

High THC, Young Brains, and a Public Health Reckoning

by Amy Turncliff, PhD

In 2016, Massachusetts voters legalized the use and sale of recreational marijuana. Ten years later, the negative public health consequences of that vote have been rippling through the state, resulting in a ballot proposal for a repeal of the sale and commercialization of recreational marijuana.

As a neuroscientist and public health advocate specializing in mental health and substance use disorders, I have been advocating for cannabis (marijuana) policies that protect public health in my home state of Massachusetts for more than 10 years. The health-related harms associated with delta-9-tetrahydrocannabinol (delta-9-THC), the main psychoactive component of cannabis, have been studied for decades. However, with each passing week, it seems that there are new scientific studies adding to what we've already known: today's high-THC cannabis products are associated with functional, anatomical, cellular, and molecular brain changes that may translate into higher rates of addiction, cognitive deficits, amotivational syndrome, psychiatric symptoms, cannabinoid hyperemesis syndrome (CHS), cardiovascular risks, and other functional and health concerns including impaired driving.

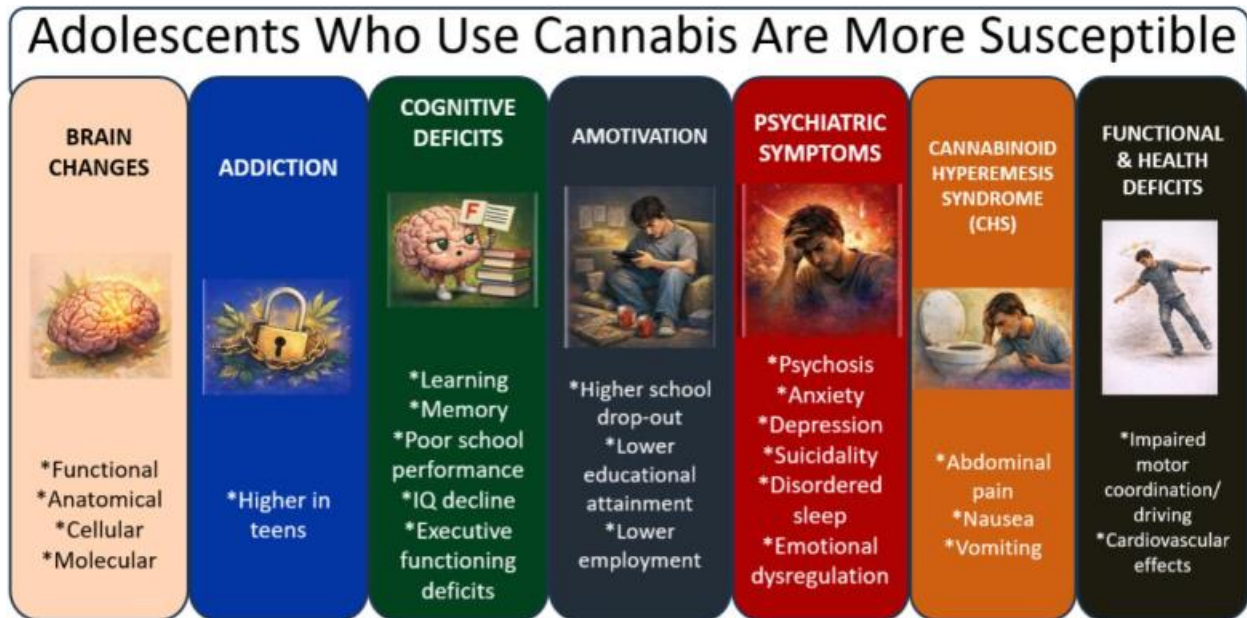


Image Credit: Adapted from image created by Dr. Bertha Madras, PhD

Adolescents—typically defined as people between the ages of 10–24, with new evidence suggesting this developmental period may extend to age 32—are especially vulnerable to THC’s negative effects on the brain. This is likely because the endocannabinoid system, a molecular signaling system, is a key regulator in adolescent brain development processes, such as: regulating synaptic pruning, modulating emotional learning, calibrating reward sensitivity, shaping executive function development, modulating and integrating responses to rewards, fear, anxiety, and stress. The endocannabinoid system acts as a neurodevelopmental tuning system, helping the brain to wire itself according to experiences. Delta-9-THC and intoxicating hemp-derived cannabinoids such as delta-8-THC and delta-10-THC, especially in high doses, interfere with the fine tuning and modulatory role of the endocannabinoid system because they are able to bind to the receptor in the brain (CB1) that is meant to be used by our endocannabinoid system.

This is one reason why it is important to close the 2018 Farm Bill loophole that has allowed the sale of intoxicating hemp-derived cannabinoids (e.g., delta-8-THC) and to limit the THC content in commercial cannabis products in “legal” states.

Marijuana was legalized by ballot initiatives in Massachusetts for “medical” purposes in 2012 and for “recreational” use in 2016 with the first licensed shops opening in late 2018. Many people in the prevention and public health communities were concerned about the looming consequences, particularly for young people. I wish I could say that those concerns were not borne out; however, several studies have been published since 2019, showing these negative public health impacts in our state. For example, data show that there has been an increase in cannabis-related poison control calls, ED visits, and hospitalizations among those aged 0-19 years:

- **Poison control calls:** After the legalization of medical marijuana in 2012, the incidence of single-substance cannabis calls to poison control centers in Massachusetts nearly tripled from 0.4 to 1.1 per 100,000. 81.7% of the calls involved adolescents between the ages of 15–19, signifying a 140% increase. The study’s authors concluded, “additional efforts are needed to keep higher-potency edible products and concentrated extracts from children and teenagers, especially considering the [medical marijuana legalization] and retail cannabis sales in an increasing number of US states.”
- **ED visits with cannabis exposure & hospitalizations for cannabis intoxication:** Comparing before recreational cannabis commercialization (2016-2018) to post-commercialization (2019-2021), cannabis exposure ED visit incidence rose from 18.5 to 31.0 per 100,000 and hospitalizations for intoxication increased. The biggest relative increases involved individuals between the ages

of 0–5 and 6–12. There were 2,357 ED visits and 538 hospitalizations related to cannabis exposure in Massachusetts between 2016-2021.

Data from Massachusetts has also shown a negative impact on mental health and psychiatric symptoms including:

- Teens frequently report psychotic-like symptoms during and after THC use.
- In the first year after recreational cannabis commercialization, THC positivity and cannabis-related disorders increased among adolescents aged 12-17 years old seeking psychiatric emergency service at a tertiary care hospital.
- In a study of Boston Medical Center (BMC) ED psychosis visits, THC positive screens signaled greater psychosis severity.
- In a multi-state analysis (including MA), after recreational cannabis commercialization 30-day cannabis use rose 10 percentage points among people with psychosis.

Massachusetts clinicians and scientists have been warning about these and other cannabis-related health harms since before cannabis legalization. Every time the Massachusetts Cannabis Control Commission issues a press release celebrating cannabis sales and the tax revenue collected, I think of these harms and the families I have met who are struggling to find help for a loved one suffering from cannabis-induced psychosis.

The truth is that many people who voted for cannabis legalization, including some of these families being harmed, say they were unaware of the potential harms of today's high-potency THC products. **High THC products, like “strawberry kush” distillate cart, are equal to 93 1970s joints.** It is now recognized that cannabis, specifically THC use, is an independent, modifiable, risk factor for both acute psychosis and chronic psychotic disorders. This means that THC use can cause acute psychosis that with continued cannabis use can increase the risk of developing chronic, serious mental illnesses (SMIs) such as schizophrenia-spectrum disorders. These are PREVENTABLE cases of SMI!

This is causing frustration among families and healthcare providers, as one parent of a young adult child experiencing cannabis-induced psychosis told me: “It was 3 years ago that we received a call from an ER Psychiatric Nurse from Newton-Wellesley Hospital

who explained that he was in the midst of a cannabis-induced psychosis. You could hear the anger in her voice when she said, 'We are seeing this all the time now!'."

This November, Massachusetts voters will have the opportunity to repeal recreational commercial marijuana at the ballot box. If the repeal passes, it will be because Massachusetts regulators have failed to protect public health. There has been no meaningful public health awareness campaign or warnings about the risks of today's high-potency THC products including psychosis, no effective restrictions on billboard advertising, and no limits on THC content in products. As we saw with the opioid epidemic, as the harms continue to accumulate, families will be the ones to demand accountability and change; I will be standing with them.

About the Author: Amy is the Founding Director of RockFern Scientific Consulting. She 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. Amy has been a scientific consultant specializing in mental health and substance use disorders for more than 20 years. She has used her experience and expertise to build coalitions and advocate for policies that prioritize addiction prevention and behavioral health promotion at the local, regional, state, and federal level. Her primary area of focus is cannabis education and policy, aiming to prevent serious mental health harms caused by today's high THC cannabis products.