Legalized Cannabis in Colorado Emergency Departments: A Cautionary Review of Negative Health and Safety Effects

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Cannabis legalization has led to significant health consequences, particularly to patients in emergency departments and hospitals in Colorado. The most concerning include psychosis, suicide, and other substance abuse. Deleterious effects on the brain include decrements in complex decision-making, which may not be reversible with abstinence. Increases in fatal motor vehicle collisions, adverse effects on cardiovascular and pulmonary systems, inadvertent pediatric exposures, cannabis contaminants exposing users to infectious agents, heavy metals, and pesticides, and hash-oil burn injuries in preparation of drug concentrates have been documented. Cannabis dispensary workers ("budtenders") without medical training are giving medical advice that may be harmful to patients. Cannabis research may offer novel treatment of seizures, spasticity from multiple sclerosis, nausea and vomiting from chemotherapy, chronic pain, improvements in cardiovascular outcomes, and sleep disorders. Progress has been slow due to absent standards for chemical composition of cannabis products and limitations on research imposed by federal classification of cannabis as illegal. Given these factors and the Colorado experience, other states should carefully evaluate whether and how to decriminalize or legalize non-medical cannabis use. [West J Emerg Med. 2019;20(4)557–572.]

Changes in past-month cannabis use by year and age group

Timeline of Marijuana Legalization in Colorado

Prior to 2000: illegal to grow or possess marijuana

2000 – 2009: medical marijuana legalized

2010 - 2013: medical marijuana commercialized

2014 to present: recreational and medical marijuana fully regulated and commercialized

Colorado (legalized)

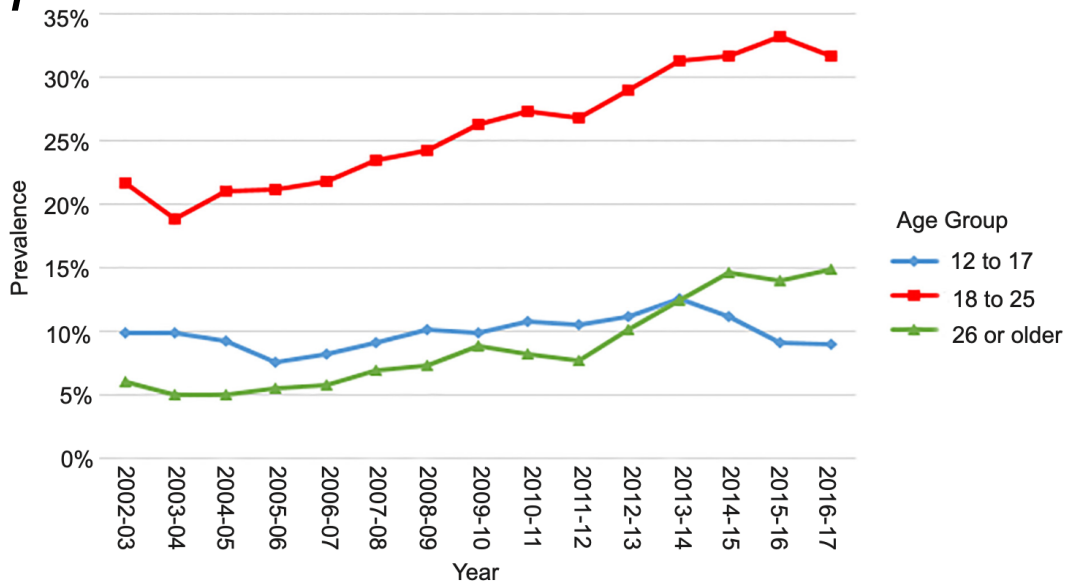

Figure 1. Marijuana use in the past month in Colorado, by age group.
Reproduced from Substance Abuse and Mental Health Services Administration National Survey on Drug Use and Health: State Estimates. Available at: https://pdas.samhsa.gov/saes/state. Accessed November 2018.

Kansas (non-legalized)

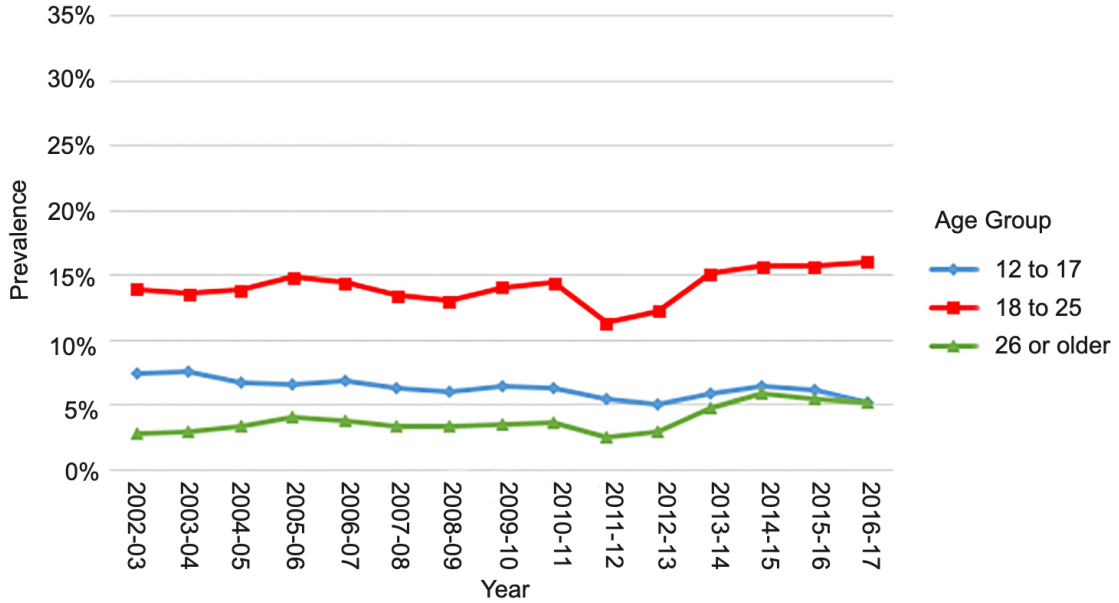

Figure 2. Marijuana use in the past month in Kansas, by age group.
Reproduced from Substance Abuse and Mental Health Services Administration National Survey on Drug Use and Health: State Estimates. Available at: https://pdas.samhsa.gov/saes/state. Accessed November 2018.

ED Visits and Hospitalizations with Marijuana-Related Billing Codes

CDPHE data:
- significant increase in hospitalizations with marijuana diagnostic codes in each phase of legalization

Wang et al. retrospective review of that data:
- prevalence of mental illness 5x higher for ED visits, 9x higher for hospital admissions, for patients with marijuana related diagnostic codes than those without

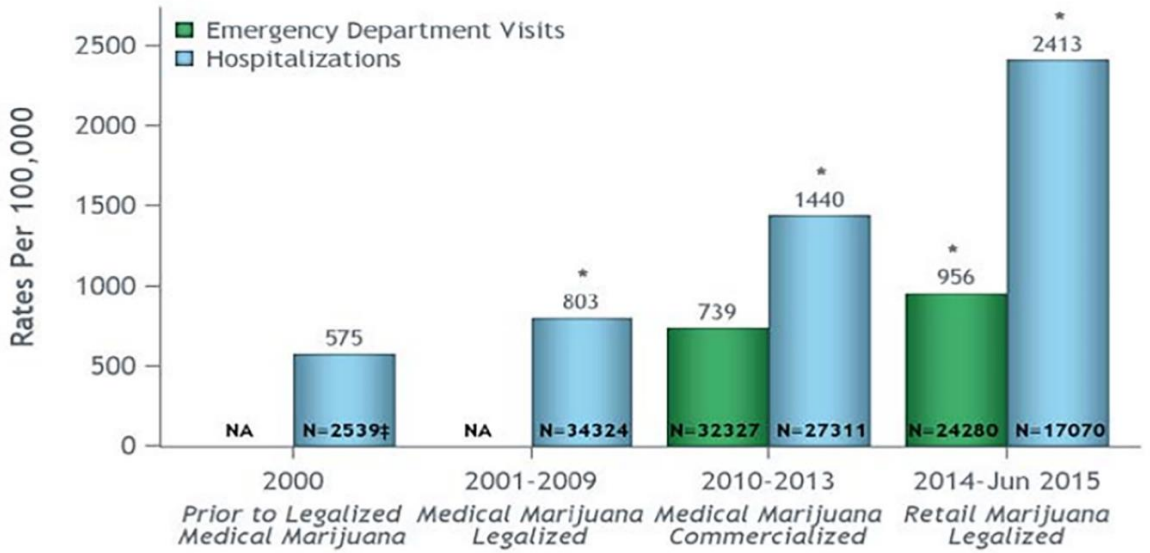

Figure 3. Rates of hospitalizations (HD) and emergency department (ED) visits per year with possible marijuana exposures, diagnoses, or billing codes per 100,000 HD and ED visits, by legalization eras in Colorado.
NA, Data not available.
Data provided by Colorado Hospital Association with analysis provided by Colorado Department of Public Health and Environment.
Note: Data for 2015 covers January 1, 2015 – June 30, 2015. An individual can be represented more than once in the data; therefore, the rate is HD or ED visits with marijuana codes per 100,000 total HD or ED visits.
Reproduced from Marijuana Legalization in Colorado: Early Findings. A Report Pursuant to Senate Bill 13-283. Colorado Department of Public Safety. 2016. Available at: http://cdpsdocs.state.co.us/ors/docs/reports/2016-SB13-283-Rpt.pdf. Accessed March 2018.

Author's sources:
-Marijuana legalization in Colorado: early findings. A report pursuant to Senate Bill 13-283 2016. Available at: https://cdpsdocs.state.co.us/orsdocs/reports/2016-SB13-283Rpt.pdf
-Wang, GS, Hall K, Vigil D, et al. Marijuana and acute health care contacts in Colorado. Prev Med. 2017;104:24-30.

Adolescent ED/UC Visits with Cannabis-Associate Billing Codes

ED and UC visits with cannabis-associated ICD codes or positive urine drug screens for teenagers and young adults have increased; the majority require behavioral health evaluations.

Retrospective review, Wang et al.:

2005-2015 – 4202 visits for patients 13 to <21 to a tertiary care children's hospital
- Behavioral health evaluation was obtained for 2813 (67%)
- Psychiatric diagnosis was made for 2813 (71%)
- ED/UC visits with cannabis-associated ICD codes or + UDS increased 2.7 fold 2009-2015
- Behavioral health consultations increased 2.7 fold 2009 - 2015

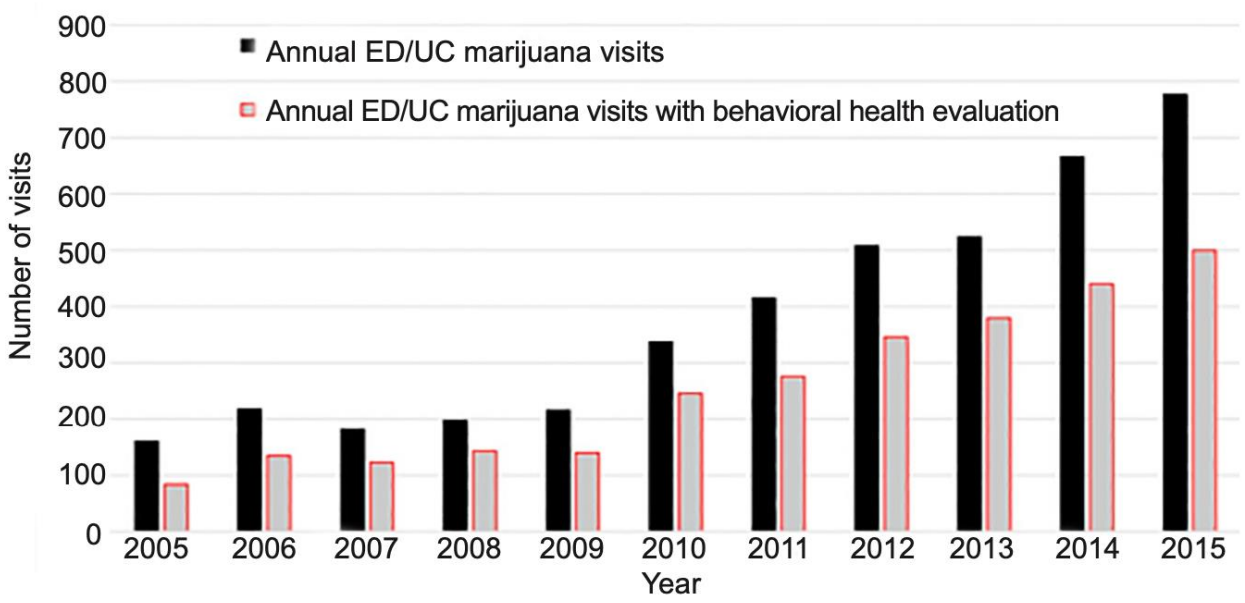

Figure 4. Number of emergency department (ED)/urgent care (UC) visits with cannabis-associated International Classification of Diseases codes or positive urine drug screens by adolescents aged 13 to < 21 to a tertiary-care children's hospital system in Colorado by year.[105]

Author's sources:

-Wang GS, Davies SD, Halmo LS, et al. Impact of Marijuana Legalization in Colorado on Adolescent Emergency and Urgent Care Visits. J Adolesc Health. 2018;63(2):239-41.

-Figure from: Wang GS, Hoyte C, Roosevelt G, et al. The continued impact of marijuana legalization on unintentional pediatric exposures in Colorado. Clin Pediatr (Phila). 2019;58(1):114-6.

Colorado Suicides with Marijuana Present on Toxicology

Data from Colorado Violent Death Reporting System:

- 2004 – 2009: 7.1% of suicides were marijuana positive on toxicology
- 2010 – 2015 (legalization): 12.6% of suicides were marijuana positive on toxicology
- 77.5% increase in proportion of suicide victims with toxicology positive for marijuana

In adolescents in 2016:
- Of 62 suicides with toxicology data available, marijuana was present in 30.6%

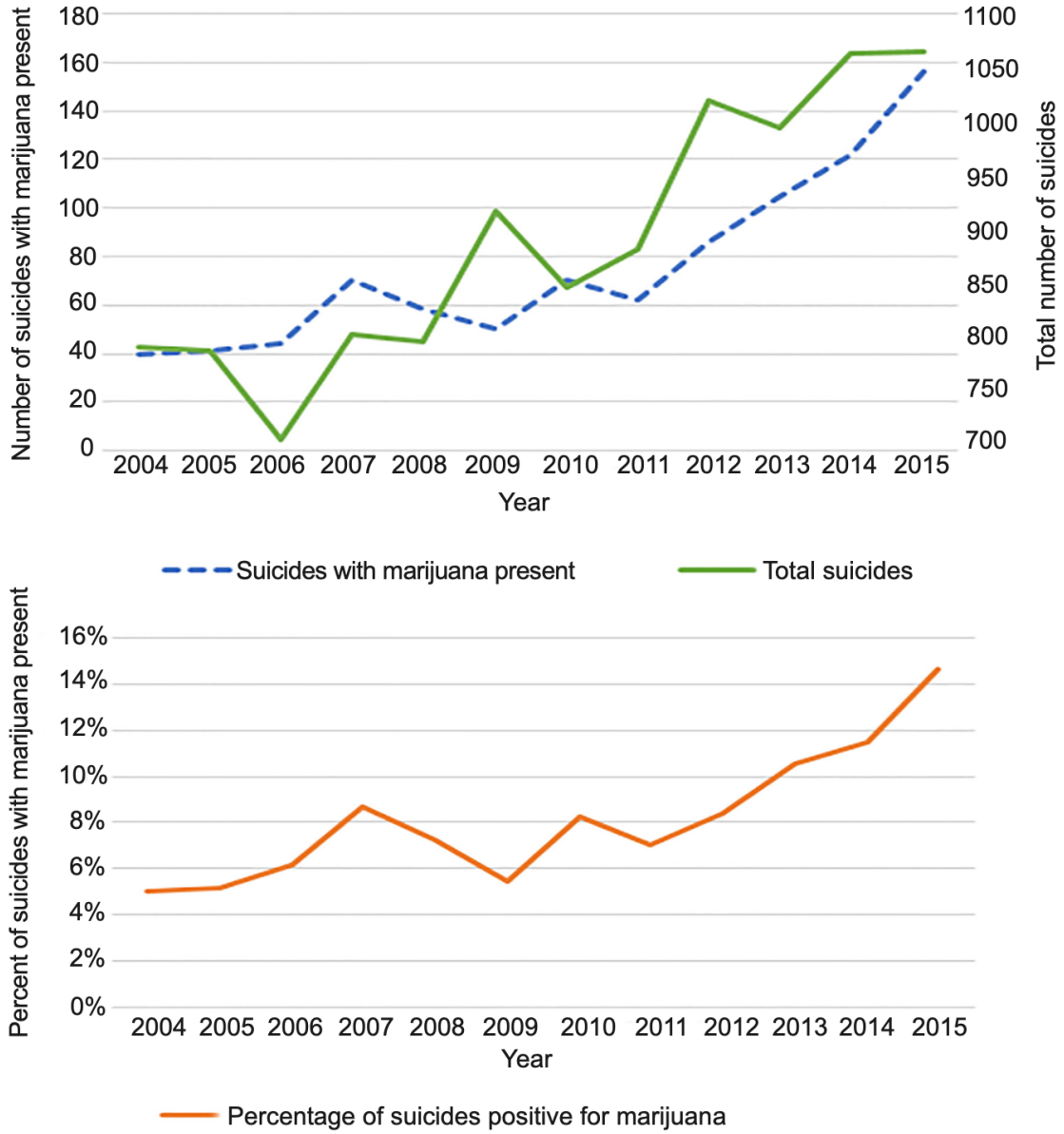

Figure 5. Suicides with marijuana toxicology by year and total suicides by year in Colorado (A). Percent of suicides with marijuana present by year (B).[24]

Author's source:
- Suicides in Colorado: methods, circumstances, and toxicology. Colorado Violent Death Reporting System 2016.

Pediatric Exposures (Age <10 yrs) to Marijuana

Retrospective cohort study of hospital admissions 2009-2015 found:

- Mean rate of marijuana-related visits ages 0-9 increased from 1.2 per 100,000 in the 2 years prior to legalization to 2.3 per 100,000 after
- Median age of exposure was 2.4 years
- Majority exposed to infused edible product (48%)
- 65% were observed in ED/UC
- 21% were admitted inpatient
- 15% were admitted to the ICU
- 2 children required respiratory support

Review of RPC cases:

- Annual RPC cases increased 5 fold from 2009 to 2015
- Colorado had an average increase in RPC cases of 34% per year while the remainder of the US had an increase of 19%

Follow-up study in 2018: despite multiple public health interventions, incidence of hospital visits and RPC calls doubled in 2017 compared to 2016

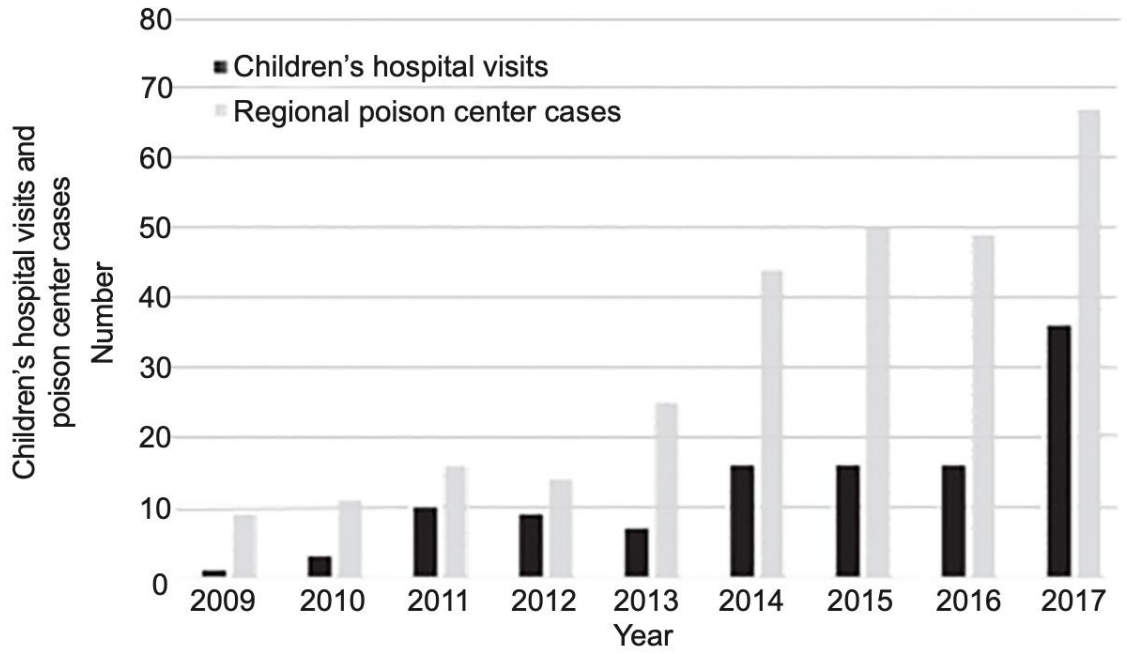

Figure 8: Colorado pediatric marijuana exposures (ages 0-9) to a tertiary-care children's hospital, and regional poison control center cases by year.[105]

Author's sources:

-Wang G, Le Lait M, Deakyne SJ, et al. Unintentional pediatric exposure to marijuana in Colorado, 2009-2015. JAMA Pediatr. 2016;170(9):e160971.

-Wang GS, Hoyte C, Roosevelt G, et al. The continued impact of marijuana legalization on unintentional pediatric exposures in Colorado. Clin Pedatr (Phila). 2019;58(1):114-6.

Additional Health and Safety Concerns

- Cannabinoid Hyperemesis Syndrome:
  - Following legalization, the prevalence of cyclic vomiting presentations to Denver Health and UC Hospital EDs increased 1.92-fold (95% CI, 1.33 to 2.79) in the year after medical marijuana commercialization (in 2010)
  - Patients with cyclic vomiting in the post-liberalization period were more likely to have marijuana use documented than in the pre-liberalization period (OR = 3.59), 95% CI, 1.44 to 9.0)
- Traffic Fatalities
  - Traffic fatalities with blood or urine drug screens positive for cannabinoids have risen across Colorado
  - CDPHE found substantial evidence that recent marijuana use by a driver increases risk of an MVC, and the higher the blood THC level, the higher the risk of an MVC
- Overdose deaths
  - Colorado has had an increase in poisoning and deaths from opioids and methamphetamines since 2010
  - However, this reflects a nationwide trend and the influence of cannabis in Colorado is difficult to discern
- Hash-oil burns
  - Preparation of concentrated THC products (oil, waxes/shatter, dab) has led to fires and explosion injuries in amateur production attempts
  - In Colorado, 29 patients with hash-oil burns were admitted to UC Burn Center 2008-2014, with increasing numbers during medical liberalization and after commercialization
  - The median TBSA burn size was 10% (range 1%-90%), median length of admission was 10 days, 6 patients required intubation and 19 required skin grafting

Author's sources:
-Kim HS, Anderson JD, Saghafi O, et al. Cyclic vomiting presentations following marijuana liberalization in Colorado. Acad Emer Med. 2015;22(6):694-9
-Salomonsen-Sautel S, Min S, Sakai JF, et al. Trends in fatal motor vehicle crashes before and after marijuana commercialization in Colorado. Drug Alcohol Depend. 2014;140:137-44.
-Drugged driving statistics [internet]; c2016, available at www.codot.gov
-Bell C, Slim J, Flaten HK, et al. Butane has oil burns associated with marijuana liberalization in Colorado. J Med Toxicol. 2015;11(4):422-5.