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4th International Conference on Transportation Information and Safety

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LEGALIZATION OF MARIJUANA: Lessons Learned from the United States

What Are the Implications for Traffic Safety?

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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
Background

- U.S. States Colorado, Washington, Alaska, Oregon, California, Maine, Massachusetts, Nevada 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.
Background

- 29 U.S. states plus DC have legalized the use of marijuana for medical purposes.
- Two U.S. Congressmen have introduced a bill that would change Federal laws that now prohibit marijuana use.
- 19 states and DC have decriminalized possession of small amounts of marijuana.
Background

- Slightly over half of U.S. adults believe recreational marijuana should be legalized.
- Close to 20 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 17-20 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
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]
Percent of Drivers on the Road with Positive BAC Levels (BAC ≥ .01) (Weekend Evenings)

Source: National Roadside Surveys

- 1973: 36% (1 out of 3)
- 1986: 26% (1 out of 4)
- 1996: 17% (1 out of 6)
- 2007: 12% (1 out of 8)
- 2013-14: 8% (1 out of 12)
Percentage of Weekend Nighttime Drivers with BACs ≥ 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%
- Norcocics/Andgesic: 1.6%
- Antidepressants: 0.7%
- Sedative: 0.8%
Background in U.S.

- 15% of drivers on U.S. roads with illegal BACs (> .08 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 $\geq 0.08$

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 = .05 is **2.07** (adjusted for age & gender) compared to drivers with a BAC = .00.

- The odds of being in a crash for drivers with a BAC = .08 is **3.93** (adjusted for age & gender) compared to drivers with a BAC = .00.

- The odds of being in a crash for drivers with a BAC = .15 is **12.18** (adjusted for age & gender) compared to drivers with a BAC = .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>
</tr>
</thead>
<tbody>
<tr>
<td>16-20</td>
<td>6.24</td>
<td>12.61</td>
<td>490.41</td>
</tr>
<tr>
<td>21-34</td>
<td>4.78</td>
<td>8.74</td>
<td>200.03</td>
</tr>
<tr>
<td>35+</td>
<td>4.03</td>
<td>6.89</td>
<td>111.94</td>
</tr>
</tbody>
</table>

*Risk relative to BAC=.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)]
Relative Risk of Being Killed as a Driver in a Single Vehicle Crash

(RELATIVE RISK BY AGE)

<table>
<thead>
<tr>
<th>BAC</th>
<th>16 - 20</th>
<th>21 - 34</th>
<th>35+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Both Male/Female</td>
<td>Both Male/Female</td>
<td>Both Male/Female</td>
</tr>
<tr>
<td>.10+</td>
<td>15 - 68</td>
<td>14 - 38</td>
<td>15 - 29</td>
</tr>
<tr>
<td>.08</td>
<td>7 - 21 times</td>
<td>7 - 14 times</td>
<td>7 - 11 times</td>
</tr>
<tr>
<td>.06</td>
<td>3 - 5 times</td>
<td>3 - 4 times</td>
<td>3 - 4 times</td>
</tr>
<tr>
<td>.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.02</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>.00</td>
<td></td>
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</tr>
</tbody>
</table>

Source: Voas, Torres, Romano, Lacey (2012)
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 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.
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 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
What Are Some of The Risks of Using Marijuana?

- 9% who use marijuana eventually become clinically dependent upon marijuana at some point in their lives (compared to 15% who use alcohol and 16% who use cocaine)
- Marijuana accounted for more than 350,000 drug treatment admissions in the U.S. in a recent year (2% of the 17,000,000 users)
- No known fatal dose of marijuana, but there have been deaths from mental and behavioral disorders due to the use of cannabinoids
What Are Some of The Risks of Using Marijuana?

- 375,000 emergency room visits in the U.S. which recorded marijuana as a factor
- Marijuana smoke contains known carcinogens that could cause cancer with long-term heavy use
- Clear correlation between marijuana use and poor performance in school, but not sure if causal.
How Many Arrests Are Made for Drugged Driving For Every Drugged Driver Involved in a Fatal Crash?

- 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.
Per Se Drugged-Driving Laws

- **Classical Per Se Laws**
  - Make it an offense to be in charge of a vehicle with a specified impairing concentration of a substance in the blood (3 States)

- **Zero Per Se Laws**
  - Make it an offense to be in charge of a vehicle with any measureable amount of a substance in the blood (12 States)

- **No Drug Per Se Laws in Canada**
  - Behavioral evidence of impairment is needed
Basis for Zero Per Se Laws

If a drug is illegal, drivers should not be using it.

Impairment levels cannot be established for drugs:

- Low correlation between body fluid level and behavior
- Tolerance much more significant for drugs

Establishing impairment levels for drug/alcohol and drug/drug combinations is impractical
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)
Current Drugged Driving Enforcement

- Police resources for DWI enforcement are limited.

- Enforcing per se drug laws may detract from enforcing alcohol-impaired driving.
Is drugged driving enforcement cost effective?

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

- And **Zero Tolerance** Drug Per Se Laws are established (easier to enforce)

- And if low BAC, but obviously impaired drivers can be **tested for drugs** without high refusal rates or high costs
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 eight 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
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.
Summary and Conclusions

- We need to monitor Colorado, Washington, Alaska, Oregon, California, Maine, Massachusetts and Nevada 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


References


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