86)†	3.79 (2.05, 7.01)†	2.95 (1.94, 4.50)†	3.94 (2.39, 6.48)†	3.20 (2.22, 4.61)†	4.10 (2.69, 6.25)†	3.55 (2.49, 5.08)†
Any product	3.79 (2.73, 5.27)†	3.81 (2.95, 4.92)†	2.90 (1.70, 4.93)†	3.33 (2.40, 4.62)†	3.59 (2.38, 5.43)†	3.26 (2.48, 4.28)†	4.21 (3.05, 5.81)†	4.00 (3.12, 5.14)†
Number of products	2.55 (2.01, 3.24)†	2.80 (2.30, 3.40)†	1.94 (1.38, 2.71)†	2.11 (1.70, 2.63)†	2.19 (1.66, 2.89)†	2.31 (1.90, 2.80)†	2.77 (2.18, 3.51)†	2.95 (2.42, 3.59)†

E-cigarette and hookah use at age 14 was associated with a 3.6 to 4-fold increase in the odds of initiating and currently using marijuana two years later.

Audrain-McGovern, Pediatrics, 2018

MARIJUANA USE

- 26% of US 12th graders are current marijuana users.
  - 8% have used synthetic weed (Full agonist at Cannabinoid receptor 1)
- Vaping weed often is solution of ≥ 95% THC
- As trends for increased legalization of marijuana continue, the impact on youth must be further explored and understood.
  - legalization and subsequent commercialization of marijuana corresponds with the development of new forms of cannabis including candies, gummy bears, and sodas.
  - Legalization is associated with widespread marketing of CBD products which are not well regulated and sometimes have significant amounts of THC

MARIJUANA USE

- Children's Hospital Colorado saw a significant increase in ED visits related to cannabis ingestion among children < 12 pre vs. post 2009 (legal commercialization)
  - 2/3 of children required medical hospitalization for lethargy
  - Some required admission to intensive care unit
- Significant increase in adolescent cannabis-associated ED/urgent care visits was seen in Colorado in the years following commercialization of medical and recreational cannabis.
  - Marijuana-related visits increased from 1.8 per 1,000 visits in 2009 to 4.9 in 2015. (p = < .0001)

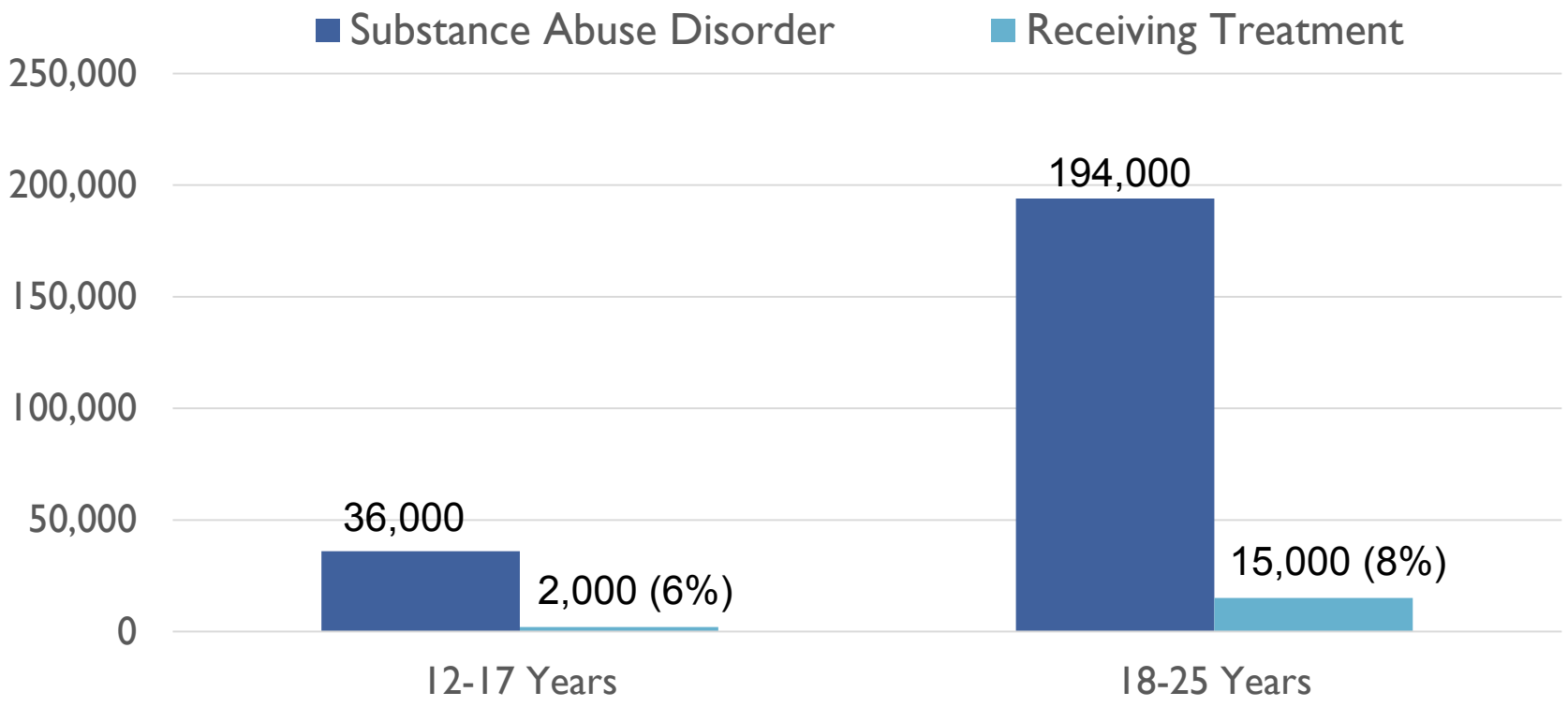
Wang, JAMA Pediatr. 2013 Jul;167(7):630-3. doi: 10.1001/jamapediatrics.2013.140
Wang, Journal of Adolescent Health. Volume 63, Issue 2, August 2018, Pages 239-241

MARIJUANA HEALTH IMPLICATIONS

- Cannabis use and addiction
  - 17% of youth who use develop a cannabis use disorder
  - 25 to 50% of daily marijuana smokers
- Youth cannabis use and cognition
  - Impairment in attention, concentration, and decision making
  - Associated with poorer academic performance

SUBSTANCE ABUSE TREATMENT

NEEDING AND RECEIVING SUBSTANCE ABUSE TREATMENT (OHIO 2016-2017)



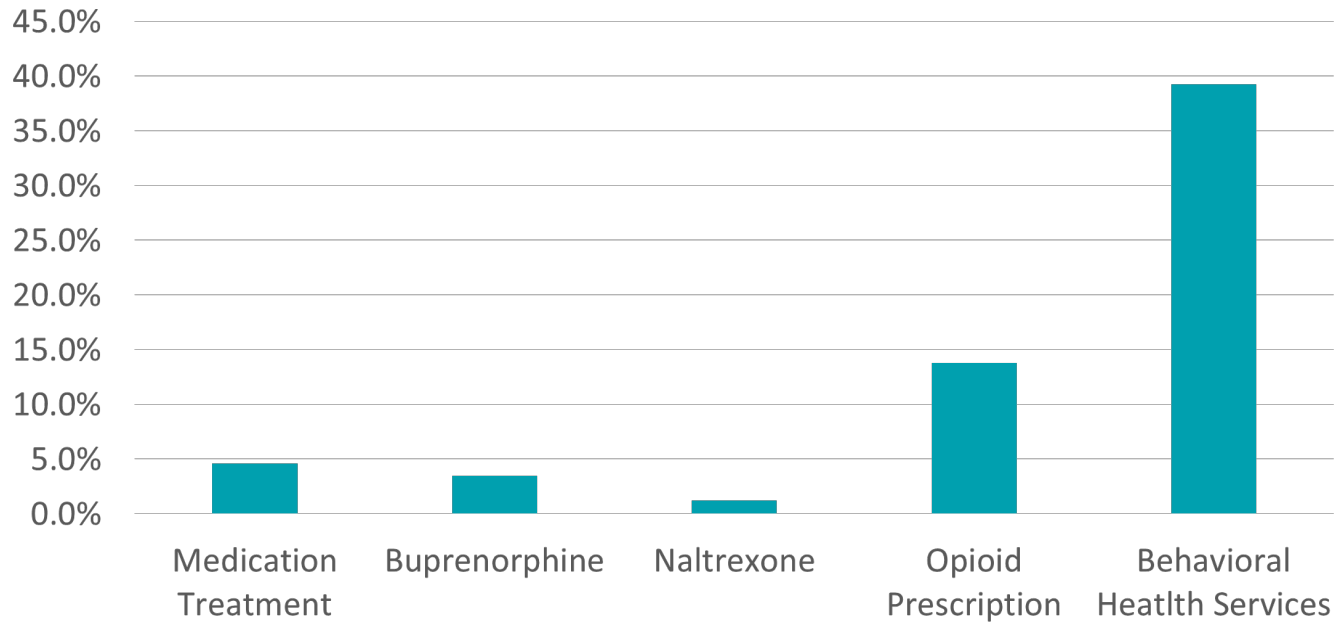
SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2016 and 2017.

MEDICATION TREATMENT FOR OUD AMONG ADOLESCENTS ENROLLED IN OHIO MEDICAID

- Objectives
  - Determine the proportion of adolescents enrolled in Ohio Medicaid with OUD who are prescribed MAT within 6 months of diagnosis.
  - Determine the proportion of adolescents enrolled in Ohio Medicaid with OUD who are prescribed opioids within 6 months of diagnosis.
- Data source
  - Ohio Medicaid claims from 2011-2016 including inpatient, outpatient, professional, and pharmacy
- Adolescents (12-18 years) with:
  - Primary/secondary diagnosis for OUD
  - Enrolled for at least 9 of 12 months before diagnosis
  - Were enrolled continuously for 6+ months after diagnosis

MAT FOR OUD AMONG ADOLESCENTS ENROLLED IN OHIO MEDICAID

- Among 659,073 adolescents, 3,356 (0.5%) had an OUD diagnosis.
- Of these, 1,627 adolescents met all inclusion criteria:



MEDICATION TREATMENT FOR OUD AMONG ADOLESCENTS ENROLLED IN OHIO MEDICAID

- Adolescents aged 16-18 years were more likely to receive MAT than those aged 12-15 years (5.9% vs. 1.6%).
- White adolescents were more likely to receive MAT than Black adolescents (5.0% vs. 0.8%).
- MAT was higher among adolescents with a diagnosis of Hepatitis C or Opioid Overdose (13.3% and 9.1% respectively).

NCH MEDICATION ASSISTED TREATMENT FOR ADDICTION PROGRAM, 2009-2012

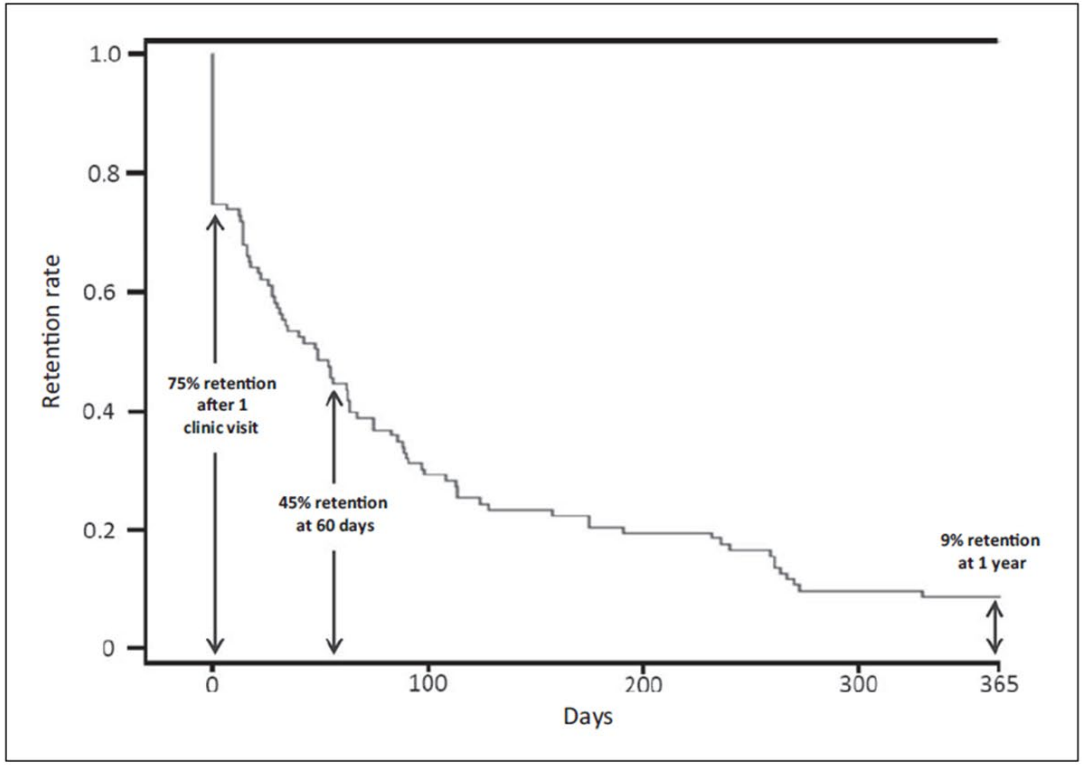
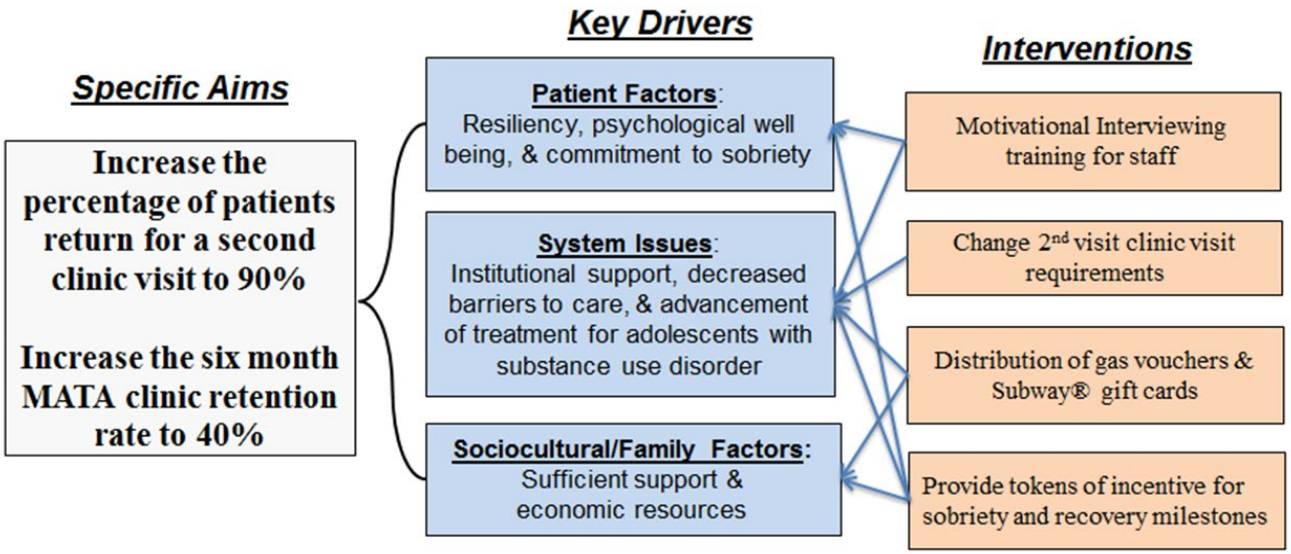


FIGURE 1. Retention rate over time of opioid-dependent adolescents and young adults receiving outpatient buprenorphine/naloxone therapy (N = 103).

Matson, SC; Hobson, G; Abdel-Rasoul, M; Bonny, AE. *J Addict Med* 2014;8: 176-182.

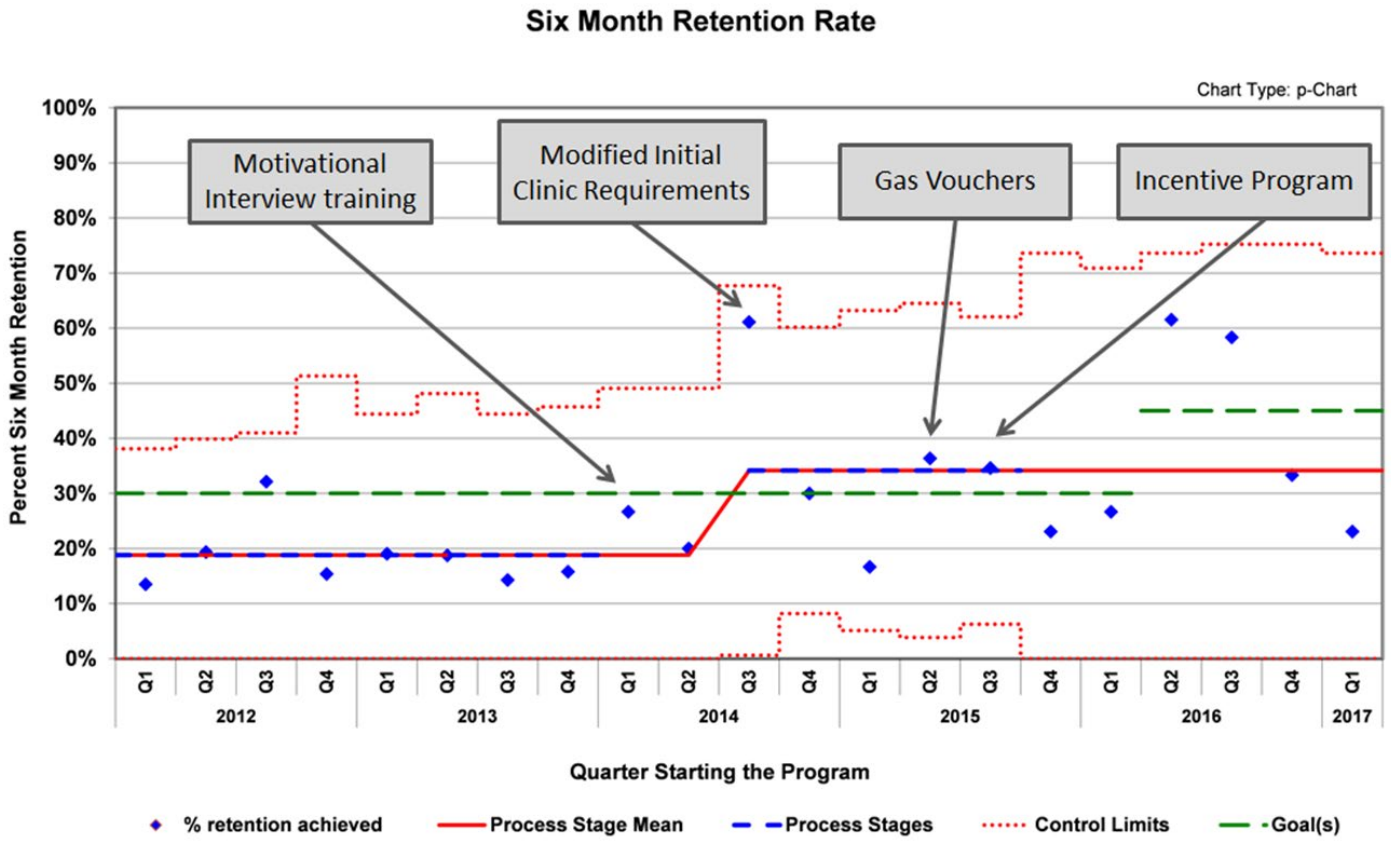
QI INITIATIVE



INTERVENTIONS

- Motivational interviewing training
- More modest initial treatment requirements
- Transportation assistance/gas vouchers
- Incentive programs

SIX MONTH RETENTION RATE



NCH MATA IMPROVING OUTCOMES

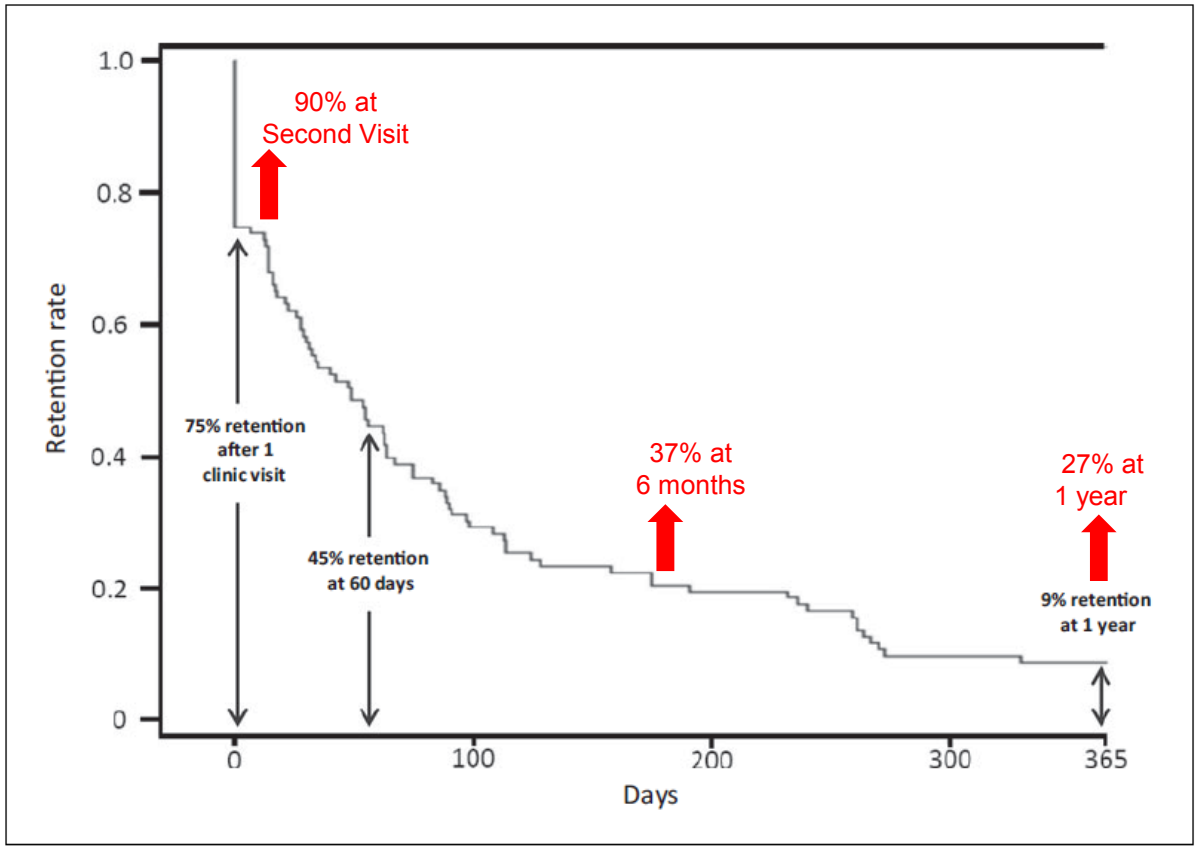


FIGURE 1. Retention rate over time of opioid-dependent adolescents and young adults receiving outpatient buprenorphine/naloxone therapy (N = 103).

HEALTHCARE UTILIZATION AMONG ADOLESCENTS RECEIVING MAT

- The purpose of this study was to evaluate the effect of the NCH MAT clinic on the number of acute care visits and inpatient admissions for opioid-related events including opioid use disorder, withdrawal, and overdose.
- Single-center, retrospective, cohort design; 2006-2016
- Inclusion Criteria
  - Adolescents aged 10-19 years
  - Minimum 2 visits to urgent care, emergency, or inpatient hospital admission for opioid-related events
  - Referred to MATA clinic
- Patients with opioid-related presentations secondary to the treatment of chronic illness such as oncology or sickle cell disease were excluded.

Characteristics of patients who did/did not initiate care in MAT clinic (N=315)

		MAT (n = 275)	Non-MAT (n = 40)	p-value
Sex, n (%)	male	118 (42.9)	20 (50.0)	0.40
Race, n (%)	white	251 (91.3)	33 (82.5)	0.08
	black	3 (1.1)	5 (12.5)	<0.001
Mean Age, (range)		17.7 (14-19)	17.0 (12-19)	1.00
Poverty in Zip Code, n (%)	<10%	101 (36.7)	12 (30)	0.41
	10-19.99%	108 (39.3)	9 (22.5)	0.04
	>20%	66 (24.0)	19 (47.5)	<0.001
Distance from NCH, n (%)	< 10 miles	51 (18.5)	17 (42.5)	<0.001
	10-24.9 miles	89 (32.4)	10 (25)	0.35
	>25 miles	135 (49.1)	13 (32.5)	0.05

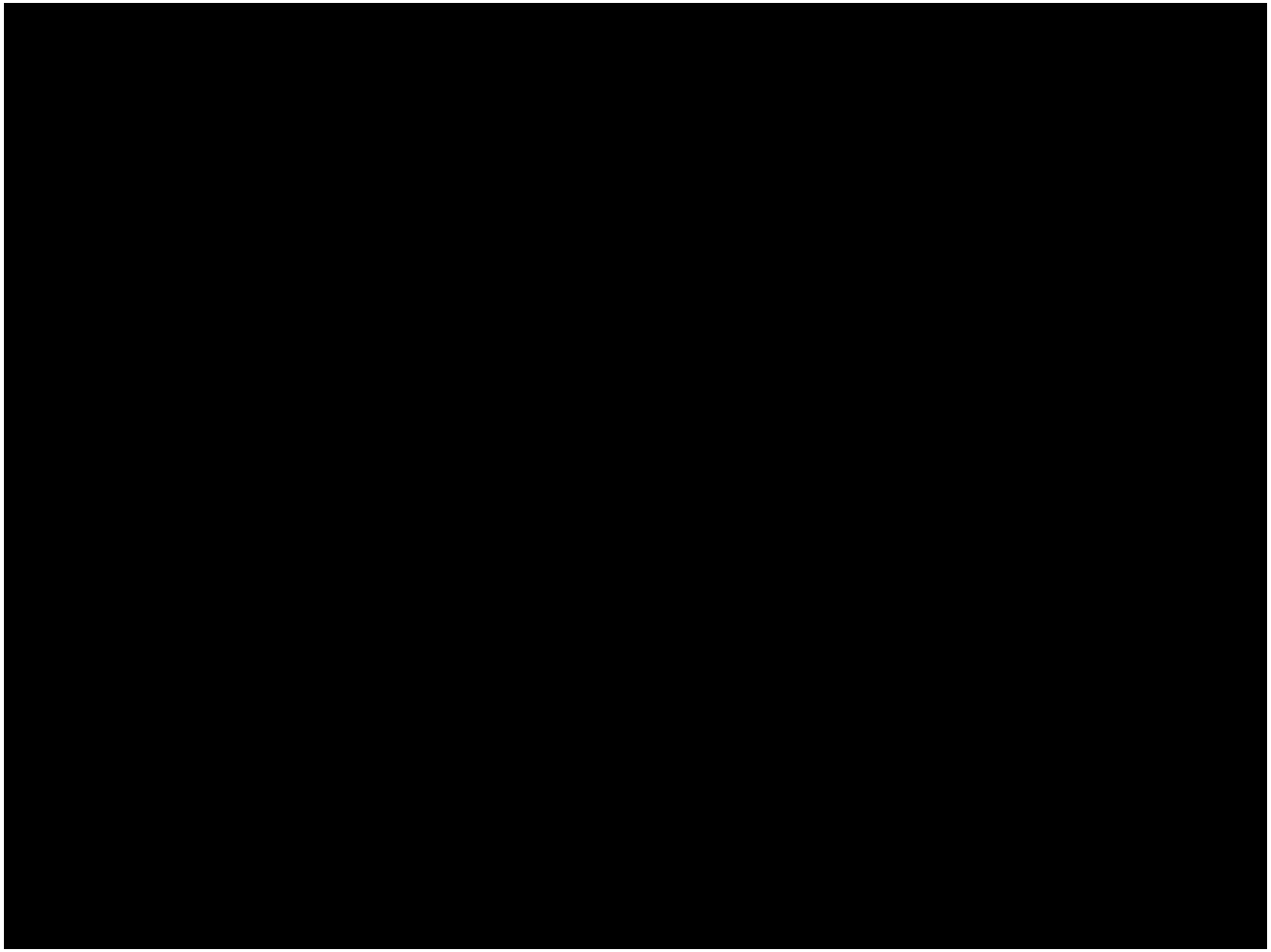
HEALTHCARE UTILIZATION AMONG ADOLESCENTS RECEIVING MAT

Visit frequency per patient year	MAT Cohort	non-MAT Cohort	Z-test	p-value
ED/UC (Mean Rank)	0.080 (153.77)	0.076 (187.06)	3.073	<0.002
Inpatient (Mean Rank)	0.084 (142.19)	0.243 (266.69)	10.611	<0.005
Total Acute Care and Inpatient (Mean Rank)	0.164 (140.91)	0.319 (275.46)	10.121	<0.005

HEALTHCARE UTILIZATION AMONG ADOLESCENTS RECEIVING MAT

Visit frequency per patient year	Pre-MAT	Post-MAT	t-test	p-value
ED/UC (Mean Rank)	0.994 (32.2)	0.080 (0.768)	3.755	< 0.005
Inpatient (Mean Rank)	0.761 (7.84)	0.084 (5.98)	2.466	< 0.005
Total Acute Care and Inpatient (Std. Dev.)	2.75 (32.7)	0.164 (6.01)	4.481	0.014

MAT SUCCESS STORY



MAT SUCCESS STORY