



# **Pacific Southwest**

RURAL OPIOID TECHNICAL  
ASSISTANCE REGIONAL CENTER

# **Cannabis Updates**

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# STRESS CONTINUUM FOR HEALTHCARE PERSONNEL

## READY: Thriving *"I got this."*

- Calm and steady
- Sense of mission
- Spiritually, physically and emotionally healthy
- Emotionally available
- Able to focus
- Able to communicate effectively
- Normal sleep patterns and appetite
- Healthy sleep
- Sense of joy/vitality
- Room for complexity

## REACTING: Surviving *"Something isn't right."*

- Nervousness, sadness, increased mood fluctuations
- Cynicism
- More easily overwhelmed and irritated
- Work avoidance
- Loss of interest or motivation
- Distance from others
- Short fuse
- Loss of creativity
- Fatigue/weariness
- Trouble sleeping and eating

## INJURED: Struggling *"I can't keep up."*

- Persistent fear, anxiety, anger or pervasive sadness
- Isolation/avoiding interaction
- Sleep disturbances/bad dreams
- Numbing
- Feeling trapped
- Distant from life
- Exhausted
- Physical symptoms
- Persistent shame, guilt or blame
- Disengaged

## ILL: In Crisis *"I can't survive this."*

- Hopelessness, anxiety, panic or depression
- Intrusive thoughts
- Feeling lost or out of control
- Insomnia, nightmares
- Thought(s) of suicide or self-harm
- Hiding out
- Easily enraged or aggressive
- Broken relationships
- Dependence on substances, food or other numbing

### WHAT TO DO

**Exercise, nourish, relax, prioritize family and social connections**

**Talk to trusted individuals: friend, family or peer responder**

**Talk to counselor, therapist or medical provider**

**Seek immediate mental health treatment (CO Crisis Services available at 1-844-493-8255)**

### CHANGE IN WORLDVIEW

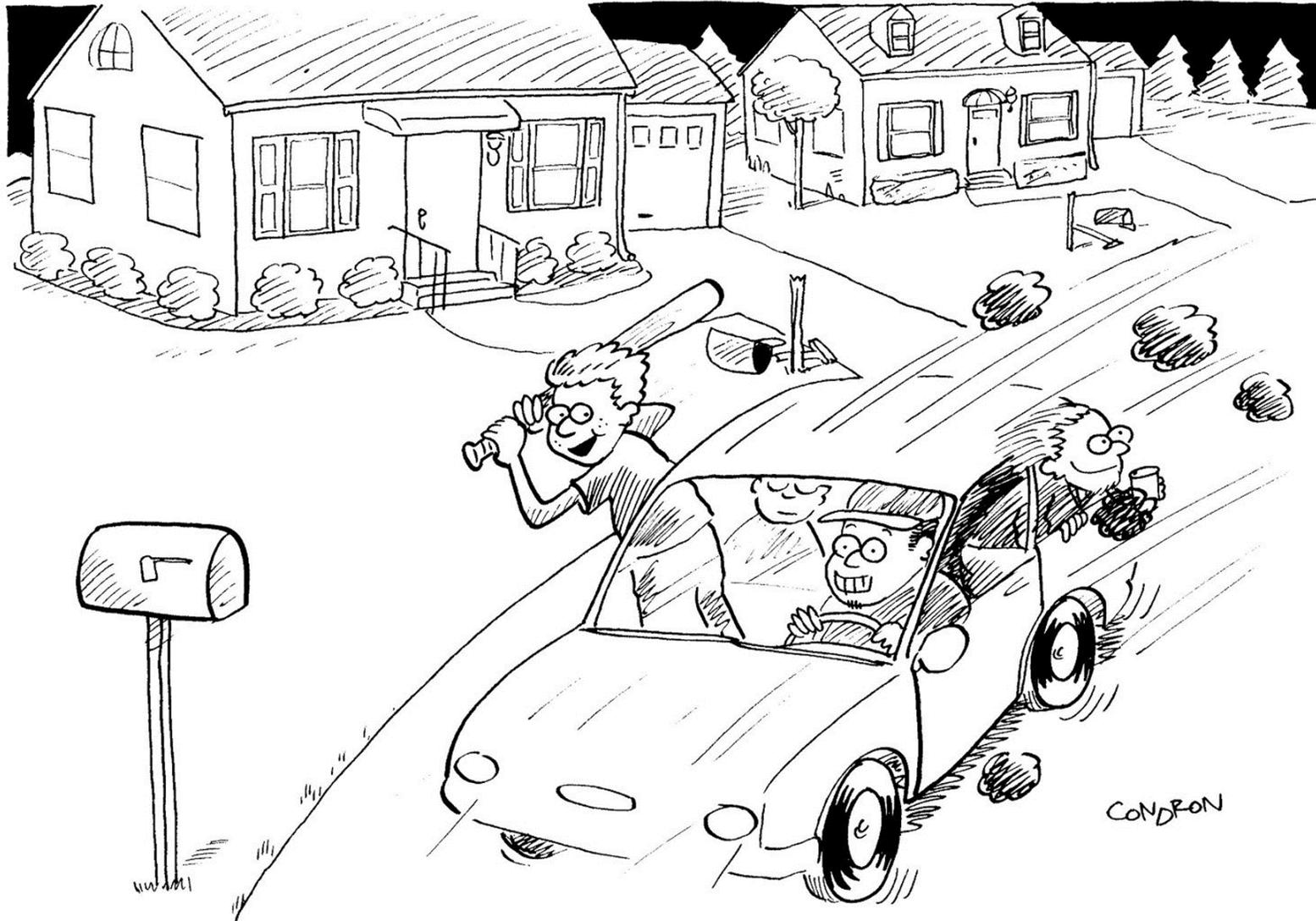
← Individual Responsibility

Community, Family, Colleague Responsibility

→ Care or Medical Provider Responsibility

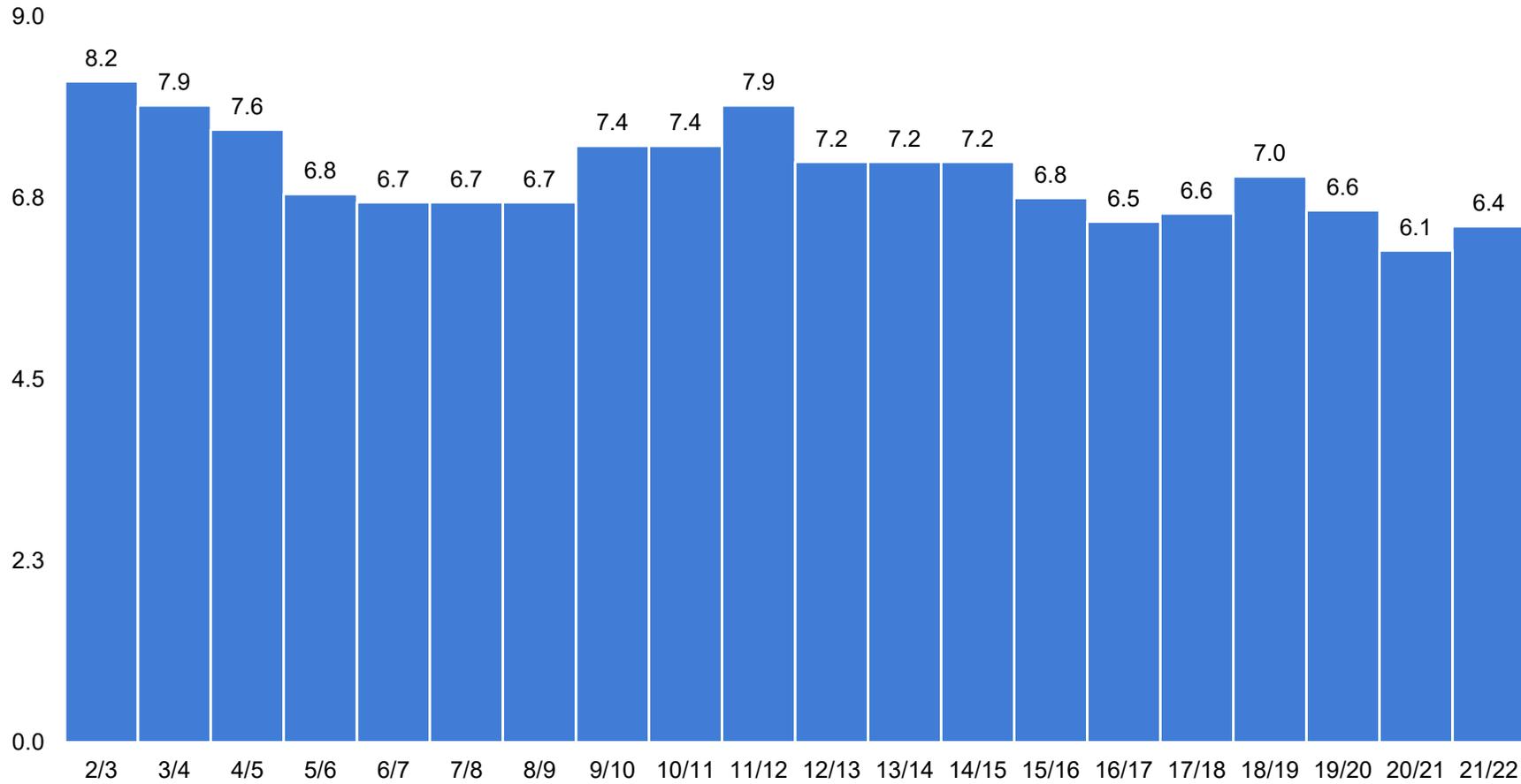
- 1. Remember current trends
- 2. Understand the impact on the developing brain
- 3. Apply skills to care for adolescents



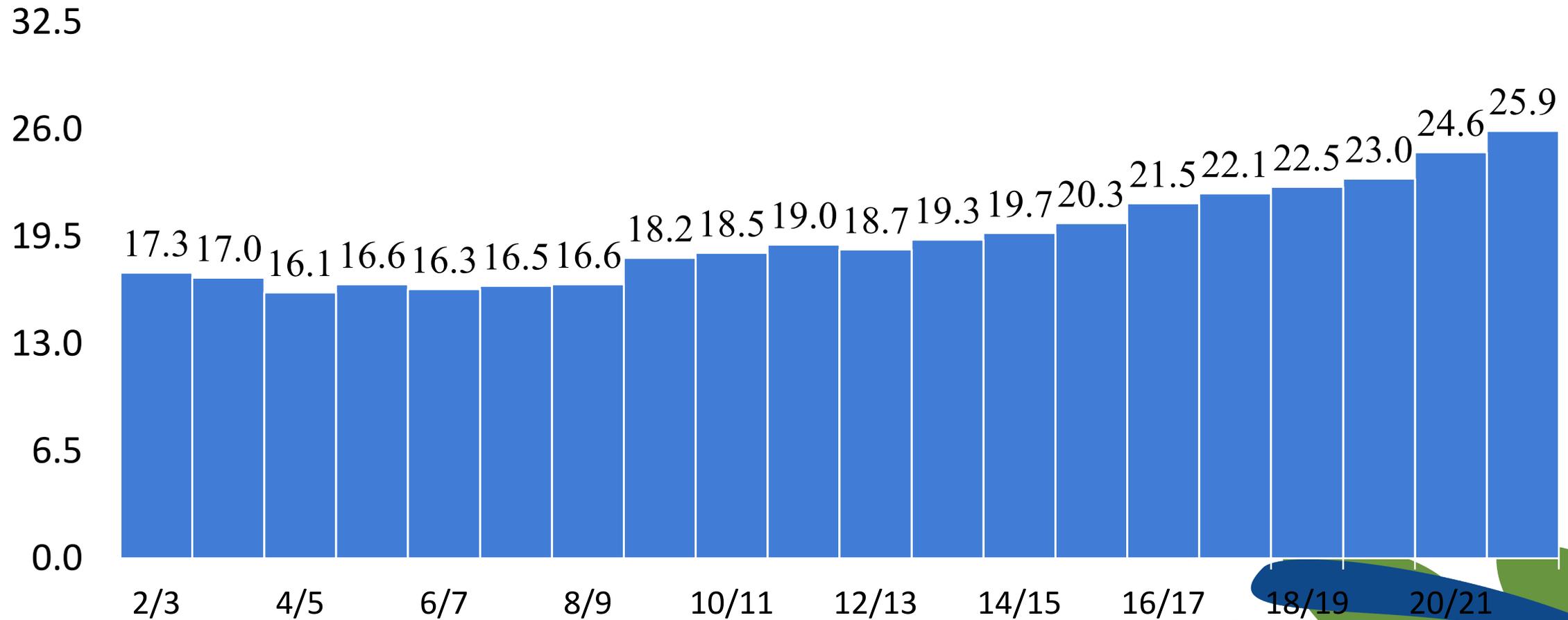


"SOMEDAY, WHEN OUR PRE-FRONTAL CORTEXES ARE FULLY DEVELOPED, WE'LL LOOK BACK ON THIS AND SHAKE OUR HEADS."

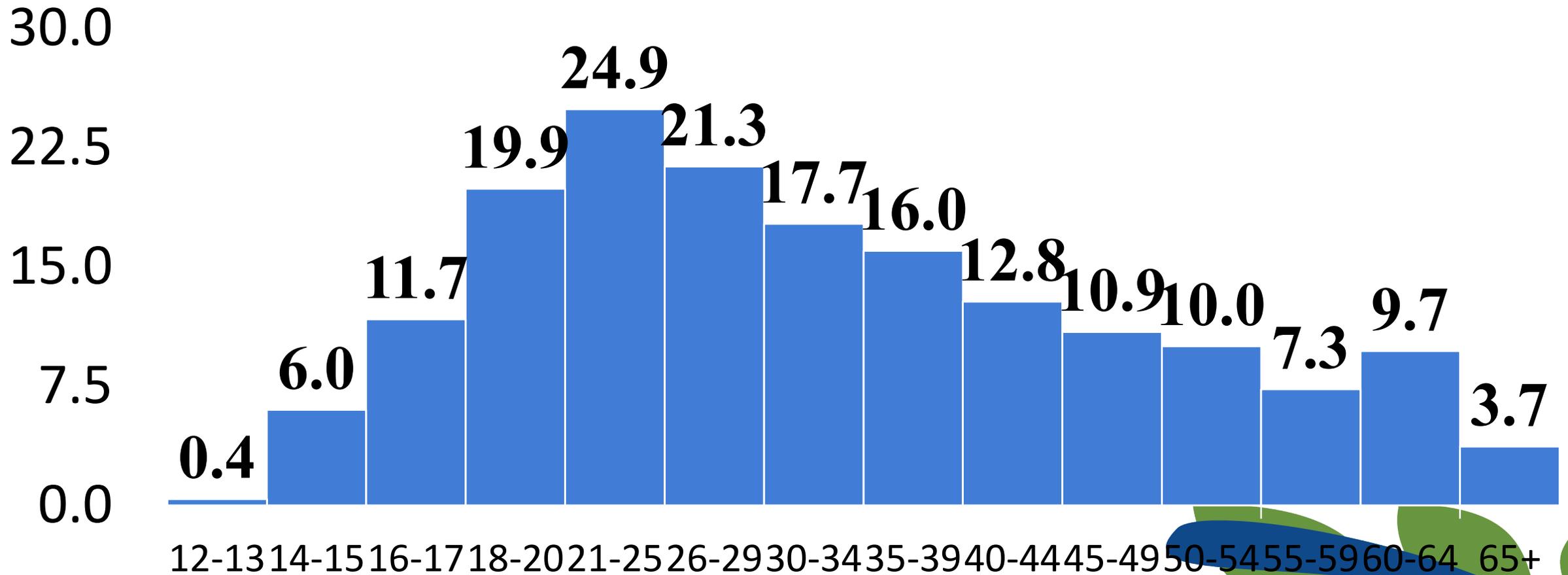
# Past Month Prevalence of Marijuana Use - by Year, NSDUH. 12-17 year olds - US



# Past Month Prevalence of Marijuana Use - by Year, NSDUH. 18-25 year olds - US



# Past Month Prevalence of Marijuana Use in CO- by Age - 2020



# Shatter, Wax, Butane Hash Oil















important



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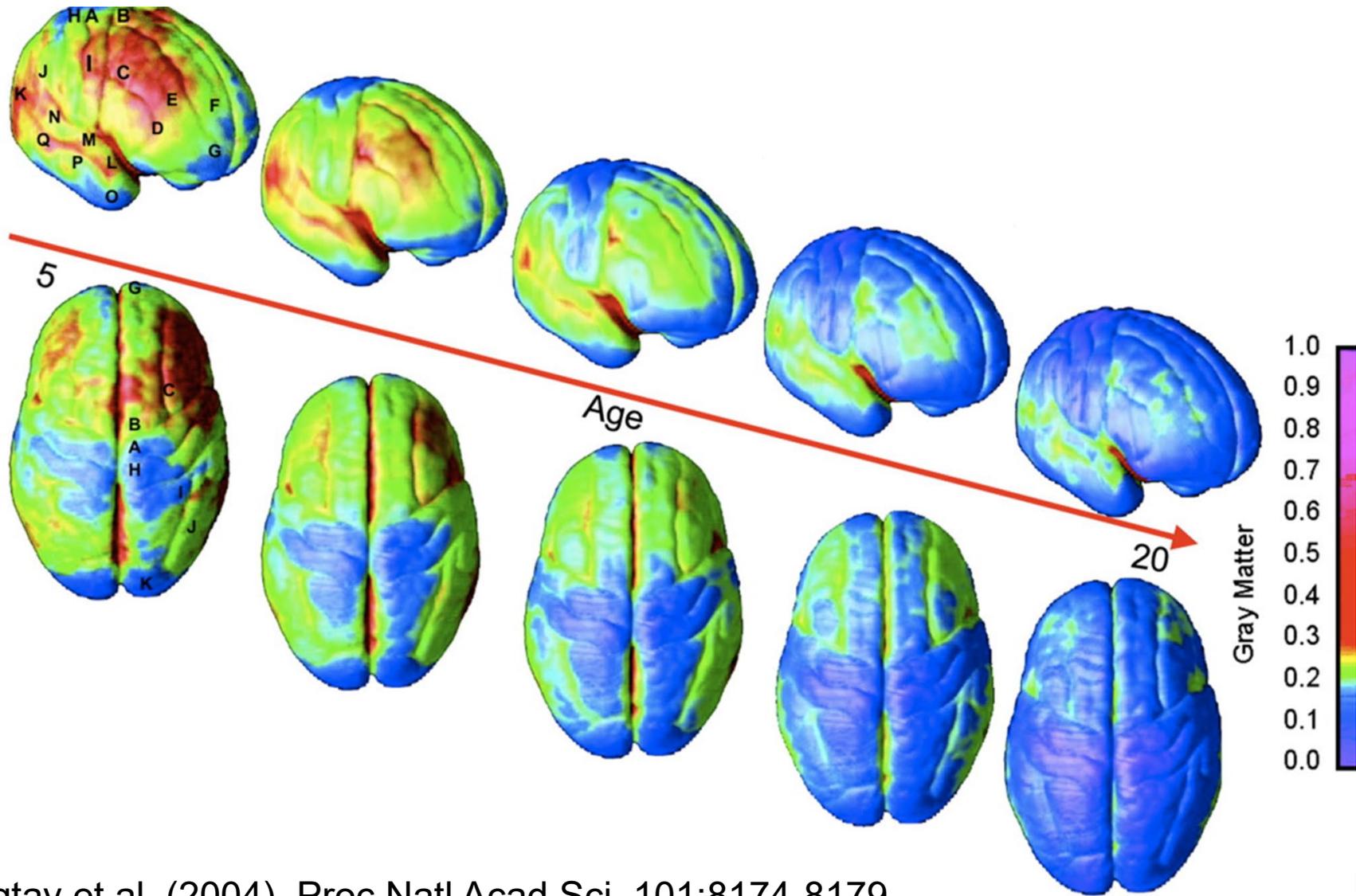
First Time Patients  
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New Patient Special \$140 0Z Any Strain

**GREENFIELDS**

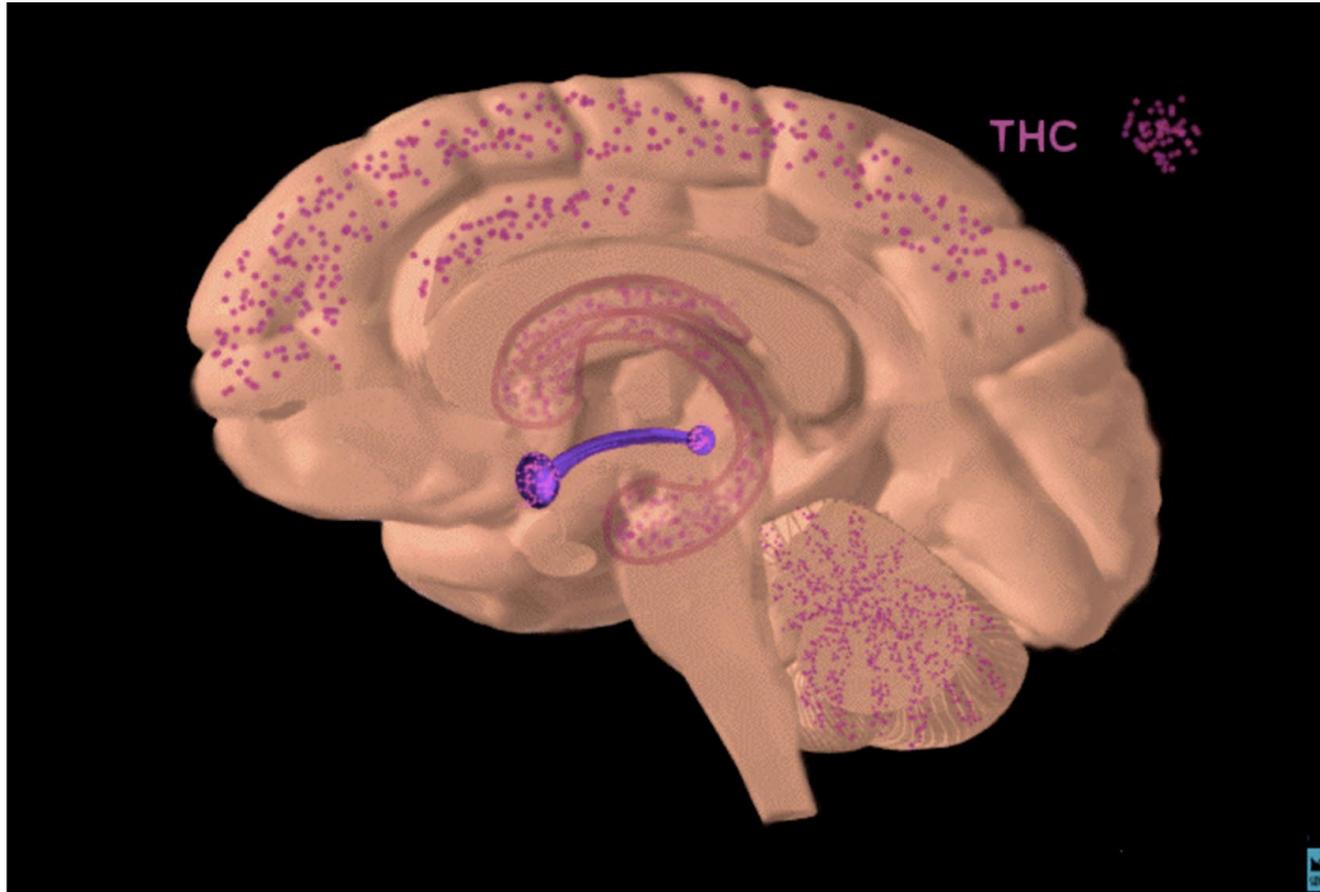
1798 West Mississippi Ave. Denver, CO 80223





Gogtay et al. (2004), Proc Natl Acad Sci 101:8174-8179





National Institute on Drug Abuse





Lawrence et al., 2015, *Frontiers in Psychology* 6:1-14



# Marijuana and Development

- 1 in 6 develop addiction Hall and Degenhardt (2009), Lancet 374:1383-1391
- Heavy marijuana exposure starting in adolescence predicts and 8-point drop in IQ from age 13 to 38 years Meier et al., (2012), Proc Natl Acad Sci USA 109:E2657-E2664
- 2-fold increased risk of psychosis in adulthood Andreasson et al. (1987), Lancet 2:1483-1486; Arsenuault et al. (2004), Br J Psychiatry 184:110-117; Bechtold et al. (2016), Am J Psychiatry 173:781-789; Fergusson et al. (2005), 100:354-366; Henquet et al. (2005), BMJ 330:11; Kuepper et al. (2001), BMJ 342:d738; van Os et al. (2002), Am J Epidemiol 156:319-327; Shanahan et al., (2022), Drug Alcohol Depend 228:109063; Trotta et al. (2023), Psychol Med 53:7375-7384

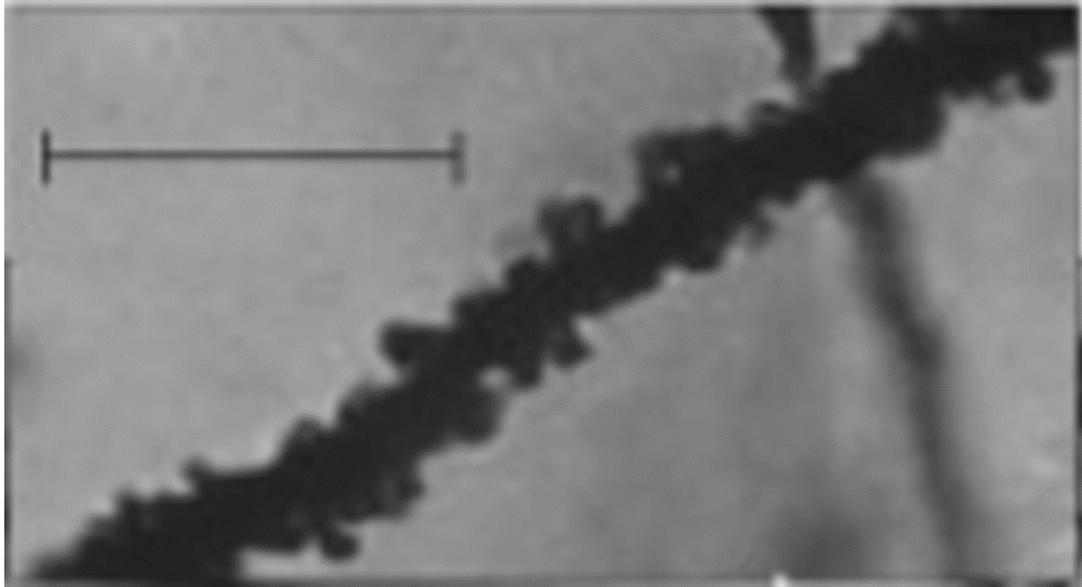


# Marijuana and Development

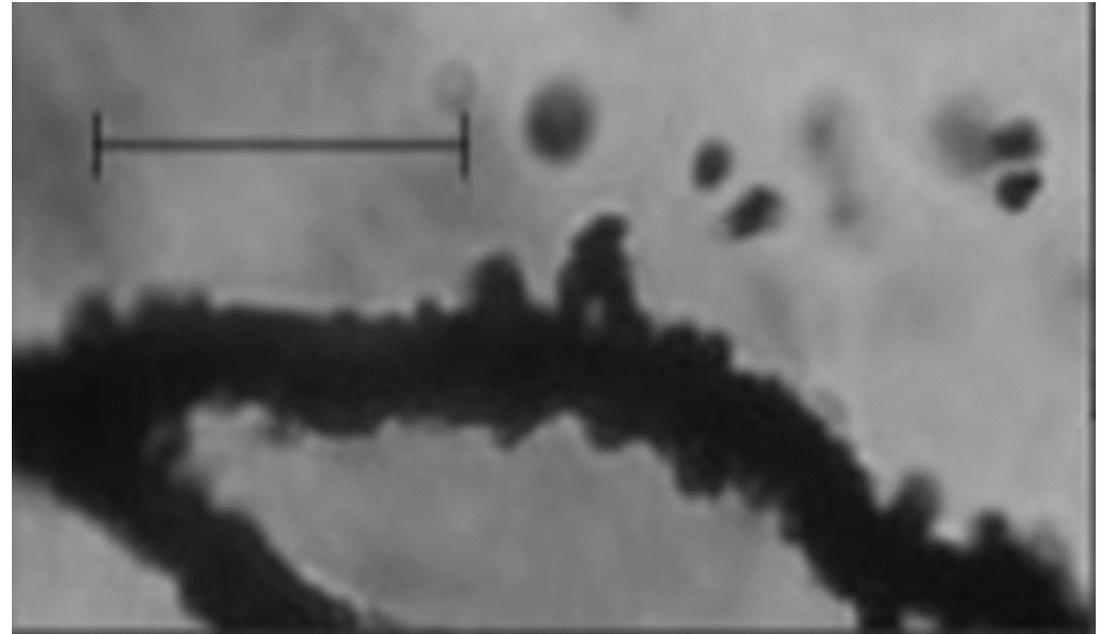
- Decreased school achievement Brook et al. (1999), Am J Public Health 89:1549-1554; Fergusson et al. (2003), Addiction 98:1681-1692; Horwood et al. (2010), Drug Alcohol Depend 110:247-253; Lynne-Landsman et al. (2010), Dev Psychopathol 22:933-948; Stiby et al. (2015), Addiction 110:658-668
- Increased risk of using other substances Smith et al. (2013), Drug Alcohol Depend 132:63-68
- Depression (OR=1.37) and suicide attempt (3.46) Gobbi et al., 2019 JAMA
- Cannabinoid Hyperemesis Allen et al. (2004), Gut 53:1566-1570; Kim et al. (2005), Acad Emerg Med 22:694-699; Simonetto et al. (2012), Mayo Clinic Proceedings 87:114-119; Soriano et al. (2010), Dig Dis Sci 55:3113-3119; Wallace et al. (2011)



# No MJ in adolescence

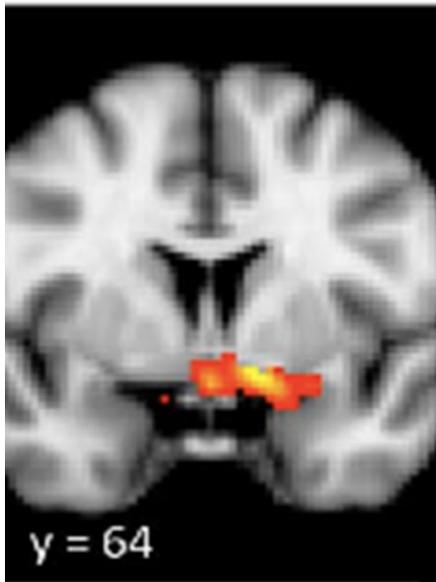
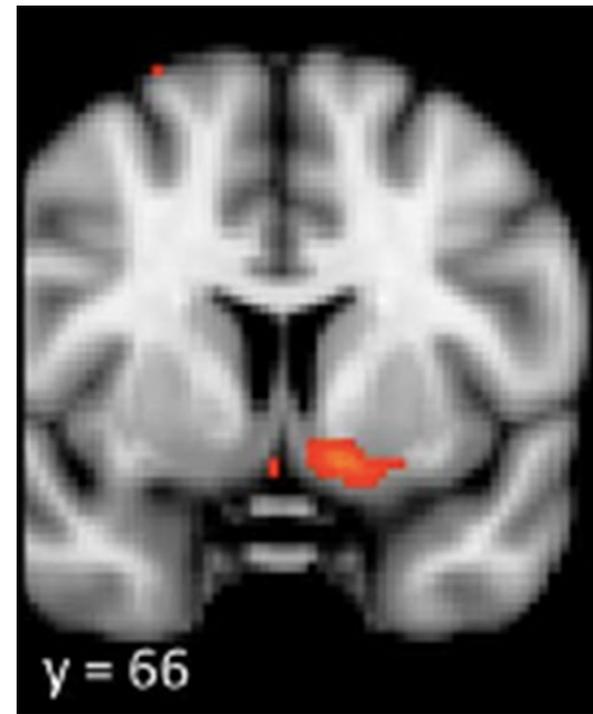
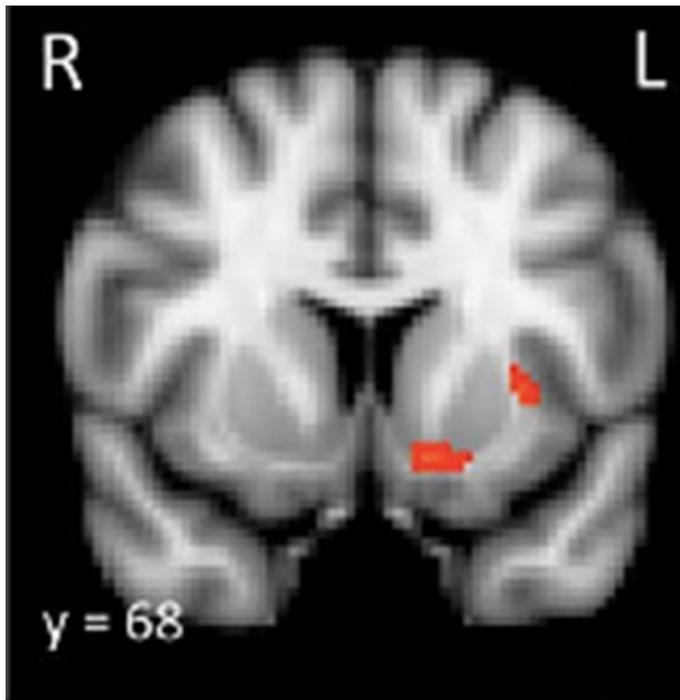


MJ in adolescence



Rubino et al. (2009), *Hippocampus* 19:763-772





- CB1 receptor peak in adolescents
- Mice/humans with no/reduced FAAH have reduced fear, quicker fear extinction
- Humans with reduced FAAH have increased reward/impulsivity
- Humans/Mice both have more alcohol/substance use
- DISC1 mutation associated with SMI
- DISC1 expression altered in adolescent mice exposed to THC
- Increased DISC1 expression increased inflammatory markers in hippocampus
- Adolescents THC reduces dendrite expression in pre limbic system of rats
- Adolescent THC exposure alters 95% of gene expression in adult rats in pyramidal cells of amygdala, cortex, hippocampus - including pacsin, Clu, Snap 25 genes - associated with schizophrenia



- Cognition typically returns after 25 days of chronic cannabis exposure - but adolescents have greater activation of multiple parts of the brain associated with attention, schizophrenia, mood disorders - even after abstinence

Hurd et al. (2019), J Neuroscience 39:8250-8258



# Marijuana and Development

Rats exposed to THC as adolescents (28-49 days of life) have more opioid administration as adults

Ellgren et al., 2007. Neuropsychopharm 32:607-615  
Stopping et al., 2014. Neuropsychopharmacol 24:1037-1045  
Tomasiewicz et al., 2012. Biol Psychiatry 72:803-810

Adolescent THC upregulates opioid receptors and pre-proenkephalin in the brain reward circuit

Lecca et al., 2020. Neuropharmacology 166:107974  
Tomasiewicz et al., 2012. Biol Psychiatry 72:803-810

Adolescent THC alters CB1 gene expression in the brain reward

Kruse et al., 2019. Neuropsychopharmacol 44:1406-1414

Adolescent THC leads to dopamine dysregulation in the brain reward circuits

Renard et al., Cerebral Cortex 27:1297-1310

Leads to premature pruning of dendrites in PFC, atrophy of dendritic arborization, altered morphology, dendritic development, and cytoskeletal organization in PFC pyramidal neurons, altered expression of epigenetic regulators

Miller et al., 2019. Mol Psych 24: 588-600



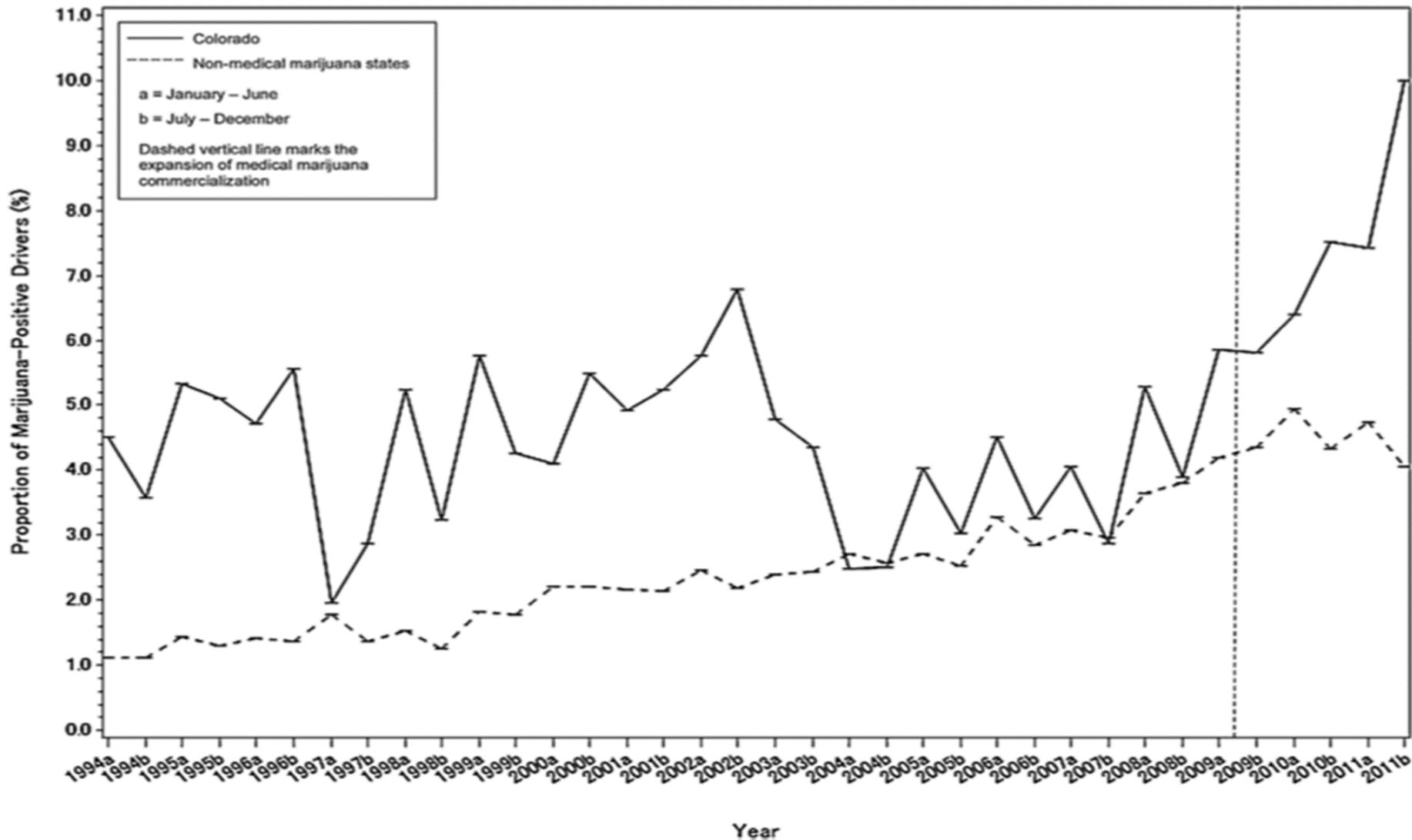
- No known safe amount of marijuana use during adolescence



- 5.5% of CO high school drivers drove in the last 30 days after using marijuana
- 12.5% of high school students rode in a car in the last 30 days with a driver who had been using marijuana
- Three leading causes of death for teenagers: accidents, homicide, suicide (CDC - <https://www.cdc.gov/nchs/data/databriefs/db37.pdf>)
- <https://cdphe.colorado.gov/healthy-kids-colorado-survey-dashboard>



# Traffic fatalities



# Marijuana and Cars

- Doubles odds of a traffic crash (Li et al., 2012 *Epidemic Rev* 34:65-72)
- Impairs staying in lane, reaction time, and maintaining distance (Lenne et al., 2010 *Accid Anal Prev* 42:859-866)
- Lane weaving, reaction time, divide-attention, maintaining distance, more distractible (Hartman et al., 2012 *Chin Chem* 59:478-492; Hartman et al., 2015 *Drug Alc Depend* 154:25-37)



Warm relationship between child and caregivers is the strongest prevention and treatment



# Attachment



- Available - Physically reachable?
- Responsive - Do you answer when called?
- Engaged - Can you show that you are tuned into their emotions?

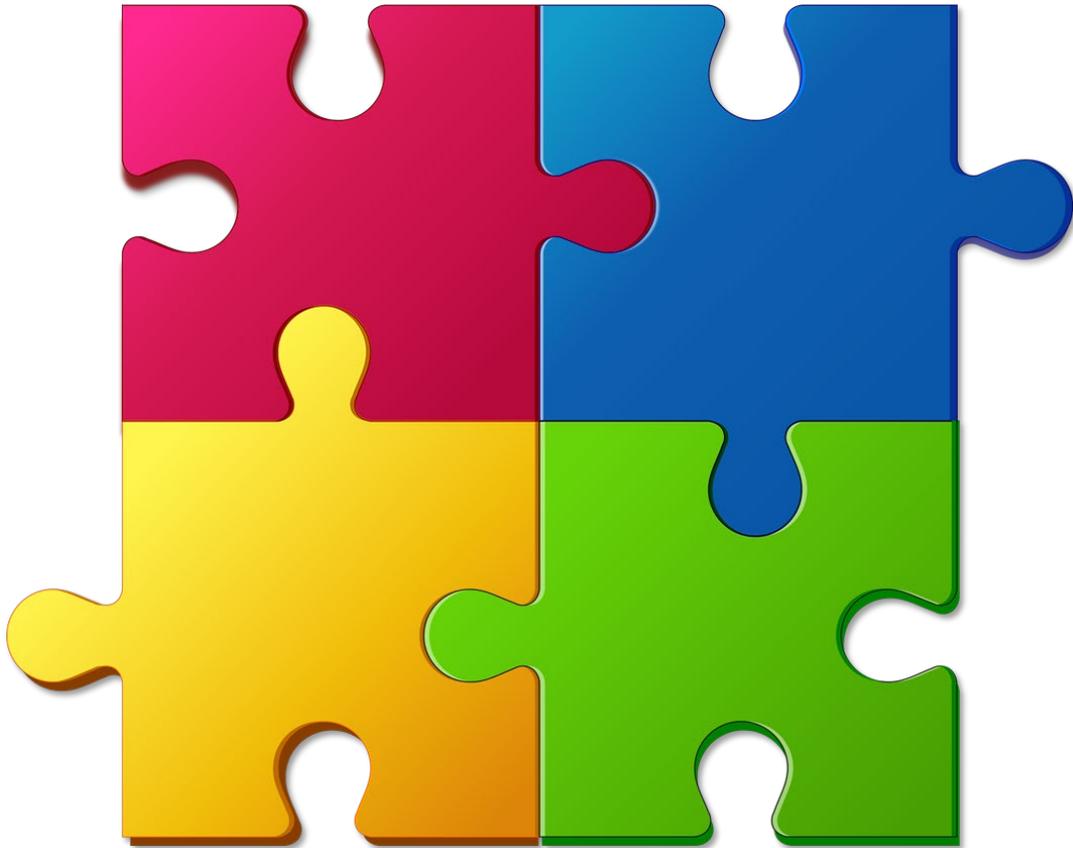


# AHRQ: Interventions for Substance Use Disorders in Adolescents: A Systematic Review - 2020

- MI and family therapy reduce alcohol use
- No clear intervention emerges as superior for cannabis use



# Overall Model



# Favorite Teacher Exercise



<b>Authenticity</b>	<b>Adventure</b>	<b>Autonomy</b>	<b>Balance</b>	<b>Beauty</b>
<b>Compassion</b>	<b>Challenge</b>	<b>Citizenship</b>	<b>Competency</b>	<b>Contribution</b>
<b>Fairness</b>	<b>Trustworthiness</b>	<b>Friendships</b>	<b>Fun</b>	<b>Growth</b>
<b>Happiness</b>	<b>Honesty</b>	<b>Inner Harmony</b>	<b>Kindness</b>	<b>Knowledge</b>
<b>Loyalty</b>	<b>Meaningful work</b>	<b>Peace</b>	<b>Recognition</b>	<b>Respect</b>
<b>Security</b>	<b>Self-respect</b>	<b>Spirituality</b>	<b>Wealth</b>	<b>Wisdom</b>



# Contingency Management



# Systems of Care

Residential/Detox

Intensive outpatient/  
In-home

Outpatient/ER/Urgent  
Care

Selective prevention

Universal prevention

Thurstone et al., 2023, J School Health pub; Thurstone et al., 2022 Pediatric Emergency Care 38:e1590-e1593



# Medications

- Fluoxetine > PBO (Riggs et al., 2007, Arch Pediatr Adolesc Med 161:1026-1034)
- OROS-MPH (Riggs et al., 2011, J Am Acad Child Adolesc Psychiatry 50:903-914)
- Atomoxetine (Thurstone et al., 2010, J Am Acad Child Adolesc Psychiatry 49:573-582)
- NAC 1200 mg twice daily (Gray et al., Am J Psychiatry 169:805-812)
- Aripiprazole (Thurstone et al., J Child Adolesc Psychopharmacol 33:332-336)



# Summary

- 1. Remember current trends
- 2. Understand the impact on the developing brain
- 3. Apply skills to care for adolescents





# Pacific Southwest

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## Thank you!

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