

A SYSTEMATIC REVIEW OF ROAD ACCIDENTS ASSOCIATED WITH ALCOHOL AND PSYCHOACTIVE DRUG USE: A 5-YEAR SURVEY (2018-2022)

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Rezumat. *Accidentele rutiere reprezintă una dintre cele mai mari provocări pentru siguranța publică în întreaga lume. Deși există numeroși factori care contribuie la producerea acestor accidente, consumul de alcool și stupefiante la volan rămâne unul dintre cei mai periculoși, dar evitabili factori de risc. Radiografia accidentelor rutiere a ultimilor ani demonstrează o predispoziție crescută a consumului de substanțe interzise la volan, deși legislația românească nu tolerează niciun grad de folosire a acestora. Lucrarea de față, realizată cu ajutorul informațiilor oficiale furnizate de Poliția Română, explorează impactul acestui comportament asupra siguranței rutiere și măsurile necesare pentru a combate această problemă gravă.*

Abstract. *Road accidents are one of the biggest challenges to public safety worldwide. Although there are many factors that contribute to these accidents, drink and drug driving remains one of the most dangerous but avoidable risk factors. The radiography of road accidents in recent years shows an increasing propensity to use banned substances behind the wheel, even though Romanian legislation does not allow any degree of use. This paper, based on official information provided by the Romanian Police, explores the impact of this behavior on road safety and the measures needed to combat this serious problem.*

Keywords: alcohol; fatalities; psychoactive drugs; traffic accidents; road safety

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1. Introduction

Tens of thousands of deaths could be prevented by resolving a major public problem, namely driving under the influence of banned substances, with more than 20% of global deaths caused by drink and drug driving, according to the World Health Organization. In recent years, we have seen an alarming increase in the number of road accidents associated with drink and drug driving, both globally and locally [20]. This worrying trend has serious consequences for road safety, society, and the economy, with statistical data showing a steady increase in alcohol and drug related road accidents, an escalation observed in most countries and regions as being in line with social and cultural changes. The causes of this increase are complex and include factors such as relaxed laws, excessive stress in modern life, accessibility of drugs and substance addiction, all contributing to reckless driving [1].

This research aims to analyse the impact of the use of prohibited substances while driving and how their association with other factors can increase the risk of serious accidents with fatalities.

2. Literature review and hypothesis development

Studies [11,14] estimate that in the next 20 years the number of road traffic fatalities will increase by about 66%, with different projections across the globe depending on the economic level of each region. In high-income countries, crash fatalities are expected to fall by up to 30%, while in developing countries they are expected to rise by up to 5%. In China, on the other hand, the percentage of road deaths is expected to increase to close to 95% and in India to 147% compared to the current period. The factors that are taken into account in the above-mentioned predictions relate in particular to a number of elements, such as the ability to monitor traffic, urban agglomerations, i.e. the density of traffic in risk areas, the lack of vertical and horizontal signage, the reaction time of emergency response teams, the lack of road safety education, permissive legislation and a national culture which, in some countries, does not involve the promotion of collective responsibility in traffic.

Even outside the context of driving under the influence, alcohol consumption is considered an important risk factor for premature death. Institute for the Study of Alcohol reports place the European continent at the highest level of alcohol consumption and consider it to be the additional cause of 25% of deaths among young people. Alcohol consumption behavior differs across Europe according to region. Thus, in Central and Eastern Europe a Mediterranean behavior is found, characterized by a daily consumption of alcoholic beverages, especially wine, often associated with meals, while Northern European culture is associated with

the consumption of strong spirits, especially vodka, mostly at weekends or parties [16].

The latest World Health Organization report on alcohol consumption in Europe [20] places Romania in the top 10 countries, with 12.3 liters of pure alcohol per adult per year (see Fig 1), with high consumption of alcoholic beverages on a single occasion in about 35% of the adult population at least once a month, compared to 19% representing the European average (see Fig 2).

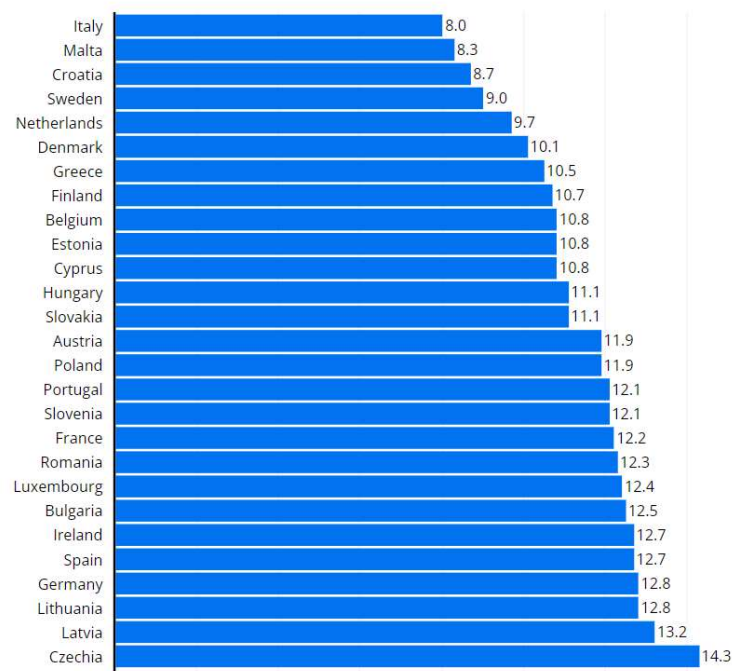


Fig. 1. Total consumption of alcohol per capita among adults (liters of pure alcohol) in the EU

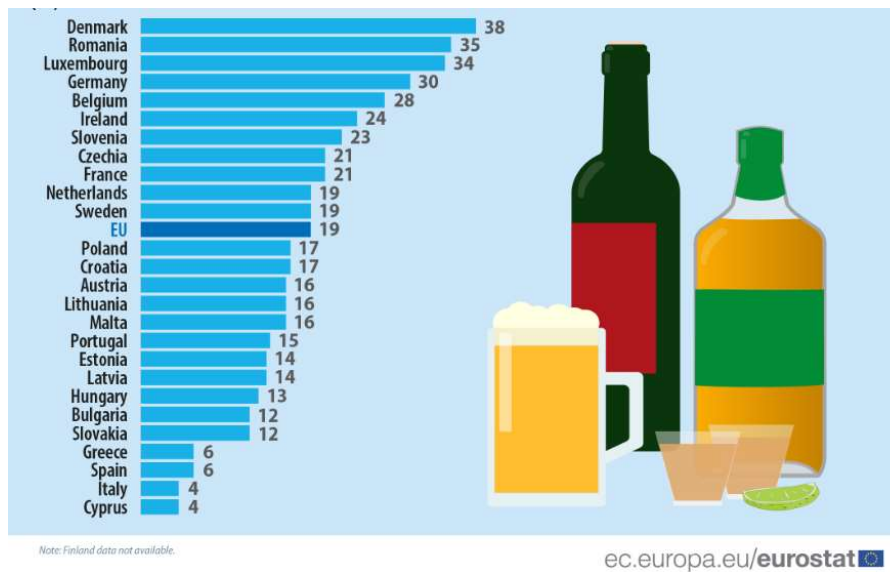


Fig. 2. Percentage prevalence of heavy episodic drinking at least once a month (Source: Eurostat)

In terms of drug use associated with driving, European Transport Safety Council [4] estimates show that, on average, 11% of EU drivers admitted having experienced driving under the influence of drugs whilst 8% of European countries identified banned substances as a contributory cause of serious accidents resulting in fatalities.

Statistics [2] on drug use while driving show that 11.7 million people worldwide got behind the wheel under the influence of drugs over the course of a year, with a 22.5% prevalence in the 16-25 age group. In terms of substances used, research [6,8] shows that it is difficult to estimate the severity of marijuana use, as it can be detected in tests even weeks after consumption. In addition, the use of marijuana, cocaine or benzodiazepines is associated with the most serious accidents, substantially increasing the severity of the risk when combined with alcohol.

The Fatality Analysis Reporting System (FARS) raises a problem also faced by Romania, namely the consumption of prescription drugs that act similarly to other drugs and can be obtained much more easily, including from a financial perspective. Their latest global report on the subject shows that around 20% of those who have driven under the influence of banned substances have tested positive for a particular opioid.

2.1 The association of alcohol and drug driving

According to studies conducted by the Institute for Road Safety Research (SWOV), the severity of crashes increases when using amphetamine, combined drugs and notably when combining alcohol and drugs (See Table 1).

Table 1. Risk increase for illegal drugs (Source: SWOV, 2020)

Drug	Crash severity	Risk increase	95% CI
Amphetamines	Fatal (Elvik, 2013)	5.2	(2.6 – 10.4)
	Injuries (Elvik, 2013)	6.2	(3.5 – 11.1)
Cannabis	Fatal (Elvik, 2013)]	1.3	(0.9 – 1.8)
	Injuries (Elvik, 2013)	1.1	(0.9 – 1.4)
	Fatal and injuries (Rogeberg & Elvik, 2016)	1.4	(1.1 – 1.6)
	Fatal and injuries (Els et al., 2019)	2.5	(1.7 – 3.7)
Cocaine	Fatal and injuries (Rogeberg, 2019)	1.3	(1.2 – 1.4)
	Fatal (Elvik, 2013)	3.0	(1.2 – 7.4)
	Injuries (Elvik, 2013)	1.7	(0.9 – 3.0)
Opiates	Fatal (Elvik, 2013)	1.7	(1.0 – 2.8)
	Injuries (Elvik, 2013)	1.9	(1.5 – 2.4)
Multiple drugs	Crashes (Hels et al., 2011)	5 - 30	-
Combination alcohol & drugs	Crashes (Hels et al., 2011)	20 - 200	-
Abbreviations: CI = Confidence Interval; the 95% confidence interval defines a range of values that you can be 95% certain contains the (true) population mean.			

Concerning the use of prescription drugs, the same studies show that antidepressants, antihistamines double the risk of accidents, while the use of opioids, barbiturates and benzodiazepines is associated with up to 7 times higher risk [14].

Both alcohol and drugs, including illegal substances and prescription medications, can impair a driver's judgment and decision-making abilities. This can lead to risky behaviors on the road, such as speeding, aggressive driving, and poor decision-making in critical situations. In some cases, drivers may use a combination of alcohol and drugs, which can have synergistic effects. The combined impairment of both substances can be even more severe, making it extremely dangerous to operate a vehicle [18].

Accordingly, based on previous research, the hypothesis was developed as follows:

Hypothesis 1: The association of alcohol and drug driving increases the risk of severe crashes

2.2 Low visibility conditions and drunk driving

Alcohol affects the central nervous system, altering the level of concentration and reducing the ability to control the vehicle and the driver's behavior [12,19]. Alcohol interferes with one's visual acuity and can lead to blurred vision or temporary vision loss. Perception and psychomotor function are also impaired,

leading to a tendency to underestimate the distances and speed of other road users and a weakening of rational decision-making skills based on risk assessment. Low-visibility conditions, such as fog, heavy rain, snow, or darkness, already increase the challenges of driving. Consuming alcohol further impairs a driver's ability to react quickly to unexpected situations, such as sudden stops or obstacles on the road. This reduced reaction time significantly increases the risk of accidents. Several studies [13,17] have examined the association of drinking and driving in low-visibility conditions due to weather conditions or lack of street lighting, highlighting the exponentially increased risk of serious accidents in these situations compared to driving under the influence under normal visibility conditions. Accidents that occur under low-visibility conditions often have more severe consequences due to reduced time for evasive maneuvers and the potential for higher-speed collisions. This increases the likelihood of fatal injuries for all parties involved. [9]

Thus, based on previous research, we formulate the following hypothesis:

Hypothesis 2: There is a significant relationship between drink driving under low-visibility conditions and the occurrence of fatal accidents

2.3 Residential environment and the use of banned substances while driving

Individuals in lower-income social-economic environments may face higher levels of stress and reduced access to resources for coping with life's challenges. This can contribute to a higher likelihood of turning to drugs or alcohol as a coping mechanism. In such situations, individuals may be more likely to use substances before or while driving [5,10].

Social-economic environments often come with their own sets of social norms and peer pressures, in some communities or social circles where substance use is normalized or even encouraged, individuals may be more likely to engage in such behaviors, including driving under the influence.

Social determinants, including access to reliable transportation alternatives, can impact a person's decision to drive under the influence. In areas with limited access to public transportation or ridesharing services, individuals may be more likely to drive after consuming alcohol [23,24]. Studies that have analysed the occurrence of alcohol-related accidents in rural areas have identified the lack of alternative transport solutions as the main problem, and therefore the driver's propensity to get behind the wheel despite being aware of his or her inability to drive [3,7].

Hypothesis 3: There is a relationship between the use of banned substances while driving and the residential environment

3. Methodology

The methodology used in this research consists in processing the primary data obtained from the Romanian Police, in order to identify the factors involved in the occurrence of accidents in the last 5 years, having as main or secondary cause the consumption of alcohol or drugs. Thus, we requested the situation of accidents over a period of 5 consecutive years and the reporting of determining factors, such as: time of accident occurrence, road category, lighting conditions, number of vehicles involved, number and type of injuries in case of persons involved in the accident. The resulting sample comprises 7367 correlations, for the processing of which we used the statistical package for social sciences to test the hypotheses under investigation.

4. Results

To determine whether there is an increased risk when alcohol and drugs are associated while driving, we performed a logit test, as shown in the table below (See Table 2).

Table 2. Correlating drug driving with associated causes that lead to accidents

		Cell Counts and Residuals ^{a,b}							
Maincause	associated cause	Observed		Expected		Residual	Standardized Residual	Adjusted Residual	Deviance
		Count	%	Count	%				
drug driving	traffic offences by road users	.500	0.5%	.500	0.5%	.000	.000	.	.000
	misconduct of machine operators	.500	0.5%	.500	0.5%	.000	.000	.	.000
	cyclists' offences	.500	0.5%	.500	0.5%	.000	.000	.	.000
	passenger misconduct	.500	0.5%	.500	0.5%	.000	.000	.	.000
	falling asleep at the wheel	.500	0.5%	.500	0.5%	.000	.000	.	.000
	pedestrian misconduct	.500	0.5%	.500	0.5%	.000	.000	.	.000
	other driver offences	1.500	1.4%	1.500	1.4%	.000	.000	.	.000
	other distracting preoccupations	2.500	2.4%	2.500	2.4%	.000	.000	.000	.000
	aggressive driving	3.500	3.3%	3.500	3.3%	.000	.000	.	.000
	driving without a license	.500	0.5%	.500	0.5%	.000	.000	.	.000
	fatigue	5.500	5.2%	5.500	5.2%	.000	.000	.	.000
	drunk driving	18.500	17.5%	18.500	17.5%	.000	.000	.000	.000
	illegal overtaking	.500	0.5%	.500	0.5%	.000	.000	.	.000
	medical conditions	.500	0.5%	.500	0.5%	.000	.000	.	.000
	illegal turning	5.500	5.2%	5.500	5.2%	.000	.000	.	.000
	lack of traffic safety devices	.500	0.5%	.500	0.5%	.000	.000	.	.000
	failure to give way to pedestrians	.500	0.5%	.500	0.5%	.000	.000	.	.000
	failure to give way to vehicles	.500	0.5%	.500	0.5%	.000	.000	.	.000
	unsafe when changing direction	8.500	8.0%	8.500	8.0%	.000	.000	.000	.000
	unsafe reversing	14.500	13.7%	14.500	13.7%	.000	.000	.000	.000

unsafe when changing lanes	3.500	3.3%	3.500	3.3%	.000	.000	.	.000
failure to ensure distance between vehicles	.500	0.5%	.500	0.5%	.000	.000	.	.000
failure to obey traffic signs	1.500	1.4%	1.500	1.4%	.000	.000	.	.000
failure to comply with railway crossing rules	6.500	6.1%	6.500	6.1%	.000	.000	.000	.000
disobeying traffic lights	.500	0.5%	.500	0.5%	.000	.000	.000	.000
unmarked obstacle on the road	.500	0.5%	.500	0.5%	.000	.000	.	.000
pedestrians on the road	2.500	2.4%	2.500	2.4%	.000	.000	.000	.000
illegal crossing pedestrians	.500	0.5%	.500	0.5%	.000	.000	.	.000
speed not adapted to road conditions	2.500	2.4%	2.500	2.4%	.000	.000	.	.000
aggressive driving	4.500	4.2%	4.500	4.2%	.000	.000	.	.000
erratic speed	16.500	15.6%	16.500	15.6%	.000	.000	.	.000
animals on the road	.500	0.5%	.500	0.5%	.000	.000	.000	.000

a. Model: Multinomial Logit

b. Design: Constant + maincause + maincause * associatedcause

Thus, correlating accidents caused by drug consumption with the secondary causes of accidents resulting in fatalities, we can see that when the main cause is drug consumption and the secondary cause is alcohol consumption, the percentage of accidents resulting in fatalities is significantly higher.

The correlation between drug and alcohol driving defines 17.5% of severe accidents resulting in fatalities, followed in terms of gravity by the association with erratic driving, where a proportion of 15.6% of the serious accidents of the last 5 years were caused by drug use.

Hypothesis 1 is thus validated, as our research confirms previous studies that have highlighted an increased risk of serious accidents due to the association of drug and alcohol use while driving.

For the second hypothesis, we used the Spearman correlation test. Thus, we sought to test for a significant relationship between alcohol-related fatalities and serious injuries and reduced visibility conditions (See Table 3).

Table 3. Correlation between the visibility when drunk driving and accidents resulting in fatalities

Nonparametric Correlations

			Accidents resulting in fatalities	Visibility
Spearman's rho	Accidents resulting in fatalities	Correlation Coefficient	1.000	-.036**
		Sig. (2-tailed)	.	.002
		N	7367	7367
	Visibility	Correlation Coefficient	-.036**	1.000
		Sig. (2-tailed)	.002	.
		N	7367	7367

** . Correlation is significant at the 0.01 level (2-tailed).

Analyzing Table 3, we see that there is a statistically significant correlation between the visibility when drunk driving and accidents resulting in fatalities. At the same time, we have a significant negative correlation between variables leading to the fact that with reduced visibility on the road while driving under the influence of alcohol, more serious accidents resulting in fatalities occur.

Table 4. Correlation between the visibility when drunk driving and accidents resulting in serious injuries

Nonparametric Correlations

			visibility	accidents resulting in serious injuries
Spearman's rho	visibility	Correlation Coefficient	1.000	-.044**
		Sig. (2-tailed)	.	.000
		N	7367	7367
	accidents resulting in serious injuries	Correlation Coefficient	-.044**	1.000
		Sig. (2-tailed)	.000	.
		N	7367	7367

** . Correlation is significant at the 0.01 level (2-tailed).

In the case of accidents causing serious injuries because of drink-driving in conditions of reduced visibility, the hypothesis remains valid, Table 4 showing the significant relationship between the 2 variables.

In order to test the third hypothesis, we correlated drink-driving accidents with the county in which they occurred (See Table 5).

Table 5. Correlation drug driving accidents with their location

		Cell Counts and Residuals ^{a,b}							
maincause	county	Observed		Expected		Residual	Standardized Residual	Adjusted Residual	Deviance
		Count	%	Count	%				
drink driving	ALBA	5.500	0.5%	5.500	0.5%	.000	.000	.	.000
	ARAD	24.500	2.0%	24.500	2.0%	.000	.000	.	.000
	ARGES	27.500	2.3%	27.500	2.3%	.000	.000	.	.000
	BACAU	52.500	4.4%	52.500	4.4%	.000	.000	.	.000
	BIHOR	29.500	2.5%	29.500	2.5%	.000	.000	.	.000
	BISTRITA-NASAUD	36.500	3.0%	36.500	3.0%	.000	.000	.	.000
	BOTOSANI	48.500	4.0%	48.500	4.0%	.000	.000	.	.000
	BRAILA	15.500	1.3%	15.500	1.3%	.000	.000	.	.000
	BRASOV	7.500	0.6%	7.500	0.6%	.000	.000	.	.000
	BUCURESTI	3.500	0.3%	3.500	0.3%	.000	.000	.000	.000
	BUZAU	11.500	1.0%	11.500	1.0%	.000	.000	.	.000
	CALARASI	20.500	1.7%	20.500	1.7%	.000	.000	.	.000
	CARAS-SEVERIN	14.500	1.2%	14.500	1.2%	.000	.000	.	.000
	CLUJ	43.500	3.6%	43.500	3.6%	.000	.000	.	.000
	CONSTANTA	18.500	1.5%	18.500	1.5%	.000	.000	.	.000
	COVASNA	25.500	2.1%	25.500	2.1%	.000	.000	.	.000
	DIMBOVITA	19.500	1.6%	19.500	1.6%	.000	.000	.	.000
	DOLJ	22.500	1.9%	22.500	1.9%	.000	.000	.	.000
	GALATI	21.500	1.8%	21.500	1.8%	.000	.000	.	.000
	GIURGIU	9.500	0.8%	9.500	0.8%	.000	.000	.	.000
	GORJ	18.500	1.5%	18.500	1.5%	.000	.000	.	.000
	HARGHITA	30.500	2.5%	30.500	2.5%	.000	.000	.	.000
	HUNEDOARA	26.500	2.2%	26.500	2.2%	.000	.000	.	.000
	IALOMITA	5.500	0.5%	5.500	0.5%	.000	.000	.	.000
	IASI	58.500	4.9%	58.500	4.9%	.000	.000	.	.000
	ILFOV	11.500	1.0%	11.500	1.0%	.000	.000	.	.000
	MARAMURES	36.500	3.0%	36.500	3.0%	.000	.000	.	.000
	MEHEDINTI	35.500	3.0%	35.500	3.0%	.000	.000	.	.000
	MURES	61.500	5.1%	61.500	5.1%	.000	.000	.	.000
	NEAMT	40.500	3.4%	40.500	3.4%	.000	.000	.	.000
	OLT	46.500	3.9%	46.500	3.9%	.000	.000	.	.000
	PRAHOVA	24.500	2.0%	24.500	2.0%	.000	.000	.	.000
SALAJ	34.500	2.9%	34.500	2.9%	.000	.000	.	.000	
SATU MARE	51.500	4.3%	51.500	4.3%	.000	.000	.	.000	
SIBIU	22.500	1.9%	22.500	1.9%	.000	.000	.	.000	
SUCEAVA	68.500	5.7%	68.500	5.7%	.000	.000	.	.000	
TELEORMAN	8.500	0.7%	8.500	0.7%	.000	.000	.	.000	
TIMIS	28.500	2.4%	28.500	2.4%	.000	.000	.	.000	
TULCEA	23.500	2.0%	23.500	2.0%	.000	.000	.	.000	
VASLUI	31.500	2.6%	31.500	2.6%	.000	.000	.	.000	
VILCEA	45.500	3.8%	45.500	3.8%	.000	.000	.	.000	
VRANCEA	34.500	2.9%	34.500	2.9%	.000	.000	.	.000	

a. Model: Multinomial Logit

b. Design: Constant + county + county * maincause

As may be seen in Table 5, in counties belonging to the north-eastern part of Romania (Botoșani 4%, Iasi 4.9%, Suceava 5.7%), the area considered the fifth poorest region in the European Union, a significantly higher percentage of accidents caused by alcohol consumption behind the wheel is recorded, compared to the capital of Romania, for example, where we have 0.3% accidents in recent years or the Ilfov region where 1% of accidents caused by alcohol consumption are recorded.

The significant differences identified when applying the location of accidents caused by alcohol consumption validate hypothesis 3, according to which there is a correlation between the use of banned substances while driving and the residential environment.

5. Conclusions

The last years have brought attention to the problem of alcohol and drug consumption while driving through the exponential multiplication of serious and very serious accidents.

Romania's Road safety strategy, public policies, the political statements, and the projects of non-governmental organizations are focused more than ever on the drastic sanctioning of the use of prohibited substances while driving, as well as the identification of ways to reduce this type of behavior.

The current research emphasized the danger of combining alcohol and drug consumption and driving in these circumstances, highlighting the exponential increase in the risk of serious accidents compared to any other type of behavior.

At the same time, a problem that Romania is facing is represented by the lack of street lighting on various road sectors and inadequate road markings. The analysis of the statistical data of the last 5 years demonstrates the fact that in conditions of reduced visibility, the consumption of alcohol or prohibited substances is even more dangerous, and the visibility factor contributes to the increase in the number of deaths on the roads.

Finally, the prevalence of accidents as a result of the consumption of prohibited substances while driving in the poor counties of Romania demonstrates the fact that the interventions must be customized, depending on the local and regional specifics, adapting to economic and social factors so that the solutions identified for reducing the accidents can be developed on feasible plans.

6. Acknowledgement

This research was conducted with the help of the Romanian Police, which provided us with statistical data on accidents from the last 5 years having as main

or secondary cause the consumption of drugs or alcohol while driving. All authors were equally involved in the present research.

7. Limitations and future research

It is important to analyze in the following research a series of factors such as the years of the driver's license or the age of the driver, following the hypotheses in the context of new variables. A driver with a long-term license may react differently even under the influence of alcohol or prohibited substances, and young people may be more tempted to use prohibited substances without associating them with a significant danger when they get behind the wheel.

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