

# Driving Under the Influence of Cannabis (DUIC):

Key information for  
DUIC policy



# Traffic Safety

- More than 35,000 people die annually on our roadways.
- Crashes are the leading cause of death for young people (8 to 24 years).
- Years of life lost from dying prematurely in a crash total more than 1.3 million.
- To reach our vision of zero traffic fatalities, we need to remove all crash factors.

RANK	Cause and Number of Deaths											Years of Life Lost <sup>2</sup>
	Infants Under 1	Toddlers 1-3	Young Children 4-7	Children 8-15	Youth 16-20	Young Adults 21-24	Other Adults			Elderly 65+	All Ages	
							25-34	35-44	45-64			
1	Perinatal Period 11,613	Congenital Anomalies 389	Malignant Neoplasms 360	<b>MV Traffic Crashes 744</b>	<b>MV Traffic Crashes 3,114</b>	<b>MV Traffic Crashes 3,415</b>	Accidental Poisoning 11,231	Malignant Neoplasms 10,909	Malignant Neoplasms 159,176	Heart Disease 507,138	Heart Disease 633,842	Malignant Neoplasms 23% (9,426,319)
2	Congenital Anomalies 4,825	Homicide 329	<b>MV Traffic Crashes 279</b>	Malignant Neoplasms 694	Suicide 2,441	Accidental Poisoning 2,820	Suicide 6,947	Accidental Poisoning 10,580	Heart Disease 111,120	Malignant Neoplasms 419,389	Malignant Neoplasms 595,930	Heart Disease 19% (7,767,386)
3	Heart Disease 292	Accidental Drowning 316	Congenital Anomalies 168	Suicide 663	Homicide 2,027	Suicide 2,798	<b>MV Traffic Crashes 6,281</b>	Heart Disease 10,387	Chronic Liver Disease 22,152	CLRD <sup>5</sup> 131,804	CLRD <sup>5</sup> 155,041	CLRD <sup>5</sup> 5% (1,880,774)
4	Homicide 263	Malignant Neoplasms 273	Accidental Drowning 163	Homicide 307	Accidental Poisoning 1,075	Homicide 2,601	Homicide 4,863	Suicide 6,936	CLRD <sup>5</sup> 131,804	Stroke 120,156	Stroke 140,323	Accidental Poisoning 4% (1,832,709)
5	Septicemia 180	<b>MV Traffic Crashes 249</b>	Homicide 136	Congenital Anomalies 261	Malignant Neoplasms 614	Malignant Neoplasms 747	Malignant Neoplasms 3,704	<b>MV Traffic Crashes 4,652</b>	Diabetes 20,378	Alzheimer's 109,495	Alzheimer's 110,561	Suicide 4% (1,553,110)
6	Influenza/Pneumonia 174	Heart Disease 132	Exposure to Smoke/Fire 70	Heart Disease 202	Heart Disease 352	Heart Disease 607	Heart Disease 3,522	Homicide 2,895	Accidental Poisoning 19,452	Diabetes 56,142	Diabetes 79,535	Stroke 4% (1,528,047)
7	Stroke 89	MV Nontraffic Crashes <sup>4</sup> 88	Heart Disease 61	Accidental Drowning 160	Accidental Drowning 261	Accidental Drowning 210	Chronic Liver Disease 844	Chronic Liver Disease 2,861	Stroke 17,423	Influenza/Pneumonia 48,774	Influenza/Pneumonia 57,062	<b>MV Traffic Crashes 3% (1,349,898)</b>
8	Nephritis/Nephrosis 85	Influenza/Pneumonia 76	CLRD <sup>5</sup> 55	CLRD <sup>5</sup> 135	Congenital Anomalies 181	Congenital Anomalies 159	Diabetes 798	Diabetes 1,986	Suicide 16,490	Nephritis/Nephrosis 41,258	Nephritis/Nephrosis 49,959	Diabetes 3% (1,237,459)
9	<b>MV Traffic Crashes 57</b>	Exposure to Smoke/Fire 73	MV Other/Nontraffic Crashes <sup>4</sup> 43	MV Other/Nontraffic Crashes <sup>4</sup> 91	MV Other/Nontraffic Crashes <sup>4</sup> 101	MV Other/Nontraffic Crashes <sup>4</sup> 129	Stroke 567	Stroke 1,788	<b>MV Traffic Crashes 10,043</b>	Septicemia 30,817	Accidental Poisoning 47,478	Chronic Liver Disease 2% (940,717)
10	Malignant Neoplasms 53	Perinatal Period <sup>6</sup> 45	Influenza/Pneumonia 41	Exposure to Smoke/Fire 69	Accidental Falls 83	Accidental Falls 128	HIV 529	HIV 1,055	Septicemia 8,316	Accidental Falls 28,486	Suicide 44,193	Perinatal Period 2% (922,063)
ALL <sup>3</sup>	23,455	3,376	2,096	4,995	12,461	16,942	51,517	73,088	532,279	1,992,283	2,712,630	All Causes 100% (41,462,779)

## Top 10 Leading Causes of Death in the U.S. (2015).

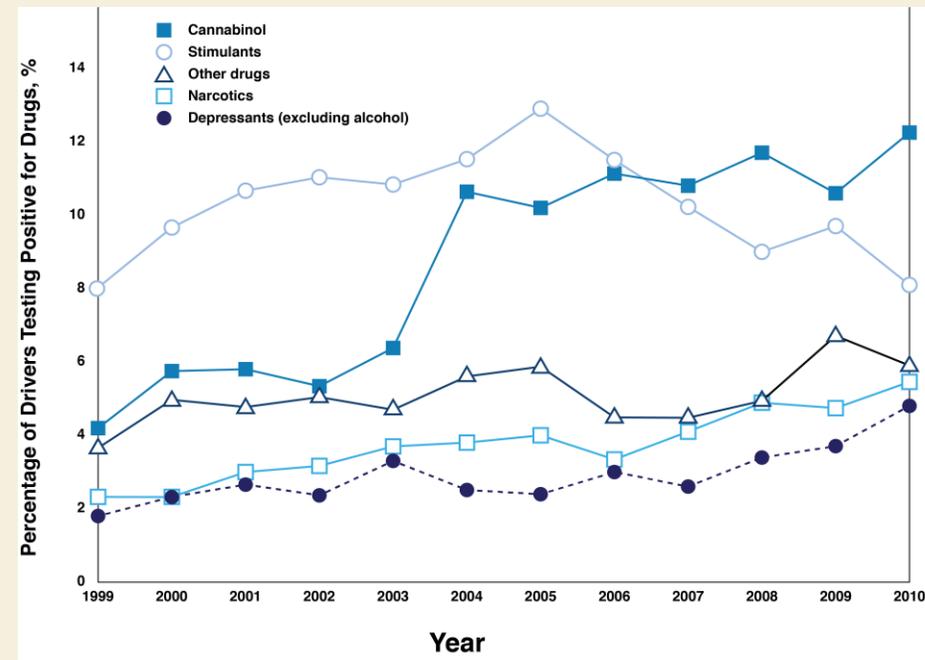
Source: NHTSA (2018). Motor Vehicle Traffic Crashes as a Leading Cause of Death in the United States, 2015. Traffic Safety Facts (DOT HS 812 499). US Department of Transportation. Washington, DC.

# Impaired Driving

- Drugs are now more prevalent in fatally-injured crashes than alcohol.

Source: Governors Highway Safety Administration (GHSA): Drug-Impaired Driving - Marijuana and Opioids Raise Critical Issues for States. <https://www.ghsa.org/resources/DUID18>

- Cannabis is the most common drug detected in fatally-injured drivers.



**Percentage of fatally-injured drivers testing positive for drugs.**

Source: Li, G., Brady, J.E., & Chen, Q. (2013). Drug use and fatal motor vehicle crashes: A case-control study. *Accident Analysis and Prevention*, 60, 205 – 210.

# Complexity

- Understanding the effects of cannabis is complex.
- Many factors influence the timing, duration, and magnitude of impairment resulting from cannabis use:
  - Different methods of consumption
  - Differences in THC potency
  - Differences in use frequency
  - Differences in metabolism rates
- There is also considerable variability in policies, practices, and methods for testing and reporting evidence of cannabis.
- As a result, there is variability and contradictions in the literature.
- To make meaning, we need to consider the “majority” of evidence.

# Cognitive Impairment

- Cannabis causes short (and long-term changes) in how the brain functions.
- These changes can impair the way we think and respond.
- This includes a reduction in our ability to pay attention and process information.

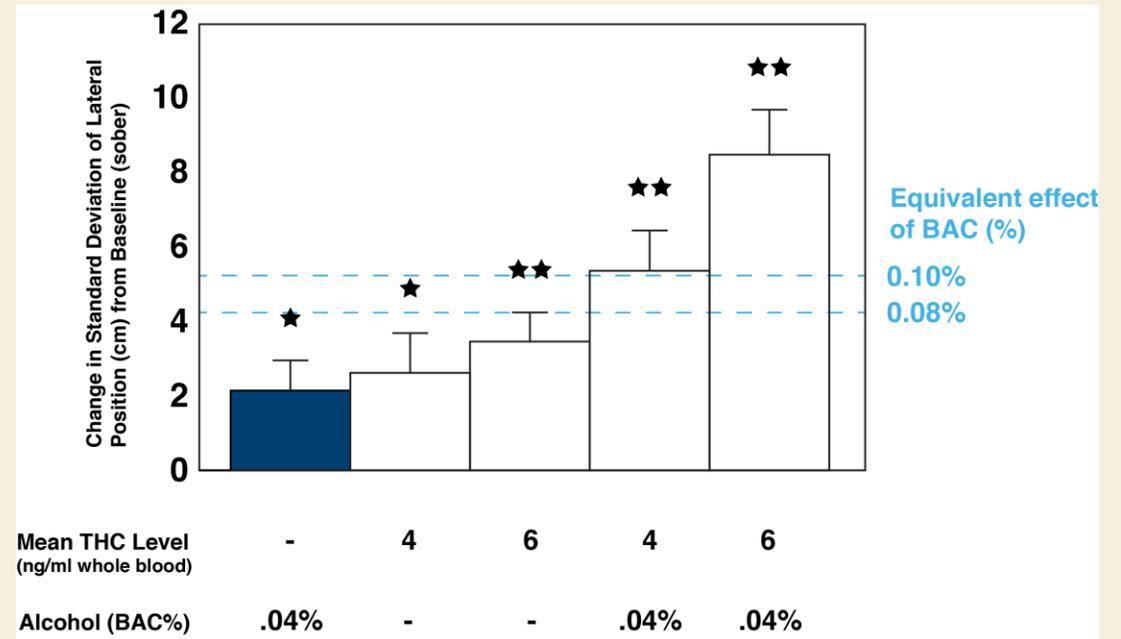
Source: Crean, R.D., Crane, N.A., & Mason, B.J. (2011). An evidence-based review of acute and long-term effects of cannabis use on executive functions. *Journal of Addiction Medicine*, 5(1), 1 – 8.



Source: [www.pexel.com](http://www.pexel.com)

# Driving Impairment

- Cognitive impairment translates to impairment of driving behavior.
- Variability of lateral position is commonly used to measure impairment during real on-road driving studies.
- THC impairs lane control, especially when combined with alcohol.



## Variability of Lateral Position as a Function of THC Level.

Source: Ramaekers, J.G., Robbe, H.W.J., & O'Hanlon, Marijuana, Alcohol and Actual Driving. Human Psychopharmacology, 15, 551 – 558.

# Driving Impairment

- As a result of impairment of cognitive functions and driving ability, cannabis increases the probability that a driver makes an unsafe act (e.g., inattention, speeding).
- Drivers testing positive for THC are more likely to be responsible for crashes, especially when combined with alcohol.

BAC	Predicted Odds	
	THC absent	THC present
0.00	1.07	1.25
0.01	1.19	1.37
0.02	1.32	1.50
0.03	1.46	1.64
0.04	1.61	1.79
0.05	1.78	1.94
0.06	1.95	2.10
0.07	2.13	2.27
0.08	2.32	2.44

**Predicted odds of a driver making an unsafe act in a fatal crash.**

# Trying to compensate for impairment does NOT result in SAFE driving.

- Some users of cannabis believe they are aware of their impairment and can compensate to be safe when driving.
- Some driving tasks do involve awareness (like deciding on a safe speed or car following distance), so drivers could make safer decisions – but they are never safe enough.
- And, many other driving tasks happen automatically without a conscious decision like braking for an emergency.
- Because these happen without awareness, drivers cannot compensate by trying harder – even if they recognize they are impaired.
- As a result, there is no evidence that individuals can compensate enough to be absolutely safe when driving after using cannabis.

# Cannabis and Crashes

- Driving under the influence of cannabis nearly **DOUBLES** the risk of a fatal crash.
- Cannabis is often combined with alcohol, which has a very high risk of a fatal crash.
- Adjusting for age and gender may reduce risk estimates.
  - This **ONLY** means age and gender may represent a greater crash risk than cannabis.
  - This does **NOT** mean there is no risk associated with cannabis.
  - The brains of **BOTH** men and women (of all ages) are affected by THC, so they all have a higher risk of a fatal crash than when sober.

Drug Type	Odds Ratio	95 <sup>th</sup> Confidence Interval
Cannabis	1.83	1.39 – 2.39
Narcotics	3.03	2.00 – 4.48
Stimulants	3.57	2.63 – 4.76
Depressants	4.83	3.18 – 7.21
Any drug (average)	2.22	1.68 – 2.92
Polydrug	3.41	2.43 – 4.73
Alcohol	13.64	11.12 – 16.72
Alcohol + Drug	23.24	17.79 – 30.28

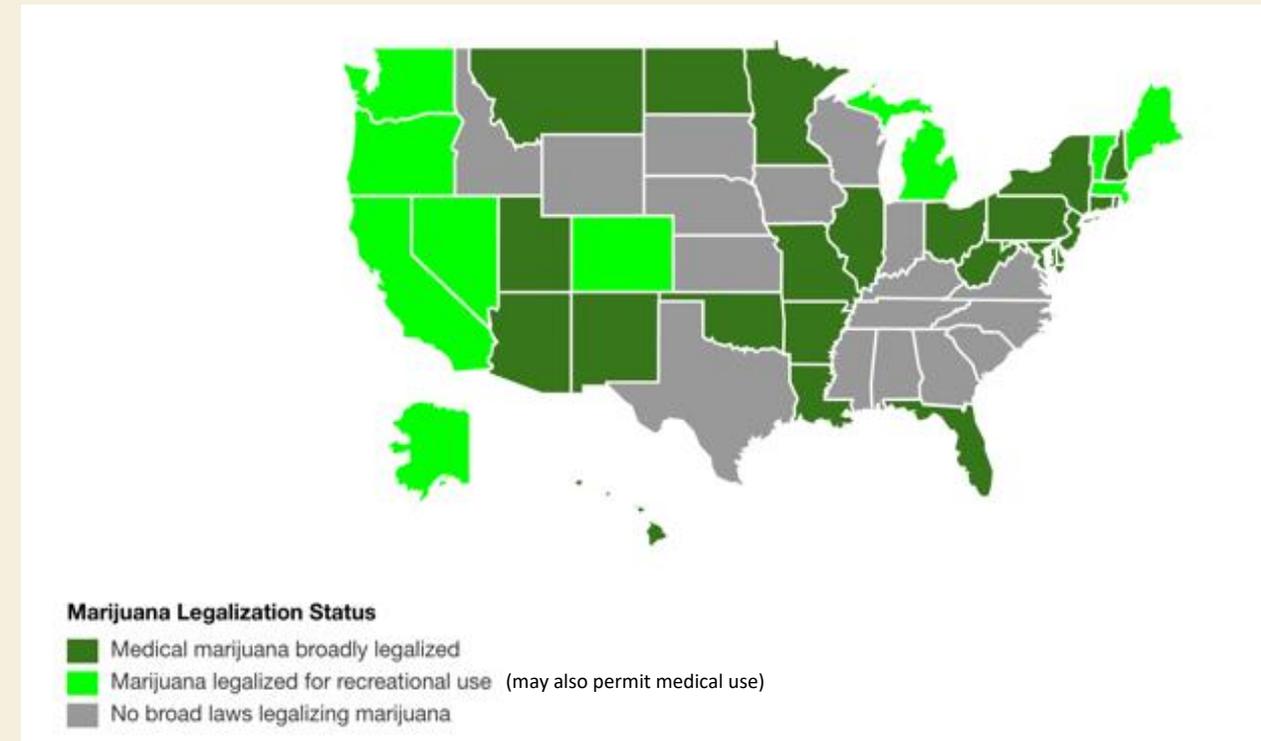
## Predicted odds of a fatal crash by drug type.

Source: Li, G., Brady, J.E., & Chen, Q. (2013). Drug use and fatal motor vehicle crashes: A case-control study. *Accident Analysis and Prevention*, 60, 205 – 210. .

# Cannabis Laws

- Some states have legalized cannabis for recreation or medical purposes.
- Legalization can increase use by expanding access and reducing perceptions of harm.

Source: Cerdá, M., Wall, M., Feng, T., Keyes, K. M., Sarvet, A., Schulenberg, J., ... Hasin, D. S. (2017). Association of State Recreational Marijuana Laws With Adolescent Marijuana Use. *JAMA pediatrics*, 171(2), 142–149.

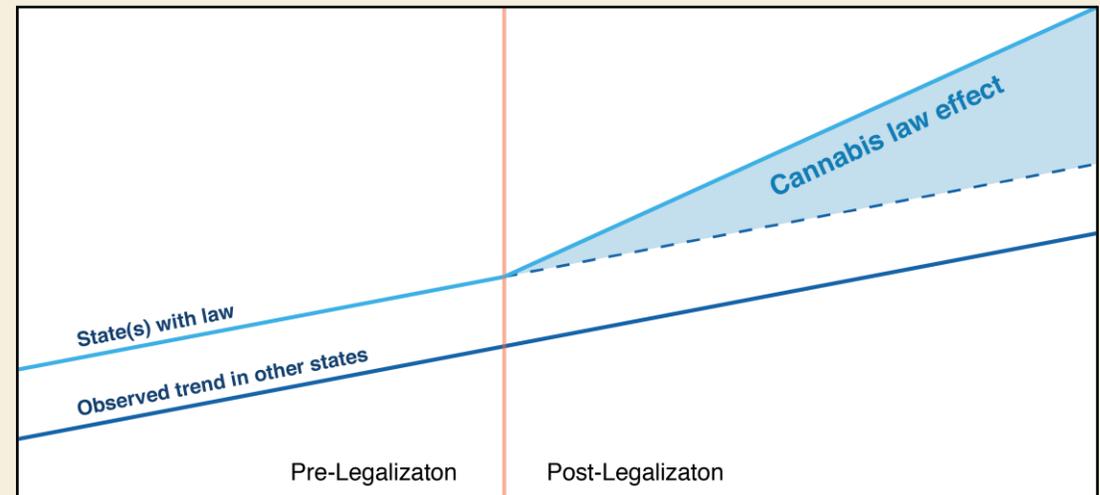


## Status of legalization of cannabis in U.S. States.

Source: Governing (2019). State Marijuana Laws in 2018 Map. Accessed January 31, 2019: <http://www.governing.com/gov-data/safety-justice/state-marijuana-laws-map-medical-recreational.html>

# Legalization Laws

- There is growing interest in the effects of laws that legalize cannabis on traffic safety.
- However, to isolate the effect of these laws, rigorous evaluation methods are needed.
- To date, there are too few states that have been evaluated and over relatively short periods.
- As a result, it is not possible to make definitive conclusions about the effects of such laws on traffic safety.
- More analyses are required with more states and longer post-law periods.



**Rigorous design to evaluate effect of legalization laws.**

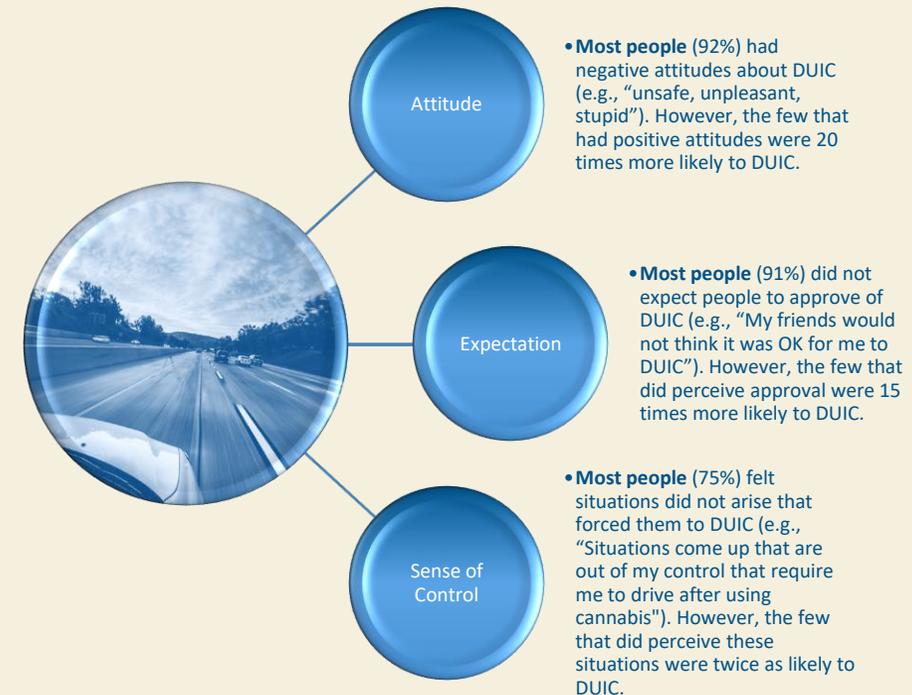
Source: Coyle, D. (2018). Recreational marijuana and traffic fatalities: Sensationalism or new safety concern. Graduate Student Thesis, Dissertation, & Professional Paper. ScholarWorks at University of Montana.

# Conclusion

- Cannabis is a complex drug, which means there are many factors that determine how it affects people.
- Because of this, reported results about the effects of cannabis can vary widely.
- It is therefore necessary to combine results and look for common patterns.
- Cannabis alters brain activity in ways that impair driving and increase crash risk.
- Some people may think they can overcome their impairment and drive safely, but there is no evidence this is true.
- Regardless, DUIC policies should address the risk that most people experience.
- Therefore, laws and policies are necessary to deter and prevent DUIC.
- This will improve traffic safety for everyone, which is necessary for reaching the goal of zero traffic fatalities.

# Culture

- Fortunately, we have a strong traffic safety culture regarding DUIC behavior.
- Most U.S. residents have negative attitudes about this behavior and do not DUIC (> 90%).
- This culture can support strategies across the social environment to reduce DUIC.



## National representative survey about DUIC (n = 879)

Source: Coyle, D. (2018) Otto, J., Finley, K., & Ward, N.J. (2016). An assessment of traffic safety culture related to driving after cannabis use. Montana Department of Transportation. Helena, MT.

# Thank You!

## For more information, please contact:

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Project URL: <https://www.mdt.mt.gov/research/projects/trafficsafety.shtml>



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**Center for  
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