

©Changing Your Mind: Drugs in the Brain

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Drug Challenges and Use

Drugs in the Brain

The Adolescent Brain and Marijuana

The Opioid Crisis

What You Can Do!

2019: Drug Challenges

**Opioid
crisis**

Marijuana

**Hallucinogens
Medicines?**

**New
Psychoactive
Substances**

**Meth
Cocaine**

**Vape
delivery**

All Drugs Legal - No abstinence

People Use Drugs for Many Reasons

To have novel

- feelings
- sensations
- experiences

And...

To share them

**TO FEEL
GOOD**

To alleviate

- ⊗ anxiety
- ⊗ worries
- ⊗ fears

**TO FEEL
BETTER**

Self-medication hypothesis

To alleviate

- ⊗ sadness
- ⊗ depression
- ⊗ hopelessness

**TO FEEL
BETTER**

Immediate Drug Effects in Brain

- Most drugs of abuse are “imposters” of brain’s messages
- Drugs elevate dopamine
- Drugs disrupt normal communication
- Drug signals can produce “euphoria”
- Signals more intense, last longer than normal signals

Repeated Drug Use Changes

Brain signaling, cell biology, structure

Brain circuits

Reward, thinking, judgment, life goals, mood

Risks of Transitioning to Compulsive Use

Early age of onset

Genetics

Psychiatric, personality disorders

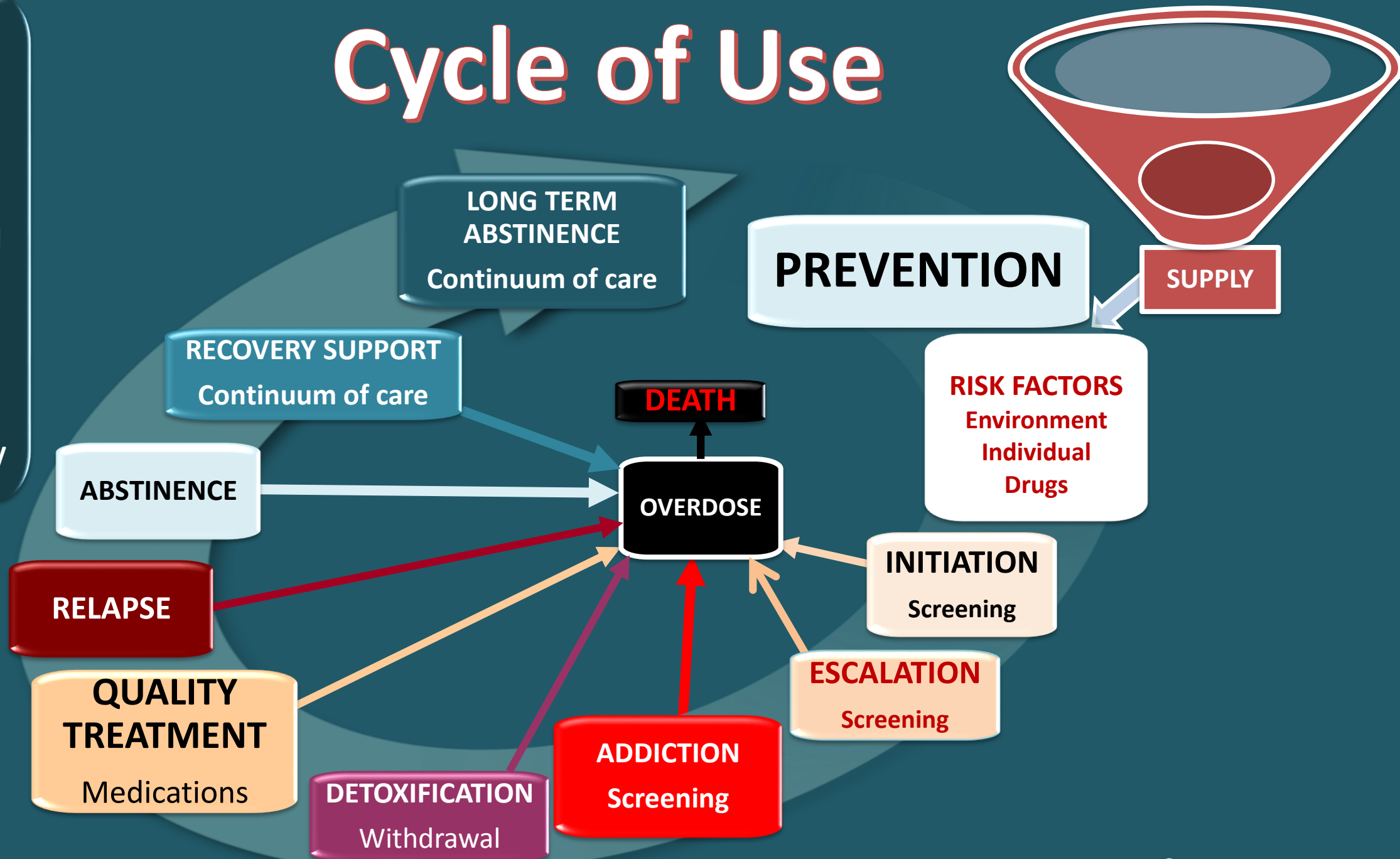
Chronic stress, abuse, shocks, trauma

Embedded in volitional choices are involuntary components

IMPACT

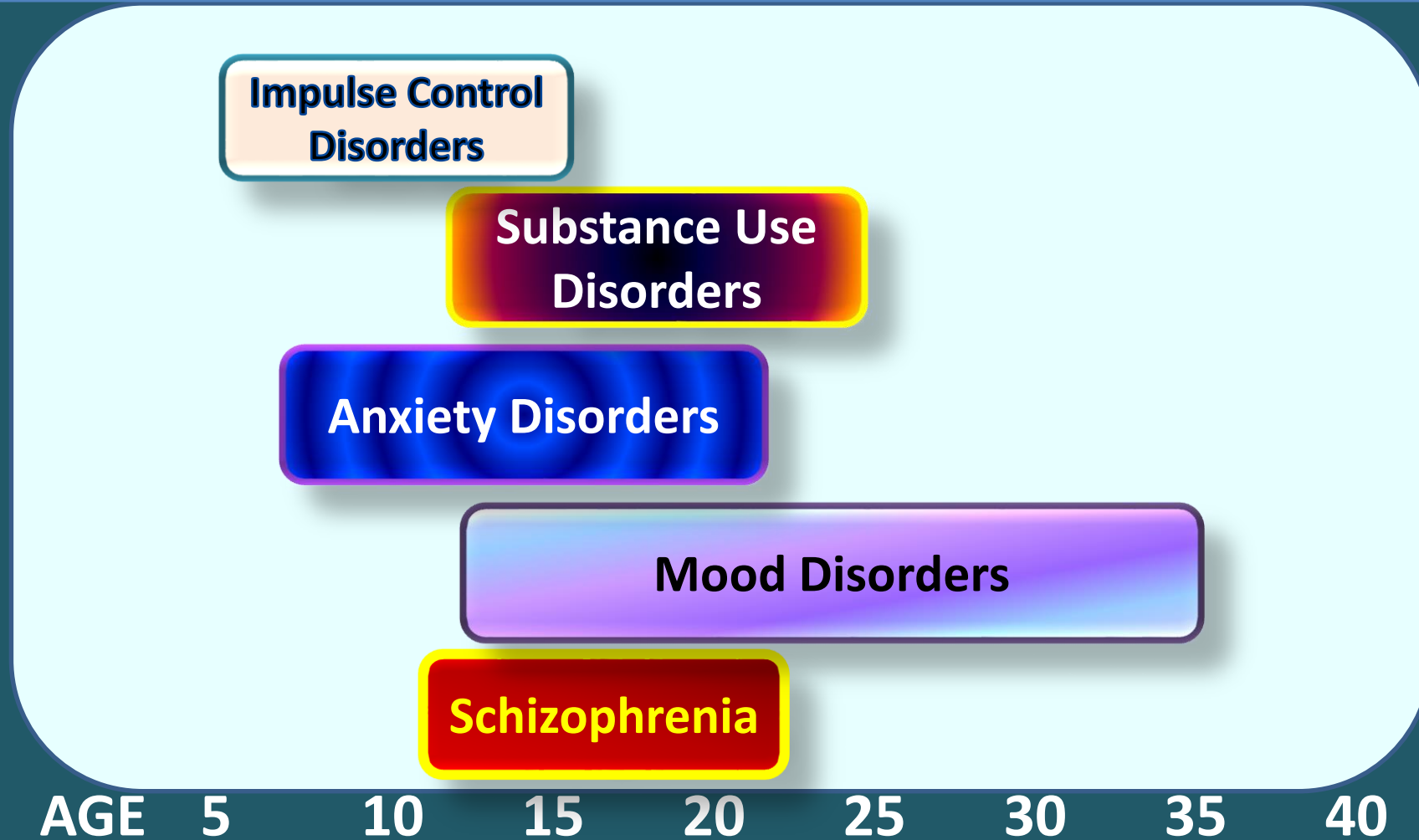
Children
Families
Workplace
Imprisoned
Parolees
Health
Safety
Costs
Productivity

Cycle of Use



The Adolescent Brain:

Many Brain Disorders Start During Adolescence

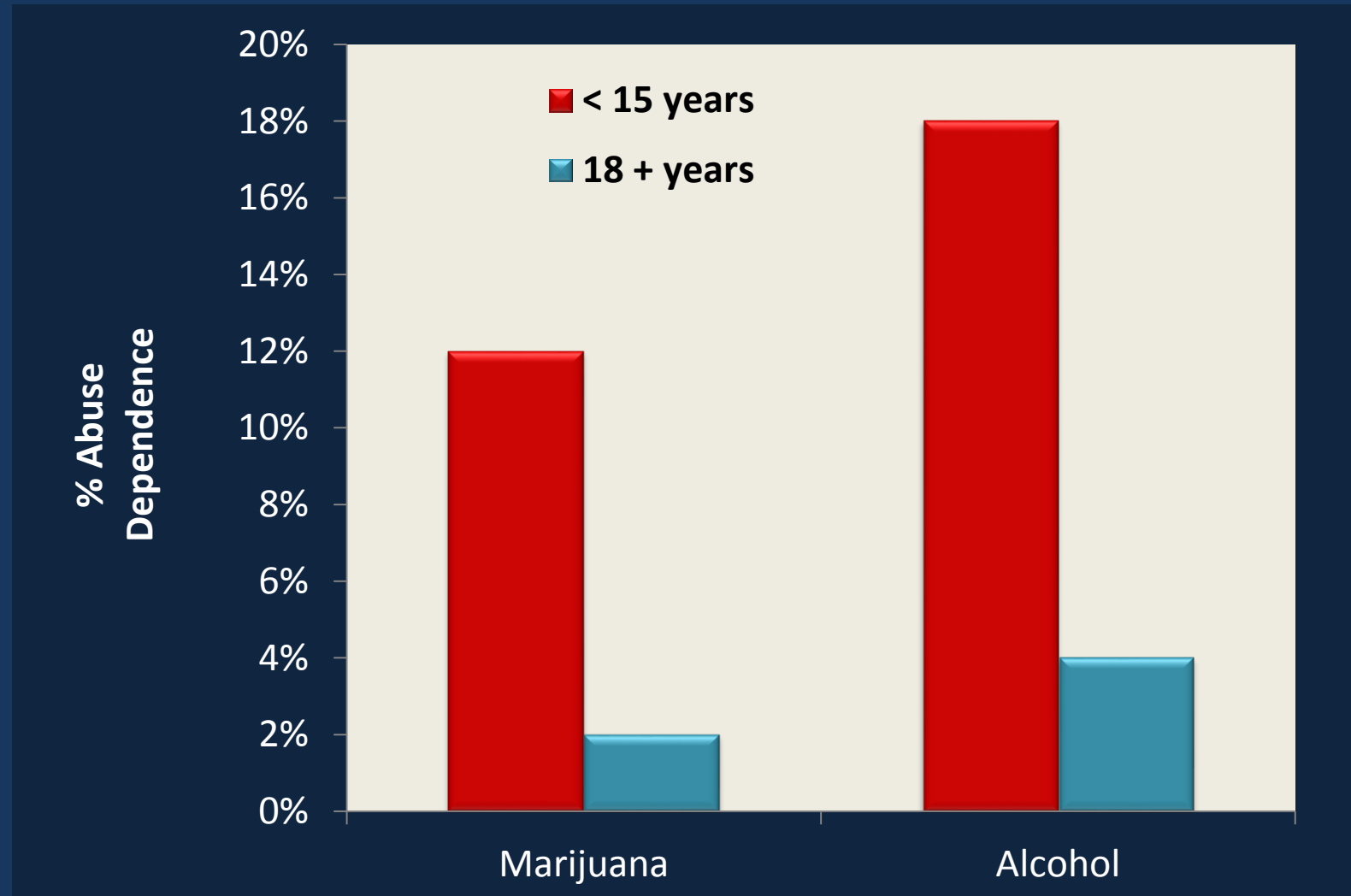


Source: Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Archives of general psychiatry Jun;2005 62(6):593–602. Kessler RC, Wang PS. The descriptive epidemiology of commonly occurring mental disorders in the United States. Annual review of public health 2008;29:115–129.

The Developing Adolescent Brain

- Grows
- Prunes some connections
- Strengthens connections
- Changes function regionally

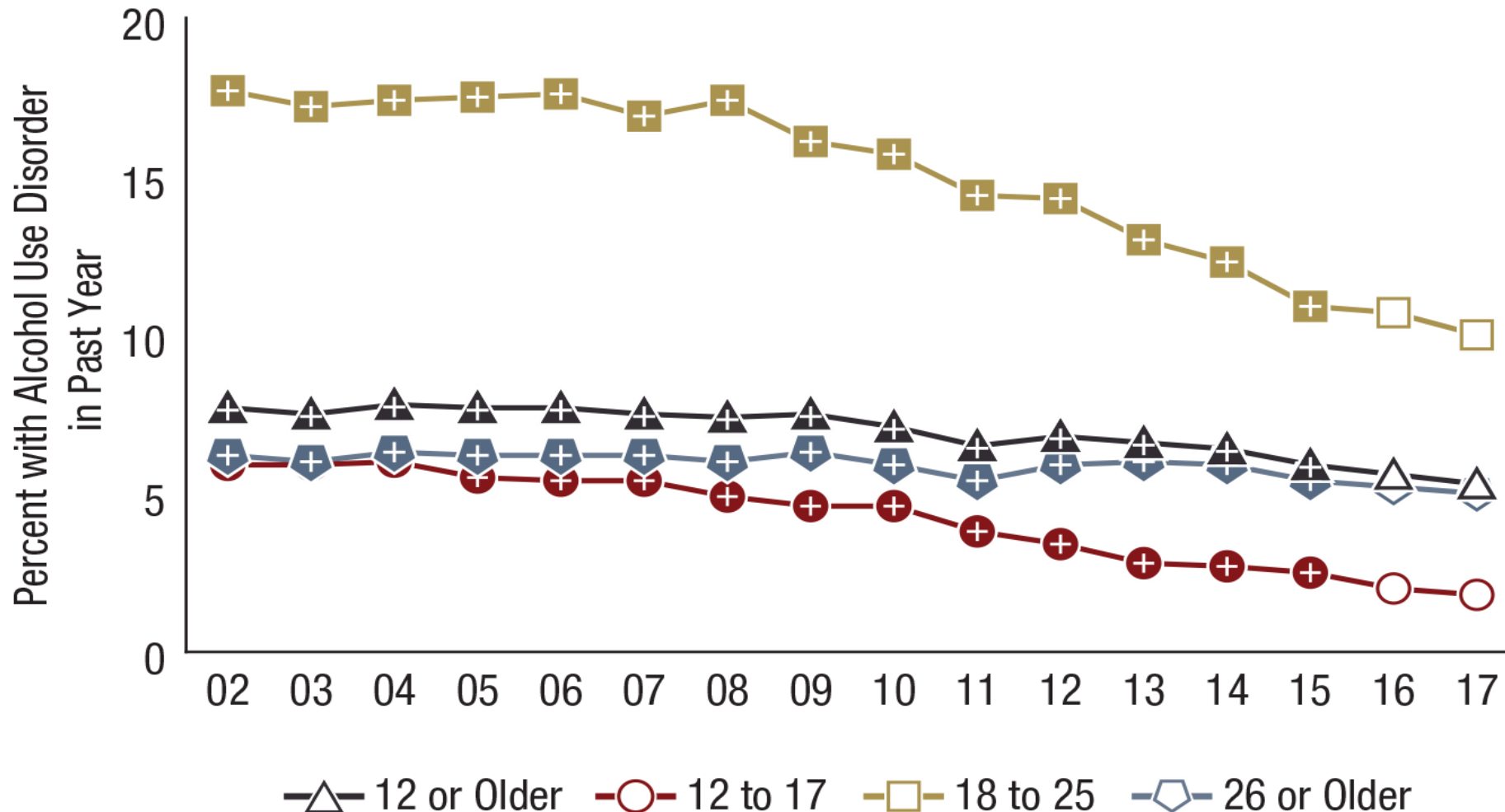
Earlier Age of Onset, Addiction More Likely



Nicotine
Inhalants
Stimulants
Cocaine
Opioids
Hallucinogens
Anxiolytics

Source: SAMHSA, 2013 National Survey on Drug Use and Health (September 2014)

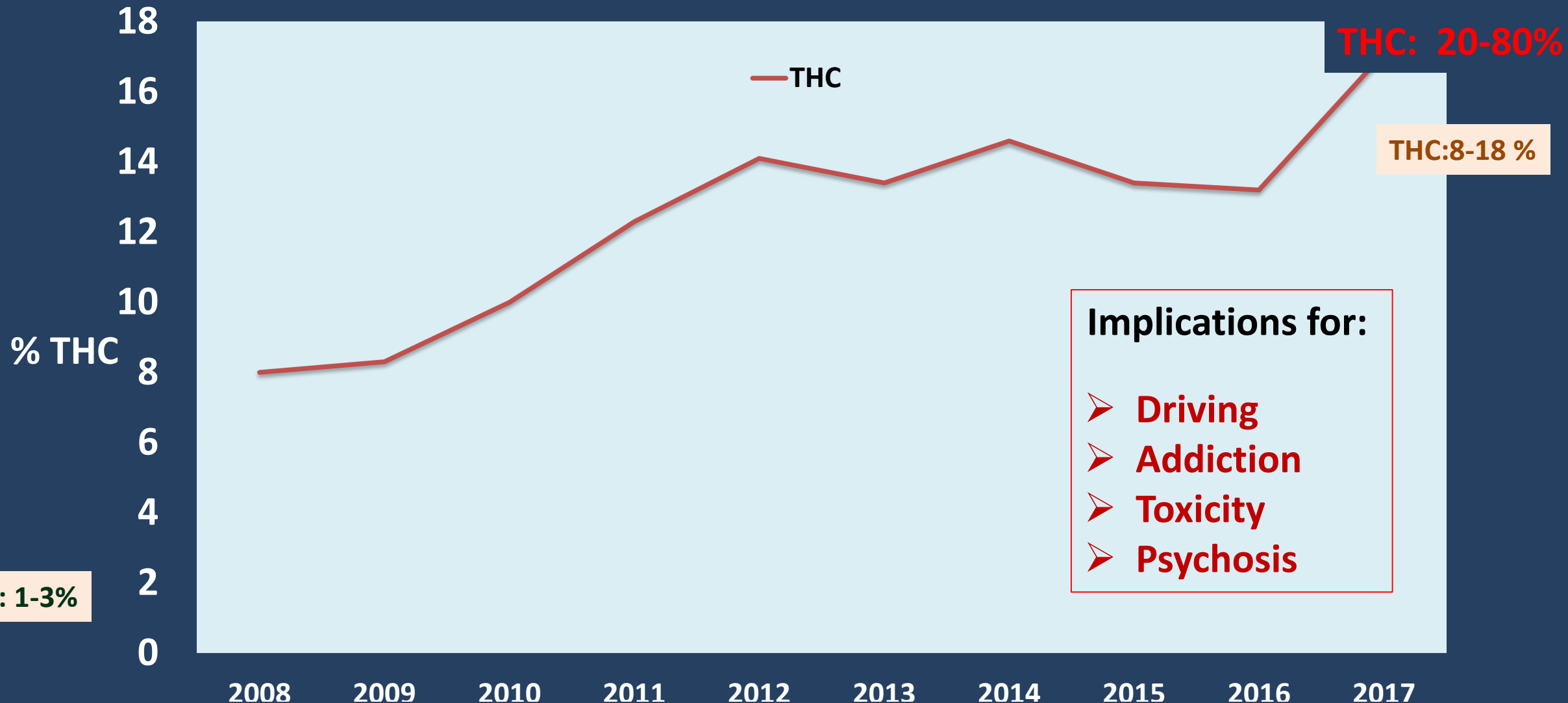
The Good News: Alcohol Use Disorder is Declining Smoking is Decreasing



+ Difference between this estimate and the 2017 estimate is statistically significant at the .05 level.

Marijuana and the Brain

THC Content in Marijuana is Rising



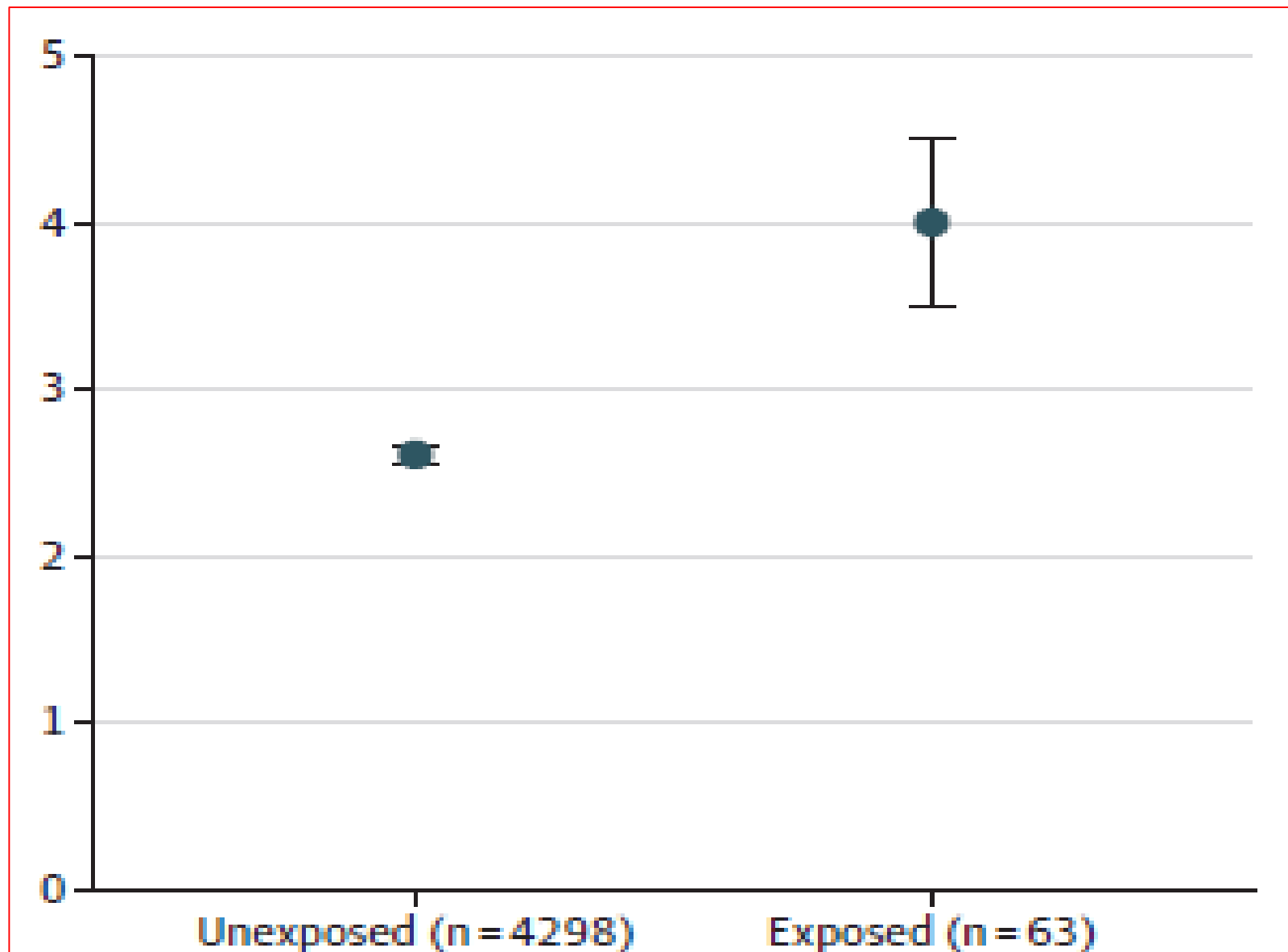
Chandra S, et al New trends in cannabis potency in USA and Europe during the last decade (2008-2017). Eur Arch Psychiatry Clin Neurosci. 2019 Feb;269(1):5-15.
ElSohly MA, et al. Changes in Cannabis Potency Over the Last 2 Decades (1995-2014): Analysis of Current Data in the United States. Biol Psychiatry. 2016 Apr 1;79(7):613-9.

Cannabinoid Signaling Critical for Brain Development

- **Guides formation of circuits**
- **Forms connections between cells**
- **During brain development, adulthood**

Prenatal Marijuana Exposure Associated With Psychosis Proneness During Childhood?

Psychosis Proneness



- Jeremy D. Fine et al., Association of Prenatal Cannabis Exposure With Psychosis Proneness Among Children in the Adolescent Brain Cognitive Development (ABCD) Study. JAMA Psychiatry Published online March 27, 2019

The Teen Brain and Marijuana

**Brain
changes**

Addiction

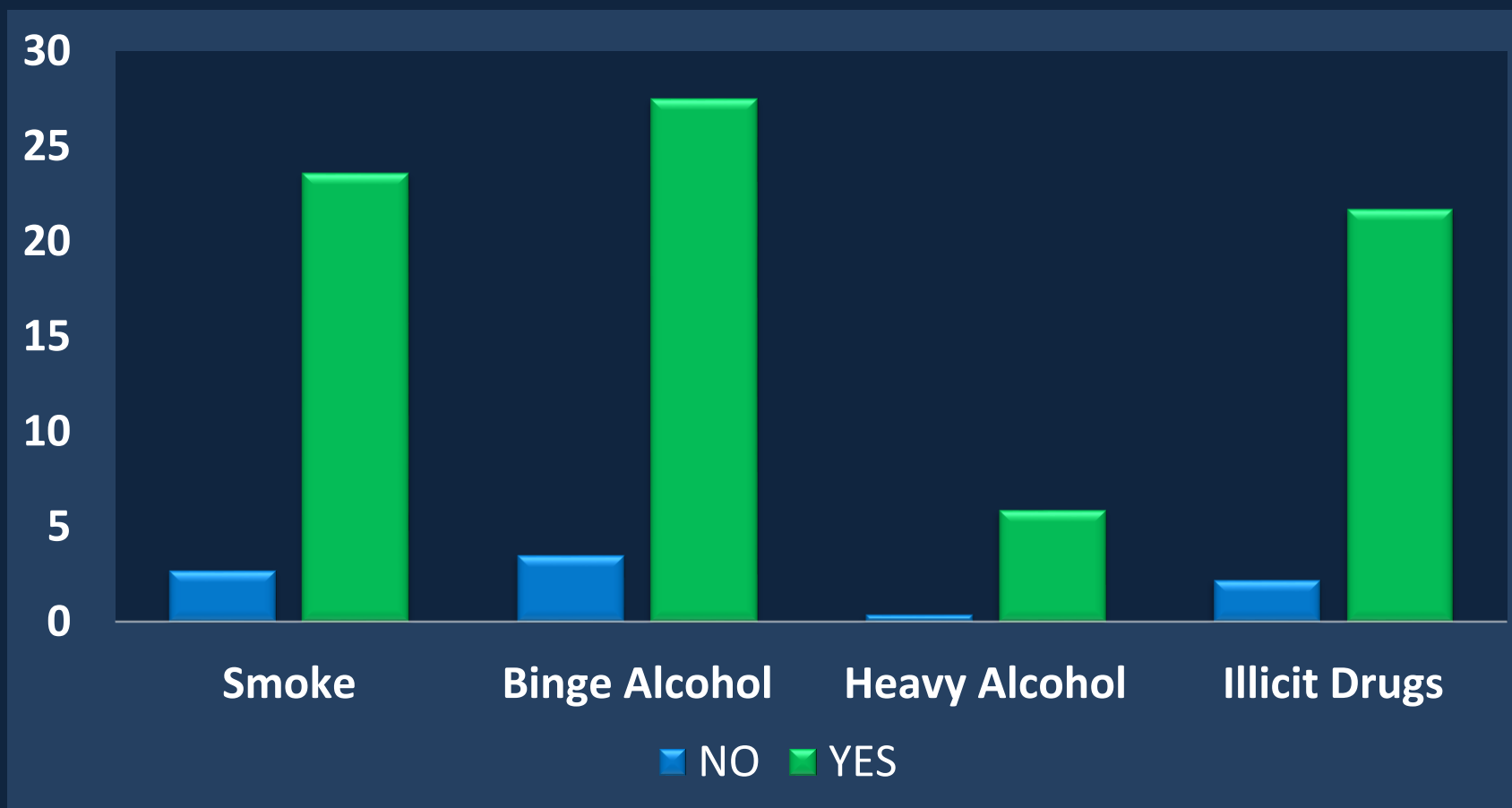
**Deficits
Cognition**

Amotivation

**Psychiatric
diseases**

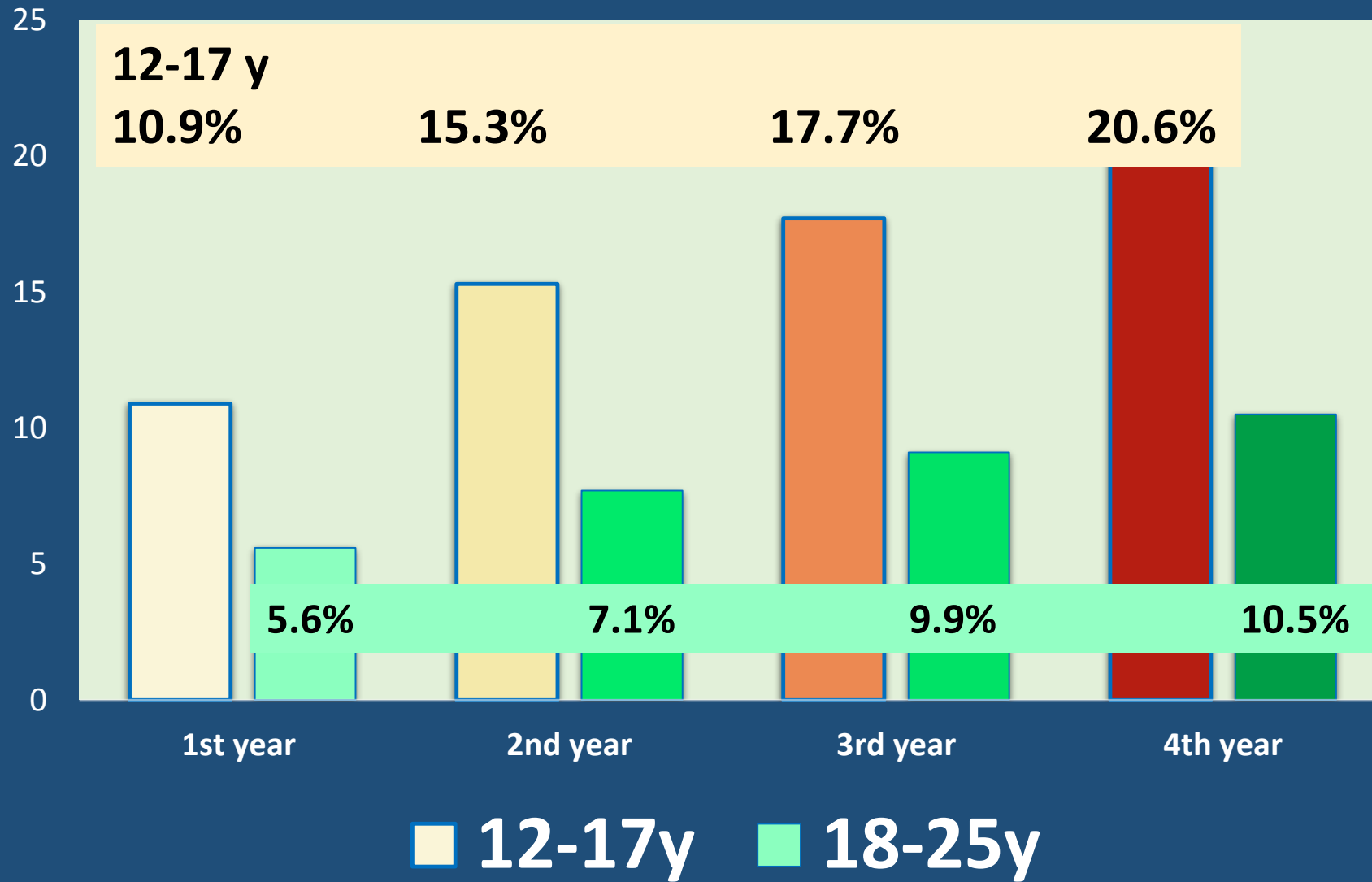
Safety

If Youth Use Marijuana...other drug use much higher



Data from 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 %)

% Marijuana Use Disorder After First Year of Use



If 12-17 year olds start using marijuana, addiction rates after 1,2,3,4 years much higher than if use begins at age 18 and older

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

12-month prevalence of cannabis use disorder among US youth aged 12-17 and emerging adults aged 18-25 varied by time since first cannabis use. (n=100,000 12-25; Past 12-month cannabis use disorder was assessed using DSM-IV criteria)

Cognition

Motivation

Persistent Marijuana Addiction Associated with IQ Drop

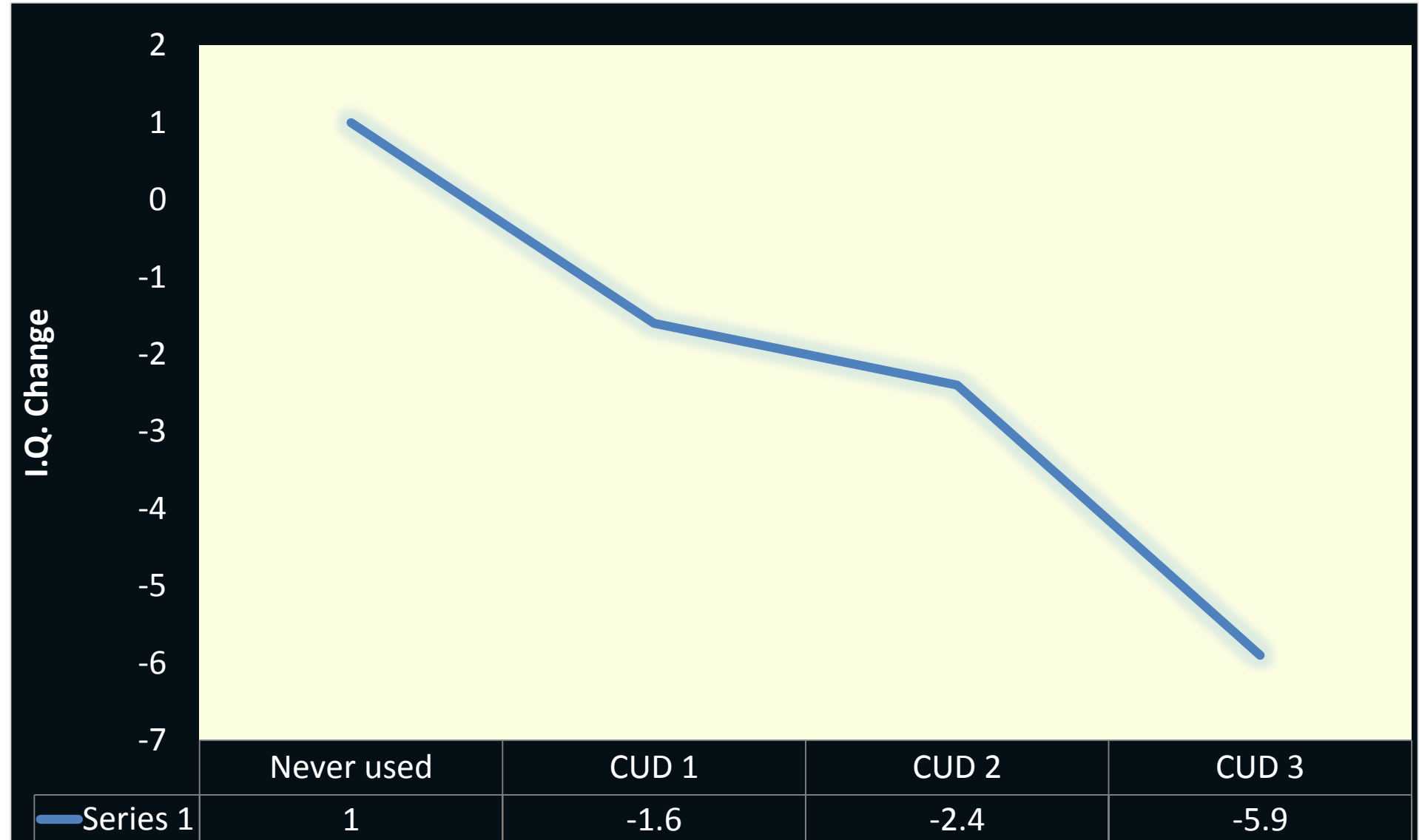
(birth to age 38 n=1037)

Tested marijuana use
marijuana use
disorder at ages
18,21,26,32,38

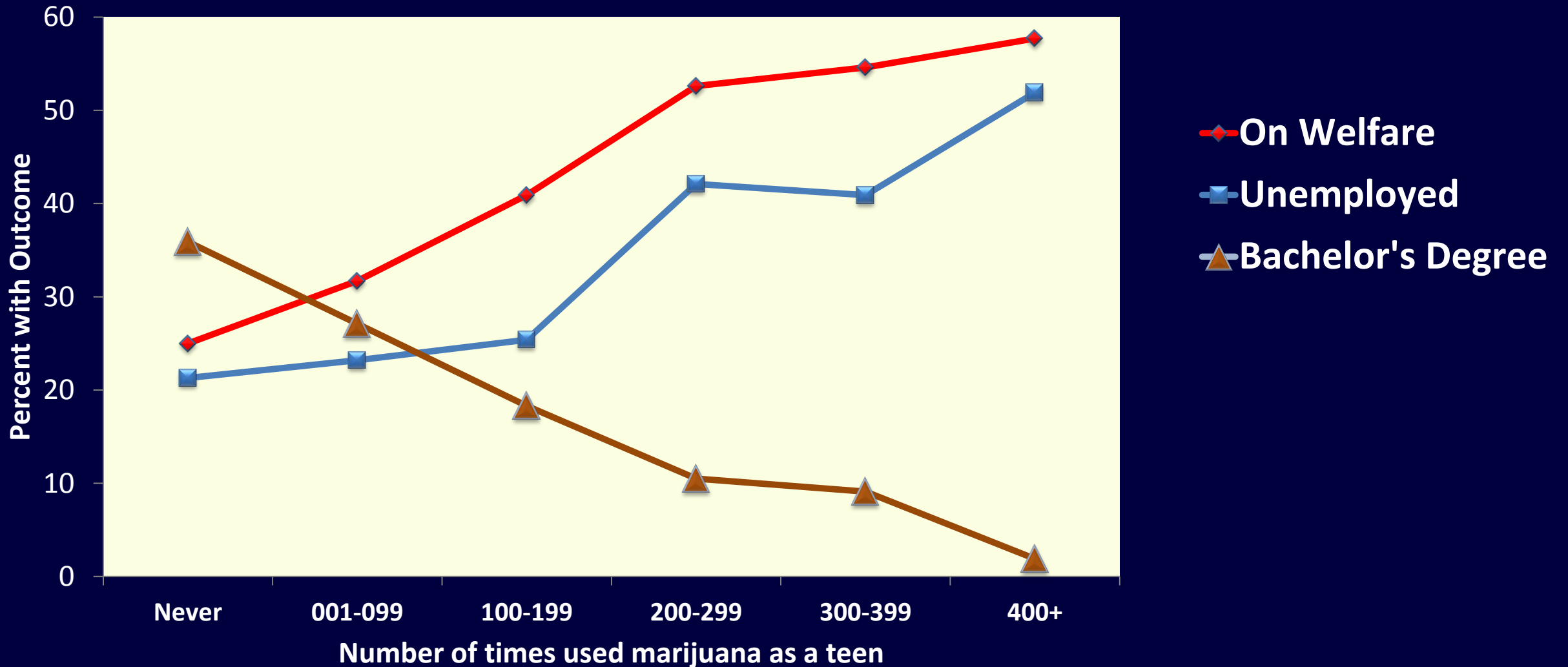
Tested I.Q. at 13, 38

By age 38, those
tested for CUD at all
test times lost I.Q.
points

Meier M, PNAS, 2012



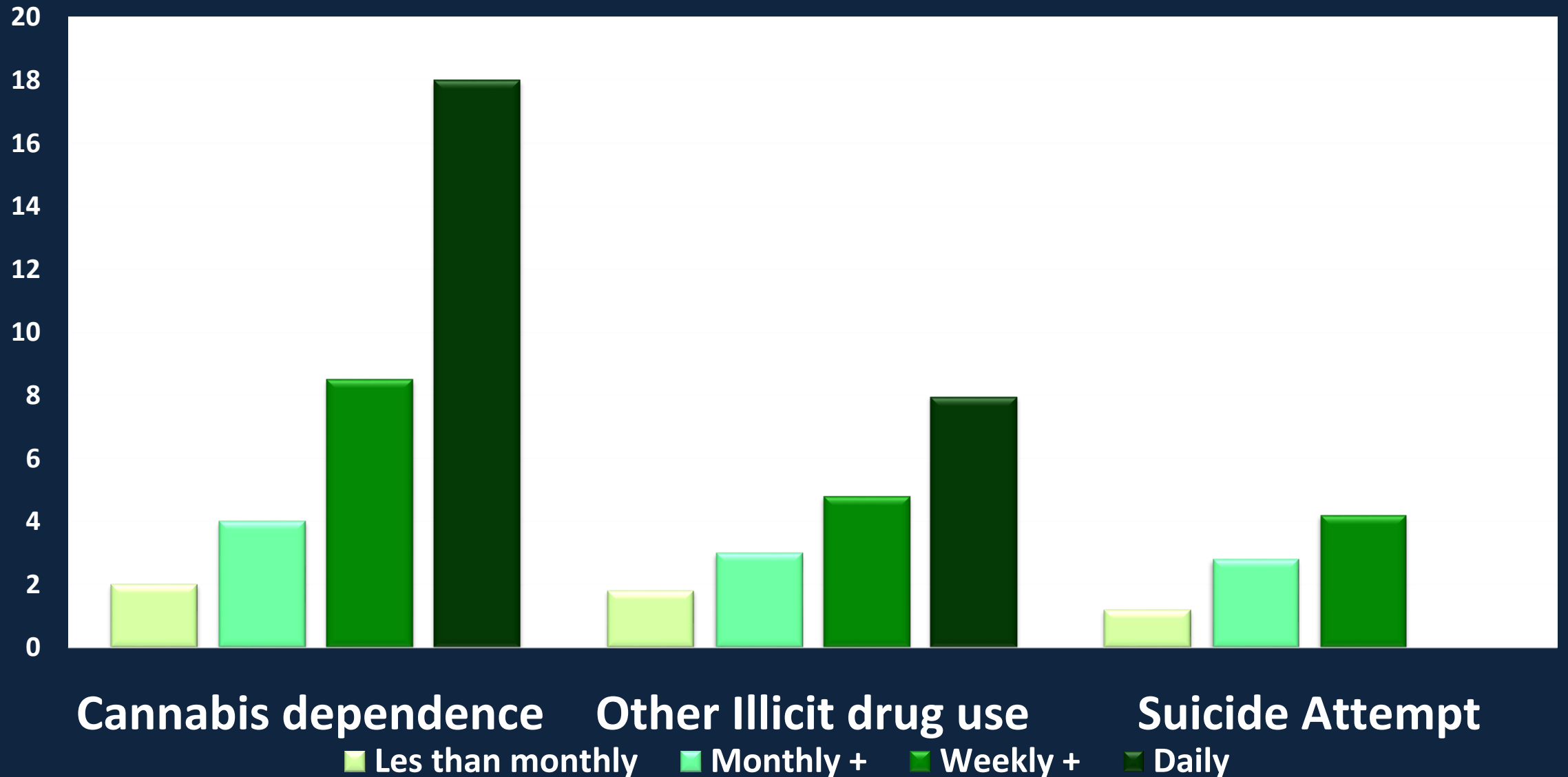
Teen Marijuana Use Affects Adult Motivation



Source: Fergusson and Boden , Addiction, 103, pp. 969-976, 2008.

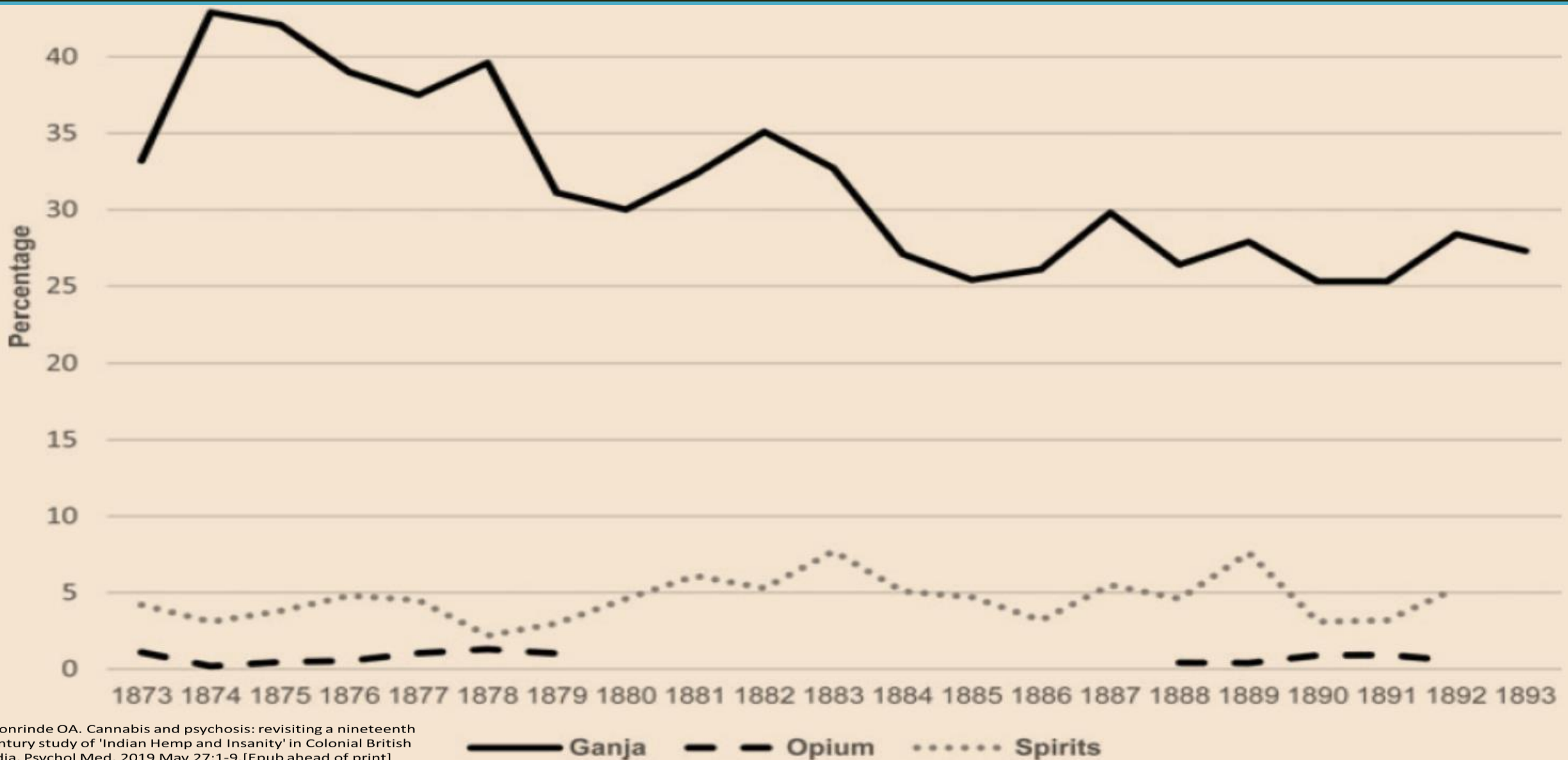
Mental Health

If Marijuana Used Before Age 17: Risks at 30 years



Attributed Cause of Admission to Bengal Insane Asylum (25-40%)

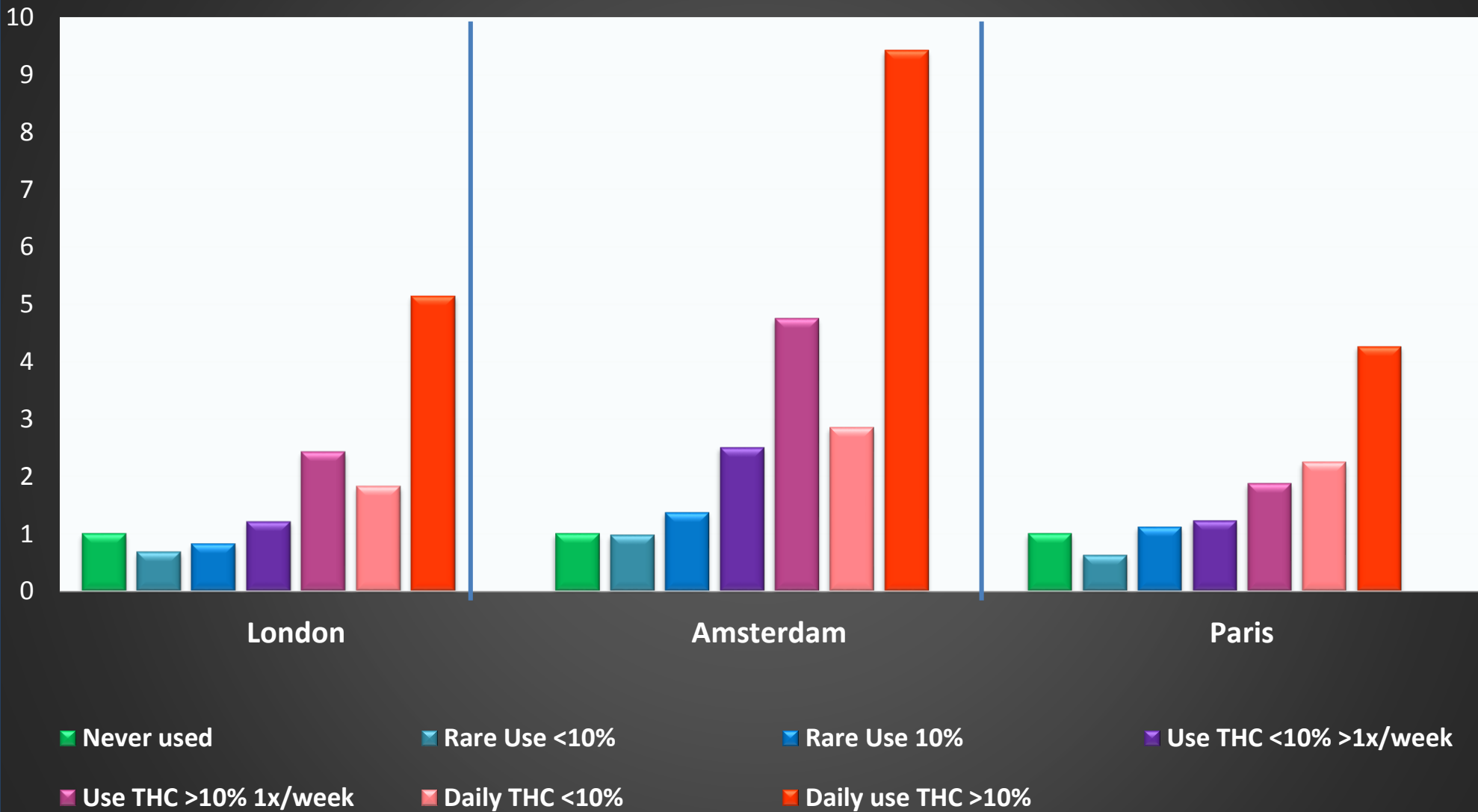
1873-1893



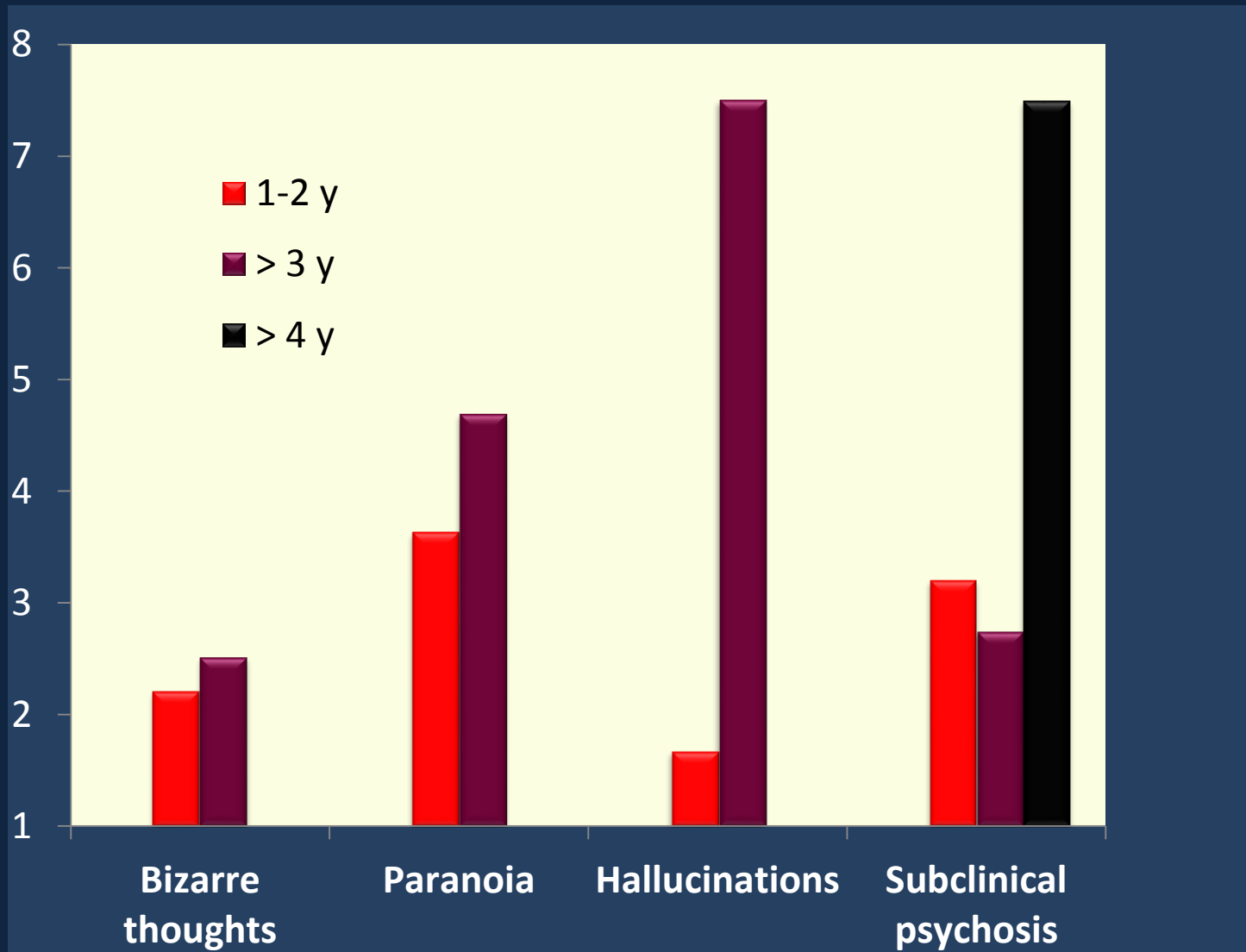
Psychotic Disorders Related to Frequency of Use, %THC

A “Tale” Of 3 Cities (Actually 11 Sites)

The contribution of
cannabis use to variation
in the incidence of
psychotic disorder across
Europe (EU-GEI):
Di Forti et al
www.thelancet.com/psychiatry
Published online
March 19, 2019



Marijuana Use Adolescent Symptoms



Evidence for timing:

Moore et al., 2007, Zammit et al., 2002, Arseneault et al., 2002; Gage et al., 2015; Van Os et al., 2002, Fergusson et al., 2005

Evidence for earlier onset of psychosis:

Large et al, 2011; Myles et al, 2012

Evidence for psychotic relapse:

Manrique-Garcia et al, 2014; Schoeler et al., 2016, Patel et al., 2016; Seddon et al., 2015;

Heavy Marijuana Use: Risks for Young People

Brain
changes

Addiction

Deficits

Amotivation

Psychosis

Safety
Sleep

Why do Adolescents use Vaping (JUUL)?

Curiosity

**Recreational use
friends**

**Belief vaping healthier
than smoking**



**Disguise use from
parents, teachers,
schools**

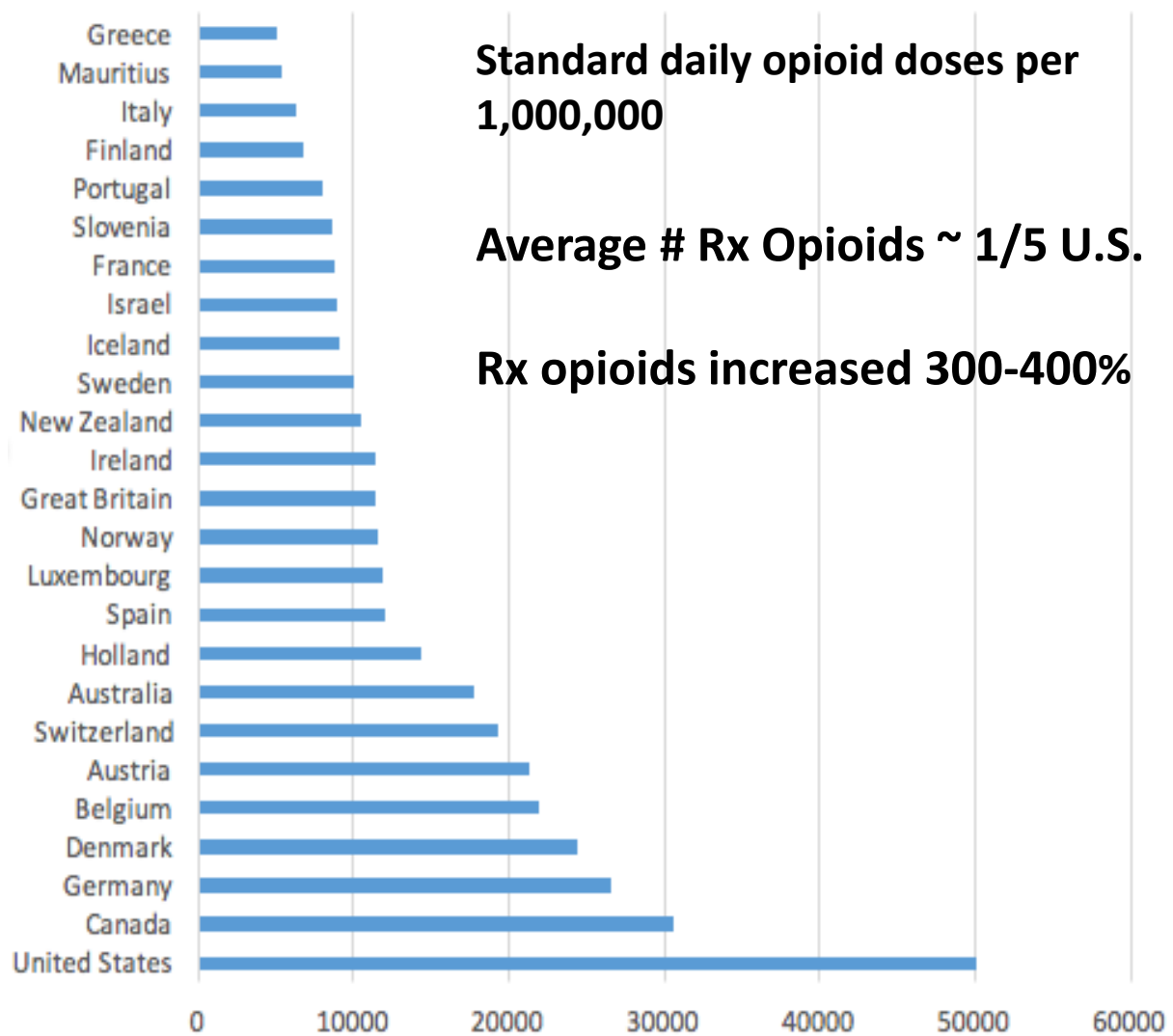
Odor-free

**No smoke
small size**

Audrain-McGovern J, Stone MD, Barrington-Trimis J, Unger, JB, Leventhal, AM. Adolescent E-Cigarette, Hookah, and Conventional Cigarette Use and Subsequent Marijuana Use PEDIATRICS 142, 3, September 2018:e20173616

Opioids: The U.S. Leads the World in Prescription Opioid Daily Doses

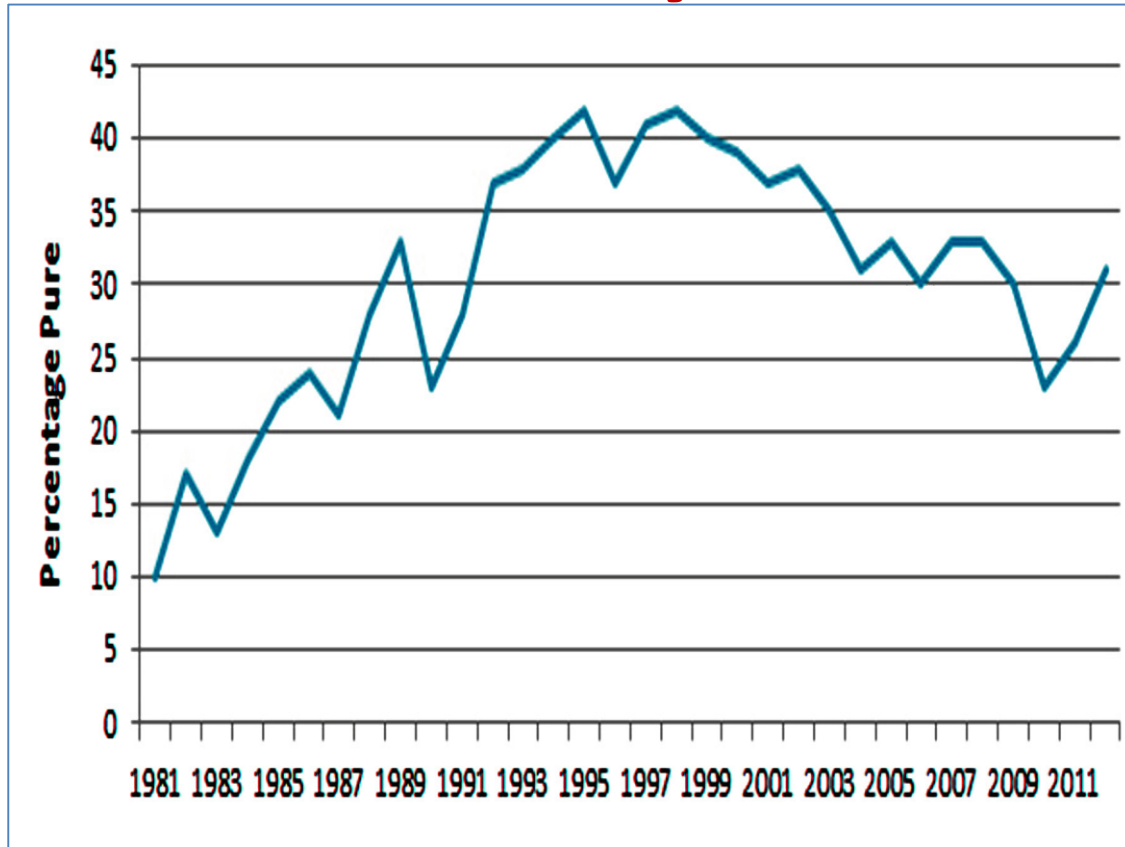
Yet, U.S. doesn't have more pain than European nations



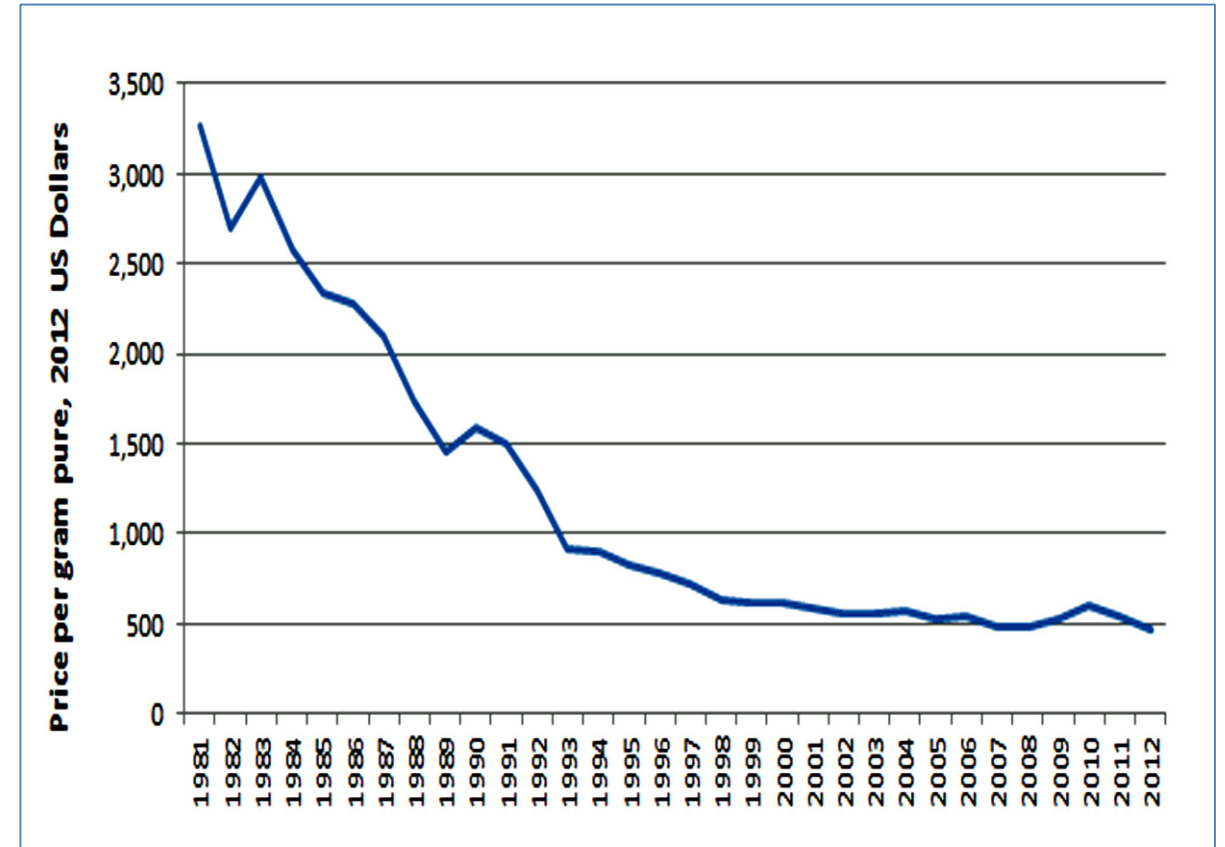
Source: K. Humphreys, www.thelancet.com 390: 437-439. July 29, 2017. Adapted from United Nations International Narcotics Control Board. 2016 Narcotic drugs: estimated world requirements for 2017; statistics for 2015. Vienna, Austria

Conversion from Rx Opioids to Heroin

Purity



Price



Source: Institute for Defense analysis and ONDCP

With Advent of Fentanyl, a Lethal Storm



This is 1 kilogram fentanyl
It weighs about 2.2 pounds

It can kill 500,000 people



Commission Report Solutions

Screening



Treatment
Reimburse
Medications



Rescue



Recovery
Support
Aid to
families,
imprisoned



Data Analytics



Research





Improve Treatment

- **Comply with parity laws**
- **Quality standards**
- **Quality outcome measures**
- **Reimburse true costs**
- **Quality Recovery Homes**
- **Recovery coach training**
- **Medical education**

Expand Treatment

- **Screening: substance use, mental health** (quality measure)
- **Addiction training**
- **Increase treatment capacity**
- **Increase availability of medications**
- **Telemedicine**
- **Recovery support services**
- **Treatment referrals within 24-48 hours**

Research and Development

Better medications to treat OUD

Safer, non-addictive alternatives to opioids

Improved rescue drugs for high potency agonists

Electronic Devices for pain, treatment, rescue

RTC Improve delivery of interventions, PDMP, MAT

The President's Commission On Combating Drug Addiction and the Opioid Crisis



THE PRESIDENT'S COMMISSION ON COMBATING DRUG ADDICTION AND THE OPIOID CRISIS

Roster of Commissioners

Governor Chris Christie, Chairman
Governor Charlie Baker
Governor Roy Cooper
Congressman Patrick J. Kennedy
Professor Bertha Madras, Ph.D.
Florida Attorney General Pam Bondi



What Can You Do?

You Can Prevent with Education

Teach people

**To guard
their pills**

**Prevent
diversion of
opioids**

- Hazards of opioids
- Dangerous drug combinations
- Alternatives for pain
- They can refuse opioids

- Dispose of unused medications

- Keep away from children

**Dangers of
sharing
medicines**

**Dangers of
street drugs**

Teach People Consequences of Opioid Use

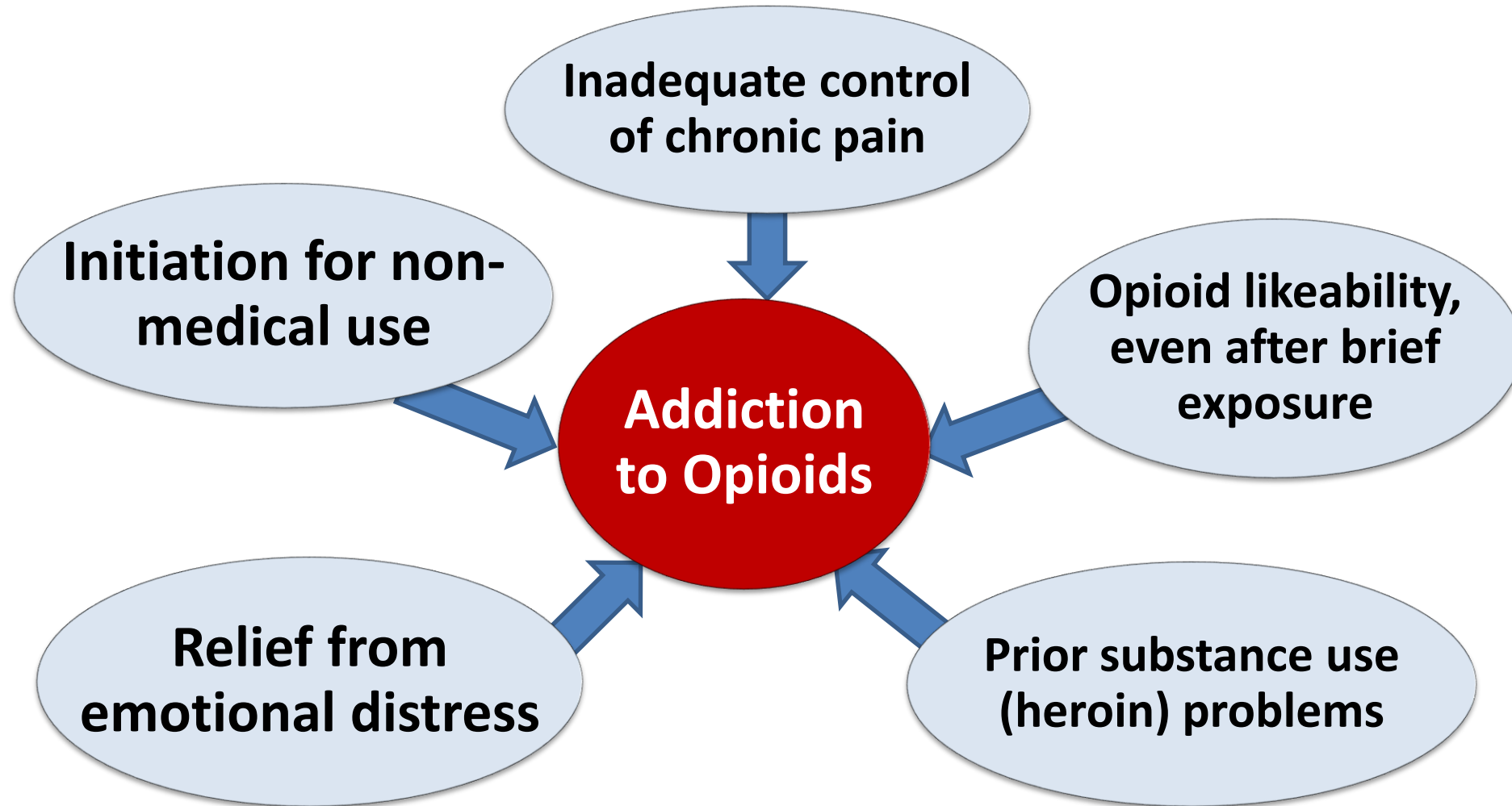
Opioid Use Disorder (addiction)

**Chronic medical conditions,
brain toxicity**

Neonatal abstinence syndrome

Overdose, shortened life span

Teach People Pathways to Prescription Opioid Use Disorder



Source: White et al, Am. J Managed Care 15: 897-906, 2009; Stumbo SP, Yarborough BJ, McCarty D, Weisner C, Green CA. Patient-reported pathways to opioid use disorders and pain-related barriers to treatment engagement. J Subst Abuse Treat. 2017 Feb;73:47-54.

You Can Protect Children

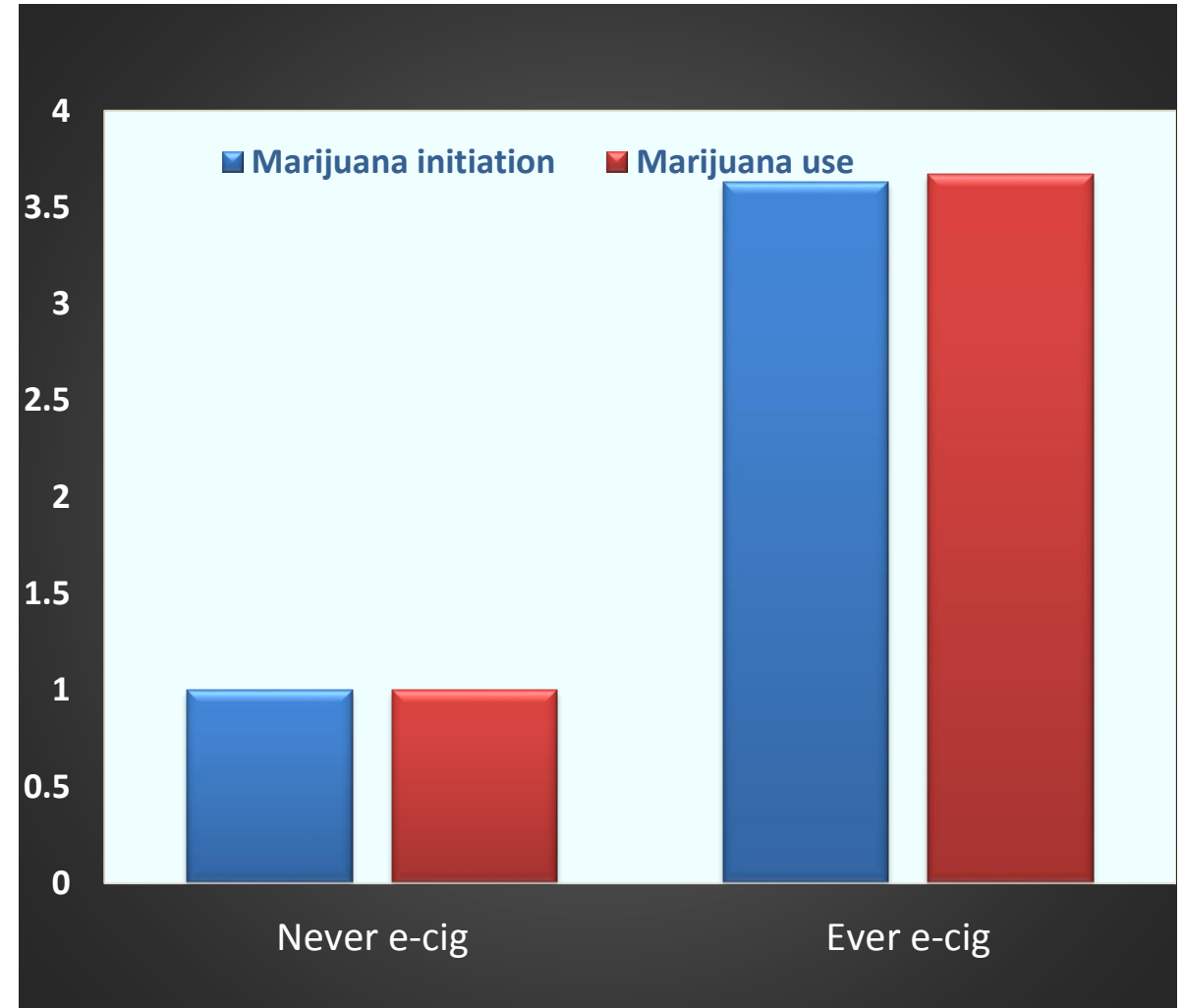
If children maltreated, future substance use:

~40% - 50% children maltreated will develop substance use

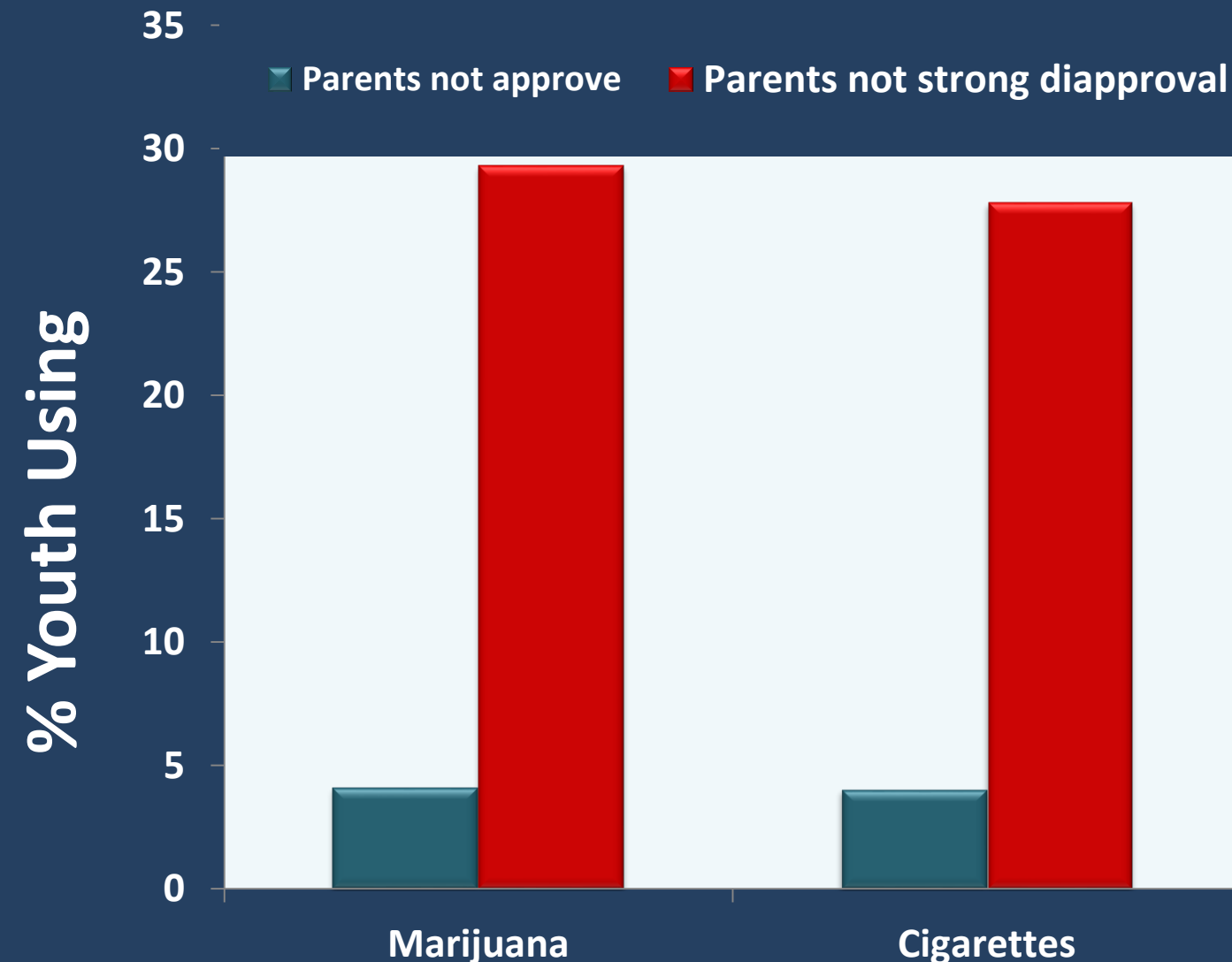
- ~ 2X more likely to use illicit substances**
- 2-3X more likely to use in early adolescence**
- more likely to develop severe substance use disorder**
- more likely to relapse**

Teach Parents the Hazards of Youth E-Cigarette/hookah Use and Marijuana Use

- e-cigarette use 3.3-3.6 X risk for starting, using marijuana
- Hookah use risk 3.5 X of start, current 4.10X marijuana use
- Increases likelihood of adolescent dependence on both nicotine and cannabis
- Federal regulations do not restrict youth targeted advertising, promotion, sales of youth-friendly flavors



Educate Parents on Their Influence



- Environment Risk Factors
- Child's Risk Factors
- Signs of Drug Use

Source: NSDUH, 2010 published Sept 2011; <http://www.samhsa.gov/data/NSDUH/2k10NSDUH/2k10Results.htm>

You Can Teach Risks For Drug Use, if Youth Have

ADHD

**Personality
disorder**

**First degree
relative with
alcoholism**

**First degree
relative with
drug addiction**

**Poor grades
at school**

You Can Teach Environmental Risks for Youth Drug Use if:

Abused at home

Fights at home; neglect

Parents give mixed messages

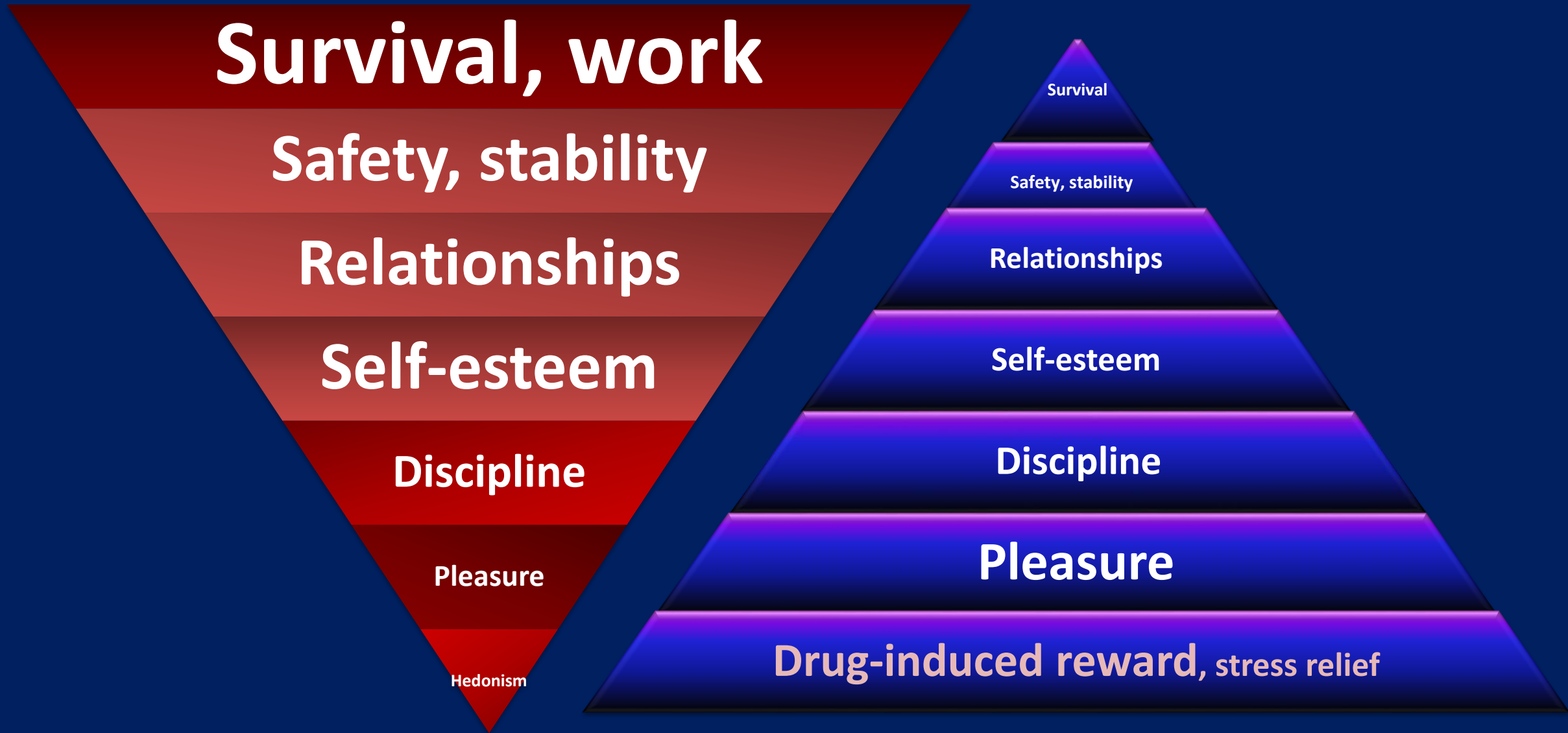
Parents use drugs

Unlimited access to social net-working

You can Teach Signs of Youth Drug Use

- Neglect school work
- Lose interest in extracurricular
- Change friends, groups, clothes, behavior
- Change sleep patterns, reduce sleep
- Increase in health issues, personal hygiene
- Decline in family relations
- Reduce openness and honesty

Addiction Compromises our Humanity



“This is not a War on Drugs

It is a Defense of our Brains...

The Repository of our Humanity”

Bertha K Madras