

# Testimony on [S.278](#) for VT House Committee on Government Operations and Military Affairs

## Amy Turncliff, PhD

Neuroscientist & Public Health Advocate  
Founding Director, RockFern Scientific Consulting, LLC

Expertise: Cannabis Policy, Mental Health, and Substance  
Use Disorders

[Amy.Turncliff@RockFernScientific.com](mailto:Amy.Turncliff@RockFernScientific.com)

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# Professional Background

- I am the Founding Director of RockFern Scientific Consulting.
- I obtained a PhD in Neurobiology from the University of North Carolina at Chapel Hill and completed post-doctoral training with Dr. Bertha Madras at Harvard Medical School.
- I have been a scientific consultant specializing in mental health and substance use disorders for more than 20 years.
- Over the past 10 years, I have used my experience and expertise to educate and advocate for the prioritization of public health in cannabis policy.
- Finally, I am mom to three kids ages 19, 17, and 14 and Auntie to my two nephews, who are growing up in VT; they are 16 and 14.

# Topics to Cover

- Level Set on Cannabis: THC content in cannabis today, THC impact on the brain and body, how THC is similar to, and different from, alcohol and why it matters.
- Cannabis Events: Public Health Concerns
- Outcome Measures to Track Public Health Impacts

# National Institute on Drug Abuse (NIDA)

NIDA Notice Issued May 7, 2021:

- **A standard THC unit is defined as any formulation of cannabis plant material or extract that contains 5 milligrams (5mg) of THC. This is regardless of consumption method.**

## THC vs Alcohol

- 5mg THC is generally considered equal to 1 serving of alcohol in acute impairing effect\*; HOWEVER, THC clearance by the body is highly unpredictable and variable from person to person. Generally, impairing effects can last 2-8+ hours.
- THC can accumulate in fatty tissues in the brain and body. High THC in products with no defined metered dosing (e.g. smoking and vapes) and delayed onset of THC edibles, can lead to stacking of impairing effects and unintentional overconsumption.
- After THC accumulation, THC can be released over time, prolonging impairment.
- In contrast, generally alcohol clears the body in a predictable way, at approximately 1 standard drink/hr.

\*this is unofficial but generally accepted for public health messaging

1 joint  
today

Could be as  
powerful as

≥10 joints in  
1970-1990



100mg THC in 0.3g  
joint (30%THC)

Note: ≈ 20 x 5mg THC doses



10x 10mg THC in 0.3g  
joint (3%THC)

Note: = 2 x 5mg THC doses

**A joint or pre-roll today, generally contains 10x more THC than the same size joint in the 1970s, 80s, and 1990.**

1 vape  
cart  
today

Could be as  
powerful as

~87 joints in  
1990



DISPOSABLE

Orange Cookies, Disposable Distillate Vape, 1g

86.5% THC

865mg THC in  
1g vape cart



86.5 x 10mg THC  
in joints of 1990

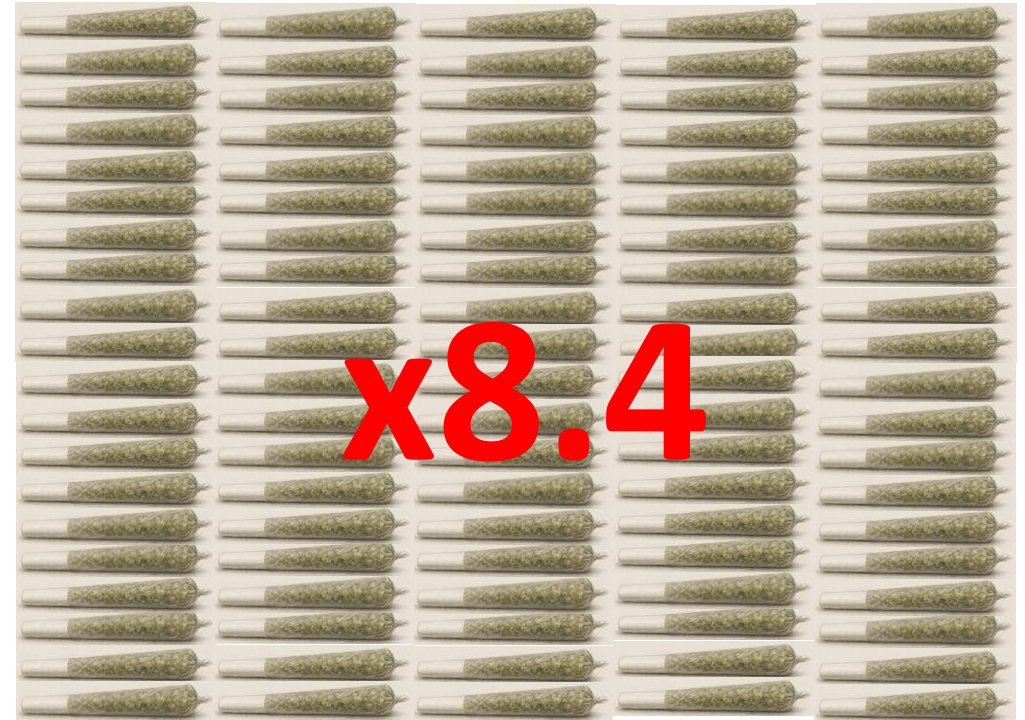
Note:  $\sim 173 \times 5\text{mg THC servings} = \sim 173$  servings of alcohol = 173 nip bottles OR more than a keg of 5% ABV beer; HOWEVER, a single small vape cart is used very differently than a keg of beer and people don't carry 173 nip bottles in their pocket.

A vape pod is typically used by a single person and the THC is delivered in a form that allows rapid repeated dosing. This is why vape pods can lead to much higher THC exposure than people realize.

1oz of 30%  
THC flower

Could be  
equivalent to

840 joints in  
1990



= 1,680 x 5mg NIDA-defined dose units  
=approx. 1,680 nip bottles, 10 kegs of beer, OR 19  
gallons of hard alcohol.

2oz of 30%  
THC flower

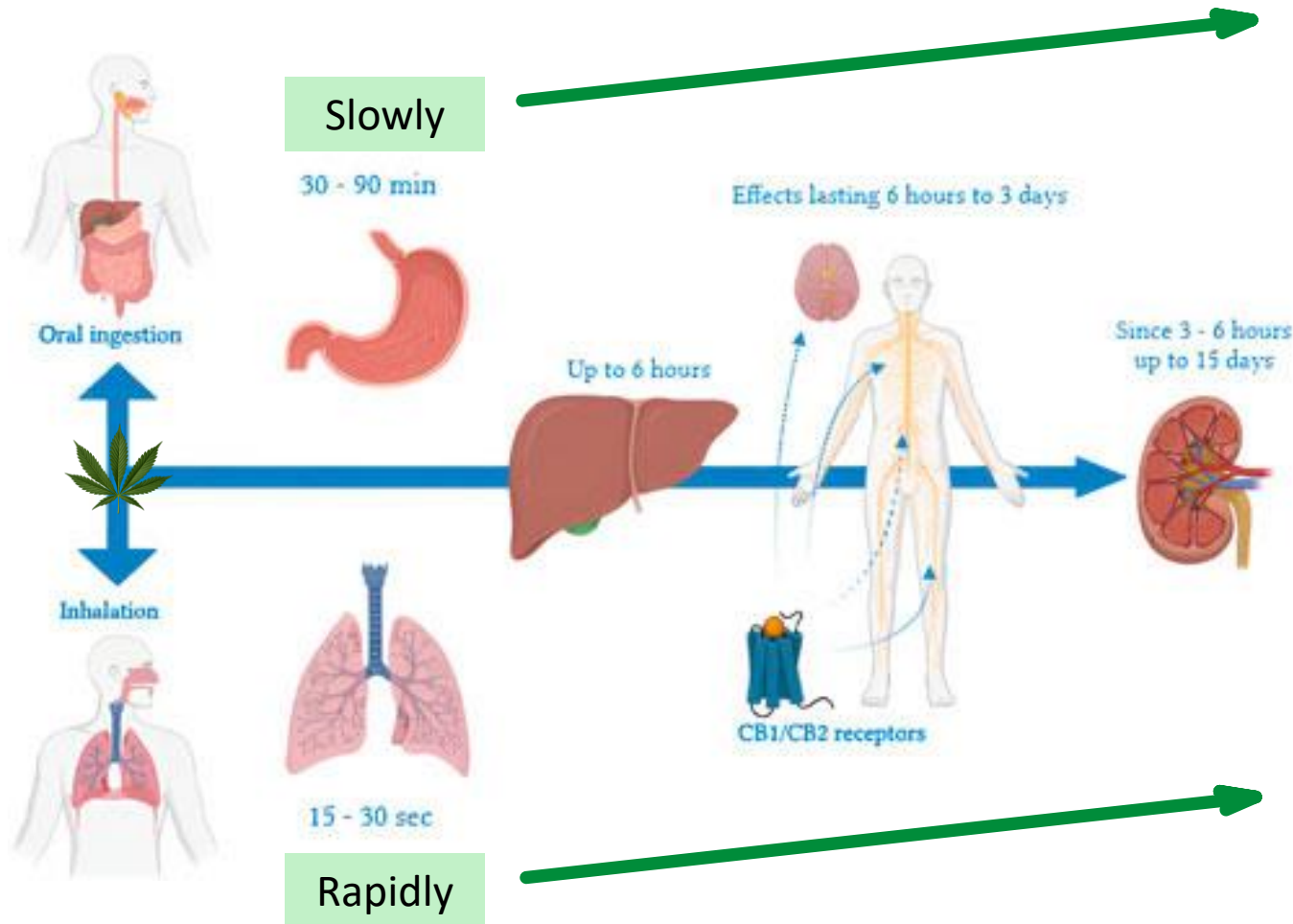
Could be  
equivalent to

1,680 joints  
in 1990

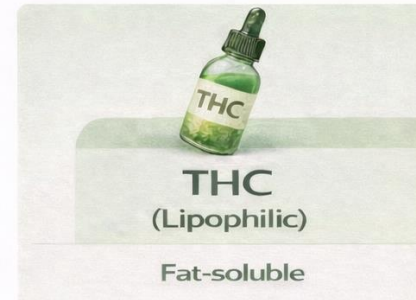


(= 3,360x 5mg NIDA-defined dose units)

# Cannabis products deliver THC to the brain and body.



## THC vs. Alcohol: Distribution & Pharmacokinetics



THC is **lipophilic**, meaning it sticks to fats/lipids.

Alcohol/ethanol is **hydrophilic**, meaning it dissolves in water.



THC rapidly **redistributes from blood into fatty tissues** (brain, adipose tissue, etc).

Alcohol **distributes throughout the brain and body in a relatively predictable way.**



THC can be released slowly from fatty tissues for **days, weeks, months.**

Alcohol is metabolized and cleared relatively quickly, typically **within hours.**

Impairment lasts ~2-8+ hours, highly variable



Impairment lasts ~1-3 hr/drink

# Prevalence of AUD & CUD Among U.S. Adolescents Who Reported Past-Year Use, NSDUH 2022

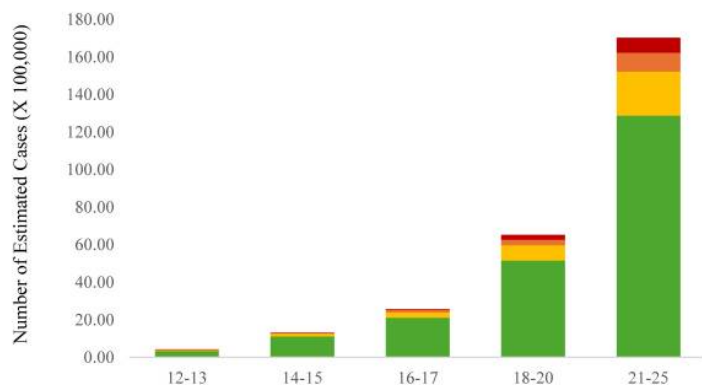
ALCOHOL

n = 27,858,838 (weighted)

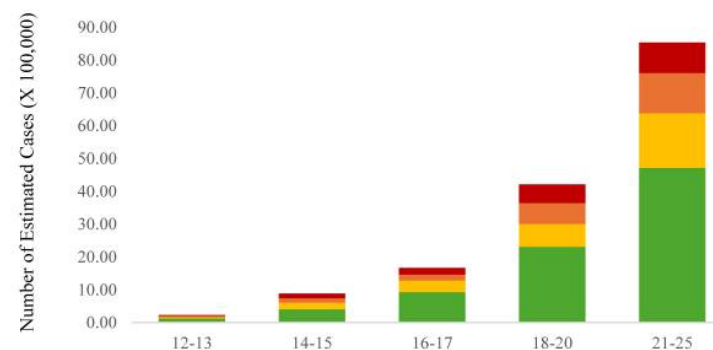
CANNABIS

n = 16,240,632 (weighted)

**A** Prevalence of Alcohol Use Disorder Across Age Cohorts

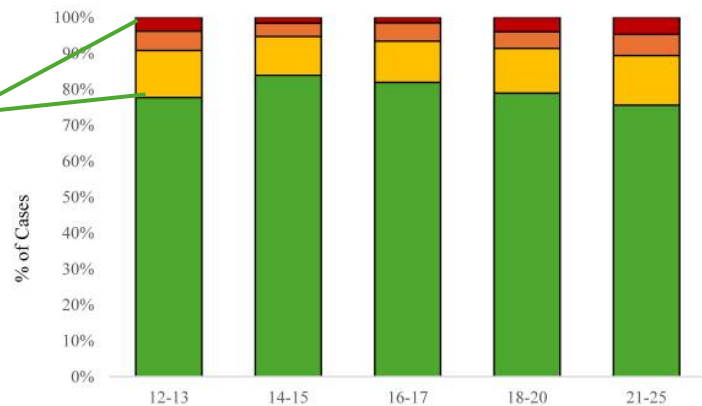


**B** Prevalence of Cannabis Use Disorder Across Age Cohorts



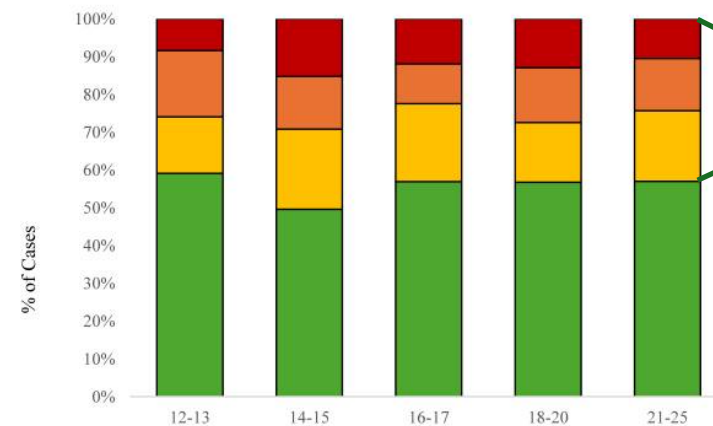
**C**

~16-24%



**D**

~41-50%



■ Non-disordered Use ■ Mild ■ Moderate ■ Severe

# Adolescents Who Use Cannabis Are More Susceptible

## BRAIN CHANGES



- \*Functional
- \*Anatomical
- \*Cellular
- \*Molecular

## ADDICTION



- \*Higher in teens

## COGNITIVE DEFICITS



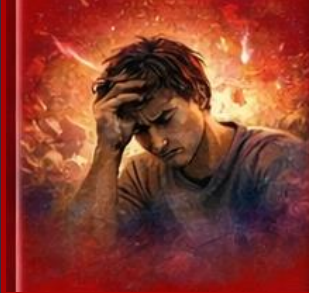
- \*Learning
- \*Memory
- \*Poor school performance
- \*IQ decline
- \*Executive functioning deficits

## AMOTIVATION



- \*Higher school drop-out
- \*Lower educational attainment
- \*Lower employment

## PSYCHIATRIC SYMPTOMS



- \*Psychosis
- \*Anxiety
- \*Depression
- \*Suicidality
- \*Disordered sleep
- \*Emotional dysregulation

## CANNABINOID HYPEREMESIS SYNDROME (CHS)



- \*Abdominal pain
- \*Nausea
- \*Vomiting

## FUNCTIONAL & HEALTH DEFICITS



- \*Impaired motor coordination/driving
- \*Cardiovascular effects

# Key Topics: Cannabis of Today



- High THC content in commercial products increases potential for health and safety harm.
- THC is processed by the body very differently than alcohol: fat soluble vs water soluble meaning THC accumulates in fatty tissues in the body (especially the brain) and can be released over time, increasing the potential for prolonged impairment.
- Cannabis, in particular THC, can cause short and long-term impacts on physical, cognitive, and mental health including cannabis-induced psychosis.
- These impacts are especially relevant for adolescents (now being recognized as up until age 32) because of the important role of the endocannabinoid system in brain development.

# Cannabis Events: Key Public Health Concern #1

## \*Social Normalization\*

- Young people are influenced by what they see and hear in their family, social circles, and community.
- Social cannabis events, especially public events, in communities are likely to reduce perception of harm associated with cannabis.
- Research has shown that more cannabis retail shops in a community is associated with more youth use and more intention to use.
- Even if entry is restricted to adults 21+, social-use venues can normalize cannabis use as something to do for fun, especially if located near areas where adolescents hang out.
- The concern is not only direct underage entry, but increased visibility, adult-to-youth diversion, flavored/high-potency product exposure, and reduced perception of risk.

# Cannabis Events: Key Public Health Concern #2

## \* Overconsumption\*

- NIDA-defined dose unit for research purposes = 5mg THC (all consumption methods)
- **THC is fat soluble**, and metabolized by the body completely differently than alcohol, which is water soluble. Alcohol metabolism is fairly predictable with the body clearing about 1 drink/hr while THC can accumulate making metabolism and clearance highly variable across individuals.
- Today's cannabis products can be very high in THC: a 0.5g joint can be 30% THC delivering 150mg THC.

### **Signs & Symptoms of Overconsumption:**

- Cardiovascular: Palpitations, tachycardia
- Gastrointestinal: Abdominal pain, nausea, vomiting
- Central Nervous System: Dizziness, sleepiness, lack of coordination, confusion, amnesia, anxiety/nervousness, paranoid reaction, delusions, hallucination, depersonalization, dissociation
  - It is now well accepted that THC, especially high doses, can induce acute psychosis and is an independent risk factor for chronic psychotic disorders such as schizophrenia and BPD.

# Cannabis Events: Key Public Health Concern #3

## \* Impaired Driving \*

- Can affect pedestrians, other drivers, police, EMS, and local liability exposure.
- **THC has many of the same impairment effects as alcohol** — slowed reaction time, a foggy memory, impaired coordination, attention, and judgement
  - Studies have shown that even if a person feels like they are able to drive after consuming THC, they still show impairments in key driving functions.
- THC impairment can be **delayed, harder to self-detect, and less predictable** than alcohol.

### Colorado Department of Public Health and Environment (CDPHE) says:

- **Wait at least six hours** after smoking marijuana containing < 35 milligrams (mg) THC before driving, biking or performing other safety-sensitive activities. If you've smoked > 35 mg, you need to wait longer.
- **Wait at least eight hours** after eating or drinking marijuana containing < 18 mg THC before driving, biking or performing other safety-sensitive activities. If you've consumed > 18 mg, wait longer.

<https://cannabis.colorado.gov/health-effects/immediate-health-effects>

# Cannabis Events: Key Public Health Concern #4

## \* Secondhand Smoke Exposure\*

- If smoking or vaping is allowed, workers, patrons, nearby residents, and passersby may be exposed to secondhand cannabis aerosol/smoke. This is counter-productive to smoke-free workplace advancements.
- The CDC notes that secondhand cannabis smoke contains not only THC, but also many of the same toxic and cancer-causing chemicals found in tobacco smoke, sometimes in higher amounts. A study just published last week, found high levels of toxic metals in vapor from THC vapes. This raises concerns for employees, pregnant people, people with asthma/COPD, and neighboring businesses or housing.

# Key Public Health Concern #5

\* Lack of compliance with public health protections\*

- VT has enacted proactive policy measures to reduce cannabis-related public health and safety harm; however, even with the best of intentions, local officials may face practical enforcement issues in the following areas:
  - Preventing co-use with alcohol or other drugs, monitoring intoxication and impaired driving, preventing diversion to those underage, managing odor complaints, ensuring worker protections, and avoiding accumulation of impacts in already burdened communities.

# Public Health-related Outcome Measures to Track

- Collection of quantitative & qualitative data from host municipalities:
  - Impact on utilization of local services
    - Local/state first responder service utilization (e.g., law enforcement, EMT services): OUI cannabis, underage use, emergency response for physical/mental health crises
    - Local/state emergency medical services utilization: medical emergencies with cannabis code
  - If event attendees are allowed to leave premises with product, consider assessing child poisoning data which may fall under emergency medical service utilization metrics
  - Compliance check data especially for public events (e.g., prevention of underage access, compliance with prohibition on alcohol co-service, sales limits, permitted product types, etc)
- Assess local/state adolescent health survey data, especially in and around communities that host cannabis events:
  - This may help to show if changes in cannabis/THC product availability, perceptions of harm, and perceptions of disapproval were associated with events (especially public events).
  - You can include questions about whether teens/underage persons report seeing and/or attending a state licensed cannabis event.