Cannabis legalization and driving under the influence

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Introduction to Driving Under the Influence of Cannabis (DUIC)
Learning objectives

- Introduce DUIC policies
- Introduce National Cannabis Climate Survey
- Define the relationship between cannabis legalization, legal provisions, and driving high
- Define the relationship between cannabis legalization, legal provisions, and perceived safety of driving high
Existing literature on legalization and traffic safety

- Conflicting data from driving simulation research (Hartman et al., 2015; Hartman & Huestis, 2013; Ogourtsova et al., 2018)
  - Realistic?

- Conflicting data from research on cannabis exposure and crashes (Asbridge et al., 2012; Compton & Berning, 2015; Hartman & Huestis, 2013; Li et al., 2012, Rogeberg et al., 2019)
  - Covariates and statistical modeling

- Conflicting literature on legalization and population-level traffic safety outcomes (Berning & Smither, 2015; Davis et al., 2016; Highway Loss Data Institute, 2017; Santaella-Tenorio, 2017)
  - Data sources
The challenge of quantifying DUIC

- THC positive ≠ impaired
- No common definition of impairment
- Inaccurate and inconsistent testing
- Varying policies and consequences across states
More on testing

- Testing methods vary in accuracy and measurement of cannabis metabolites

- Blood: one of the more accurate methods but invasive with critical period for testing (~2 hours) (Bosker et al., 2012; Wood et al., 2016)

- Field sobriety tests and experts: useful but subjective? (Porath-Waller & Beirness, 2014; Desrosiers et al., 2012)

- Testing methods constantly evolving
Introduction to DUIC policies
Two main types of DUIC laws

- Per se
  - Driver considered impaired if a certain amount or more of cannabis detected
  - Has varied from state to state and over time
  - No agreed upon level: 1ng/mL, 2ng/mL, 5ng/mL

- Zero tolerance
  - Driver considered impaired if any level of cannabis detected
Consequences of driving under the influence of cannabis

- Fines
- Jail time
- Searches
  - Disparities
Introduction to the National Cannabis Climate Survey
THE POT THICKENS

Marijuana remains illegal under federal law, but a growing number of states are decriminalizing it. Voters in Colorado are divided.

- **MEDICAL USE LEGALIZED**
- **RECREATIONAL AND MEDICAL USE LEGALIZED**
- **MEDICAL USE ON NOVEMBER BALLOT**
- **NO LEGISLATION**
- **MEDICAL USE LEGALIZED, RECREATIONAL USE ON NOVEMBER BALLOT**

* Expected to be on the ballot. There’s also a possibility in Michigan, but it’s unclear whether it will be able to qualify for the ballot.

Source: Marijuana Policy Project

Huddleston, 2016
Methods: Sample

- Data collected August 2016 – June 2017
- Quotas for medical, recreational, and neither states
- Address-based sample (ABS) and social media sample
- 18 years of age or older
- $2 prepaid mail incentive or $5 gift card for social media
- 6,604 adults
- 2,230 current (30-day) cannabis users
Methods: Sample (continued)

- Social media samples are prone to fraud
- We used a number of fraud prevention, detection, and elimination procedures to clean our data
  - IP addresses
  - Referral source
  - Required state and zip code
  - Flagged cases with inconsistent answers
  - Eliminated cases with similar e-mail addresses
  - Checked for speeding and straight-lining
  - Incorporated attention checks
Methods: Variables

- **Outcomes**
  - Driving a car within 3 hours of getting high at least once in the past 30 days
  - Perceived safety of driving “a little high on marijuana”

- **Exposure variables**
  - Cannabis legalization
  - Specific provisions of legalization
  - Covariates
  - Cannabis-impaired driving laws
Legalization and policies

- Legalization: recreational, medical, neither
- Policies related to driving
  - Cannabis-impaired driving laws: per se, zero tolerance, or neither
Provisions of legalization

- One method of accounting for heterogeneity in medical laws
- Provisions we analyzed
  - Qualifying conditions include non-specific pain
    - Affects ease of access (Masten & Guenzburger, 2014)
  - Dispensaries
    - Linked to traffic fatalities (Santaella-Tenorio et al., 2016)
  - Home cultivation
    - Measure of ease of access (Masten & Guenzburger, 2014)
    - Associated with higher edible use (Borodovsky & Budney, 2017)
  - Voluntary patient registry
    - Affects likelihood of being tested/cited for DUIC (Larkin, 2015)
Covariates

- Age
- Gender
- Race/ethnicity
- Education
- Employment status
- Mental health
- Political philosophy
Methods: Analysis

- Chi-square and ANOVAs for bivariate analyses
- Logistic regression
- Age, sex, education level, political affiliation, and Internet access used to calibrate the sample to the U.S. population and to calibrate the ABS and social media samples to each other
- Covariates included if p < 0.10
Results: Sample characteristics
<table>
<thead>
<tr>
<th></th>
<th>HS or less</th>
<th>Some college</th>
<th>College degree +</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational</td>
<td>24.0</td>
<td>41.4</td>
<td>34.6</td>
</tr>
<tr>
<td>Medical</td>
<td>34.1</td>
<td>38.2</td>
<td>27.7</td>
</tr>
<tr>
<td>Neither</td>
<td>34.2</td>
<td>42.8</td>
<td>23.0</td>
</tr>
</tbody>
</table>

HS = high school
NH = non-Hispanic
Overall demographics

- Male 49.40%
- Female 50.60%

Age distribution:
- 18-34: 25%
- 35-54: 30%
- 55+: 45%

Employment status:
- Employed: 55%
- Unemployed: 5%
- Student: 10%
- Homemaker: 5%
- Retired: 15%
- Disabled: 5%
Results: Legalization, legal provisions, and DUIC
Results: Prevalence of driving high

Driving within 3 hours of getting high

<table>
<thead>
<tr>
<th>Legalization of marijuana</th>
<th>% in past 30 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational</td>
<td>18.7</td>
</tr>
<tr>
<td>Medical</td>
<td>17.3</td>
</tr>
<tr>
<td>Neither</td>
<td>26.9</td>
</tr>
</tbody>
</table>
Results: Odds of driving high

- **Legalization**
  - Recreational: OR = 0.80 (95%CI: 0.39 - 1.63)
  - Medical: OR = 0.46 (95%CI: 0.25 - 0.86)

- **Legal provisions**
  - Home cultivation: OR = 2.04 (95%CI: 0.89 - 4.72)

- **Not in model (p > 0.10)**
  - Non-specific pain
  - Voluntary patient registry
  - dispensaries
  - Zero tolerance and per se laws
Results: Odds of driving high by legalization

<table>
<thead>
<tr>
<th></th>
<th>Recreational</th>
<th>Medical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.63</td>
<td>0.80</td>
<td>0.39</td>
</tr>
<tr>
<td>0.86</td>
<td>0.46</td>
<td>0.25</td>
</tr>
</tbody>
</table>
Results: Legalization, legal provisions, and perceived safety of driving high
Results: Prevalence of reporting safe to drive high

![Bar chart showing agreement on safe to drive high by marijuana legalization status]

- Recreational: 15.7%
- Medical: 16.9%
- Neither: 31.3%

2019 North American Cannabis Summit
Results: Odds of reporting safe to drive high by legalization

![Bar chart showing odds ratios for recreational and medical marijuana use.]

- Recreational
  - 1.19
  - 0.77
  - 0.50

- Medical
  - 0.90
  - 0.59
  - 0.39
Results: Odds of reporting safe to drive high

- **Legalization**
  - Recreational: OR = 0.77 (95% CI: 0.50 - 1.19)
  - Medical: OR = 0.59 (95% CI: 0.39 - 0.90)

- **Legal provisions**
  - Home cultivation: OR = 1.55 (95% CI: 0.91 - 2.63)

- **Not in model (p > 0.10)**
  - Non-specific pain
  - Voluntary patient registry
  - Dispensaries
  - Zero tolerance and per se laws
Discussion

- Medical marijuana states versus no legal marijuana
  - Fewer participants in medical states reported driving high
  - Perceived safety of driving high lower in medical states

- Recreational marijuana versus no legal marijuana
  - No significant difference in driving high
  - No significant difference in perceived safety of driving high
Limitations

- Social media sample
- Sampling → generalizability
- Self-reported driving high
- Too soon after legalization?
Conclusions

- No proof that legalization is encouraging driving high
- Potential role of educational campaigns
- Specific provisions are important in addition to legal status
Limitations

- Social media sample
- Sampling → generalizability
- Self-reported DUIC
- Too soon after legalization?
Implications

- Legalization is likely to affect people’s behaviors and perceptions
- Future analyses can test the relationship between DUIC educational campaigns and behaviors and perceptions
- Home cultivation may influence DUIC above and beyond legalization
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