

©Drug Policy

The Importance of Prevention

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The Consequences of Drug Use, Use Disorders

Medical costs

- Compromised mental health
- Compromised physical health

Criminal justice costs

- Arrests
- Incarceration

Lost productivity

- Workplace culture
- Absenteeism, injuries

Personal losses

- educational achievement
- employment opportunities

Addiction

- Treatment needs
- Overdose or even death
- Disruption, loss of income, home

Family

- Personal grief
- Loss of hope

Learning Objectives

Knowledge

Why Prevent Youth Drug Use and Restrict Access?

Risks FOR using drugs

- environment, individual, drug

Developing adolescent brain (and fetus)

- more vulnerable to drug use

Risks OF using drugs

- Marijuana, methamphetamine, opioids

Action

Prevention Strategies

Prevention strategies

- global, community, medical, family, parents

Importance of parents, home:

- Influencers for using drugs
- Influencers for avoiding drugs

Importance of Culture, Policies

Risks *for* Using Drugs

DRUG

Legality

Access

Potency

Frequency

Dose

Route

Price

INDIVIDUAL

Genetics

Age of onset

Psychiatric

Personality

Stress

Trauma

ENVIRONMENT

Parents

Home

Friends

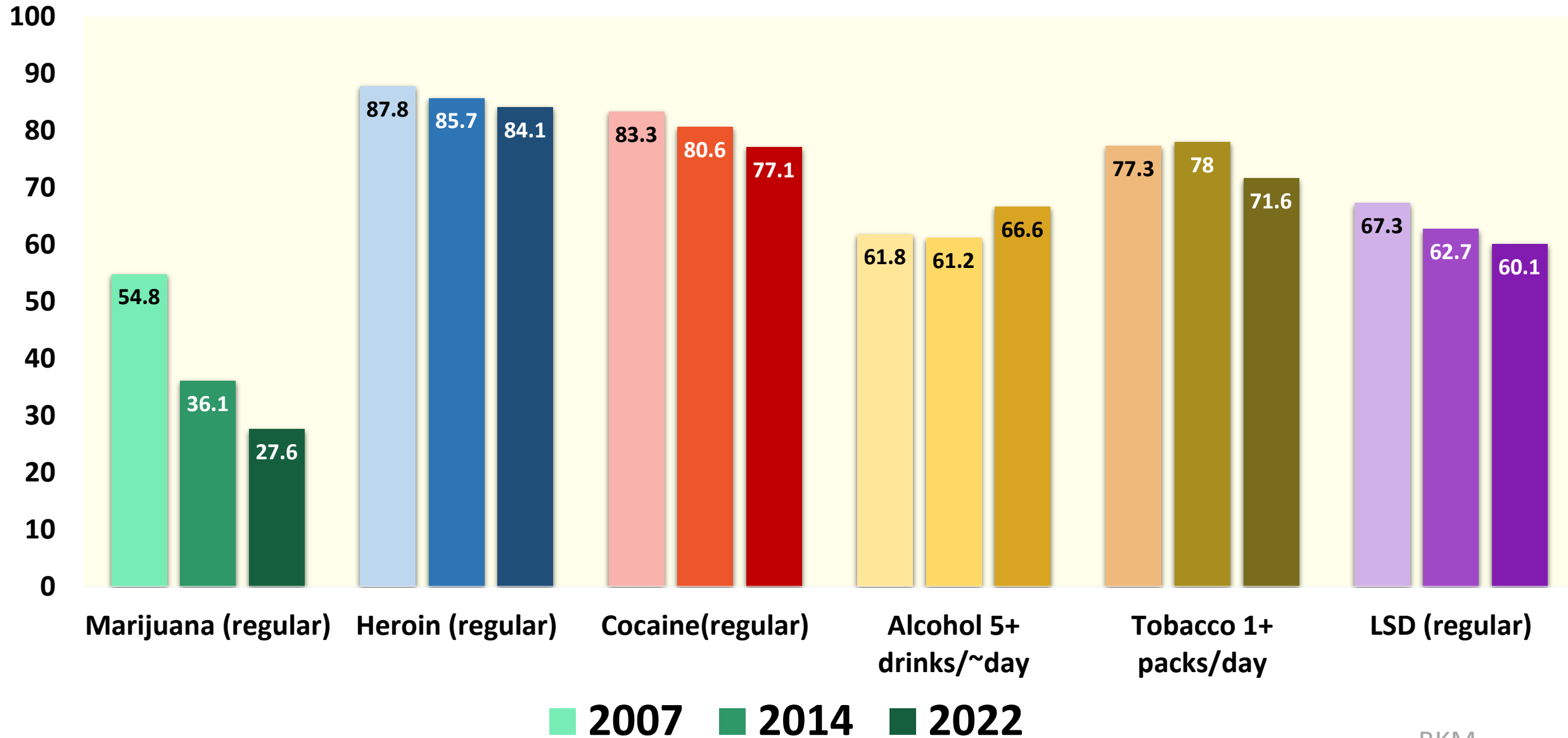
School

Social media

Culture

Risk perception

Marijuana: Perception of Risk at All-time Low 12th Graders



Examples of Poor Environment

Poor family, social support

Strife at home, childhood adversity
absent loving relationships

High level of social stressors

Divorce, school problems
relationship problems

Few opportunities, alternatives to drugs

No jobs, no money,
no extracurriculars

Social media

Encourage drug use
as social connectedness

Easy access to drugs

Friends, classmates distribute encourage

Adolescent Brain is Vulnerable to Drugs

- Adolescent brain is developing
- Adolescent frontal cortex is not mature
- Adolescents are vulnerable to
 - Risk seeking
 - Drug effects
- Different drugs affect brain differently

Differences in the Adolescent and Adult Brain Response to Drugs

Adolescents more susceptible to negative effects of substance use

- To substance use disorder, more quickly: drug reward stronger
- To drug-induced brain changes, worse mental health problems, new ones
- To greater risk-taking, overdose

If use continues into adulthood, adolescents are more prone

- To long term effects on education, employment, relationships
- To adult addiction, challenge recovering
- To compromised health, mental health
- To reduced lifespan

WHY?

Developing Adolescent Brain Undergoes Remodeling

- **Grey, white matter changes**
- **Prunes some connections**
- **Strengthens connections**
- **Changes function regionally**

Grey, White Matter Changes

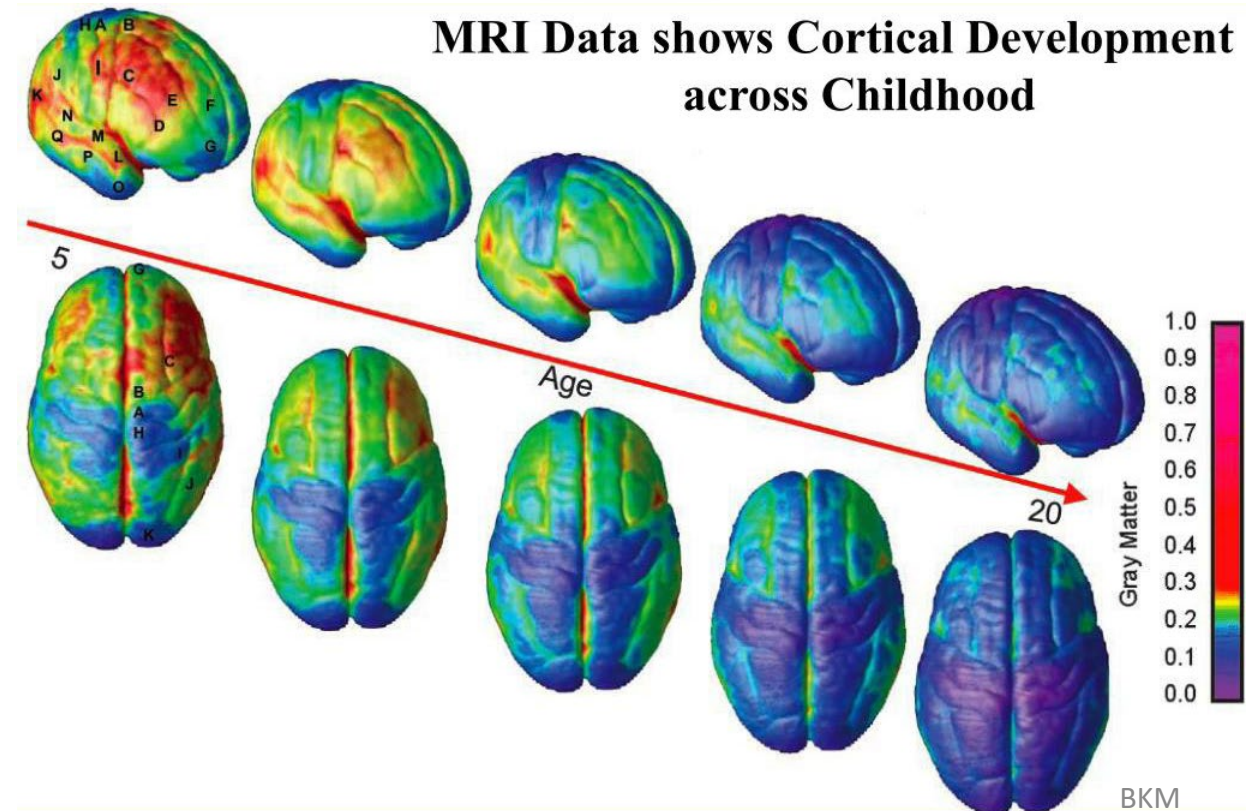


Removes unnecessary connections

Reorganizes circuits

Strengthens important connections

Frontal Cortex last to mature



The Teen Brain Prunes Connections

- **Removes unnecessary connections**
- **Optimizes, prioritizes relevant neural pathways**
- **Makes cognitive processing faster, more efficient**
- **Refines skills**
- **Makes brain more efficient, focused, mature**

The Teen Brain Increases White Matter (myelin)

More myelination makes teen brain faster, smarter, more efficient

- Faster Processing Speed
- Strengthens connections
- More Efficient Brain Connectivity
- Improves learning, memory
- Better emotional regulation

Prefrontal Cortex: complex thinking

A

- decision-making
- planning
- attention
- problem-solving
- impulse control

Amygdala: survival, emotions

B

- processes emotions (fear, aggression, anger)
- memories associated with these emotions

Ventral striatum: pleasure, peer approval

C

- sensitivity to reward greater than adults
- drug rewards more powerful

- ***Teen Brain Reorganizes Functions***
- **Frontal cortex gains control over emotions**
- **Drug rewards lower as brain matures**

The Risks of Adolescent Drug Use

Chemical signals used to mature and remodel, develop connections, circuits

Drugs can interfere with normal brain development:

- disrupt signaling or excess signals
- cause brain to adapt to abnormal signals
- changes cell biology, brain size, circuits, behavior
- worse adverse outcomes

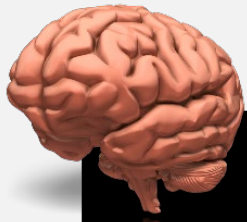
Preventing frequent, moderate use is crucial

- For reducing risk of addiction, mental health, other consequences

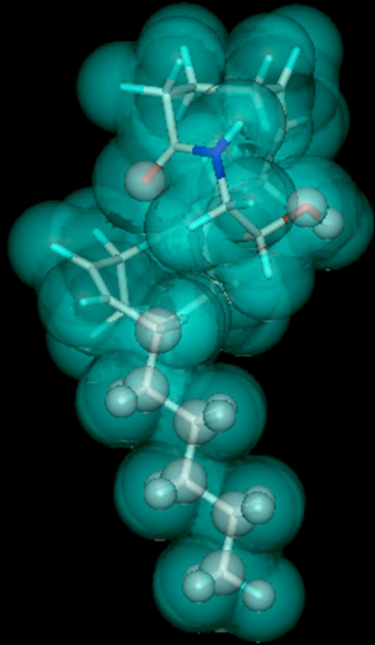
Every year use of a substance is delayed

- **Reduce risk of developing a substance use disorder**

THC Resembles-is not Identical to 2-AG or AEA



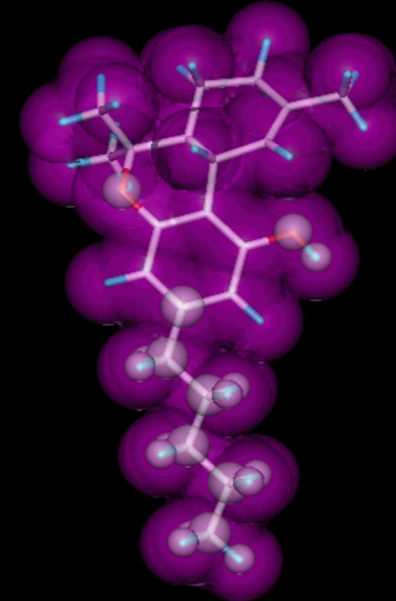
Made by the brain



Anandamide



Made by marijuana



THC

Factors that Drive Marijuana Effects

THC Dose

Ratio with other cbn

% THC and absolute amount

Frequency of use

> 1x daily, daily, weekly, monthly, yearly

Mode of delivery

Inhaled: (smoking, vaping), oral mucosa

Smoked: THC levels peak 30 min, subside 1 - 3.5 hours

Ingested: THC levels peak 30 min - 2 hours; subside 5 - 8 hours

Age of onset

Prenatal; Early adolescence

Age of onset

Marijuana Initiation During Adolescence or Post Adolescence

By mid-30s, young-adult, adolescent-onset regular users more likely than minimal/non-users (63.5%) to:

- *have used other illicit drugs (OR > 20.4)*
- *be a high-risk alcohol drinker (OR > 3.7)*
- *smoked daily (OR > 7.2)*
- *less likely to be in relationships (OR < 0.4)*
- *Began regular use in teens had poorer later life outcomes than non-users*
- *Began regular cannabis use after leaving high school: most cannabis-related harms in adulthood*

(longitudinal; 15-35 years; n=1792)

Age of Onset

Adolescent Cannabis Use Associated With Increased Risk for Psychosis Later in Life

Systematic review and meta-analysis

Adolescent cannabis use increased risk for psychosis (RR = 1.71 $p < 0.00001$)

- Cannabis Use Predicts Earlier Age of Onset of Psychosis
- Modifiers:
 - Age of onset and frequency of cannabis use
 - Exposure to childhood trauma
 - Concurrent use of other substances
 - Genetic factors

Psychotic-like Experiences in Young People

Systematic review and meta-analysis

Psychotic-like experiences (PLEs) and substance use in children, adolescents aged ≤ 17 years

- *younger age associated with greater odds of PLEs in substance users*
- *earlier age of psychosis onset, more severe*
- *substance users were ~2X likelier to report PLEs than non-users*

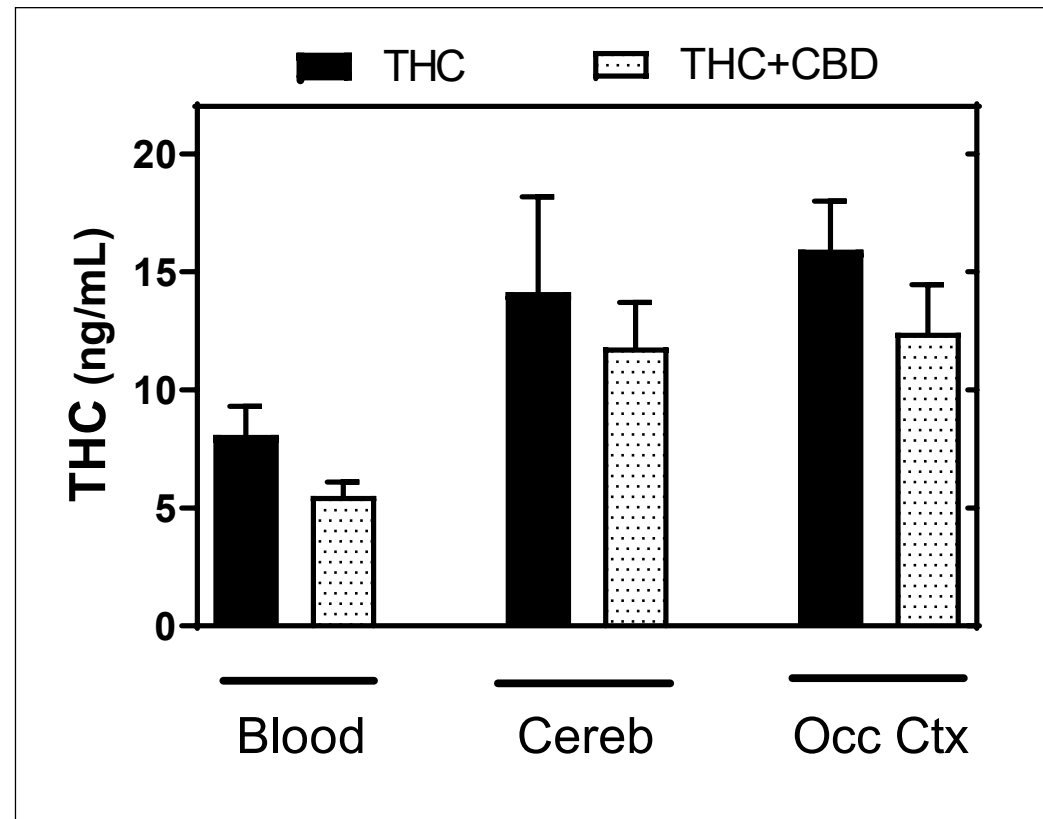
Early detection and intervention for substance use, PLEs

Marijuana Use Trends

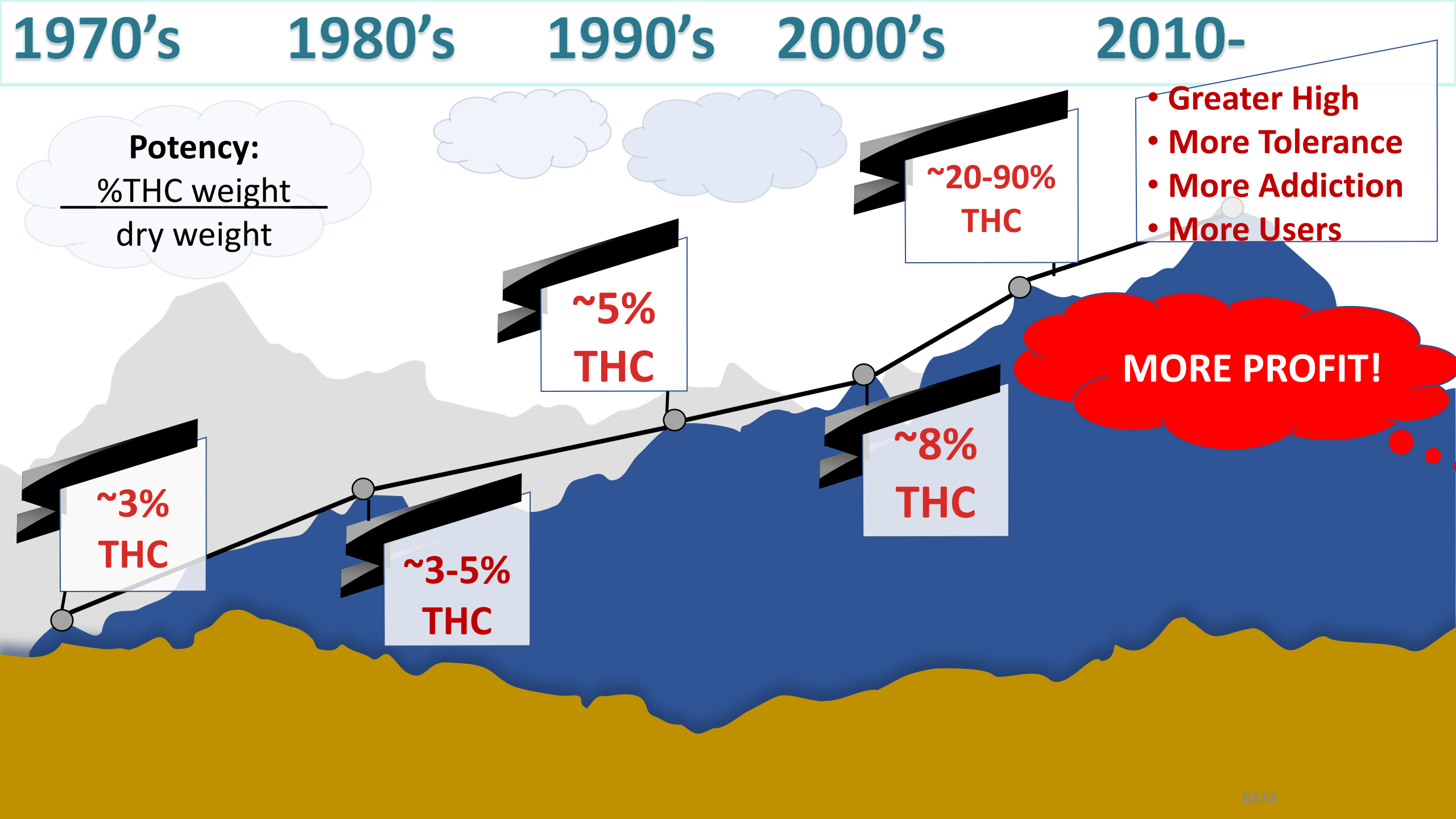
- **More daily use**
- **More potent products**
- **Brain Accumulation**

THC Accumulates in Brain

Brain THC levels are higher than blood THC



Withey SL, Bergman J, Huestis MA, George SR, Madras BK. THC and CBD blood and brain concentrations following daily administration to adolescent primates [published online ahead of print, 2020 Jun 18]. *Drug Alcohol Depend.* 2020;213:108129.



9973 ED visits for cannabis use

Inhaled cannabis vs edibles

more likely:

**Cannabis hyperemesis
syndrome**

(18.0% vs. 8.4%)

Edible cannabis

more likely:

**acute psychiatric
symptoms**

intoxication

cardiovascular symptoms

(18% vs 10.9%)

Edibles

10.7% of cannabis-
related ED visits

0.32% of cannabis sales
in Colorado 2014, 2016

High THC Potency Associated With Higher Risk

Psychosis, anxiety

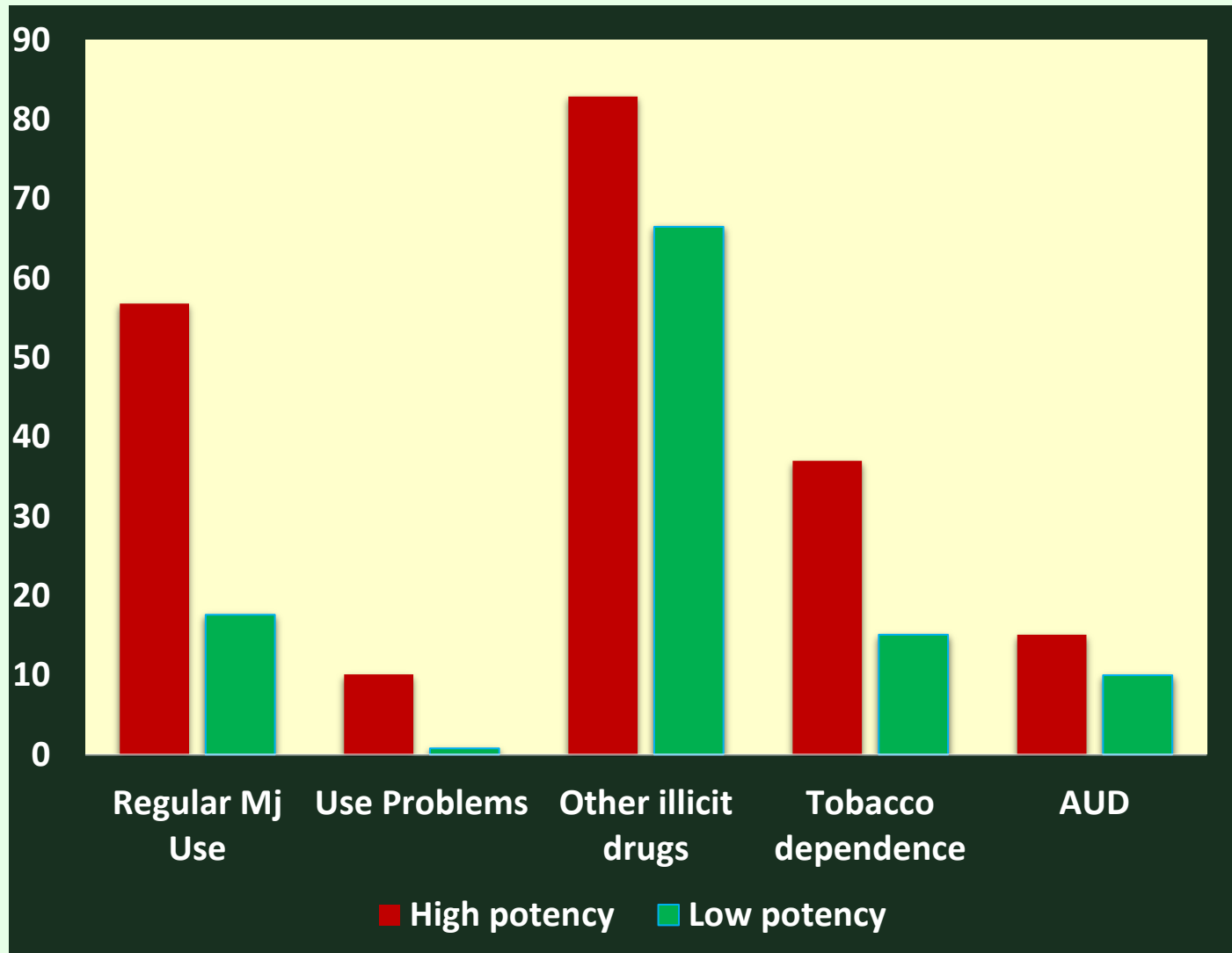
Lower age of schizophrenia

**Impaired memory, brain function, driving,
emergency care, uncontrolled vomiting**

Use of other drugs; social problems

More use, higher risk for progression to addiction

Adolescent Use of High Potency Marijuana Associated with Higher Risk for



High potency vs low potency

- More regular marijuana use
- More use problems
- More use of other drugs
- More tobacco dependence
- More alcohol use disorder

Marijuana and Consequences

1. Cell biology
2. Brain structure
3. Addiction, Mental Health
4. Function
5. Long term
6. Prenatal

1. Cell biology

1. Marijuana and Cell Biology

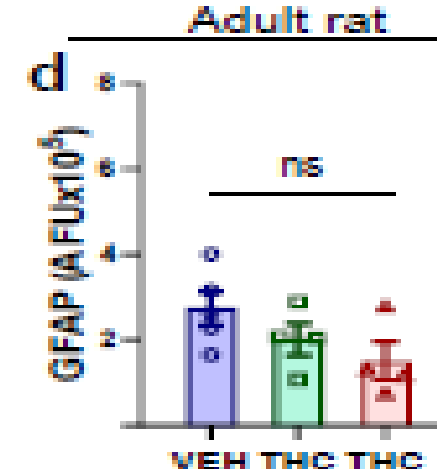
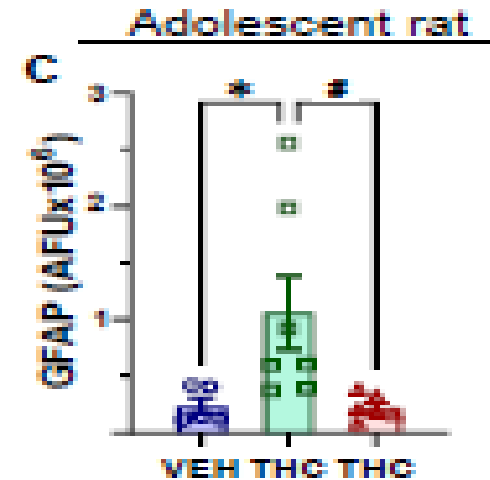
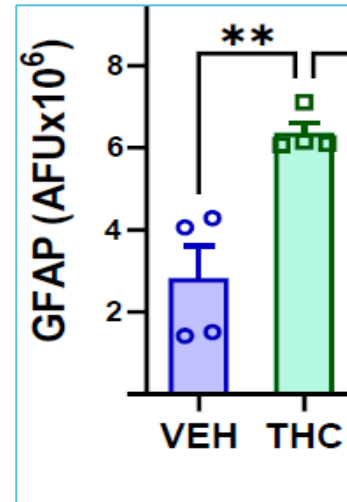
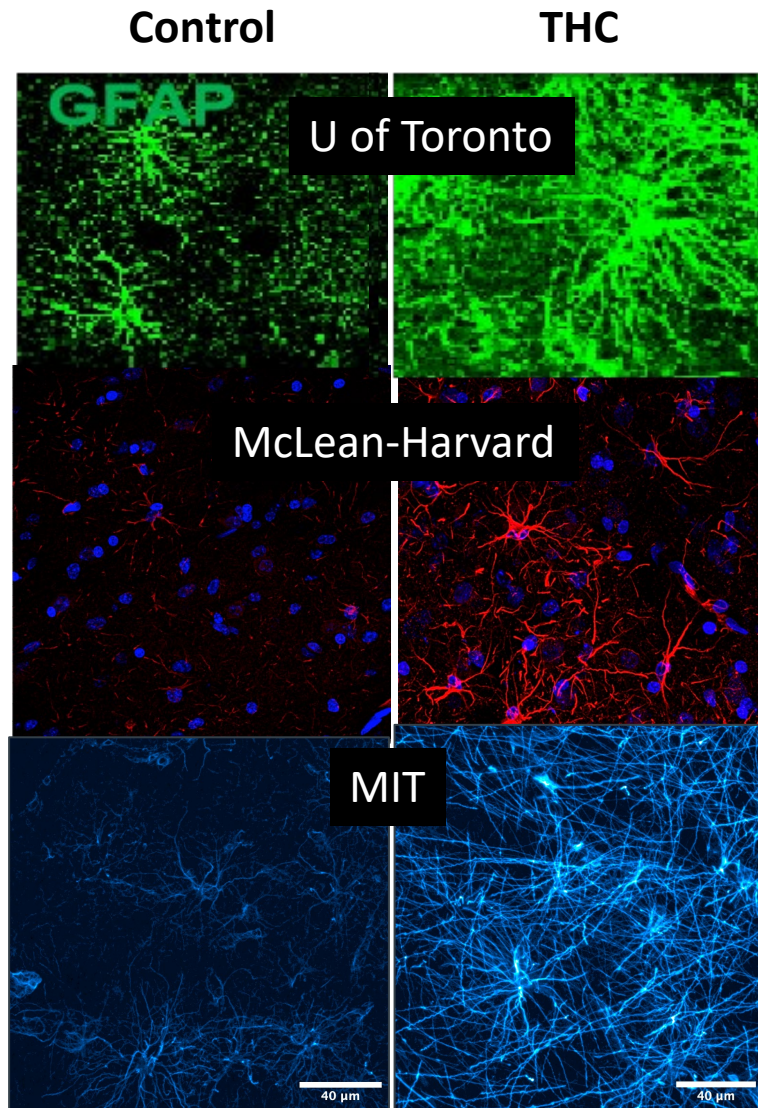
Amygdala in Brain: “Darwinian survival”

- regulates behaviors to find food, fluids
- assesses sensations, threats, safety
- responds to external stimuli, internal states
- Can respond with anxiety fear, aggression
- **damage to amygdala** impairs or removes these functions

Brain Region: Amygdala

- high endocannabinoid signaling
- sensitive to cannabinoids
- implicated in heavy cannabis use
 - depression
 - anxiety
 - hyper-sensitivity to threat
 - impaired facial recognition
 - compromised cognition
 - psychosis
 - sleep disturbances
 - withdrawal or craving during withdrawal

THC Increases a Marker for Inflammation in Amygdala Only in Adolescent, not Adult Brain



Conclusions

**THC increased GFAP, marker of inflammation
Only in Adolescent, not Adult Amygdala**

M. Sivasubramanian, S. Withey, J. Bergman, Preston Ge, M. Heiman, BK Madras, SR. George, 2025, in press

Implications

THC increases

- Inflammatory cells in “emotional amygdala

Cells implicated in

- brain development, inflammation, toxicity, cognition, sleep, depression, anxiety

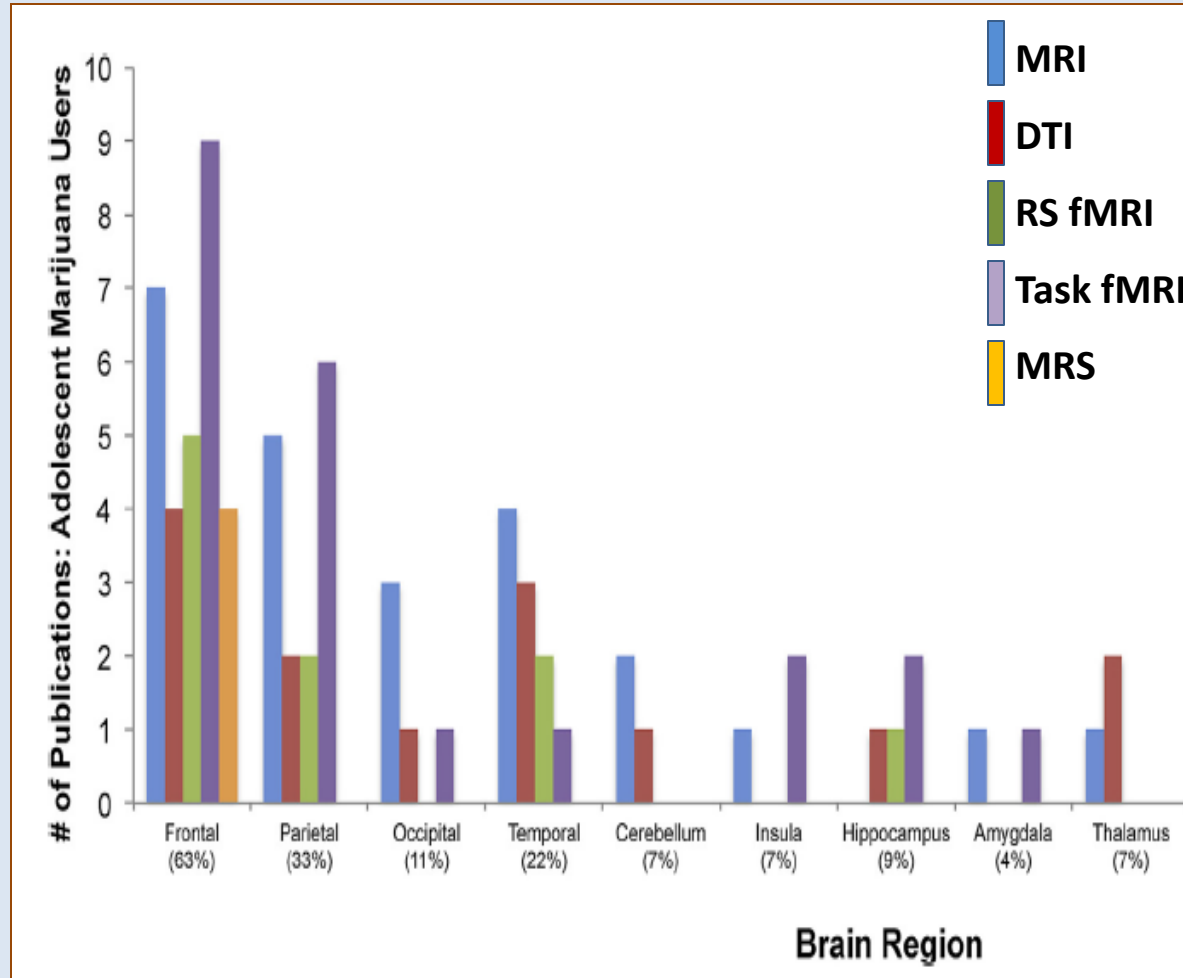
Are these changes

- A new form of brain toxicity which may persist into adulthood?

2. Brain Structure

2. Brain Structure

Brain Changes in Adolescent Marijuana Users: 46 MRI studies



Conclusions:

- Marijuana-related brain changes
- Robust in adolescent brain
- Some associated with impaired function

Silveri, M.M., et al., Neurobiological signatures associated with alcohol and drug use in the human adolescent brain. *Neurosci. Biobehav. Rev.* (2016), <http://dx.doi.org/10.1016/j.neubiorev.2016.06.042>

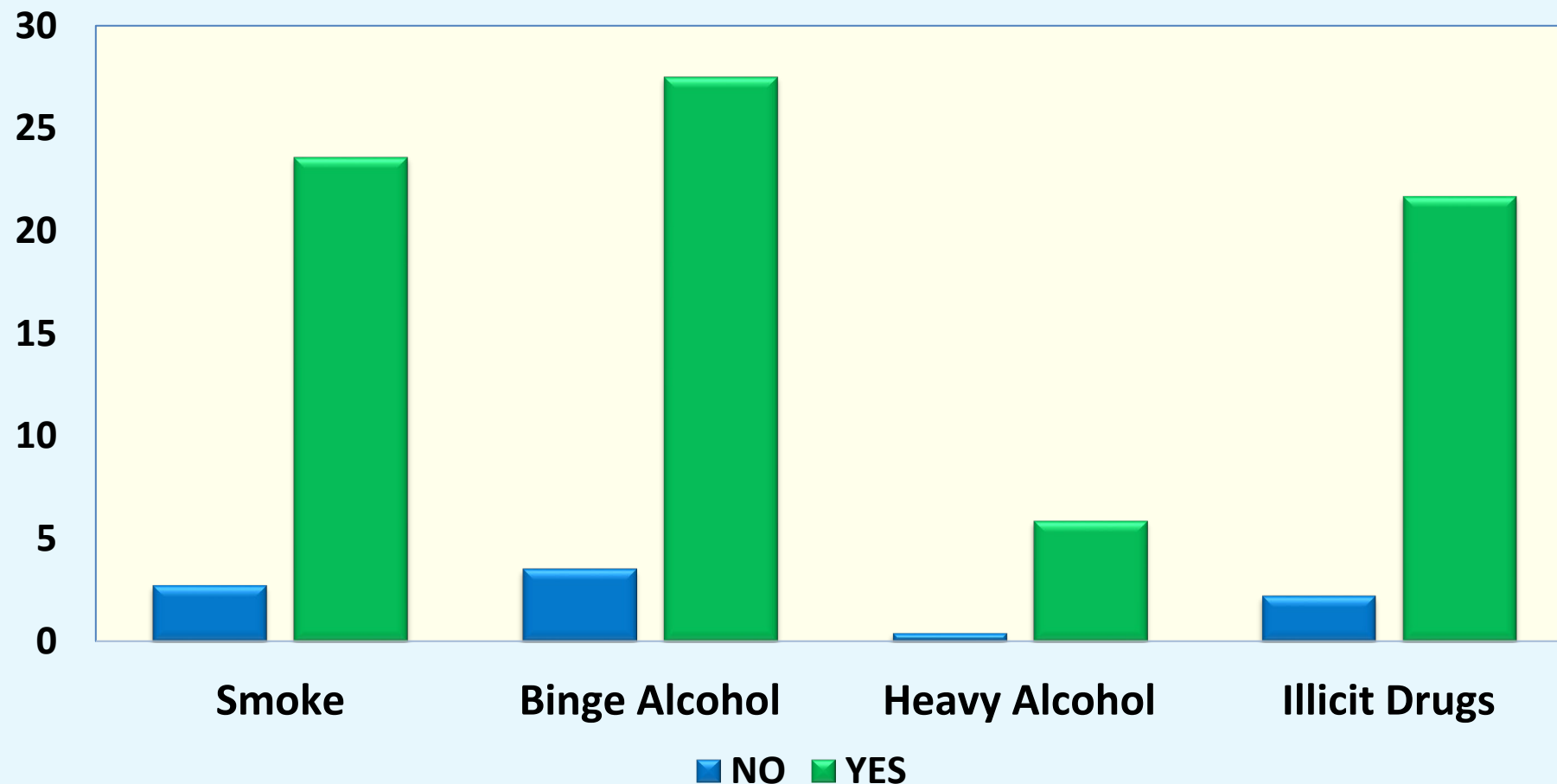
3. Addiction

Mental Health

3. If Adolescents Use Marijuana

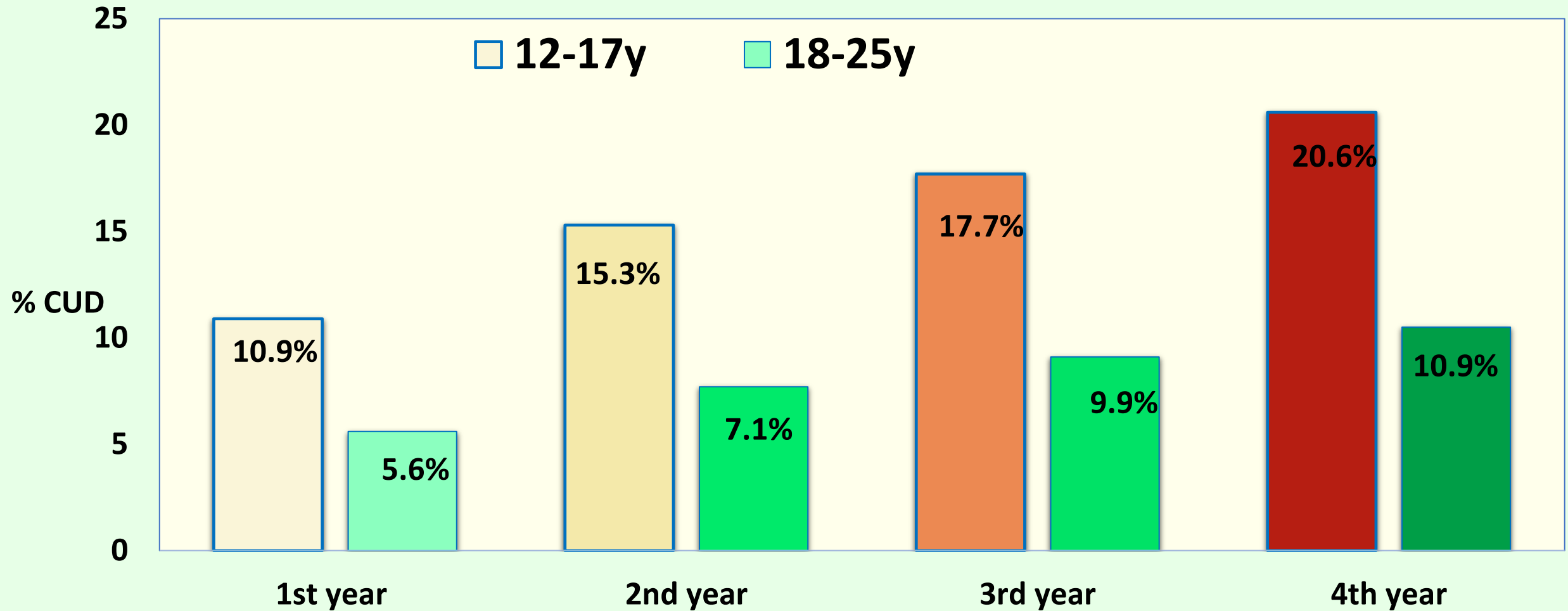
Risks Of Using Alcohol or Tobacco, Other Drugs is Much Higher

RR



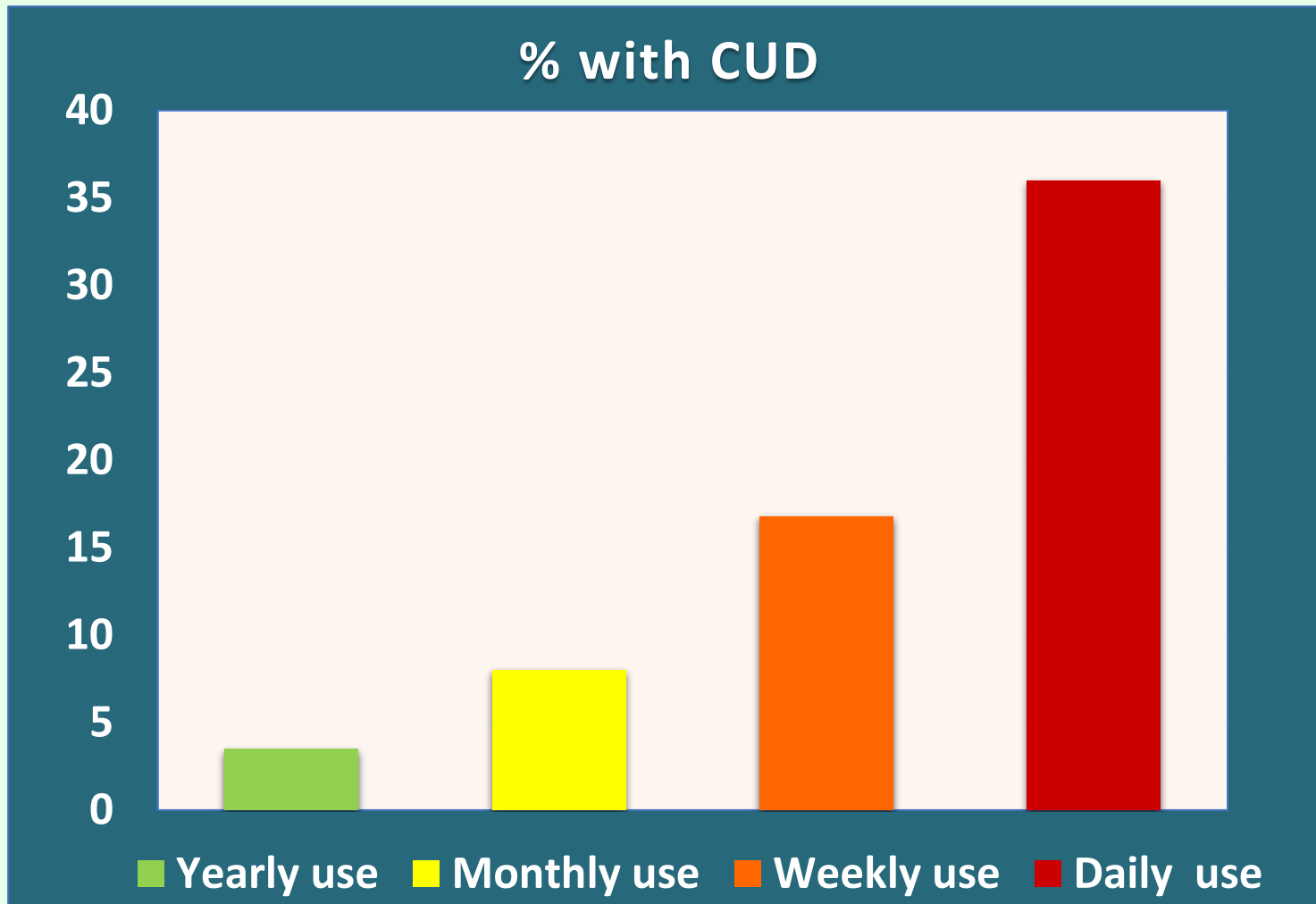
Dupont, Han, Shea, Madras. Preventive Medicine 113: 68-73, 2018. [Graph prepared by BK Madras] Past month use of alcohol, tobacco and illicit drugs, among youth aged 12-17, by marijuana status (past month unadjusted prevalence; n = 17,000; data from Table 1). Y-axis: past month prevalence in %

3. Adolescents At Much Greater Risk for Cannabis Use Disorder



Han B, Compton WM, Blanco C, Jones CM. Time since first cannabis use and 12-month prevalence of cannabis use disorder among youth and emerging adults in the United States. *Addiction*. 2019 Apr;114(4):698-707; Hamaoui J, et al., Age of onset of cannabis use and substance use problems: A systematic review of prospective studies. *Addict Behav*. 2025 Apr;163:108259. doi: 10.1016/j.addbeh.2025.108259.

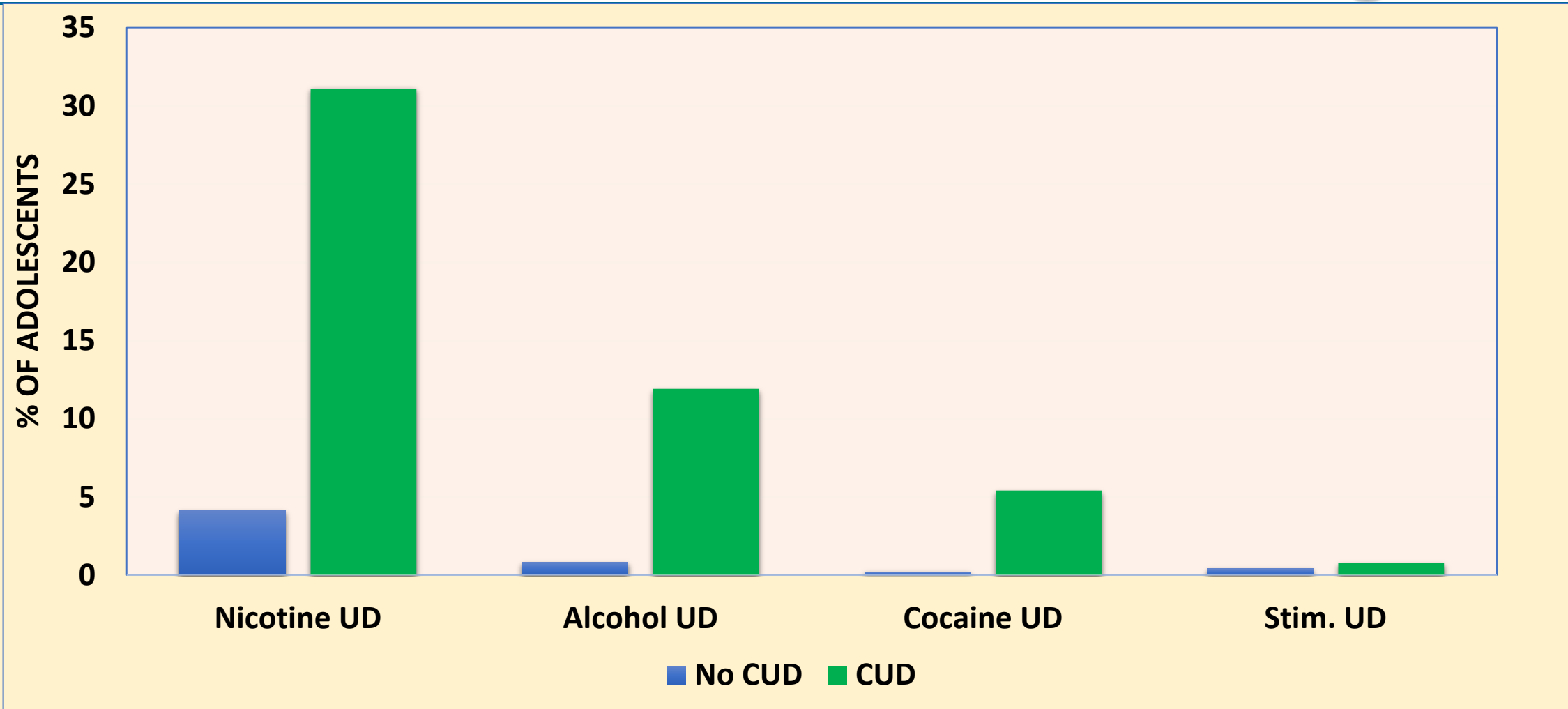
3. More Frequent Use more Marijuana Use Disorder



The more frequently marijuana is used the greater the risk of addiction

3. Adolescent Cannabis Use Disorder

Risk of other Substance Use Disorder Higher

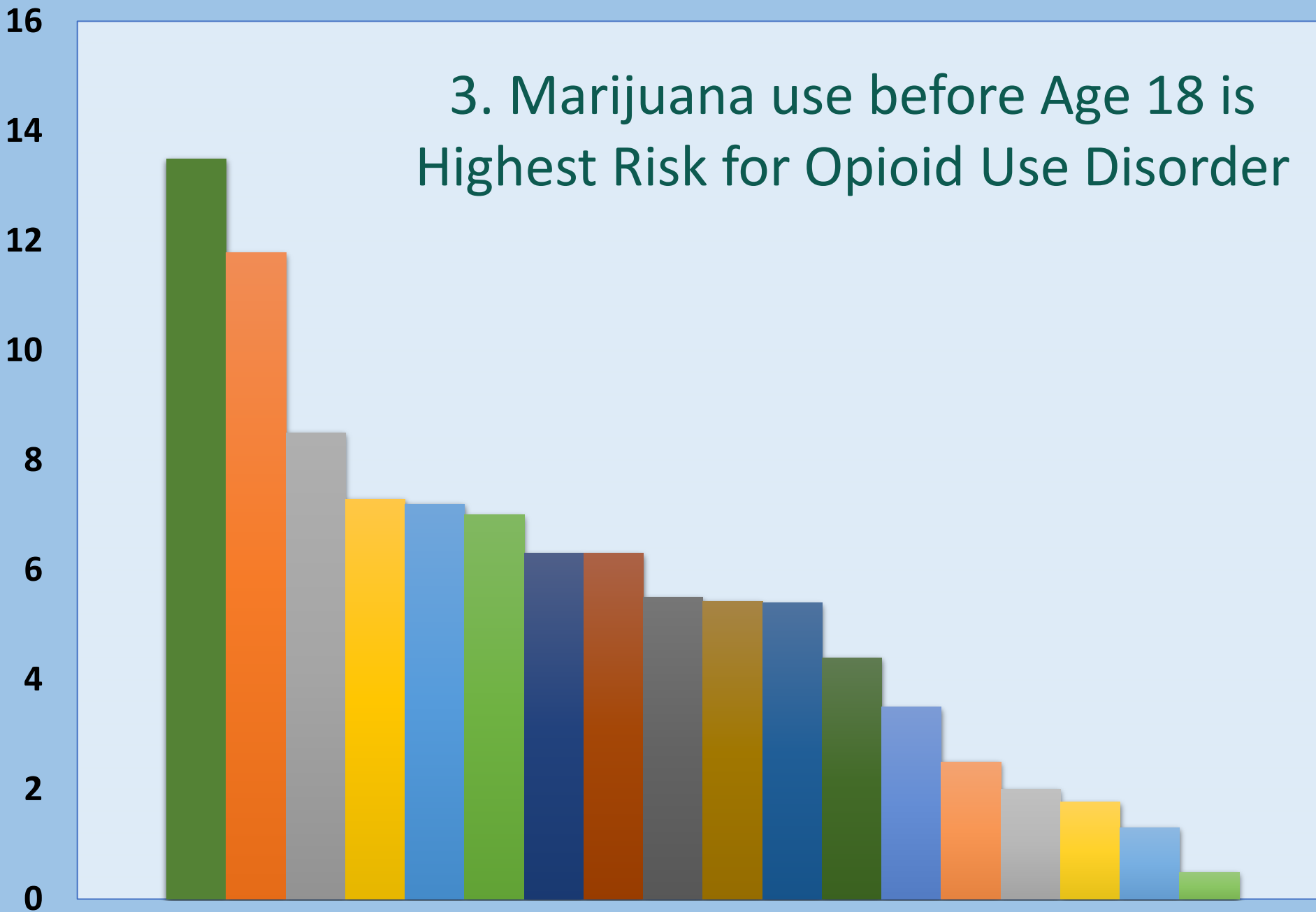


Oladunjoye AF, Li E, Aneni K, Onigu-Otite E. Cannabis use disorder, suicide attempts, and self-harm among adolescents: A national inpatient study across the United States. PLoS One. 2023 Oct 17;18(10):e0292922. doi: 10.1371/journal.pone.0292922. PMID: 37847698; PMCID: PMC10581466.; Olsavsky AK, Hinckley JD, Vidal C. Editorial: Marijuana Legalization and Suicide in Adolescents and Transitional-Age Youth: Important Future Directions for This Line of Research. J Am Acad Child Adolesc Psychiatry. 2023 Oct 25:S0890-8567(23)02147-0. doi: 10.1016/j.jaac.2023.10.007.

3. Marijuana use before Age 18 is Highest Risk for Opioid Use Disorder

% CONTRIBUTION TO DEVELOPING OUD

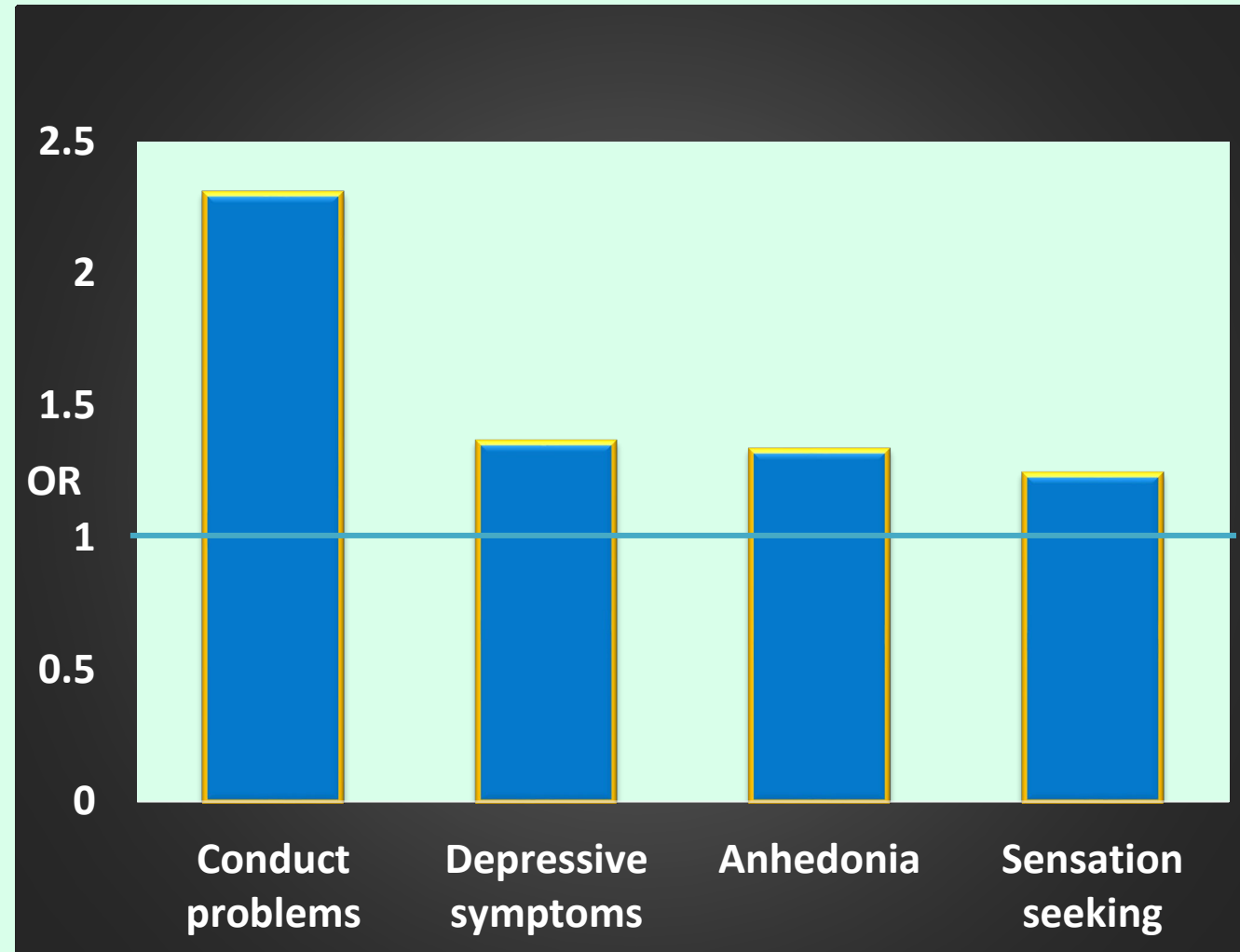
- Marijuana before 18
- Mental illness
- Drug seller encounter
- Age
- Health
- Easy access
- Income
- Education
- Employment
- Alcohol before 18
- Race
- Obesity
- Disability
- Gender
- Risk of trying heroin
- Probation
- Risk of weekly heroin
- Parole



3. Edibles and Vaporized Marijuana

Associated with Psychiatric Symptoms in Adolescents

- Psychiatric symptoms associated use of combustible, edible, vaporized marijuana
- Psychiatric symptoms higher in poly-product use



Leventhal AM, Bae D, Kechter A, Barrington-Trimis JL. Psychiatric comorbidity in adolescent use and poly-use of combustible, vaporized, and edible cannabis products. *J Psychiatr Res.* 2020;124:91-98.

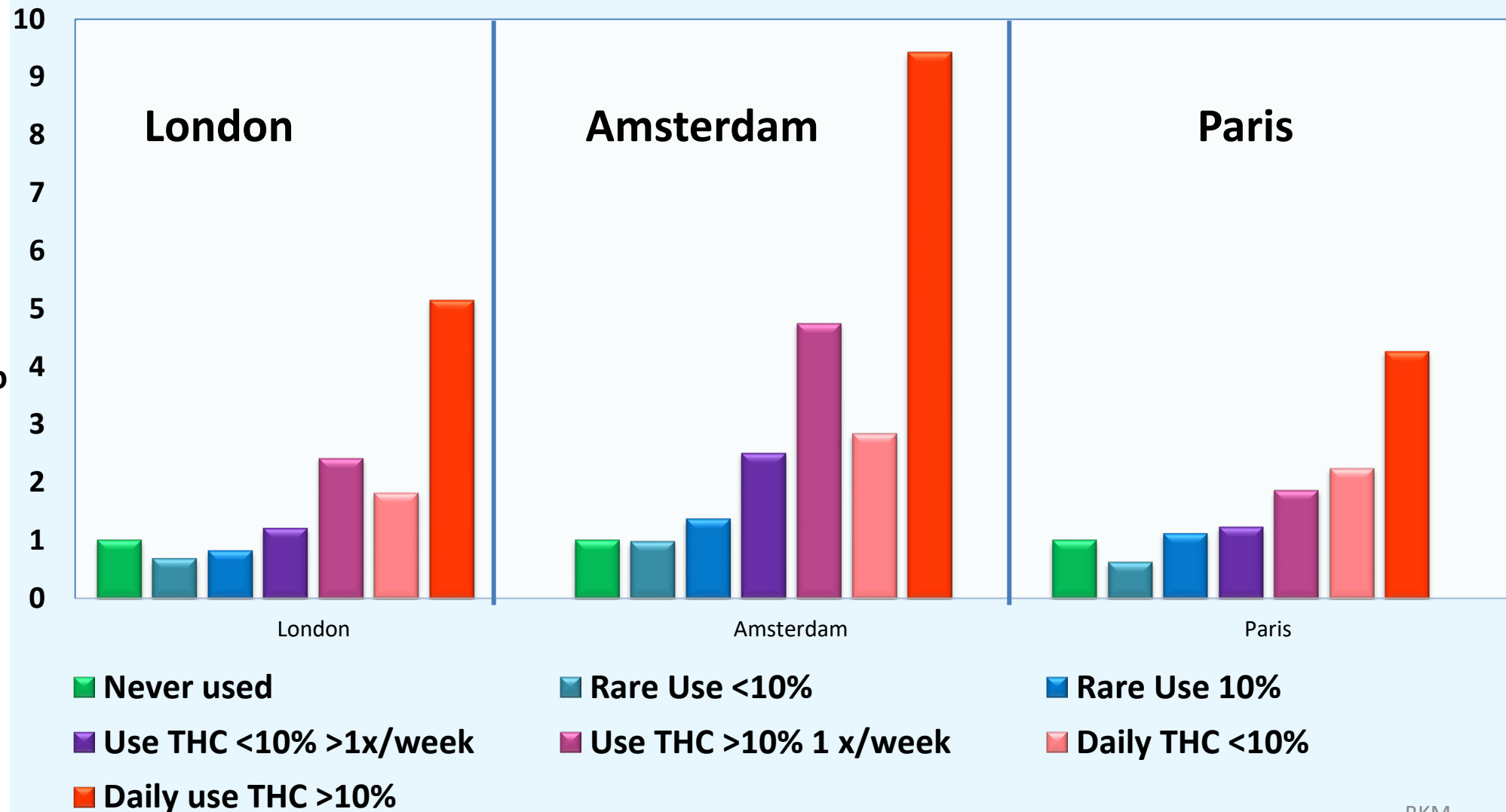
3. Mental Health: Psychosis and Schizophrenia

Marijuana Dose (%THC), Frequency of Use Increase Risk for Psychotic Disorder

3 Cities
(Actually 11 Sites)

Di Forti et al
Lancet Psychiatry 2019
May;6(5):427-436.

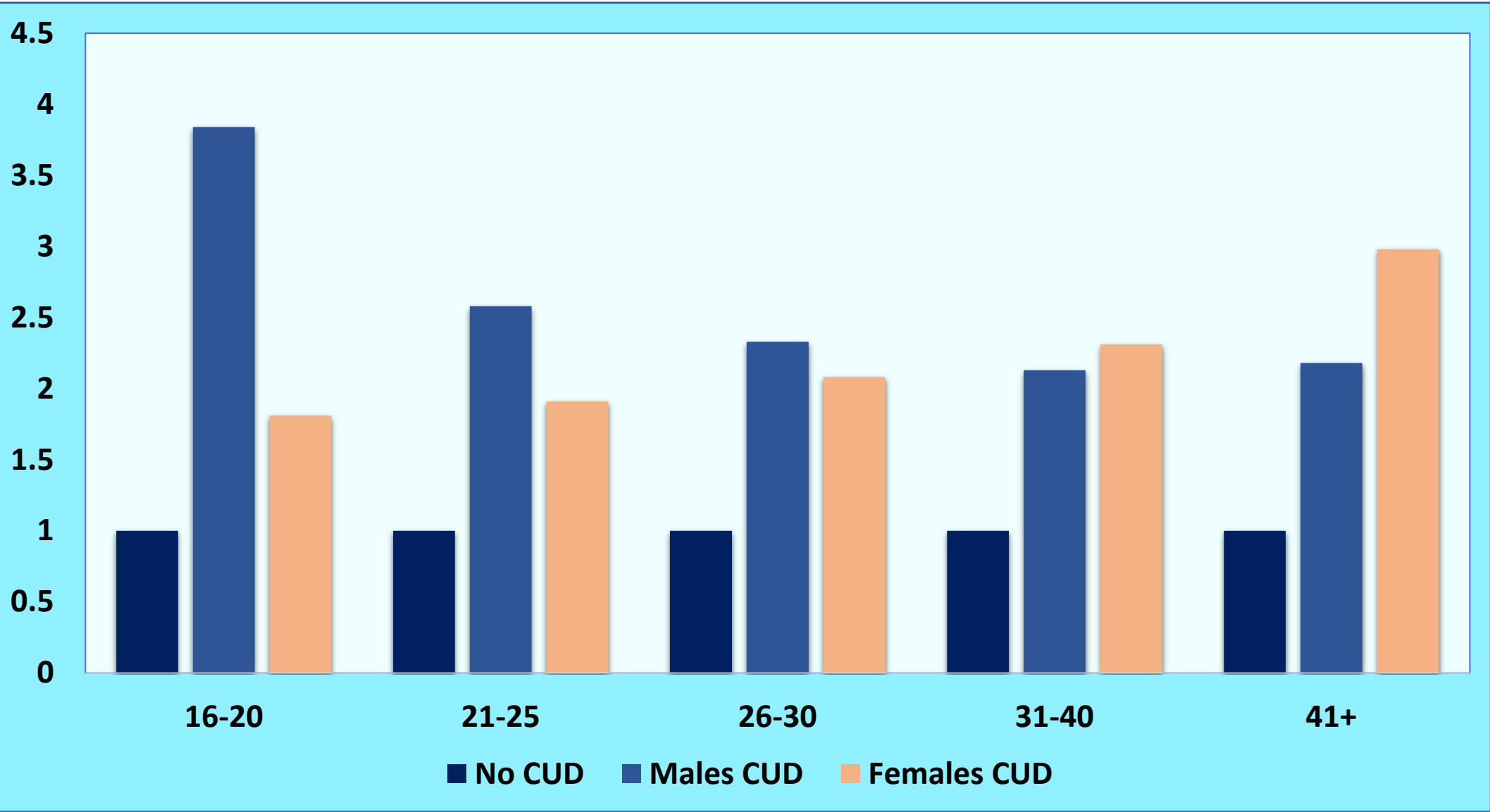
Odds ratio



Dose-response:

- van Os J, et al 2002;
- Henquet C, et al 2005;
- Moore THM et al: 2007;
- Haney and Evins, 2016;
- Marconi et al 2016;

3. Cannabis Use Disorder and Schizophrenia Association Stronger In Young Males Than Females



3. Cannabis Use Disorder and Schizophrenia Association Stronger In Young Males Than Females

- 20% of schizophrenia cases young males might be prevented by averting CUD!
- CUD-associated cases may be 25% -30% for males
- Early detection! treatment, reduce cannabis use access particularly for 16–25-year-olds

3. Increased Marijuana Use-Prevalence of Schizophrenia (Ontario, CA)

13 588 681

% CUD associated with schizophrenia

3.7% pre-legalization

10.3% post-legalization

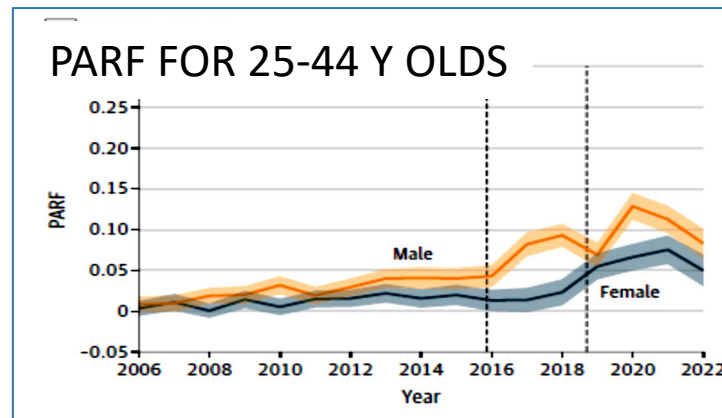
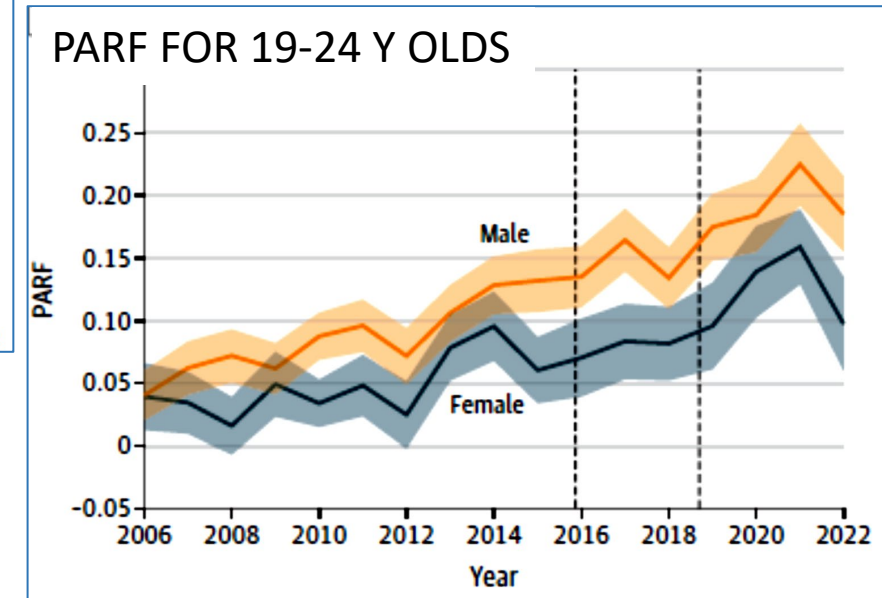
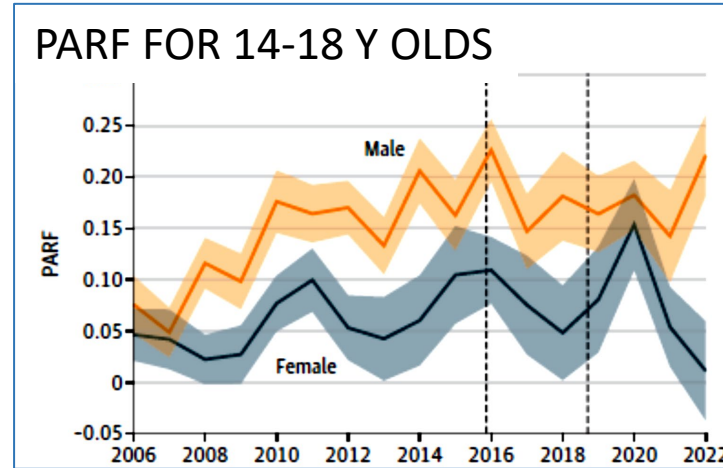
New schizophrenia cases associated with CUD

1.6% (2006)

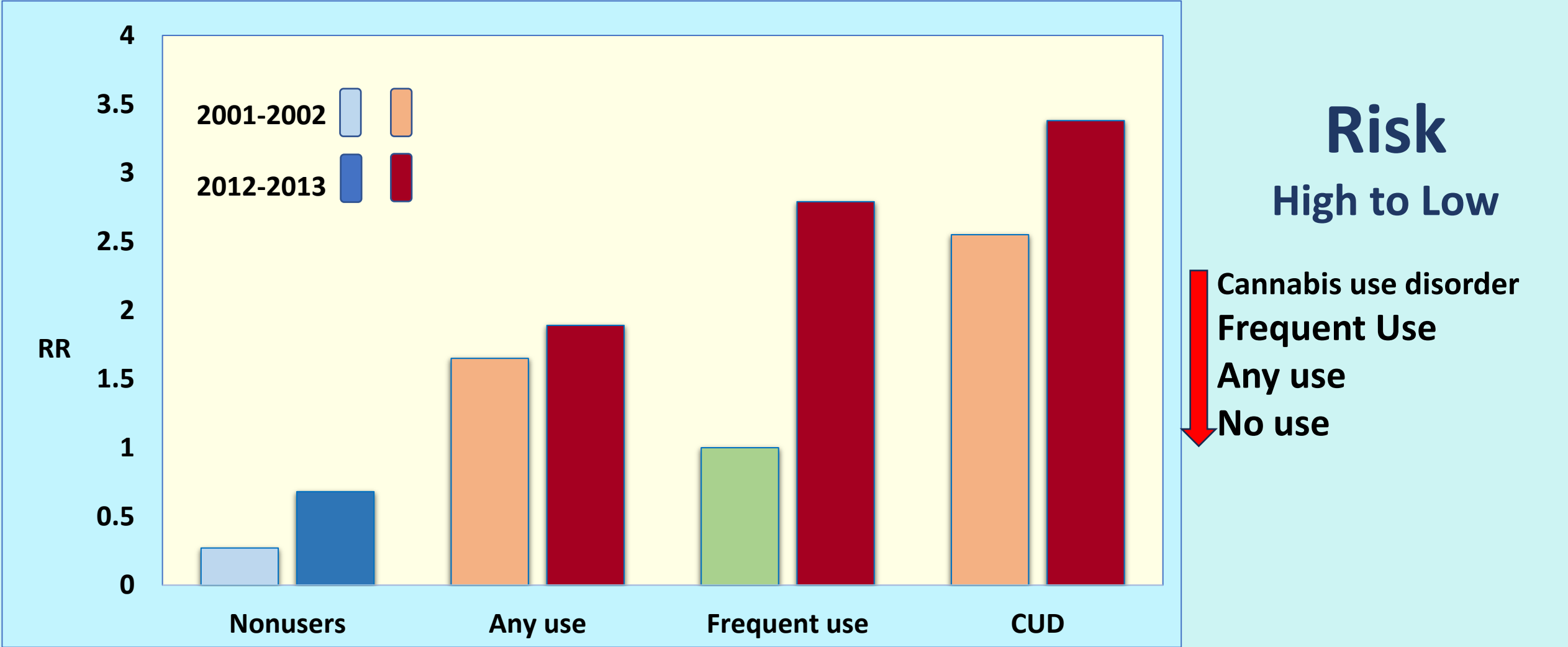
9.6% (2022)

- **Risks associated with prevalence of CUD**

Changes in Population Attributable Risk Fraction (PARF) Over Time CUD Associated with Schizophrenia



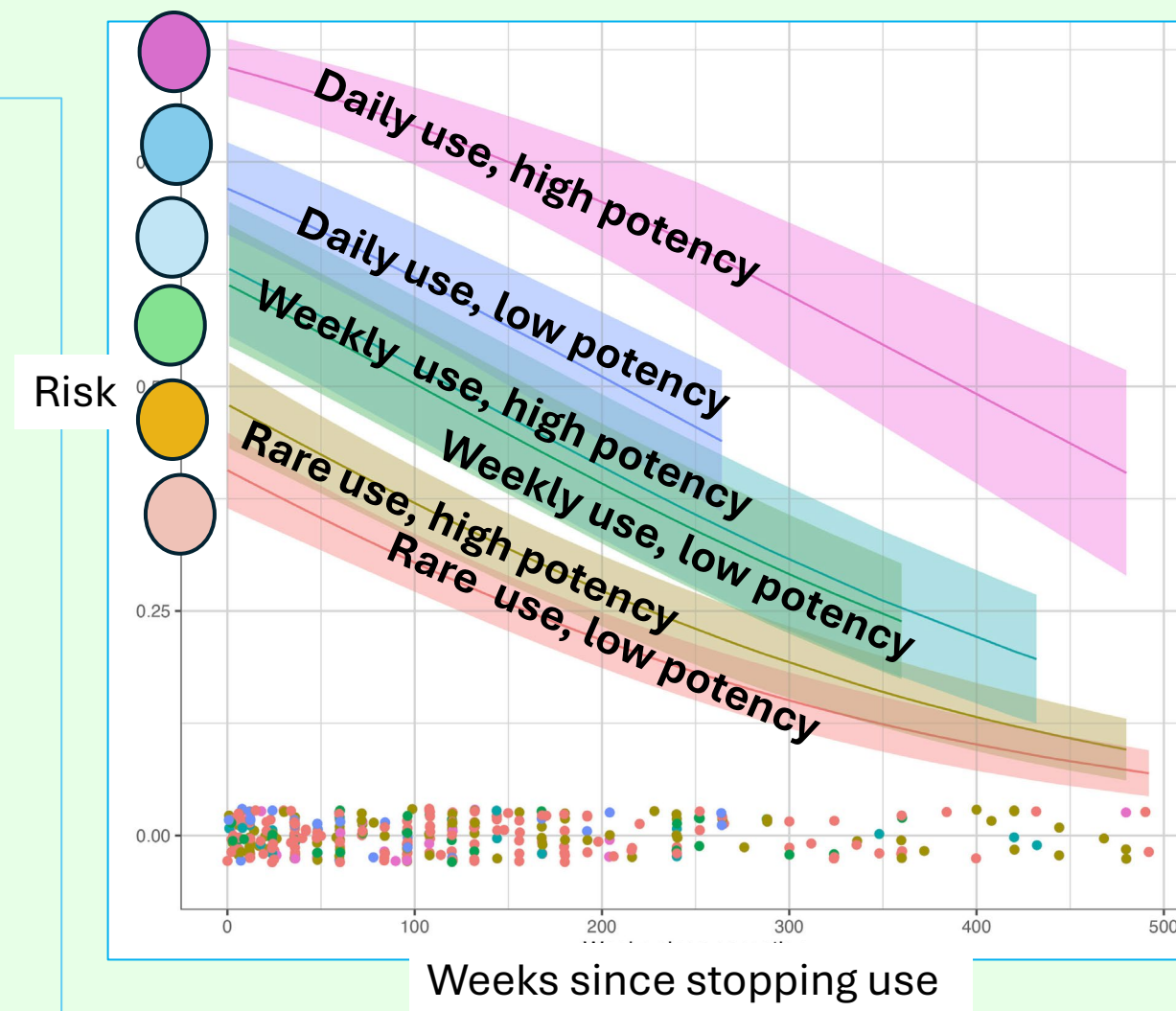
3. Rising Psychotic Disorders Associated with Marijuana Use



Livne O, Shmulewitz D, Sarvet AL, Wall MM, Hasin DS. Association of Cannabis Use-Related Predictor Variables and Self-Reported Psychotic Disorders: U.S. Adults, 2001-2002 and 2012-2013. Am J Psychiatry. 2022 Jan;179(1):36-45; Gutkind S, Fink DS, Shmulewitz D, Stohl M, Hasin D. Psychosocial and health problems associated with alcohol use disorder and cannabis use disorder in U.S. adults. Drug Alcohol Depend. 2021 Dec 1;229(Pt B):109137.

Risk of Psychotic Disorders Decreases Over Time

by: Stopping Use
Lower Potency



3. Early Adolescent Marijuana Use Associated with Young Adult Psychosis

More likely to develop a non-mood psychosis

More likely to have high psychiatric scores

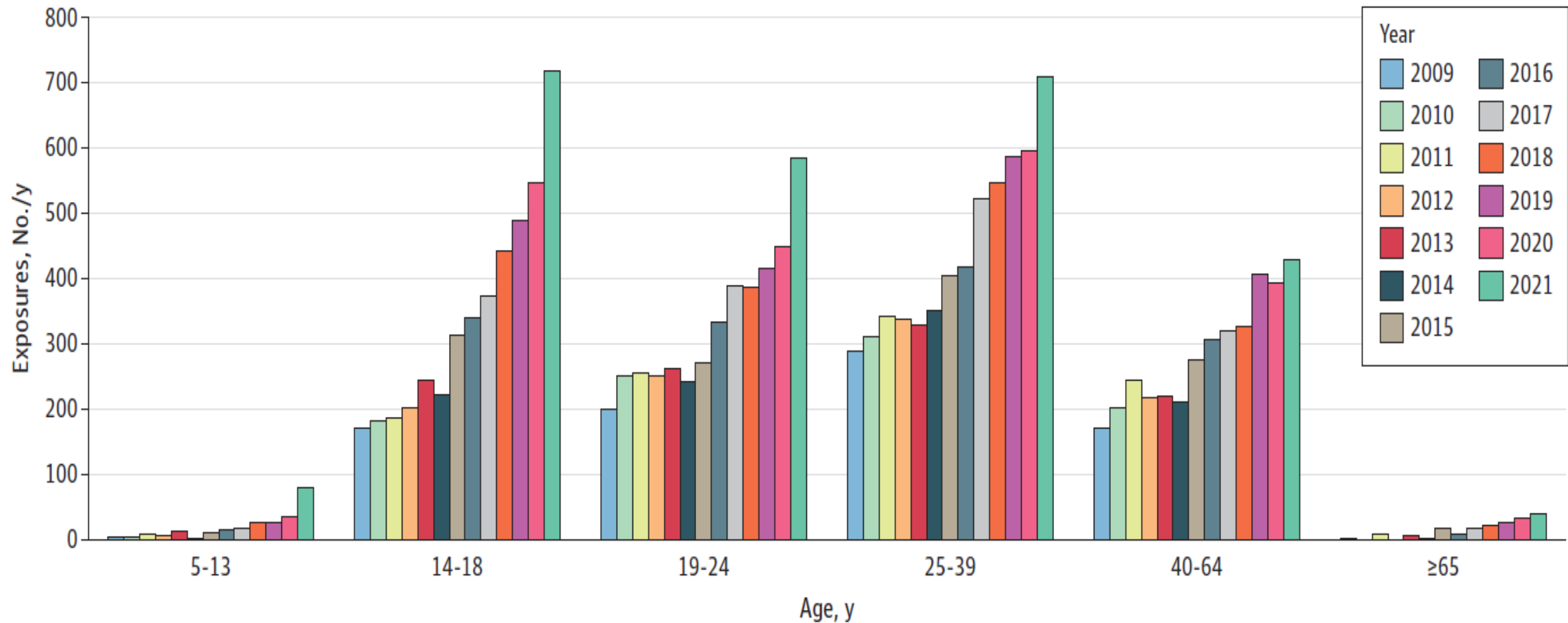
Heavy marijuana use during early adolescence

- **increases risk for schizophrenia**
- **reduces age of onset**

Psychiatric Diagnostic Interview: McGrath J, et al. Arch Gen Psychiatry. 2010 May;67(5):440-7. Arseneault et al., 2002; van Os et al, 2002; Zammit et al., 2002; Henquet et al., 2005; Stefanis et al., 2004; Rubino and Parolaro, 2008; Konings et al., 2008; Andreasson et al., 1987; Moore et al, 2007

3. Suspected Cannabis Suicide Exposures

. Annual Numbers of Intentional, Suspected Suicidal Cannabis Exposures Reported to US Poison Centers, by Age Group, January 1, 2009, to December 31, 2021



Graves JM, Dilley JA, Klein T, Liebelt E. Suspected Suicidal Cannabis Exposures Reported to US Poison Centers, 2009-2021. JAMA Netw Open. 2023 Apr 3;6(4):e239044. doi: 10.1001/jamanetworkopen.2023.9044. PMID: 37074718; PMCID: PMC10116359.

4. Function

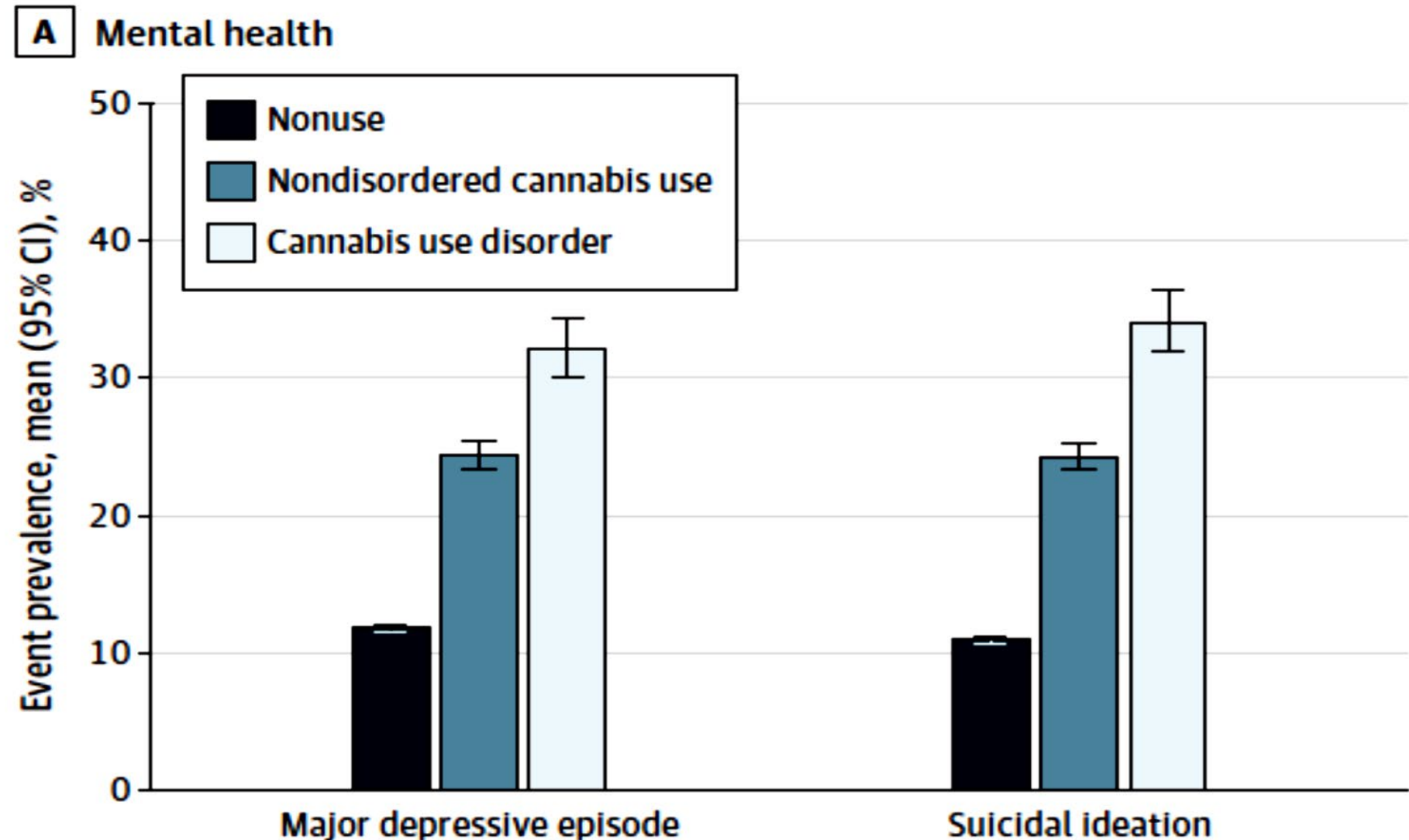
4. Psychosocial function: nonusers, moderate users, CUD

Adverse psychosocial events was greatest for adolescents with CUD >NDCU >nonuse

CUD: 1675 (2.5%)

NDCU: 6971
(10.2%)

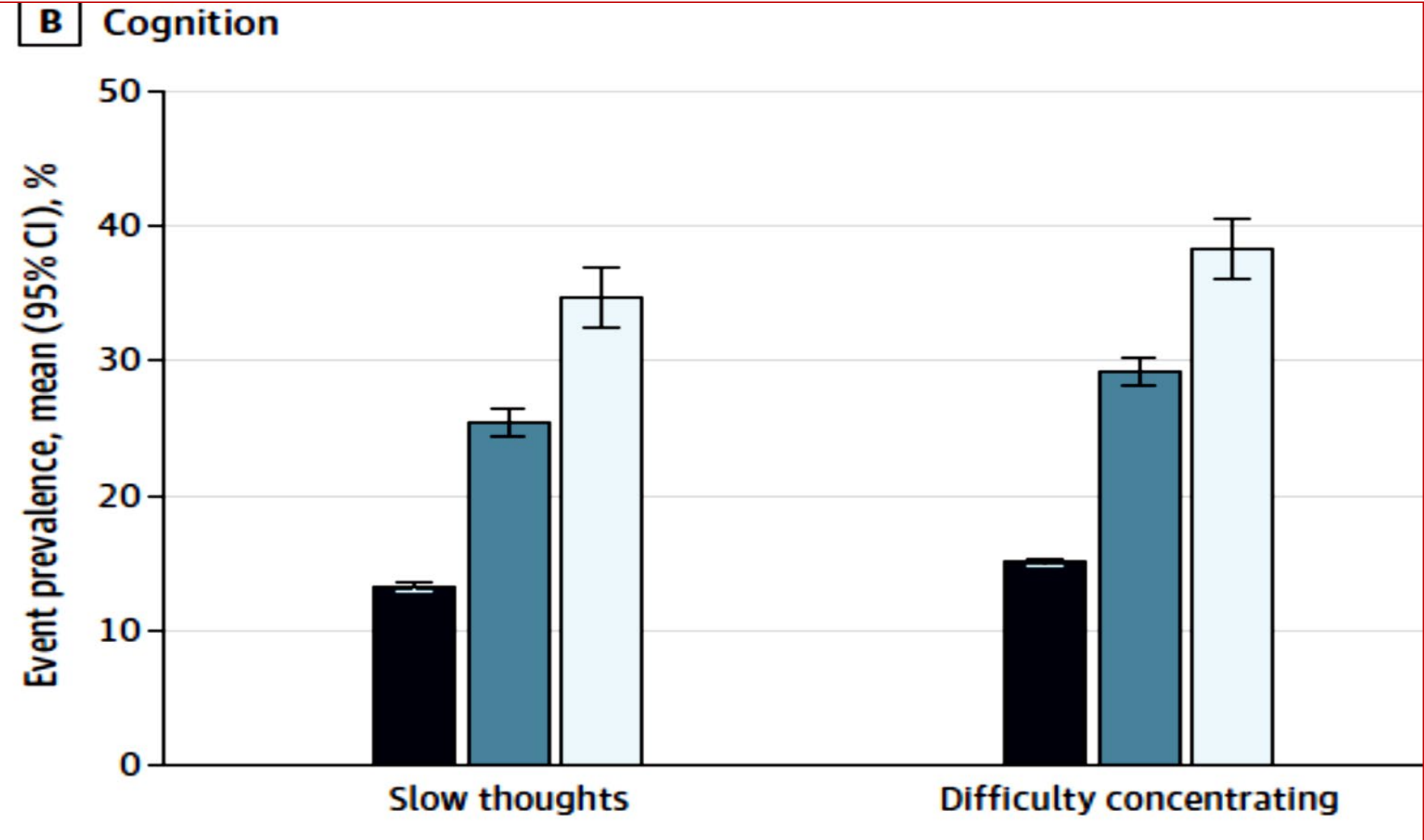
No use: 59,617
(87.3%)



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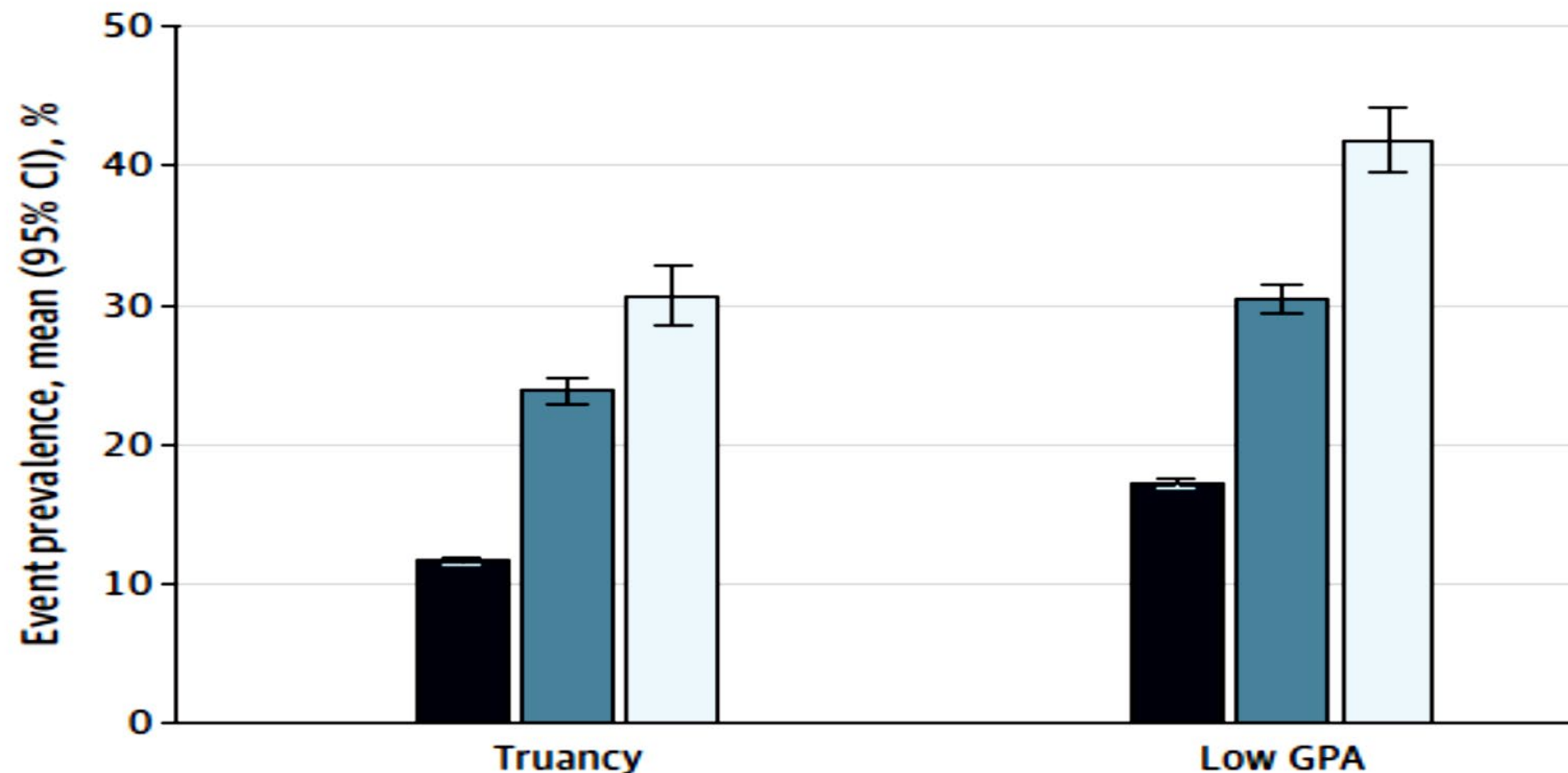
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C Academic performance



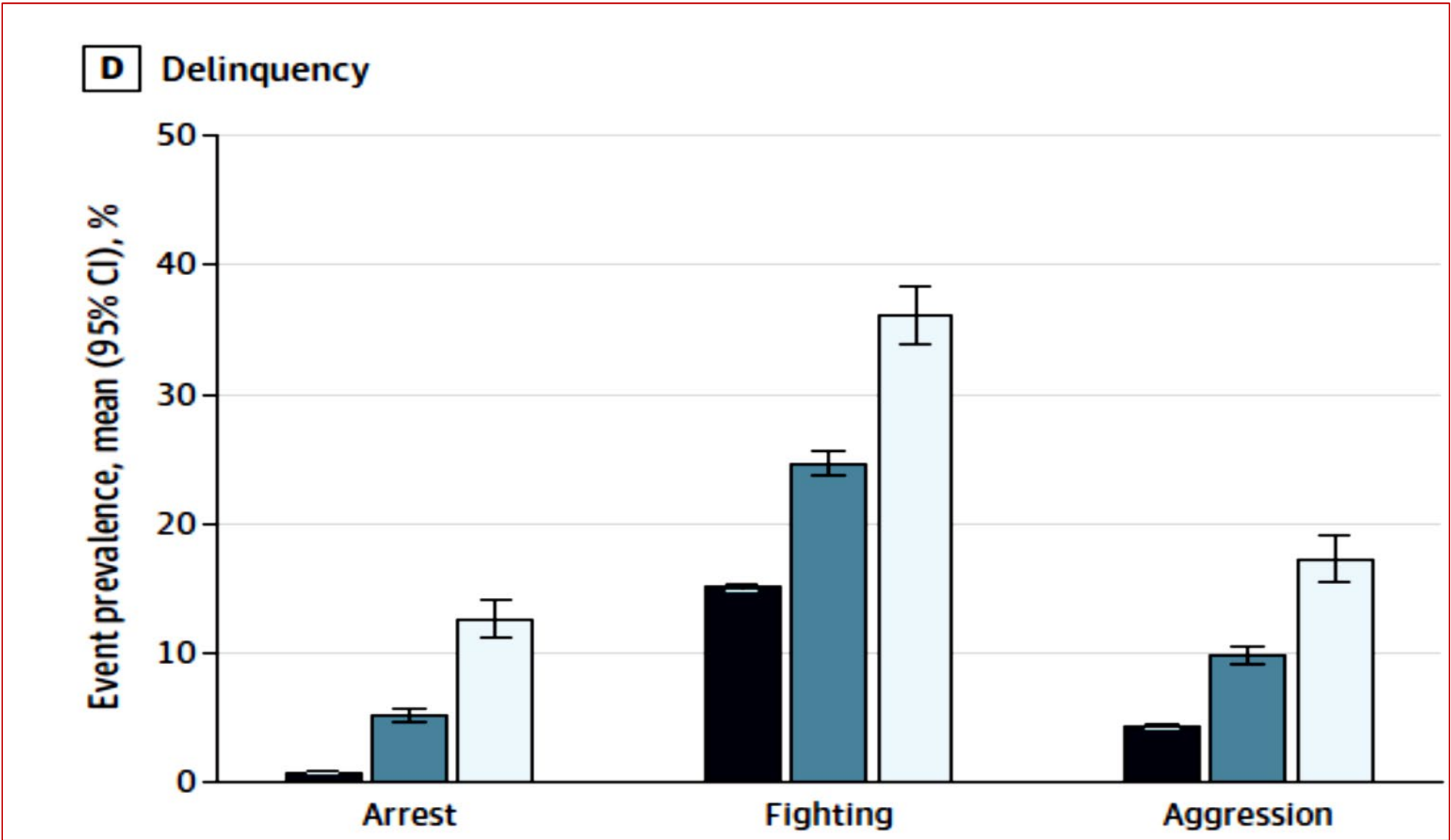
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4. Adolescent Marijuana Use-Academic Achievement

MORE LIKELY

School Absenteeism

School Dropout

Unemployment

LESS LIKELY

Enroll University

Post secondary degree

Higher School Grades

Complete High School

Added Risks

- Younger age
- More Use

Compared with adolescent alcohol use, marijuana use associated with worse educational outcomes

4. I.Q. Adolescent Marijuana Use: Is 8-point Decline in I.Q. Significant?

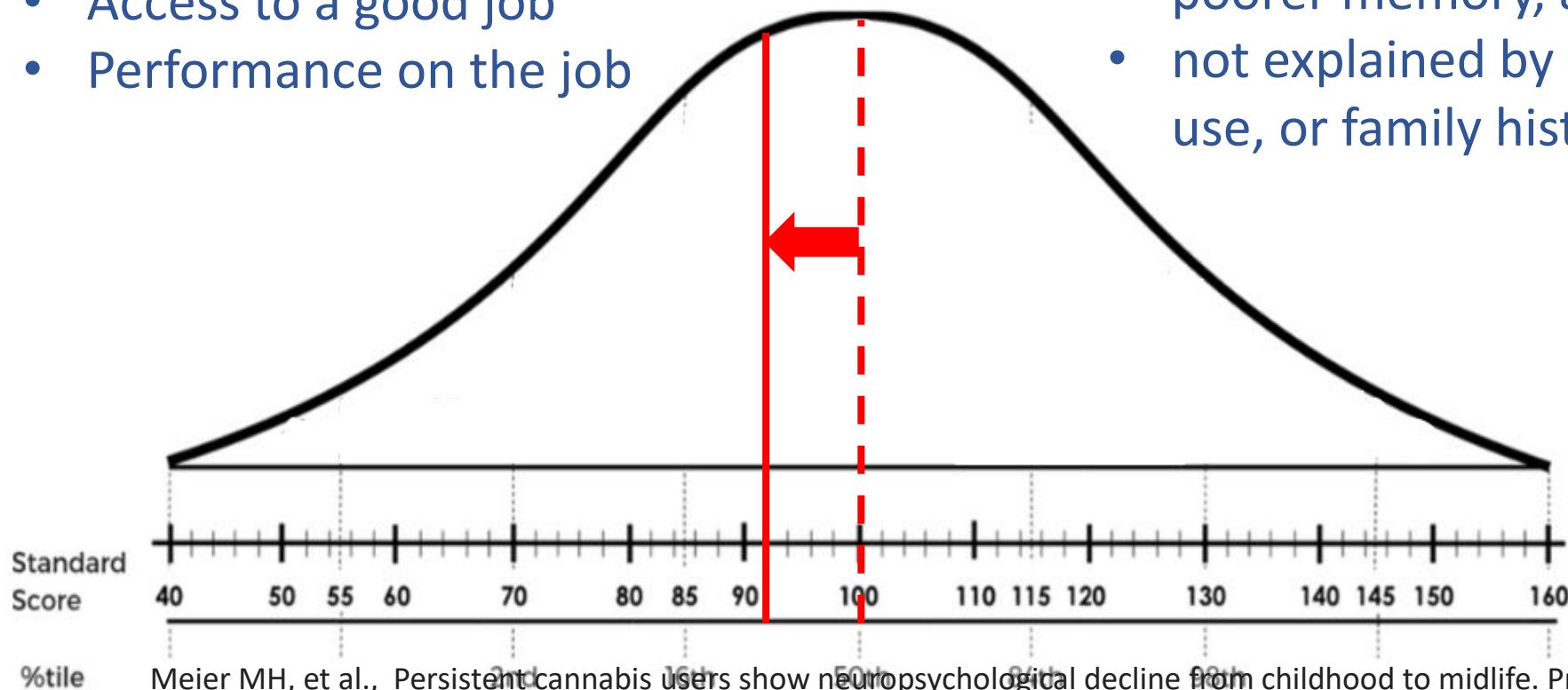
An 8-pt IQ loss drops a person with average IQ from the 50th to the 29th percentile

I.Q. Predicts

- Access to university education
- Lifelong total income
- Access to a good job
- Performance on the job

Dunedin study

- persistent cannabis users
- had less skilled jobs than their parents
- poorer memory, attention
- not explained by tobacco, alcohol, illicit drug use, or family history of SUD

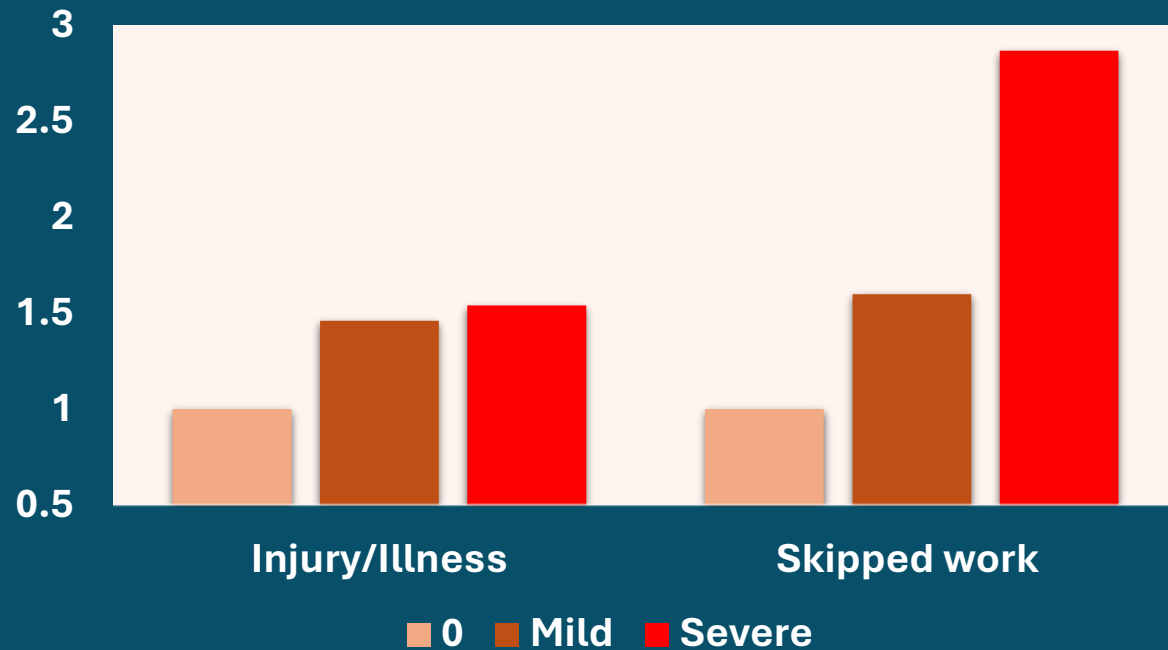


Slide Courtesy of Dr. M. Meier

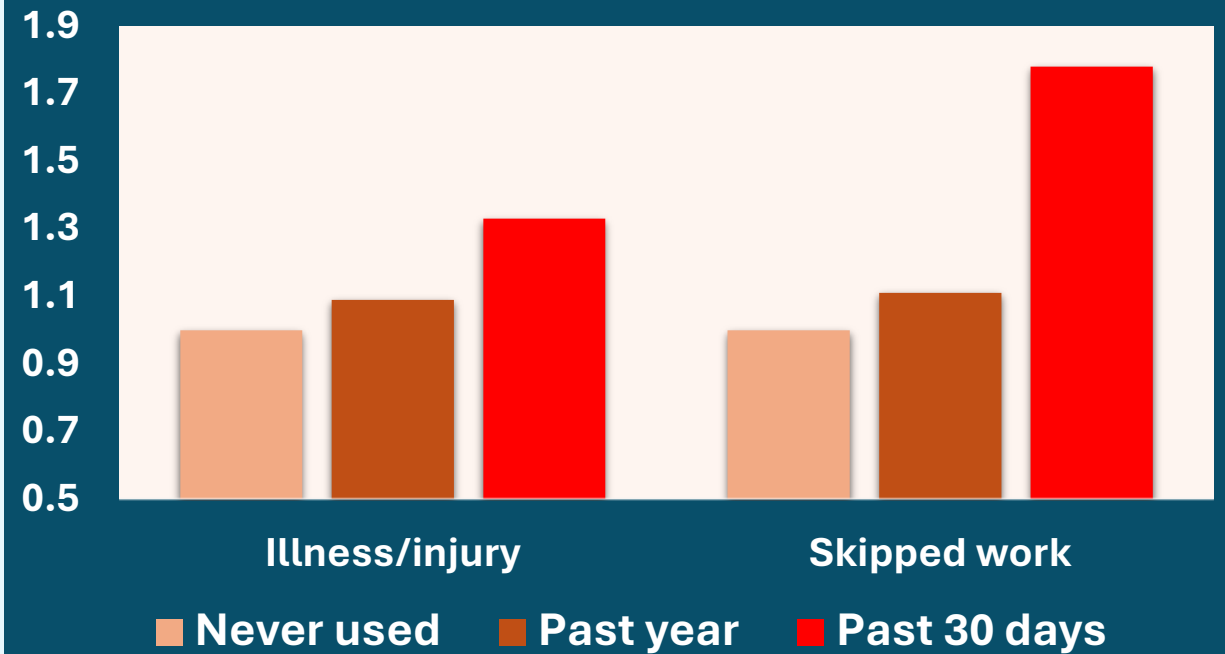
Meier MH, et al., Persistent cannabis users show neuropsychological decline from childhood to midlife. Proc Natl Acad Sci U S A. 2012 Oct 2;109(40):E2657-64. Meier t al., Long-Term Cannabis Use and Cognitive Reserves and Hippocampal Volume in Midlife. Am J Psychiatry. 2022 May;179(5):362-374.

4. Marijuana Use and the Workplace

Absenteeism: Cannabis Use Disorder



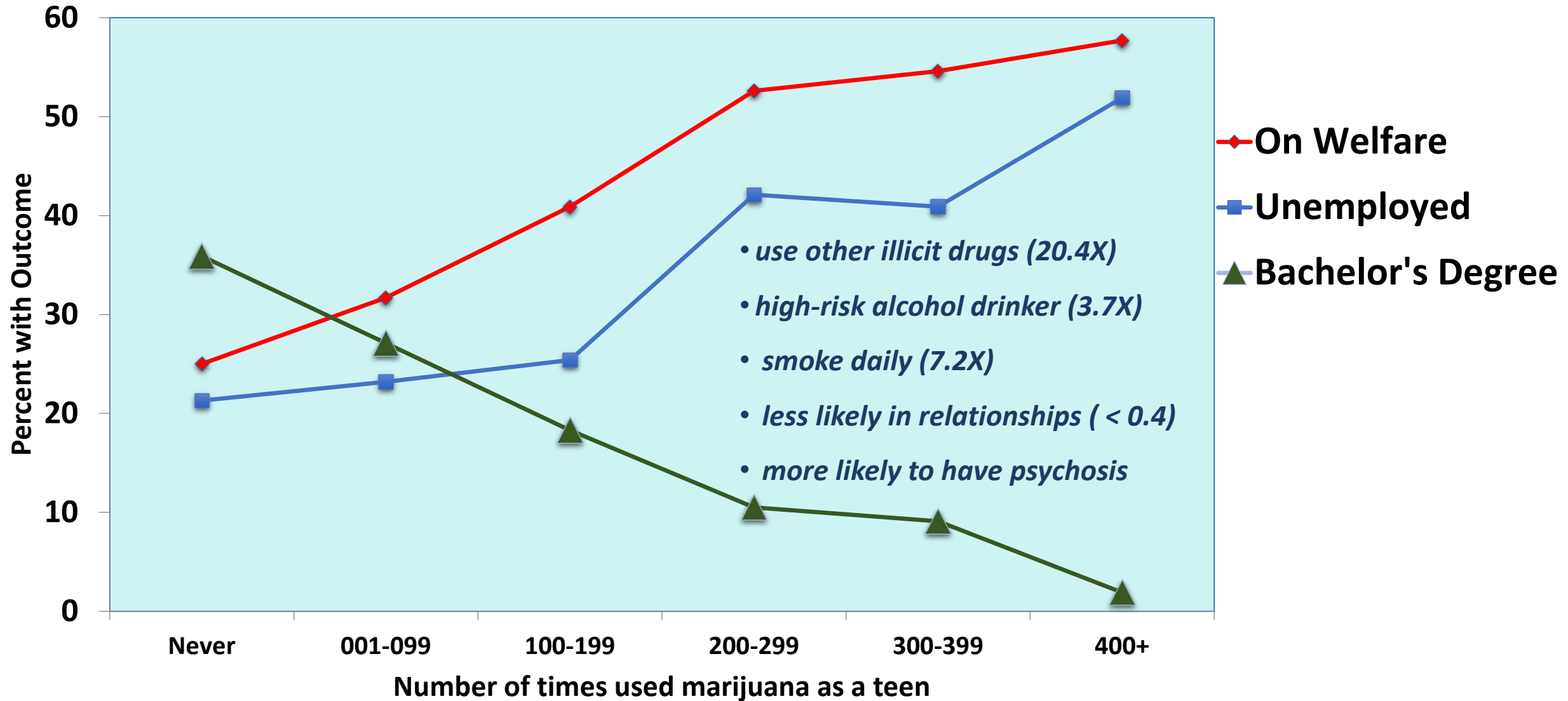
Absenteeism: Days of cannabis use



Yang KH, Mueller L, El-Shahawy O, Palamar JJ. Cannabis Use, Use Disorder, and Workplace Absenteeism in the U.S., 2021-2022. Am J Prev Med. 2024 Dec;67(6):803-810. doi: 10.1016/j.amepre.2024.07.021.

5. Long term

5. Teen Marijuana Use Affects Adult Motivation, Drug Use



Source: Fergusson and Boden , *Addiction*, 103, pp. 969-976, 2008; Chan et al., Young-adult compared to adolescent onset of regular cannabis use: A 20-year prospective cohort study of later consequences. *Drug Alcohol Rev* 2021; 18 - 63 studies Kiburi SK, Cannabis use in adolescence and risk of psychosis: Are there factors that moderate this relationship? A systematic review and meta-analysis. *Subst Abus.* 2021 Feb 22:1-25.

5. Adolescent Cannabis Use Associated with more Substance Use, Problems Later in Life

(longitudinal; 15-35 years; n=1792)

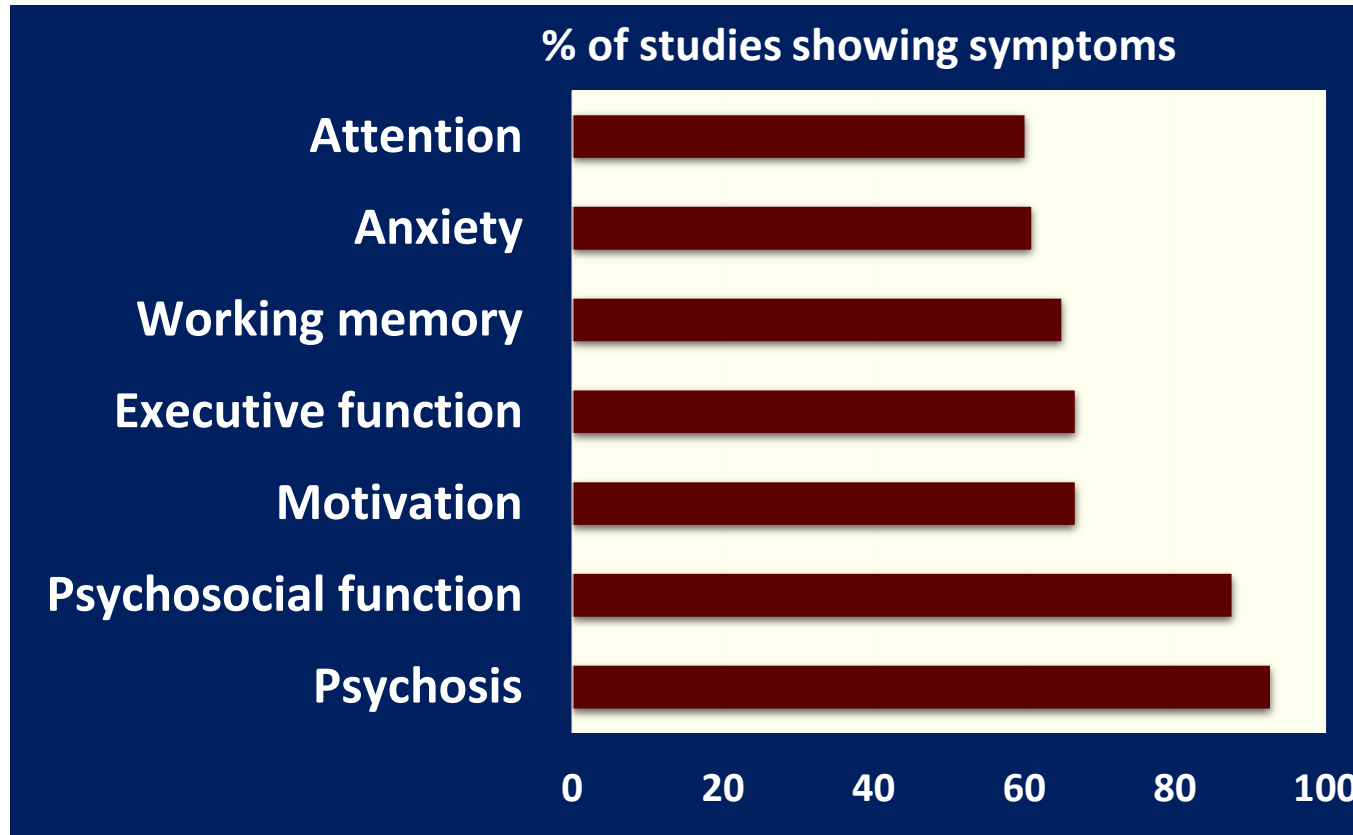
By mid-30s, young-adult, adolescent-onset regular users more likely than minimal/non-users (63.5%) to:

- *have used other illicit drugs (**OR > 20.4**)*
- *be a high-risk alcohol drinker (**OR > 3.7**)*
- *smoked daily (**OR > 7.2**)*
- *less likely to be in relationships (**OR < 0.4**)*
- *If began regular use in teens, poorer later life outcomes than non-users*

5. Marijuana Adverse Outcomes in Adults

No Pre-existing Medical Or Psychiatric Disorder

Frequency Found in Studies



Contributors:

- **Age of onset (worse if use starts before age 15)**
- **Frequency of Use**
- **Potency (THC Content)**
- **Cumulative amounts used**

Sorkhou M, Bedder RH, George TP. The Behavioral Sequelae of Cannabis Use in Healthy People: A Systematic Review. Front Psychiatry. 2021 Feb 16;12:630247. Fontes MA, Bolla KI, Cunha PJ, Almeida PP, Jungerman F, Laranjeira RR, Bressan RA, Lacerda AL. Cannabis use before age 15 and subsequent executive functioning. Br J Psychiatry. 2011 Jun;198(6):442-7.

Adolescent Marijuana Users Susceptibility

Brain changes

- Molecular Cellular, Anatomical, Circuitry, Functional

Addiction

- Much higher in teens

Deficits in cognition, function

- Impaired learning, memory, Poor school performance, IQ decline, Poor driving skills

Amotivation

- School dropout
- Lower educational employment achievement

Psychiatric symptoms

- Psychosis, schizophrenia
- Depression, anxiety, suicidality, sleep problems

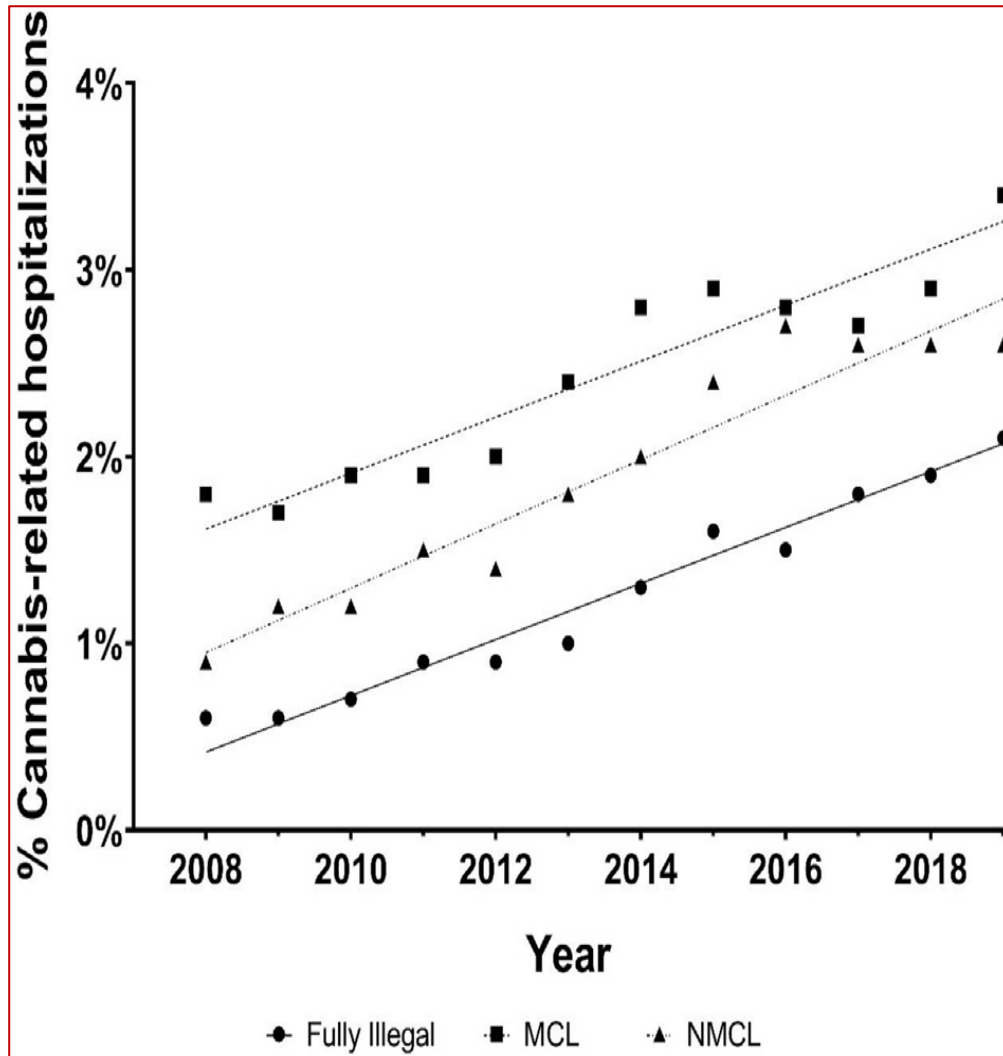
Long term life outcomes

- Poorer function, social connectedness; Poorer life satisfaction; More mental health, health problems; More substance use disorders; More financial instability

Adolescent Marijuana Use and Physical Health



Cannabis-based Hospitalizations



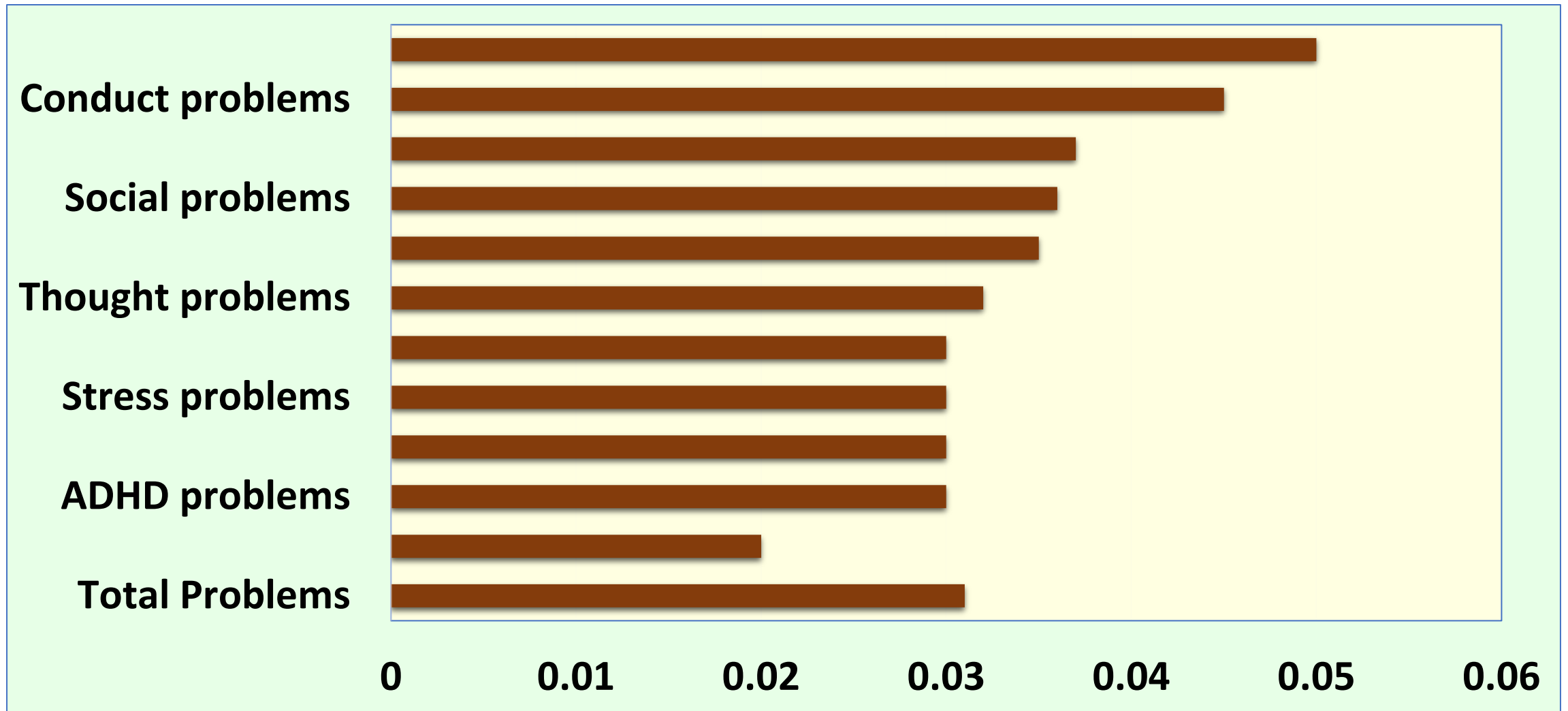
- Cannabis-related adolescent hospitalizations at children's hospitals increasing
- Increase post-legalization in states NMCLs
- Need to identify, intervene, treat at-risk adolescents in hospital-based setting

6. Prenatal

THC in Marijuana Interferes with Developing Fetal Brain

- **Changes signaling systems**
- **Creates mistakes in neuron migration**
- **Reorganizes circuitry**
- **Changes neuron type**

Prenatal Marijuana Exposure: Mental Health Burden of Children Exposed, Compared with Non-exposed



Baranger DAA, Paul SE, Colbert SMC, Karcher NR, Johnson EC, Hatoum AS, Bogdan R. Prenatal Cannabis Exposure Associated with Mental Health Burden From Childhood to Early Adolescence: Adolescent Brain Cognitive Development (ABCD) Study JAMA Pediatr. 2022 Sep 12:e223191.

Summary: Prenatal Marijuana Exposure

Brain Changes

- Signaling system
- Cell growth, migration errors
- Cortical circuitry changes
- Nerve cell changes
- White grey matter lower

At Birth

- Preterm
- Small head
- Low weight
- NICU

Deficits functional

- Attention
- Thinking
- Cognition

Social Problems

Psychosis proneness

Sleep Problems

Methamphetamine

- Forms and routes
- Immediate effects
- Consequences
- Long term consequences

Meth: Positive and Negative Effects

POSITIVES

Euphoria, “rush”
Alertness
Wakefulness
Antifatigue
Confidence
Hyperactivity
Loss Of appetite

HIGHER DOSES

Agitation, Confusion,
Anxiety, Irritability,
Dysphoria, Violent
Behavior, Impaired
Motor, Cognition

CRASH

Intense Fatigue
Sleepiness

Depression

Motor Impairments
Sleep disruption

Aggression
Talkative
Restlessness

Psychotic
symptoms
Auditory
Hallucinations,
Delusions

Addiction

Methamphetamine Overdose

Arrhythmia

Hyperventilation

Extreme Hyperthermia

Muscle pain

**Biphasic changes in
arterial blood pressure**

**Coma, death from
heart attack or stroke**

Consequences of Methamphetamine

Behavioral, Neuropsychiatric Disorders

- Addiction
- Toxicity
- Cognitive function
- Meth-induced psychiatric disorders

Vascular Toxicity

- Brain, heart, liver, kidney, eyes
- Common cause of heart failure
- Strokes in young people

Santo et al Int. J. Drug Policy,. 2024; Ekhtiari et al., September 3, 2024; <https://doi.org/10.1101/2024.09.02.24312084> medRxiv preprint; Roy et al., Addiction Biology, 2024; To et al., Cureus, 2024; Ramli et al., Intern. J. Medical Sci. 2025; Hemphill et al., Frontiers in Neurology, 2024; Coffin and Suen NEJM Evid. 2023 December ; 2(12): EVIDra2300160. doi:10.1056/EVIDra2300160; Vincent and Shuklla, *Current Neuropharmacology*, 2024, 22, 2113-2156.

Chronic METH use: Behavioral Consequences

Methamphetamine Use Disorder

Cognitive impairment

Anxiety or depression

Violent behavior (often risk-taking)

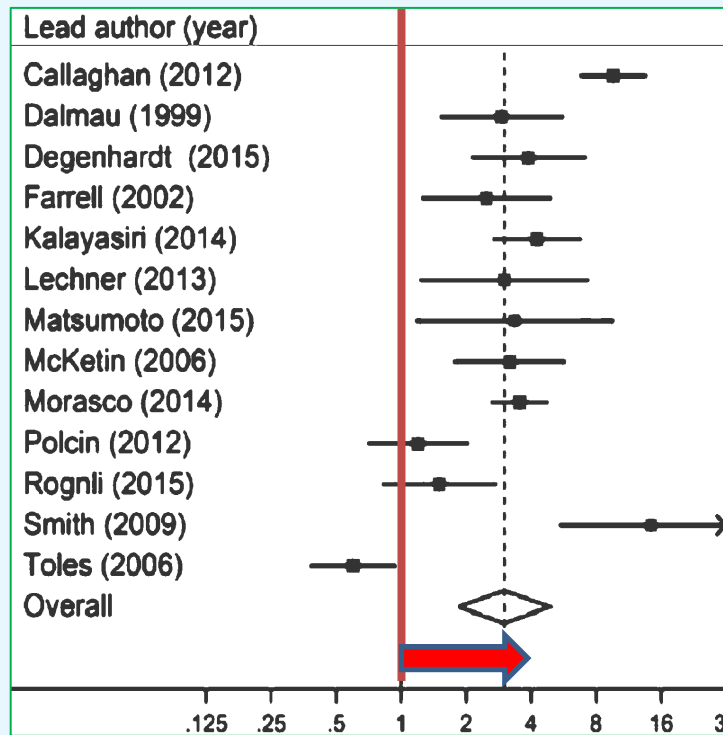
Insomnia

Repetitive movements(stereotypy)

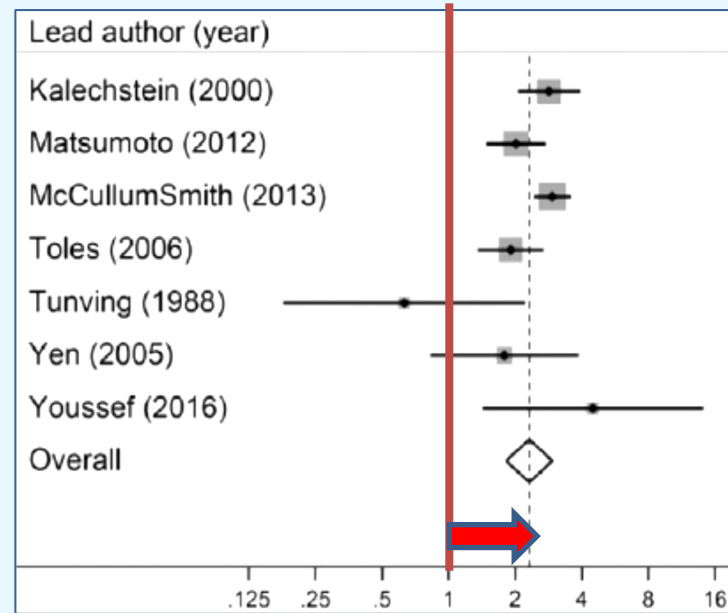
Psychosis

Amphetamines Use Disorder: Global Outcomes

Psychosis



Suicide

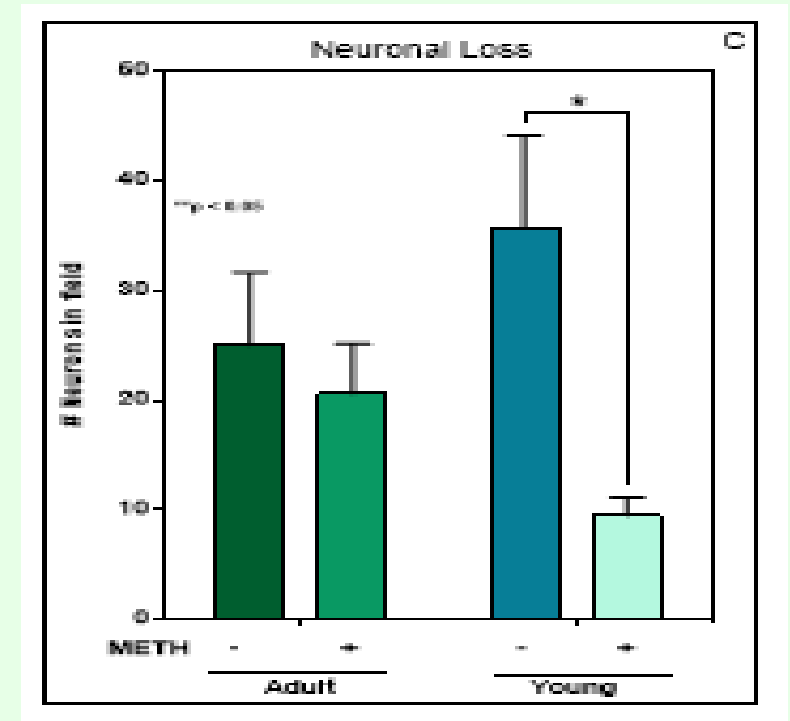
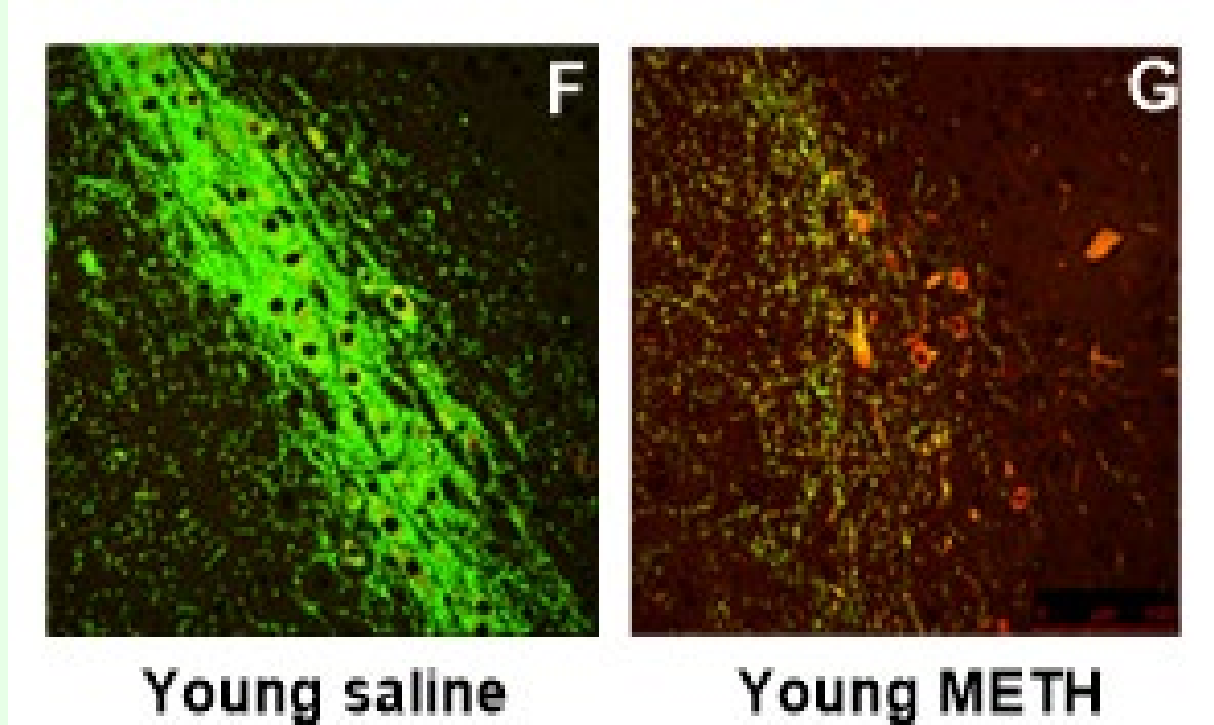


Violence



McKetin R, Leung J, Stockings E, et al. Mental health outcomes associated with of the use of amphetamines: A systematic review and meta-analysis. *EClinicalMedicine*. 2019;16:81–97. Published 2019 Oct 17.

Methamphetamine is More Toxic to Dopamine Neurons in Adolescent than Adult Brain (mouse)



- Daily methamphetamine destroys dopamine neurons (nerve cells)
- More neuron lost in meth-treated adolescent mice than adult mice
- **Does this have implications for human methamphetamine users?**

Methamphetamine and Parkinson's Disease

Methamphetamine use associated (but rare) with

- increased risk for Parkinson's disease, parkinsonism
- premature development of Parkinson's disease

Prevalence of Parkinson's disease, parkinsonism

- greater in meth users
- greater in people who previously used methamphetamine

Meth Actions in the Body

BRAIN

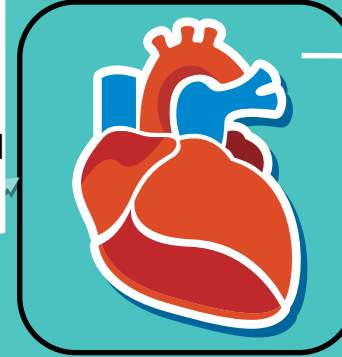
Psychosis
Cognitive impairment
Dizzy, seizures
Hemorrhage
Loss of appetite
Headaches
Blurred vision
Addiction
Parkinsonism



Dose-dependent
hyperthermia
BBB compromised
Fever sweating

HEART

Increased heart rate
Vasoconstriction
Chest pains
Arrhythmias
Infarct



TEETH

Decay



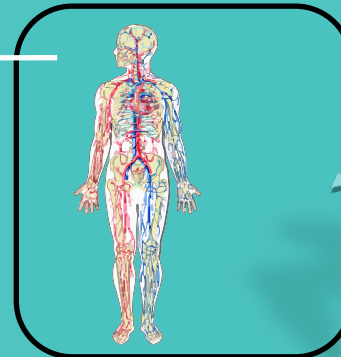
Stomach

Cramps
Nausea
Vomiting



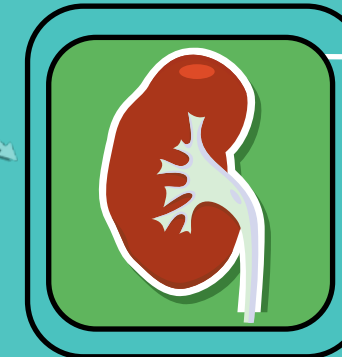
IMMUNE SYSTEM

Infectious diseases
(HIV, HepC)



KIDNEY

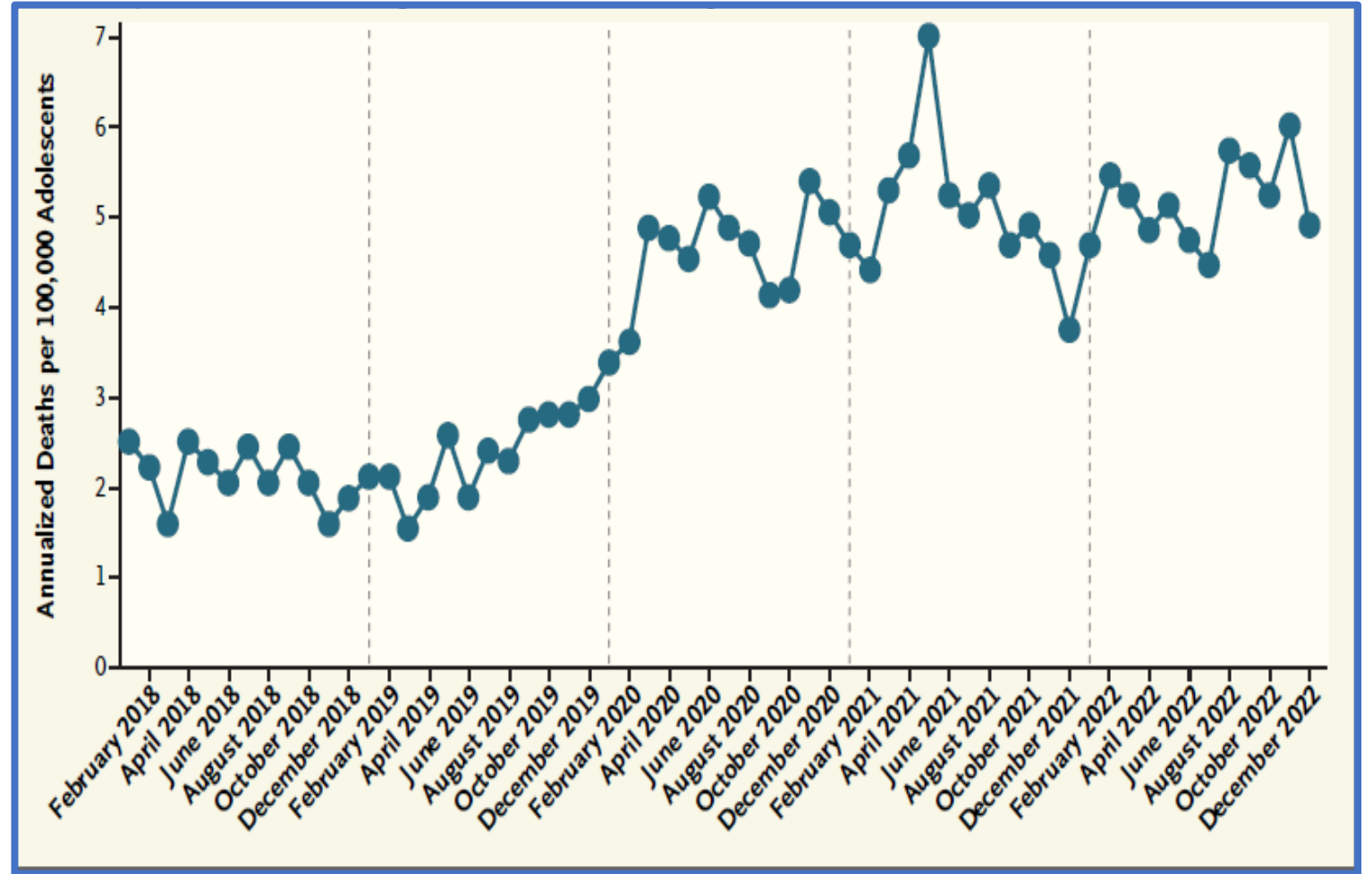
Dysfunction
Renal failure



Consequences of Opioids

- Addiction
- Overdose
- Brain damage
- Infections
- Infectious diseases
- Overdose and Death

Overdose Deaths Rising 14-18 years



Friedman J, Hadland SE. The Overdose Crisis among U.S. Adolescents. N Engl J Med. 2024 Jan 11;390(2):97-100.

Wishful Thinking: The Oregon Decrim. Experiment

Decriminalize or legalize all drugs

- Measure 110 Drug Policy Alliance major backers; rebuke to War on Drugs

Remove criminal penalties

- small possession amounts (meth, heroin, cocaine, fentanyl)

Reduce harm

- that drugs cause to their users

Allocate >\$250 million

- to naloxone distribution, employment, housing, voluntary treatment

End penalties, reduce stigma of drug use

- users to access harm-reduction services (remove shame or fear to seek treatment)

Belief

- Surge of help-seeking, reduce drug-overdose deaths, racial disparities in health, criminal-justice systems, lower rates of incarceration, safer neighborhoods

The Reality: The Failed Oregon Experiment

It did not reduce Oregon's drug problems; they got worse: Gov. Kotek repealed 110 April 1, 2024

Touted as racial-justice policy

- support for repeal was especially strong among African Americans and Hispanics

Drug overdose deaths 2021

- increased 43%, year one of implementation; kept rising

Sept 2022-2023, overdose deaths

- rose 41.6%, highest among all states; national average

Help-seeking

- Failure: \$100 ticket for drug possession (no criminal penalties), fine waived if called a toll-free number for a health assessment to encourage treatment; > 95% ignored the ticket without consequence.

Open-air drug market, violent crimes

- flourished and rose dramatically

Gentle pressure to seek treatment

- Ineffective; most people enter treatment via pressure from family, friends, employers, health professionals, the law. Pressure was eliminated

Solutions to Drug Use, Addiction

Prevention Intervention

- Universal
- Activities
- School
- Family
- SBIRT
- PARENTS

Treatment

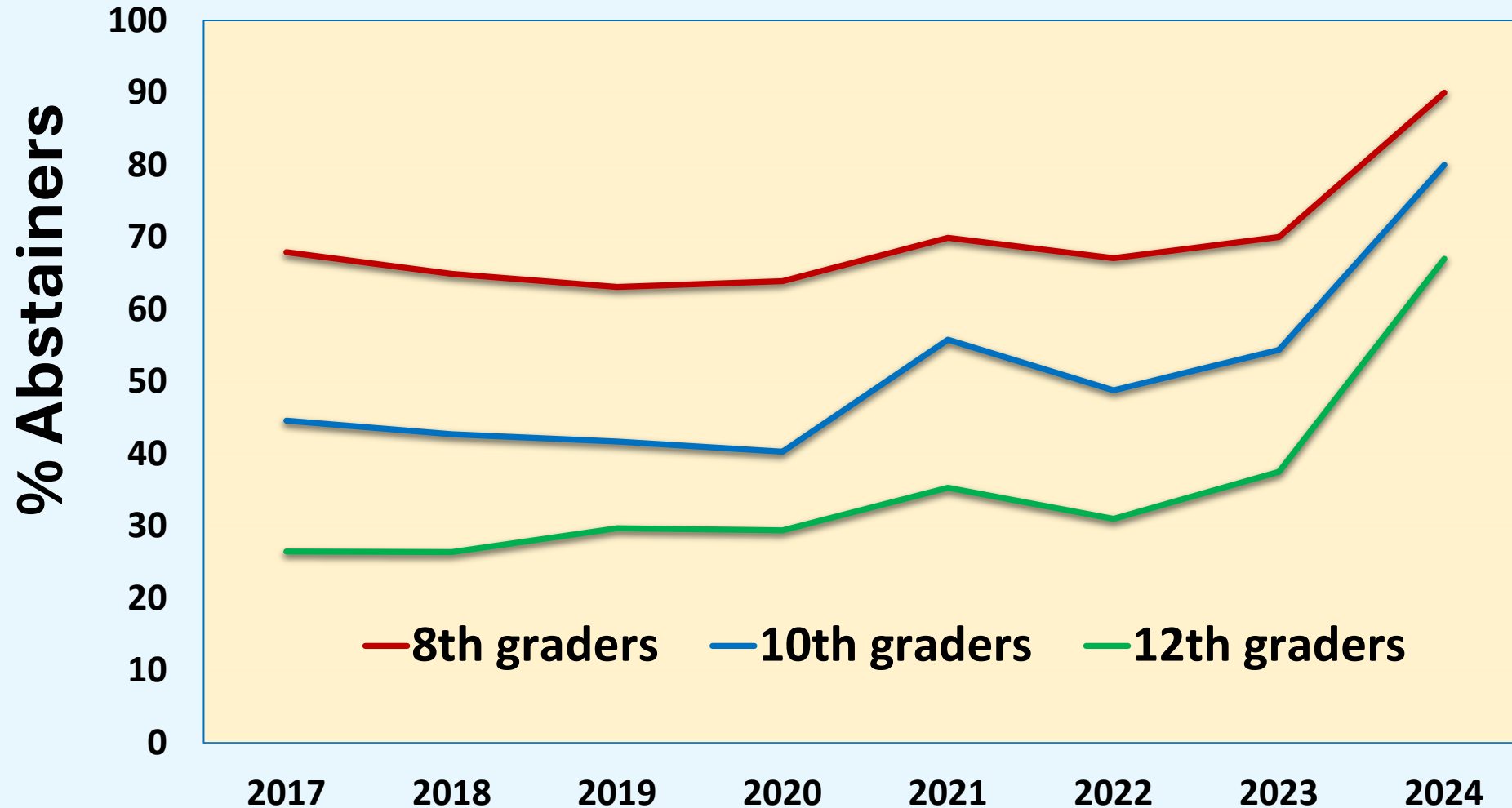
Law Enforcement

Interdiction

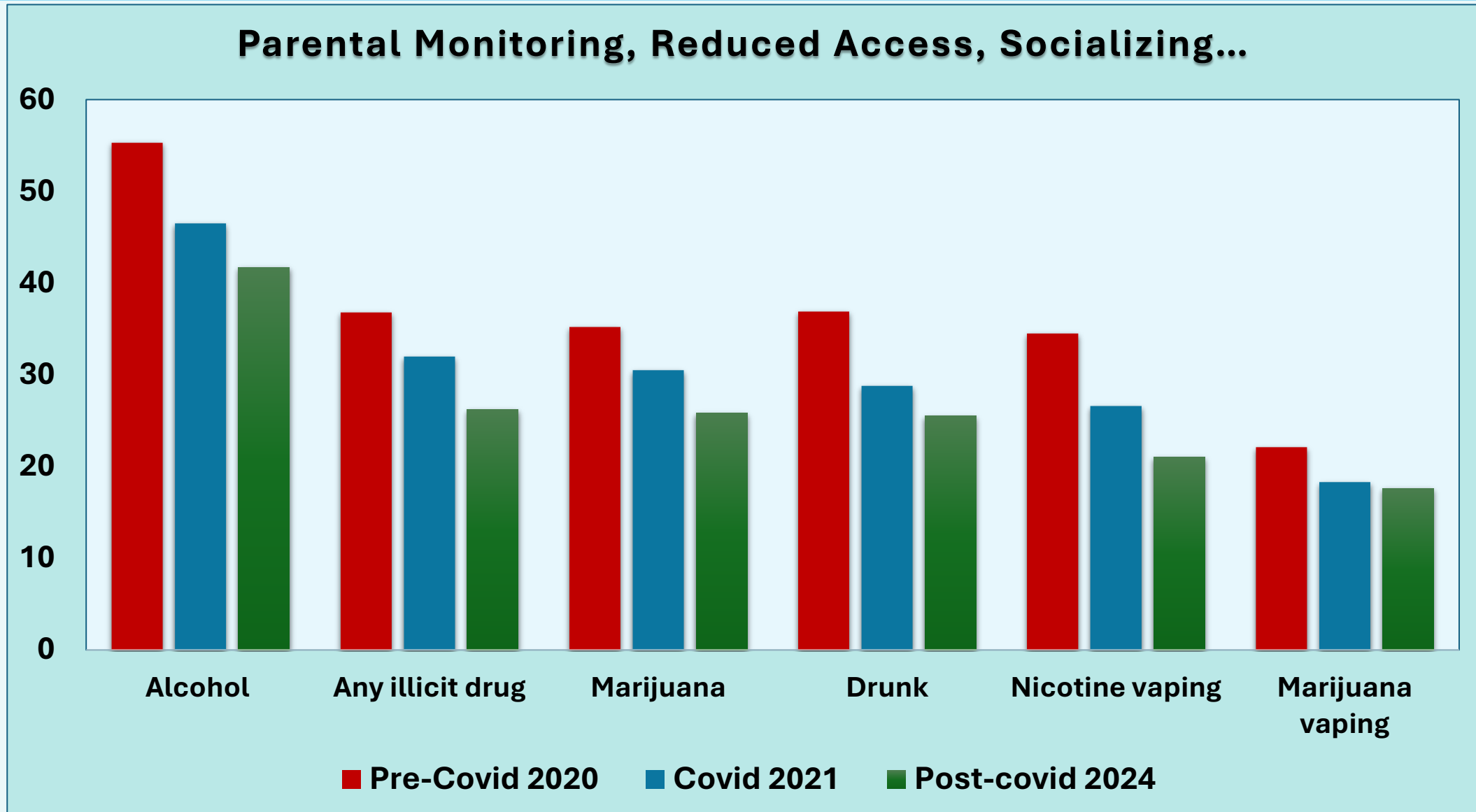
Disrupt Production

Good News! Lifetime Teen Abstainers are Rising

8th, 10th, 12th Grades



Covid and Post-Covid 12th Graders



Miech, R. A., Johnston, L. D., Patrick, M. E., & O'Malley, P. M. (2024). Monitoring the Future national survey results on drug use, 1975-2024: Overview and key findings for secondary school students. Monitoring the Future Monograph Series. Ann Arbor, MI: Institute for Social Research, University of Michigan. Available at:

<https://monitoringthefuture.org/results/annual-reports/>

Covid and Post-Covid 12th Graders

Covid may have

- increased parental oversight
- disrupted peer groups encouraging drug use, recruiting new members
- replaced social groups with social media

Covid decline persisted

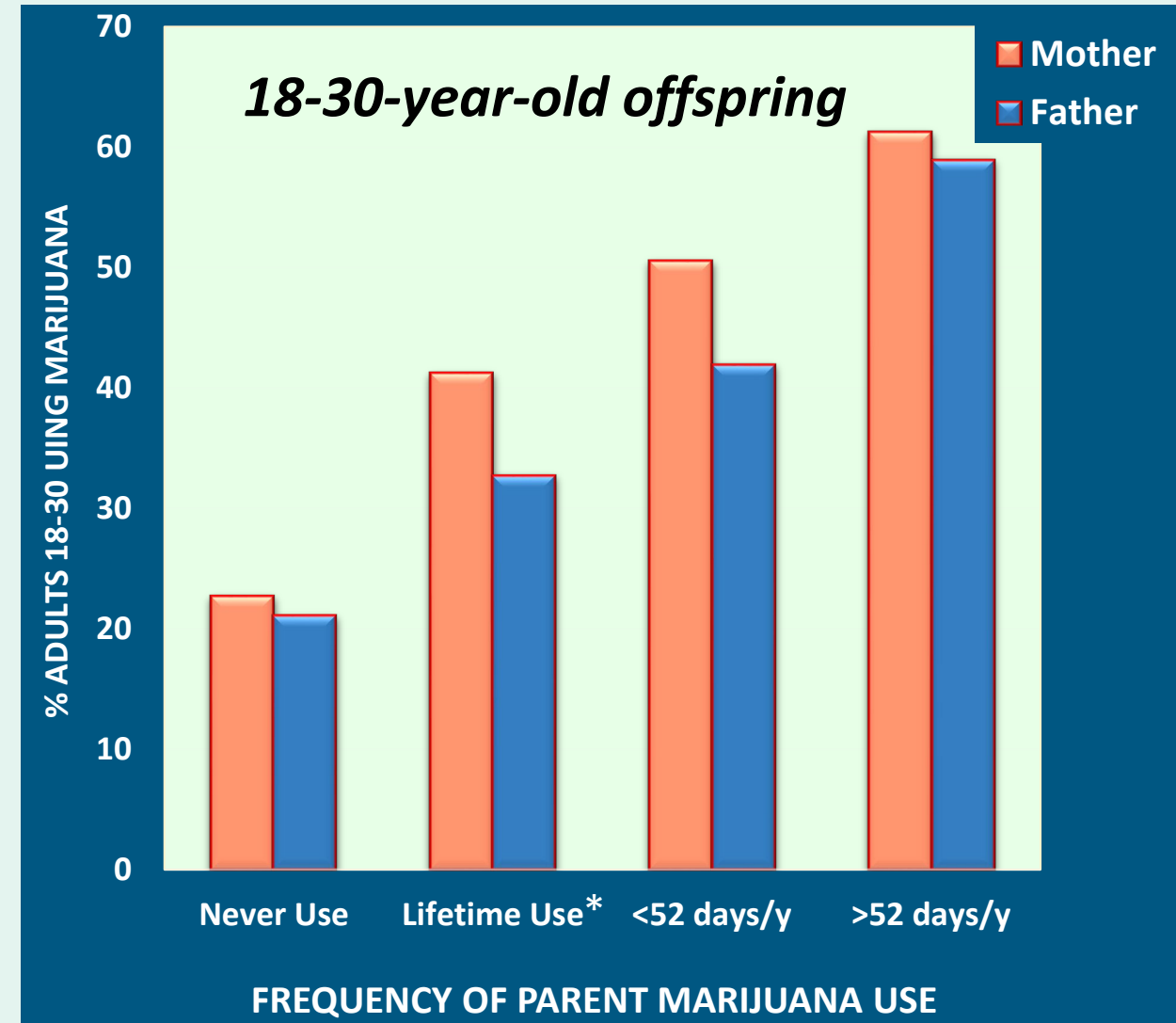
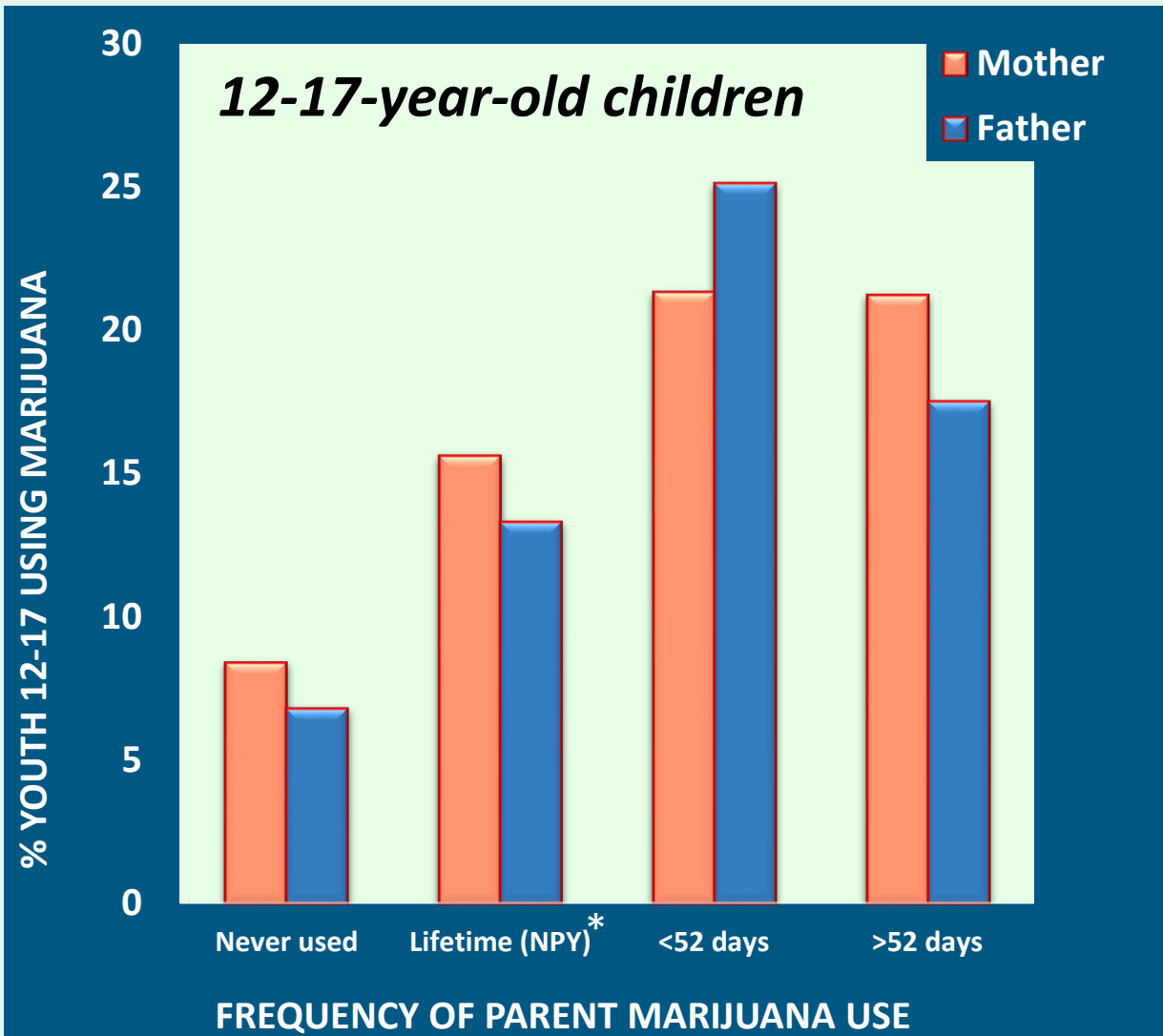
- Delay in drug use initiation in adolescence
- Could prevent youth from joining drug-using peers
- **Could disrupt biological processes fostering addiction**

Why Target Parents?

Risk of Child's Drug Use Less *IF PARENTS:*

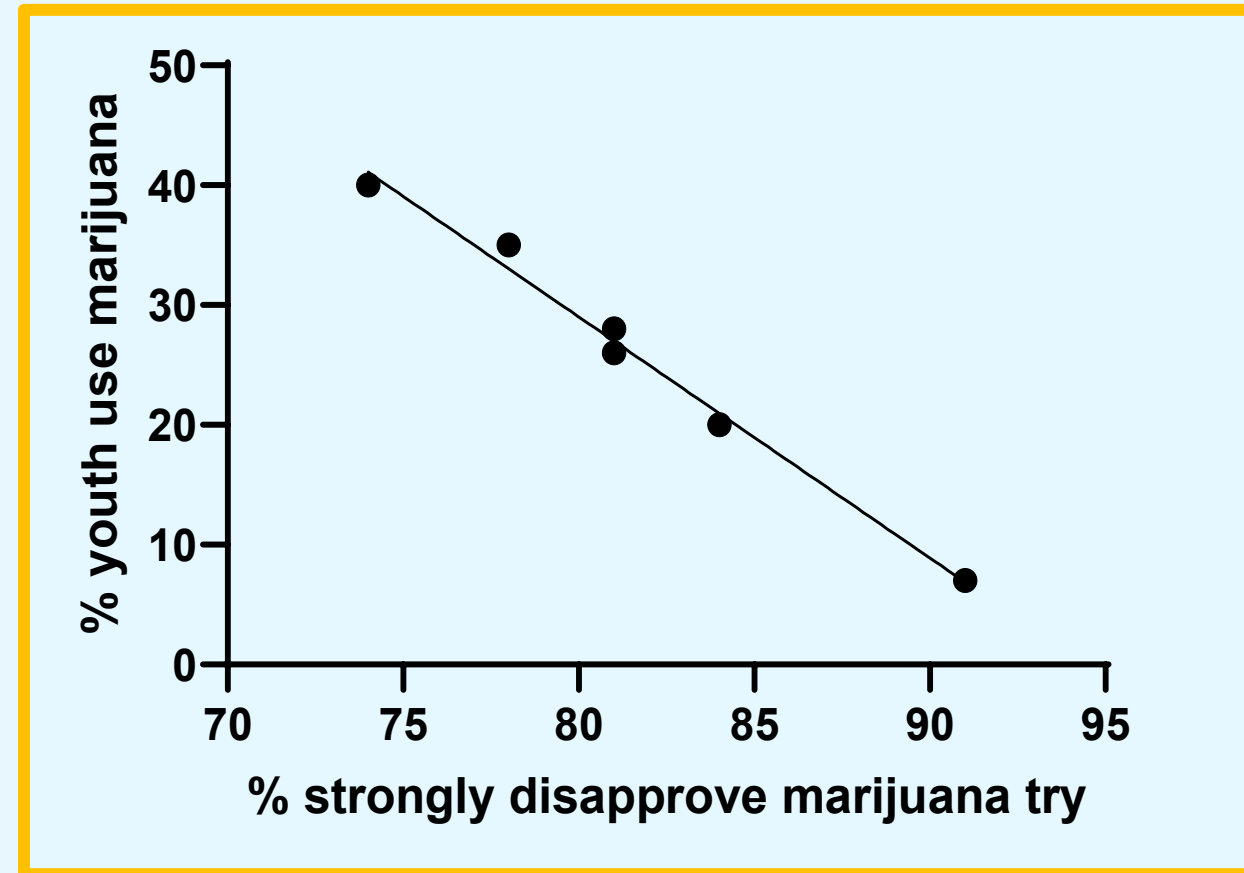
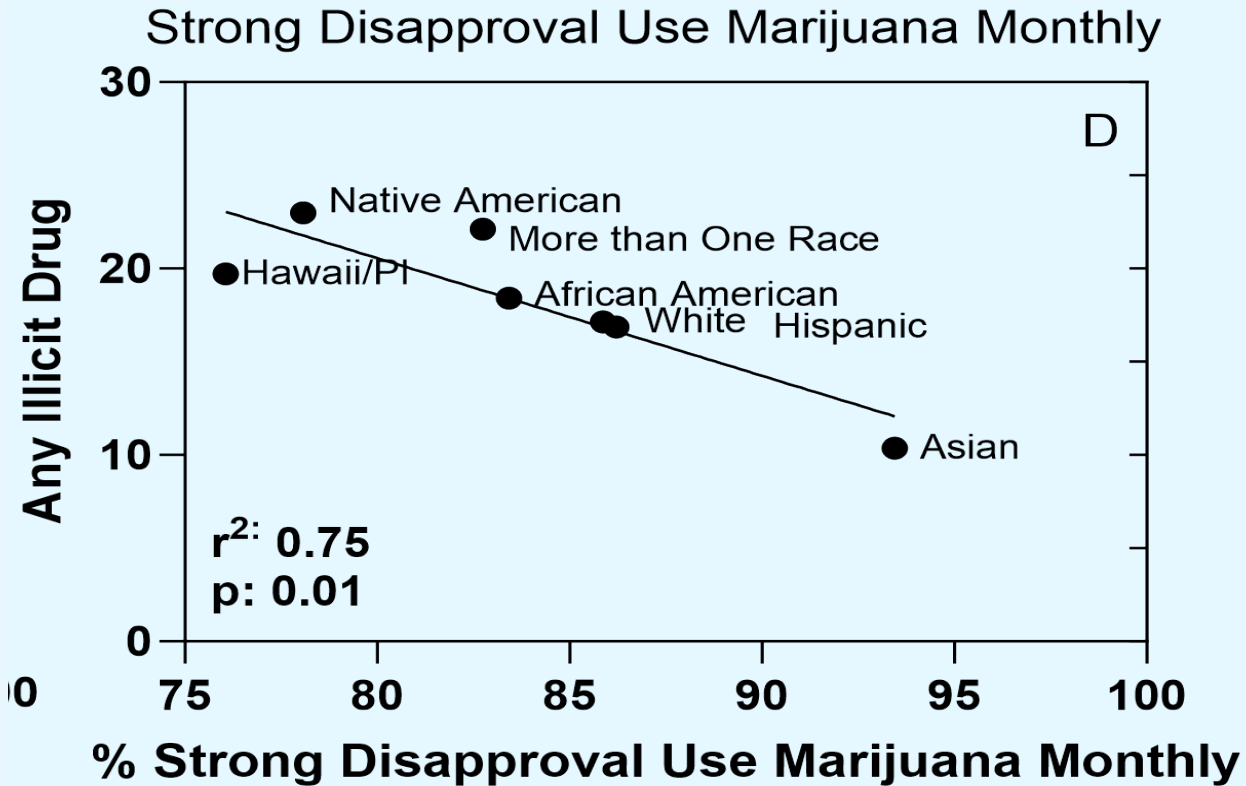
- **Don't use drugs themselves**
- **Clearly “disapprove of drug use”**
- **Set boundaries on social media, curfews**
- **Monitor child's homework, activities, friends**
- **Establish trust, supportive environment for dialog**

If Mothers or Fathers Use Marijuana Offspring 12-30 y More Likely to Use Marijuana



Madras BK, Han B, Compton WM, Jones CM, Lopez EI, McCance-Katz EF. Associations of Parental Marijuana Use With Offspring Marijuana, Tobacco, and Alcohol Use and Opioid Misuse. JAMA Netw Open. 2019 Nov 1;2(11):e1916015. *Not in past year BKM

If a Parent Disapproves of Drug Use their Child is Less Likely to Use Drugs



Why Target Parents? KNOWLEDGE GAPS

**Risks for
Using
Drugs?**

**Risks of
Using Drugs?**

If only I knew

How to open a conversation about drugs...

How to help my child refuse drugs...

HARVARD X (VPAL) coming soon...

**Prevention for Parents
Supporting Drug-Free Adolescents**

MODULES

1

2

3

4

5

Introduction

Risks of Child

Risks of Child?

Risks to Child

Action, Reflect,
Resources

Why?
What?
How?

Media, Culture
Emerging Risks
Assessing myths
Critiquing science

Biology
Home
School
Community
Conversations

Adolescent brain
Drugs + adolescent
Specific Drugs
Brain
Body
Behavior

Knowledge?
Goals?
Strategies?
Resources

Key Points

KNOWLEDGE

Risks for Drug Use

Risks of Drug Use



ACTION

Programs

Parents



In Defense of our Brains The Repository of our Humanity

Bertha K Madras

Thank You!