



TBI-BH ECHO

Traumatic Brain Injury – Behavioral Health ECHO
UW Medicine | Psychiatry and Behavioral Sciences

Cannabis and TBI

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Objectives

1. Provide an overview of cannabis
2. Describe the evidence for the therapeutic and harmful health effects of cannabis
3. Describe the limited evidence related to the health effects of cannabis in TBI
4. Describe approaches to treating cannabis use disorder
5. Questions



History of Cannabis Legislation in Washington

Medical (legal since 1998)

- Allows use of marijuana for palliation of symptoms related to qualifying conditions (e.g., cancer, AIDS, MS, epilepsy)
- Requires statement from patient's health care provider



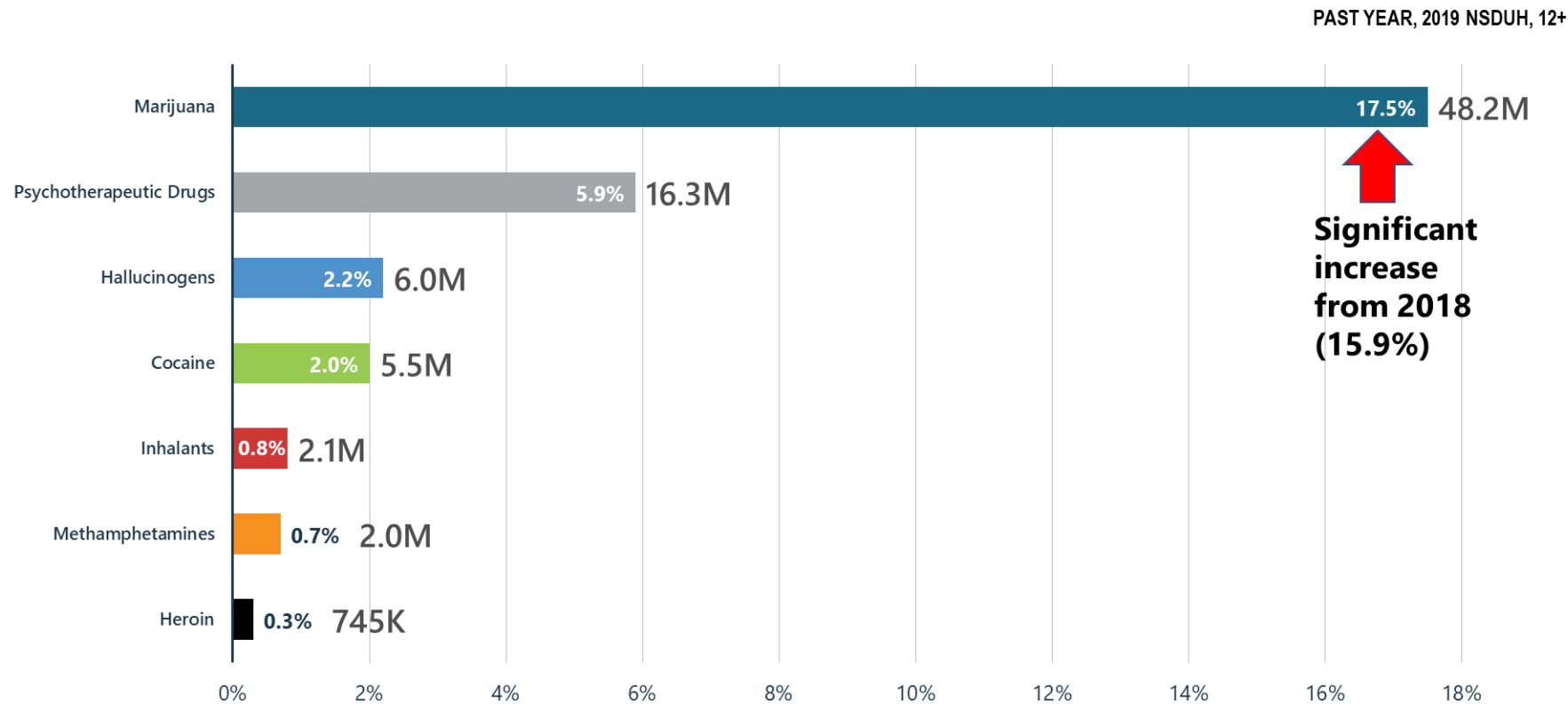
Recreational (I-502 passed Nov 2012)

- Possession of small amounts (1 oz.; 28 g.) legal for ages 21+
- Hundreds of retailers & producers/processors
- Still a schedule 1 controlled substance under federal law
- Home growing not allowed except for medical use
- Quality control not well established

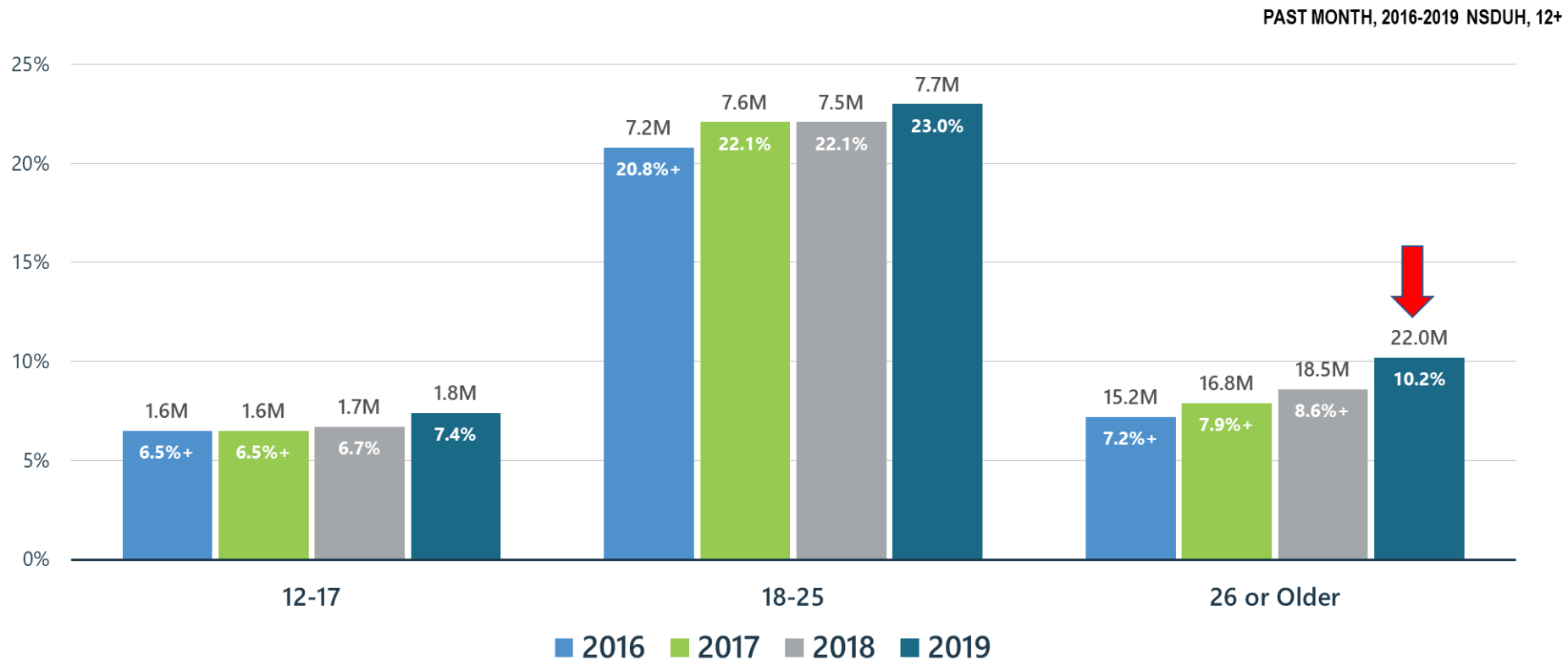
LEGALIZE IT!



Marijuana is the most commonly used drug overall

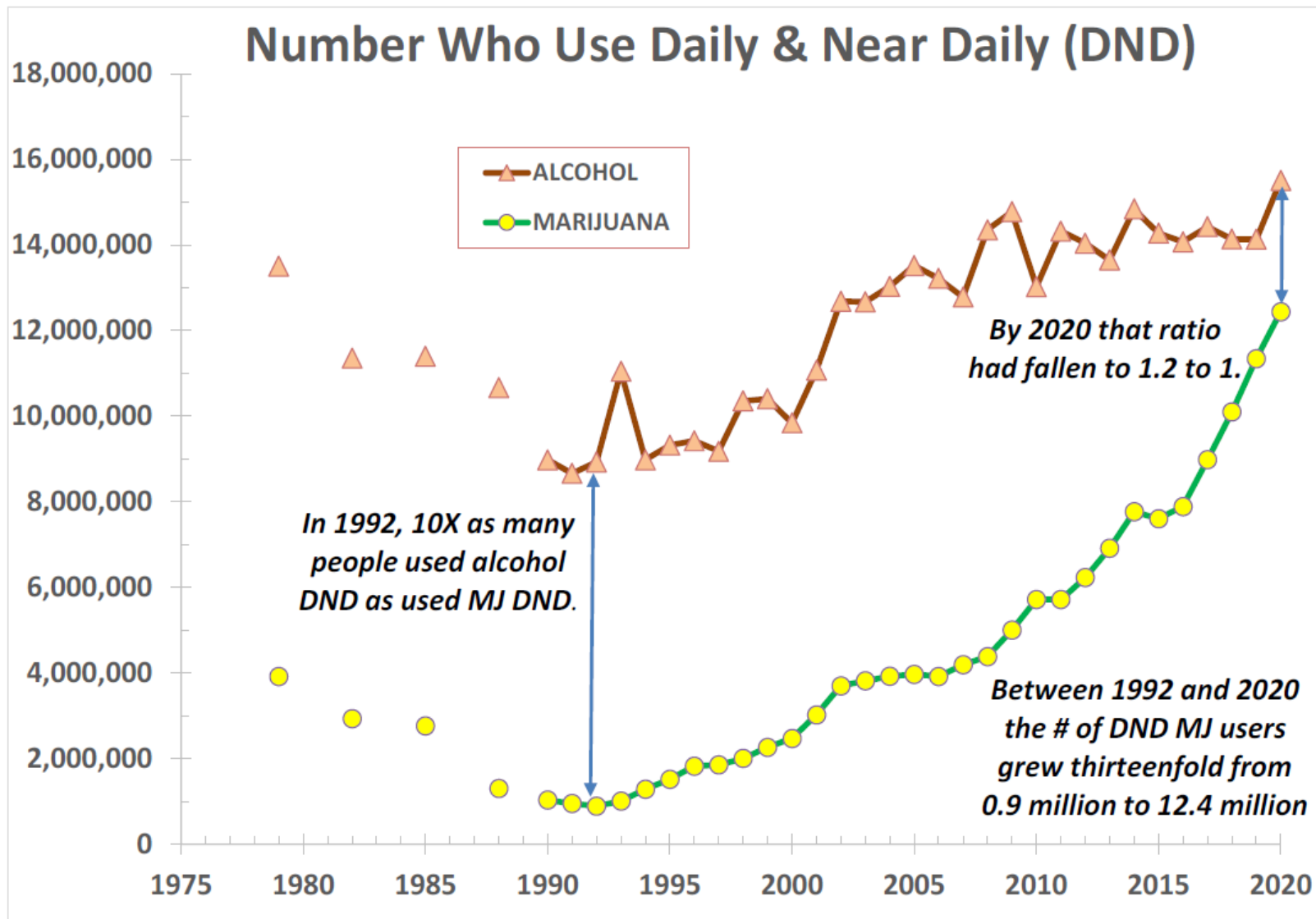


Past Month Marijuana Use for All Age Groups



+ Difference between this estimate and the 2019 estimate is statistically significant at the .05 level.

High-Frequency Use Approaching that of Alcohol



~80% of MJ consumption now by daily or near daily users
Caulkins J, 2022



Methods for cannabis delivery

- ▶ Rolled cigarette “joint”, blunt
 - With or without tobacco
- ▶ Water pipe “bong”
- ▶ Concentrates (>60-90%+ THC)
- ▶ Vaporizers (Vapes)
- ▶ Edibles - slow, prolonged effects
 - ▶ Oils
 - ▶ Baked goods
 - ▶ Candy
 - ▶ Drinks
- ▶ Tinctures, lozenges
- ▶ Lotions, creams, Rick Simpson Oil
- ▶ Synthetic THC preparations



Cannabinoids

- ▶ **Endocannabinoids** - naturally occurring (CB1, CB2 receptors, help regulate stress, pain, immunity)
- ▶ **Exogenous Cannabinoids**- mimic endocannabinoids: phytocannabinoids (plants), synthetic
 - **Tetrahydrocannabinol (THC)** - psychoactive, analgesic, anti-spasmodic, muscle relaxant, appetite stimulant, antiemetic properties
 - **Cannabidiol (CBD)** - no 'high', neuroprotective, anti-inflammatory, analgesic, anticonvulsant, buffers THC effects
 - **Over 100 other cannabinoids!**



Cannabis Plant Types

SATIVA



HIGH THC LEVEL

Energizing
Stimulating
Reduce anxiety
Increase creativity
Increase focus



INDICA



HIGH CBD LEVEL

Relaxing
Relief of pain
Decreases nausea
Increases appetite
Better sleep



HYBRID



MIX

Sativa and indica
effects depending
on the traits
from both
parent strains

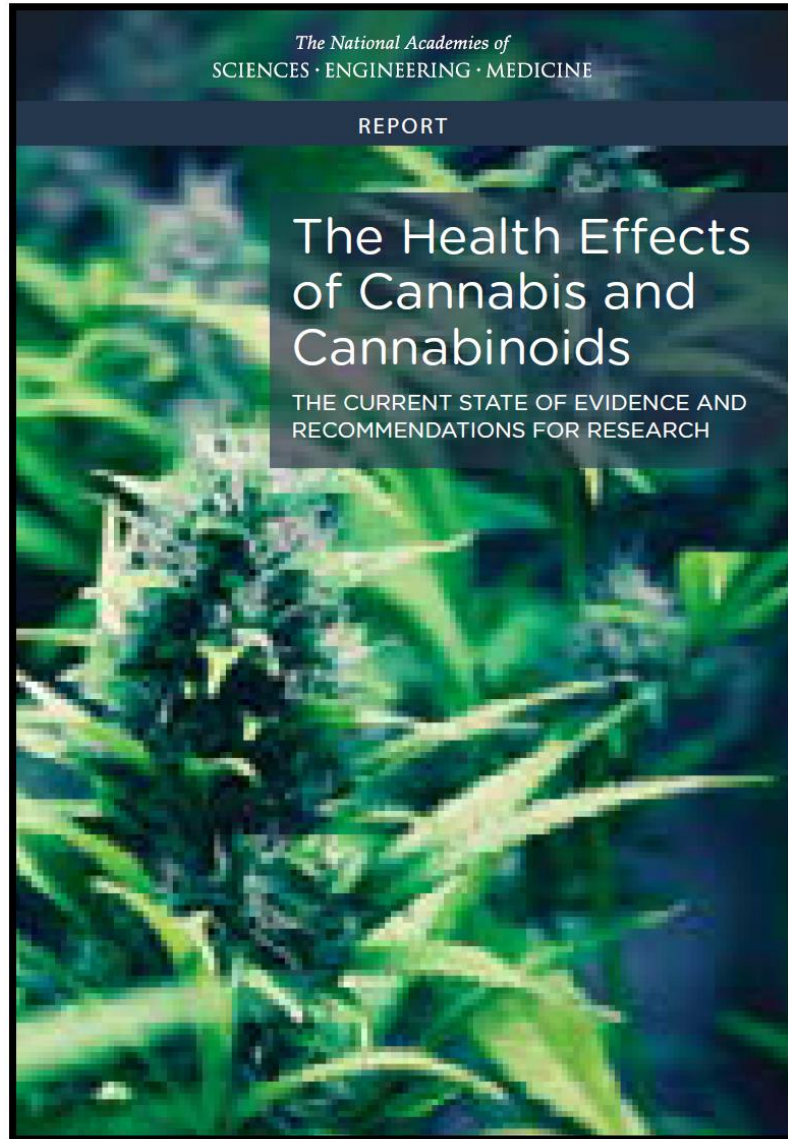
Many strains / “chemovars” / cannabinoid profiles ...

dankbudz.com



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Health Effects of Cannabis & Cannabinoids



- ▶ 2017 Report of the National Academies of Sciences, Engineering, and Medicine
- ▶ <https://www.nap.edu/catalog/24625/the-health-effects-of-cannabis-and-cannabinoids-the-current-state>
- ▶ UW Cannabis Education & Research Program
- ▶ <https://adai.uw.edu/research/cannabis-research-education/>



True or False?

Anxiety and Cannabis

- ▶ There is MODERATE evidence of a statistical association between regular cannabis use and improved symptoms of anxiety.



True

False



True or False?

Anxiety and Cannabis

- ▶ There is *MODERATE* evidence of a statistical association between regular cannabis use and improved symptoms of anxiety.



True



False



Therapeutic Effects of Cannabis

▶ **Conclusive or substantial evidence:**

- Chronic pain in adults (e.g., from neuropathy, cancer, MS, rheumatoid arthritis)
- Chemotherapy-induced nausea & vomiting
- Multiple Sclerosis spasticity symptoms

▶ **Moderate evidence:**

- Sleep symptoms associated with obstructive sleep apnea, fibromyalgia, chronic pain, MS



True or False?

Psychosis and Cannabis

- ▶ There is **SUBSTANTIAL** evidence of a statistical association between cannabis and the development of schizophrenia or other psychoses.



True



False



True or False?

Psychosis and Cannabis

- ▶ There is **SUBSTANTIAL** evidence of a statistical association between cannabis and the development of schizophrenia or other psychoses.



True



False



Harmful Effects of Cannabis (most relevant to TBI)

► **Substantial evidence**

- **Respiratory symptoms & bronchitis** (smoking)
- **Risk of motor vehicle crashes** (& other accidents)
 - Effects on judgment, coordination, fine motor function, reaction time, sedation, etc.
- **Development of schizophrenia / psychosis**
- **Low birth weight** among offspring
- **Initiating cannabis use at early age is risk for development of problem cannabis use**



Harmful Effects of Cannabis (cont.)

► **Moderate evidence**

- Impaired **cognition**: learning, memory, attention, executive function - lasts from days to four weeks
- Increased risk of **stroke***
- Increased **depression**
- Increased **suicide** ideation, attempts, completion
- Increased **social anxiety** disorder
- Increased **mania** among bipolar patients
- Increased **abuse** of alcohol, tobacco, other drugs
- **Cannabis overdose** among children
- Major depression, being male are risks for **problem cannabis use**
- **Problem cannabis use** associated with **severe PTSD**

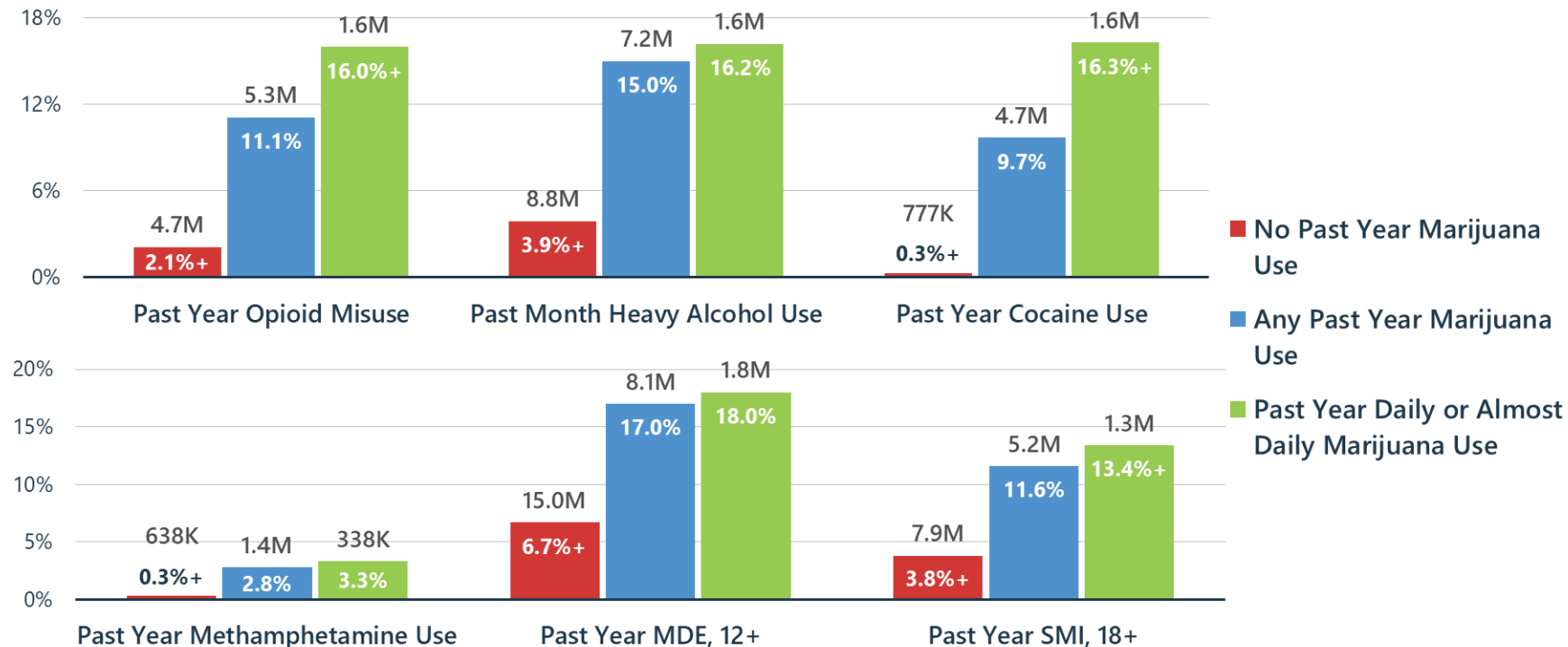
National Academies of Science, 2017; *Swetlik et al J Addict Med 2022



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Marijuana Use Related to Other Substance Use, MDE and SMI

PAST YEAR/MONTH, 2019 NSDUH, 12+



+ Difference between this estimate and the estimate for people with past year marijuana use is statistically significant at the .05 level.

MDE = Major Depressive Episode
SMI = Serious Mental Illness

True or False?

Daily Use and Concentrates

- ▶ Daily / Near Daily Use and use of Concentrates is NOT associated with increased risk of adverse effects



True



False



True or False?

Daily Use and Concentrates

- ▶ Daily / Near Daily Use and use of Concentrates are NOT associated with increased risk of adverse effects



True



False



How much is too much?

- ▶ **Daily or near daily use**
- ▶ Daily use leads to:
 - ▶ Increase risk of **other illicit drug use**, RR > 50%
 - ▶ More likely to be involved in **MVAs**
 - ▶ Increase risk of developing a **cannabis use disorder**
 - ▶ Daily: 75% had a CUD
 - ▶ 2x/wk or less: 13% had a CUD
 - ▶ Increase in **cognitive problems**
 - ▶ Increase in **mental and physical health problems**



Concentrates (Dabbing)

aka: Butane Hash Oil

- ▶ **58-66%** of cannabis users have used concentrates
- ▶ **13-37%** use on a regular basis
- ▶ **2014-16: increased by 146%**, flower decreased by 22%
- ▶ Potential risks:
 - ▶ Higher rate of reported **cannabis use disorder (CUD)**
 - ▶ Increase in **tolerance** and **withdrawal**
 - ▶ Stronger **cognitive effects**
 - ▶ Severe **psychosis**, esp. in youth
 - ▶ Orthostatic hypotension and **falls**
 - ▶ More likely to use **other substances**
 - ▶ More likely to have a **mental health diagnosis**



Cannabis Use after TBI

- ▶ Survey of 65 people with moderate to severe TBI
 - 74% used before TBI, 45% used after
 - **Reasons for use:**
 - 72% for Recreation
 - 62% to Reduce Stress / Anxiety
 - 55% to Improve Sleep
 - **Among those with Negative Side Effects (n=29)**
 - 28% had Decreased Motivation
 - 21% had Paranoia
 - 21% felt Hazy or Dull
 - 21% felt Fatigued

Hawley et al, 2018



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Uncontrolled studies exist showing Association of TBI with...

▶ **Potential Benefits:** sleep, headache, mood, post-concussive symptoms, quality of life

▶ **Potential Harms:**

- Cognitive impairment
- New & worsened depression
- Anxiety
- Worsened PTSD
- Psychosis
- Post-concussive symptoms (greater frequency, duration, intensity)

Grenier et al, 2019; Gallant et al, 2020; Hergert et al, 2021



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Can Cannabinoids Improve TBI Outcomes?

- ▶ Potential mechanisms found in **animal studies**
 - Neurogenesis, neuroplasticity, anti-inflammation
- ▶ Conflicting human neuroimaging studies
- ▶ 2 observational **human studies** suggest a possible association between cannabis and:
 - Higher TBI survival (Nguyen et al, 2014)
 - Lower disability after intracranial hemorrhage (di Napoli 2016)
- ▶ However, a large (N=861) **randomized placebo-controlled trial** of dexamabinol (a synthetic cannabinoid) within 6 hrs after **severe TBI** showed no improvement in **6-month functional outcomes, survival, or quality of life** (Maas 2005)



Takeaways

- Cannabis has some benefits (esp. pain) and several potential harms in **non-TBI individuals**
- **Individuals with TBI are likely more vulnerable** to the adverse effects of cannabis, including repeat injury, cognitive impairment, depression, anxiety, substance use & psychotic disorders
- Before using cannabis, people with TBI should **discuss with their health care providers** individual potential risks & benefits of cannabis, particularly regarding frequency & concentrates
- **More quality research is needed** on potential neuroprotective, therapeutic (e.g., headache), & harmful properties of cannabis after TBI



Screening & Assessment

Patient: “Cannabis is not a problem for me”

Provider: “Good, lets try to keep it that way”



Problems that should prompt screening for cannabis use after TBI

- ▶ Depression
- ▶ Anxiety
- ▶ PTSD
- ▶ Psychosis
- ▶ Mania
- ▶ Persistent sleep disturbances
- ▶ Other substance use
- ▶ Worsening cognitive status
- ▶ Respiratory infections
- ▶ Chronic cough
- ▶ Poor school or work performance
- ▶ MVAs, falls
- ▶ Relationship difficulties
- ▶ Nausea and vomiting



Screening for a cannabis use disorder

- ▶ **Cannabis Use Disorder Identification Test-Revised (CUDIT-R)**
 - ▶ Asks about use over past 6 months
 - ▶ 8 items
 - ▶ Stratifies: low risk → high risk → use disorder
 - ▶ PPV for CUD: 0.960
 - ▶ Sens: 0.913
 - ▶ Spec: 0.900
 - ▶ Free to use, works with DSM-5
 - ▶ Not widely validated



The Cannabis Use Disorder Identification Test - Revised (CUDIT-R)

Have you used any cannabis over the past six months? YES / NO

If YES, please answer the following questions about your cannabis use. Circle the response that is most correct for you in relation to your cannabis use *over the past six months*

- | | | | | | | |
|----|---|------------------|--|------------------------|------------------------------------|-----------------------------|
| 1. | How often do you use cannabis? | Never
0 | Monthly or less
1 | 2-4 times a month
2 | 2-3 times a week
3 | 4 or more times a week
4 |
| 2. | How many hours were you "stoned" on a typical day when you had been using cannabis? | Less than 1
0 | 1 or 2
1 | 3 or 4
2 | 5 or 6
3 | 7 or more
4 |
| 3. | How often during the past 6 months did you find that you were not able to stop using cannabis once you had started? | Never
0 | Less than monthly
1 | Monthly
2 | Weekly
3 | Daily or almost daily
4 |
| 4. | How often during the past 6 months did you fail to do what was normally expected from you because of using cannabis? | Never
0 | Less than monthly
1 | Monthly
2 | Weekly
3 | Daily or almost daily
4 |
| 5. | How often in the past 6 months have you devoted a great deal of your time to getting, using, or recovering from cannabis? | Never
0 | Less than monthly
1 | Monthly
2 | Weekly
3 | Daily or almost daily
4 |
| 6. | How often in the past 6 months have you had a problem with your memory or concentration after using cannabis? | Never
0 | Less than monthly
1 | Monthly
2 | Weekly
3 | Daily or almost daily
4 |
| 7. | How often do you use cannabis in situations that could be physically hazardous, such as driving, operating machinery, or caring for children: | Never
0 | Less than monthly
1 | Monthly
2 | Weekly
3 | Daily or almost daily
4 |
| 8. | Have you ever thought about cutting down, or stopping, your use of cannabis? | Never
0 | Yes, but not in the past 6 months
2 | | Yes, during the past 6 months
4 | |

Scores

- 8+ hazardous use
- 12+ CUD?



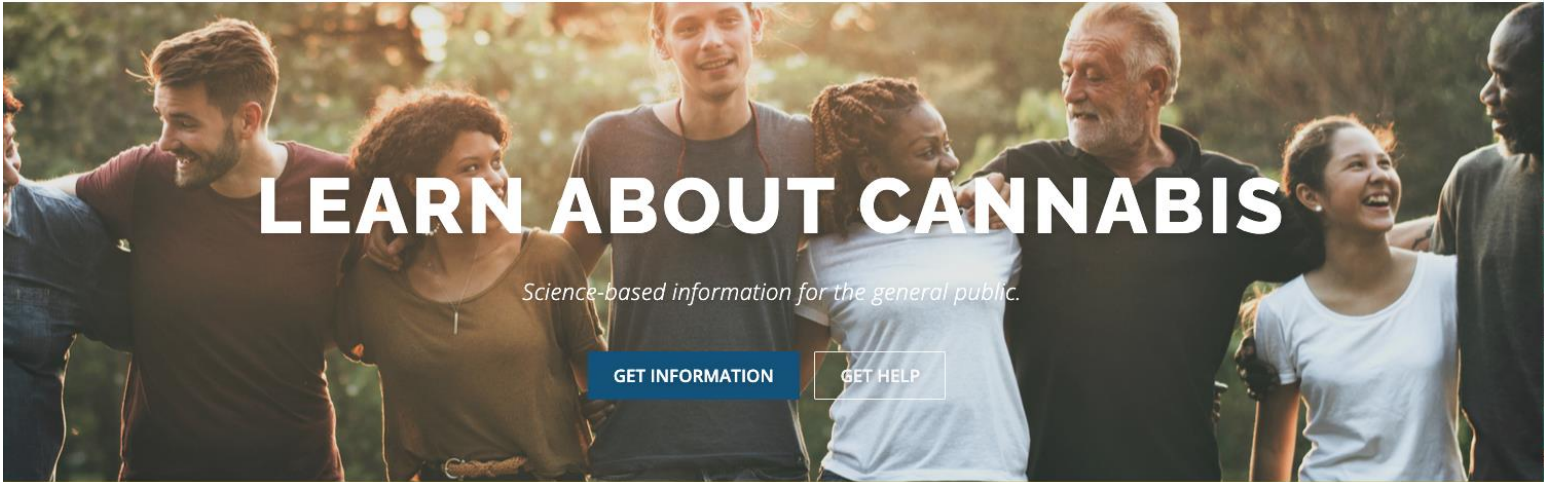
Intervention Options



Education

LEARN ABOUT CANNABIS
Science-based information for the general public.

[TOPICS](#) [PARENTS](#) [TEENS](#) [CONSUMER FAQ](#) [VIDEO EDUCATION](#) [GET HELP](#)



Why we changed "marijuana" to "cannabis" on our website. [READ MORE](#)

GET INFORMATION



Topics



Consumer FAQ



Video Education



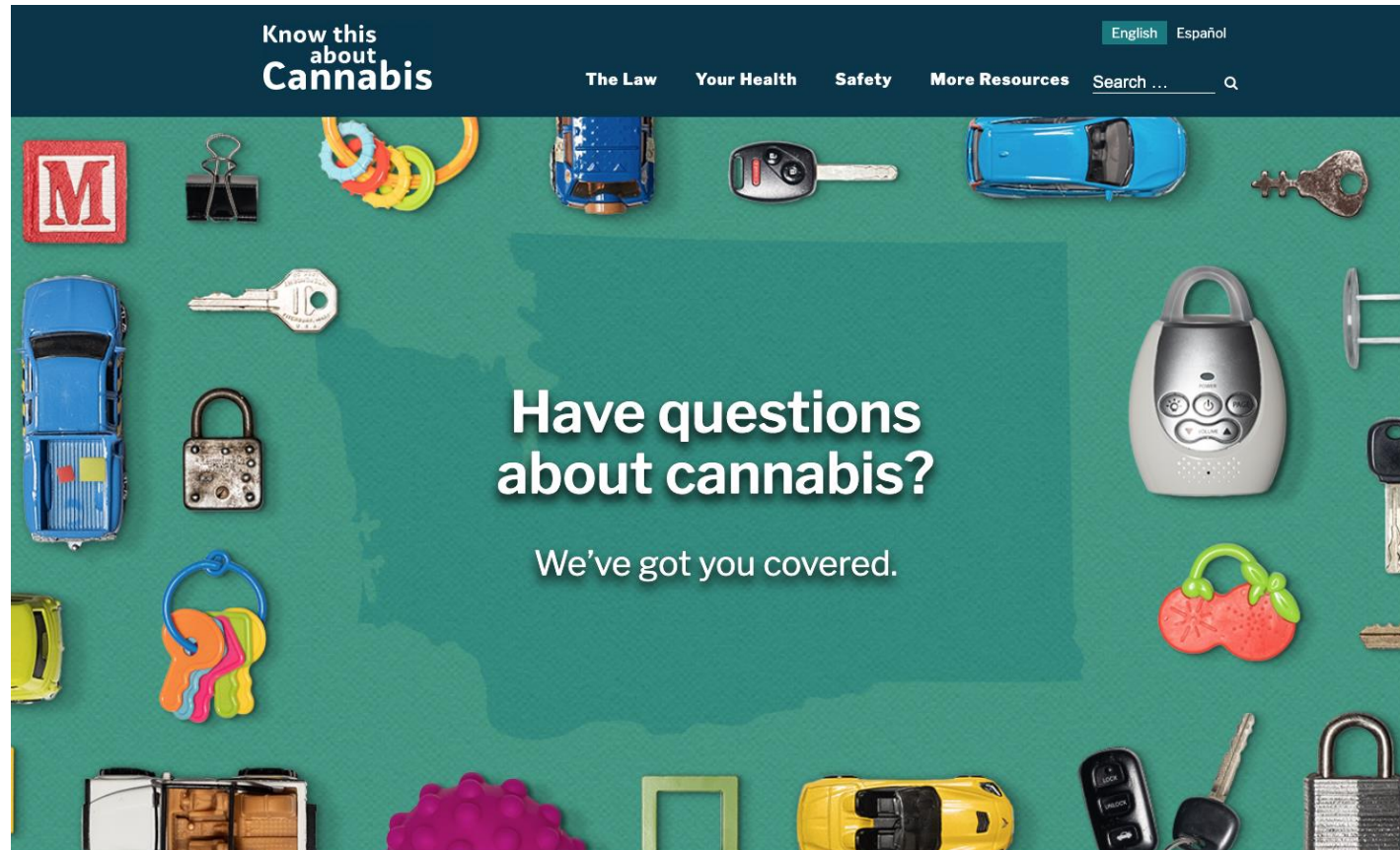
Medicinal Cannabis Online
Training

<https://www.learnaboutcannabiswa.org/>



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Education



What we're talking about.

Washington state legalized retail—sometimes called recreational or non-medical—cannabis for adults 21 and over.

[Learn more about this campaign >](#)

The Law

When it comes to retail—or non-medical—cannabis in our state, there's a lot to know.

[Learn more about the law >](#) ✨

<https://www.knowthisaboutcannabis.org/>



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Stepped Treatment

Step 1: Treatment engagement

- ▶ Motivational interviewing
- ▶ Elicit pros and cons of cannabis use
- ▶ Provide information with permission, if needed

Step 2: Goals setting

- ▶ Menu of options e.g., small reduction in frequency of use; small reduction in amount used; limit use to low-risk situations; mitigate psychological, social or occupational impairment from use



Stepped Treatment

Step 3: Cognitive behavioral strategies

- ▶ Identify triggers for use
- ▶ Develop skills to avoid or cope with triggers
- ▶ Learn strategies to manage negative mood
- ▶ Engage in pleasant/meaningful activities
- ▶ Identify and challenge depressive thinking
- ▶ Learn assertiveness (refusal) skills to deal with people who offer cannabis

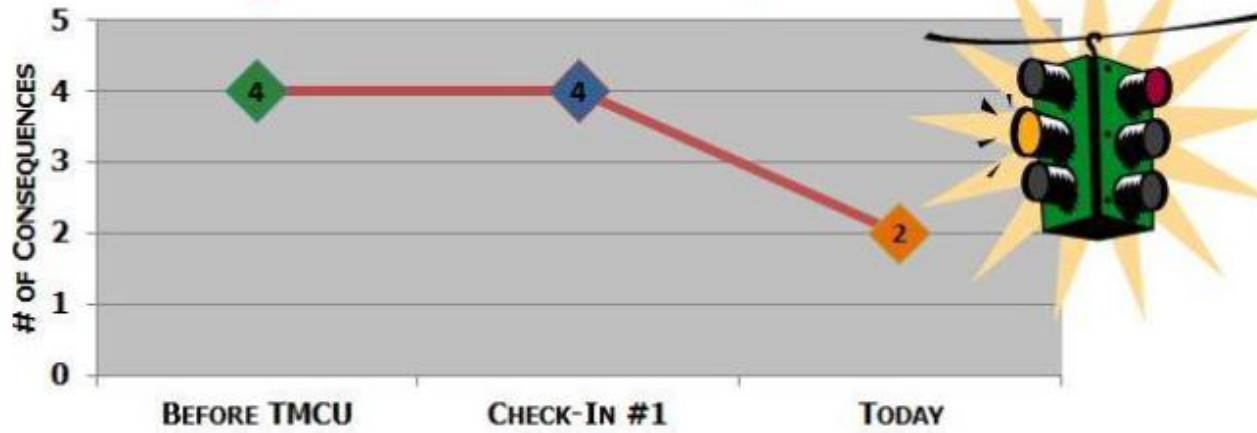




Marijuana Check-up

- ▶ Brief intervention designed to attract users who would not seek treatment
- ▶ Advertised as an opportunity to receive objective feedback about marijuana use; not offered as treatment.
- ▶ Successful studies have involved 1-6 sessions of assessment, *personalized* feedback, and motivational interviewing (no pressure, no judgement)



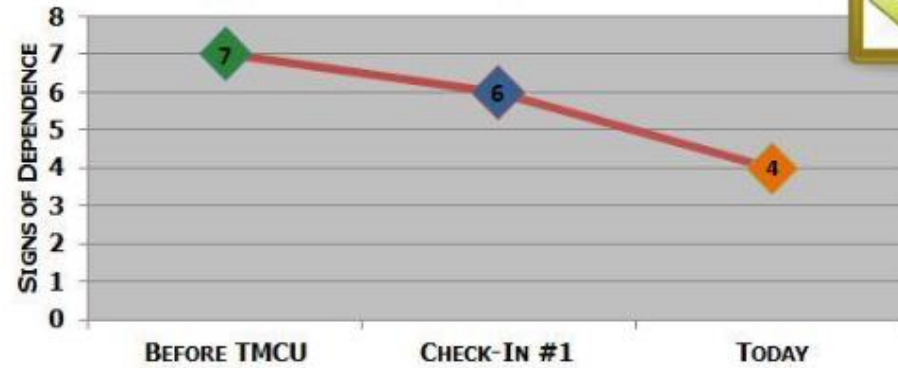
Marijuana Consequences



	<p>1. You kept using marijuana even though it kept you from meeting your responsibilities at:</p> <ul style="list-style-type: none"> • Home (like doing chores or coming home on time) ⚠️ • School (like going to classes, doing homework or studying for tests) ⚠️ • Work (like doing a good job or arriving on time)
	<p>2. You used marijuana where it made the situation unsafe or dangerous for you, like when:</p> <ul style="list-style-type: none"> • You were driving a car or using a machine ⚠️ • You were in a situation where you might have been forced into sex or hurt
	<p>3. You had problems with the law because of your marijuana use.</p>
	<p>4. You kept using even after you knew it was causing problems between you and the people around you.</p>
<p>Today, you reported 2 of 4 types of consequences.</p>	



Signs of Dependence



1.	You used marijuana in larger amounts, more often or for a longer time than you meant to.	
2.	You were unable to cut down or stop using marijuana.	
3.	You spent a lot of time either getting marijuana, using marijuana, feeling the effects of marijuana, or waiting for the effects to wear off.	
4.	Your use of marijuana caused you to give up, reduce or have problems at important activities at work, school, home, or social events.	
5.	You kept using marijuana even after you knew it was causing you problems with: <ul style="list-style-type: none"> ▪ your health (breathing, coughing) ▪ your emotions (feeling less motivated, depressed, or anxious) ▪ your memory or concentration 	
6.	You needed more marijuana to get the same high or found that the same amount did not get you as high as it used to.	
7.	You had withdrawal problems from marijuana (like being irritable, anxious, having trouble sitting still or sleeping).	
	You continued to use to avoid or stop withdrawal problems.	
Total		4
Current risk of marijuana dependence:		 High



Efficacy of marijuana check-up (2-6 sessions)

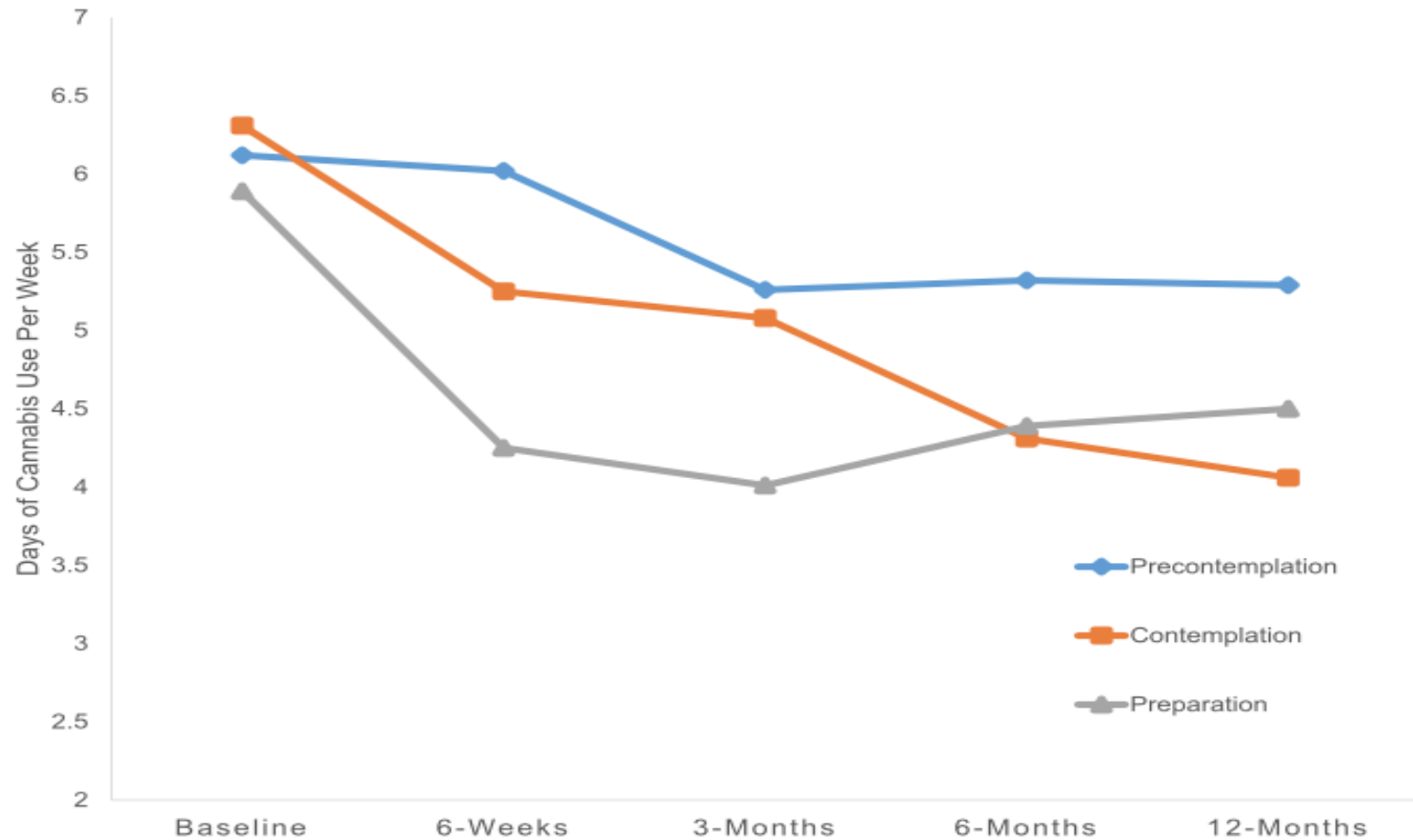


Fig. 2. Days of cannabis use per week by stage of change.

Stephens et al., J Subst Abuse Treat 2021



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Treatment efficacy

- ▶ **Interventions in non-treatment seeking persons**
- ▶ Meta-analysis of 26 studies in 15-30 year-olds comparing brief interventions to passive controls showed that treatment increased the odds of abstinence 1-3 months later (odds ratio 1.73, 95% CI 1.13-2.66) and significantly reduced symptoms of CUD (Halladay et al *Drug Alcohol Depend* 2019)
- ▶ **Interventions in treatment seeking persons**
- ▶ Meta-analysis of 7 controlled trials of people with CUD, those receiving treatment were twice as likely to be abstinent (21% vs.10%) (Patnode et al *JAMA* 2020)



Pharmacotherapy

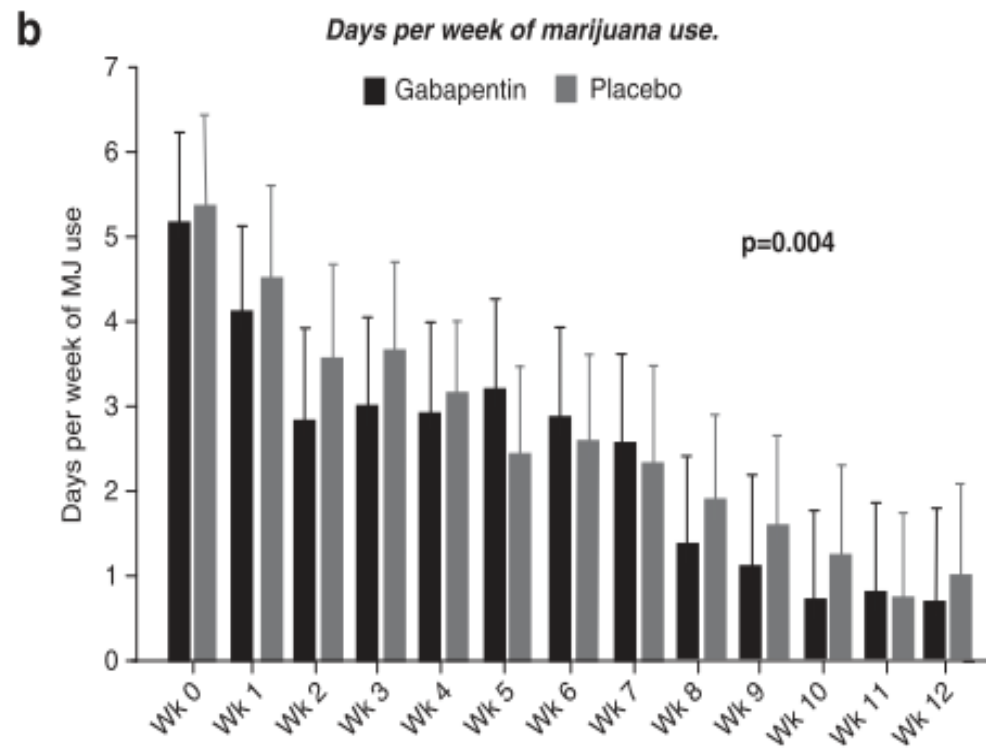
(evidence is limited)

- ▶ **N-acetylcysteine (NAC)**, OTC (Gray et al, 2012)
 - ▶ Antioxidant, modulates glutamate
 - ▶ 15-21 yo, N=116
 - ▶ 1200 mg BID vs placebo BID: plus contingency management + Brief (<10min) weekly cessation counseling x 8 weeks
 - ▶ NAC had 2.4 odds neg urine tests vs Placebo
 - ▶ Not helpful in adults 18-50 yo. (Gray et al, 2017)
- ▶ **Oxytocin** (neuropeptide) - small pilot, worth further study?
- ▶ **SSRI, SNRI, bupropion, buspirone, atomoxetine** probably of little value



Gabapentin

- ▶ Anticonvulsant
- ▶ 12-wk trial in 18-65 yo, N=50 outpatients
- ▶ 1200 mg/day vs Placebo: plus weekly manualized, abstinence-oriented individual counseling
- ▶ Decreased withdrawal, use, and more neg urine test
- ▶ Increased executive function



THC Preparations

- ▶ Dronabinol (+/- lofexidine*), nabiximols**
- ▶ May help reduce withdrawal & craving
 - ▶ Case reports, small pilots
 - ▶ Ongoing studies



*alpha-2-adrenergic agonist, **cannabis extract



Thank You



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