a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA
Faculty of Medicine

University of Victoria

let's talk science

DISCLOSURES

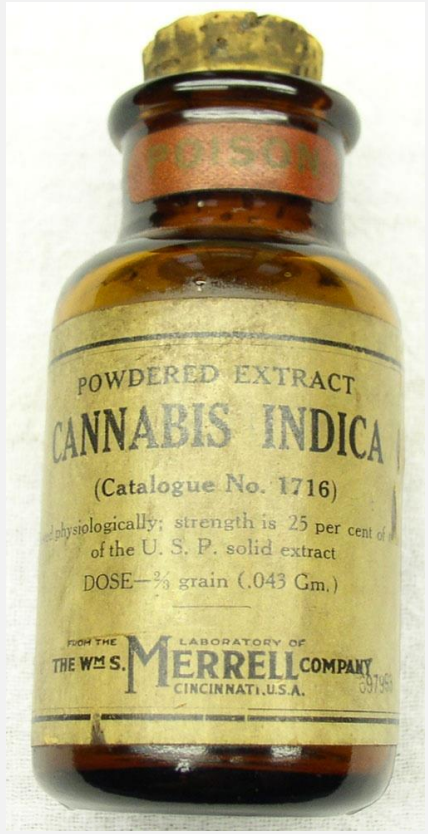
- We are medical students
- This session is not intended to give you a diagnosis or replace going to see a health care professional
- No medical marijuana will be given out after this talk

CLEARING THE HAZE ABOUT THIS TALK

- What is the science behind medical marijuana
- How to get and where to get medical marijuana
- Indications for medical marijuana
- CMA position
- Has society changed as a result of medicalization of marijuana

THE HISTORY

- Marijuana has been used for over 5000 years
- Cannabinoids isolated in 1960's
- Cannabinoid receptor discovered in 1980's
- Endocannabinoids discovered in 1990's



CHALLENGES WITH STUDYING CANNABIS

- Political climate
- Lack of pharma interest
- Formal RCTs of smoked cannabis are “limited”
- Public perception
- Most research has been done in animals
- Since 1960s THC increased from 1 - 5 % to 10-15%

WAYS OF CONSUMPTION

BIOAVAILABILITY (OF THC)

- Smoked - 10-25%, peaks in minutes
- Oral/Sublingual – 5-20%, peaks 1-3h later

ACTIVE INGREDIENTS

- ***tetrahydrocannabinol* (THC)**
- ***cannabidiol* (CBD)**
- Cannabavarin
- Cannabigerol
- Cannabichromene
- Delta-8-THC
- Cannabicyclol
- Cannabitiol
- + 70 other cannabinoids
- + terpenes
- + other bioactive compounds

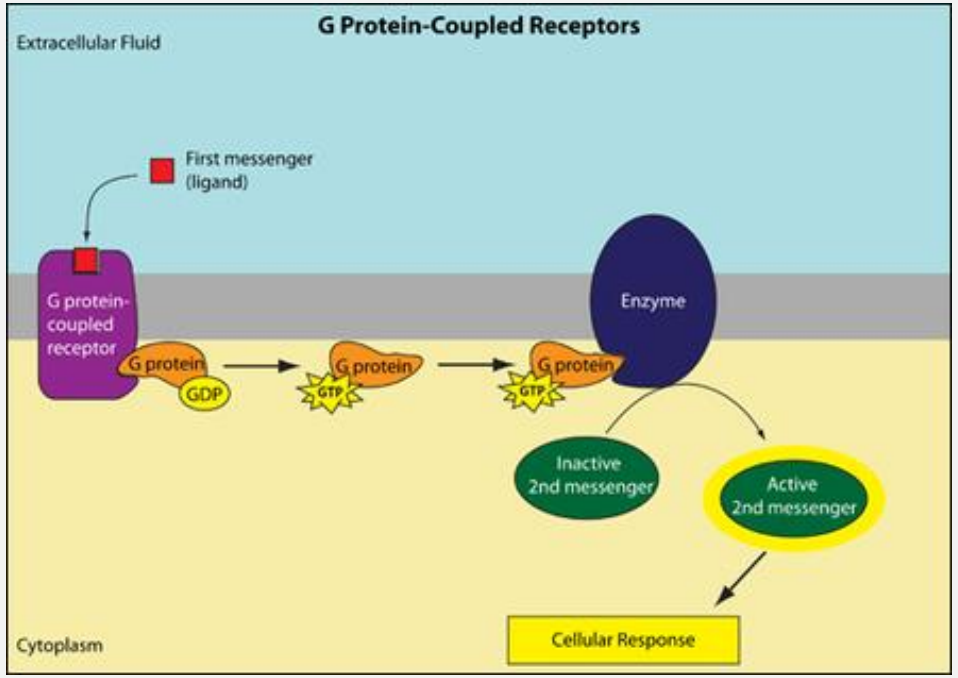
Cannabis sativa contains a higher ratio of Δ9-THC to CBD, producing more stimulating, psychotropic effects. *Cannabis indica* strains contains a higher ratio of CBD:Δ9-THC and are typically more sedating

THE BASICS

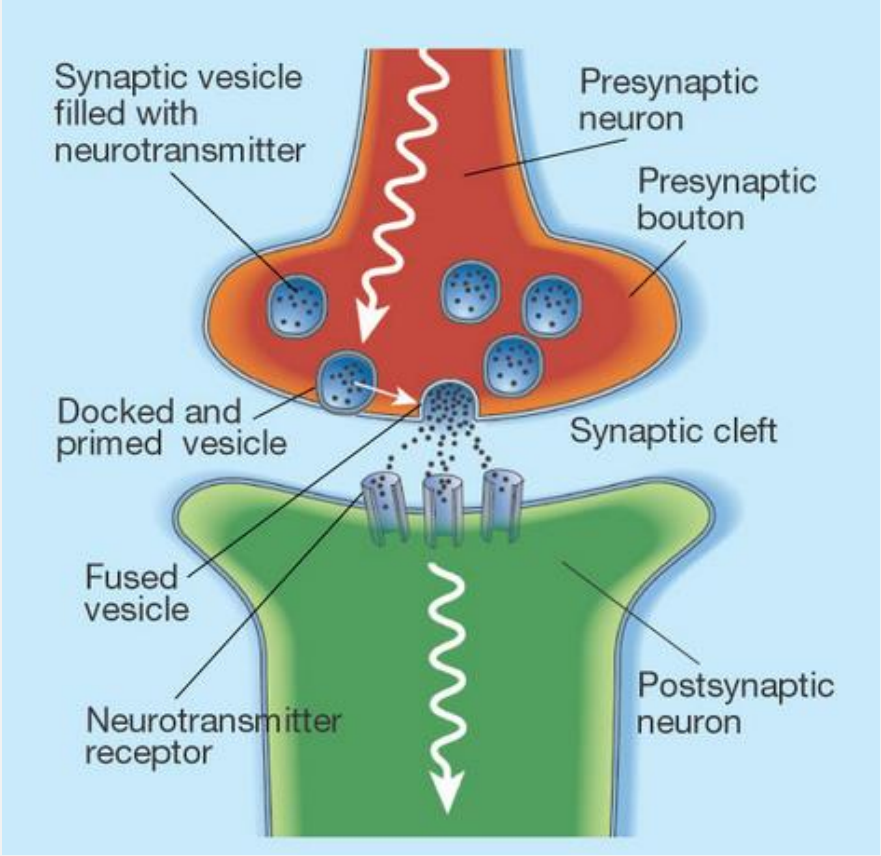
- The compounds:
  - Endocannabinoids
    - anandamide (AEA)
    - 2-arachidonoylglycerol (2-AG)
  - Phytonannabinoids
    - delta-9-tetrahydrocannabinol (THC)
    - cannabidiol (CBD)
  - Synthetic cannabinoids
    - Nabiximol
    - Dronabinol
    - Nobilone

TYPES OF RECEPTORS

- CB1:
  - regulation of neurotransmitter release
  - the heart
  - vascular smooth muscles and endothelial cells
- CB2:
  - in the immune cells
  - hematopoietic cells
- GPR55, PPARy
  - Regulation of neuronal excitability
  - Cell proliferation



EXAMPLE


Synaptic vesicle filled with neurotransmitter
Presynaptic neuron
Presynaptic bouton
Docked and primed vesicle
Synaptic cleft
Fused vesicle
Neurotransmitter receptor
Postsynaptic neuron

EFFECTS OF CANNABINOIDS ON RECEPTORS

- Δ9-THC is a partial agonist at central nervous system CB1 and CB2 in the immune system
  - The high is from its action on CB1 in the CNS
  - Regulates mood, learning, memory, food intake
  - Anti-inflammatory functions via CB1 and CB2
- CBD is an agonist at GPR55 TRPV1, TRPV2, TRPA1, GRP55, adenosine receptors
  - Limits the excitability of neurons by modulating calcium release
  - Reduces inflammation and oxidative stress
  - Reduces reperfusion injury post-stroke
  - Antiarrhythmic effects

CURRENT EVIDENCE: PAIN

Table 1 Summary of select clinical studies (RCT) on cannabis

Lead author	Year	Type of study	Study focus	Subjects	Drug	Results
RJ Noyes	1975	RCT	Cancer pain	10	Oral THC vs placebo	Improved pain relief at higher doses (with side effects)
RJ Noyes	1975	RCT	Cancer pain	36	Oral THC vs codeine vs placebo	Equianalgesic
PR Jochimsen	1978	RCT	Cancer pain	35	Benzopyranoperidine vs placebo	Not as effective as codeine
JR Johnson	2010	RCT	Cancer pain	177	Nabiximols vs THC vs placebo	Nabiximols showed pain reduction >30 %
RK Portenoy	2012	RCT	Cancer pain	263	Nabiximols vs placebo	Did not reach response rate goal but per patient report, superior analgesia overall
M Karst	2003	RCT	Neuropathic pain	21	CT-3 vs placebo	Reduction in pain scores
JS Berman	2004	RCT	Neuropathic pain	48	Nabiximols vs THC vs placebo	Did not meet study target for clinical significance, but improved pain scores and quality of sleep
DT Wade	2003	RCT	Neuropathic pain	20	THC vs CBD vs nabiximols vs placebo	THC and CBD superior to placebo
DJ Rog	2005	RCT	Neuropathic pain	66	Nabiximols vs placebo	Superior to placebo in pain reduction/sleep disturbance
TJ Nurmikko	2007	RCT	Neuropathic pain	125	THC:CBD vs placebo	Greater reduction in pain scores, allodynia, improved sleep over placebo
DI Abrams	2007	RCT	Neuropathic pain	50	Inhaled THC vs placebo	Greater pain reduction vs placebo
RJ Ellis	2009	RCT	Neuropathic pain	28	Inhaled THC vs placebo	Greater pain reduction vs placebo
B Wilsey	2008	RCT	Neuropathic pain	38	Inhaled THC vs placebo	Superior to placebo in pain reduction
MA Ware	2010	RCT	Neuropathic pain	21	Inhaled THC vs placebo	Highest dose reduced pain and improved quality of sleep over placebo
A Holdcroft	2006	RCT	Acute pain (post-op)	20	Cannador	Dose-dependent pain reduction overall
DJ Buggy	2003	RCT	Acute pain (post-op)	40	Dronabinol vs placebo	Did not show benefit for post-op pain
P Beauliu	2006	RCT	Acute pain (post-op)	41	Nabilone vs placebo	Did not show benefit for post-op pain (actually increased pain)
AK Jain	1981	RCT	Acute pain (post-op)	56	Levonantradol vs placebo	Better analgesic effects over placebo, but no significant dose-response curve
D Raft	1977	RCT	Acute pain	10	IV THC vs diazepam vs placebo	Diazepam>low-dose THC>placebo for analgesia. High dose<both placebo and diazepam
S Narang	2008	RCT	Chronic pain	30	Dronabinol vs placebo	Decreased pain intensity/increased satisfaction
DR Blake	2005	RCT	Chronic pain	58	Nabiximols vs placebo	Improved pain control/quality of sleep
W Notcutt	2004	RCT	Chronic pain	34	Sublingual THC vs cannabidiol vs Both in 1:1 combo vs placebo	THC and THC:CBD combo most effective in pain relief/sleep improvement

THE CURRENT EVIDENCE: SEIZURES

Table 2 Clinical trials of cannabidiol (CBD) and epilepsy (adapted from [11, 13])

Study	Seizure type	Population size	Treatment (subjects per group)	Continued AEDs?	Duration	Outcome	Toxicity	Limitations
Mechoulam and Carlini [261]	Treatment-resistant, temporal lobe epilespy	9	CBD, 200 mg/day (4) Placebo (5)	NS	3 months	CBD: seizure free (2), partial improvement (1), no change (1); placebo: no change (4)	None	No baseline seizure frequency; no definition of improvement; unclear if AEDs were changed; not truly randomized or blinded; unknown if groups were matched
Cunha et al. [262]	Treatment-resistant, temporal lobe epilespy	15*	CBD 200–300 mg/day (8*) Placebo (8*)	Yes	3–18 weeks	CBD: near seizure freedom (4), partial improvement (3), no change (1); placebo: no change (7), partial improvement (1)	Somnolence	Not clearly blinded (1 patient transferred groups); doses were adjusted in CBD group, not in placebo; CBD group received longer average treatment
Ames and Cridland [263]	Treatment-resistant epilepsy, intellectual/ developmental disability	12	CBD 300 mg/day for 1 week; 200 mg/day for 3 weeks (6?) Placebo (6?)	NS	4 weeks	No difference between CBD and placebo	Somnolence	Brief letter to the editor, details lacking on specifics; discontinued owing to "technical difficulties in preparing the drug"
Trembly and Sherman [264]	Treatment-resistant epilepsy	10–12†	CBD 100 mg once daily Placebo	Yes	3 months baseline, 6 months CBD or placebo, then 6 months crossover to alternative treatment	No difference between CBD and placebo (seizure frequency or cognitive/behavioral tests)	None	Differences in sample size reporting; dada reported are incomplete (conference abstract)‡

AEDs = antiepileptic drugs; NS = not stated

*1 patient switched groups after 1 month

† Abstract and subsequent book chapters have different numbers

‡ Only truly double-blind study

THE CURRENT EVIDENCE: SATIVEX (NABIXIMOL)

- Treatment of multiple sclerosis complications
  - Neuropathic pain, overactive bladder, spasticity
    - Mean difference of - 0.32 (out of 10) compared to placebo

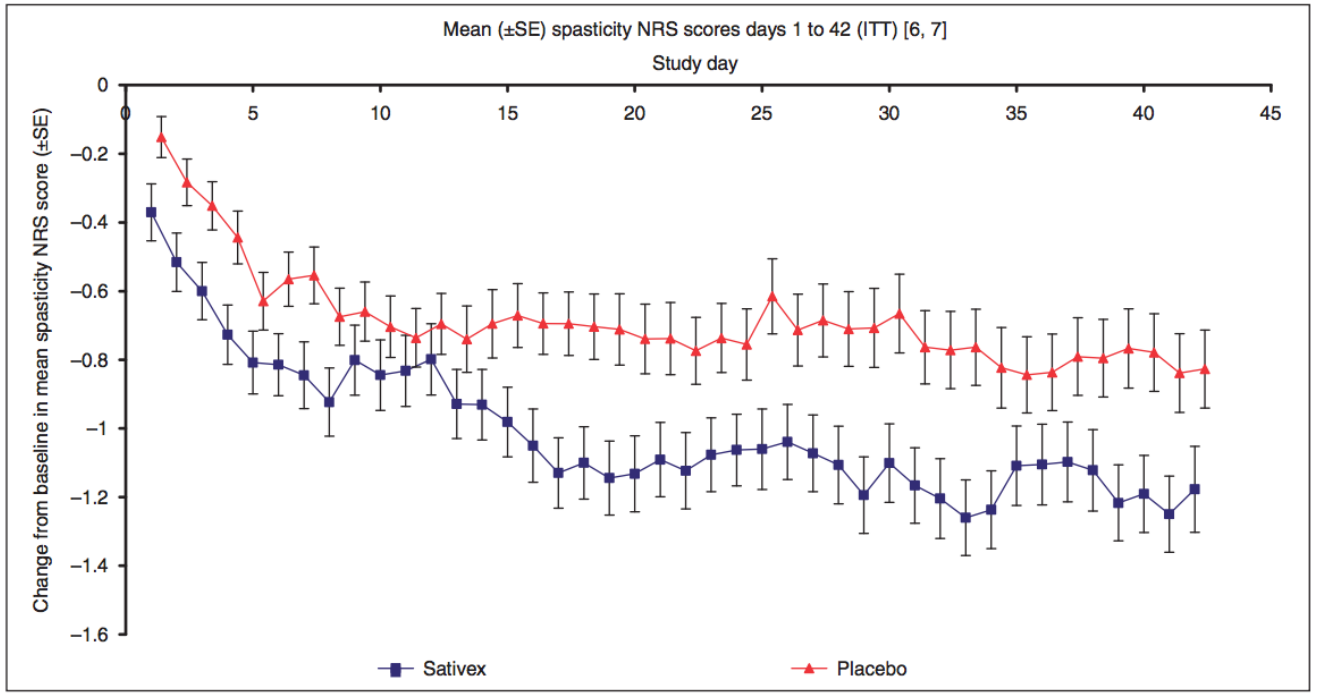


Figure 1. Change from baseline in spasticity over time.

THE CURRENT EVIDENCE: DRONABINOL (MARINOL)

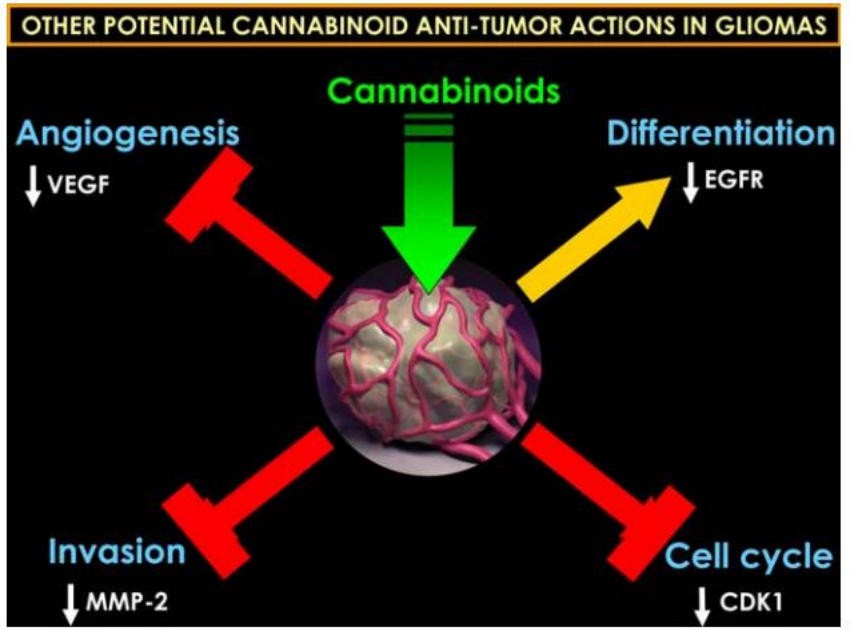
- Anorexia
  - Found to be most effective in HIV/AIDS induced anorexia
- Chemotherapy nausea and vomiting
  - Superior to placebo, inferior to metaclopramide
- Chronic pain

THE CURRENT EVIDENCE: NABILONE (CESAMET)

- Fibromyalgia
  - Modest effect
- Nausea
  - Better efficacy than metoclopramide for some forms of chemo
- Neuropathic pain

THE CURRENT EVIDENCE: NEEDS MORE WORKS

- Stoke
  - Reducing reperfusion injury
- Glaucoma
- Cancer
  - inhibits growth of some tumors *in vitro* and in animal models
  - Variety of cancers expressing CB1 or CB2 receptors
  - No good human clinical trials as of yet***



CANNABIDIOL

- Decreased brain edema following brain injury
- Increased fracture healing
- Decreased development of diabetes
- Improved arthritis

SAFETY

- Need to smoke 1500 lbs in 15 minutes to achieve lethal dose
- Side effects
  - euphoria and easy laughter, temporal and spatial perception alterations and disorientation, drowsiness, dizziness and motor incoordination, confusion, memory lapses and difficulty concentrating
  - tachycardia and hypotension, conjunctival injection, bronchodilation, muscle relaxation, and decreased gastrointestinal motility
- Synthetic cannabinoids are well tolerated

THE RISKS

- Lungs
  - 50% more carcinogens in inhaled marijuana smoke than cigarette
  - One cannabis joint had a similar effect to 2.5–5 tobacco cigarettes in regard to airflow obstruction
  - Exacerbation of pulmonary conditions (asthma, cystic fibrosis, COPD)
- Heart
  - Increased risk of cardiovascular events in people with heart disease
- Reproductive
  - Decreased libido, impotence, decreased sperm count, gynecomastia (man boobs)

THE RISKS

- Brain health
  - Associated with development of schizophrenia in young users
  - Depression and anxiety
  - Permanent reduction in IQ points if smoking from childhood/teens
    - Problems with study design?
  - Problems with attention and concentration and with acquisition of complex new verbal material
  - If used with benzodiazepines, opiates, and tricyclic antidepressants can cause a further decrease in alertness
  - Decrease in brain volume of the amygdala and hippocampus

CONCLUDING REMARKS

WHO? HOW? WHERE?

CURRENT LEGISLATION

The Access to Cannabis for Medical Purposes allow for reasonable access to cannabis for medical purposes for Canadians who have been authorized to use cannabis for medical purposes by their health care practitioner.

HOW: STEP BY STEP (100% LEGALLY)

- Consult a Health Care Practitioner
- Obtain a Medical Document completed by Health Care Professional

Health Canada Santé Canada

Your health and safety… our priority. *Votre santé et votre sécurité… notre priorité.*

Sample Medical Document for the Access to Cannabis for Medical Purposes Regulations

This document may be completed by the applicant's health care practitioner as defined in the Access to Cannabis for Medical Purposes Regulations (ACMPR). A health care practitioner includes medical practitioners and nurse practitioners. In order to be eligible to provide a medical document, the health care practitioner must have the applicant for the medical document under their professional treatment. Regardless of whether or not this form is used, the medical document must contain all of the required information, (see in particular s. 8 of the ACMPR).

Patient's Given Name and Surname _____

Patient's Date of Birth (DD/MM/YYYY) _____

Daily quantity of dried marihuana to be used by the patient: _____ g/day

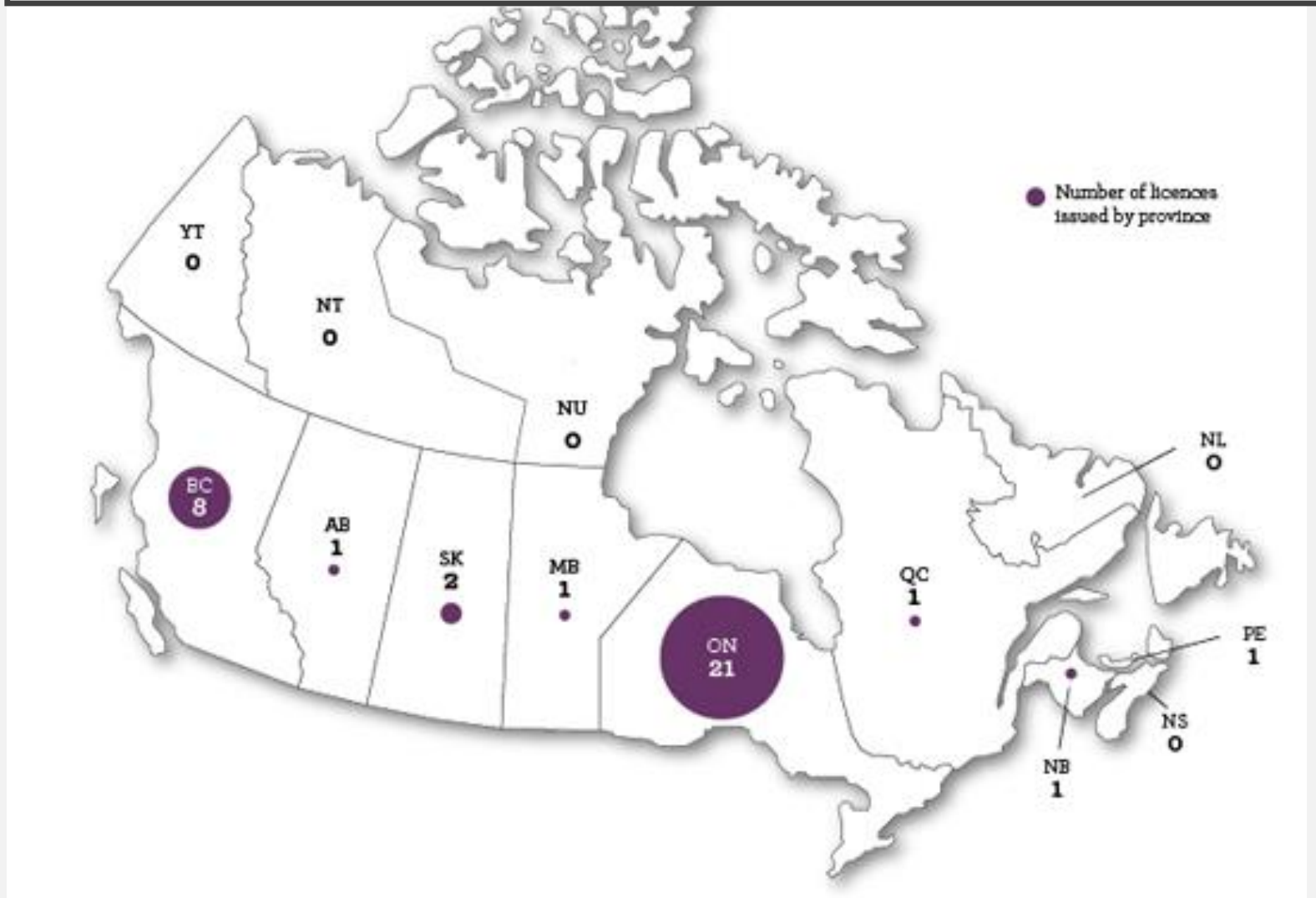
THE HEALTH CARE PROFESSIONAL

- In BC can be a licensed physician or a nurse practitioner
- Long term treating relationship with the patient
- Not selling or dispensing marijuana for medical purposes to any patient
- Can not authorize through telemedicine (BC specific)

https://www.cpsbc.ca/files/pdf/PSG-Marijuana-for-Medical-Purposes.pdf

WHERE TO GET CANNABIS FOR MEDICAL PURPOSES

LICENSED PRODUCER




SHOPPERS
DRUG MART

DISPENSARIES IN VICTORIA

				603 Gorge Rd. East | 851 Johnson Street. 6691 Sooke Road
Trees Dispensaries 2610 Rock Bay | 1056 North Park | 546 Yates	**Ocean Grown** 1725 Cook Steet.	**Victoria's Natural Way** 1545 Fort Street.	**BC Pain Society** 1719 Quadra Street.	**.Cloud Nine Medicinal** 778 Fort Street.
Weeds Social Club 1601 Douglas Street.	**Buds & Leaves** 732 Tyee Road	**The Green Ceiling** 1625 Quadra Street	**Jupiter THC** 619 Johnson Street.	**Cannabis Buyers Club** 826 Johnson Street.
Alternative Aromatic 2641 Quadra Street.	**Nature's Botanicals** 1011 Johnson Street.	**V I Compassion Society** 853 Cormorant St.	**Beard Brothers Society** 849 Fort Street.	**Pineapple Express** 608 Esquimalt Road.
Burnside Dispensary 3175 Harriet Road	**Urban Earth Med** 2020 Douglas Street	**Herb's Victoria** 1010 Cook Street	**Nature's Aid Medicinal** 532 1/2 Fisgard Street	**Green Buddha Medicinals** 2616 Bridge Street

WHO

INDICATIONS FOR MEDICAL MARIJUANA (HC)

- Severe nausea and vomiting associated with cancer chemotherapy
- Cachexia and Anorexia associated with terminal illness, cancer, or HIV/AIDS
- Spasms and pain associated with MS
- Chronic pain
- Severe cancer-associated pain
- Insomnia or depression associated with chronic diseases
- Palliative setting

http://www.hc-sc.gc.ca/dhp-mps/marihuana/info/cons-eng.php

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- **Alcohol and Opiod Withdrawl Symptoms**
- ***Alzheimer's***
- ***Anorexia***
- ***Anxiety and Depression***
- ***Any condition diagnosed as "debilitating" by a licensed physician***
- ***Arnold-Chiari malformation and syringomyelia***
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- ***Epilepsy***
- ***Fibromyalgia***
- ***Fibrous dysplasia***
- ***Glaucoma***
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- ***Terminal illness***
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https://treesdispensary.com/conditions/

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College of Family Physicians of Canada. Authorizing Dried Cannabis for Chronic Pain or Anxiety: Preliminary Guidance from the College of Family Physicians of Canada. Mississauga, ON: College of Family Physicians of Canada; 2014.

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- *Dystonia*
- *Epilepsy*
- *Fibromyalgia*
- *Fibrous dysplasia*
- *Glaucoma*
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- *HIV/AIDS*
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- *Hypertension*
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- *Nail-patella syndrome*
- *Nausea and Vomiting*
- *Neurofibromatosis*
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- *Osteoarthritis*
- *Osteoporosis*
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- *Post-traumatic stress disorder*
- *Residual limb pain*
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- *Spasticity disorders*
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https://treesdispensary.com/conditions/
College of Family Physicians of Canada. Authorizing Dried Cannabis for Chronic Pain or Anxiety: Preliminary Guidance from the College of Family Physicians of Canada. Mississauga, ON: College of Family Physicians of Canada; 2014.

INDICATIONS FOR MEDICAL MARIJUANA (DISPENSARIES)

- **Alcohol and Opiod Withdrawl Symptoms**
- *Alzheimer's*
- *Anorexia*
- *Anxiety and Depression*
- *Any condition diagnosed as "debilitating" by a licensed physician*
- *Arnold-Chiari malformation and syringomyelia*
- *Arthritis*
- *Asthma*
- *Autism*
- *Cachexia (wasting syndrome)*
- *Cancer*
- *Causalgia*
- *Central and peripheral chronic*
- *Chronic inflammatory demyelinating polyneuropathy*
- *Chronic or severe pain*
- *Crohn's disease*
- *CRPS (Complex Regional Pain Syndrome Type I)*
- *CRPS (Complex Regional Pain Syndrome Type II)*
- *Decompensated cirrhosis*
- *Dementia*
- *Diseases of the Liver*
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CMA POSITION

- The Canadian Medical Association has consistently opposed Health Canada's approach which places physicians in the role of gatekeeper in authorizing access to marijuana.

ASSOCIATION MÉDICALE CANADIENNE

CANADIAN MEDICAL ASSOCIATION

SOCIAL EFFECTS OF MEDICAL MARIJUANA

- Discuss the controversy
- Case study Colorado
- Explore the difficulty

CANNABISDIGEST.CA – 5 SOCIAL IMPACT

1. Fewer Deaths from Opiates
2. Reduced Crime Rates
3. Reduced Marijuana use in Youth
4. Decrease in Car Crash Deaths
5. Fewer Suicides in Young Men

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Cannabis Digest

There is no evidence that implementing medical marijuana laws impacts the rate of adolescent use.

Anderson, D Mark, Benjamin Hansen, and Daniel Rees. "Medical Marijuana Laws and Teen Marijuana Use." Available at *SSRN 2067431*, (2012).

Caulkins, Jonathan P, Angela Hawken, Beau Kilmer, and Mark AR Kleiman. *Marijuana Legalization: What Everyone Needs to Know*. Oxford: Oxford University Press, 2012.

Harper, S., E. C. Strumpf, and J. S. Kaufman. "Do Medical Marijuana Laws Increase Marijuana Use? Replication Study and Extension." *Ann Epidemiol* 22, no. 3 (Mar 2012): 207-12.

Hughes, Caitlin Elizabeth, and Alex Stevens. "What Can We Learn from the Portuguese Decriminalization of Illicit Drugs?". *British Journal of Criminology* 50, no. 6 (2010): 999-1022.

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Room, Robin. *Cannabis Policy: Moving Beyond Stalemate*. Oxford University Press, USA, 2010.

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Thies, Clifford F., and Charles A. Register. "Decriminalization of Marijuana and the Demand for Alcohol, Marijuana and Cocaine." *The Social Science Journal* 30, no. 4 (1993): 385-99.

There is no compelling evidence that marijuana contributes substantially to traffic accidents and fatalities.

Ahlner, J., A. Holmgren, and A. W. Jones. "Prevalence of Alcohol and Other Drugs and the Concentrations in Blood of Drivers Killed in Road Traffic Crashes in Sweden." *Scand J Public Health* 10.1177/1403494813510792 (Nov 21 2013).

Anderson, D. Mark, Benjamin Hansen, and Daniel I. Rees. "Medical Marijuana Laws, Traffic Fatalities, and Alcohol Consumption." *Journal of Law and Economics* 56, no. 2 (2013): 333-69.

Armentano, P. "Cannabis and Psychomotor Performance: A Rational Review of the Evidence and Implications for Public Policy." *Drug Test Anal* 5, no. 1 (Jan 2013): 52-6.

Blows, S., R. Q. Ivers, J. Connor, S. Ameratunga, M. Woodward, and R. Norton. "Marijuana Use and Car Crash Injury." *Addiction* 100, no. 5 (May 2005): 605-11.

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Li, Guohua, Joanne E. Brady, and Qixuan Chen. "Drug Use and Fatal Motor Vehicle Crashes: A Case-Control Study." *Accident Analysis & Prevention* 60, no. 0 (11// 2013): 205-10.

Ménétrey, Annick, Marc Augsburger, Bernard Favrat, Marie A. Pin, Laura E. Rothuizen, Monique Appenzeller, Thierry Buclin, Patrice Mangin, and Christian Giroud. "Assessment of Driving Capability through the Use of Clinical and Psychomotor Tests in Relation to Blood Cannabinoids Levels Following Oral Administration of 20 Mg Dronabinol or of a Cannabis Decoction Made with 20 or 60 Mg Δ9-Thc." *Journal of Analytical Toxicology* 29, no. 5 (July 1, 2005 2005): 327-38.

Ramaekers, J. G., G. Berghaus, M. van Laar, and O. H. Drummer. "Dose Related Risk of Motor Vehicle Crashes after Cannabis Use." *Drug and Alcohol Dependence* 73, no. 2 (2004): 109-19.

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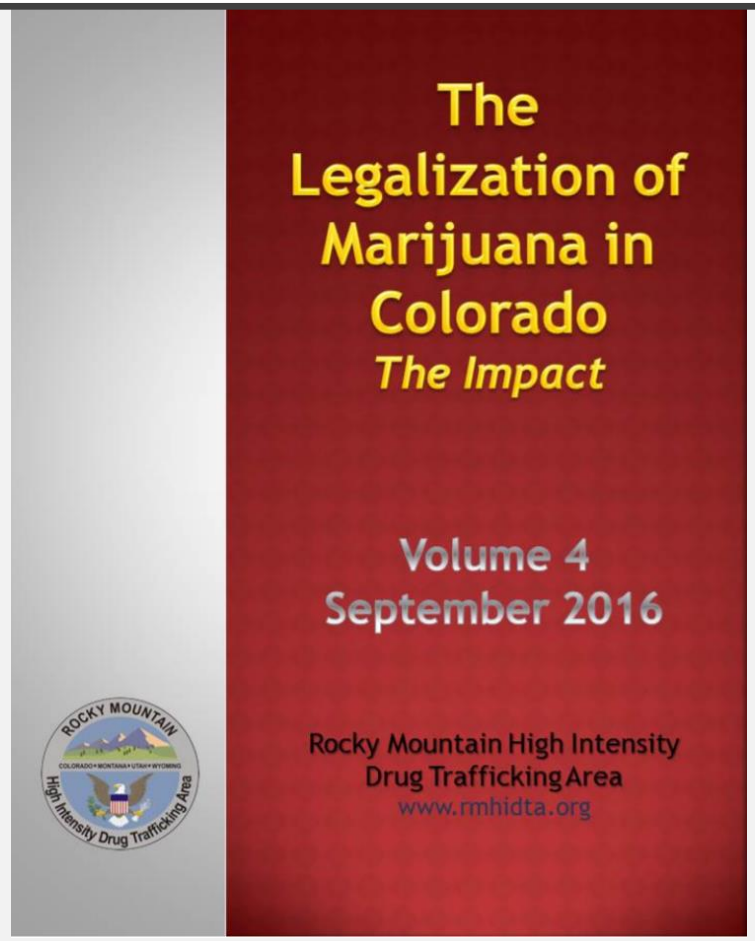
Ramaekers, Johannes G, Eef L Theunissen, Marjolein de Brouwer, Stefan W Toennes, Manfred R Moeller, and Gerhold Kauert. "Tolerance and Cross-Tolerance to Neurocognitive Effects of Thc and Alcohol in Heavy Cannabis Users." *Psychopharmacology* 214, no. 2 (Mar 2011): 391-401.

Ronen, A., P. Gershon, H. Drobiner, A. Rabinovich, R. Bar-Hamburger, R. Mechoulam, Y. Cassuto, and D. Shinar. "Effects of Thc on Driving Performance, Physiological State and Subjective Feelings Relative to Alcohol." *Accid Anal Prev* 40, no. 3 (May 2008): 926-34.

COLORADO – THE IMPACT



COLORADO - THE IMPACT

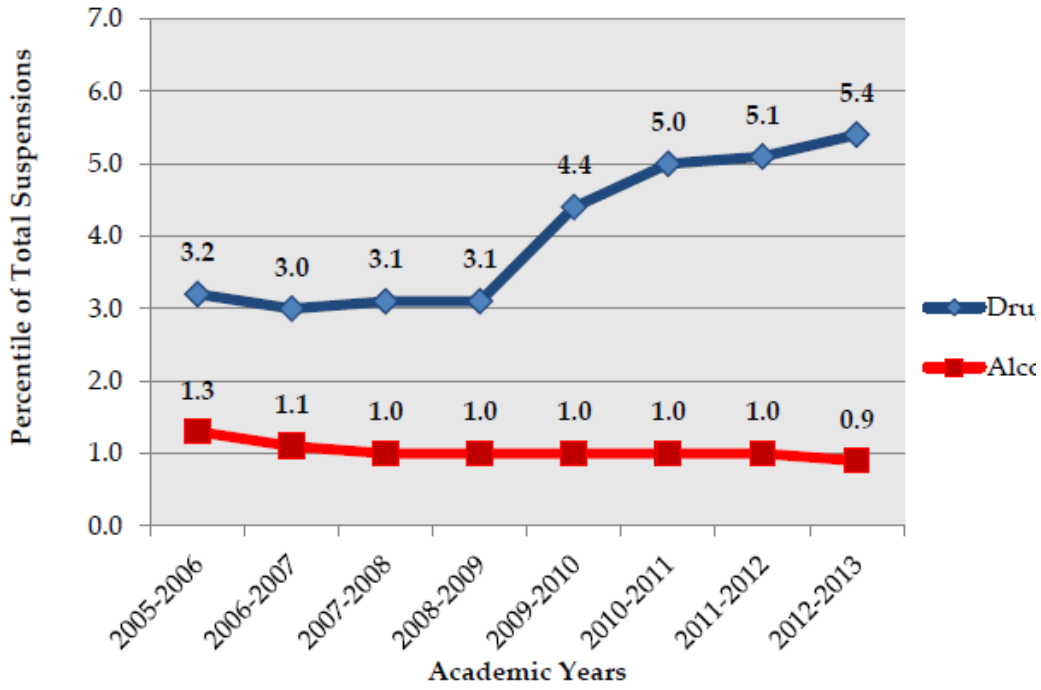
- Dates to remember
  - **2000-2008:** Medical marijuana legalized, 2 oz. & 6 potted plants
    - ~6000 applications
    - No retailers, no dispensaries
  - **2009-current:** Commercialization of medical marijuana
    - 38,000 applicants in 1 year, went from 4800 to 41,000 cardholders
    - by 2012, there were 108,000 cardholders
  - **2013-current:** Recreational marijuana legalized, first retailers Jan 2014

COLORADO - THE IMPACT (2014)

- Traffic fatalities involving operators testing positive for marijuana have increased **100%** from 2007 to 2012
- In 2012, **10.47% of youth ages 12 to 17** were considered current marijuana users compared to **7.55% nationally**. Colorado, ranked 4th in the nation, was 39% higher than the national average
- Drug related suspensions/expulsions **increased 32%** from school 2008/2009 through 2012/2013
- From 2011 through 2013, there was a **57% increase** in marijuana-related emergency room visits.
- Hospitalizations related to marijuana have increased **82%** from 2008 to 2013

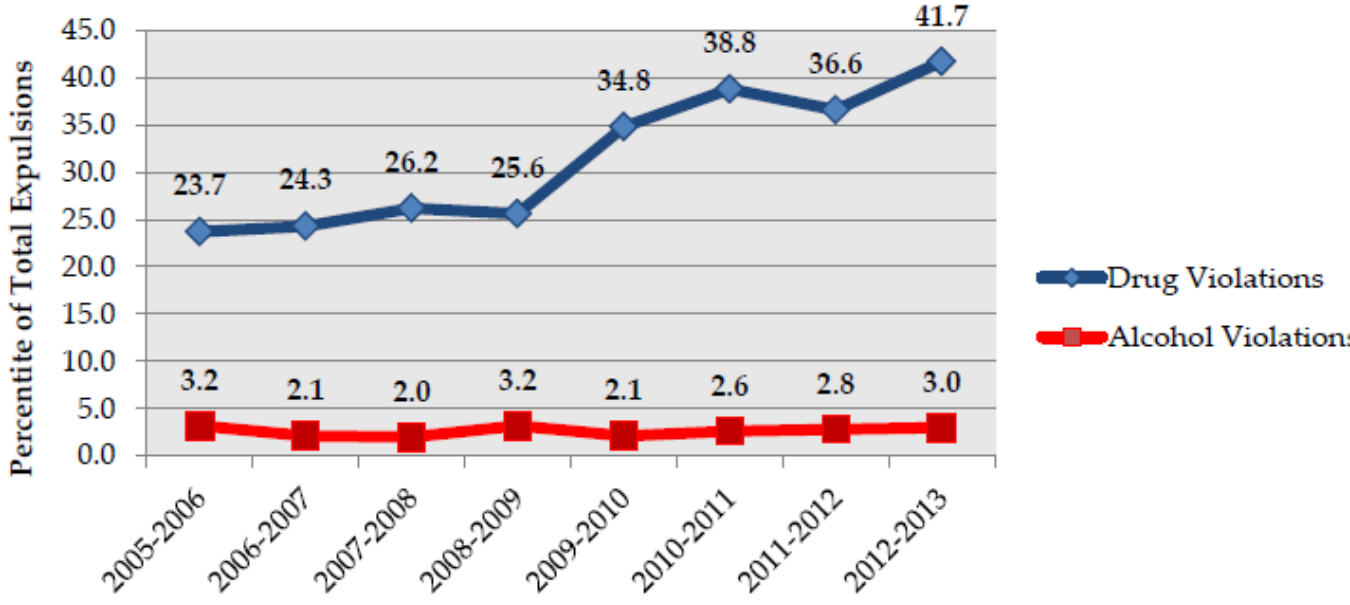
EFFECTS ON YOUTH - SCHOOL

Percentage of *Total Suspensions* in Colorado, 2005 - 2013 School Years



SOURCE: Colorado Department of Education, Academic Years 2006-2013

Percentage of *Total Expulsions* in Colorado 2005 to 2013 School Years



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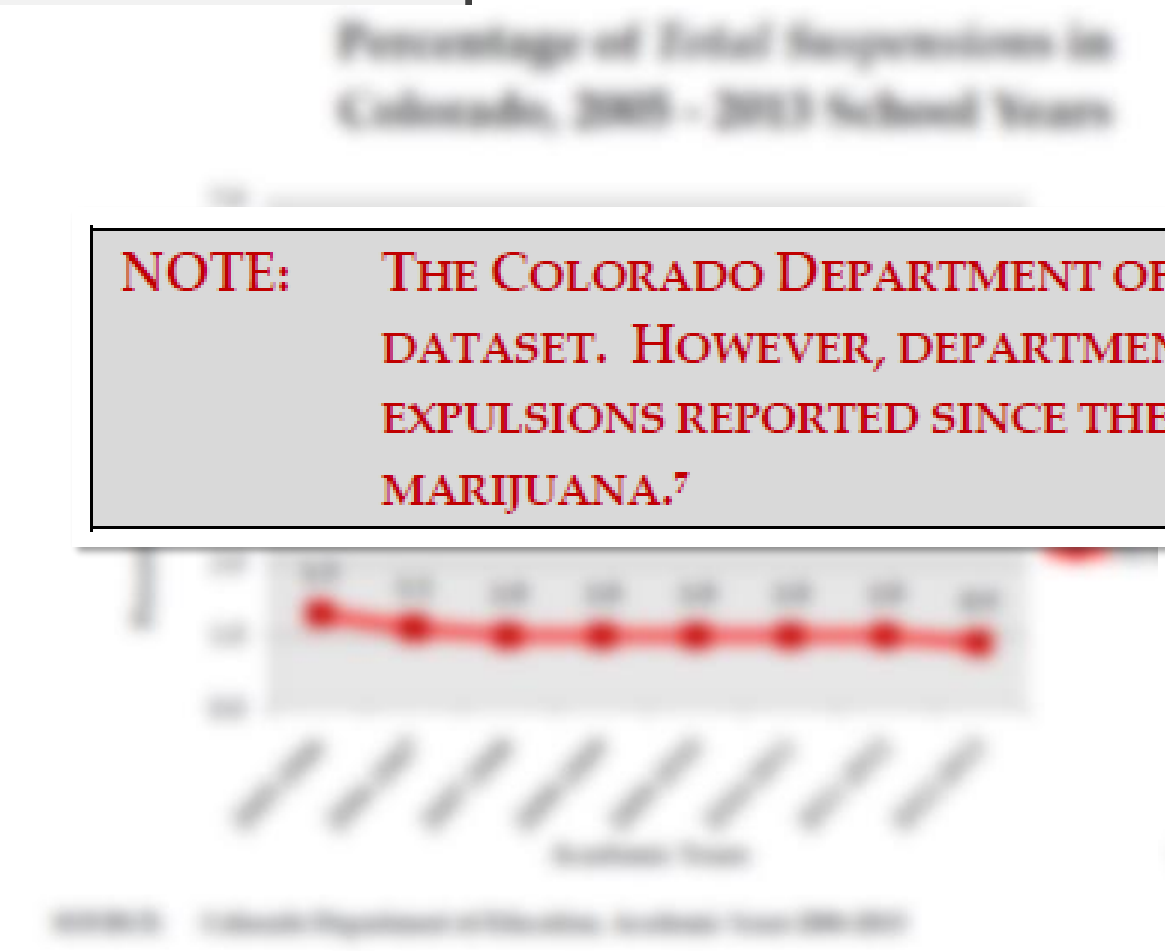
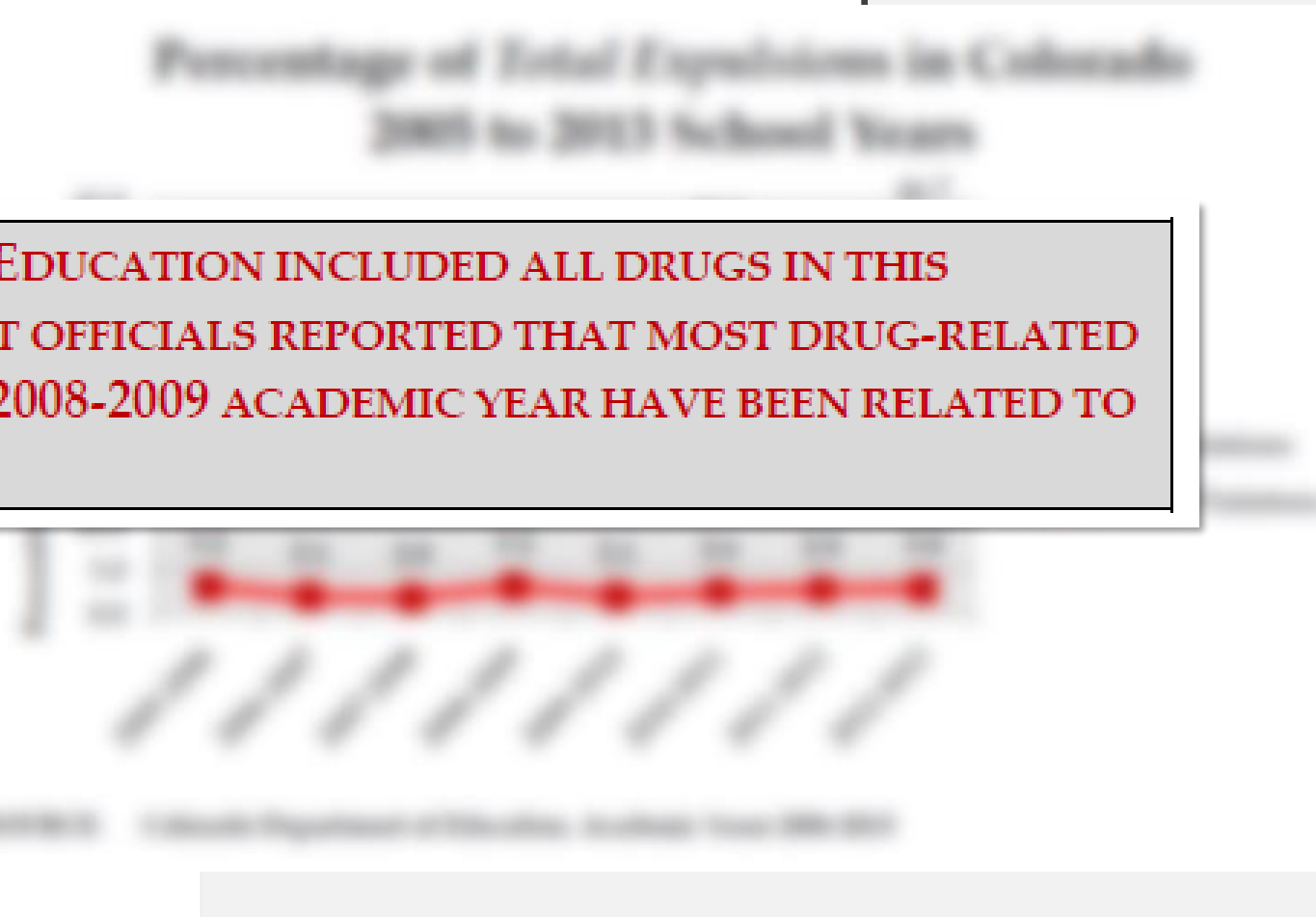
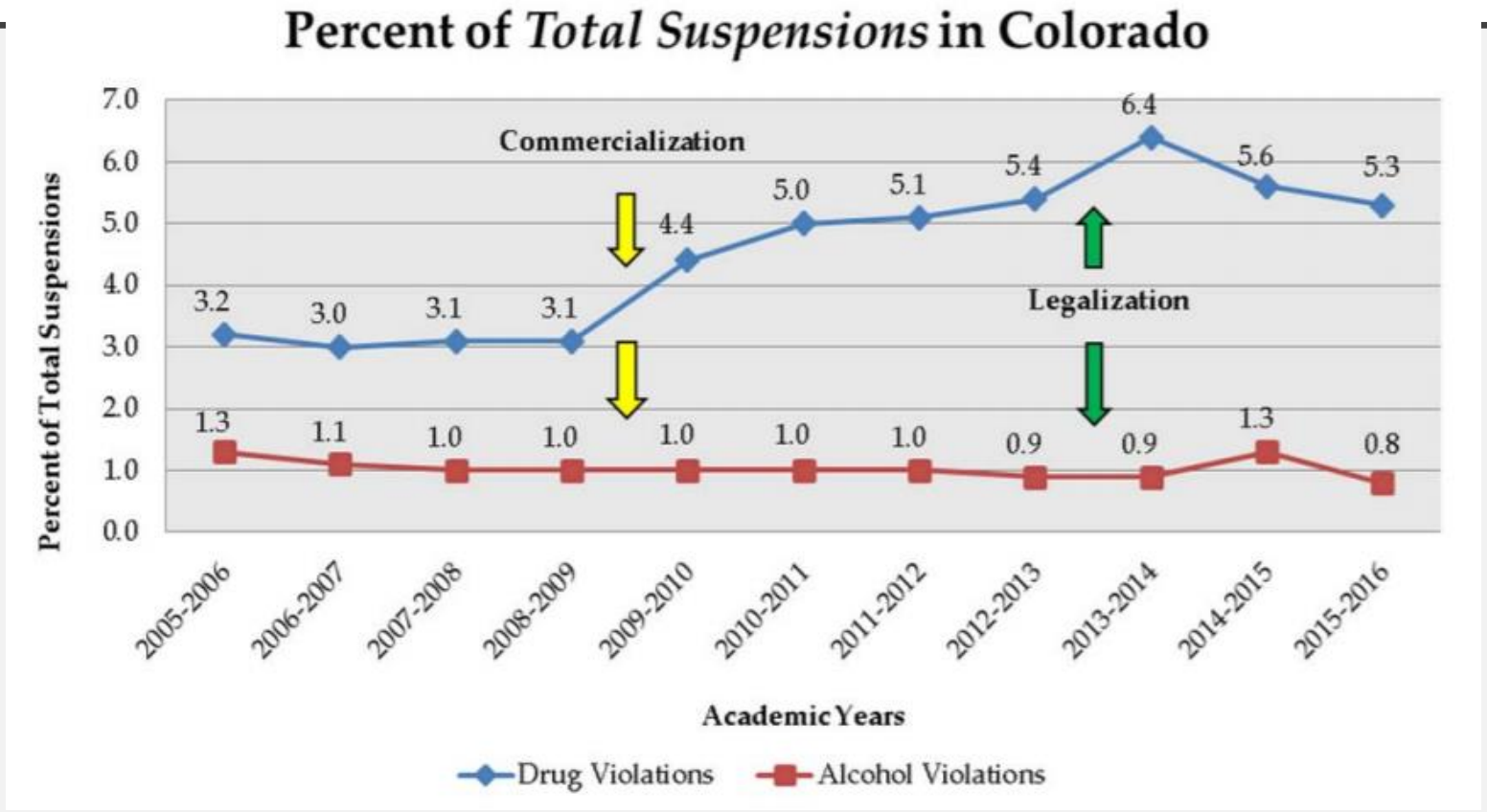


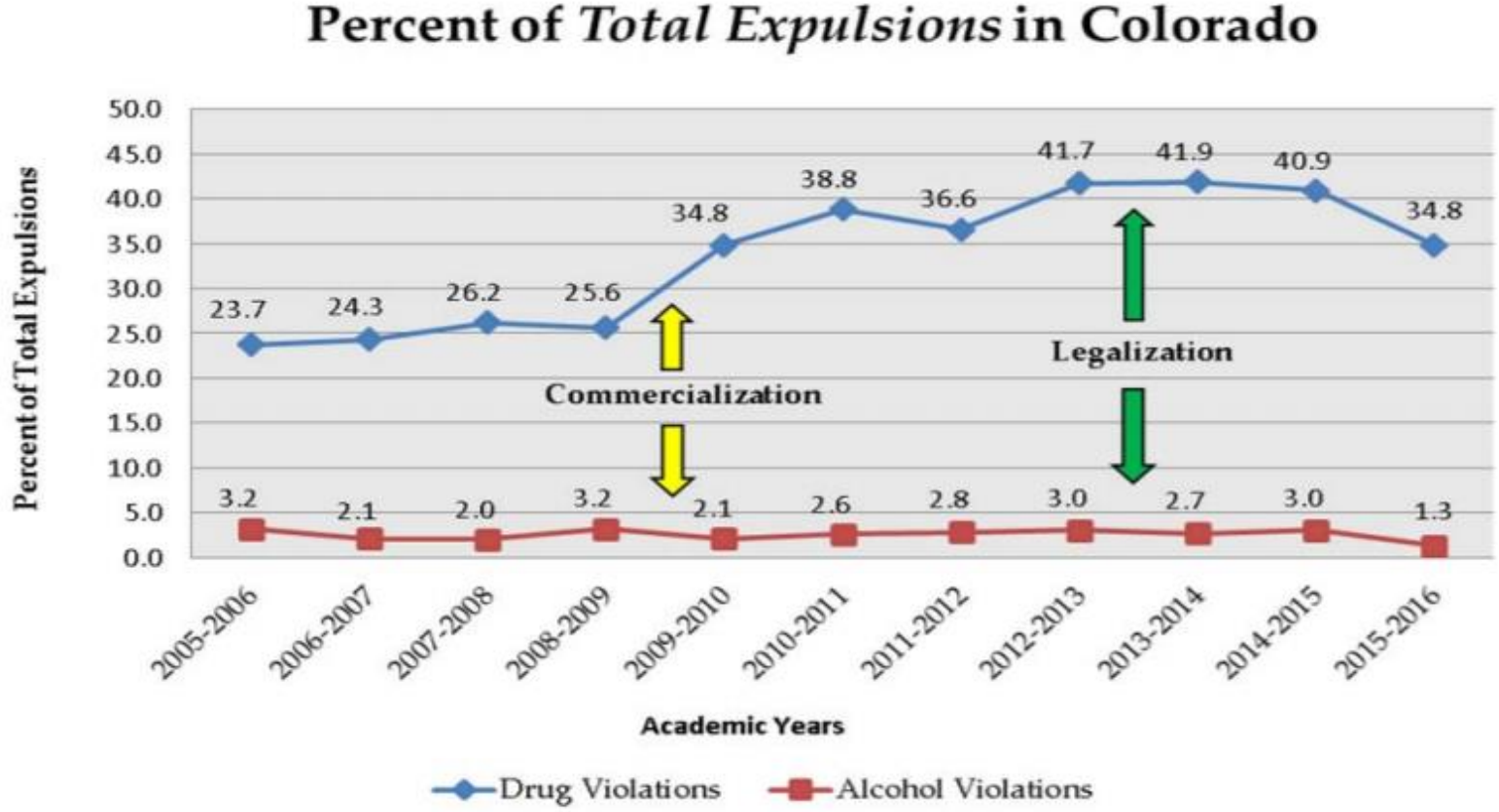


NOTE: THE COLORADO DEPARTMENT OF EDUCATION INCLUDED ALL DRUGS IN THIS DATASET. HOWEVER, DEPARTMENT OFFICIALS REPORTED THAT MOST DRUG-RELATED EXPULSIONS REPORTED SINCE THE 2008-2009 ACADEMIC YEAR HAVE BEEN RELATED TO MARIJUANA.[7]

EFFECT ON YOUTH - SCHOOL

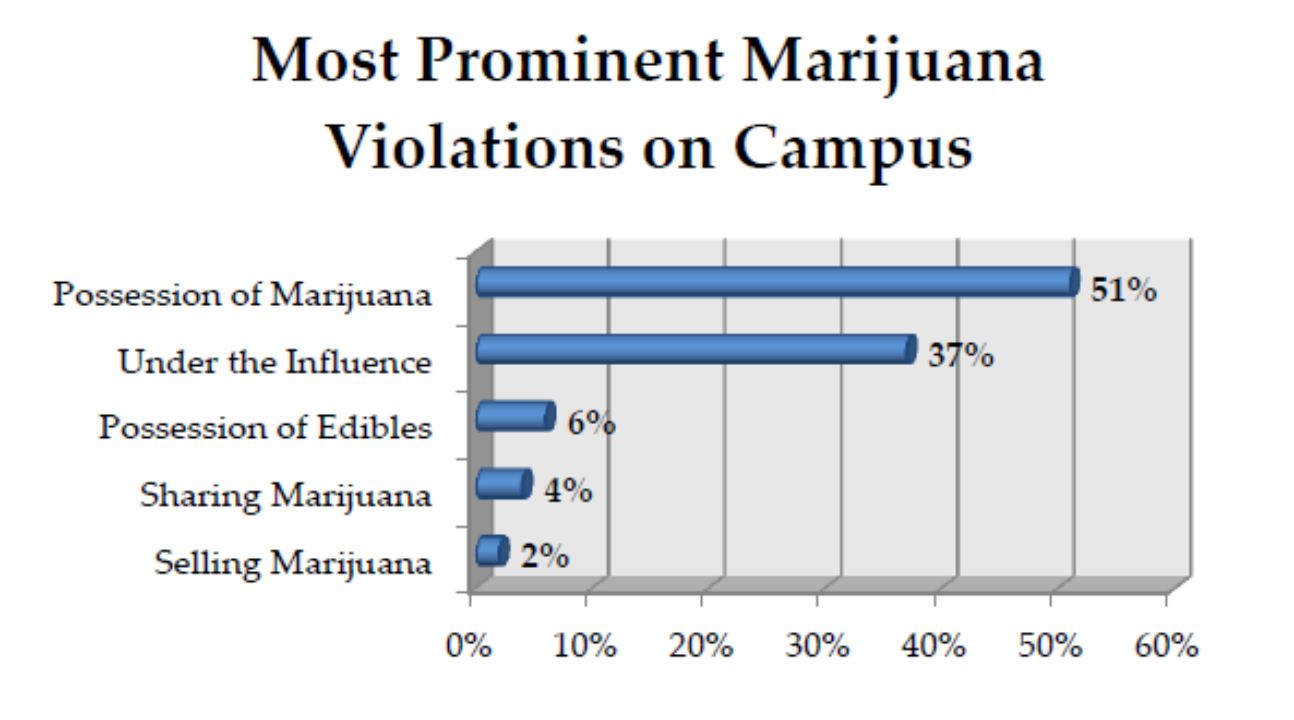


EFFECT ON YOUTH - SCHOOL

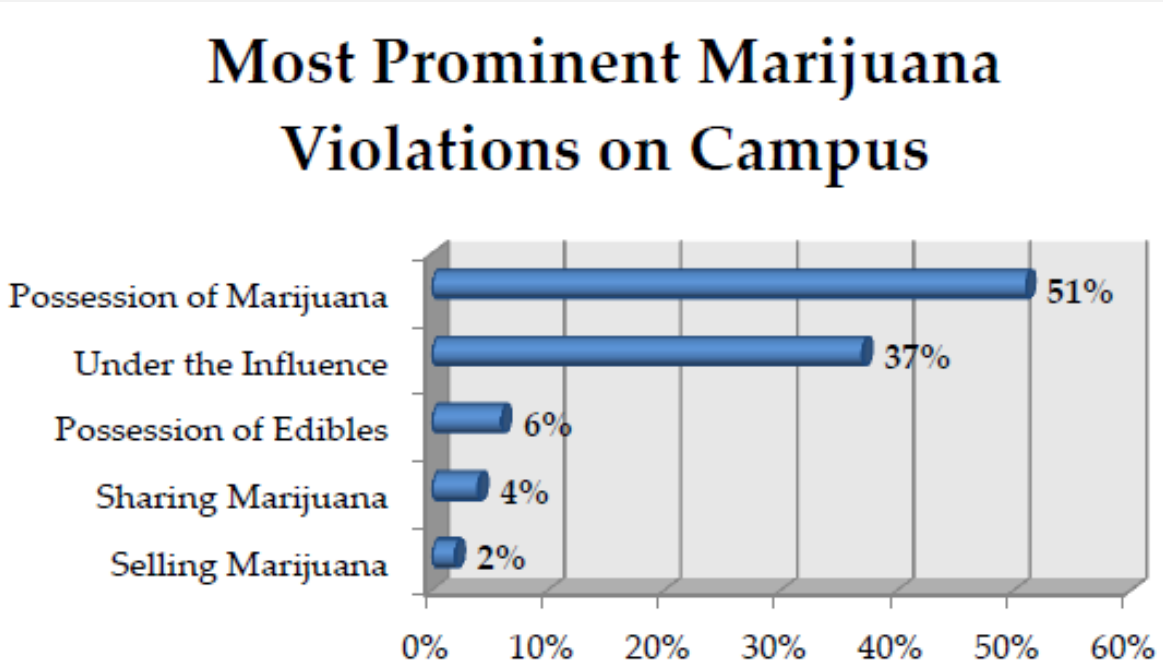


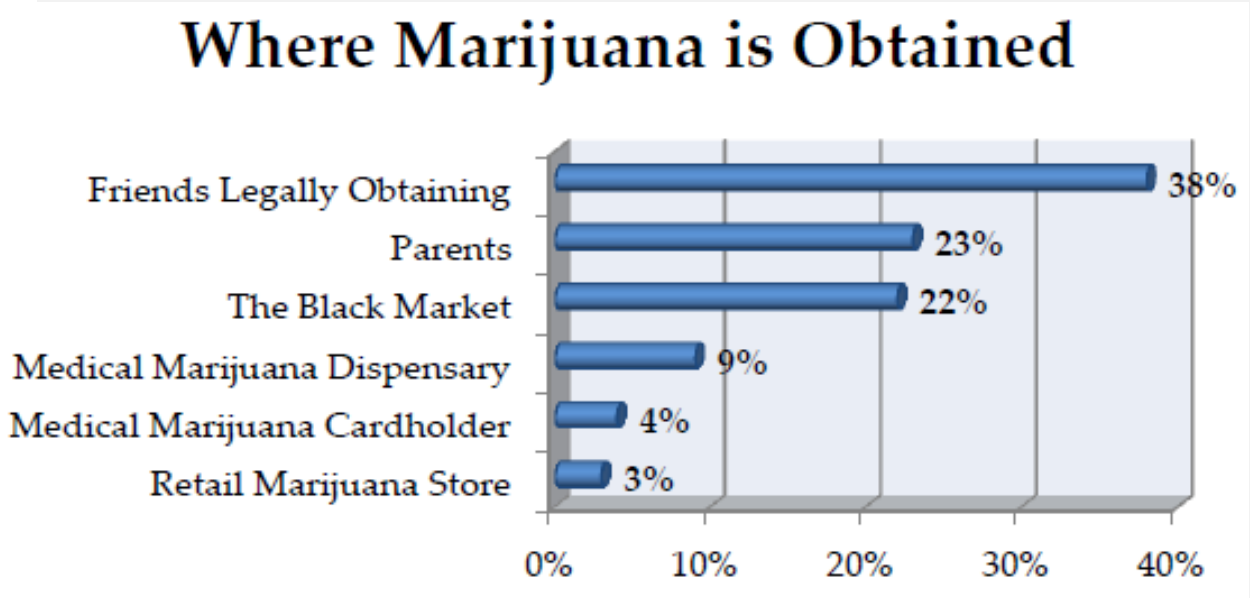
SOURCE: **Colorado Department of Education, 10-Year Trend Data : State Suspension and Expulsion Incident Rates and Reasons**

EFFECT ON YOUTH - SCHOOL

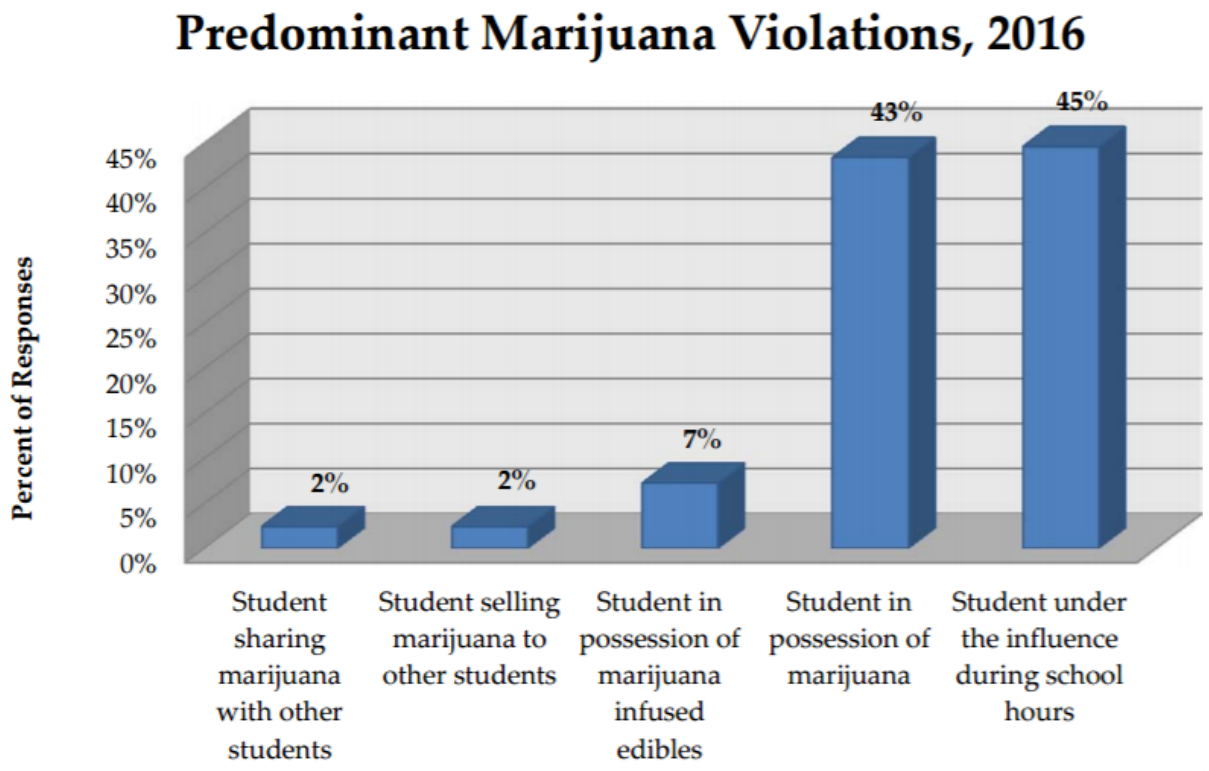


EFFECT ON YOUTH – SCHOOL (2014)

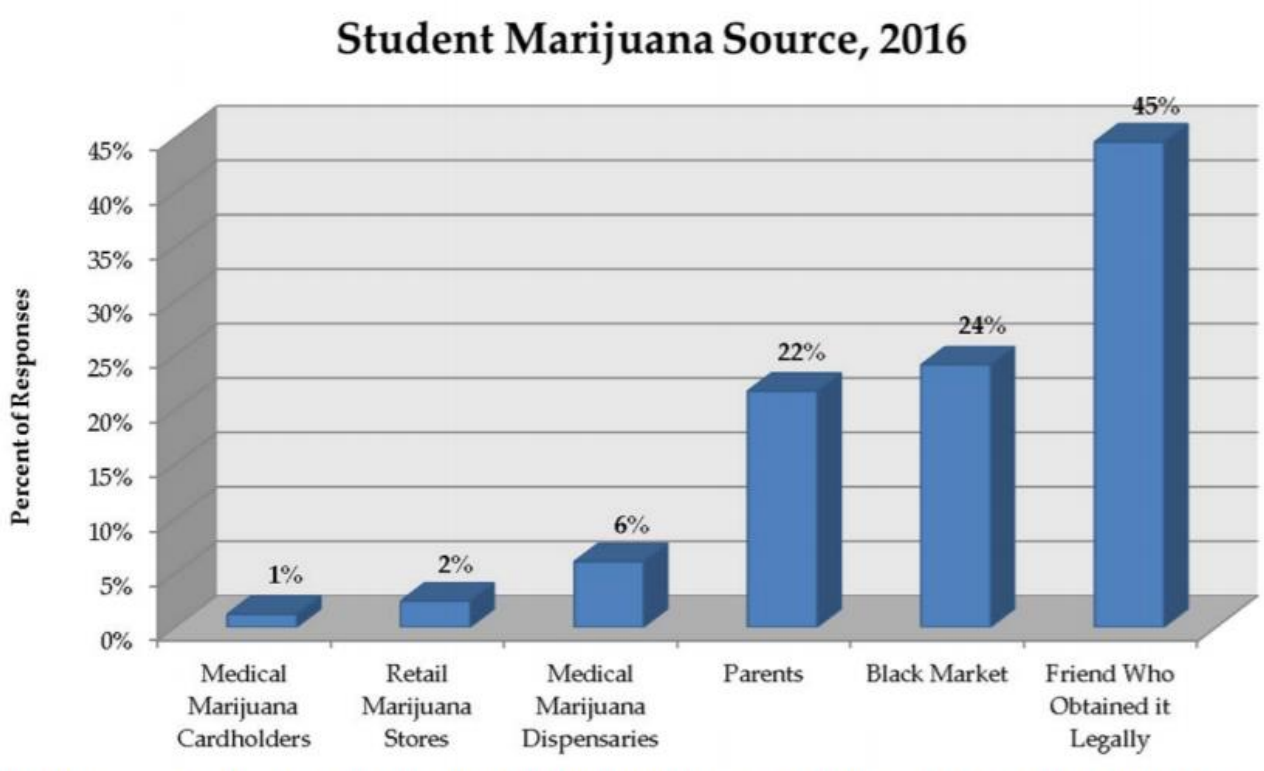




EFFECT ON YOUTH – SCHOOL (2016)



SOURCE: Colorado Association of School Resource Officers (CASRO) and Rocky Mountain HIDTA



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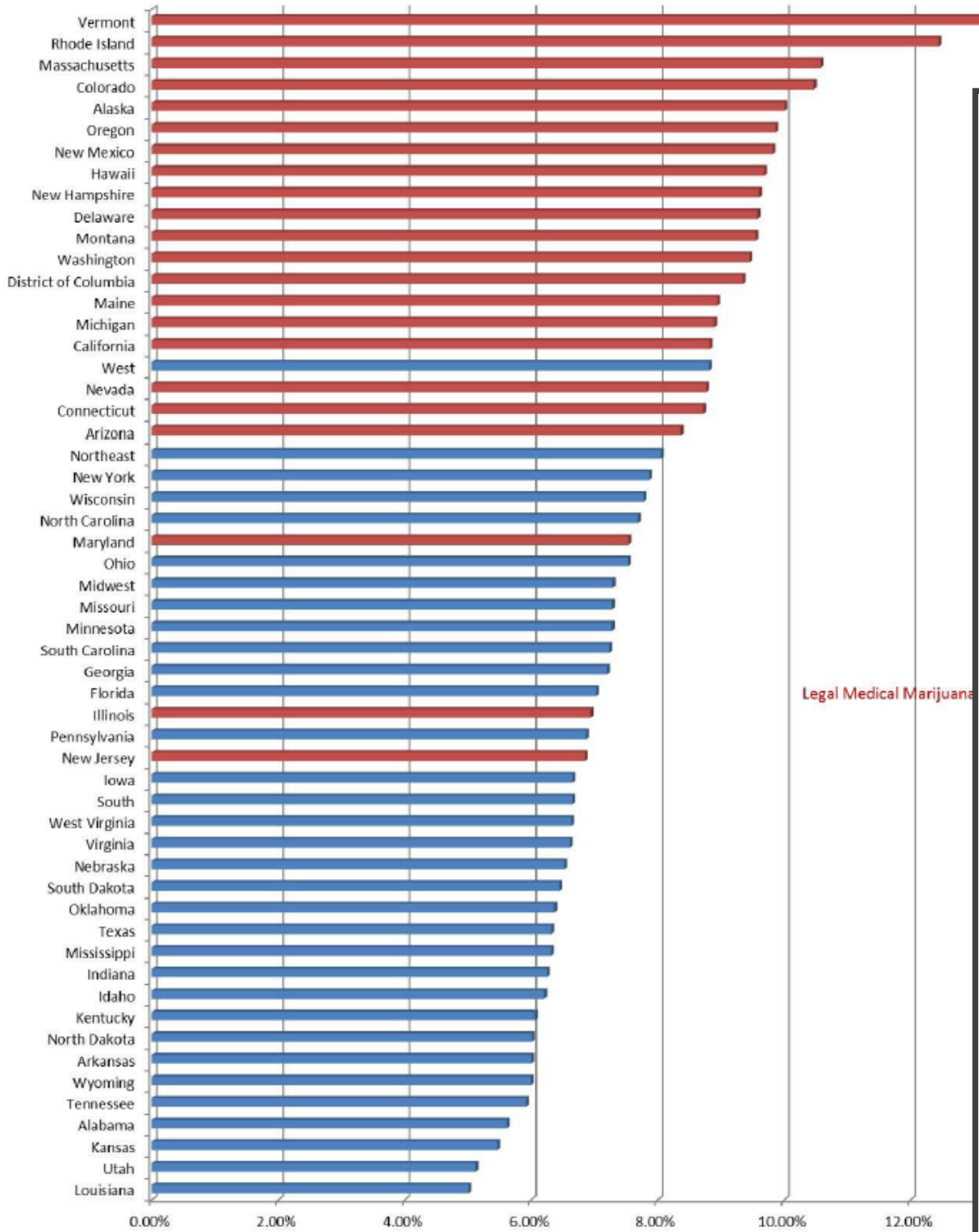
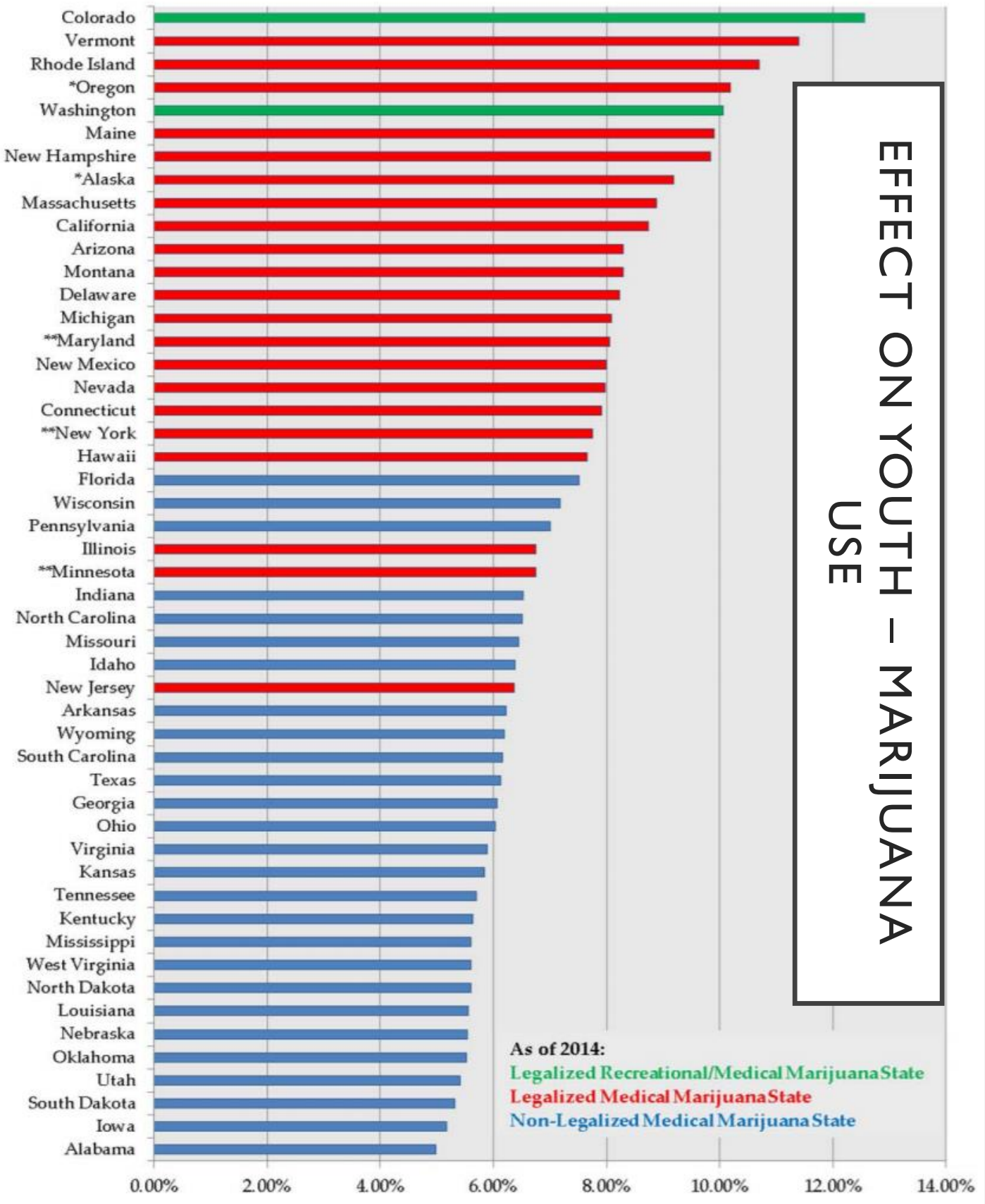
Past Month Usage by 12 to 17-Year-Olds in Medical Marijuana States, 2012



RCE: SAMHSA.gov, National Survey on Drug Use and Health, 2013

EFFECTS ON YOUTH – MARIJUANA USE

Past Month Usage, 12 to 17 Years Old, 2013/2014

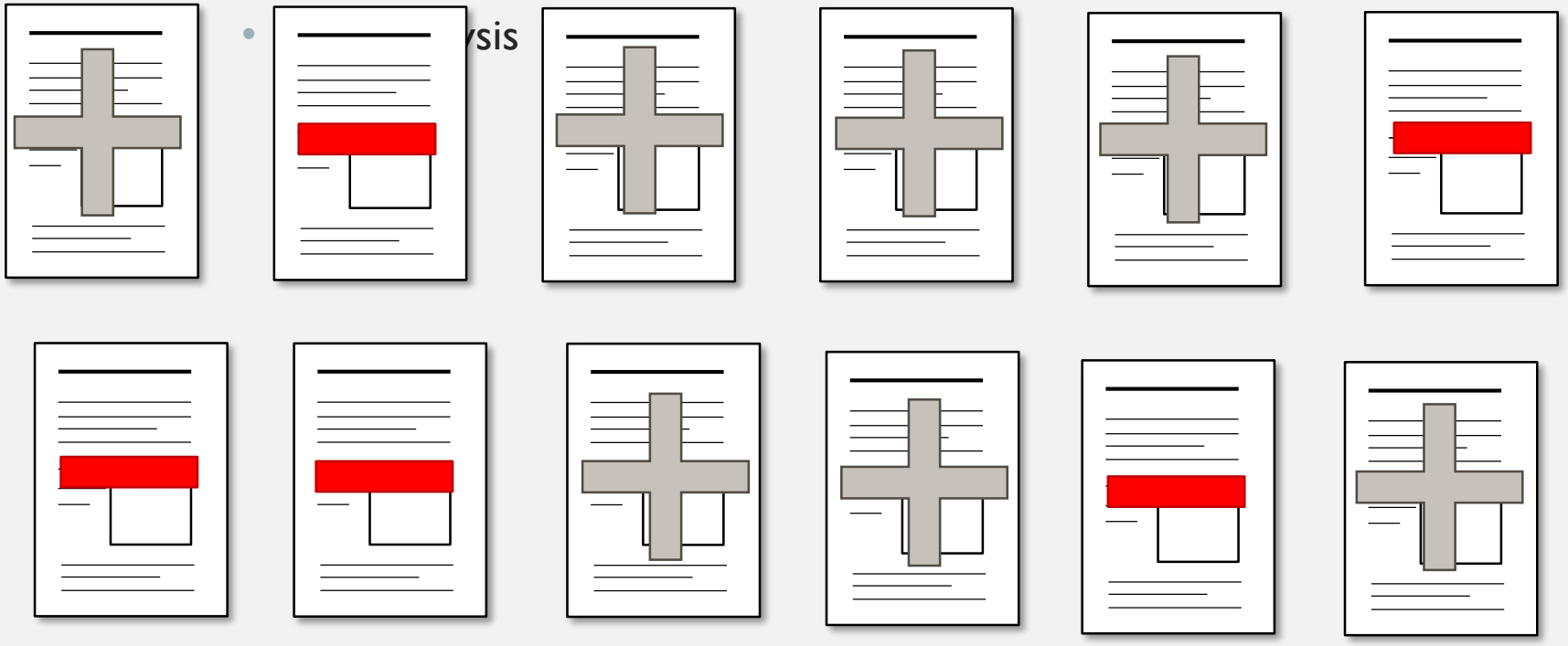


EFFECT ON YOUTH – MARIJUANA USE

OURCE: SAMHSA.gov, National Survey on Drug Use and Health 2013 and 2014

TRAFFIC

- ysis



ODDS RATIO

Group A

children who go trick-o-treating

Group B

children who **do not** go trick-o-treating

children who are out of control the morning following Halloween

ODDS RATIO

$$\frac{\frac{\text{children who go trick-o-treating}}{\text{children who are out of control the morning following Halloween}}}{\frac{\text{children who } \mathbf{do\ not} \text{ go trick-o-treating}}{\text{children who are out of control the morning following Halloween}}}$$

Risk of road accident associated with the use of drugs: A systematic review and meta-analysis of evidence from epidemiological studies

Rune Elvik, 2012

Accident Analysis & Prevention

Table 6
Summary estimates of relative risk of accident involvement associated with the use of various drugs. Based on meta-analysis.

Drug	Accident severity	Number of estimates	Best estimate of odds ratio[a]	95% confidence interval	Best estimate adjusted for publication bias[a]	95% confidence interval
Amphetamine	Fatal	8	**5.61**	(2.74, 11.49)	**5.17**	(2.56, 10.42)
	Injury	2	**6.19**	(3.46, 11.06)	**6.19**	(3.46, 11.06)
	Property damage	1	**8.67**	(3.23, 23.32)	**8.67**	(3.23, 23.32)
Analgesics	Injury	8	1.06	(0.92, 1.21)	1.02	(0.89, 1.16)
Anti-asthmatics	Injury	6	**1.33**	(1.09, 1.62)	**1.31**	(1.07, 1.59)
Anti-depressives	Injury	20	**1.39**	(1.17, 1.70)	**1.35**	(1.11, 1.65)
	Property damage	5	1.28	(0.90, 1.80)	1.28	(0.90, 1.80)
Anti-histamines	Injury	7	**1.12**	(1.02, 1.22)	**1.12**	(1.02, 1.22)
Benzodiazepines	Fatal	10	**2.30**	(1.59, 3.32)	**2.30**	(1.59, 3.32)
	Injury	51	**1.65**	(1.49, 1.82)	**1.17**	(1.08, 1.28)
	Property damage	4	**1.35**	(1.04, 1.76)	**1.35**	(1.04, 1.76)
Cannabis	Fatal	10	1.31	(0.91, 1.88)	1.26	(0.88, 1.81)
	Injury	15	1.26	(0.99, 1.60)	1.10	(0.88, 1.39)
	Property damage	17	**1.48**	(1.28, 1.72)	**1.26**	(1.10, 1.44)
Cocaine	Fatal	4	**2.96**	(1.18, 7.38)	**2.96**	(1.18, 7.38)
	Injury	3	1.66	(0.91, 3.02)	1.66	(0.91, 3.02)
	Property damage	4	1.44	(0.93, 2.23)	1.44	(0.93, 2.23)
Opiates	Fatal	7	**2.13**	(1.23, 3.72)	**1.68**	(1.01, 2.81)
	Injury	18	**1.94**	(1.51, 2.50)	**1.91**	(1.48, 2.45)
	Property damage	1	**4.76**	(2.10, 10.80)	**4.76**	(2.10, 10.80)
Penicillin	Injury	5	1.12	(0.91, 1.39)	1.12	(0.91, 1.39)
Zopiclone	Fatal	1	2.60	(0.89, 7.56)	2.60	(0.89, 7.56)
	Injury	4	1.42	(0.87, 2.31)	1.42	(0.87, 2.31)
	Property damage	1	**4.00**	(1.31, 12.21)	**4.00**	(1.31, 12.21)

[a] Estimates shown in bold are statistically significant at the 5% level.

Table 6

Summary estimates of relative risk of accident involvement associated with the use of various drugs. Based on meta-analysis.

Drug	Accident severity	Number of estimates	Best estimate of odds ratio*	95% confidence interval	Best estimate adjusted for publication bias*	95% confidence interval
Amphetamine	Fatal	8	**5.03**	(2.74, 11.49)	**5.07**	(2.56, 10.42)
	Injury	2	**6.19**	(3.46, 11.06)	**6.19**	(3.46, 11.06)
	Property damage	1	**8.67**	(3.23, 23.32)	**8.67**	(3.23, 23.32)
Analgesics	Injury	8	1.06	(0.92, 1.21)	1.02	(0.89, 1.16)
Anti-asthmatics	Injury	6	**1.33**	(1.09, 1.62)	**1.33**	(1.07, 1.59)
Anti-depressives	Injury	20	**1.39**	(1.17, 1.70)	**1.35**	(1.13, 1.65)
	Property damage	5	1.29	(0.96, 1.80)	1.29	(0.96, 1.80)
Anti-histamines	Injury	7	**1.12**	(1.02, 1.22)	**1.12**	(1.02, 1.22)
Benzodiazepines	Fatal	10	**2.30**	(1.59, 3.32)	**2.30**	(1.59, 3.32)
	Injury	51	**1.65**	(1.49, 1.82)	**1.57**	(1.08, 1.28)
	Property damage	4	**1.35**	(1.04, 1.76)	**1.35**	(1.04, 1.76)
Cannabis	Fatal	10	1.31	(0.91, 1.88)	1.26	(0.88, 1.81)
	Injury	15	1.26	(0.99, 1.60)	1.10	(0.88, 1.39)
	Property damage	17	**1.48**	(1.28, 1.72)	**1.26**	(1.10, 1.44)
Opiates	Fatal	7	**2.13**	(1.23, 3.72)	**1.68**	(1.01, 2.81)
	Injury	18	**1.94**	(1.51, 2.50)	**1.91**	(1.48, 2.47)
	Property damage	1	**4.76**	(2.10, 10.80)	**4.76**	(2.10, 10.80)
Penicillin	Injury	5	1.12	(0.91, 1.39)	1.12	(0.91, 1.39)
Zopiclone	Fatal	1	2.60	(0.89, 7.56)	2.60	(0.89, 7.56)
	Injury	4	1.42	(0.87, 2.31)	1.42	(0.87, 2.31)
	Property damage	1	**4.00**	(1.31, 12.21)	**4.00**	(1.31, 12.21)

* Estimates shown in bold are statistically significant at the 5% level.

FURTHER COMPLICATIONS

- Did the drug cause the accident?
- Was the driver tested for the drug?
- Were multiple drugs being used at the time?
  - Which ones were tested for?

SOCIAL EFFECTS OF MEDICAL MARIJUANA

- It's complicated
- Background is muddied by tobacco, alcohol, other prescription drugs
- Personal stories….