MARIJUANA

Implications of Legal Retail Marijuana
Linda Cooke, J.D.
City of Boulder, CO
Presiding Judge, Boulder Municipal Court

Jessica Doty, Director
Office of Student Conduct and Conflict Resolution
University of Colorado, Boulder
Abbreviations

• MJ: Marijuana
• MMJ: Medical Marijuana
• RMJ: Recreational or Retail Marijuana
• THC: Tetrahydrocannabinol, the principal psychoactive ingredient of MJ
• CBD: Cannabidiol, the principal therapeutic component of cannabis, it is non-psychoactive
Overview

• Marijuana Legalization: A Brief History
• Legal Marijuana’s “Look” in Your Community
• Marijuana Attributes in a Legal Environment
• Trends in MJ Use when Legal
• Legal Marijuana & Crime
• Marijuana and Health Concerns
• Special Considerations for Youth Use
• Additional Implications for Higher Education
• Marijuana & Mental Health Impacts
• Monetary Considerations: Is it Worth It?
MARIJUANA
LEGALIZATION
Marijuana Legalization in Colorado

- **11/7/2000**: MMJ Legalized by Amendment 20
- **10/19/2009**: Ogden Memo Issued by the Feds
- **7/1/2010**: MMJ commercialized by CO HB 1284
- **1/1/2014**: RMJ implemented after Am. 64 passed

11/7/2000 - 6/30/2010: MMJ Legalized
7/1/2010 - 12/31/2013: MMJ Commercialized
1/1/2014 - 12/31/2016: RMJ Legalized
MJ Legalization in Colorado

• **2000:** Am. 20 legalizes MMJ on a small scale
  ▪ No MMJ dispensaries; MJ grown by patients or caregivers

• **2009:** Caregiver rule overturned; Fed. position softens
  ▪ MMJ patients increase from 6,000 to 41,000
  ▪ Hundreds of unlicensed legal MMJ dispensaries appear

• **2010:** State legislature legalizes MMJ businesses; the era of MMJ “commercialization” begins
  ▪ MMJ patients increase to 108,000 by 2012
  ▪ 94% of MMJ patients use MMJ to treat severe pain

• **2012:** Colorado legalizes RMJ effective Jan. 2014

• **2015:** After 1 year – 322 RMJ stores & 505 MMJ centers
Local Jurisdiction Response to RMJ Legalization in Colorado

- 58 of 272 cities allow RMJ (& vote to repeal failed in Pueblo)
- 23 of 64 counties allow RMJ (ditto for Pueblo County)
- RMJ is still illegal in 251 jurisdictions (~75%)
MJ Regulations Are Still Evolving

• State regulations continue to be modified, enhanced
• MJ lab testing, reference library
• Labeling requirements for edibles, other MJ products
• Limits on edible dosage and serving size
• Registration of MMJ caregivers
• Possible potency limits
WHAT WILL MY COMMUNITY LOOK LIKE?
Design of Marijuana Operations Can Influence Social Norms, Behaviors

Would you rather your marijuana retailer look like this?

Or like this?
Features of MJ outlets Can Be Regulated and Will Influence Social Norms
Number & Density of MJ Outlets Can be Regulated & Will Influence Social Norms
Number & Density of MJ Outlets Can be Regulated & Will Influence Social Norms
Regulation Can Mitigate MJ Odors
Smoking/Vaping Laws Play a Role

- In CO, it is illegal to use marijuana in public*
- Prohibiting smoking/vaping in public helps prevent surreptitious use

*Denver just passed a Social Pot initiative that will allow public spaces to seek permits to host BYO Marijuana activities for 21+ crowds
MJ Advertising & Promotion Will Influence Norms and Can be Regulated

Medical Marijuana ads in California
MJ Education Campaigns Also Become Part of the Local Environment & Can Influence Social Norms
HOW IS MJ DIFFERENT IN A LEGAL STATE?

“Not your parents’ pot”
THC Content Has Increased Everywhere

% THC in MJ Seized by Law Enforcement

Source: U. of Mississippi Potency Monitoring Project (MJ seized by law enforcement)
MJ Preparations in Colorado

• **Marijuana**
  - 18.7% avg. THC content; top shelf strains to 30%
  - Dried flowering tops and leaves of the plant

• **Hashish**
  - THC content 2%-20%
  - Dried and compressed resin secreted from plant

• **Hash oil**
  - THC content 15%-50%
  - Oil-based extract of hashish
  - Now often used in vaping
MJ Preparations in Legal States

• **Hash Oil Extracts**
  - THC content 50-75%+
  - THC extracted from MJ plant matter by butane, CO₂

• **Include Wax (or Earwax), Dab**
  - Like hash oil but with a waxy consistency

• **Include Shatter**
  - THC content up to 90%
  - Semi-transparent, yellow or amber, thin substance that “shatters” when a piece is broken off

Note: 30.9% of BVSD high schoolers using MJ in the past 30 days dabbed it
MJ Consumption in Legal States

- **Smoking**
  - Joints, bowls, bongs

- **Vaping**
  - I.e., e-cigarettes filled with hash oil, not liquid nicotine

- **Dabbing**
  - A dab of wax or shatter is placed on a heated surface, vaporizing the concentrate which is then inhaled
MJ Consumption in Legal States

• **Edibles, “infused” products**
  - Baked goods, candies, drinks, etc.

• **Tinctures**
  - Liquid concentrates
Edibles are Different!

Users expect effects experienced with inhaled THC, BUT . . .

• Onset of effects is delayed for edibles
• Effect of edibles is stronger than people realize
• Edibles create a longer high then expected
• THC with no CBD can cause extreme paranoia
• Edibles are attractive to naive users, tourists
THC Levels: Edibles vs. Smoked MJ

Approximate THC Whole Blood Concentrations after Smoked vs. Oral Administration

THC Levels in Whole Blood – Smoked vs. Oral

(Courtesy of Sarah Uhrfer, Chematox, Boulder CO)
MARIJUANA: Pricing and Revenues
### MJ Market in a Legal Environment*

*For Users 21+ in 2014*

<table>
<thead>
<tr>
<th>Type</th>
<th>1 Gram</th>
<th>1 Ounce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bud/Flower</td>
<td>$14.03</td>
<td>$264.14</td>
</tr>
<tr>
<td>Edibles</td>
<td>$24.99 (100 mg)</td>
<td>NA</td>
</tr>
<tr>
<td>Concentrates</td>
<td>$55.00</td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumer type</th>
<th>Demand (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLO resident</td>
<td>267,638</td>
</tr>
<tr>
<td>Visitors</td>
<td>19,621</td>
</tr>
<tr>
<td>Total</td>
<td>287,259</td>
</tr>
</tbody>
</table>

Out-of-state visitors represent about 44% of Denver metro area RMJ sales and 90% of RMJ sales in mountain communities.
2015 MJ Tax Revenues in Colorado: 0.5% of State Budget (Excludes city taxes)
ADULT USE IN COLORADO
Adult (26+) MJ Use (Past 30 days): Colorado vs. National Average

Source: NSDUH 2014
Frequency of Use: Current Adult MJ Users in CO

Source: Colo. Dept. of Public Safety & BRFSS; Influential Factors in Healthy Living Survey 2014
USE BY 18-25 YEAR OLDS
Average Past Month MJ Use Age 18 to 25

Source: SAMHSA.gov, NSDUH, 2006-2014
### Reported Number of Times College Students Used Marijuana: National ACHA/NCHA 2015 data

<table>
<thead>
<tr>
<th>Never used</th>
<th>61.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used, but not in last 30 days</td>
<td>22.1</td>
</tr>
<tr>
<td>Used 1-9 days in last 30 days</td>
<td>10.9</td>
</tr>
<tr>
<td>Used 10-29 days in last 30 days</td>
<td>3.8</td>
</tr>
<tr>
<td>Used all 30 days</td>
<td>2.2</td>
</tr>
<tr>
<td>Any use within last 30 days</td>
<td>16.9</td>
</tr>
<tr>
<td>Any use within last 30 days (CO 18-25)</td>
<td>31.2</td>
</tr>
</tbody>
</table>

Note that use by college-aged students in CO is double that of college students nationally.
USE BY ADOLESCENTS IN CO
Past Month MJ Use by State: Age 12-17

Source: RMHIDTA and SAMHSA.gov, NSDUH 2013/2014
Past Month MJ Use: Aged 12-17

Source: SAMHSA/NSDUH
CO High Schoolers: % Difference from 2013 to 2015 in Used at Least Once in Last 30 Days

-9.5%  -5.6%
-1.1%  -0.3%
19.0%  -0.3%
14.4%  -4.1%

9th grade  10th grade  11th grade  12th grade

Marijuana  Alcohol

http://www.chd.dphe.state.co.us/topics.aspx?q=Adolescent_Health_Data
BVSD High Schoolers: % Difference from 2013 to 2015 in Past Month Alc/Marijuana Use

WHAT ABOUT CRIME?
Drugged Driving

- Study: Fatal Car Crashes Involving Marijuana Use Tripled in the U.S. Between 1999 and 2010

- Alcohol contribution to fatal crashes held steady 1999-2010

- In CO, you are presumptively impaired at 5 ng/ml of THC

Source: Columbia University’s Mailman School of Public Health February 4, 2014
MJ & Driving: CO Metrics

- MJ as the impairing substance (alone or in combination) increased from 12% of all DUIs in 2014 to 15% in 2015 (CSP)

- Toxicology screening by one of the state’s largest labs demonstrates an increase in both the number of screens and the % positive screens (Sara Urfer, Chematox Laboratory):

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Screens</th>
<th>% positive for THC metabolites</th>
<th>% active THC 2ng/ml†</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>1514</td>
<td>52%</td>
<td>28%</td>
</tr>
<tr>
<td>2010</td>
<td>2809</td>
<td>58%</td>
<td>38%</td>
</tr>
<tr>
<td>2011</td>
<td>3987</td>
<td>59%</td>
<td>49%</td>
</tr>
<tr>
<td>2012</td>
<td>4263</td>
<td>57%</td>
<td>52%</td>
</tr>
<tr>
<td>2013</td>
<td>4333</td>
<td>58%</td>
<td>63%</td>
</tr>
<tr>
<td>2014</td>
<td>4371</td>
<td>65%</td>
<td>67%</td>
</tr>
</tbody>
</table>

†2 ng/ml THC represents probable recent use but not necessarily impairment
THC + ALCOHOL

• Both CNS Depressants

• Additive, possible synergistic effect
  ▪ Additive: $1 + 1 = 2$
  ▪ Synergistic: $1 + 1 = 5$

• Very low levels of both can cause major impairment
  ▪ 0.035 BAC (under the legal limit) + low doses of THC ≈ 0.09 – 0.14 BAC level of impairment (above the legal limit)

(Courtesy of Sarah Uhrfer, Chematox, Boulder CO)
JUST HOW SAFE IS IT TO USE MARIJUANA?
Dependence/Addiction
Lifetime Risk among Users

Common Addictive Substances

- Nicotine - 32%
- Heroin - 23%
- Cocaine - 17%
- Alcohol - 15%
- Stimulants - 11%
- Cannabis - 9%

Cannabis – 9%, but . . .

- 17% for those who initiate in adolescence
- More frequent cannabis use results in greater risk of dependence
  - 20%-30% among those who have used at least 5 times
  - 25%-50% among those who report near daily or daily use
Denver Metro Hospital Discharge Diagnoses: MJ Use Disorder

*2014 data extrapolated from Jan-Jun data
Health Concern: Accidental Ingestion

- MMJ in Colorado has looked like candy, baked goods, and soda pop or other beverages. (New regulations are helping, but won’t eliminate the problem.)

- This has resulted in multiple cases of accidental ingestion of marijuana by children, unsuspecting adults, and pets.
Unintentional & Intentional MJ Exposure by Age

Prior to Legalization of Medical Marijuana

Medical Marijuana Legalized

Medical Marijuana Commercialized

Retail Marijuana Legalized

https://drive.google.com/drive/folders/oBxqXhstkg2Dbfm5xDNd1dPX1pvWWM4TkFkVHZtcTdMYWVpcWh6WVRKUXZHTjfQXJOeXM
Additional Implications for Colleges & Universities
State vs. Federal Law

- MJ may be legal but the Drug Free Schools & Communities Act is still in effect
  - So universities still don’t allow it on campus
  - And most won’t accept MJ research $$

- MJ may be legal but MJ convictions can cause loss of Federal Student Financial Aid

- Even so, MJ is the 2nd most abused substance on campuses, after alcohol
Learning Outcomes

(DGB = Students from the Netherlands, Germany, and Belgium)

Summary of Effects on Learning

- THC suppresses the activity of the hippocampus in the brain below the level needed to trigger memory formation
  - So both recent and chronic MJ use affects memory and learning
- Marijuana intoxication interferes with memory for materials presented while intoxicated
  - Students who go to class high are not getting their money’s worth
- Adverse impact on learning and memory can last for days or weeks after acute effects wear off
  - Unclear if memory deficits may persist after months of abstinence
  - Daily marijuana use may result in suboptimal intellectual functioning all of the time
  - Regular/heavy users cannot stop MJ use 1-2 days before exams and expect to have normal memory
Other Impacts for Students

• Students 18-20 YOA may seek to get a MMJ card so that they can use MJ legally (& seek to live off campus so that they can use)

• Local law violations, including:
  • Use of marijuana by a Minor
  • Illegal public consumption, often by students who live on campus but consume nearby, including in their parked cars

• Loss of on campus student housing for violations

• Heightened scrutiny when traveling out of state: at airport, on highways (plates, stickers)
Impacts for Higher Ed Resources

• Student Conduct
  • Residence life & student conduct process

• Data
  • Different types of violation
    • Smoking, edibles, dabbing
    • Possessing, using, distributing
    • One violation vs. multiple violations

• Formal vs. informal (treat MJ and alcohol the same)
• Educational sanction
• Parent Notification (parents’ response)
Impacts for Higher Ed Resources

• Off campus & partnerships (CUPD, BPD, Off Campus Housing)

• Students of Concern
  • Interventions
    • MJ I & II (pros & cons)
    • BASICS/CASICS (evidence based)
Marijuana and CU Messaging

• NSW and videos/ “It’s your call”
• Halloween & Spring Break
• Poster Campaigns
MARIJUANA & ALCOHOL
IMPACT ON SLEEP

Crashing is not good sleep.

Both marijuana and alcohol hurt sleep.

Sleep encodes memory.

Memory is essential for learning.

NOT REALLY SLEEPING? NOT REALLY LEARNING.
Marijuana Edibles
Actually, most CU students do not use.

For people who do:

Know The Serving Size
Check the package. One serving might be smaller than you’d expect.

Wait
Edibles can take two hours or longer to take effect. Pace yourself.

Don't Mix
Edibles should not be mixed with alcohol or other controlled substances.

Keep Out of Reach
Keep away from children, pets, or anyone under 21, and store in original packaging.

Wait 8 hours
Before trying to drive, skateboard, ski, rock climb, boat, or swim.

Start slow to avoid a weird, bad time.
Prevention/Intervention Challenges: “It’s Just Pot!”

- Increase in user base, as well as frequency of use
- Perception of harm ranges from less dangerous than alcohol to entirely benign to beneficial (MMJ)
- Increased peer approval, or at least less disapproval
- Decreased parental disapproval, partly due to lack of understanding of attributes of today’s marijuana
- Access has not diminished
- Fewer obviously negative outcomes (cf. alcohol poisoning)
- Marijuana industry acceptance, promotion/marketing
Prevention/Intervention Recommendations

• Harm reduction: “Later and Less”
  ▪ Later initiation of use
  ▪ Lower amount and frequency
  ▪ Potency of various formulations

• Targeted Risk Education for Those Most at Risk
  ▪ Early, frequent, heavy users
  ▪ Those with or a family history of certain psychiatric conditions

• General Risk Education
  ▪ Driving
  ▪ Learning & neuro-psychological impairment
  ▪ Addiction
MARIJUANA & MENTAL HEALTH IMPACTS
CO MJ & Mental Health Hospital Data

Prevalence of MJ Codes with 1° Diagnosis of Mental Illness

- Mental Illness but no MJ-associated codes
- Mental Illness & MJ-associated codes

Source: https://drive.google.com/folderview?id=0BxqXhstk92DbfjRWQlV1SkVFRGFuZHhvdnBiWTIteDBZXzZ3T0ktRXkxZUIoeEFOZWdYR2c&usp=sharing#
Average Toxicology of Suicides Among Adolescents Ages 10 to 19 Years Old

<table>
<thead>
<tr>
<th>Substance Type</th>
<th>2012-2014</th>
<th>2006-2008</th>
<th>2009-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marijuana</td>
<td>13.13%</td>
<td>13.53%</td>
<td>13.75%</td>
</tr>
<tr>
<td>Alcohol</td>
<td>7.69%</td>
<td>12.03%</td>
<td>16.03%</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>4.49%</td>
<td>3.76%</td>
<td>1.88%</td>
</tr>
<tr>
<td>Cocaine</td>
<td>2.26%</td>
<td>2.26%</td>
<td>1.92%</td>
</tr>
<tr>
<td>Opioid</td>
<td>7.05%</td>
<td>4.38%</td>
<td>4.38%</td>
</tr>
<tr>
<td>Antidepressant</td>
<td>3.76%</td>
<td>3.13%</td>
<td>5.13%</td>
</tr>
</tbody>
</table>

*Results Unavailable
Psychosis Defined

Psychosis – Loss of touch with reality, including:

• Hallucinations
• Delusions
• Paranoia
• Catatonia
• Thought disorders

Psychosis may be seen with:

• Schizophrenia
• Bipolar disorder
• Depression
• Various medical conditions
• Other psychiatric conditions
• Independent of other conditions
MJ Use and Bipolar Disorder

• New research suggests MJ causes manic symptoms in those with bipolar disorder

• MJ use is associated with a 3-fold increase in the risk for the new onset of manic symptoms

• MJ use may worsen the severity and/or duration of manic phases for people with bipolar disorder

• This underscores the importance of discouraging MJ use among those with bipolar disorder

Marwaha, Cannabis use and mania symptoms: A systemic review and meta-analysis, Journal of Affective Disorders, September 24, 2014
Marijuana and Schizophrenia

• **MJ use is associated with an increased risk of developing schizophrenia**
  - To a degree consistent with a causal relationship
  - One study: 13% of schizophrenia cases could be averted if marijuana use was prevented

• **Risk factors include:**
  - Genetic predisposition to schizophrenia/psychosis (e.g., for one gene variant the risk of developing is 7x higher if use MJ)
  - Early marijuana use, especially before age 15
  - Frequent, heavy, and/or high-THC marijuana use

• **MJ use worsens positive symptoms of schizophrenia, including hallucinations & delusions**
# U.K. Study Findings

<table>
<thead>
<tr>
<th>MJ Use Pattern</th>
<th>Likelihood of Psychotic Disorder (vs. non users)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Began use &lt; 15 yoa</td>
<td>1.5 times more likely</td>
</tr>
<tr>
<td>Daily MJ user</td>
<td>3 times more likely</td>
</tr>
<tr>
<td>High-THC MJ* use: weekends</td>
<td>3 times more likely</td>
</tr>
<tr>
<td>High-THC MJ* use: daily</td>
<td>5 times more likely</td>
</tr>
</tbody>
</table>

**Assuming causation:**
- 19.3% of psychotic disorders attributable to daily MJ use
- 24.0% of psychotic disorders attributable to high-THC MJ use

*High-THC Marijuana: mean of 16.2% THC; median of 15.0% THC*
Adolescent MJ Use & Increase in Risk of Psychosis

Association between Adolescent Cannabis Use and Schizophreniform Disorder Based on COMT Genotype

http://iv.iiarjournals.org/content/29/1/129.short
Marijuana and Other Mental Illness

• Regular, and in particular, heavy (quantity or potency or both) cannabis use may be linked to:
  • depression, mood swings
  • suicidal thoughts/suicide attempts
  • anxiety disorder/panic attacks
  • paranoia
  • aggressive behavior
THE BOTTOM LINE?
The Bottom Line:

- The sky has not fallen
- Good regulation goes a long way
- Monitor data and anecdotal reports for trends; respond quickly
- Dedicate resources to prevention, treatment, and other social costs
- Social costs remain unknown
Questions?
Resources

- [http://www2.cde.state.co.us/artemis/hemonos/he1282m332015internet/he1282m332015internet01.pdf](http://www2.cde.state.co.us/artemis/hemonos/he1282m332015internet/he1282m332015internet01.pdf) (CO Dept. of Public Health Report)
- [https://drive.google.com/folderview?id=0BxqXhstk92DbfjRWQlV1SkVFRGFuZHhvdnBiWTIteDBZX2Z3T0ktRXkxZUIoeEFOZWdYR2c&usp=sharing#](https://drive.google.com/folderview?id=0BxqXhstk92DbfjRWQlV1SkVFRGFuZHhvdnBiWTIteDBZX2Z3T0ktRXkxZUIoeEFOZWdYR2c&usp=sharing#) (Colorado Hospital Association Data)
- [https://drive.google.com/drive/folders/0BxqXhstk92Dbfm5xMDdNd1dPX1pvWWIM4TkFkVHZtcTdMYWVpcWh6WVRKUXZHTjlfOXJOeXM](https://drive.google.com/drive/folders/0BxqXhstk92Dbfm5xMDdNd1dPX1pvWWIM4TkFkVHZtcTdMYWVpcWh6WVRKUXZHTjlfOXJOeXM) (Rocky Mountain Poison and Control Center Data)