MARIJUANA AND THE ADOLESCENT BRAIN
OUTLINE

• The Developing Brain and Susceptibility to Addiction
• Marijuana’s Effects on the Developing Brain
• Youth Marijuana Use Rates
• Youth Substance Use Prevention
• Town Policy Options
A coalition of schools, human service agencies, local government, law enforcement, businesses, faith-based organizations, parents and youth that holds the vision that:

Franklin County and the North Quabbin Region be a place where young people are able to reach their full potential and thrive with ongoing support from schools, parents and the community.
Compared to childhood and adulthood, adolescence is a time of heightened:

- Sensation- and reward-seeking
- Risk-taking and impulsivity
- Peer influence
- Mood swings
- Capacity to learn
- Exuberance
Maturation of the human brain, age 4-21
Creating neural super-highways through pruning & myelination
The “use it or lose it” principle

"If a teen is doing music or sports or academics, those are the cells and connections that will be hardwired. If they're lying on the couch or playing video games..., those are the cells and connections that are going to survive."

Jay N. Giedd, M.D., Chief of Brain Imaging, Child Psychiatry Branch, National Institutes of Health
The heightened importance of rewards
The brain’s reward system
From the neuron’s point of view (Wow! Yikes!)
When the brain’s reward system is repeatedly overstimulated, it adjusts to reduce dopamine levels.

Turn it down!!
Healthy subject

Person w/ substance use disorder
The reward system is particularly active in the teen brain.

Adolescent brains are building super-highways for the pathways used regularly.

The centers for logic and reasoning are still developing.
Dependence on substances is highly correlated with early use.

40% of those who begin drinking at age 15 will develop an alcohol use disorder.

7% of those who begin drinking at age 21 will develop an alcohol use disorder.

* Photo courtesy of NIAAA and MADD
What is marijuana?
How does it affect the body?
The marijuana plant (Cannabis)

• 480 natural chemical compounds, including THC and CBD

Like most drugs, THC and CBD mimic natural brain messengers.
Cannabinoid receptors are found all over the body... and throughout the brain.

THC, CBD and other cannabinoids from marijuana can bind with them and alter natural signals.
Average THC & CBD levels in the US: 1960 - 2011

Data from the NIDA-sponsored Potency Monitoring program at the University of Mississippi, showing average THC and CBD levels in samples of marijuana seized by federal, state and local governments in each year shown.
THC Concentrates

“Green Crack” wax

“Ear Wax”

Butane Hash Oil (BHO)

Hash Oil Capsules

“Budder”

“Shatter”
Ways to consume marijuana

**SMOKING**
- Pipe
- Bong
- Bubbler
- Dab
- Joint
- Blunt

**EDIBLES**
- Candy
- Ice cream
- Baked goods

**VAPORIZING**
- Desktop vaporizer
- Portable vaporizer

**BEVERAGES**
- Tea
- Soda
- Alcohol
- Milk

**OTHER**
- Capsules
- Spray
- Tincture
Acute effects of using marijuana (during intoxication)

- Altered judgment
- Slowed reaction time
- Euphoria
- Impaired memory
- Increased appetite
- Panic/paranoia/psychosis
- Anti-nausea effects
- Impaired coordination
- Altered pain sensitivity
Marijuana and Driving

- Lab and simulator studies show that marijuana impairs driving skills, and the more THC, the greater the impairment.
Marijuana and Driving

- Marijuana used with alcohol causes greater impairment than either alone.
- In Colorado in 2014, of drivers testing positive for THC, 2/3 had alcohol and/or other drugs in their systems as well as marijuana.
What are the longer-term effects of regular marijuana use on youth development?
Prospective longitudinal studies

- Assess during childhood
- Monitor marijuana use from onset
- Assess again in adulthood
One thing researchers agree on...

Frequent marijuana use during adolescence has more serious consequences than use by adults.
Potential longer-term effects of regular marijuana use on youth development

- Issues with attention, memory and learning
- Poorer educational and life outcomes
- Loss of IQ for persistent heavy users
- Potential for addiction to marijuana and increased risk of addiction to other drugs
- Increased risk of risk of psychosis
Deficits in cognitive functioning among active users

Many studies show that adolescents who use marijuana heavily tend to score worse than non-users on tests of:

- attention
- verbal learning
- memory
- processing speed

... even when they are not high.

Messinis, et al 2006
Deficits in cognitive functioning among active users

- Deficits are larger for those who use more, and for those who begin using younger.
- With sustained abstinence, functioning is largely restored.
Adult life outcomes affected by marijuana use in adolescence

Increasing use of marijuana from age 15-21 was also associated with lower relationship quality and lower life satisfaction at age 25.

Fergusson DM & Boden JM, Cannabis use and later life outcomes. Addiction. 2008 Jun; 103(6):969-76
Loss of adult IQ associated with marijuana dependence in adolescence

The most comprehensive study of marijuana and cognitive function to date:

- Dunedin study followed 1037 individuals from birth to age 38
- assessed IQ at 13 and at 38
- assessed marijuana use and dependence at five points in time from age 18-38
- controlled for use of alcohol and other substances, socio-economic status and years of education
Loss of adult IQ with marijuana dependence in adolescence

Findings:

• Those who developed marijuana dependence before age 18 showed IQ decline in adulthood.

• The longer their dependence persisted, the greater the decline, with a decline of 8 IQ points for the most persistent users.

• Those who began using in adulthood did not show IQ decline.

• Quitting in adulthood did not restore functioning in those who began in adolescence.
Other studies show no association between marijuana use and IQ loss

Mokrysz, et al, 2016:
• Prospective cohort study of 2235 young people in Bristol, UK, considered impact of marijuana use on IQ between age 8 and age 15.
• No association found between teen marijuana use and IQ, after adjusting for various confounders, most notably cigarette smoking.

• Study of 789 pairs of twins followed from preadolescence (age 9-12) to late adolescence (age 17-20).
• Marijuana users experienced declines – as did their non-using twins.
• The authors conclude the decline was related to factors other than marijuana.
Are tobacco, alcohol & marijuana “gateway drugs”?

There is a correlation between use of tobacco, alcohol and marijuana and use of other drugs of abuse.

What percent of each group use prescription narcotics?

- **Cigarettes**: 16% of those who smoke cigarettes.
- **Alcohol**: 8% of those who drink.
- **Marijuana**: 11% of those who use marijuana.

Of those who do not smoke, 1%
Of those who do not drink, 1%
Of those who do not use marijuana, 0%

SOURCE: 2015 FC/NQ PNA
Marijuana use at age 18 and later risk of schizophrenia (n=45,570)

Cases of schizophrenia per 1,000

Number of times marijuana used

Andréasson, 1987
Marijuana, psychosis and schizophrenia

Regular marijuana use increases schizophrenia risk in those with gene for schizophrenia

DiForti, 2012
How common is youth marijuana use?
Percentage of U.S. 12th grade students reporting past month use of cigarettes, marijuana and alcohol

Percentage of local middle & high school students reporting past month use of cigarettes, marijuana and alcohol

Source: Franklin County/North Quabbin Prevention Needs Assessment.
Prevention:
Factors in the community, family and schools influencing youth use
Advertising & Marketing
Advertising & Marketing

MAHATMA
2 for $45
While supplies last.
$20 1/8th
Select Strains

$125 Oz
Select Strains
While supplies last.

$125 Oz
First Time Patients
Buy 1 Gram
Get One FREE

MIND BODY SPIRIT
WELLNESS CLINIC
Stop by on your way up
the mountain for all your
recreational needs!

SHOW YOUR SKI PASS AND RECEIVE
A $1.00 JOINT
WITH PURCHASE!

6745 West Mississippi
(East of Pierce)
Lakewood, Colorado
303.934.9750 • MEDICAL ONLY

MILAGRO • 1181 County Rd 308
(Exit 234 off I-70)
Dumont, CO
720.379.3672

greenfields
1798 West Mississippi Ave. Denver, CO 80223
A dispensary in Colorado ... now painted gray after community complaints that the mural enticed children
The Northampton dispensary
Products & packaging: Like this?
Or this? *(Products at the Northampton dispensary)*
Perception:

Reality:

THE LEGALIZATION OF MARIJUANA means ushering in an entirely new group of corporations whose primary source of revenue is a highly habit-forming product. Sounds a lot like another industry we just put in its place. Many facts are being ignored by this and other news organizations. Go to GrassIsNotGreener.com to see why so many major medical associations oppose marijuana legalization.
Prevention in schools
LifeSkills Prevents Substance Use

Randomized trials show LifeSkills reduces tobacco, alcohol and marijuana use among participants relative to controls:

up to 87% for tobacco use,
up to 60% for alcohol use, &
up to 75% for marijuana use.

SOURCE: Various studies cited at http://www.lifeskillstraining.com/
Screening, Brief Intervention & Referral to Treatment
Prevention in the family

Students’ report on their parents’ attitudes

<table>
<thead>
<tr>
<th>Attitude</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>very wrong</td>
<td>64%</td>
</tr>
<tr>
<td>wrong</td>
<td>16%</td>
</tr>
<tr>
<td>a little bit wrong</td>
<td>12%</td>
</tr>
<tr>
<td>not wrong at all</td>
<td>8%</td>
</tr>
</tbody>
</table>

How wrong do your parents think it is for you to use marijuana?

SOURCE: Franklin County/North Quabbin Prevention Needs Assessment.
MARIJUANA TALK KIT

What you need to know to talk with your teen about marijuana
In this 10-15 minute experience, you will talk to a child about underage drinking. Watch Get the Story to learn more about your characters. Then select Start Talking to start the conversation.
Communities that Care Coalition
What municipal leaders can do

• Educate the community through meetings, town newsletters, editorials, etc.
• Support the implementation of LifeSkills and SBIRT in the schools
• Assess zoning and Board of Health regulations on marijuana
## Menu of Policy Options: Marijuana

<table>
<thead>
<tr>
<th>Policy</th>
<th>Description</th>
<th>Benefits</th>
<th>Examples of other communities that have adopted the policy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mass Assn of Health Boards (MAHB) Template Board of Health Regulations</strong></td>
<td>The template regulations include several optional provisions for municipalities to choose from, including local BOH oversight and right to inspect facilities that manufacture or serve edible marijuana products.</td>
<td>Multiple benefits. Food inspections ensure sanitary conditions for workers and consumers.</td>
<td>Several across the state: updated list in progress.</td>
</tr>
<tr>
<td><strong>Zoning Bylaw setbacks from places where children and teens may congregate.</strong></td>
<td>Set maximum setback of 500 feet to schools and include in any setback daycare centers, teen centers, playgrounds, and other places intended for use primarily by children and youth under 21 years of age and places where children and youth gather for regularly scheduled educational and recreational programs.</td>
<td>Reduces likelihood that children and youth will regularly see line ups at marijuana business or people with products, which helps to reduce risk factors related to lower perception of risk of harm from marijuana for children and youth.</td>
<td>Setbacks from schools and/or parks: Shelburne, Whately, Erving &amp; others across the state. Other municipalities are including more locations for setbacks.</td>
</tr>
<tr>
<td><strong>Model Host-Community Agreement (HCA) language</strong></td>
<td>Examples of wording and content for Host-Community Agreements to assist towns and include important aspects for youth prevention.</td>
<td>Reduce workload for towns and enhance youth prevention and recovery-friendly practices.</td>
<td>Pending</td>
</tr>
<tr>
<td><strong>Social consumption establishment HCA options when we have more info</strong></td>
<td>See above – social consumption (cannabis cafés, etc) regulations will be considered by the Cannabis Control Commission in February, 2019.</td>
<td>See above.</td>
<td>Pending</td>
</tr>
<tr>
<td><strong>Optional town tax bylaw</strong></td>
<td>Towns are permitted to implement an additional 3% tax on retail marijuana businesses.</td>
<td>Helps to cover costs associated with marijuana businesses and raises revenue for town.</td>
<td>Many across the state: updated list in progress</td>
</tr>
</tbody>
</table>
**Resource list**

### Adolescent brain

### Prevention
- *Community Action Plan*, May 2016, available on the Communities That Care Coalition website [CommunitiesThatCareCoalition.org](http://CommunitiesThatCareCoalition.org)

### Addiction
- Dr. Ruth Potee, *Physiology of Addiction* (video), [https://www.youtube.com/watch?v=eySb0etE1PA](https://www.youtube.com/watch?v=eySb0etE1PA)

### Marijuana
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