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LEGALIZATION OF MARIJUANA: Implications on Traffic Safety

Presented by

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What is Marijuana?

- Marijuana is the term for the dried flowers and leaves of the *Cannabis sativa* plant
- **Cannabinoids** in marijuana are mind-altering chemicals
- **Marijuana** – herbal cannabis
- **Hashish** – cannabis resin
- **Cannabis** is a *psychoactive drug*, not a CNS stimulant nor a depressive
- Psychoactive ingredient in marijuana is: delta-9-tetrahydrocannabinol (*THC*)
How is Marijuana Consumed?

- Smoked (joint, pipe, bong)
- Eaten (brownies, cookies, cakes)
- Drank (Green Dragon: alcohol infused with THC; tea)
- Patch (in mouth above gum line)
- Pills (THC)
How is Testing for Marijuana Use Accomplished?

- **Blood** - THC stays in blood for a few hours; measured in nanograms per milliliter [ng/ml]
- **Urine** – THC metabolites stay in urine for days
- **Saliva** – detects most immediate smoking of marijuana
- **Hair** – can detect marijuana use 3-4 months after
- **Breath?** – Working on it
Background

- U.S. States Colorado, Washington, Alaska, Oregon, California, Maine, Massachusetts, Nevada & Vermont have legalized the commercial production, distribution and possession of marijuana for non-medical purposes for adults aged 21 and older.

- Marijuana is legal for recreational use in DC, but not for production, distribution or selling.
29 U.S. states plus DC have legalized the use of marijuana for medical purposes.

U.S. Congressmen have introduced bills that would change Federal laws that now prohibit marijuana use.

19 states and DC have decriminalized possession of small amounts of marijuana.
# Marijuana Laws in the US

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Slightly over half of U.S. adults believe recreational marijuana should be legalized.

Close to 22 million Americans use marijuana (self-report).

In 2014, 6.5% of 8th graders, 16.6% of 10th graders and 21.2% of 12th graders used marijuana in the past 30 days.
Background in U.S.

- Marijuana is most widely used illegal drug in the U.S. (current estimated 18-22 million users)
- 9%-13% of nighttime drivers on U.S. roads have marijuana (THC) in their systems
- 23% of drivers killed in crashes tested for drugs have marijuana (THC) in their blood
Signs of Marijuana Use

- Bloodshot eyes
- Increased heart rate
- Sleepiness
- Poor coordination
- Delayed reaction time
- Increased appetite
What Are the Effects of Marijuana on Driving?

- Some driving skills impaired (e.g., tracking, lane maintenance)
- Heavy marijuana use may increase the risk of being in a serious crash

[Sources: Sewell (2012), Yale University, Review of Literature; Li (2011), Meta-Analysis, Columbia University]
THC Not Like Alcohol

- Concentration of THC in the blood rises very rapidly after smoking marijuana and peaks in the blood after about 20-30 minutes. Then the concentration drops rapidly.
- However, the subjective “high” and measured impairment remain for 1-2 hours.
- So THC measured in the blood had no relationship to impairment.
Percent of Drivers on the Road with Positive BAC Levels (BAC ≥ .01) (Weekend Evenings)

Source: National Roadside Surveys
Percentage of Weekend Nighttime Drivers with BACs $\geq 0.08$ g/dL* in the Five National Roadside Surveys

*During the period from 1973 through 1996, the States had BAC limits that ranged from 0.08 to 0.15 g/dL.
Percentage of Drivers on U.S. Roads in 2007 and 2013-14 with Drugs Other than Alcohol (Oral Fluid and Blood)

- Drug Positive, 2007: 16.3%
- Drug Positive, 2013-14: 20.0%
- Marijuana (THC), 2007: 8.6%
- Marijuana (THC), 2013-14: 12.6%
Percentage of Drivers on U.S. Roads in 2007 with Drugs Other than Alcohol (Oral Fluid and Blood)

- Illegal Drugs: 11.3%
- Medications: 3.9%
- Illegal + Medications: 1.1%
Percentage of Drivers on U.S. Roads in 2007 with Drugs Other than Alcohol (Oral Fluid and Blood)

- Drug Positive: 16.3%
- Marijuana Only: 6.9%
- Stimulants: 3.3%
- Norcotics/Andgesic: 1.6%
- Antidepressants: 0.7%
- Sedative: 0.8%
Background in U.S.

- **15%** of drivers on U.S. roads with illegal BACs ($\geq 0.08 \text{ g/dL}$) also have *marijuana* in their systems.
- **14%** of drivers on U.S. roads with low BACs (.01-.07) also have *marijuana* in their systems.
- **25-30%** of nighttime drivers on U.S. roads with illegal BACs were also using other drugs.
Background in U.S.

- **48%** of fatally injured drivers not wearing seat belts at the time of the crash had **BACs \( \geq 0.08 \)**
- **24%** of fatally injured drivers not wearing seat belts at the time of the crash had **marijuana** in their systems
47% of fatally injured drivers who were speeding at the time of the crash had **BACs > 0.08**

27% of fatally injured drivers who were speeding at the time of the crash had **marijuana** in their systems
Drug Crash Risk Study

A case-control study was conducted to assess the crash risk presented by:

- Drug-positive drivers
- Alcohol plus drug-positive drivers
- Alcohol-positive drivers

Data were collected on drivers in crashes and compared to non-crash drivers on the same road/same time one week later.

Completed in Virginia Beach, VA, USA

ALCOHOL and THC

- The **odds of being in a crash** for drivers with THC (marijuana) in their systems is **1.05** (adjusted for age & gender) compared to drivers with no THC.

- The odds of being in a crash for a driver with a **BAC = 0.05** is **2.07** (adjusted for age & gender) compared to drivers with a **BAC = 0.00**.

- The odds of being in a crash for drivers with a **BAC = 0.08** is **3.93** (adjusted for age & gender) compared to drivers with a **BAC = 0.00**.

- The odds of being in a crash for drivers with a **BAC = 0.15** is **12.18** (adjusted for age & gender) compared to drivers with a **BAC = 0.00**.

Source: NHTSA, Compton & Berning (2015), DOT HS 812-117
## Relative Risk* of Being Involved in a Fatal Crash by BAC

<table>
<thead>
<tr>
<th>Driver Age</th>
<th>BAC 0.05 - 0.079</th>
<th>BAC 0.08 - 0.099</th>
<th>BAC &gt; 0.15</th>
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<tr>
<td>16-20</td>
<td>6.24</td>
<td>12.61</td>
<td>490.41</td>
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<tr>
<td>21-34</td>
<td>4.78</td>
<td>8.74</td>
<td>200.03</td>
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<tr>
<td>35+</td>
<td>4.03</td>
<td>6.89</td>
<td>111.94</td>
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*Risk relative to BAC=0.00 for same age group

- Relative risks are the same for men and women at a given BAC. Relative risk for 16-20 year old women are now the same as 16-20 year old men at a given BAC (a change from 1996).

[Source: Voas, Torres, Romano, Lacey, JSAD, (2012)]
US and Canada Driver Fatalities

- 2016 US Fatality Analysis Reporting System (FARS) showed that 22% of fatally injured drivers had THC in their blood.

- 2014 Canadian data from TIRF showed that 18.6% of fatally injured drivers tested positive for THC.
Ongoing Case-Control Study

- **Cases**: drivers injured in crashes taken to trauma centers in Jacksonville, FL, Miami, FL and Charlotte, NC; drivers killed in crashes taken to medical examiner in same three cities.
- **Controls**: drivers on same roads, same time of day, same day of week one week later.
- **Blood Samples**: tested for alcohol and other drugs.
- **2500 injured/fatally injured** drivers compared to **5,000 control drivers** on roads one week later.
What Are the Implications for Traffic Safety?

- Marijuana **impairs some** driving skills:
  - Tracking
  - Unexpected events difficult to handle
- Combination of alcohol and THC **exacerbates** impairment effects
- Acute cannabis (THC) consumption can **increase the risk of a crash** involving serious injury or death according to some studies
- But the risk of being killed in a single vehicle crash at .02-.04 BACs is **3 to 4 times** that of a sober driver
How Can We Limit Marijuana Impaired Driving Where it is Legal?

Establish a **State (or Provincial) Monopoly:**

- Control the **price (via tax)** and, therefore, the consumption of marijuana
- Limit or ban marijuana **advertising**
- Limit marijuana **outlet** locations and density
- Control the % **THC** in marijuana
How Can We Limit Marijuana Impaired Driving in Legal States?

- Enforce the minimum legal purchase age (MLPA) [21 in the US].
- Enforce drugged driving using roadside saliva testing.
- Establish a standardized field sobriety test (SFST) for THC.
- Establish a DUID Visual Detection Guide similar to the NHTSA guide for alcohol
What Happened in U.S. States Where Marijuana was Legalized?

- Price per ounce **decreased** (~50%)
- Marijuana use and initiation **increased**
- 10% decline in price was associated with a **5% increase** in use
- About **20%** of marijuana users consumed about **80%** of the marijuana
- Some experts thought that legalization **would** lead to a **reduction** in heavy drinking (some would drink less when using marijuana). No evidence yet.
What Happened in Colorado Where Marijuana was Legalized in 2013?

In 2018:

- Population of Colorado is 5,680,000
- 491 retail marijuana stores
- 1613 liquor stores
- 392 Starbucks and 208 McDonalds restaurants
- 107,534 Medical Marijuana Registry ID Cards
- Medical Marijuana ID Cards: 65% are male and 49% are between the ages of 21 and 30
What Happened in Colorado Where Marijuana was Legalized in 2013?

Average Number of Marijuana-Present Fatalities (drivers tested positive for THC);

- 2006-2008 (pre-commercialization of medical marijuana): 34
- 2009-2012 (post-commercialization of medical marijuana): 53
- 2013-2016 (post-legalization of recreational marijuana): 88
What If U.S. States That Legalize Establish a Monopoly? (None did)

- State would control the production, distribution, and sale of marijuana
- **Amount of THC** in marijuana would be regulated
- Marijuana **outlet density** would be regulated as would advertising
- Sales in bars and restaurants would be prohibited
- Significant excise **tax** would be established (~$50/ounce)
What If U.S. States That Legalize Establish a Monopoly? (None did)

- Minimum Legal Purchase Age (MLPA) of 21 would be enforced.
- States would seek to find a price of marijuana high enough to **limit sales** yet low enough to **discourage black market** production.
- Education (and warnings) about drugged driving laws and enforcement could be at the **place of sale**.
How Many Arrests Are Made for Drugged Driving For Every Drugged Driver Involved in a Fatal Crash in the US?

- Unknown
- Most U.S. States cannot differentiate an arrest or conviction for DWI on whether it was alcohol or other drugs (same statute)
- There is no evidence yet that drugged driving per se laws have been effective.
The enforcement of drugged driving is currently an *adjunct* to alcohol-impaired driving enforcement.

- Because drivers with BACs greater than .08 are generally **not tested** for other *drugs*, we do not know how many drugged drivers are currently being arrested.
Nearly all research studies have found that the relationship of a BAC for alcohol to crash risk is much greater than most other drugs.

Alcohol is the most frequently used drug by U.S. drivers (60%-70% report drinking alcohol in the past year)
Police resources for DWI enforcement are limited.

Enforcing per se drug laws may detract from enforcing alcohol-impaired driving.
Current Drugged Driving Enforcement in the US

Is drugged driving enforcement cost effective?

- It could be--- if portable roadside oral fluid tests for presence can be administered for reasonable costs

- And if low BAC, but obviously impaired drivers can be tested for drugs without high refusal rates or high costs
Current Drugged Driving Enforcement in the US

Is drugged driving enforcement cost effective?

- Keep in mind that an estimated 25-30% of U.S. drivers arrested for DWI-alcohol also have other drugs on board.

- So a large number of drugged drivers are already naturally being taken off the roads.
Minimum Legal Purchase Age

The nine states that legalized recreational marijuana have adopted only four MLPA laws:

- Illegal to purchase if underage
- Illegal to posses
- Illegal to consume
- Illegal to furnish to underage
Minimum Legal Purchase Age

Based upon the effectiveness of MLDA-21 concerning alcohol in the U.S.:

- Use marijuana, lose driver’s license (90 days)
- No amount (zero tolerance) of THC in system if driving
- Age of seller should also be 21
- Fake ID Retailer Support: ID scanners, distinctive drivers’ licenses, confiscate fake IDs
Minimum Legal Purchase Age

Based upon the effectiveness of MLDA-21 in the U.S.:

- **Dram Shop liability**: can sue marijuana seller if underage purchases marijuana and then injures or kills someone in a traffic crash.

- **Social Host liability**: can sue provider of marijuana if underage user crashes and injures or kills someone.
Research that is Needed

- Demonstrate the feasibility of collecting oral fluid from drivers stopped by police at night for various traffic violations
- Determine the incidence of alcohol and other drugs in 100 drivers who were stopped for traffic violations
- Determine what incentives are needed to gain cooperation from 75%-90% of drivers at the traffic stops [$20? $30? $40? $50?]
Ultimate Goals

- Determine magnitude of drugged driving problem in drivers stopped for traffic violations: Is it high enough to justify roadside oral screening tests by police?
- Develop a Visual Detection Guide of DUID Motorists similar to the NHTSA Guide for DWI.
- Increase the detection of DUID by police conducting traffic enforcement.
Most Traffic Enforcement Officers Use The NHTSA Guide

**DWI DETECTION GUIDE**

*Weaving plus any other cue: p = at least .65*

*Any two cues: p = at least .50*

**PROBLEMS MAINTAINING PROPER LANE POSITION**
- Weaving
- Weaving across lane lines
- Straddling a lane line
- Swerving
- Turning with a wide radius
- Drifting
- Almost striking a vehicle or other object

**SPEED AND BRAKING PROBLEMS**
- Stopping problems (too far, too short, or too jerky)
- Accelerating or decelerating for no apparent reason
- Varying speed
- Slow speed (10+ mph under limit)

**VIGILANCE PROBLEMS**
- Driving in opposing lanes or wrong way on one-way
- Slow response to traffic signals
- Slow or failure to respond to officer’s signals
- Stopping in lane for no apparent reason
- Driving without headlights at night
- Failure to signal or signal inconsistent with action

**JUDGMENT PROBLEMS**
- Following too closely
- Improper or unsafe lane change
- Illegal or improper turn (too fast, jerky, sharp, etc.)
- Driving on other than the designated roadway
- Stopping inappropriately in response to officer
- Inappropriate or unusual behavior (throwing, arguing, etc.)
- Appearing to be impaired

**POST STOP CUES**

- Difficulty with motor vehicle controls
- Difficulty exiting the vehicle
- Fumbling with driver’s license or registration
- Repeating questions or comments
- Swaying, unsteady, or balance problems
- Leaning on the vehicle or other object
- Slurred speech
- Slow to respond to officer (officer must repeat)
- Provides incorrect information, changes answers
- Odor of alcoholic beverage from the driver

* p ≥ .50 when combined with any other cue:
  - Driving without headlights at night
  - Failure to signal or signal inconsistent with action

The probability of detecting DWI by random traffic enforcement stops at night has been found to be about three percent (.03).
NHTSA DWI Detection Guide

Probability Driver BAC ≥ 0.08

Weaving plus any other cue: \( p = \text{at least } 0.65 \)
Any two cues: \( p = \text{at least } 0.50 \)

- **Problems Maintaining Proper Lane Position**
  \( p = 0.50 - 0.75 \)
  - Weaving, Weaving across lane lines, Straddling a lane line, Swerving, Turning with a wide radius, Drifting, Almost striking a vehicle or other object.

- **Speed and Braking Problems**
  \( p = 0.45 - 0.70 \)
  - Stopping problems (too far, too short, or too jerky), Accelerating or decelerating for no apparent reason, Varying speed, Slow speed (10+ mph under limit)
Eligible Drivers for this New Study

- Stopped and given a warning
- Stopped and given a traffic citation (e.g. speeding, seat belt, etc.)
- Stopped and arrested for driving while intoxicated (DWI), driving under the influence (DUI) or some other crime (e.g. driving while suspended)

Excluded:

- Drivers involved in crashes
City of Winter Park Police Department have agreed to participate.

Trained Research Assistant (RA) will ride along with a traffic enforcement officer on Thursday-Saturday evenings from 10 PM to 3 AM.

When the officer has finished the traffic stop he/she will indicate to the driver that there is a person conducting research who would like to speak to the driver.
Pilot Procedures

- RA approaches driver, explains study, offers $20 for a brief survey and an oral sample.
- RA assures confidentiality and anonymity
- If driver refuses, RA offers $30, then $40 and finally $50 for cooperation.
- If driver still refuses, RA returns to patrol car
- If driver agrees, RA administers QuantisaTM collection device and a 20 question survey while waiting for oral sample
Pilot Procedures

- If driver is arrested and taken to a holding facility, RA will not approach driver until all processing is completed.
- Pilot will continue for 3-5 months until 100 drivers have participated.
- Oral samples will be sent to a testing laboratory (Immunalysis Corporation has agreed) for analysis.
Drug Classes and Categories To Be Reported

- Results will be consolidated into:
  - **Drug Classes** (defined by potential drug effects):
    - Stimulants
    - Sedatives
    - Antidepressants
  - **Drug Categories**:
    - Illegal
    - Prescription
    - Over-The-Counter
    - Marijuana
    - Narcotic Analgesics
    - Other
Benefits of Pilot Study

- Pilot will lead to a larger study of 2,000 drivers at traffic stops in 4 regions of the country
- We will learn more about drug presence in traffic enforcement offenders
- Could lead the way to justifying that patrol officers use roadside rapid drug detection screening devices
- Use of drug detection devices could deter drugged driving
Roadside Oral Fluid Testing

DUID DETECTION  www.duid-detect.com

“Cops need a breathalyzer-like technology that works to identify drug-impaired drivers on the spot”
-Senator Charles Schumer

DUID DETECTION

THE ROADSIDE IMPAIRMENT DRUG TEST FOR D.U.I.D.

MARIJUANA (THC) 40 NG/ML
METHAMPHETAMINE 50 NG/ML
AMPHETAMINE 50 NG/ML
COCAINE 20 NG/ML
PHENCYCLIDINE (PCP) 10 NG/ML
OPIATES 40 NG/ML
INCLUDES HEROIN AS 6-AM,
MORPHINE, CODEINE,
HYDROCODONE (VICODIN,
LORTAB), HYDROMORPHONE
(DILAUDID) AND OXYCODONE
(OXYCONTIN, PERCODAN)

FDA 510K CLEARED
Hand-Held Ion Mobility Spectrometers (IMS)
Ion Mobility Spectrometers
Field Prototype

• Detects *vapor-phase* chemicals
  • Flash-vaporized THC from breath

• Low ng level of material are able to be detected, including THC

• Onboard computer or tethered to laptop
New Research

Develop an SFST for Marijuana Impairment

- Dose 100 subjects in a laboratory with placebo, low % THC, high % THC, low % THC plus alcohol in a double-blind experiment.
- Conduct six tests on each subject under each condition: e.g. finger-to-nose; one-leg-stand; free-recall test; go/no-go test; tracking-task; eye-pupil-reaction test.
- Determine relationship of performance on the tests with THC presence in the system
Current Situation in the US

- Enforcement of alcohol impaired driving laws is constrained by increasing demands on officers to deal with competing problems (e.g. distracted driving, drugged driving, terrorism, calls for service).

- Increased enforcement of drugged driving laws threatens to divert effort from alcohol enforcement.
Current Enforcement Dilemma in the US

- Maintain current DWI-alcohol arrest procedures where 25% also have drugs.
- Conduct more oral fluid testing at the roadside to detect drugged drivers.
- Develop a DUID Detection Guide indicating traffic violations with a high probability of drug involvement.
- Train officers to use Guide.
Summary and Conclusions

- We need to continue to monitor Colorado, Washington, Alaska, Oregon, California, Maine, Massachusetts, Nevada & Vermont and the legalization in Canada very closely.

- We need to balance our limited enforcement resources between alcohol-DWI and drug-DWI enforcement.

- States need to establish separate statutes for alcohol-DWI and drug-DWI and more severe sanctions for the combination of alcohol and other drug-DWI.
References


References


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