Marijuana Health Effects, Related Issues, and How to Treat Them

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Disclosures of Potential Conflicts

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Rowman Littlefield					X			
US Army			X					
Other								X

Participants will be able to:

1. Discuss the latest health effect findings in current research.

2. Describe the clinical issues practitioners may encounter when working with individuals using marijuana.

3. Explain how Motivational Interviewing and impact can be applied when working with this population.
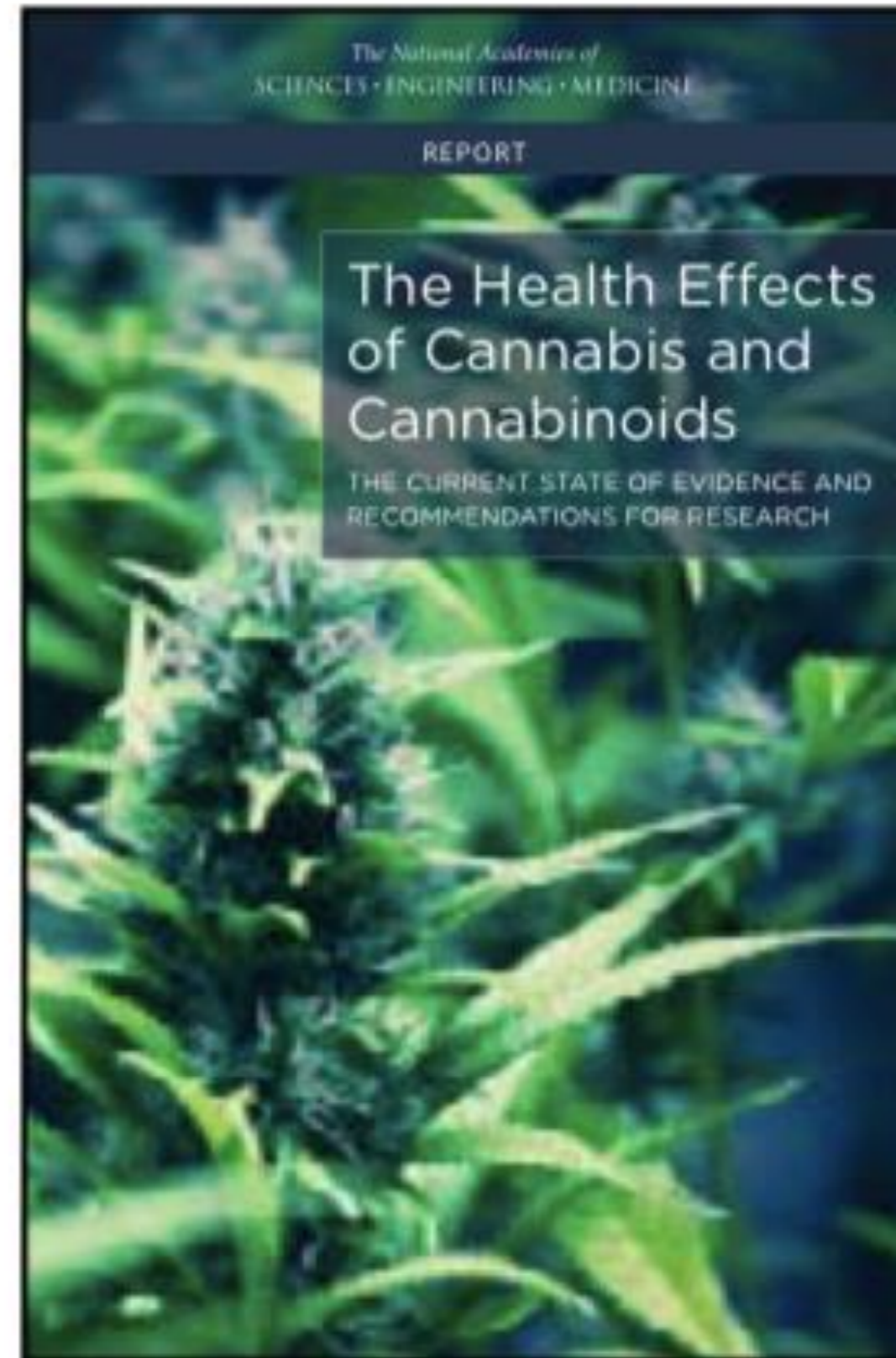
Morning Meditation

1. Summary of health effects (Why do we care about marijuana?)
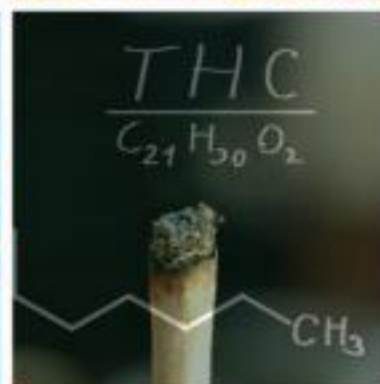
Monitoring Health Concerns Related to Marijuan in Colorado: 2016

Changes in Marijuana Use Patt
Systematic Literature Review,
and Possible Marijuana-Relate
Health Effects

THC
$C_{21}H_{30}O_2$

CH₃

The Health Effects of Cannabis and Cannabinoids

THE CURRENT STATE OF EVIDENCE AND
RECOMMENDATIONS FOR RESEARCH

Medical Uses

- 120 children with Dravet's syndrome
- CBD v PBO
- CBD group had seizures decrease from 12.4 to 5.9 per month. PBO group had a decrease from 14.9 to 14.1 ($p=0.01$).
- Diarrhea, vomiting, fatigue, pyrexia, somnolence and increased LFTs

Devinsky et al. (2017), N Engl J Med 376:2011-2020

Substantial evidence

- Treatment for chronic pain in adults
- Antiemetics for chemotherapy-induced nausea and vomiting
- MS spasticity

Moderate evidence

- Short term sleep for people with chronic pain, OSA, fibromyalgia, MS (nabiximols)

Limited evidence

- Anxiety (CBD)
- HIV
- PTSD (Nabilone) but worse outcomes among those using raw marijuana (Johnson et al., 2016 J Affect Discord 190:439-442; Wilkinson et al., 2015 J Clin Psychiatry 76:1174-1180)
- TBI
- Tourette's
- Ineffective for dementia, glaucoma, depression in people w chronic pain or MS

Insufficient/No evidence

- Addiction
- CBD for for schizophrenia
- Cancer
- Epilepsy
- Huntington's chorea
- Irritable bowel

Pertinent Negatives

- Fetal distress Gunn et al. (2016)

- Maternal diabetes, rupture of membranes, premature labor, duration of labor, placenta abruption, hypertension, hyperemesis, hemorrhage Gunn et al. (2016), BMJ Open 6(4):e009986

- Birth length, head circumference, small for gestational age Fergussion et al. (2002), Br J Ob Gyn 109:21-27; Gray et al. (2010), Clin Chem 56:1442-1450; Gunn et al. (2016), BMJ Open 6(4):e009986

- SIDS with maternal use Klonoff-Cohen and Lam-Kruglic (2001), Ped Adol Med 155:765-770

Pertinent Positives

- Decrease in birth weight(?) Fergussion et al. (2002), Br J Ob Gyn 109:21-27; Gray et al. (2010), Clin Chem 56:1442-1450; Gunn et al. (2016), BMJ Open 6(4):e009986 (84 g difference with 1 joint per week)
- Decreased IQ at age 5 (6 points) Goldschmidt et al. (2008), *J Am Acad Child Adolesc Psychiatry* 47:254-263
- Increased odds of depression at age 10 (35% v 17%, p<0.01) Gray et al. (2005), *Neurotoxicol Teratol* 27:439-448
- Increased odds of marijuana use at age 14 Day et al. (2006), *Addiction* 101:1313-1322
- Decreased school achievement at age 14 (Composite WIAT 83.9 v 89.9, p=0.003) Goldschmidt et al. (2012), *Neurotoxicol Teratol* 34:161-167

Not clear

- Congenital malformations
- Prematurity
- Neonatal admission

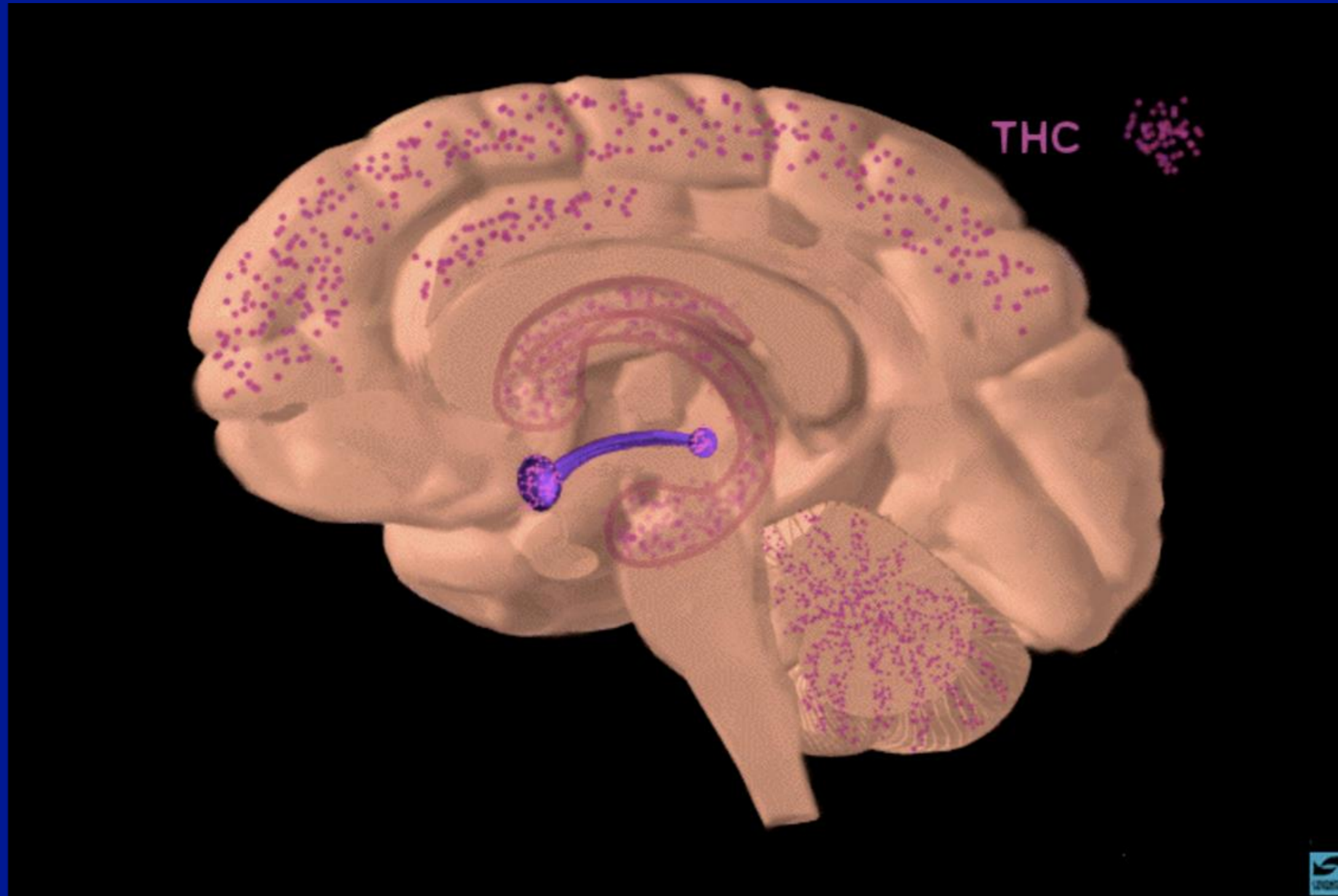National Academy of Science, 2016. The health effects of cannabis and cannabinoids

Second-hand exposure:

- 14 marijuana exposures in children < 12 yrs evaluated since 2010
- 8 patients admitted, 2 to ICU

Sources: Wang et al. (2013), *JAMA* 140:epub

THC

National Institute on Drug Abuse
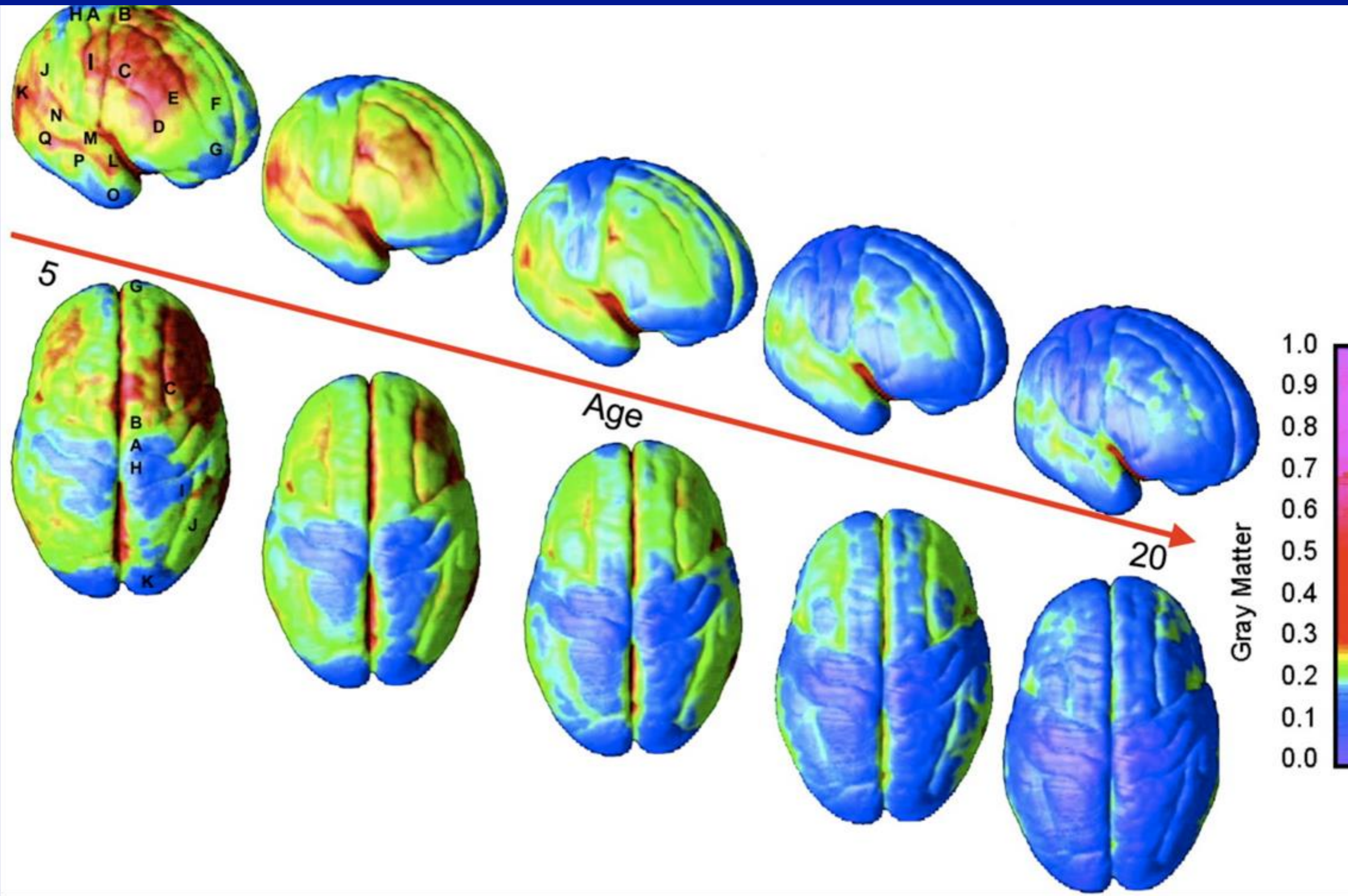
How many neurons are in the brain?

1 million | **A**

1 billion | **B**

10 billion | **C**

100 billion | **D**

1 lb

2 lbs

3 lbs

4 lbs

5 lbs

How many miles of blood vessels are in the brain?

1 mile

1,250 miles

125,000

1,250,000

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

Mixed findings

anxiety Bechtold et al. (2015), Psychol Addict Behave 10:1037; Degenhardt et al. (2013), Addiction 108:124-133; Gage et al. (2015), PLoS One 10:e0122896; Miettunen et al. (2013), Psychol Med 10:1017; Zaman et al. (2015), J Addict Med 10:1097

depression Arsenault et al. (2004), Br J Psychiatry 184:110-117; Bechtold et al. (2015), Psychol Addict Behave 10:1037; Degenhardt et al. (2013), Addiction 108:124-133; Gage et al. (2015), PLoS One 10:e0122896; Horwood et al. (2012), Drug Alcohol Depend 126:369-378; Miettunen et al. (2013), Psychol Med 10:1017; Pahl et al. (2011), Psychol Med 41:1775-1783; Rasic et al. (2013), Drug Alcohol Depend 129:49-53; Zaman et al. (2015), J Addict Med 10:1097

suicide Consoli et al. (2013), Child Adolesc Psychiatry Ment Health 7:8; Kokkevi et al. (2012), Eur Child Adolesc Psychiatry 21:443-450; Rasic et al. (2013), Drug Alcohol Depend 129:49-53; Spears et al. (2014), Soc Psychiatry Psychiatr Epidemiol 49:629-637; Zhang and Wu (2014), Drug Alcohol Depend 142:63-73

Positive findings

- 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; Arsenault 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

-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 Depend110:247-253; Lynne-Landsman et al. (2010), Dev Psychophathol 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

Pregnancy   Latency   Adolescence   Adulthood
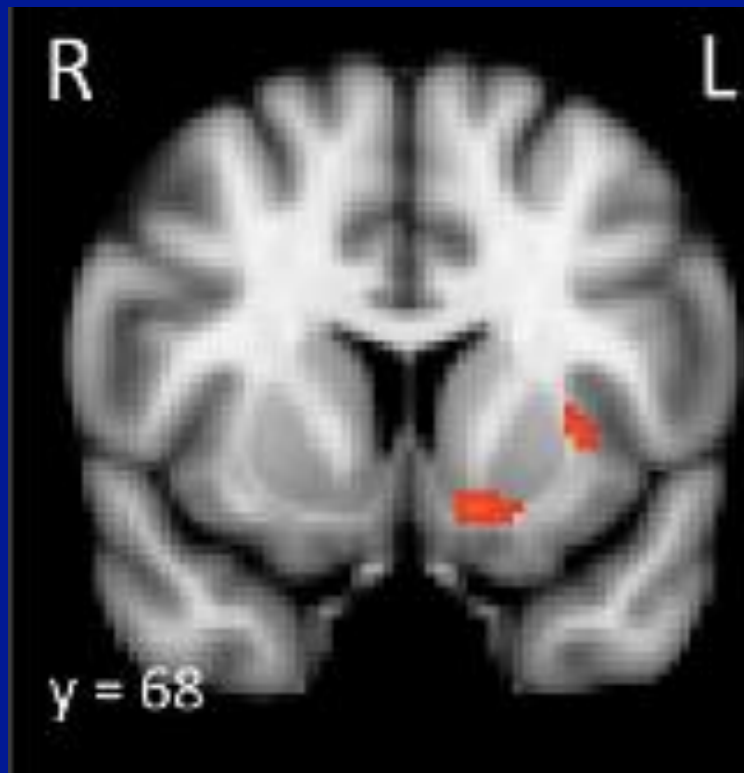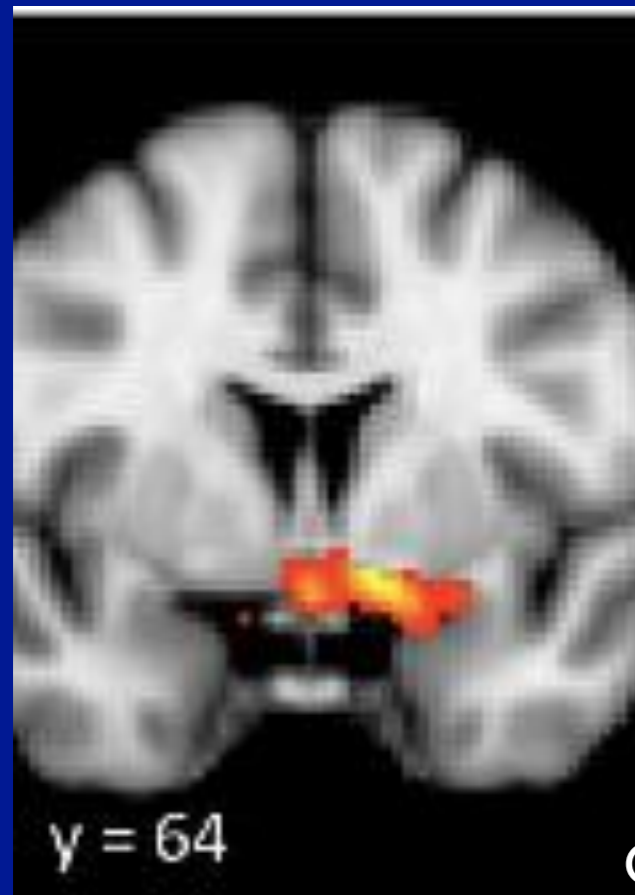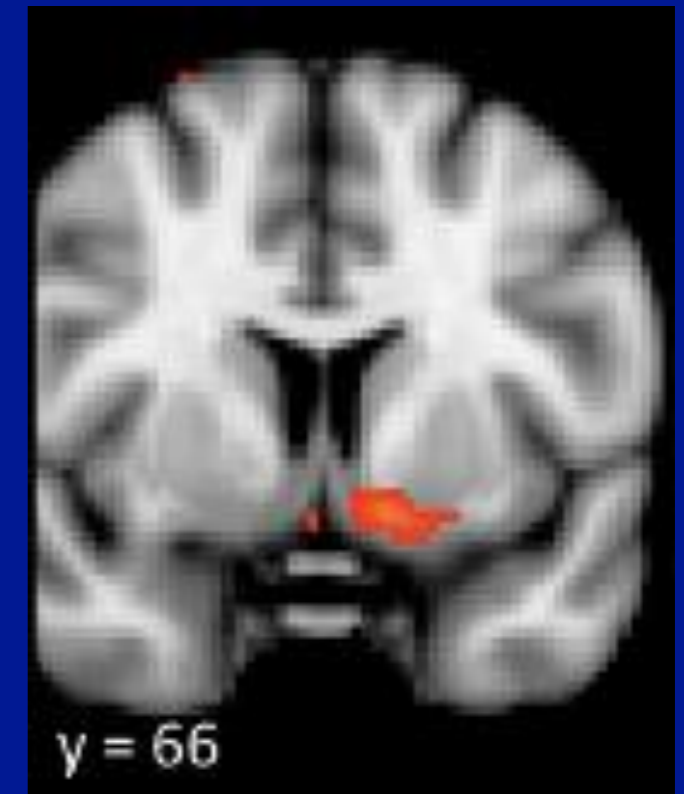
Animal Data

No MJ in adolescence

MJ in adolescence ⟶

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

Pregnancy Latency Adolescence Adulthood

R L

y = 68

← MJ

y = 66
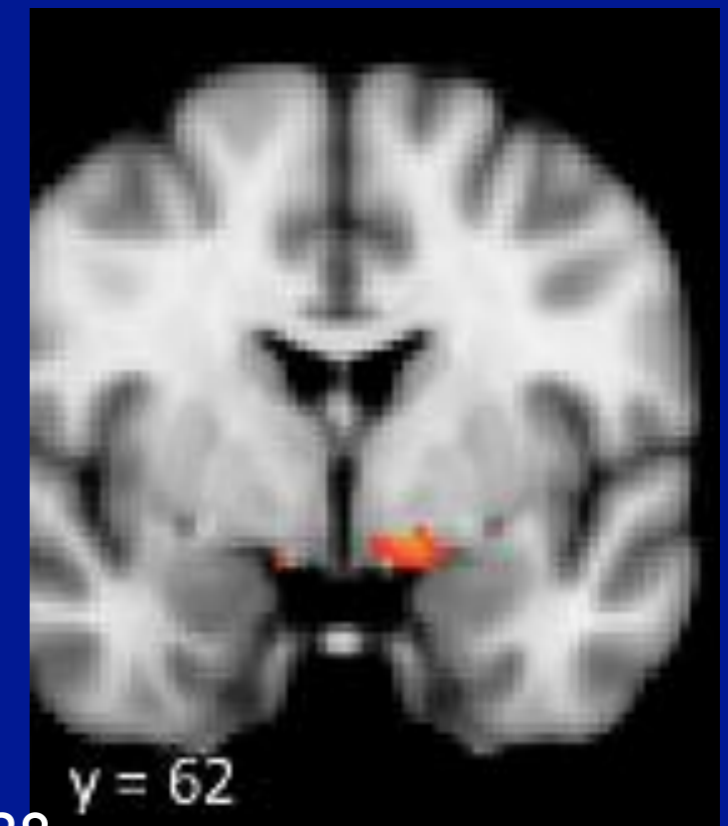
Control →

y = 64

y = 62

Gilman et al. (2014), *J Neurosci* 34:5529-5538

Pertinent Negatives

Fewer than 10 joint years is not associated with lung cancer Aldington et al (2008), Eur Respire J 31:280-286; Callaghan et al. (2013), Cancer Causes Control 24:1811-1820; Han et al. (2010), Ann Epidemiol Biomarkers Prev 15:1829-1834; Hashibe et al. (2006), 15:1829-1834; Sidney et al (1997), 8:722-728; Zhang et al. (2014), In J Cancer 10:1002

Pertinent Positives

- Marijuana smoke contains similar carcinogens as tobacco smoke Moir et al. (2008), Chem Res Toxic 21:494-502
- Daily smoking associated with pre-malignant changes in airways Barsky et al. (1998), J Natl Cancer Inst 90:1198-1205; Fliegiel et al. (1997), Chest 112:319-326; Gong et al. (1987), Am Rev Respire Dis 136:142-149
- Increased risk of ischemic stroke in people < 55 years Barber et al. (2013), Stroke 44:2327-2329; Geller et al. (2004), Pediatrics 113:e365; Hackam et al. (2015), Stroke 46:852-856; Rumalla et al. (2016), J Neurol Sci 364:191-196; Thani et al. (2009), Postgrad Med J 85:80-83; Wolff et al. (2013), Stroke 44:558-563
- Increased risk of myocardial infarction Jouanjus et al. (2014), J Am Heart Assoc 3:e000638; Mittleman et al. (2001), Circulation 103:2805-2809;

Pertinent Positives

- Cannabinoid Hyperemesis Syndrome Allen et al. (2004), Gut 53:1566-1570; Kim et al. (205), 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), South Med J 104:659-664

- Chronic Bronchitis Bloom et al. (1987), Clin Res Ed 295:1516-1518; Roth et al. (1998), Am J Respire Crit Care Med 157:928-937; Sherrill et al. (1991), Int J Epidemiol 20:132-137; Tashkent et al. (1987), Am Rev Respir Dis 135:209-216

- Daily use and memory impairment for 7 days Bolla et al. (2002), Neurology 59:1337-1343; Roebke et al. (2014), Am J Drug Alcohol Abuse 10:3109; Solowij et al. (2002), JAMA 287:1123-1123; Thames et al. (2014), Addict Behav 39:994-999

- Addiction Hasin et al. (2015), JAMA Psychiatry 72:1235-1242; Lopez-Quintero et al. (2011), Drug Alcohol Depend 115:120-130

Marijuana and Opioid Overdose

- Among people with Medicaid, states with MMJ laws had a 5.88% lower rate of opioid prescriptions compared to states w/o MMJ (Wen & Hockenberry, 2018, JAMA Int Med

- Similar findings for patients w Medicare Part D (Bradford et al., 2018, JAMA Int Med; Powell et al., 2018, J Health Economics 58:29-42)

- 2014 Commercialization of MJ in CO associated with decrees in opioid deaths of 0.7 per month (Livingston et al., 2017, AJPH 107:1827-1829)

Marijuana and Opioid Overdose

- Adults w past year marijuana use were 6 X's more likely to have non-medical opioid use and 8 X's more likely to have opioid use disorder in 3-4 years (Olfson et al., 2018, Am J Pyschiatry 175:1)

Clinical and treatment issues

827 retail stores
1145 marijuana cultivation facilities
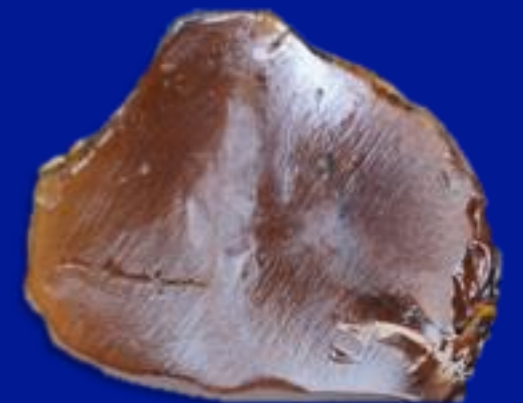261 edible producers

Green crack

Ear wax

Budder

Butane hash oil

Hash oil capsules

Shatter

An example of Herijuana, a.k.a. Harijuana, Herojuana, from Colorado dispensary Wellspring Collective. (Ry Prichard, The Cannabist)

Herijuana, a.k.a. Harijuana, Herojuana (marijuana review)
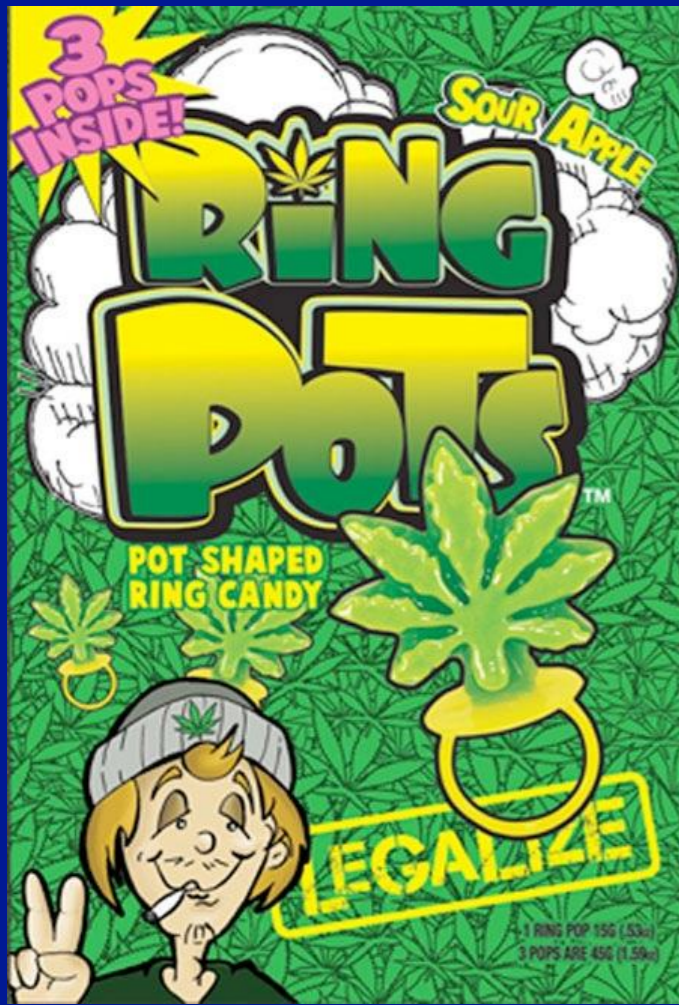
Marijuana Strains

Cannabis sativa - stimulating

Cannabis indica - depressing

Maui Wowie - 60/40, flavorful, good smell, may cause nausea

Sour D - Sativa brand

Daddy Fat Sacks MMC

Medical Marijuana Use Among Adolescents in Substance Abuse Treatment

Stacy Salomonsen-Sautel, Ph.D., Joseph T. Sakai, M.D., Christian Thurstone, M.D.,
Robin Corley, Ph.D., Christian Hopfer, M.D.

Objective: To assess the prevalence and frequency of medical marijuana diversion and use among adolescents in substance abuse treatment and to identify factors related to their medical marijuana use. **Method:** This study calculated the prevalence and frequency of diverted medical marijuana use among adolescents (n = 164), ages 14–18 years (mean age = 16.09, SD = 1.12), in substance abuse treatment in the Denver metropolitan area. Bivariate and multivariate analyses were completed to determine factors related to adolescents' use of medical marijuana. **Results:** Approximately 74% of the adolescents had used someone else's medical marijuana, and they reported using diverted medical marijuana a median of 50 times. After adjusting for gender and race/ethnicity, adolescents who used medical marijuana had an earlier age of regular marijuana use, more marijuana abuse and dependence symptoms, and more conduct disorder symptoms compared with those who did not use medical marijuana. **Conclusions:** Medical marijuana use among adolescent patients in substance abuse treatment is very common, implying substantial diversion from registered users. These results support the need for policy changes that protect against diversion of medical marijuana and reduce adolescent access to diverted medical marijuana. Future studies should examine patterns of medical marijuana diversion and use in general population adolescents. J. Am. Acad. Child Adolesc. Psychiatry, 2012;51(7):694–702. **Key Words:** medical marijuana, marijuana, diversion, adolescents, substance abuse treatment
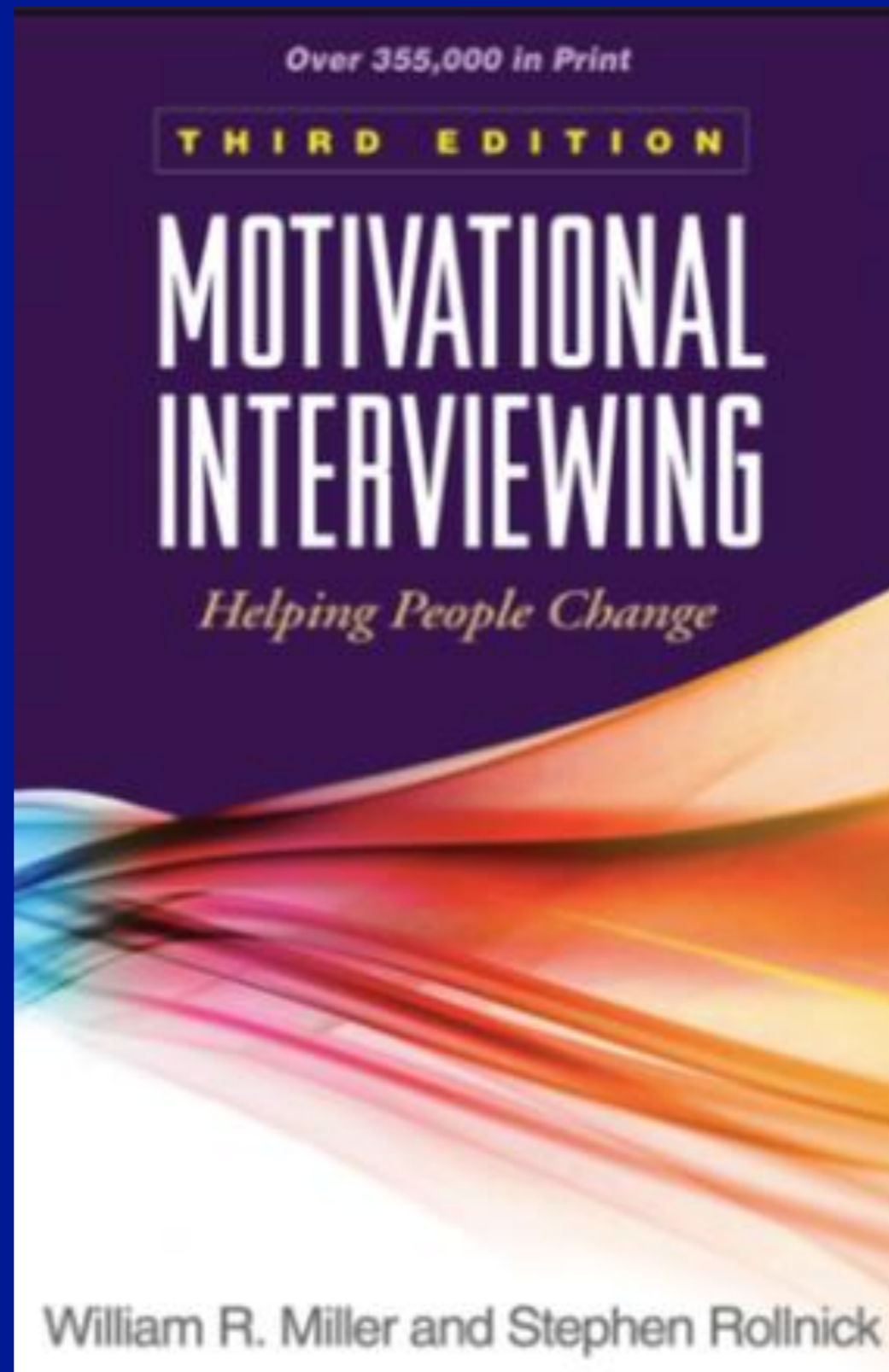
Traffic fatalities
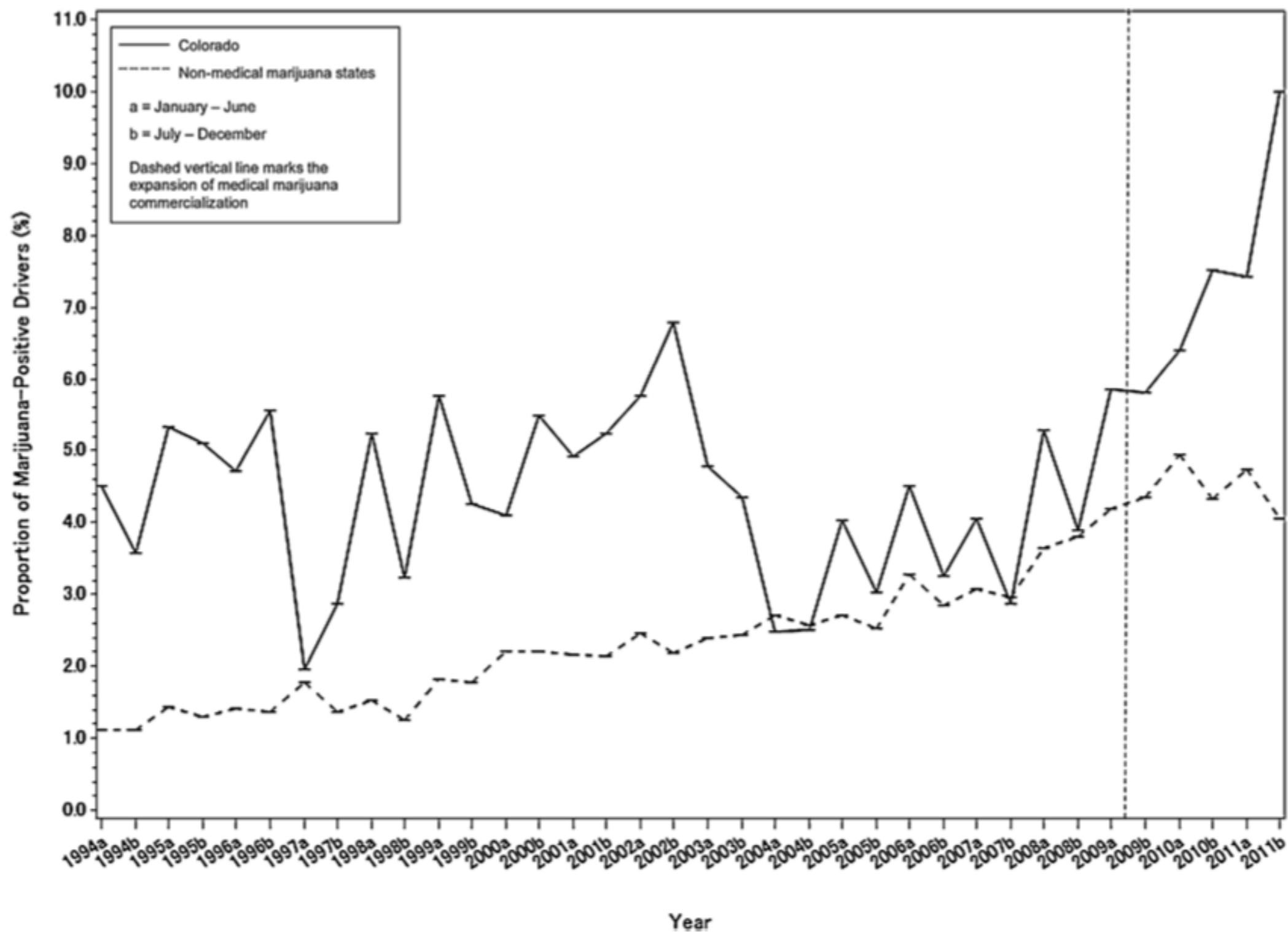
	Marijuana (n=62)	Cocaine (n=70)	p-value
Continued use	97%	97%	NS
Efforts to cut down	86%	93%	NS
Excessive time	80%	100%	<0.01
Withdrawal	75%	81%	NS
Tolerance	63%	97%	<0.01
Use to eliminate withdrawal	65%	69%	NS
Hazardous use	53%	64%	NS
Activities reduced	41%	87%	<0.01

Budney et al., 1998, Exp Clin Psychopharm 6:419-426

Motivational interviewing

Characteristics of your favorite teacher?

FIGURE 1. Adolescent females' monthly average THC/Cr over time.
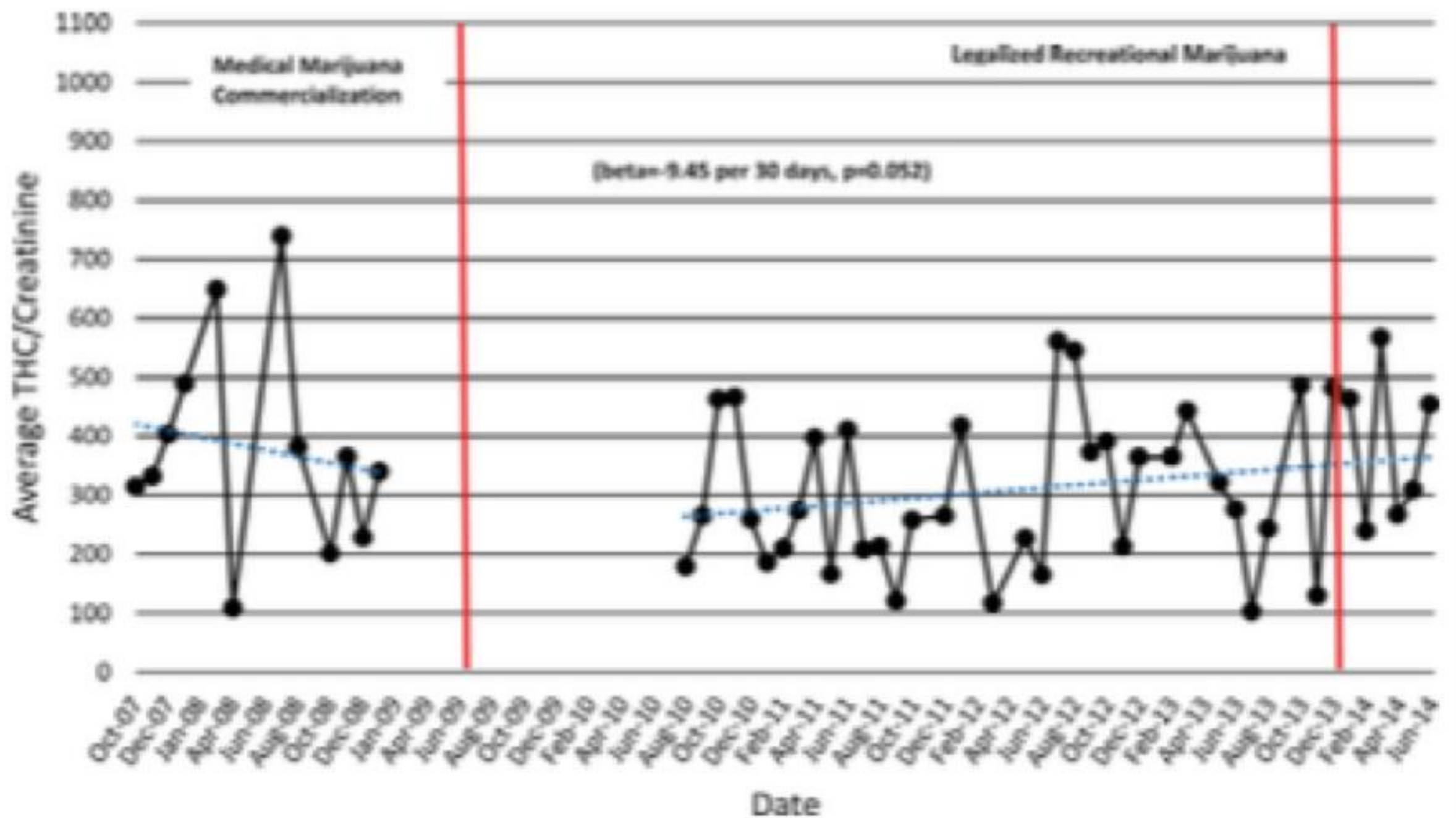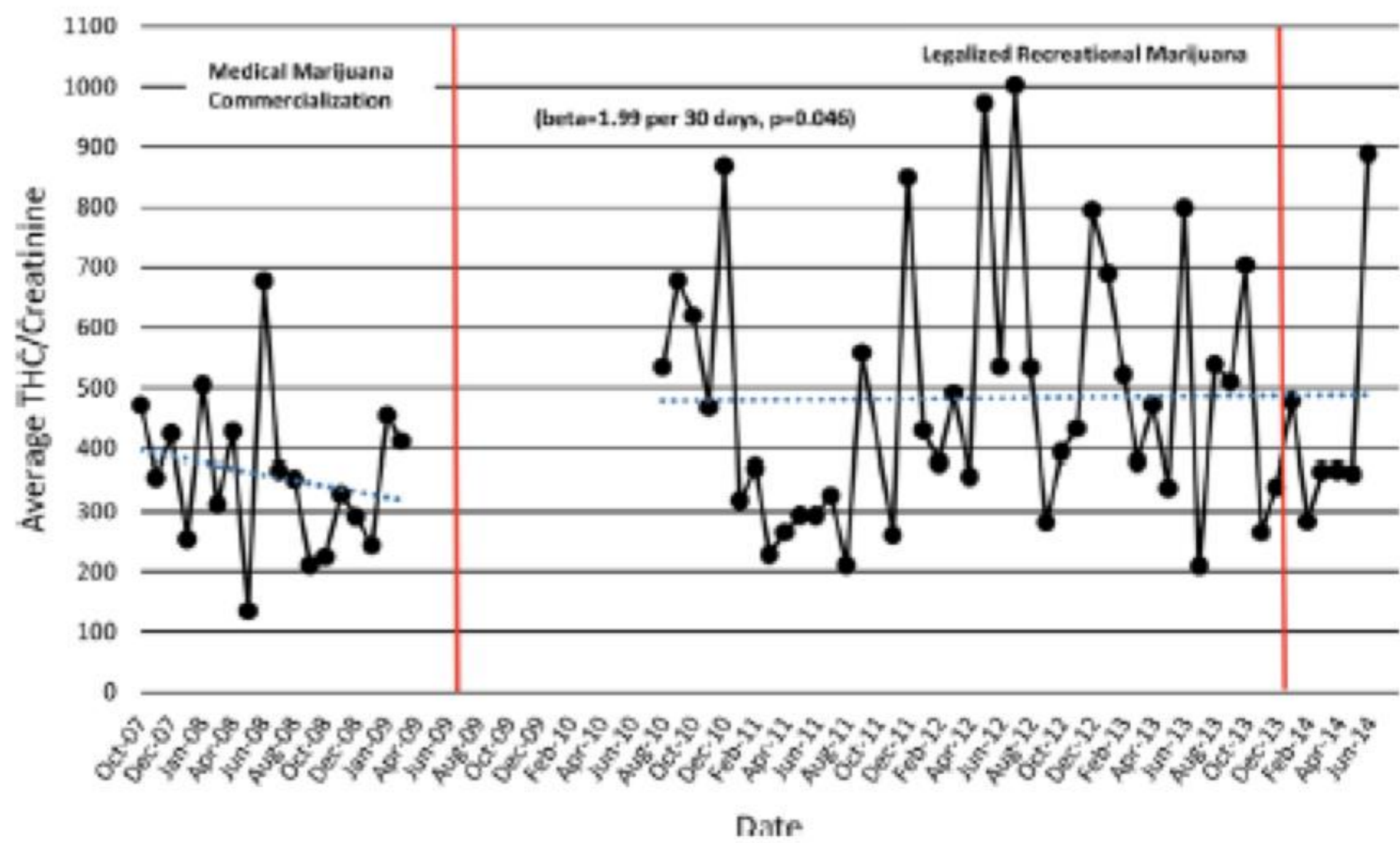
Lenoue et al., 2017, *Am J Addictions* 26:802-806

FIGURE 2. Adolescent males' monthly average THC/Cr over time.
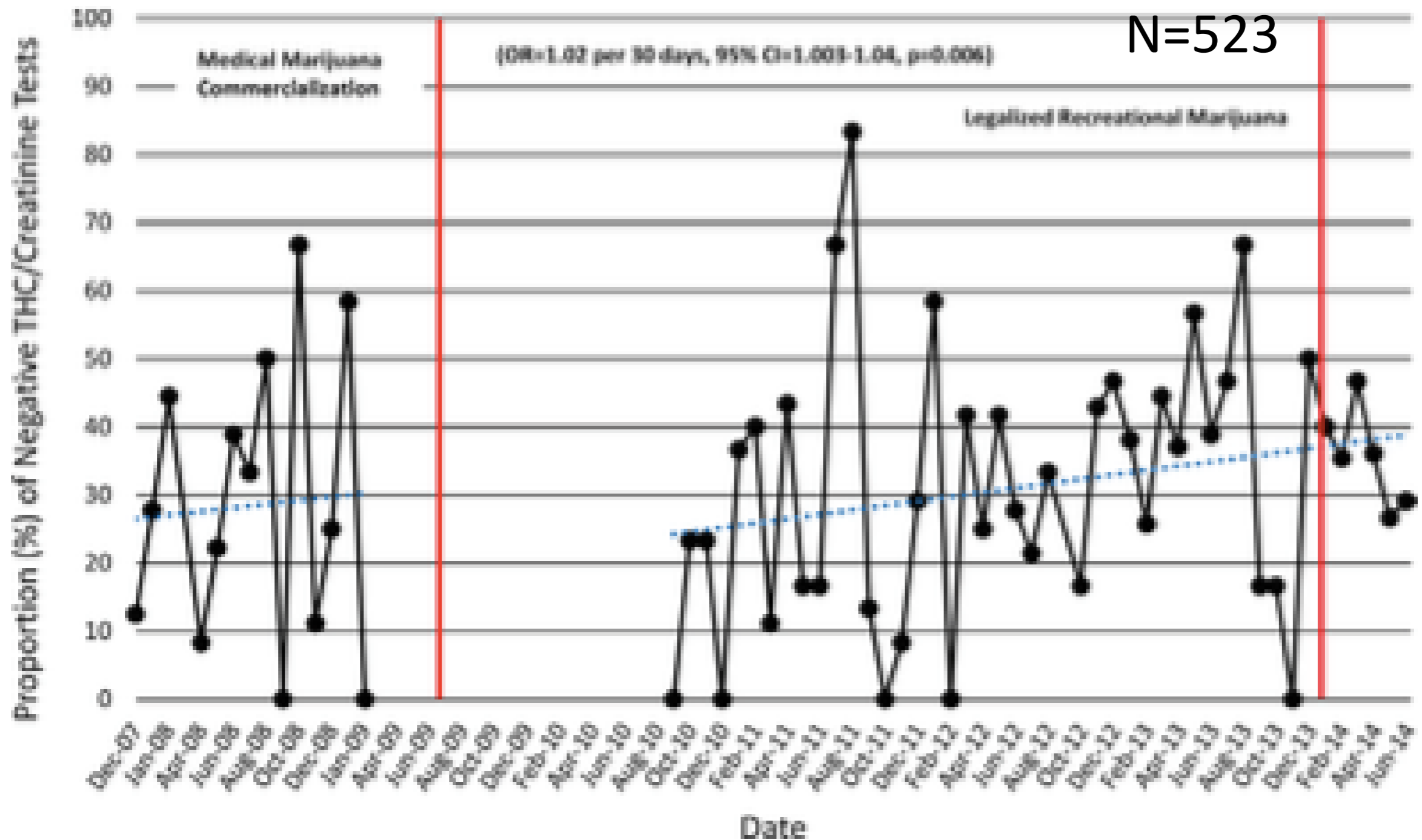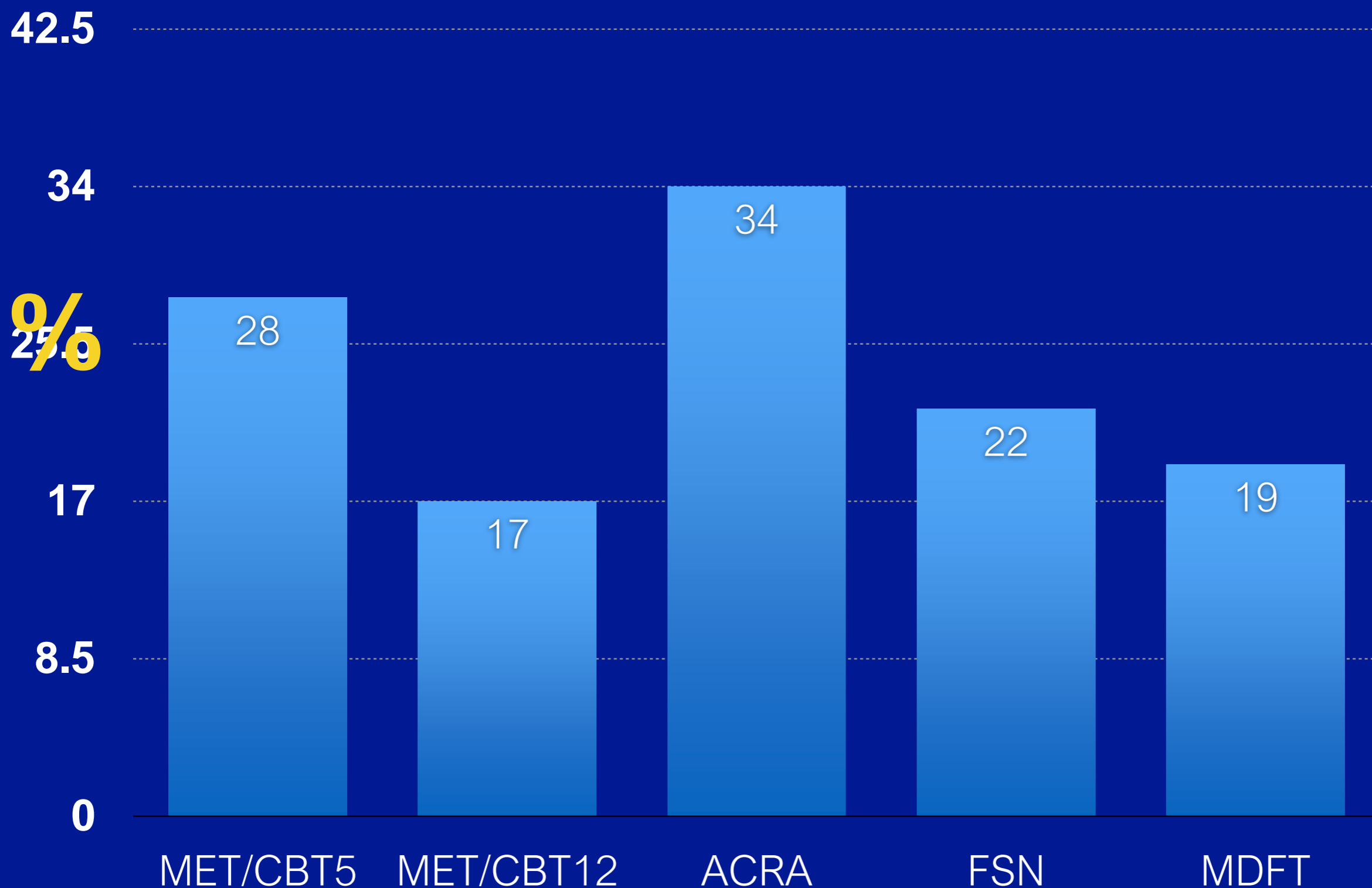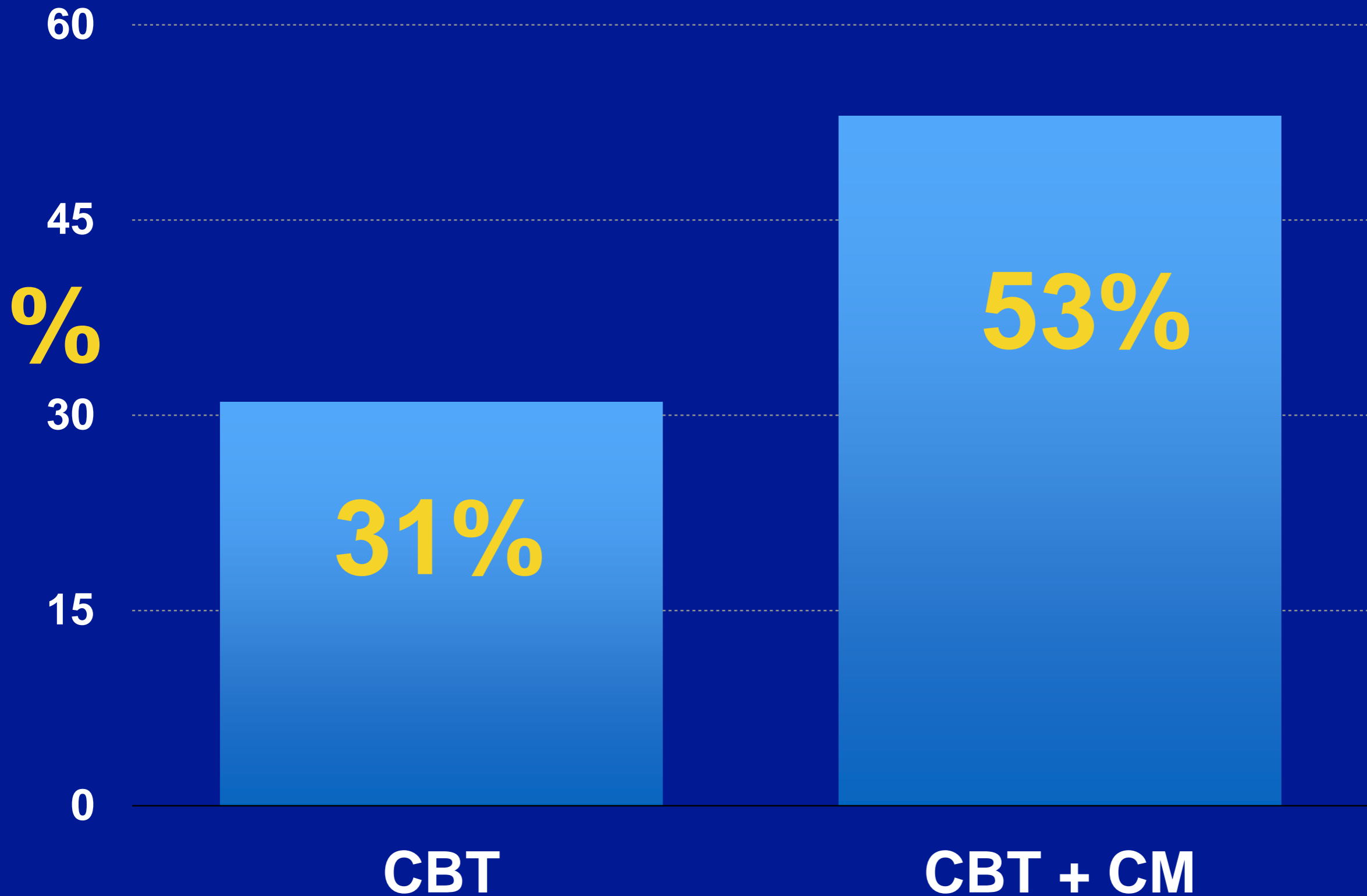
FIGURE 3. Adolescent males' monthly average proportion of negative THC/Cr tests over time.

% of youth with >=4 weeks abstinence

Dennis et al., 2004, J Subst Ab Treatment 27:197-213

% of youth with >=4 weeks abstinence

CBT: 31%
CBT + CM: 53%

Stanger et al., 2015, JAACAP 54:445-453

Disorder	% (n=600)	Treatment
Conduct disorder	53%	Family, CBT
ADHD	38%	CBT
Generalized anxiety disorder	23%	CBT
Major depressive disorder	18%	CBT
Any traumatic stress disorder	16%	CBT

NAC

Patients: 116 15-21 yo's

Methods: 8 weeks, NAC/PBO 1200mg bid + CM

Results: 41% v 27% negative UDS, p=NS, well-tolerated, OR=2.4 of - UDS

Limitations: 8 weeks, 40% drop-out

Gray et al., 2012

Gabapentin

50 adults in tx for cannabis dependence for 12 weeks

Gabapentin (1200 mg/day) v placebo

Gabapentin had greater decrease in grams and days per week (5 days to 0.75 for gabapentin or 1 for PBO) and urine THC levels

Mason et al., 2012

impACT

Comprehensive Assessment

Integrated MH/Substance Tx

Individual MI

Case Management

ACT

Incentives

0 week 12

ACT Exercise

https://www.youtube.com/watch?v=Z29ptSuoWRc

Results (N=41)

Variable	Value
Age in years, mean (SD)	15.6 (1.5)
Gender, % (N) Female Male	 24 (10) 76 (31)
Race, % (N) African American Caucasion/White Other	 12.2 (5) 36.6 (15) 51.2 (21)
Substance use disorder dx's, % (N) Cannabis use disorder Alcohol use disorder Opioid use disorder	 95 (39) 51 (21) 2 (1)
Psychiatric disorders, % (N) PTSD MDD ADHD GAD	 44 (18) 41 (17) 39 (16) 39 (16)

Results (N=41)

Variable	Value
Mean number of sessions attended (SD)	7.4 (3.6)
Youth having at least one family session, % (N) Youth rx'd psychotropic meds, % (N)	12.2% (5) 26.8% (11)
Clean urine drug screen, % (N) Week of abstinence by self-report, % (N)	56% (23) 61% (25)
SRS score, mean (SD)	38.2 (2.8)
Chronbach alpha for SEI	0.8

Results

Variable	Pre	Post	P-value (Statistic)
Proportion of days used in the past 7 days, median (IQR) (n=29)	0.5 (0.1, 0.7)	0 (0, 0.4)	<0.0001 (U=101)
School engagement, mean (SD) (N=26)	20.2 (5.7)	23.7 (6.1)	0.0011 (t=3.59)
Modified Outcome Rating Scale	6.8 (1.8)	7.8 (2.9)	0.0499 (t=2.04)

Results

Variable	Pre	Peri	Post	P-value
# missed classes	170.4	132.4	176.6	pre v peri = 0.037 peri v post = 0.018
# behavioral incidents	1.38	0.90	0.48	pre v post = 0.0076
GPA	1.37	1.05	1.04	all = NS

Summary

Some benefits (pain)

Some concerns (driving, pregnancy, teens, addiction, psychosis)

Clinical issues (MI, ACT)

Questions, comments

www.DrThurstone.com