# MARIJUANA USE AMONG DRIVERS IN CANADA, 2000-2016

*Traffic Injury Research Foundation, November 2019*

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## Introduction

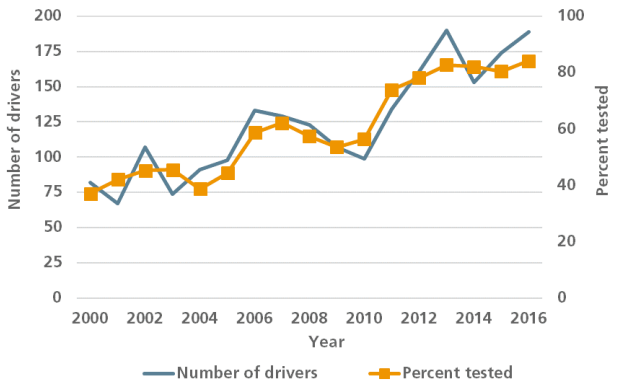
Public concern about drug-impaired driving generally and marijuana-impaired driving in particular has increased in recent years. Seven out of 10 Canadians (71.3%) were very or extremely concerned about drugged drivers according to TIRF's Road Safety Monitor in 2019. In comparison, only 59.5% of respondents were concerned about this issue as recently as 2014 (Woods-Fry et al. 2019). This concern is justified as studies have shown that the psychoactive chemical delta-9-tetrahydrocannabinol (or THC) enters the user's bloodstream and brain immediately after smoking marijuana and has impairing effects. In addition, research investigating drivers in fatal crashes has demonstrated that THC-positive drivers are more than twice as likely to crash as THC-free drivers (Grondel 2016). More recently, evidence from surveys of Canadian drivers suggests that the prevalence of marijuana use is greater among 16-19 year old drivers than drivers in other age groups (Robertson et al. 2017). With the recent legalization of recreational marijuana in Canada in October 2018, continued monitoring of this issue is important to inform decision-making.

This fact sheet, sponsored by Desjardins, examines the role of marijuana in collisions involving fatally injured drivers in Canada between 2000 and 2016. Data from TIRF's National Fatality Database were used to prepare this fact sheet which explores trends in the use of marijuana among fatally injured drivers, and the characteristics of these drivers.[1] Other topics that are explored include the presence of different categories of drugs among fatally injured drivers in different age groups, as well as comparisons of the presence of marijuana and alcohol among this population of drivers.

## Trends over time in marijuana use among fatally injured drivers

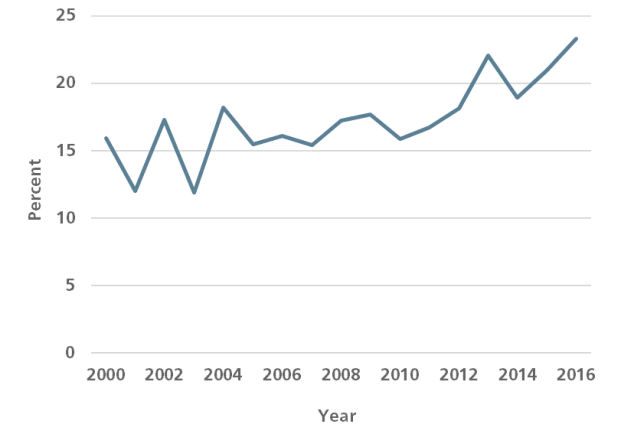
The number of fatally injured drivers who tested positive for marijuana from 2000 to 2016 as well as the percentage of fatally injured drivers who were tested for marijuana is displayed in Figure 1. It should be noted that positive results for marijuana use refer to the presence of any level of marijuana in a driver's blood or urine sample. Positive results do not necessarily indicate impairment while driving since it cannot be determined how long the substance was ingested prior to driving. A total of 82 fatally injured drivers tested positive for marijuana in 2000. This number generally increased to 189 in 2016. Of importance, only 49% of fatally injured drivers killed between 2000 and 2010 were tested for drugs, compared to 80.1% between 2011 and 2016. Therefore, these results should be interpreted with caution.

**Figure 1: Fatally injured drivers who tested positive for marijuana compared to testing rates, Canada, 2000-2016**




Trends related to the percentage of marijuana-positive drivers among all fatally injured drivers who were tested for the presence of drugs is shown in Figure 2. Among those drivers tested for drugs, 15.9% of fatally injured drivers were positive for marijuana in 2000. This percentage generally increased to 23.3% in 2016.

**Figure 2: Percentage of fatally injured drivers who tested positive for marijuana, Canada, 2000-2016**

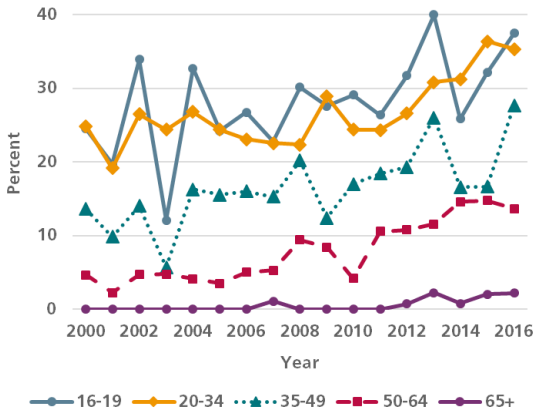



## Characteristics of fatally injured drivers testing positive for marijuana

In this section, demographic factors were analyzed to determine their role in marijuana-related driver fatalities from 2000 to 2016. Fatally injured drivers who tested positive for marijuana were examined according to the age and sex of drivers. Comparisons were also made to data regarding the presence of alcohol use among fatally injured drivers.

The percentage of fatally injured drivers in each age group who tested positive for marijuana is shown in Figure 3. Drivers were grouped according to the following age categories: 16-19 years, 20-34 years, 35-49 years, 50-64 years, and 65 years and older. The percentage of fatally injured 16-19 year old drivers that tested positive for marijuana decreased from 24.5% in 2000 to a low of 12.1% in 2003, then peaked at 40.0% in 2013, and decreased again to 37.5% in 2016. The proportion of fatally injured drivers aged 20-34 years that tested positive for marijuana generally increased from 24.9% in 2000 to its highest level at 36.4% in 2015, then slightly declined to 35.3% in 2016.

**Figure 3: Percentage of fatally injured drivers testing positive for marijuana by age group, Canada, 2000-2016**



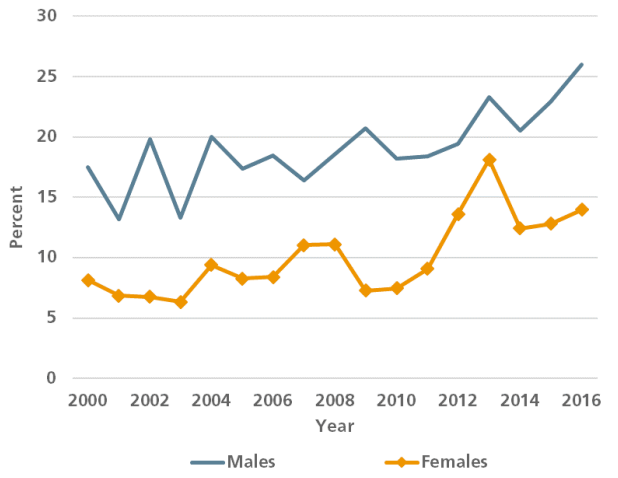

The percentage of fatally injured 35-49 year old drivers that tested positive for marijuana decreased from 13.6% in 2000 to 5.7% in 2003, then peaked to 27.7% in 2016. Although 35-49 year old drivers were the most recent to peak in terms of positive test results for marijuana, this age group has historically been less likely to test positive than younger age groups. For fatally injured 50-64 year old drivers, the percentage testing positive for marijuana rose from 4.7% in 2000 to 14.8% in 2015 before decreasing to 13.7% in 2016. Drivers aged 50-64 have also consistently had lower than average percentages of fatally injured drivers testing positive for marijuana. In sharp contrast, throughout this 17-year period, a very small percentage of fatally injured drivers aged 65 and older tested positive for marijuana, ranging from 0.0% to 2.3%.

To summarize, the age group with the highest percentage of fatally injured drivers testing positive

for marijuana is 16-19 year olds. It should also raise concern that comparable percentages of drivers aged 20-34 and 45-49 have, in recent years, tested positive for marijuana.

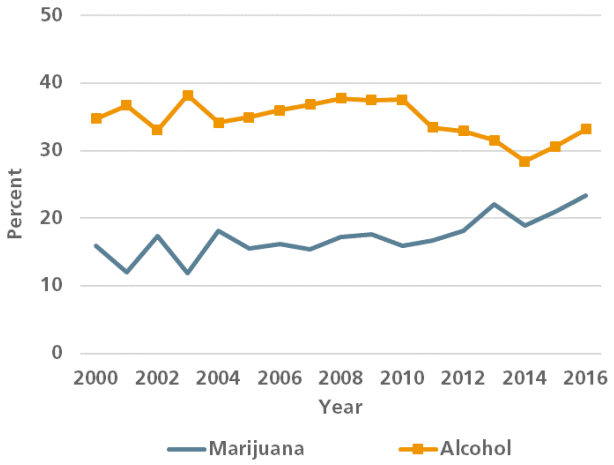
The percentage of male and female fatally injured drivers who tested positive for marijuana is compared in Figure 4. Throughout this 17-year period, males were more likely than females to test positive for marijuana. The percentage of fatally injured male drivers who tested positive for marijuana generally increased from 17.5% in 2000 to 26.0% in 2016. The percentage of fatally injured female drivers who tested positive for marijuana increased from 8.1% in 2000 to 18.1% in 2013, decreased to 12.4% in 2014, and increased again to 14.0% in 2016. Although there was an increase from 2010 to 2016 in the percentage of male and female fatally injured drivers who tested positive for marijuana, the increase among male drivers appears to be more pronounced since 2014.

**Figure 4: Percentage of fatally injured drivers testing positive for marijuana by sex, Canada, 2000-2016**




Trends in marijuana use versus alcohol use among fatally injured drivers are compared in Figure 5; it shows the percentage of fatally injured drivers that tested positive for each of these substances. A larger percentage of fatally injured drivers tested positive for alcohol than marijuana between 2000 and 2016. In 2000, more than one-third (34.8%) of fatally injured drivers tested positive for alcohol compared to 15.9% who tested positive for marijuana. However, from 2010 to 2016, the percentage of fatally injured drivers who tested positive for alcohol generally decreased (from 37.6% to 33.2%), while the percentage of those drivers who tested positive for marijuana increased (from 15.9% to 23.3%). Despite the more general decreasing trend for alcohol, the percentage for this substance has increased in two consecutive years (2015 and 2016).

**Figure 5: Percentage of fatally injured drivers testing positive for marijuana or alcohol, Canada, 2000-2016**



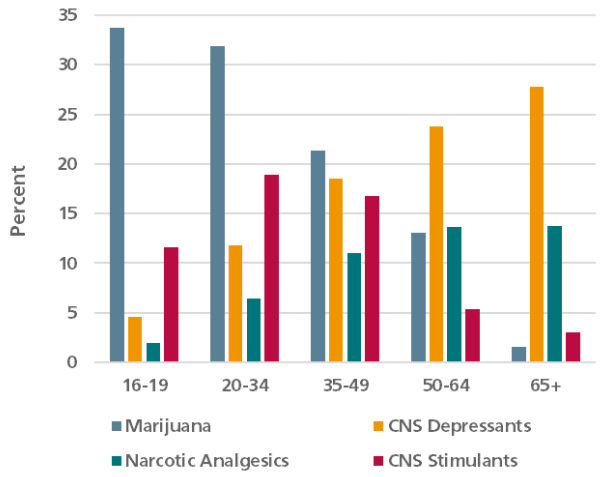

## Marijuana and other types of drugs used by fatally injured drivers by age group

Drugs are categorized according to the Drug Evaluation Classification (DEC) program which has been adopted by police services throughout North America. The program was developed by the International Association of Chiefs of Police (IACP) and the National Highway Traffic Safety Administration (NHTSA). This classification system is based upon common signs and symptoms associated with the presence of different types of drugs (Jonah 2012). The seven drug categories are:

- Cannabis (marijuana);
- Central nervous system (CNS) depressants (e.g., benzodiazepines and antihistamines);
- Central nervous system (CNS) stimulants (e.g., cocaine, amphetamines, and ecstasy);
- Hallucinogens (e.g., LSD, magic mushrooms);
- Dissociative anesthetics (e.g., ketamine and phencyclidine);
- Narcotic analgesics (e.g., morphine, fentanyl, heroin, codeine, oxycodone); and,
- Inhalants (e.g., toluene, gasoline, cleaning solvents).

The percentage of fatally injured drivers in each age group who tested positive for each drug type during a five-year period from 2012 to 2016 is presented in Figure 6. The drug types shown are marijuana, CNS depressants, narcotic analgesics, and CNS stimulants. Since less than 2.0% of fatally injured drivers tested positive for dissociative anesthetics, hallucinogens, and inhalants, these drug categories are not included in the figure.

**Figure 6: Percentage of fatally injured drivers testing positive for different categories of drugs by age group, Canada, 2012-2016**

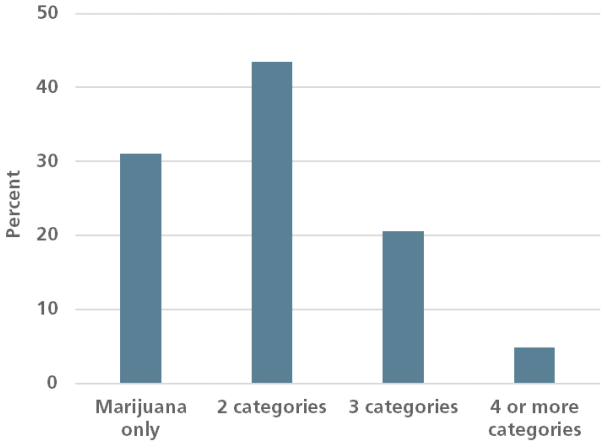



Marijuana was the drug most commonly detected among 16-19, 20-34, and 35-49 year old drivers (33.7%, 31.9%, and 21.4% respectively). The prevalence of marijuana among fatally injured 16-19 year old drivers is similar to levels that were reported in previous analyses of fatally injured drivers (TIRF 2017). This finding is also consistent with an online survey of Canadian drivers that showed marijuana use was more prevalent among 16-19 year old drivers (6.1%) as compared to drivers aged 25-44 years (2.8%), 46-64 years (0.9%), and over age 65 (0.1%) between 2002 and 2015 (Robertson et al. 2017). Only 1.6% of fatally injured drivers aged 65 years and older tested positive for marijuana.

CNS depressants were the type of drug most commonly found among fatally injured drivers aged 50-64 and 65 and older (23.8% and 27.8% respectively). Drivers aged 20-34 were the most likely to test positive for CNS stimulants (18.9%), and narcotic analgesics were most commonly found among fatally injured drivers aged 50-64 (13.7%) and 65 and older (13.8%).

Recent research on self-reported driver behaviour shows that almost one-third of respondents who admitted to driving after using marijuana also claimed to have been drinking (Robertson et al. 2018). Figure 7 shows the prevalence of other drug category use among fatally injured drivers who tested positive for marijuana between 2012 and 2016. Less than one-third of fatally injured drivers testing positive for marijuana (31.1%) only tested positive for that drug type. Over two-fifths (43.4%) of these drivers tested positive for marijuana and a second substance (2 categories). Although it is not shown in the figure, 73.0% of fatally injured drivers who tested positive for two categories of drugs were positive for marijuana and alcohol. Among fatally injured drivers testing positive for marijuana, 20.6% were positive for three different categories of drugs (most commonly marijuana, alcohol, and CNS stimulants). A smaller percentage (4.9%) of fatally injured drivers testing positive for marijuana used four different categories of drugs.

**Figure 7: Percentage of fatally injured drivers testing positive for marijuana who were also positive for other types of drugs, Canada, 2012-2016**



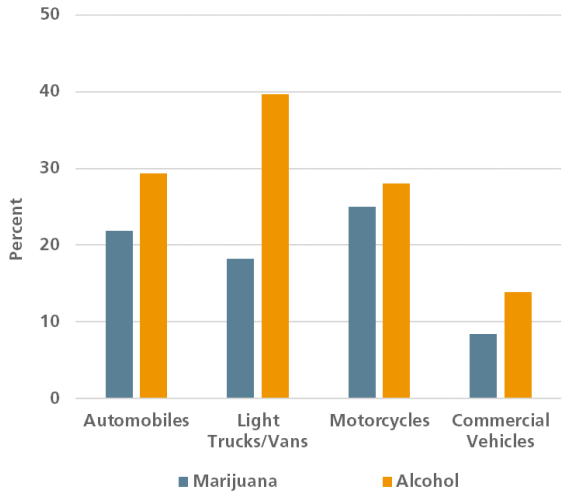

## Characteristics of collisions involving drivers testing positive for marijuana or alcohol

Patterns of marijuana use versus alcohol use among fatally injured drivers were compared during the same five-year period (2012-2016). Characteristics that were examined included the type of vehicle driven by the fatally injured driver and the number of passengers that were in that driver's vehicle.

The percentage of drivers of different vehicles that tested positive for marijuana or alcohol during this

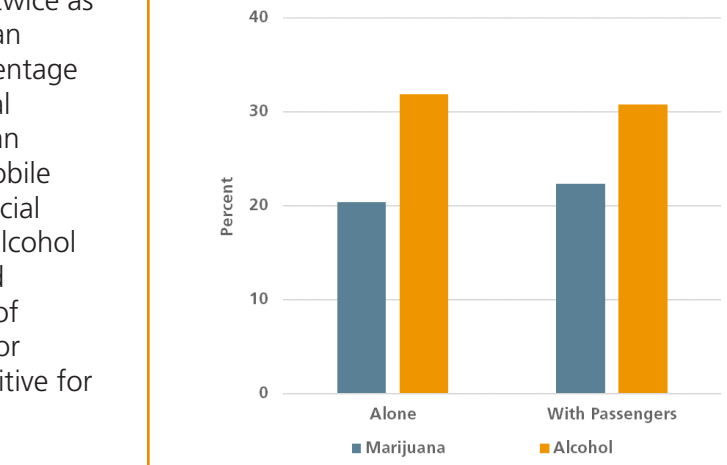
five-year period is presented in Figure 8. The vehicle types are: automobiles, light trucks/vans, motorcycles, and commercial vehicles (heavy trucks and tractor-trailers). As can be seen, fatally injured drivers of light trucks/vans were more than twice as likely to test positive for alcohol (39.7%) than marijuana (18.2%). Similarly, a greater percentage of fatally injured automobile and commercial vehicle drivers tested positive for alcohol than marijuana (29.3% versus 21.9% for automobile drivers and 13.9% versus 8.4% for commercial vehicle drivers). However, the difference in alcohol use and marijuana use among fatally injured motorcyclists is not as pronounced: 28.0% of fatally injured motorcyclists tested positive for alcohol compared to 25.0% that tested positive for marijuana.

**Figure 8: Percentage of fatally injured drivers who tested positive for marijuana or alcohol by vehicle type, Canada, 2012-2016**




A comparison of the percentage of fatally injured drivers testing positive for marijuana or alcohol among drivers travelling alone as opposed to those travelling with passengers is shown in Figure 9. Approximately 50% more fatally injured drivers who were travelling alone tested positive for alcohol (31.9%) than marijuana (20.4%). An almost identical proportion is found among fatally injured drivers who were travelling with passengers (30.8% of these drivers tested positive for alcohol and 22.3% tested positive for marijuana). Thus, the prevalence of either marijuana or alcohol among fatally injured drivers does not appear to be influenced by the number of occupants in a vehicle.

**Figure 9: Percentage of fatally injured drivers who tested positive for marijuana or alcohol by presence of passengers, Canada, 2012-2016**




## Conclusions

In the past 17 years, the percentage of fatally injured drivers in Canada who tested positive for marijuana has generally increased. Historically, fatally injured drivers aged 16-19 years were most likely to test positive for marijuana. In many years during this 17-year period, a comparable percentage of fatally injured drivers aged 20-34 years tested positive for marijuana, especially since 2014. Continued monitoring is required to determine whether the presence of marijuana in fatally injured drivers varies by age group. If 20-34 year old drivers are just as likely to drive after using marijuana as drivers aged 16-19, this may require different approaches in terms of enforcement and education.

Fatally injured male drivers were almost twice as likely to test positive for marijuana than fatally injured female drivers. Driver sex explains differences in the magnitude of marijuana use among fatally injured drivers. Trends among male and female fatally injured drivers, particularly since 2014, show that increases in the percentage of fatally injured male drivers testing positive for marijuana have been greater than those for fatally injured female drivers. Continued scrutiny will be needed as this may suggest that male drivers are more willing to drive while positive for marijuana than female drivers.

Between 2000 and 2016, a larger percentage of fatally injured drivers tested positive for alcohol than for marijuana. Between 2010 and 2013, the

percentage of alcohol-positive drivers decreased while the percentage of marijuana-positive drivers increased. In the past three years, however, trends in the prevalence of these substances are similar, meaning there is an upward trend in both and this is cause for concern.

Similar to previous years, almost one-third of fatally injured 16-19 year old drivers tested positive for marijuana. The percentage of 20-34 year old drivers who tested positive was almost as large. Although marijuana use was not as prevalent among fatally injured 35-49 year old drivers, it was still the most commonly found drug in this age category. Education programs have been developed to reduce marijuana use among 16-19 year old drivers. However, efforts may need to be made to address marijuana-impaired driving among the 20-34 and 35-49 year old age groups.

On the other hand, fatally injured drivers aged 50-64 and 65 and older were more likely to test positive for CNS depressants and narcotic analgesics. Although programs to reduce marijuana use among drivers aged 50 and older may not appear to be necessary at this time, continued monitoring of trends is needed to track whether the prevalence of marijuana use will increase across all age categories since the legalization of recreational marijuana use in October 2018. Furthermore, a 'one size fits all' approach to reduce any kind of drug-impaired driving among all age groups may not resonate equally throughout the driving population.

Of concern, among all fatally injured drivers testing positive for marijuana, 69% tested positive for at least one other impairing substance. In particular, 43.4% tested positive for exactly two substances, mostly marijuana and alcohol. Another 20.6% tested positive for three substances, with the most commonly found combination being marijuana, alcohol and CNS stimulants. A smaller percentage (4.9%) of fatally injured drivers testing positive for marijuana tested positive for four different substances.

Finally, fatally injured drivers were more likely to test positive for alcohol than marijuana, particularly among drivers of automobiles, light trucks/vans and commercial vehicles. Although recent data show that fatally injured motorcyclists were almost as likely to test positive for marijuana as they did for alcohol, it should be considered that there are fewer motorcyclists on the road. Also, it would appear that both marijuana and alcohol use among drivers is not dependent upon whether these drivers are travelling alone or with passengers.

In conclusion, the increasing trend in the percentage of fatally injured drivers testing positive for marijuana is concerning, especially considering the combination with alcohol, which has been demonstrated to increase crash risk exponentially. Such multi-substance use of marijuana with alcohol among fatally injured drivers appears to be quite common based on data from TIRF's National Fatality Database. The most recent data year available today for these indicators is 2016, which is two years before the legalization of the recreational use of marijuana. Other types of indicators such as self-reported use provide more recent data, and suggest that the use of marijuana while driving is increasing still. The expectation therefore is that the number and percent of fatally injured drivers testing positive will continue to increase, unless effective countermeasures are implemented. Further monitoring of marijuana use is essential. Equally important, the percentage of fatally injured drivers testing positive for alcohol is still higher (37.6% versus 23.3%) and has also increased in two consecutive monitoring years (2016 compared to 2015, and 2015 compared to 2014). Clearly the continued monitoring of indicators regarding both substances, and their combined use, remains highly necessary.

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[1] Fatality data from British Columbia from 2013 to 2016 were not available at the time that this fact sheet was prepared. As a result, Canadian data presented have been re-calculated to exclude this jurisdiction and make equitable comparisons.

## Traffic Injury Research Foundation

The mission of the Traffic Injury Research Foundation (TIRF) is to reduce traffic-related deaths and injuries. TIRF is a national, independent, charitable road safety institute. Since its inception in 1964, TIRF has become internationally recognized for its accomplishments in a wide range of subject areas related to identifying the causes of road crashes and developing programs and policies to address them effectively.


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ISBN: 978-1-988945-89-7


## Acknowledgements


Production of this fact sheet was made possible through the sponsorship of Desjardins. Data used in this fact sheet come from TIRF's National Fatality Database, which is also maintained with funding from Desjardins.


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