JUST HOW DANGEROUS IS MARIJUANA? A HEALTH RISK COMPARISON OF ALCOHOL, TOBACCO AND MARIJUANA

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The majority of U.S. states have legalized medical marijuana, but the federal government continues marijuana's Schedule 1 designation, identifying it as among the most dangerous drugs. Such a disparity makes Americans wonder about the health risks posed by marijuana, as opposed to the more familiar alcohol and tobacco. This brief looks at the evidence to provide health impact comparisons for alcohol, tobacco and marijuana.

HEALTH RISKS: MARIJUANA VS. TOBACCO

Marijuana has not been studied as long as tobacco, but it has been found to contain similar cell-damaging compounds as tobacco, such as carbon monoxide and tar. Marijuana joints have three to four times the tar of tobacco cigarettes, and users tend to inhale more deeply, using a larger lung volume, which deposits the tar over more lung area. But since marijuana users typically consume one or two joints per day, versus the typical 10-40 daily tobacco cigarettes, less tar is consumed by marijuana users than by tobacco users.[1]

Smoking tobacco has long been associated with lung cancer and other cancers, emphysema and chronic obstructive pulmonary disease. The nicotine in tobacco also contributes to tobacco's carcinogenicity, while smoked marijuana has no nicotine. Combined with lower consumption levels among marijuana smokers, this lack of nicotine is likely why, although both lead to similar respiratory problems of converting respiratory cells to a carcinogenic state, studies have not found a causal link between marijuana and the lung and colorectal cancers that are associated with tobacco. As well, researchers have suggested that marijuana's tumor-fighting compounds mitigate its negative health effects.[2]

Most studies have found that, while tobacco smoke reduces air volume in the lungs,[3] marijuana was found to increase it. A 20-year study of 5,000 marijuana users found that, at typical doses, marijuana was associated with normal or greater lung capacity, and was not associated with lung disease or emphysema.[4]

The Schedule 1 designation of marijuana has hampered research and made broad study of its effects challenging. Most research does not include very heavy smoking of marijuana, which researchers expect to offset marijuana's more benign effects, and contribute to bronchitis and other lung problems.[5] Still, the fact that marijuana smokers smoke so much less product than tobacco users has led to findings that marijuana is less dangerous than tobacco.[6]

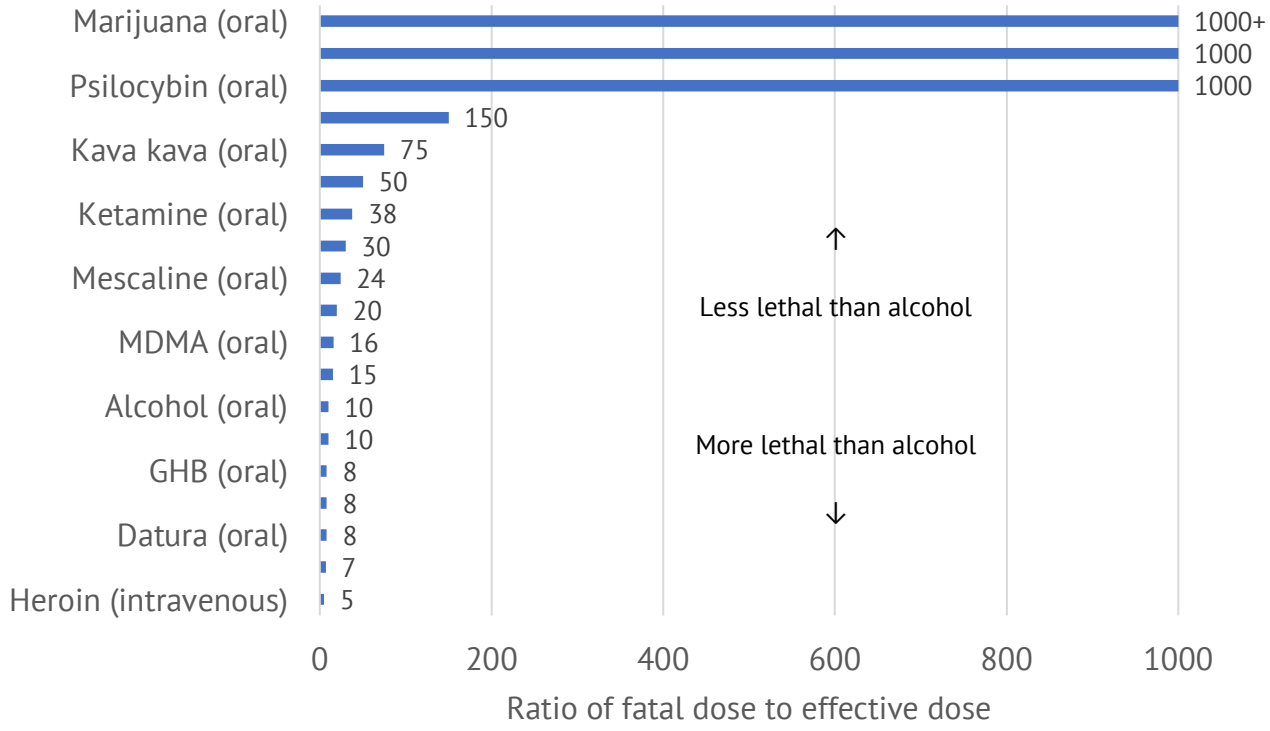
MARIJUANA VS. ALCOHOL: LETHAL DOSES

Most of the time marijuana is smoked, but ingesting marijuana's psychoactive compound, tetrahydrocannabinol (THC), without smoking—typically in edibles, oils or via vaping—eliminates most respiratory dysfunctions associated with a smoked drug. Orally ingested marijuana's health effects are more easily compared with alcohol.

As many fraternity hazings can attest to, one can easily die of binge alcohol drinking. Indeed, 88,000 annual U.S. deaths are caused by overdoses of alcohol, most often due to binge drinking,[7] with zero fatal overdoses by marijuana.[8] Determining why this occurs has led researchers to establish lethal doses of psychoactive drugs.

A 2006 study calculates the fatal dose of many psychoactive drugs in widespread use as a multiple of effective doses (the dose most commonly used to achieve desired effects). With a fatal dose of 10 times the effective dose, alcohol is vastly more lethal than marijuana (at 1,000 times the effective dose).[9] As Figure 1 shows, cannabis is one of the least lethal drugs.

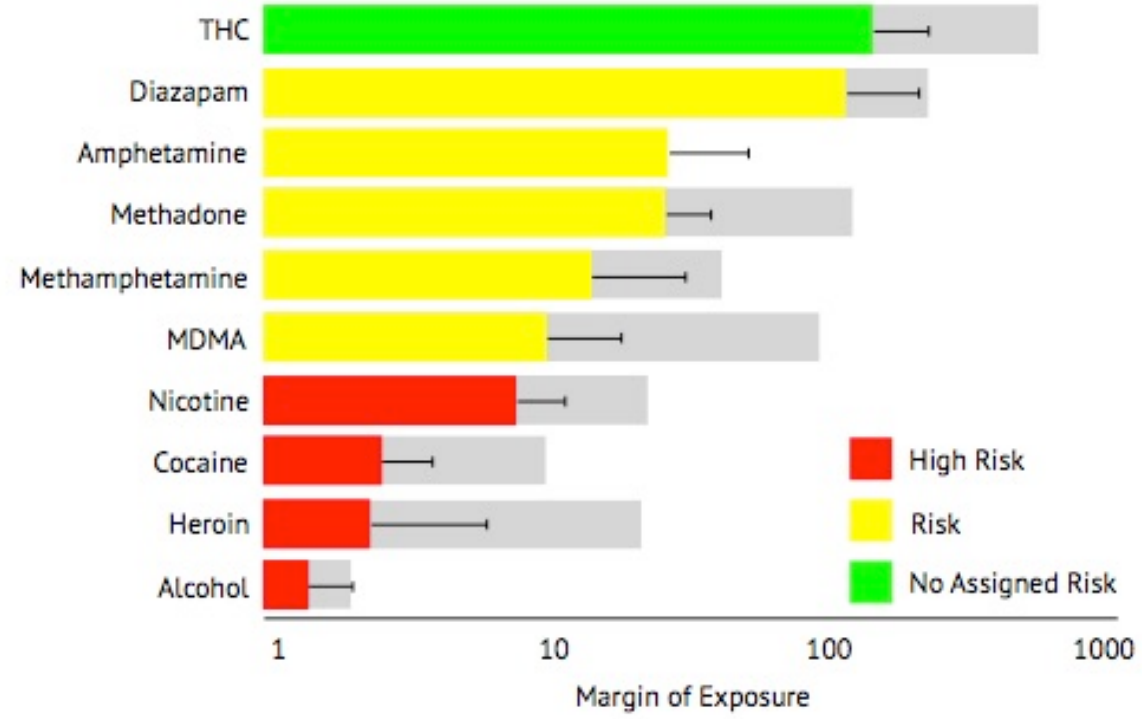
FIGURE 1: LETHAL DOSES OF PSYCHOACTIVE SUBSTANCES



Source: Gable, Robert S. "The Toxicity of Recreational Drugs." *American Scientist*. May 2006.

A more recent study takes a "margin of exposure" approach as a ratio of lethal dose to human estimated doses—the dose normally taken by a user to achieve psychoactive effects—to assign risk levels to various substances. While alcohol and nicotine fall into the "high risk" category (<10), and other substances are considered a risk (<100), THC is not assigned a risk category at all.[10]

FIGURE 2: RISK ASSESSMENT FOR PSYCHOACTIVE DRUGS AS A RATIO OF LETHAL DOSE TO AVERAGE HUMAN INTAKE



Source: Adapted from Lachenmeier, Dirk W. and Juergen Rehm. Comparative risk assessment of alcohol, tobacco, cannabis and other illicit drugs using the margin of exposure approach. *Scientific Reports*. Jan 13, 2015. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4311234/

Researchers estimate that it is nearly impossible to ingest the amount of THC that would constitute a lethal dose. This is probably why no fatalities have been attributed to humans ingesting marijuana by smoking, edibles, or any other means of consumption. A study comparing the health effects on the brain of alcohol and cannabis concluded that: "...while marijuana may also have some negative consequences, it definitely is nowhere near the negative consequences of alcohol."[11]

LONG-TERM HEALTH RISKS OF ALCOHOL VS. MARIJUANA

The long-term health risks of alcohol use have been thoroughly studied. Long-term chronic use is associated with alcohol liver disease, pancreatitis, heart problems, degeneration of the nervous system, fetal alcohol syndrome (in fetuses of pregnant women alcohol users) and other serious problems.

The current scant research of long-term marijuana use health risks finds a link between heavy use of marijuana and a predisposition to psychosis in some individuals.[12] As well, recent studies have connected heavy use of marijuana in adolescents with interference of development of the brain.[13] More studies are needed to fully explore the effects of chronic marijuana use.

HEALTH BENEFITS OF ALCOHOL, TOBACCO AND MARIJUANA

While these substances are often associated with health risks, some studies document health benefits as well, but these must be balanced against the risks.

Alcohol: In moderate drinkers, research finds some possible cardiovascular beneficial effects, but dramatically increased risk of several cancers.

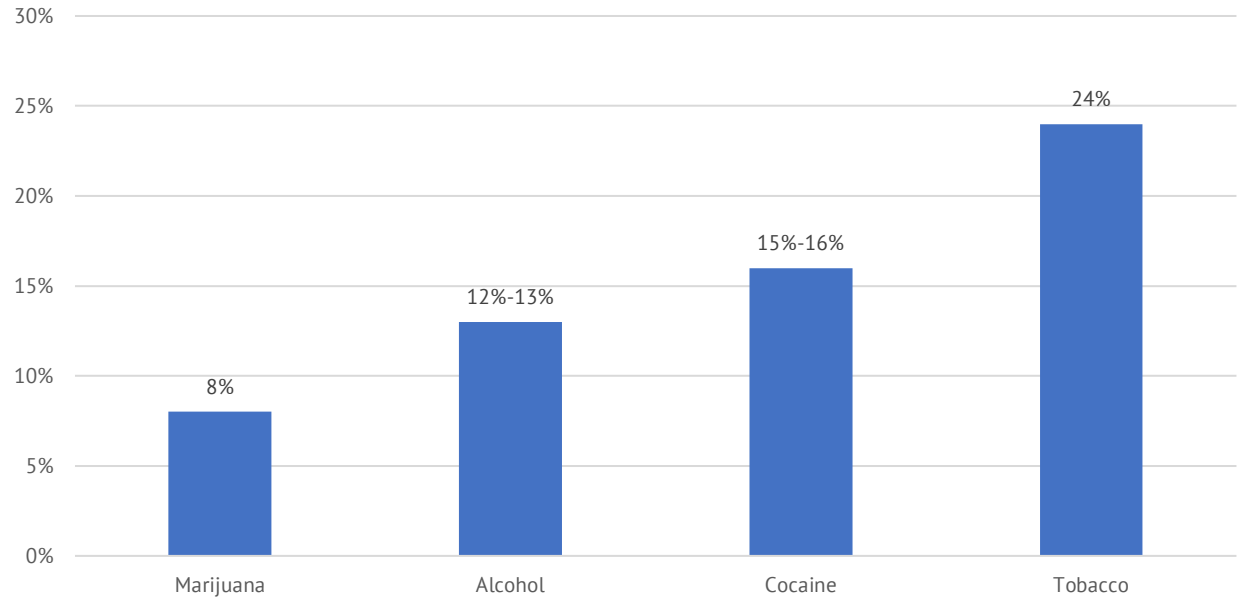
Tobacco: Tobacco smoking is the leading avoidable cause of mortality and morbidity in most industrialized countries. Tobacco that is not smoked, however, may have some tenuous health benefits, largely related to countering the carcinogenic effects of estrogen, specifically in endometrial cancer, and some possible neuroprotective effects in Parkinson's disease, but more study in this area is needed to identify the causal factor—if there is one—as tobacco or nicotine specifically. At any rate, any possible benefit is likely to be overwhelmed by the rich source of broad spectrum carcinogens in smoked tobacco and its well-documented damaging cardiovascular effects, such that tobacco cannot be considered as beneficial to health.[14]

Marijuana: Unlike alcohol and tobacco, compounds in marijuana have been linked to many medical therapies, leading to the legal use of medical marijuana in 31 states and Washington, D.C. Therapies range from an appetite stimulant for chemotherapy, cancer and other treatments to counteracting epileptic seizures, and mitigating effects on Crohn's disease, glaucoma, multiple sclerosis and other pathologies.[15]

ADDICTION

Drug use hazards are often viewed in their capacity for addiction. Researchers have studied several drugs to determine the percentage of users who had become dependent on them within 10 years of first use, finding marijuana less addictive than tobacco or alcohol.[16]

FIGURE 3: PERCENTAGE OF USERS DEPENDENT ON DRUG 10 YEARS AFTER FIRST USE (% OF USERS)



Source: Wagner, Fernando A. and James C. Anthony. April 1, 2002. *Neuropsychopharmacology*. "From First Drug Use to Drug Dependence: Developmental Periods of Risk for Dependence upon Marijuana, Cocaine, and Alcohol. 26. 479-488; For 24% tobacco: Anthony, James C., Lynn A. Warner and Ronald C. Kessler. "Comparative epidemiology of dependence on tobacco, alcohol, controlled substances, and inhalants: Basic findings from the National Comorbidity Study." *Experimental and Clinical Psychopharmacology*. 2(3). August 1994. 244-268.

CRASH RISK FOR IMPAIRED DRIVERS UNDER THE INFLUENCE OF ALCOHOL VS. MARIJUANA

For psychoactive drugs, such as alcohol and marijuana, risks go beyond the user to the general public. The most compelling and directly relevant research puts dosed drivers on simulators or closed driving courses to compare their driving with sober drivers. These studies find both groups of drivers to be impaired, with slower reaction times and difficulty operating a vehicle.[17] Consistently, studies find alcohol-impaired drivers tend to drive faster and more recklessly. Marijuana-impaired drivers, in contrast, tend to drive below the speed limit, likely compensating for slowed reaction times and other impairment.[18]

Other studies compare the statistics of fatal crashes for drug-impaired and sober drivers to calculate a fatal crash risk. Perhaps due to the more cautious driving of marijuana-impaired drivers, they find alcohol-impaired drivers to have many times the fatal crash risk of marijuana-impaired drivers.[19] Such a result has led to the conclusion by researchers that alcohol-impaired driving is vastly more dangerous than marijuana-impaired driving.[20]

TABLE 1: FATAL CRASH RISK OF ALCOHOL- VS MARIJUANA-IMPAIRED DRIVERS

(According to alcohol and drug testing results, the continental United States, selected time periods on Fridays and Saturdays, July 20 through December 1, 2007, where 1.00=no increased risk compared to sober drivers)	
MARIJUANA ONLY	1.83 X the risk to sober drivers
ALCOHOL ONLY	13.64 X the risk to sober drivers

Source: Li, Guohua, Joanne E. Brady and Qixuan Chen. "Drug use and fatal motor crashes: a case-control study." *Accident Analysis and Prevention*. 2013. 60. 205-210. Tables 3 and 4. https://www.cuinjuryresearch.org/wp-content/uploads/2013/10/Li-et-al-AAP-2013.pdf?version=meter+at+5&module=meter-Links&pgtype=article&contentId=&mediaId=&referrer=&priority=true&action=click&contentCollection=meter-links-click, or https://www.ncbi.nlm.nih.gov/pubmed/24076302

Most studies find that marijuana-only impaired drivers are the minority: research consistently finds just over half of arrested marijuana-impaired drivers are also alcohol-positive.[21] Some studies find an additive effect of the two substances, and some find a synergistic effect, with both drugs combined being more impairing than either one alone. Given the disparity in the crash risk calculations, it's likely that the risk of crash is associated more closely with a driver's alcohol content than his marijuana content.

CONCLUSION

While alcohol and tobacco have little if any redeeming value for health, marijuana has proven therapeutic value and is currently in use across a wide range of pathologies. Illogically, both alcohol and tobacco are legal in all 50 states, whereas marijuana legalization and public acceptance is highly contested. For example, marijuana is still considered a "Schedule 1" drug, meaning it is considered highly addictive and of no medical use, despite evidence to the contrary. It is likely that historical negative cultural dispositions toward marijuana, compared to the more socially accepted and widely used alcohol and tobacco, have skewed public attitudes. A review of the data shows marijuana to be less hazardous to health overall than both alcohol and tobacco. Public attitudes and government policy should reflect what studies demonstrate are the actual health risks of marijuana, tobacco and alcohol.

ABOUT THE AUTHOR

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For more on cannabis policy, see reason.org/topics/drugpolicy

ENDNOTES

1 Melamede, Robert. "Cannabis and tobacco smoke are not equally carcinogenic." *Harm Reduction Journal*. Oct. 18, 2005. 2. 21. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1277837/

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3 Measured as "forced expiratory volume" in the first second of expiration (FEV_1) and "forced vital capacity" (FVC).

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