Cannabis & TBI: Seeing Through the Haze

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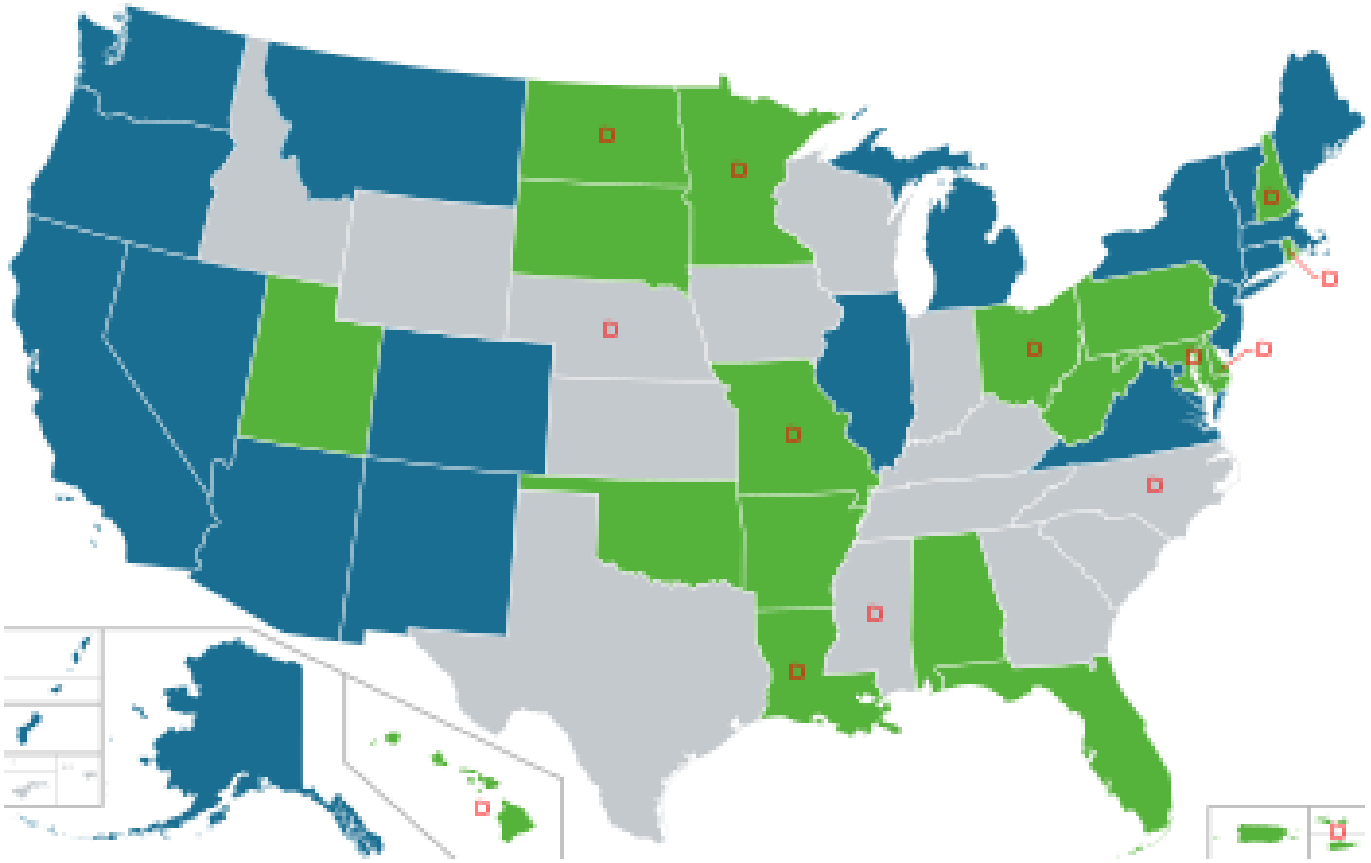
Objectives

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. Questions

Legality of Cannabis in the US



Wikipedia
9/7/21

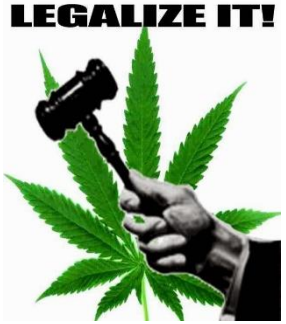
History of Cannabis Legislation in Washington

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)

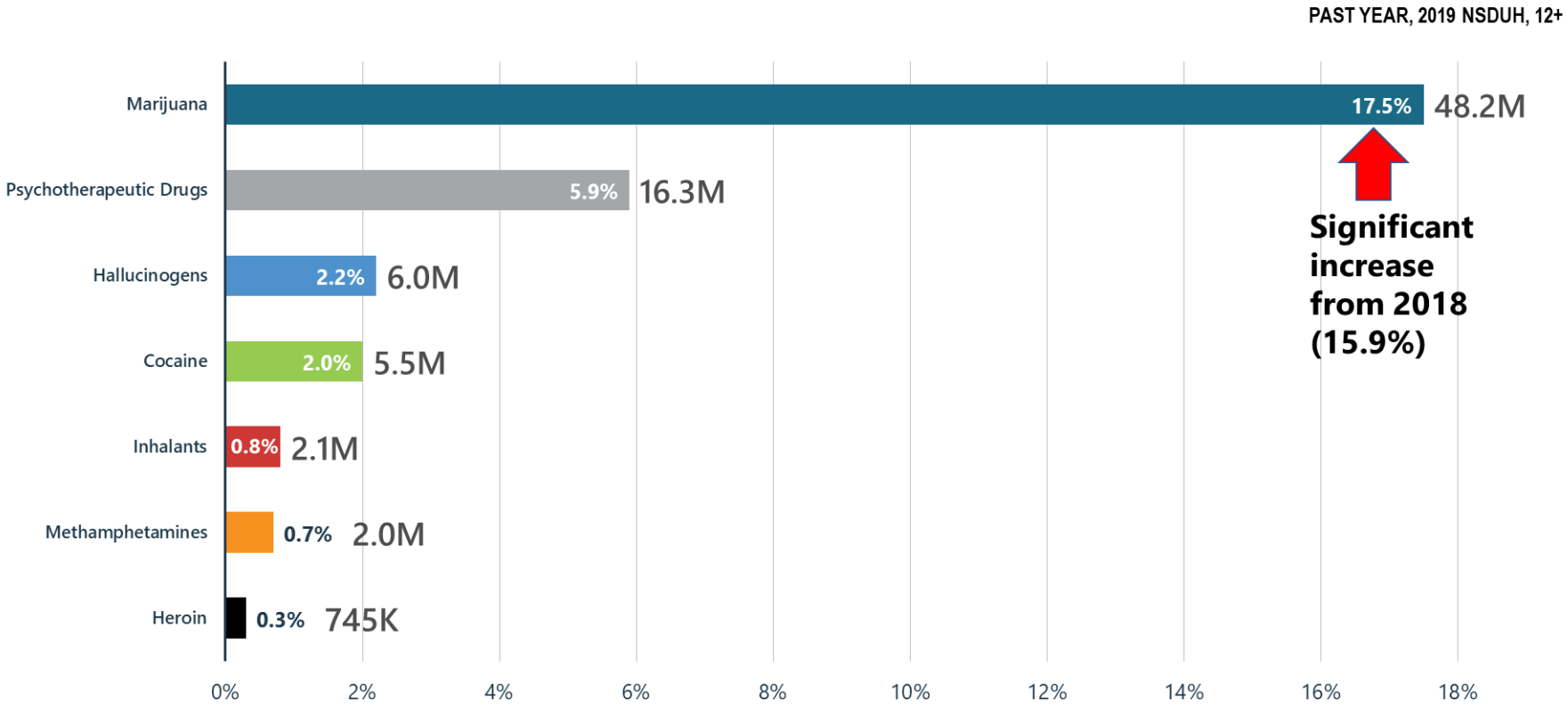
- Possession of small amounts (1 oz.; 28 g.) legal for ages 21+
- Hundreds of retailers & producers/processers
- Still a schedule 1 controlled substance under federal law
- Home growing not allowed except for medical use
- Quality control not well established



Aggressive Marketing

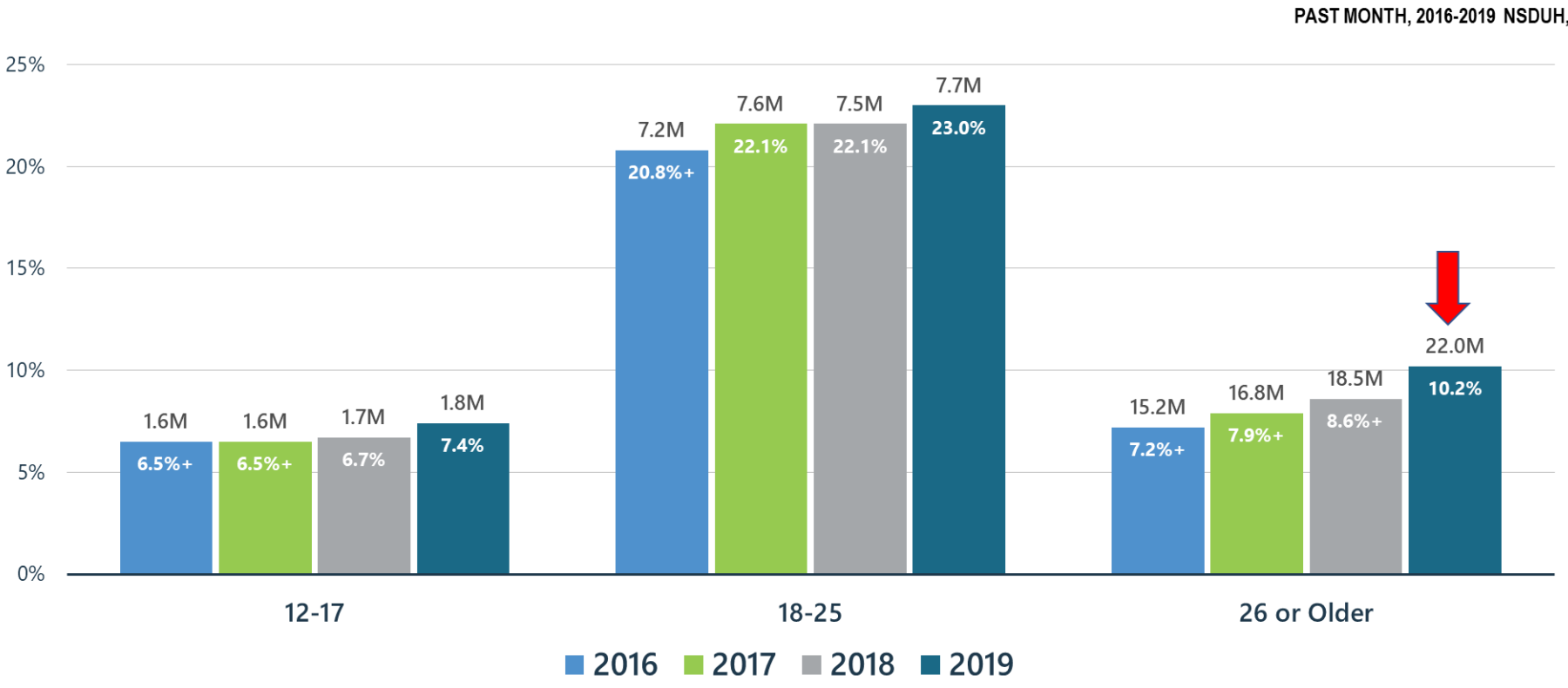
MacCoun & Mello, NEJM 2015

Marijuana is the most commonly used drug overall



SAMHSA
Substance Abuse and Mental Health Services Administration

Past Month Marijuana Use for All Age Groups



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

SAMHSA
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Methods for cannabis delivery

- Rolled cigarette “joint”, blunt
  - With or without tobacco
- Water pipe “bong”
- Dabbing (high concentrates)
- Vaporizers (Vapes)
- Edibles – slow, prolonged effects
  - Oils
  - Baked goods
  - Candy
  - Drinks
- Tinctures, lozenges
- Lotions, creams, Rick Simpson Oil
- Synthetic THC

Common Cannabis Preparations

Preparations	Description
Marijuana[a]	Dried plant product consisting of leaves, stems, and flowers; typically smoked or vaporized
Hashish	Concentrated resin cake that can be ingested or smoked
Tincture[a]	Cannabinoid liquid extracted from plant; consumed sublingually
Hashish oil	Oil obtained from cannabis plant by solvent extraction; usually smoked or inhaled; butane hash oil (sometimes referred to as "dabs"), for example
Infusion[a]	Plant material mixed with nonvolatile solvents such as butter or cooking oil and ingested

[a] These preparations are available from state-approved medical marijuana dispensaries.

Hill K, JAMA 2015

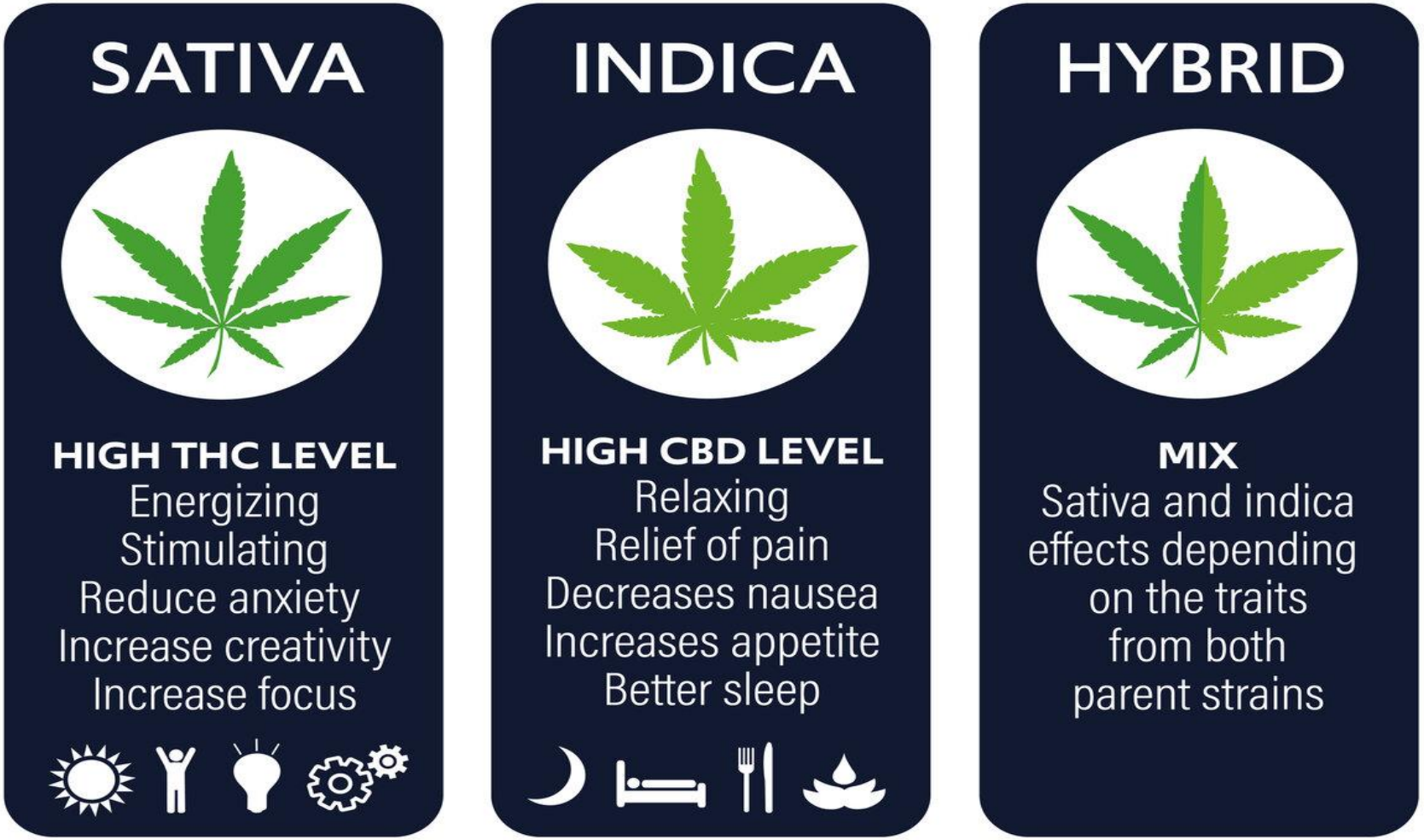
Cannabinoids

Endocannabinoids – naturally occurring (CB1, CB2 receptors, help regulate stress, pain, immunity)

Exogenous Cannabinoids– mimic endocannabinoids: phytocannabinoids (plants), synthetic

- **Tetrahydrocannabinol (THC)** – psychoactive, analgesic, anti-spasmotic, muscle relaxant, appetite stimulant, antiemetic properties
- **Cannabidiol (CBD)** – no ‘high’, neuroprotective, anti-inflammatory, analgesic, anticonvulsant, buffers THC effects
- **Over 100 other cannabinoids!**

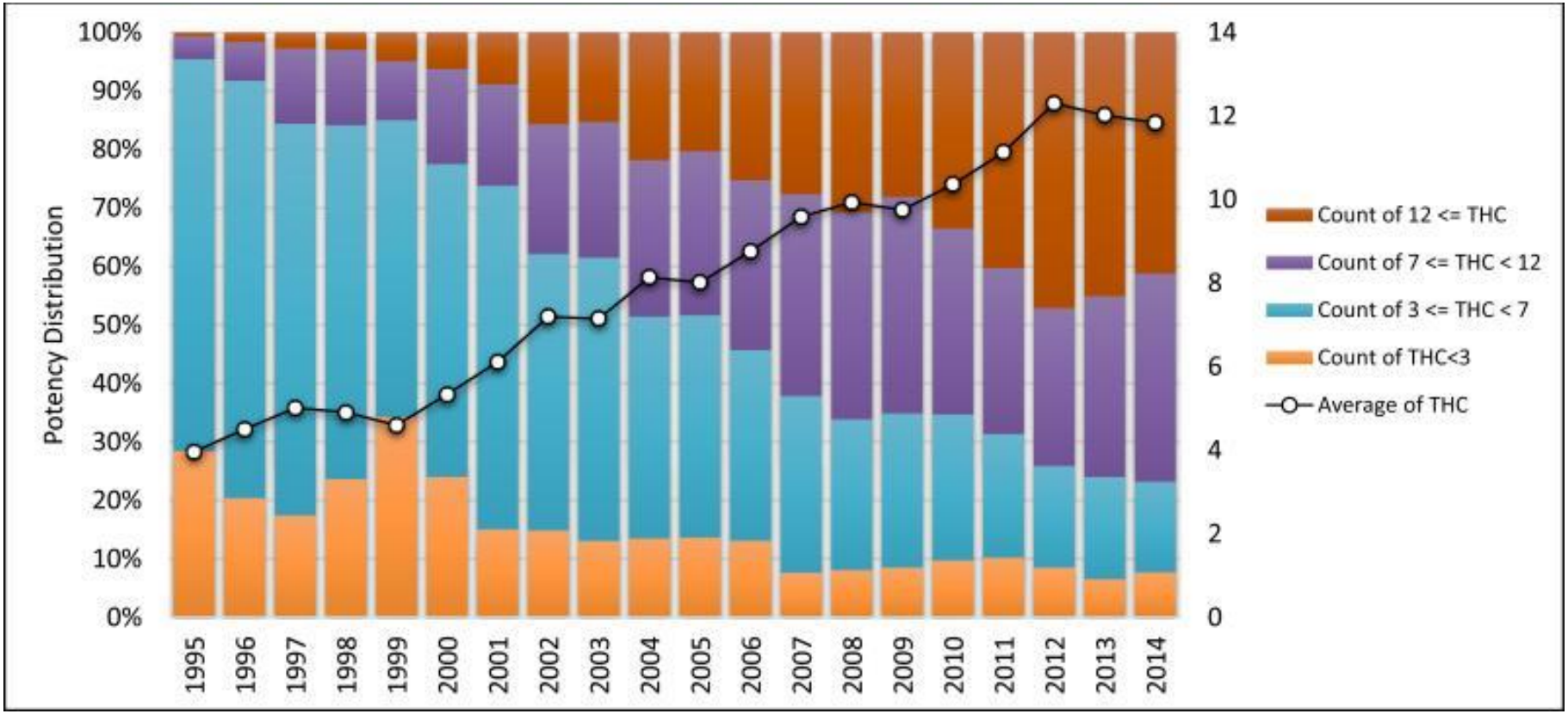
Cannabis Plant Types



Many strains / "chemovars" / cannabinoid profiles …

dankbudz.com

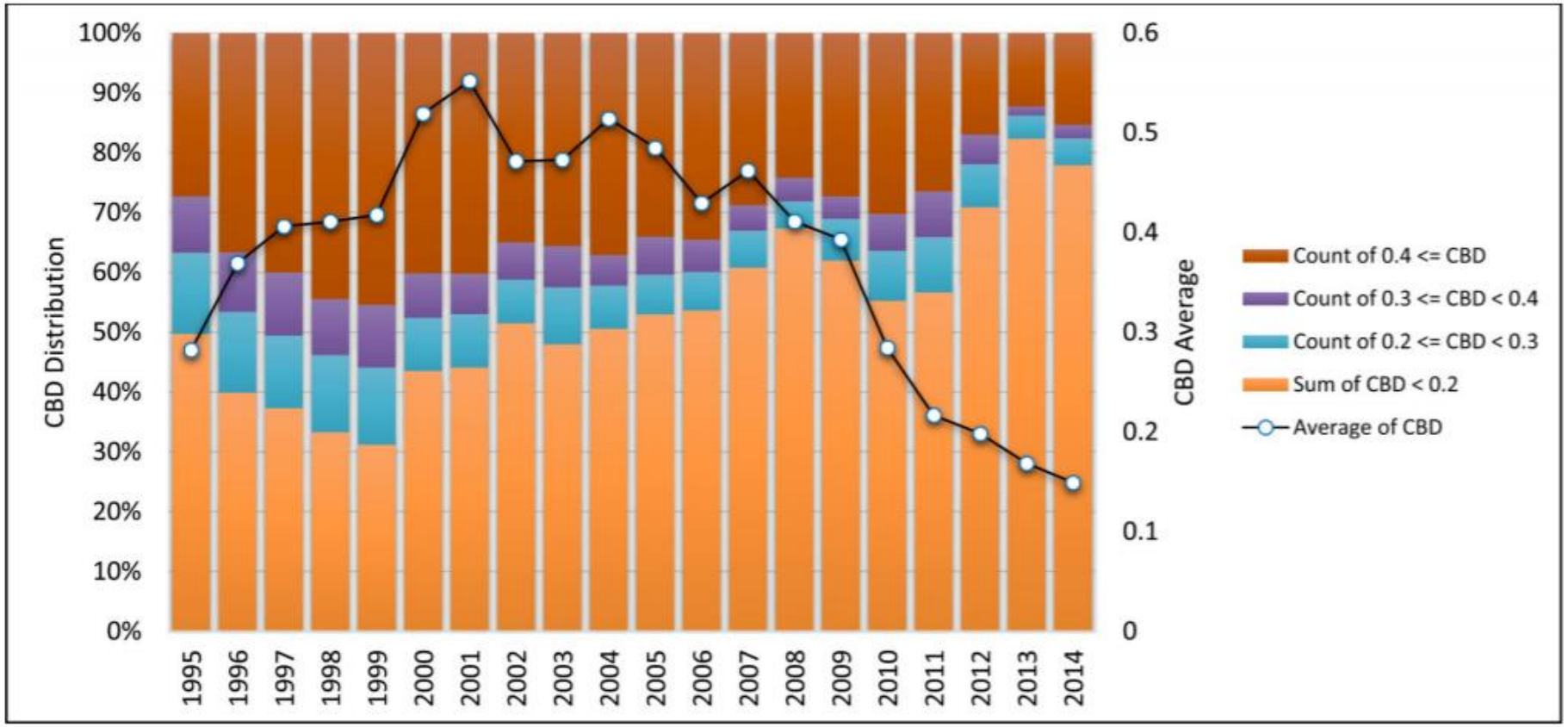
THC potency over time



Highest concentration of THC is in WA state

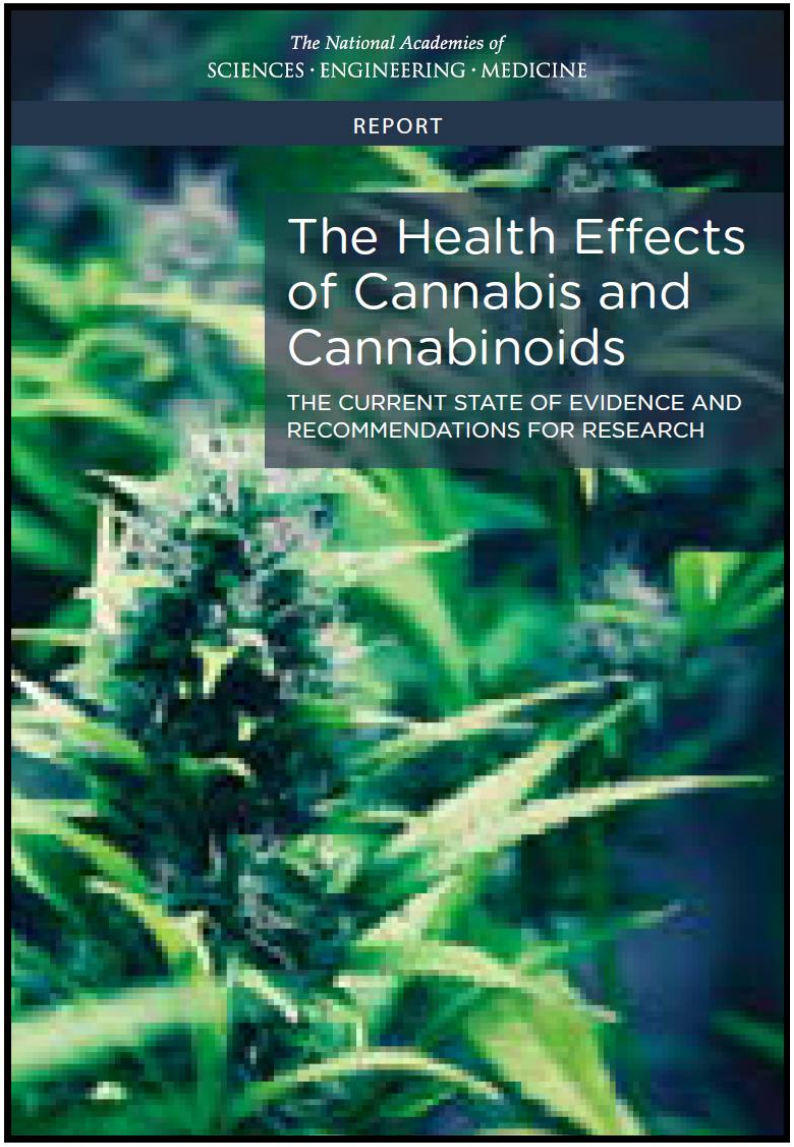
ElSohly et al, Biol Psychiatry 2016

CBD potency over time



ElSohly et al, Biol Psychiatry 2016

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 Research & Education

https://adai.uw.edu/research/cannabis-research-education/

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

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**

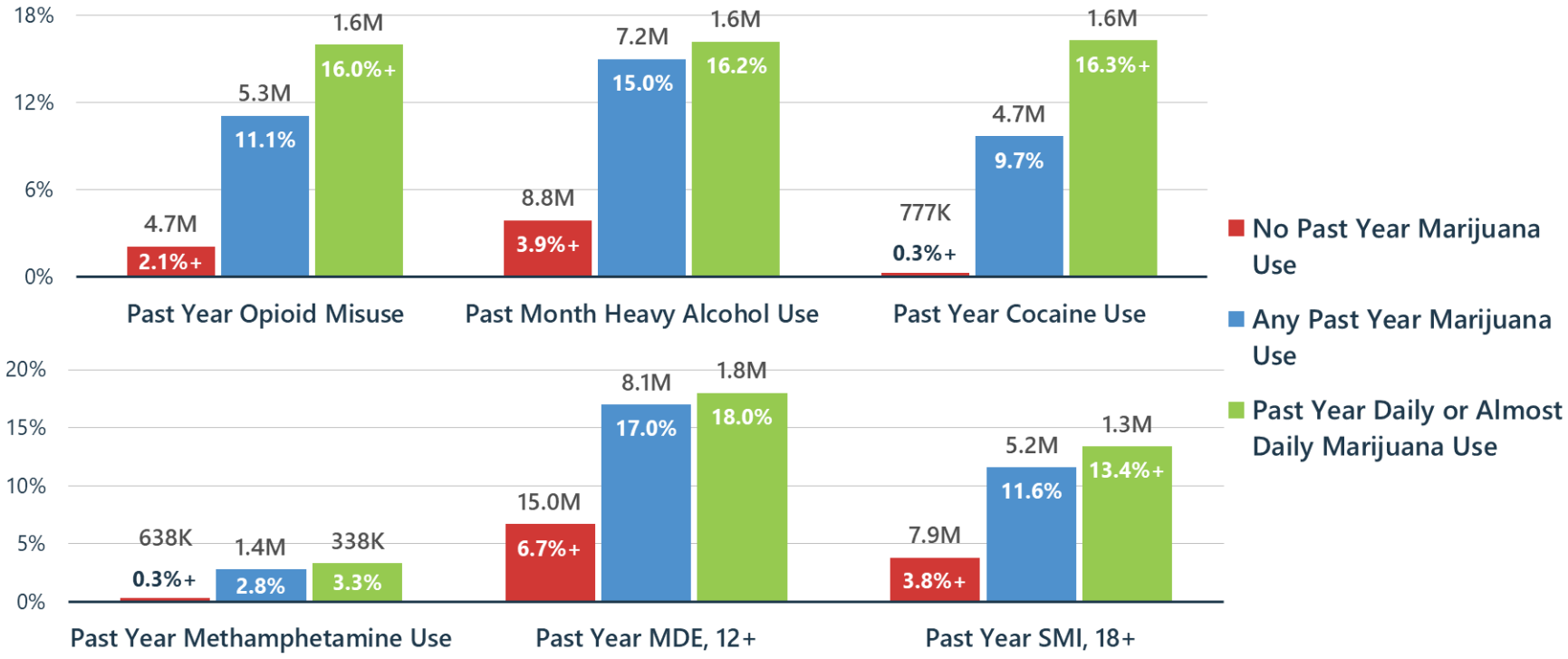
Harmful Effects of Cannabis (cont.)

Moderate evidence

- Impaired **cognition**: learning, memory, attention
- 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** assoc. with severe PTSD

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

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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

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

Can Cannabinoids Improve TBI Outcomes?

Potential mechanisms found in **animal studies**

- Neurogenesis, neuroplasticity, 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 **dexanabinol** (a synthetic cannabinoid) within 6 hrs after **severe TBI** showed **no improvement in 6-month functional outcomes, survival, or quality of life** (Maas 2005)

Conclusions

- 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, and mood, substance use & psychotic disorders
- Before using cannabis, people with TBI should **discuss with their health care providers** individual potential risks & benefits of cannabis
- **More quality research is needed** on potential neuroprotective, therapeutic (e.g., headache), & harmful properties of cannabis after TBI

Thank You

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