

Brief Review of the Effects of Recreational Marijuana Legislation on Academic Student Performance, Crime and Driving Accidents

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Introduction

The effects of Recreational Marijuana Legislation (RML) have raised some concerns about detrimental consequences among lay individuals but also some professionals and scientists. However, some of these concerns that RML would, for instance, increase the use of marijuana and other substances and would lead to more marijuana abuse problems did not materialize as the use of marijuana and other substances such as smoking and alcohol did not increase significantly after RML but actually might have decreased slightly. Similarly, the incidence of Cannabis Use Disorder or CUD did not increase markedly but again might actually have declined slightly [1].

However, other concerns still exist as to negative effects of RML on the academic performances of students in schools and universities, on crime and in particular car driving problems such as accidents and deaths. This review tries to answer some of these questions by citing and interpreting a number of representative and pertinent studies obtained from PUBMED and reputable internet websites like those ending in edu., org and gov. The search questions were, for instance, like: recreational marijuana legislation and academic performance --- or crime --- or traffic accident and deaths.

Academic School and College Performance after RML

A large number of studies have amply demonstrated that marijuana per se affects detrimentally many cognitive functions and can significantly interfere with school and later on college performance. For instance, it has been well established that active adolescent users of marijuana perform worse than their peers on tests of memory, attention, learning, and planning. Critical factors in this pathological process are the time of onset, dose and duration with early onset, high doses and longer durations intensifying the pathological consequences. Of course, there are also genetic and environmental factors to be considered which mean that individuals are differently affected. Thus, these detrimental cognitive effects will be more marked in some and less marked in others. Fortunately, prolonged abstinence from marijuana has been shown to ameliorate some of these detrimental effects [2-9].

The effect of RML on school performance up to the end of High School is basically a mute point since recreational use is only

allowed at and after age 21. Thus, very few studies are available which compared school performance before and after RML or between states with and without RML. Nevertheless, some data from Colorado (legal 2012) showed that school suspensions spiked between 2013 and 2014 but then declined significantly until 2016. This was accompanied by an overall decrease in expulsions of 25 percent. The four year graduation rate rose from 79% in 2017 to 82% in 2020. The dropout rate fell from 2.2% in 2016 to 1.8% in 2020. In Oregon (legal 2015) the graduation rate has hit 80%, an all-time high, which represents an increase of 600 students in the Class of 2019 who received a diploma as compared to 2018. A comparison of 4 states with and without RML showed that the percentages of 8th grade math proficiency, 8th grade reading proficiency, graduation and high AP scores did not differ significantly: 35 vs. 35, 38 vs. 32, 80 vs. 85 and 32 vs. 36. The SAT math scores in the USA increased from 515 in 2010 to 528 in 2020 in spite of the increasing number of states with RML. In Colorado alone, the SAT scores increased from 944 in 2016 to 1001 in 2019. In 2020, the total SAT scores for the RML states Alaska, Colorado, Oregon, California and Washington were 1098, 1012, 1104, 1049 and 1073 with an average of 1072 while non-RML states like Connecticut, Delaware, Florida, North Carolina, New York, Indiana, Georgia, Texas and Rhode Island had scores like 1039, 979, 992, 1096, 1058, 1074, 1049, 1053 and 990 with an average of 1036 [10-17].

Similarly, the literature offers few scientific data or papers on the impact of RML on college students' academic performances. One study found that after legalization the G.P.A. of daily marijuana users was not different from that of non users among college students in Colorado. Another study found that the four year graduation rates have increased while dropout rates have decreased since RML started in Colorado. The 6 year graduation rates held steady at 73%. This is higher than the national average. The undergraduate graduation rate in Washington (legal 2012) in 2019 was about 38% for the first 4 years which is about the national average. Graduation after 6 years was about 64% which is better than the national average. Similarly, graduation rates in Oregon rose over the last years and were 76% in 2017 and 79% in 2018. The University of Colorado at Boulder reported that average cumulative G.P.A. scores were slowly rising from 3.04 in 2010 to 3.15 in 2019 [18-21].

While excessive use of marijuana is well known to affect scholarly performance in most users, the data on RML available, however, do not show that RML had a significant deleterious effect if it had an effect at all on school performance and college achievements.

Crime after RML

Another concern is that RML might affect public safety by raising crimes not only in states with RML but also in neighboring states where marijuana is still illegal. Generally, the effects of marijuana per se on various criminal activities (not associated with obtaining it illegally) are unclear and have been rarely studied. A paper in 2013 from the White House, however, stated that there is a strong link between marijuana use and crime. Eighty percent of the adult males arrested for crimes in Sacramento, Calif., last year tested positive for at least one illegal drug. Marijuana was the most commonly detected drug, found in 54 % of those arrested. Another study found similar results in four other cities: New York, Denver, Atlanta and Chicago. A study of about 400 boys who were born around 1953 and were followed for 50 years found that participants who never used cannabis were never reported to have shown any violent behavior. However, 20% of the boys who started using pot by age 18 were reported for violent behavior later on. It was concluded that continued use of cannabis over the lifetime of the study was the strongest predictor of violent convictions later on [22-25].

However, the concerns here are did RML increase any type of criminal behaviors. Some initial studies found that there is indeed an increase in the crime rate after RML. A 2015 report by the Rocky Mountain High Intensity Drug Trafficking Area Program Property showed that in Denver violent crime increased 6.7 %, all crimes increased 6.2 %, crimes against persons increased 7.5 percent and crimes against property increased 6 % after RML. However, the report finished by saying “This is not to infer that the data is due to the legalization of recreational marijuana”. Similarly, the *Journal of Criminal Justice* reported in 2021, a crime-exacerbating effect of recreational marijuana legalization, as reflected by substantial increases in the rates of multiple types of serious crimes in Oregon after RML relative to non-legalized states. These included property and violent crimes overall, as well as other crimes such as burglary, motor vehicle thefts, larceny, and aggravated assaults. For instance, property crimes and auto thefts were recorded for Oregon vs. comparable non-legal states in 2015 as 2631 vs. 2165 and in 2017 as 316 vs. 128 (per 100 000) [26,27].

In contrast, researchers from the universities in Washington and Utah compared monthly crime rates in Colorado and Washington to crime rates in 21 states that had not legalized recreational marijuana use. Crime rates came from the FBI’s Uniform Crime Report from 1999 to 2016. The study found no statistically significant long-term effects of recreational cannabis laws on the initiation of violent crimes, auto theft or property crime rates in either Colorado or Washington, with the exception of a decline in burglary rates in Washington. A second report found that the violent crime rate had declined and the overall crime rate had remained at a 40-year level in the State of Washington after RML. Here, violent crime had actually declined by 10% between 2011 and 2014, including a 13% decrease in the murder rate. During the same period, burglaries decreased by 6 %, and overall property crime rates remained steady across the state. A study combining yearly county-level difference-in-differences found that RML caused a significant reduction in rapes and property crimes in Washington and Oregon relative to the pre-legalization years 2010-2012. A 2018 study published in *Justice Quarterly* using a complicated quasi-experimental, multi-group interrupted time-series design to determine crime rates in Colorado and Washington concluded that recreational marijuana

legalization and sales had a minimal to no effect on major crimes in these states. Also, no statistically significant long-term effects of recreational cannabis laws and the initiation of retail sales on violent or property crime rates in these states were observed. A survey, interestingly coming from a University in Italy, found that legalization of recreational marijuana in Oregon and Washington had not increased investigated crime rates. On the contrary, it was found to have reduced rapes by between 15% and 30% and thefts by between 10% and 20% [28-32].

Another public concern is that RML in one state may affect crime in neighboring states that have not yet legalized marijuana. Based on a Uniform Crime Report (UCR), data from 2003 to 2017 suggest actually a spillover crime reduction effect of legalization, as reflected by significant decreases in the rates of property crime, larceny, and simple assault in the six states neighboring Colorado [33].

When considering the effects of RML on crime it is important to consider the year in question. For instance, the Departments of Safety and Justice of the State of Colorado found for the city of Denver that in the years from 2012 to 2017 thefts rose initially from 24 (per 100 000) to 43 and then decline markedly to 21 in 2017. Thus, both a negative or positive effect can be assumed based on the years in question. It is also important to specify which crime is being investigated. For instance, a comparison of crimes in Oregon with non-legal States showed the following statistics: violent crimes 260 vs. 261, property crime 2636 vs. 2161, robberies 29 vs. 35, aggravated assaults 139 vs. 194, burglaries 500 vs. 554 and auto thefts 184 vs. 128. While some crimes were similar while others were higher or lower in Oregon [34,35].

Thus, the overwhelming evidence points to the fact that RML did not significantly increase crime in general and actually might have decreased some crimes in particular.

Traffic and Driving Problems after RML

One of the most important concerns, however, is the effect of RML on driving safety and traffic accidents. The active ingredient in cannabis is tetrahydrocannabinol or THC, which is known to affect a person’s driving skills. A fair number of studies have shown that THC slows reaction time and ability to make quick decisions, to impair coordination, distort perception and lead to difficulty in problem-solving. All of these are necessary to drive a car safely. Of course, the impairment experienced depends on the individual and the dose and time marijuana has been smoked or ingested. At present, there is no quick test for THC (like for alcohol) albeit some prototypes are under development. Furthermore, there are no established safe driving levels of THC and laws about such levels vary from State to State [36-38].

Again, this review focuses only on the effects of RML on possible driving problems. A summary report of the Governors Highway Safety Association issued the following warning that fatal crashes involving marijuana increased in both Colorado and Washington after RML. Roadside surveys in Washington conducted immediately before and 6 and 12 months after legal sales showed that the proportion of THC-positive drivers increased from 14.6% to 19.4% and then to 21.4%, though the increases were statistically not significant. Marijuana-related traffic deaths increased 66% in the four-year average (2013- 2016) since Colorado legalized recreational marijuana compared to the four-year average (2009-2012) prior to legalization. During the same time period, all traffic deaths increased 16%. In 2009, 9% of traffic fatalities involved drivers who tested positive for marijuana. By 2016, that number more than doubled to 21%. Analysts from the

Insurance Institute for Highway Safety and the Highway Loss Data Institute (HLDI) found that the frequency of collision claims per insured vehicle/year rose a combined 6% following the start of retail sales of recreational marijuana in Colorado, Nevada, Oregon and Washington, compared with the control states of Idaho, Montana, Utah and Wyoming. This combined-state analysis was based on collision loss data from January 2012 through October 2017. A separate HLDI study examined police-reported crashes before and after retail sales began in Colorado, Oregon and Washington from 2012 to 2016. It was found that the three states combined saw a 5.2 percent increase in the rate of crashes per million vehicle registrations compared with neighboring states that didn't legalize marijuana sales [39-43].

In contrast, a paper published in ADDICTION in 2019 compared Colorado, Washington and Oregon with nine neighboring jurisdictions. There was a pooled step increase of 1.08 traffic fatalities per million residents followed by a trend reduction of -0.06 per month. However, these effects were similar in both RML states and in the neighboring non-legalizing states. This suggests a temporary increase followed by a decrease in traffic fatalities but with no significant difference between states with and without RML. A 2017 study published in the American Journal of Public Health found that three years after recreational marijuana legalization, changes in motor vehicle crash fatality rates for Washington and Colorado were statistically not different from states without recreational marijuana legalization. The Colorado Departments of Public Health and Safety released the following fatal accident figures of 359, 335, 388 and 335 from years 2014 to 2017. These data suggest that fatal accidents did not change significantly during the 4 year period following RML [44-46].

To explain some of the conflicting reports, it is important to look at the design of the studies and their conclusions. First, all correlation studies do not imply causality or that increases in traffic accidents were caused by RML. For instance, accidents increased in RML states Colorado and Washington, by 92% and 28% as compared to non RML states. When these big increase were tested for causality – did RML indeed cause these increases - then it was found that changes were similar for both RML and non-RML states. Thus, RML was not responsible for the observed marked increases in the traffic accidents. Second, time periods chosen are critical for any interpretations. For instance, it is reported that fatal traffic accidents rose in Colorado from 434 in 2012 to over 507 in 2017 implying an increase after RML. However, using previous years when marijuana was still illegal showed the following numbers for fatal accidents: 677 in 2002, 569 in 2003 and 569 in 2004. Thus, both an increase and no change can be postulated depending on the years chosen. Third, often different trends are reported in states which all have RML. For instance, officials in Colorado have seen a decrease in marijuana-impaired traffic fatalities after RML, while officials in Washington which legalized at the same time saw a spike in the number of fatally injured drivers. If RML is involved, both states should have experienced the same trends. Fourth, sometimes, available data seem to go into opposite directions when the effects of RLM on traffic accidents are evaluated. The Washington State Department of transportation reported that fatal crashes after RML increased slightly from 498 in 2015 to 523 in 2020. However, at the same time, teenage involvement in all crashes which would be expected to have increased actually decreased from 17500 to 11000 [47-54].

In conclusion, results and conclusions of the effects of RML on traffic problems are controversial. However, it can be posited if the effects of RML on traffic problems would have been quite marked, then all studies would have been in agreement which is not the case. Thus, it can be safely concluded that detrimental effects of RML on traffic safety issues must have been minimal if they existed at all [55-63].

Conclusion

This brief review shows that the effects of Recreational Marijuana Legislation or RML on the academic performance of pupils or student, crime rates and traffic accidents were minimal if they existed at all.

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