

Issue Brief 4: Marijuana and the Teen Brain

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Purpose:

The Barnstable County Department of Human Services is producing a series of issue briefs for the Regional Substance Abuse Council that presents information on topics related to substance use. This issue brief explores several issues pertaining to youth and marijuana.

The Teen Brain

The main chemical component of marijuana is delta-9-tetrahydrocannabinol (THC). When THC is ingested the chemical triggers an increased release of dopamine in the pleasure centers of the brain. Chemical changes associated with THC can affect memory, thinking, concentration, coordination, and time perception. There are three main areas of the brain that are affected: the hippocampus, the cerebellum, and the frontal cortex. The hippocampus is critical to learning and recall ability; the cerebellum controls motor function, balance, and coordination; and the frontal cortex is the decision making center of the brain. Chemical changes to any of these parts of the brain can lead to temporary and sustained disruptions in intelligence, mobility, and critical thinking.

Recent studies by the National Institute of Mental Health have found that the brain continues to develop into the early 20's and that the teenage brain is continuously developing new neural connections that regulate behavior, emotion, perception, and intelligence.¹ THC has been shown to chemically alter these neural connections and may affect brain development and maturation, potentially with permanent effect.

¹ National Institute of Mental Health. *The Teen Brain: Still Under Construction* (2011)

Effects of Marijuana Use on the Teen Brain

There are several short-term effects of marijuana use, including increased heart rate, expansion of the blood vessels, and a surge of dopamine which creates the “high” feeling. These effects may be felt immediately and last up to 3 hours. If THC is ingested with food the effects may not be felt for up to an hour but can last much longer.

The long-term effects of marijuana use can be severe. Sustained use can lead to respiratory problems, increased risk of depression and anxiety, and/or addiction. Chronic marijuana use that begins at a young age can be particularly dangerous. Studies have shown that sustained use can cause up to an 8-point drop in IQ, an increased risk of developing schizophrenia or other psychotic disorders, and higher rates of addiction.²

It is estimated that about 16% of people who start using marijuana as a teen will become addicted. For adult users that number drops to 9%.³ According to the Substance Abuse Mental Health Services Administration, 87% of people admitted to a marijuana treatment program report having started using marijuana before the age of 17.⁴

Importantly, the National Institutes of Health is launching a prospective cohort study* of adolescent brain and behavioral development call the Adolescent Brain Cognitive Development (ABCD) Study to “learn as much as possible about (children) before they start using substances, then follow them through the period of highest risk (their teenage years)...Beginning in 2016 nineteen research sites across the country will invite approximately 10,000 children ages 9-10 to join the study. Researchers will track their biological and behavioral development through adolescence into young adulthood.”⁵ Among the objectives of the study are to gain greater understanding of substance use during adolescence and its impacts on cognitive function and behavior into adulthood.

* In this type of study participants are recruited and then studied over time.

² Meier, M.H.; Caspi, A.; Ambler, A.; Harrington, H.; Houts, R.; Keefe, R.S.E.; McDonald, K.; Ward, A.; Poulton, R.; and Moffitt, T. Persistent cannabis users show neuropsychological decline from childhood to midlife. *Proceedings of the National Academy of Sciences* 109(40):E2657–E2664, 2012

³ Winters, K. C. & Lee, C.Y. S. Likelihood of developing an alcohol and cannabis use disorder during youth: Association with recent use and age. *Drug and Alcohol Dependence*. 2008; 92, 239–24

⁴ SAMHSA Treatment Episode Data Set

⁵ NIH ABCD Study, <http://abcdstudy.org/about.html>.

Teens Increasingly See Marijuana Use as Not Risky

A decreasing percentage of teens perceives regular marijuana use as risky. Data from the 2014 National Survey on Drug Use and Health show that over 75% of teens do not think that smoking marijuana poses a great risk to their health, an increase of 5% from 2010 survey. These findings demonstrate national trend of decreased perception of risk associated with past month marijuana use.⁶

At the state level, 14 states experienced a statistically significant decline in the perception of great risk of monthly use between 2010 and 2014.⁷ According to Dr. Wilson Compton, Deputy Director of the National Institute on Drug Abuse, this is not a new trend: “We’ve now had five years of consistent declines in perceived harmfulness and the use rates have been reasonably steady- or dropping.”⁸

In spite of the above, it is interesting to note that there has not been a corresponding uptick in rates of marijuana use among teens. In Massachusetts perception of great harm from marijuana use is below national averages (at 20% in 2014), while regular marijuana use (defined as having used in the past 30 days) among Massachusetts high school students has maintained a downward trend since 2001 (from 31% in 2001 to 24% in 2013).⁹ It is important to note however that these rates of use in high school are reported as averages across the four grades. Rates of use jump dramatically between grades 10 and 11 in nearly all years surveyed.

On Cape Cod, the example of the prevention work being done in Falmouth demonstrates how these trends can be reversed. Between the years 2008 and 2013 Falmouth was a participant in the Drug-Free Communities national effort and saw a corresponding a downward trend can be seen in the town of Falmouth where the perception of great risk in smoking marijuana decreased from 66.9% in 2011 to 56.4% in 2013. Other regional towns have point in time data, but there is a lack of trend data in the region. More data collection is needed to be able to infer a downward trend across the region.¹⁰

⁶ Hughes, A., Lipari, R.N., & Williams, M. State Estimates of Adolescent Marijuana Use and Perceptions of Risk of Harm From Marijuana Use: 2013 and 2014. *The CBHSQ Report*. Rockville, MD: Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality.

⁷ Ibid 2014

⁸ Nelson, S. (2014). Teen Pot Use Isn't Going Up, Despite Dive In Risk Perception. *U.S. News & World Report*

⁹ Health and Risk Behaviors of Massachusetts Youth Surveys (2007 and 2009) and Massachusetts Youth Health Surveys (2011 and 2013)

¹⁰ Falmouth Communities that Care Survey 2011, 2013. <http://www.falmouthprevention.org/community-profile-surveys.html>.

Normalization of Marijuana Use

The theory of social normalization emerged in the 1990s while examining adolescent recreational drug use. The theory predicts a large cultural shift in perception about the acceptability of a particular behavior once the behavior becomes pervasive in society.¹¹

Both opponents and proponents of marijuana legalization agree that by legalizing and regulating the production, sale, and use of marijuana, a normalization shift will occur.^{12,13} However there are differing predictions of how this normalization will impact teens.

Opponents to the legalization of marijuana for recreational use believe that current education and prevention efforts are not strong enough to prevent underage marijuana use, and that legalization will further encourage black market sales to this demographic. Supporters argue that the continued illegality is what drives users to the black market and that legalization will allow for oversight and regulation of a behavior they already believe to be normalized.

It is important to note that the debate surrounding normalization of substance use focuses on recreational use, or “the occasional use of certain substance in certain settings and in a controlled way,”¹⁴ and side-steps drug misuse or dependence.

Conclusion

Marijuana decriminalization and legalization is a contested topic in today’s society. With several states including California and Massachusetts proposing ballot initiatives in 2016 that would legalize the recreational use of marijuana for adults we can expect to see increased focus on both the alleged benefits and risks associated with legalization. Research shows the negative effects of marijuana use on the teenage brain and thus the implications of potential increased access and normalization of use on this age group must be considered.

For more information please contact Beth Albert, Director of Barnstable County Department of Human Services. balbert@barnstablecounty.org; www.bchumanservices.net.

¹¹ Parker, H. (2005) *Addiction Research & Theory: Normalization as a barometer: Recreational drug use and the consumption of leisure by younger Britons*

¹² The Campaign for a Safe & Healthy Massachusetts

¹³ The Campaign to Regulate Marijuana Like Alcohol

¹⁴ Parker (2009)