



**9th Annual (Edmonton) International
Conference on Urban Traffic Safety**

&

**4th International Conference on
Transportation Information and
Safety**

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LEGALIZATION OF MARIJUANA: Lessons Learned from the United States

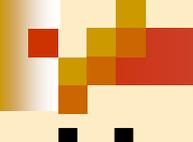
What Are the Implications for
Traffic Safety?

James C. Fell

National Opinion Research Center

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.

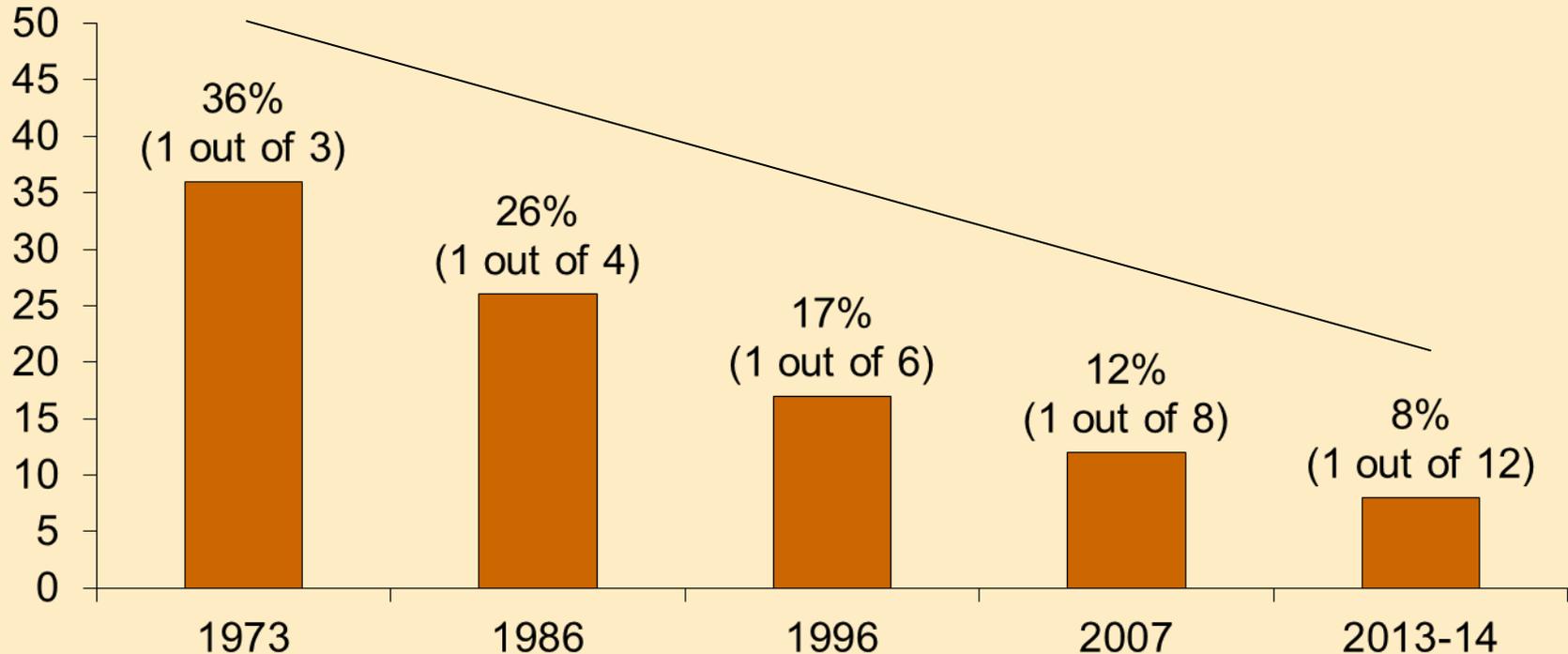
- Marijuana is most widely used illegal drug in the U.S. (current estimated **17-20 million users**)
- **9%-13%** of nighttime drivers on U.S. roads have marijuana (THC) in their systems
- **23%** of drivers killed in crashes tested for drugs have marijuana (THC) in their blood

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

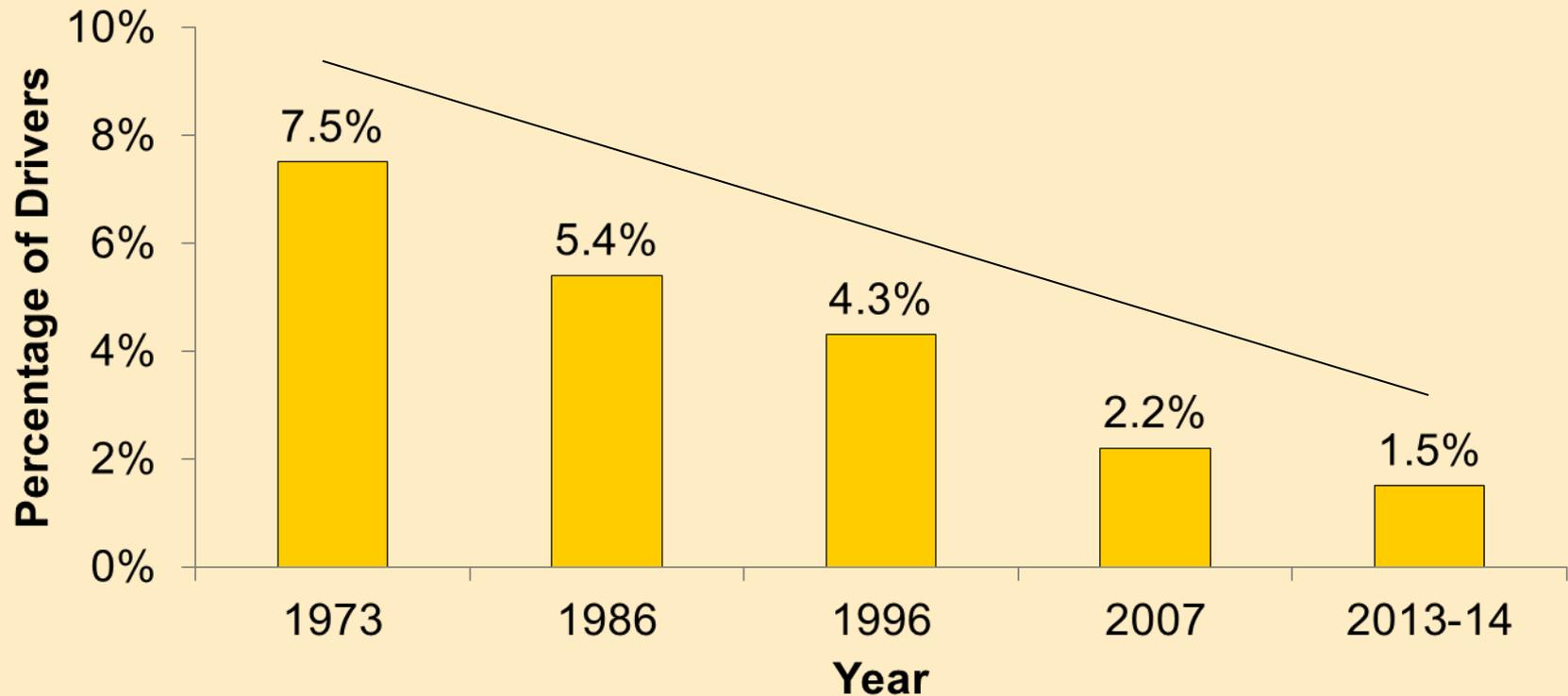
[Sources: Sewell (2012), Yale University, Review of Literature; Li (2011), Meta-Analysis, Columbia University]

Percent of Drivers on the Road with Positive BAC Levels (BAC \geq .01) (Weekend Evenings)



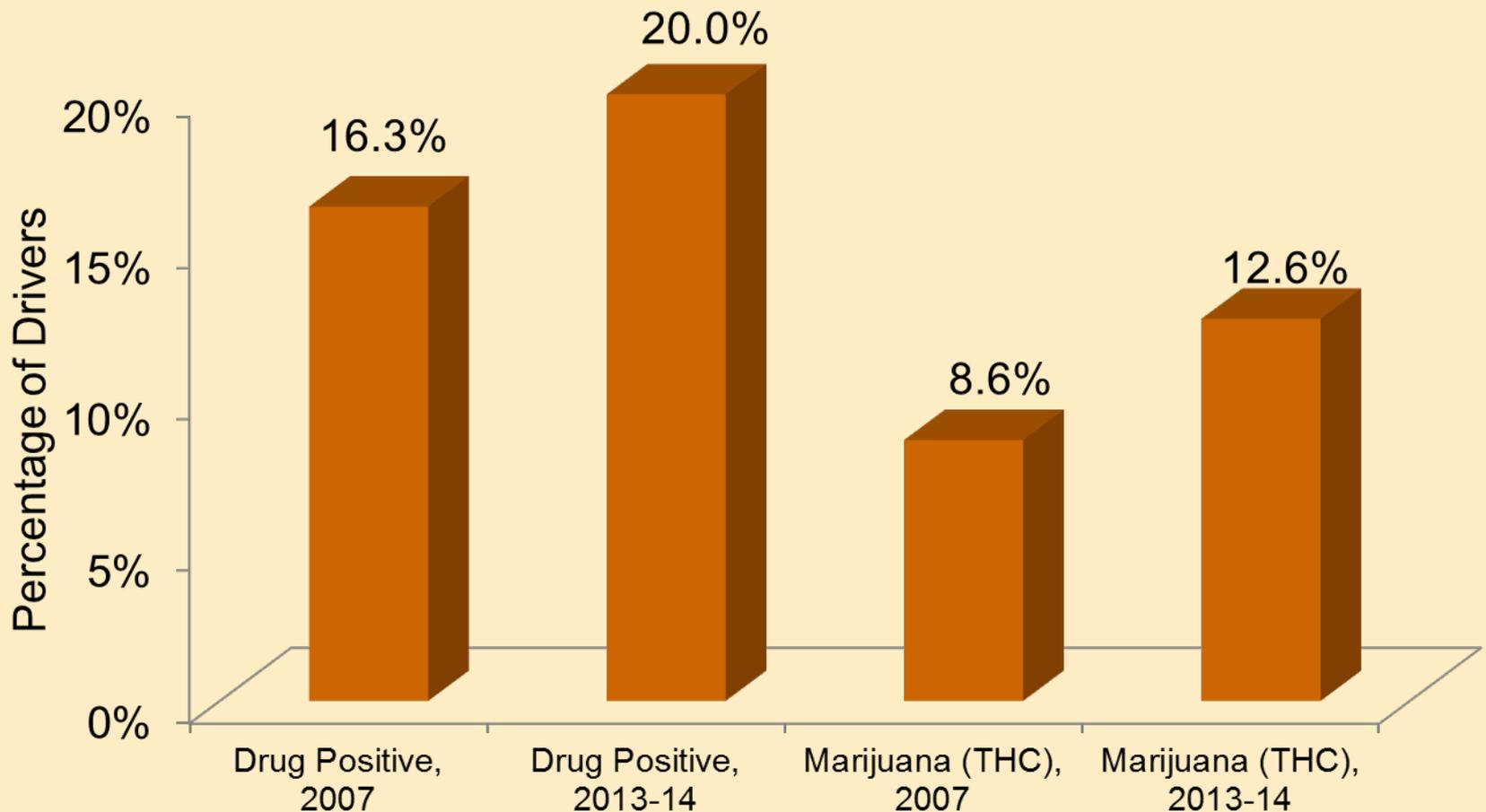
Source: National Roadside Surveys

Percentage of Weekend Nighttime Drivers with BACs ≥ 0.08 g/dL* in the Five National Roadside Surveys

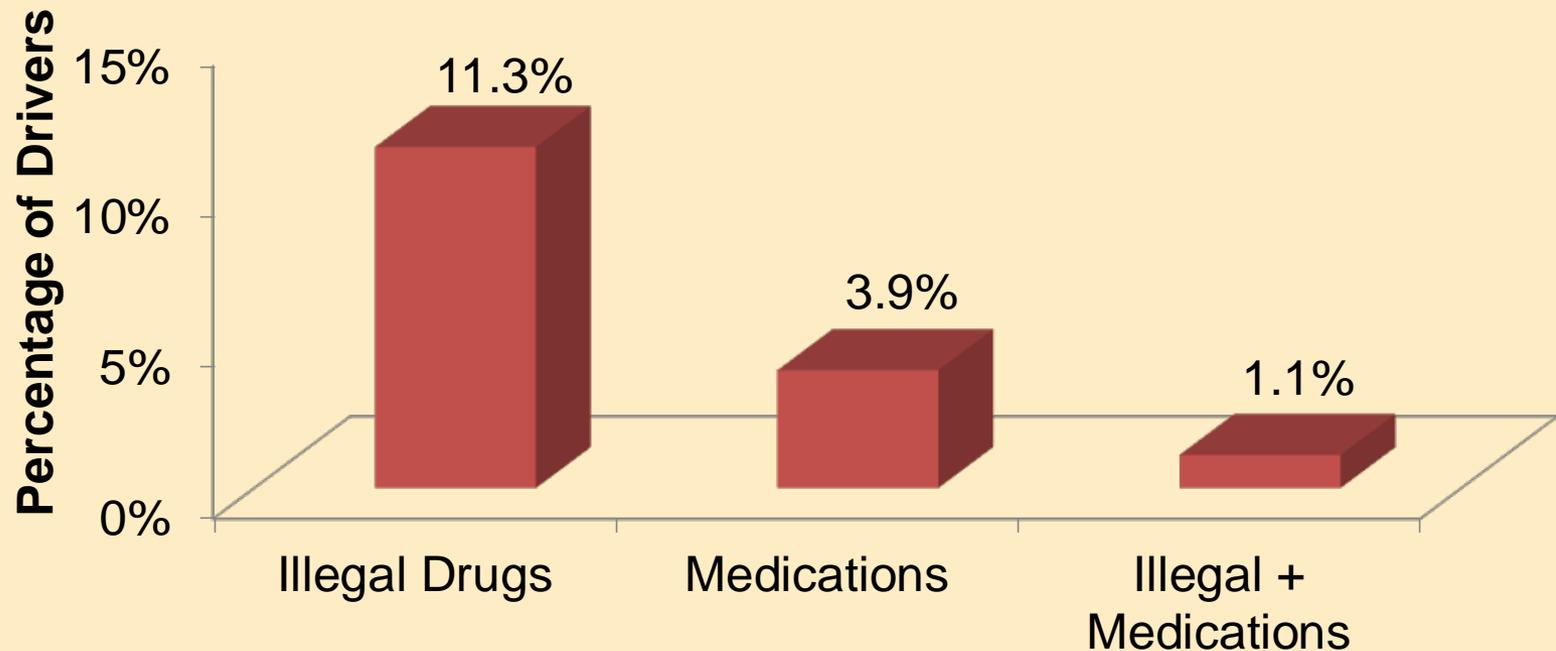


*During the period from 1973 through 1996, the States had BAC limits that ranged from 0.08 to 0.15 g/dL

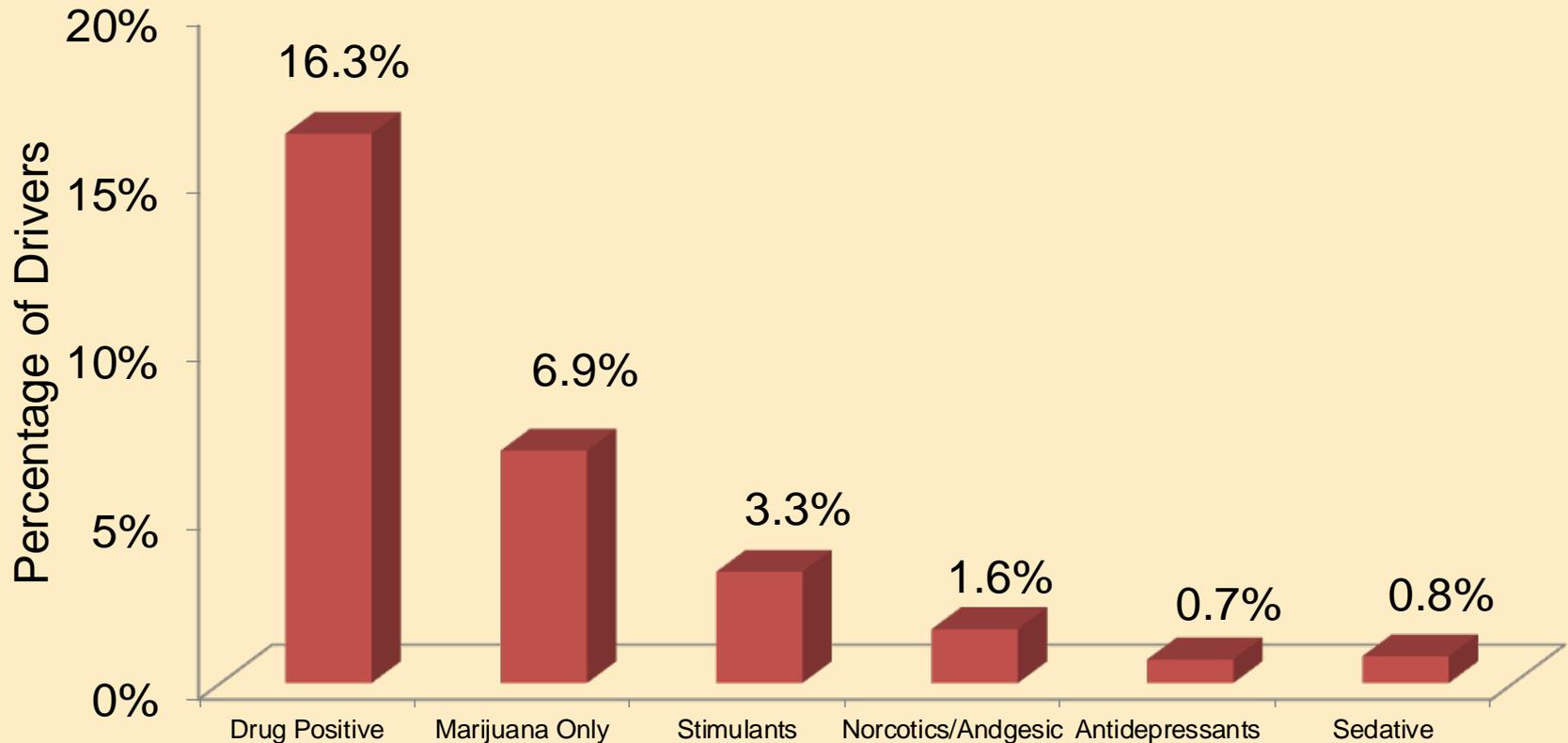
Percentage of Drivers on U.S. Roads in 2007 and 2013-14 with Drugs Other than Alcohol (Oral Fluid and Blood)



Percentage of Drivers on U.S. Roads in 2007 with Drugs Other than Alcohol (Oral Fluid and Blood)



Percentage of Drivers on U.S. Roads in 2007 with Drugs Other than Alcohol (Oral Fluid and Blood)





Background in U.S.

- **15%** of drivers on U.S. roads with illegal BACs ($\geq .08$ 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 .08**
- **24%** of fatally injured drivers not wearing seat belts at the time of the crash had **marijuana** in their systems



Background in U.S.

- **47%** of fatally injured drivers who were speeding at the time of the crash had **BACs \geq .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

Source: NHTSA, Compton & Berning (2015). Drug and Alcohol Crash Risk, Research Note, DOT HS 812 117

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

<u>Driver Age</u>	<u>BAC</u>		
	<u>.05 - .079</u>	<u>.08 - .099</u>	<u>≥.15</u>
16-20	6.24	12.61	490.41
21-34	4.78	8.74	200.03
35+	4.03	6.89	111.94

*Risk relative to BAC=.00 for same age group

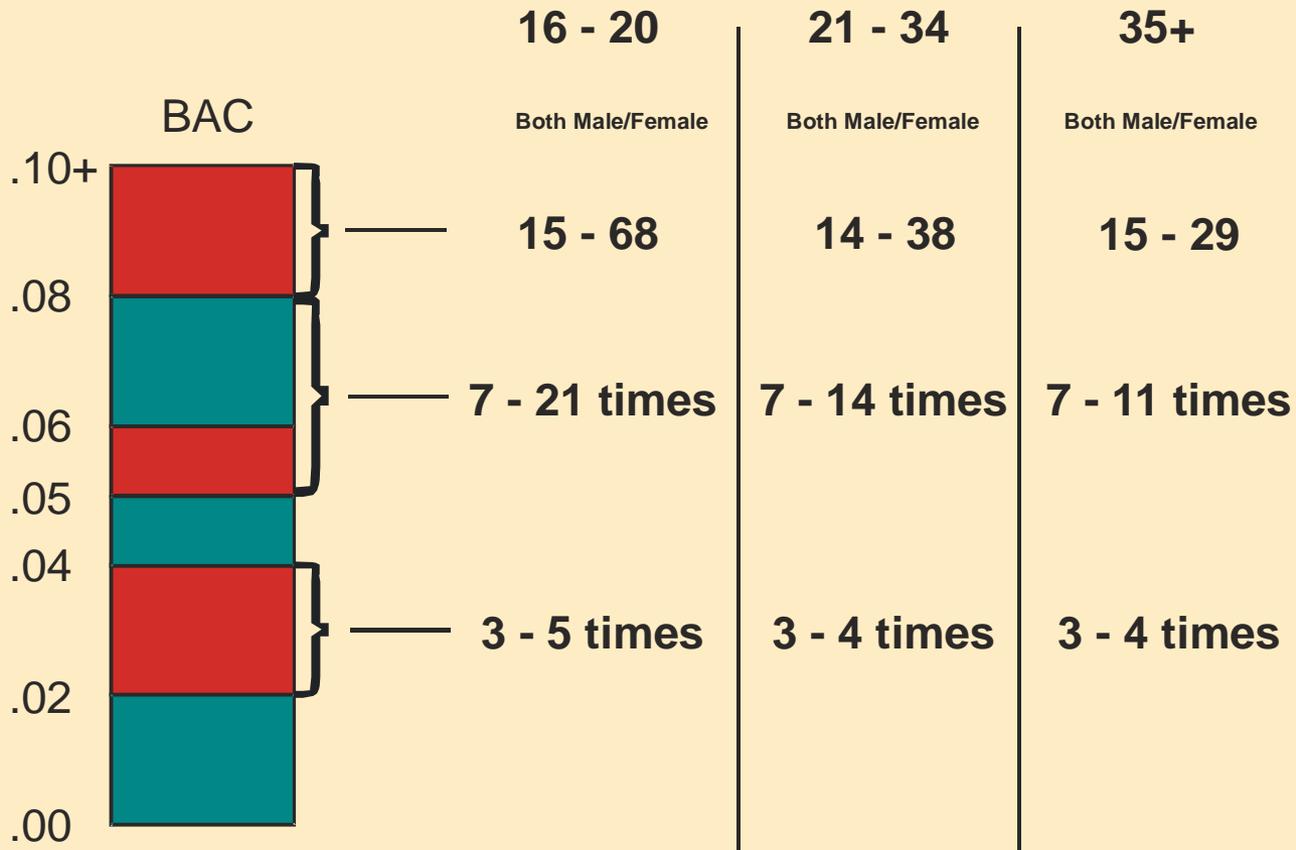
- Relative risks are the same for men and women at a given BAC. Relative risk for 16-20 year old women are now the same as 16-20 year old men at a given BAC (a change from 1996).

[Source: Voas, Torres, Romano, Lacey, JSAD, (2012)]

Relative Risk of **Being Killed as a Driver** in a Single Vehicle Crash

(Relative to BAC = .00)

RELATIVE RISK BY AGE



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 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



Current Drugged Driving Enforcement

*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.



Current Drugged Driving Enforcement

- 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.



Current Drugged Driving Enforcement

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



Current Drugged Driving Enforcement

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 possess
- 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.



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



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Contact Information

James C. Fell

Principal Research Scientist

National Opinion Research Center (NORC) at
the University of Chicago

Bethesda, Maryland 20814

Phone: 301-634-9576

E-mail: **fell@pire.org**