Drinking-driving: potential effects of a zero-limit policy on the number of traffic victims in Belgium

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Abstract

Introduction: This study evaluated the potential impact of reducing the legal BAC limit from 0.5 to zero, either for all drivers or for novice drivers only in Belgium. We elaborated three scenarios related to the BAC categories for which lowering the legal BAC limit to zero would affect drink-driving behaviour.

Methods: The effect estimates were based on scientific literature on risks related to drink-driving at different BAC-levels, national data on crashes and both national and European data on drink-driving behaviour.

Results: In case of a zero limit for all drivers, an annual reduction can be expected of 10 to 17 fatalities, 8 to 20 severe injuries and 135 to 315 slight injuries depending on the scenario. If only applied to novice drivers, an annual decrease can be expected by 2 to 4 fatalities, 8 to 16 serious injuries and 135 to 262 slight injuries.

Conclusion: There is no clear evidence on which of the three scenarios would be the most plausible. As the relative risk of a car crash increases strongly with the BAC level, the success of either measure will strongly depend on its ability to also affect drink driving at concentrations that are forbidden already.

Keywords

drink-driving; zero limit; ex ante evaluation; Belgium.

Introduction

Context

Since 1994, the legal limit of Blood Alcohol Concentration (BAC) is 0.5 g/L for the general drivers' population in Belgium. Since 2015, this limit has been lowered to 0.2 g/L for professional drivers. So far, no specific limitation has been adopted for novice drivers in Belgium unlike what is done in several European countries. In 2020, two bills were submitted to the House of Representatives. These two bills were about lowering the BAC legal limit: the first one proposed to impose a zero-limit for all drivers, the second one proposed to limit this new measure to novice drivers only.

Prevalence of driving under the influence of alcohol

In 2018, the national measurement revealed 1.94% of car drivers in Belgium had a BAC level equal to or higher than 0.5 g/L. Among them, one third (0.6%) had a BAC level that ranged from 0.5 to<0.8 g/L and two thirds (1.3%) had a BAC level equal to or higher than 0.8 g/L (Brion et al., 2019).

International surveys highlight that alcohol consumption right before driving is more frequent in Belgium than in other countries. According to the 2018 "E-Survey of Road users' Attitudes" (ESRA2), one third of car drivers in Belgium (33.1%) reported that, at least once during the past 30 days, they

had driven after having drunk alcohol. This prevalence was higher than the mean prevalence in the 20 European countries included in the study (20.6%) (Achermann Stürmer et al., 2019).

Many factors such as the legal BAC limit, the probability of being checked and the social acceptability of drinking and driving have been associated with driving under the influence of alcohol (Fell et al., 2014; Houwing et al., 2011; Meesmann et al., 2015). These factors could partly but not entirely explain why the prevalence of drinking and driving is higher in Belgium.

Effects of alcohol on driving abilities

Scientific literature extensively documented how the risk of being injured, and even more the risk of dying in a car crash, increases exponentially as the BAC level rises (Compton & Berning, 2015; Hels et al., 2011; Zador et al., 2000), in particular from a BAC level of 0.5 g/L onwards.

For low BAC levels (smaller than 0.5 g/L) the findings in relation to the risk level are mixed. On the one hand, some studies found that the relative risk of being seriously injured did not increase at a BAC level smaller than 0.5 g/L (Hels et al., 2011; Schnabel et al., 2010, Veldstra et al., 2012). On the other hand, other studies highlighted how major skills for driving such as divided attention, reaction time and vigilance could be impaired at BAC levels lower than 0.5 g/L (Caird et al., 2005; Martin et al., 2013).

Impact of BAC limits on road safety

Studies on the impact of lowering a BAC limit to 0.5 g/L or lower are scarce. In Norway, a before-and-after evaluation using statistics about crashes at night and weekend as a proxy of alcohol-related crashes showed that lowering the BAC limit from 0.5 to 0.2 g/L was not associated with a decrease in alcohol-related crashes (Assum, 2010).

In their study including data from 28 European countries, Castillo- Manzano and colleagues demonstrated the effectiveness of a BAC limitation to 0.5 g/L in Europe (Castillo-Manzano et al., 2017). However, the authors considered that implementing stricter BAC limit would not improve road safety outcomes if the measure was not supported by other alcohol-related measures such as higher tax rates on alcoholic beverages, random breath testing, enforcement of sanctions, communication campaign and public education programs.

Finally, studies on the impact of reduction in BAC limit have shown that when a positive effect was observed, this effect resulted in a deterrent effect on all BAC ranges and it might even be strongest in the highest BAC levels (Mann et al., 2001; Wagenaar et al., 2007).

The objective of this study was to estimate the potential impact of reducing the legal blood alcohol concentration limit from 0.5 g/l to zero if the law were applied to all drivers or only to novice drivers in Belgium. This meant estimating the number of alcohol-related accident victims that could be avoided in both cases. For more details on this study, we invite the reader to consult the research report[1] and the related scientific paper (Moreau et al., 2022).

Methodology

Data

To make these estimations, we needed three types of data:

1. the numbers of cases in Belgium.
2. the risks as a function of exposure (i.e. the level of blood alcohol concentration in Belgium) : the relative risks of death (Zador et al., 2000) and the relative risks of having an accident was used to estimate the relative risks of being injured (Peck et al., 2008).

[1]https://www.vias.be/publications/Verlaging%20van%20de%20wettelijke%20alcohollimiet%20in%20Belgi%C3%AB/Lowering_the_legal_alcohol_limit_in_Belgium.pdf

3. the prevalence of the exposure of car drivers with a BAC level 0.1 g/l - <0.5 g/l (Houwing et al., 2011)or with a BAC level ≥ 0.5g/l (Brion et al., 2019) in Belgium.

Expected exposure prevalence

As the legal limit is 0.5 g/l in Belgium, a zero limit policy would mainly target drivers currently driving with a BAC between 0.1 and <0.5 g/l. However, studies have shown that such a measure could also have an impact on the behaviour of drivers with a higher BAC levels.

To estimate to which extent drivers would be compliant with the new BAC limitation in Belgium, we used two indicators from a European study where data were collected in five countries with a legal BAC limit set at ≤ 0.2 g/L and in 15 countries where it is set at 0.5 g/L in 2018 (Achermann Stürmer et al., 2019):

- The mean prevalence of (self-reported) driving under the influence of alcohol[2] was 9.3% in countries where the legal limit is 0.2 g/l and 24.4% in countries with a higher legal blood alcohol limit, i.e. a crude difference of 61.9% that was used to estimate the potential change in the prevalence of drivers with BACs between 0.1 and 0.5 g/l.
- The mean prevalence of (self-reported) drunk driving[3] was 8% and 14.5% respectively, i.e. a crude difference of 44.5%. This difference was used to estimate the expected effect among drivers above the current legal threshold (halo effects).

Once all this information was gathered, we used a formula from a similar study in the Netherlands (Weijermars & Wesemann, 2013)to estimate the number of fatalities and injuries before and after the change in the BAC law:

$$S_2 = S_1 * (1-P_2*RRR) / (1-P_1*RRR)$$

where:
S_1= number of casualties in the baseline situation
S_2= number of expected casualties
RRR= relative risk reduction (1-RR)
P_1= prevalence of the risk factor in the baseline situation
P_2= expected prevalence of the risk factor
We calculated the potential number of casualties that could be prevented in traffic crashes involving (a) at least one driver aged 18-24 and (b) for drivers who were older. The sum of these two results gave the estimates for all drivers.

Scenarios on the possible effect of reducing BAC limits on drink driving

Finally, we elaborated three scenarios illustrating the extents to which lowering the legal BAC limit to zero could impact drink-driving behaviour:

- "Targeted" scenario (Scenario assumes that the new policy would impact only the specifically targeted BAC category, that is to say drivers in the category BAC below 0.5 g/L.
- "Adaptation" scenario (Scenario based on the "Targeted" scenario to which we added a "halo effect" in the BAC category "0.5 g/L≤BAC < 0.8 g/L").
- "Strong adaptation" scenario (Scenario based on the "Adaptation" scenario to which we added a "halo effect" in the BAC category "0.8 g/L≤BAC <1.2 g/L")

We did not expect any impact on the behaviour of drivers with a BAC ≥1.2 g/L given that they already exceeded greatly the current legal limit.

[2] "How often in the past 30 days they drove a car after drinking alcohol (drink-driving)"
[3] "How often in the past 30 days they drove a car with a BAC level over the legal limit"

Results

As expected, the results shew a favourable effect on the number of casualties in the three investigated scenarios.

If a zero limit was applied to **all drivers**, an annual reduction could be expected of 10 to 17 fatalities (i.e. a decrease between 2.4% and 3.9%), of 8 to 20 serious injuries (i.e. a decrease between 0.3% and 0.8%) and of 135 to 315 slight injuries depending on the scenario (i.e. a decrease between 0.4% and 0.8%) (Table 1).

Table 1. Potentially prevented casualties if the zero-limit was applied to all drivers.

	Scenario		
Casualties*	**Targeted**	**Adaptation**	**Strong adaptation**
Fatalities (n=430)	10 (-2.4%)	13 (-3.1%)	17 (-3.9%)
Severe injuries (n=2,541)	8 (-0.3%)	11 (-0.4%)	20 (-0.8%)
Slight injuries (n=37,247)	135 (-0.4%)	177 (-0.5%)	315 (-0.8%)
Total (N=40,218)	154 (-0.4%)	201(-0.5%)	352 (-0.9%)

* Numbers refer to all people involved in crashes with at least one-person car in Belgium in 2018. Numbers may not add to totals due to rounding.

In case a zero limit was restricted to **novice drivers**, an annual reduction could be expected of 2 to 4 fatalities according to the scenario considered (i.e. a decrease between 3.7% and 6.2%), of 8 to 16 serious injuries and of 135 to 262 slight injuries (i.e. a decrease between 1.7% and 3.2%).

Table 2. Potentially prevented casualties if the zero-limit was restricted to novice drivers.

	Scenario		
Casualties*	**Targeted**	**Adaptation**	**Strong adaptation**
Fatalities (n=64)	2 (-3.7%)	3 (-4.3%)	4 (-6.2%)
Severe injuries (n=489)	8 (-1.7%)	10 (-2.0%)	16 (-3.2%)
Slight injuries (n=8,093)	135 (-1.7%)	159 (-2.0%)	262 (-3.2%)
Total (N=8,646)	146 (-1.7%)	171 (-2.0%)	282 (-3.3%)

* Numbers refer to all people involved in crashes with at least one-person car and a driver aged 18-24 in Belgium in 2018. Numbers may not add to totals due to rounding.

Discussion

The strength of this study lies in the fact that it has maximally used all available data and evidence in order to make a quantitative estimate of the effects of a possible change in the legal alcohol limit for drivers. Yet, this study had several limitations.

For relative risk, we used estimations from scientific literature, which are not necessarily specific to the Belgian situation. Moreover, the relative risk for a car driver to injure someone (himself or someone else) in an accident was approximated by the risk of having a car crash.

We also compared the prevalence of two indicators for drink-driving behaviour between European countries with a zero-limit to those with a limit at 0.5 g/l. The differences were used to estimate the potential reduction in the BAC levels in the three scenarios to reflect differences in reported effects of

changing the BAC limits. However, differences between countries can still be related to other variables such as social norms related to alcohol in traffic, the height of penalties for drunk driving and the level of police enforcement that is put in place. We intentionally compared two groups of countries (all with a BAC limit ≤0.2 g/L with those with a BAC limit >0.2 g/L) to limit 'random' variation that could be related to specific factors for specific countries.

As the Belgian accident data did not allow the identification of accidents involving novice drivers, the number of casualties that could possibly be affected by a change in law for novice drivers was approximated by using all casualties from accidents with a car driver between 18 and 24.

Other major factors (e.g. the social norm) that could affect the impact of a zero-limit policy on actual behaviour and thus eventually on road safety are only implicitly addressed by the differences in the anticipated effect according to the scenarios.

Finally, the consequences of alcohol-related accidents are not limited to road traffic casualties. Economic, social, and emotional consequences for the victims, their family and the society would have to be considered too.

Our estimates illustrate that depending on the deterrent impact of the zero-limit policy on the actual level of drink driving, at best, up to 17 fatalities, 20 severe and 315 light injuries could be prevented if the new limitation was applied to all drivers. If the measure was to be restricted to young drivers, the numbers would be 4, 16 and 262 respectively.

The highest relative risks are situated in higher BAC ranges (most importantly those of 1.2 g/l and above) which also means that the potential to save casualties is by far the highest in these categories. The success of either measure will therefore strongly depend on its ability to also affect drink driving at concentrations that are forbidden already. This also means that most of the casualties could be prevented if compliance with current rules increased.

It must be also considered that a zero-limit policy could direct police enforcement capacity more towards smaller offences (e.g. drivers with BAC between 0 and 0.5 g/L) and come to the detriment of a focus on the much more problematic behaviour, e.g. drivers with BAC above 0.8 g/L.

Conclusion

As such this study aims at providing quantitative estimates and does not take a position in the debate on whether or which zero limit policy should be implemented in Belgium.

The estimated reductions depend on the assumptions made about the effect of the law change on the actual drinking and driving behaviour in traffic. There is no clear evidence on which of the three elaborated scenarios would be the most plausible.

On the 10th of July 2020, Vias institute forwarded a summary of the results of this research to the Mobility Committee of the House of Representatives. On the 14th of July, both bills were rejected by this parliamentary Committee.

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