“In theory, there is no difference between theory and practice. But, in practice, there is.”

Remark overheard at a computer science conference

Education costs money, but then so does ignorance”

Clause Moser
“Cannabis Use and Car Crashes: Implications for Traumatic Injury”

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Chatham-Kent Public Health Unit
“Cannabis Use and Car Crashes: Evidence and Causation ”

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Chatham-Kent Public Health Unit
Does cannabis use compromise safe driving and contribute to motor vehicle crashes and major/minor injury?

How does that risk metric compare to alcohol? (Or to alcohol and cannabis combined?

To distracted driving while using a cell phone?

What is the associated evidence?

What are the implications for evolving public policy?

What has been learned in other jurisdictions with changing cannabis laws?
Where I work/What I do:

• Halifax NS
• Vancouver BC
• Last month, Vancouver Council voted to regulate and licence the almost 100 “medical marijuana” shops operating around the city.

• Aside from the curious fact that the shops are ostensibly operating in violation of the federal Controlled Drugs and Substances Act, the city announced its intention to charge each shop an annual $30,000 licensing fee. The federal government immediately condemned the decision, stating that the shops are operating illegally and demanding that the federal criminal law be enforced.

• Then, as now, scant attention has been paid to the research, which one would have thought ought to play a pivotal role in determining drug policy and regulation.
Emergency Department Video: Downstream Tertiary Prevention
Life + Death at VGH ER

You Are About To Enter The Emergency Room

This website contains graphic content that some viewers may find disturbing.

EXPLORE. WATCH. SHARE. ENGAGE. DEBATE

http://er.knowledge.ca/
“Life and Death in the ER”
What’s New in Trauma Care? Why is Trauma Care Important?
CANNABIS LEGALIZATION
Is this a Trip We Want to Take?

Robin Room and Benedikt Fischer et al
2010
Oxford University Press
Why marijuana is a concern

Marijuana is the most commonly used illicit drug in Canada, with 10.6% of Canadians reporting past-year use in 2012.

Canadian youth had the highest rate of past-year marijuana use in 2009–2010 (28%), compared to students in other developed countries.

A growing body of research suggests that marijuana use — particularly chronic use — can negatively affect mental and physical health, brain function (memory, attention and thinking) and driving performance.

Marijuana can also negatively affect the development and behaviour of children born to women who used the drug during pregnancy.
Why marijuana not a concern

Because alcohol is a far bigger concern
Because you can’t overdose on marijuana
Because marijuana is safe compared to tobacco or alcohol
Marijuana is even safe in driving your car or bike because it makes you more careful and aware
Because everyone is using marijuana and moneys (law enforcement etc.) can be better spent elsewhere
Why marijuana not a concern

Five Golden Rules
(The best way to avoid the most trouble)

Don't smoke in a car. The smell of cannabis emanating from a car is the single most common way people get busted. In fact, it is safest to keep it in the trunk, out of sight in a odor-proof container, such as a glass jar or an oven roasting bag. Don't use car ashtrays to hold your roaches or pipes.
Comparison of acute lethal toxicity of commonly abused psychoactive substances.

• Aims To determine the acute lethal toxicity of a range of psychoactive substances in terms of the dose customarily used as a single substance for non-medical purposes.

• Cannabis had the “best” safety ratio

• Alcohol, heroin, cocaine had the worst

• Many other measures of “other drug comparison” and overall contribution to burden of disease...

Cannabis is and does:

• Cannabis plants produce a group of chemicals called cannabinoids, which produce mental and physical effects when consumed.

• “This includes euphoria, relaxation, alters perception, distorts time and intensifies sensory experience; short term memory, attention, motor skills, reaction time and skilled activities are impaired”

• Perfect for driving....NOT!

If you drive on drugs, you’re out of your mind.
Cannabis Hyperemesis Syndrome

- Cannabinoid Hyperemesis Syndrome is characterized by chronic cannabis use, cyclic episodes of nausea and vomiting, and frequent hot bathing.

- The hyperemetic phase usually ceases within 48 hours, and treatment involves supportive therapy with fluid resuscitation and anti-emetic medications.

- The syndrome was first described in 2004 by Allen and colleagues and is characterized by chronic cannabis use, cyclic episodes of nausea and vomiting, and the learned behavior of hot bathing.

Cannabinoid hyperemesis syndrome
Chelsey King, Andrew Holmes
Observational Studies of Cannabis and Car/Bike Crashes and Injury
Cannabis use and self-reported collisions in a representative sample of adult drivers.

• This study examines the relationships between collision involvement and several measures of cannabis use, including driving after using cannabis based on a population survey of Ontario adults in 2002 and 2003.

• RESULTS: We found that the odds of reporting collision involvement was significantly higher among cannabis users, and among those who reported driving after cannabis use. Some evidence for a dose-response relationship was seen as well.

Mann RE, Adlaf E, Zhao J, Stoduto G, Ialomiteanu A, Smart RG, Asbridge M.
Cannabis and traffic collision risk: findings from a case-crossover study of injured drivers presenting to emergency departments.

• OBJECTIVES: This study examined whether acute cannabis use leads to an increased collision risk.

• METHODS: Participants were 860 drivers presenting to emergency departments in Toronto and Halifax, Canada, with an injury from a traffic collision, between April 2009 and July 2011.

• Cannabis and other drug use were identified either through blood sample or self-report. A case-crossover design was employed with two control conditions: a fixed condition measuring substance use during last time driving, and whether the driver typically uses cannabis prior to driving.

• Collision risk was assessed through conditional fixed-effects logistic regression models.

Asbridge M, Mann R, Cusimano MD, Tallon JM, Pauley C, Rehm J
Cannabis and traffic collision risk: findings from a case-crossover study of injured drivers presenting to emergency departments.

• RESULTS: Regression results measuring exposure with blood and self-report data indicated that cannabis use alone was associated with a fourfold increased (OR 4.11; 95 % CI: 1.98-8.52) odds of a collision.

• CONCLUSIONS: Main findings confirmed that cannabis use increases collision risk and reinforces existing policy and educational efforts, in many high-income countries, aimed at reducing driving under the influence of cannabis.
Cycling-related crash risk and the role of cannabis and alcohol: a case-crossover study.

• OBJECTIVE: To examine whether alcohol and cannabis consumption increase crash risk among non-fatally injured bicyclists (N=393) seen in three Canadian emergency departments, between April 2009 and July 2011.

• CONCLUSION: Cannabis and alcohol use each appear to increase the risk of a non-fatal injury-related crash among bicyclists, and point to the need for improved efforts to deter substance use prior to cycling, with the help of regulation, increased education, and greater public awareness.

Asbridge M, Mann R, Cusimano MD, Tallon JM, Pauley C, Rehm J.
Acute cannabis consumption and motor vehicle collision risk: systematic review of observational studies and meta-analysis.

• OBJECTIVE: To determine whether the acute consumption of cannabis (cannabinoids) by drivers increases the risk of a motor vehicle collision.

• DESIGN: Systematic review of observational studies, with meta-analysis.

• DATA SOURCES: We did electronic searches in 19 databases, unrestricted by year or language of publication. We also did manual searches of reference lists, conducted a search for unpublished studies, and reviewed the personal libraries of the research team.

BMJ. 2012 Feb 9;344:e536.
Asbridge M, Hayden JA, Cartwright JL
Acute cannabis consumption and motor vehicle collision risk: systematic review of observational studies and meta-analysis.

• CONCLUSIONS: Acute cannabis consumption is associated with an increased risk of a motor vehicle crash, especially for fatal collisions. This information could be used as the basis for campaigns against drug impaired driving, developing regional or national policies to control acute drug use while driving, and raising public awareness.

• (odds ratio 1.92 (95% confidence interval 1.35 to 2.73); P=0.0003);

BMJ. 2012 Feb 9;344:e536.
Asbridge M, Hayden JA, Cartwright JL
Marijuana Use and Motor Vehicle Crashes

To assess the association between marijuana use and crash risk, the authors performed a meta-analysis of 9 epidemiologic studies published in English in the past 2 decades identified through a systematic search of bibliographic databases.

Pooled analysis based on the random-effects model yielded a summary odds ratio of 2.66 (95% confidence interval: 2.07, 3.41).

The results of this meta-analysis suggest that marijuana use by drivers is associated with a significantly increased risk of being involved in motor vehicle crashes.

Mu-Chen Li et al
CONCLUSIONS
The crash risk appears to increase progressively with the dose and frequency of marijuana use. The empiric evidence supporting the association between marijuana use and crash risk was derived from studies conducted in different countries and based on different research designs.

Given the ongoing epidemic of drug-impaired driving and the increased permissibility and accessibility of marijuana for medical use in the United States, it is urgent to better understand the role of marijuana in crash causation and outcomes.

Mu-Chen Li et al
**Risk of severe driver injury by driving with psychoactive substances**

- 6 country “DRUID” study; case-control methodology/design, European; N = > 18,000
- The highest risk of the driver being severely injured was associated with driving positive for high concentrations of alcohol (≥0.8 g/L), alone or in combination with other psychoactive substances.
- The least risky drug seemed to be cannabis and benzodiazepines and Z-drugs.
- Drivers positive for THC were estimated to be at elevated risk (1–3 times that of sober drivers), similar to drivers with BAC levels between .01 to < 0.05.
NHTSA Releases Two New Studies on Impaired Driving on U.S. Roads

The nation's decades-long campaign to combat drunk driving continues to make our roads safer, but use of marijuana and prescription drugs is increasingly prominent on the highways, creating new safety questions.
The case control crash risk study reported here is the first large-scale study in the United States to include drugs other than alcohol. It was designed to estimate the risk associated with alcohol- and drug-positive driving.

This case control study collected information from crash-involved and non-crash involved drivers for 20 months in Virginia Beach, Virginia.
Alcohol Findings
• The study found that alcohol use by drivers was clearly associated with elevated risk of crash involvement: Drivers who had been drinking at the .08 breath alcohol concentration (BrAC) had about 4 times the risk of crashing as sober drivers. (Note: The .08 BrAC and blood alcohol concentration [BAC] are the legal limit in every State.) Drivers with alcohol levels at .15 BrAC had 12 times the risk.

Drug Findings
• Drivers participating in the study were tested for a large number of potentially impairing drugs using both oral fluid (saliva) and blood samples.
• Marijuana (THC) was the only single category of drug for which study findings reached statistical significance. Drivers testing positive for THC were overrepresented in the crash-involved (case) population. However, when demographic factors (age and gender) and alcohol use were controlled, the study did not find an increase in population based crash risk associated with THC use.
Table 5
Adjusted Odds Ratios Between Drug Use and Crash Risk (Adjusted for Demographic Variables and Alcohol Use)

<table>
<thead>
<tr>
<th>Drug of Interest</th>
<th>Adjusted Odds Ratio</th>
<th>95% CI*</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>THC (Marijuana)</td>
<td>1.00</td>
<td>0.83 - 1.22</td>
<td>0.98</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>0.86</td>
<td>0.56 - 1.33</td>
<td>0.50</td>
</tr>
<tr>
<td>Narcotic Analgesics</td>
<td>1.17</td>
<td>0.87 - 1.56</td>
<td>0.30</td>
</tr>
<tr>
<td>Sedatives</td>
<td>1.19</td>
<td>0.86 - 1.64</td>
<td>0.29</td>
</tr>
<tr>
<td>Stimulants</td>
<td>0.92</td>
<td>0.70 - 1.19</td>
<td>0.51</td>
</tr>
<tr>
<td>Illegal Drugs</td>
<td>0.99</td>
<td>0.84 - 1.18</td>
<td>0.99</td>
</tr>
<tr>
<td>Legal Drugs</td>
<td>1.02</td>
<td>0.83 - 1.26</td>
<td>0.83</td>
</tr>
</tbody>
</table>

The risk of crash involvement for each category and class of drug is compared to the crash involvement rate for drug-negative drivers. An odds ratio of 1.00 means the crash involvement rate is the same. *(CI = Confidence Interval)*
NHTSA Virginia Beach Study

- Impact
- Implications
- Weakness
“The main problem in my opinion is the high refusal to participate rate. Over 20% of crash involved drivers refused to provide oral fluid samples.”

“They lumped all THC positive cases together. Low levels of THC (e.g. 1 ng/mL) might not increase crash risk. In fact very low THC levels might not even represent acute use. However, higher THC levels likely do increase the crash risk. It would be nice to know what happened to the crash risk at THC levels above 3 or 5 ng/mL. I am not sure why this wasn't reported. It may be that they did not have many drivers with higher THC levels.”
NHTSA Virginia Beach Study

• “They also include crashes of all severity levels. Only a third of crashes involved injuries. The association of MJ with crash risk seems higher in more severe crashes (e.g. Drummer, Laumon) than in minor crashes (e.g. Longo). Including minor crashes might "dilute" the effects of MJ on crash risk.”

• There are other major flaws.
  • -oral fluids
  • -no consistent measure of recent use
  • -crash drivers are only those detected by police. Drug impaired drivers might leave the crash scene prior to police involvement and thus bias the estimates down.
  • -only involves certain types of crashes, with varying severity.
NHTSA Virginia Beach Study

• “The NHTSA study has not been peer reviewed. I am surprised it is not out yet. It has flaws too (population used, the response rate, samples used). It was mostly around a military based community where zero tolerance for drugs exists (with serious consequences) so rates in cases and controls were extremely low. They didn't always measure recent use in samples.”

• “The study is pretty dismissive of other research, throwing it out as being incompetent without a good justification. They dismiss culpability studies without mention of why.”
Cannabinoid Concentrations Detected in Fatal Road Traffic Collision Victims Compared with a Population of Other Post Mortem Cases.

• BACKGROUND: Acute cannabis consumption nearly doubles the risk of motor vehicle collision resulting in injury or death. Limited data have been published regarding the concentrations of cannabinoids associated with fatal road traffic collisions (RTCs), and these have not previously been compared to a population of other post mortem cases.

• N = 214 cases in this study
Cannabinoid Concentrations Detected in Fatal Road Traffic Collision Victims Compared with a Population of Other Post Mortem Cases.

• RESULTS: The incidence of cannabinoids detected in non-RTC and RTC cases was similar (25% vs 21%, P = 0.44), but THC was detected more frequently (90% vs 59%, P = 0.01) and at significantly higher concentrations in the cannabinoid-positive RTC cases than the non-RTC cases (P = 0.01). The distribution of non-RTC and RTC cases over 4 categories of THC concentration was significantly different (P =0.004). N = 214 cases
Cannabinoid Concentrations Detected in Fatal Road Traffic Collision Victims Compared with a Population of Other Post Mortem Cases.

• CONCLUSIONS: These first data on the concentrations of cannabinoids in the post mortem blood of fatal RTC victims compared with a population of other routine coroners' cases highlight the importance of specifically measuring THC concentrations in the blood to aid interpretation of post mortem cases where cannabis may be implicated.
Conclusions: Cannabis and Crashes/Injury

• To be decided at panel discussion!
• My opinion: unsafe at any speed/concentration
Special Thanks to:

• Dr. Mark Asbridge, Associate Professor, Department of Community Health and Epidemiology, Dalhousie University, Halifax NS

• Dr. Jeff Brubacher, Department of Emergency Medicine, Vancouver University of British Columbia

• Dr. Roy Purcell, Department of Emergency Medicine, Vancouver University of British Columbia,
Our Vision:  Outstanding Care - No Exceptions!

Our Mission:  Deliver an outstanding care experience driven by a passionate commitment to excellence.
THANKS!

jtallon@dal.ca
FACT SHEET: National Roadside Survey of Alcohol and Drug Use by Drivers

• **Drinking and driving is falling**

• The proportion of drivers with measurable alcohol levels declined by about 30 percent from 2007 to 2014. This decline was seen across all alcohol levels. Since the first such survey in 1973, the prevalence of alcohol among drivers has declined by nearly 80 percent. In 2014, about 1.5 percent of weekend nighttime drivers had .08 or higher breath alcohol concentrations (BrACs). About 8.3 percent of drivers had some measurable alcohol in their systems.
FACT SHEET:
National Roadside Survey of Alcohol and Drug Use by Drivers

• **Drugged driving is rising**

• About 20.0 percent of drivers tested positive for at least one drug in 2014, up from 16.3 percent in 2007. Some 12.6 percent of drivers had evidence of marijuana use in their systems, up from 8.6 percent in 2007. More than 15 percent of drivers tested positive for at least one illegal drug, up from 12 percent in 2007.
Culpability Studies

• Abstract

• Scientific proof that drugs capable of impairing skills required for safe driving has only come relatively recently, although the proof for ethanol (alcohol) came almost 40 years earlier. Instrumental in obtaining this evidence has been the use of culpability studies. These have provided an epidemiological basis to demonstrate an increased risk for use of amphetamine-type stimulants, cocaine and for those drivers showing recent use of cannabis through the presence of THC greater 5 ng/mL in blood. Significant increases in risk (through odd’s ratio analysis) using this form of study has not been demonstrated for opiates. Benzodiazepines has provided consistent increases in risk in this form of analysis mainly because they are usually associated with other drugs (including alcohol). However, alcohol-drug and impairing drug-drug combinations generally show a very high culpability rate and are usually higher than one impairing drug alone. Culpability studies complement case control and other types of epidemiological evidence that links, or attempts to link, recent drug use with a vehicular crash.
Culpability analysis is still a valuable technique

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The February 2013 issue of the IJE included our study which used culpability analysis to examine the association of cellphone use with motor vehicle crashes.\textsuperscript{1} In a commentary in the same issue, Sanghavi stated that ‘culpability analysis won’t help us understand crash risk due to cellphones’.\textsuperscript{2} Sanghavi’s categorical rejection of culpability analysis is unfortunate and seems based on a misunderstanding of the method and perhaps aversion to the term ‘culpability’.