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The death toll of highways

Analysis of fatal road traffic accidents on Belgian motorways during the period 2014-2015

Federal Public Service
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Summary

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Summary

Objective and methodology

This study discusses the fatal accidents on Belgian motorways that took place in 2014 and 2015. It follows the study 'Deaths on the highway. An in-depth analysis of fatal road accidents on Belgian highways from 2009 to 2013'. For certain parts of this report some figures from this earlier period are included in the analysis. The purpose of this study is to gain a better understanding of de circumstances and causes of fatal road accidents on motorways.

In Belgium, 38% of the vehicle kilometers are traveled on motorways, while 15% of the deaths 30 days and 10% of injured take place on this type of road. The proportion of injury accidents is thus lower than we would expect based on the kilometers traveled. However, the severity score of accidents on motorways (the number of deaths per 1,000 accidents) is higher than the severity score on other types of roads.
The accident risk, defined as the annual number of deadly traffic accidents per million vehicle kilometers driven, is higher in Wallonia (0.27) than in Flanders (0.19). In Brussels the accident risk is 0.45. The number of fatal accidents per year per 100 kilometer motorway (also known as road risk) however is higher in Flanders (on average 5.4 fatal accidents per year per 100 km motorway) than in Wallonia (on average 4.2 fatal accidents per year per 100 km motorway). The road risk in Brussels is 11.1.

The analysis is based on the information in the police reports that were drawn up by the police. This method provides an important advantage compared to analyzing the official accident statistics. This method provides a significant added value compared to the analysis of official accident statistics. It is possible to look beyond the characteristics of accidents such as those registered in the Traffic Accidents Form. The accident factors can be mapped out, and "typical", common crash configurations can be defined. In this way, more specific policy recommendations (with the aim of reducing accidents) can be drawn up.

Key results

Key figures

In 2014 and 2015 there were a total of 158 fatal accidents on motorways. There were 182 dead, 59 seriously injured and 102 lightly wounded.

Characteristics of the analyzed accidents

General circumstances of the accident

The main findings with regard to the general circumstances are:

- Of the 158 accidents studied in 2014 and 2015, 89 occurred in Flanders (56%), 67 in Wallonia (42%) and 2 in Brussels (1%).
- The majority of these fatal accidents (61%) took place during the day, 44% on week days and 17% on weekend days. 39% of the accidents happen at night, evenly distributed between week nights and weekend nights. Fatal accidents on motorways occur much more often at night (almost 4 out of 10 accidents) compared to fatal accidents on other roads or injury accidents on motorways, both during the week as well as during the weekend.
- Approximately half of the fatal accidents took place in daylight. One third of the accidents happened in the dark where public lighting was working and a sixth of the accidents happened in the dark

without public lighting. The percentage of accidents in complete darkness is higher in fatal accidents on highways compared to other types of accidents.

- There were on average 6 deaths per 100 kilometers of motorway annually.
- The majority of accidents (87%) took place in dry weather. In 12% of accidents, the accident took place while it rained. Other weather conditions hardly feature. It rains on average 6% of the time in Belgium.
- 40% of accidents are single-vehicle accidents, accidents in which only one vehicle is involved.

Characteristics of the infrastructure

The following observations were made with regard to the characteristics of the infrastructure:

- Half of the fatal accidents happened on a motorway with 2 lanes in each direction, almost 4 out of 10 accidents took place on a motorway with 3 lanes in each direction. In 90% of accidents a hard shoulder was present.
- The speed limit was 120 km/h in 87% of the accidents.
- 6% of the accidents happened at an exit and 4% on a slipway. In addition, 12% of the accidents took place near a motorway exit and 8% near a slipway. 'Near an exit/slipway' was defined as: 'a location where the exit/slipway hasn't started yet, but where road users are already making maneuvers in order to take the exit/slipway'.
- Most accidents happen on a straight road (87%). Accidents in a bend to the right (7%) or a bend to the left (6%) do not occur as frequently. The lay-out of the motorway is described in the police report. A bend was coded in the database whenever the police mentioned this.
- In 7 out of 10 accidents the left side of the highway is protected by a concrete crash barrier. Steel crash barriers feature in 23.1% of the accidents. In 4 out of 10 accidents, there was no safety rail on the right side of the road. For half of the accidents, there was a metal crash barrier.
- The road was dry in 8 out of 10 fatal accidents. In 18% of the accidents the road was wet. Accidents on a moist or icy road were less common.
- In 13% of the fatal accidents on highways in 2014 and 2015 road works were in progress at the time of the accident. Road works play a more important role in accidents on highways than in accidents on other types of roads.

Characteristics of the vehicles and road users

Key findings in relation to the characteristics of the vehicles and road users are:

- In the 158 fatal accidents that took place in 2014 and 2015 on a motorway, a total of 529 individuals were involved: 304 drivers, 213 passengers and 12 pedestrians. 182 persons did not survive the accident, among whom 122 drivers, 50 passengers and 10 pedestrians.
- Slightly more than half of the vehicles involved in fatal accidents on highways are passenger cars, and one third of the vehicles are trucks. Light trucks account for 8% of the vehicles concerned.
- The average age of:
  - the drivers involved is 42.1 years,
  - the passengers involved is 31.2 years
  - the pedestrians involved is 32.8 years
- Three quarters of the road users are male.
- 69% of the drivers and pedestrians involved are of Belgian origin.
- Five drivers were not insured at the time of the accident, and also 5 drivers could not produce a valid proof of technical inspection. Two drivers did not have a valid driving license.

In-depth analysis of the accidents

Context of the accident

- 64% of the parties involved were travelling for professional reasons and 30% represented leisure travel. The remaining 6% were travelling from work to home, or from home to work.
- In the time before the accident, a large part of the drivers in question (90%) was travelling at a more or less constant speed. 4% of the drivers wasn't moving, 2% of the drivers were braking and an even smaller percentage was just starting up again. The majority of drivers (85%) continued on their journey. Only 9% of the drivers moved to the left of right. Driving in the opposite direction, standing still by the side of the road or taking an exit did not occur frequently.

The situations and conflicts that triggered the accident were grouped into 6 categories:

- *Loss of control and deviating from the lane* (37%): the driver loses control of his vehicle. Usually this means that the vehicle starts to swerve on the road after which the driver is unable to regain control of the vehicle. Gradually departing from the lane towards the left or right also falls into this category. Road users end up on the shoulder of the road where they collide with an obstacle.
- *Accidents in longitudinal traffic* (36%): vehicles are driving behind each other.
- *Accidents involving a crossing pedestrian* (6%): a pedestrian crosses the carriageway from the left or right side of the road.
- *Accidents with stationary traffic* (5%): accidents between a moving vehicle and a vehicle that is stationary on the left or right side of the road.
- *Other types of accidents* (6%): this category includes, among others, accidents caused by alcohol or drowsiness, but also collisions with an animal or an obstacle on the road.

The functional error was also determined. The basic principle of the method is that problems resulting in accidents can occur during various phases: perception, processing, prediction, decision, execution and global errors. Both perception errors and execution errors occur in 2 out of 10 road users involved in fatal accidents. For 35% of the persons concerned not one single functional error could be identified. This relates to drivers who 'passively' took part in the accident and who therefore made no errors.

In single-vehicle accidents, an error in execution was recorded for three quarters of the road users concerned. These accidents clearly deviate from multiple vehicle accidents. Global errors such as driving under the influence of alcohol occur more often in single-vehicle accidents in comparison with multiple vehicle accidents.

Accident factors

The **accident factors** which had played a role in causing the accident as well as all the factors that had affected the seriousness of the accident were listed for all the drivers and pedestrians who were involved in a fatal traffic accident on a highway. We made a distinction between human behaviour, vehicle, infrastructure and environment. Several accidents play a role in most of the accidents. We noted 358 accident factors for 158 accidents, which comes down to an average of 2.3 factors per accident. 260 behaviour factors (73%), 7 vehicle factors (2%), 41 infrastructure factors (11%) and 50 environment factors (14%) were coded.

The most common **behavior** factor is loss of control. The vehicle starts to sway and the driver doesn't succeed in gaining back control over his vehicle. Not wearing the seat belt is another common accident factor. Inattention is found in the same amount of accidents, these are drivers who are driving with insufficient attention for other road users.
A *temporary disorder* includes both becoming unwell while driving and getting a malaise. *Reduced vigilance and fatigue, wrong assessment of danger, risk behavior, committing an offense, driving under the influence of*

alcohol or drugs, distraction, the mental state, lack of driving experience and performing an additional task also occurred in the analyzed accidents.

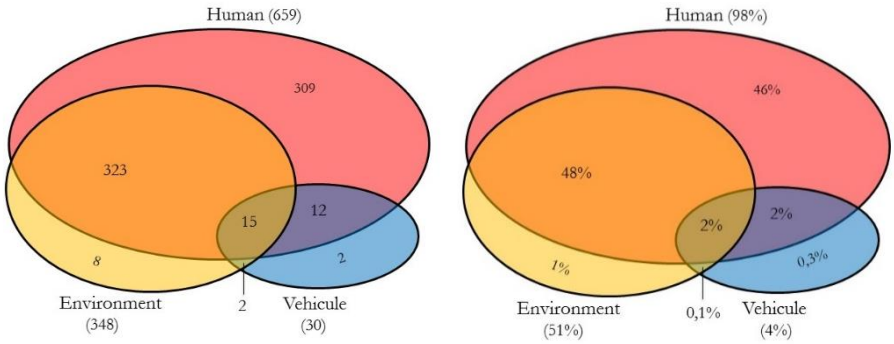
Only three types of **vehicle** factors were found. These factors are hard to determine, because the vehicles involved in the accidents aren't inspected afterwards. Possible defects are therefore overlooked. Problems with the tires occurred in 4 accidents. There were also mechanical defects (2 accidents) and unsecured cargo in a truck (1 accident).

The most common infrastructure factors is an *obstacle on or alongside the road*. This is most often a tree (11 accidents) or a (illumination) pole that is not protected by a barrier. The driver hits the obstacle which aggravates the seriousness of the accident. Problems with the *grip on the road and road works* also played a part in the analyzed accidents. Other less common factors are *problems with the profile of the road, sight obstruction because of the infrastructure and problems with the signalization.*

Finally, environmental factors include *congested traffic* (slow or stationary traffic), *sight obstruction because of the environment* (darkness, bright sun, and the transition from a tunnel to daylight or sight problems caused by a driving vehicle), *weather conditions* like rainfall and fog, and *other environmental factors* (a wild animal on the road or an emergency vehicle on the road).

The extent of the manner in which human, vehicle, infrastructural and environmental factors appear in one accident and interact is interesting. The infrastructure and environmental factors were merged to facilitate the analysis.

Firstly, the figure shows in how many accidents appear at least one human factor, at least one vehicle factor or at least one environmental factor. The figure also demonstrates in how many accidents the interactions appear between the various factors. We looked at all fatal accidents on a motorway in the period 2009-2015.



At least one human accident factor appears in almost all of the investigated accidents. 46% of the accidents involve only human factors while 48% of the accidents represent a combination of human and environmental factors. At least one environmental factor was registered for half of the fatal accidents on highways. Other combinations occur far less frequently.

The three 'killers' in traffic

In 13 accidents at least one of the involved road users was traveling at too high speed, and in at least 8 accidents at least one driver was driving at an inappropriate speed. In addition, in 17 accidents, we had a strong suspicion that one of the road users involved was driving too fast or at an inappropriate speed. This means that speed played a role in 38 fatal accidents on a motorway in 2014 and 2015 (38%).

In the period from 2014 to 2015, an alcohol test was conducted for slightly less than half of the drivers and pedestrians concerned. The percentage of drivers **under the influence of alcohol** is 6%.

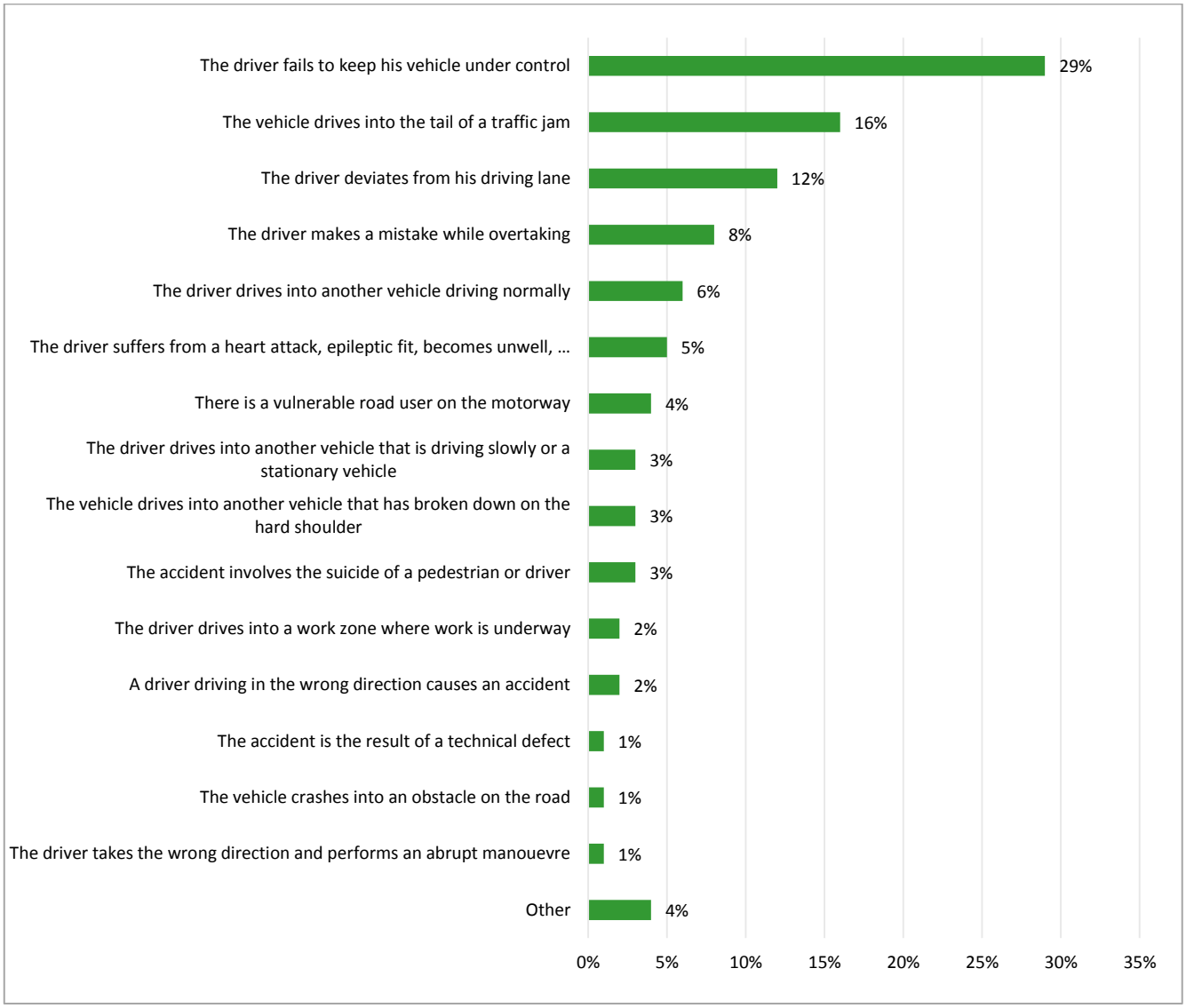
Approximately half of the drivers and passengers involved in fatal road accidents on highways in 2014 and 2015 were not wearing **a seat belt**: 35% of the drivers, 21% of the front seat passengers and 52% of the passengers in the rear.

Accident profiles

Based on the characteristics of accidents, 16 categories of fatal accidents were established (and one residual category) in response to the analysis of fatal accidents on highways from 2009 to 2013. The most common accident profiles are:

- the driver does not manage to keep his vehicle under control;
- the vehicle collides at the back of a traffic jam;
- the driver departs from his lane;
- the driver makes a mistake while overtaking;
- the vehicle collides with a normal moving vehicle.

The entire subdivision appears in the following figure.



Recommendations

Based on these results, we can make a couple recommendations. We have largely structured these recommendations based on the accident profiles so that it is clear which measures can solve a certain problem. In part, however, these recommendations are also generic.

Tackle unilateral accidents

Persistent sensitization is needed, especially for too high and inappropriate speed, driving under the influence of alcohol and fatigue. *Enforcement* remains an important condition for achieving effective behavioral change. Route controls are more effective than controls with fixed cameras at specific locations to enforce speed limits. Given the increased technological capabilities, it is recommended to gradually equip the motorway network with automated speed control systems (e.g., route controls) in the future, so that substantial speed violations disappear completely.

The forgiveness of motorways can be further enhanced by the consistent application of well-known design principles. Forgiveness means the extent to which the infrastructure is capable of avoiding a human error leading to a fatal outcome, for example for a vehicle .

Finally, *intelligent transport systems* such as Lane Departure Warning, and Lane Keeping Systems could also have a positive effect.

Avoid collisions on file types and on slow-moving vehicles

Sensitization about keeping distance while driving and in congested traffic deserves lasting attention.

Technical driving aid systems can also help prevent these type of accidents on motorways and also reduce the consequences of these accidents. More specifically systems that control the speed of the vehicle according to the current speed limits and traffic conditions are important here.

The use of dynamic road signs alongside the road can be further generalized. They set a speed limit that is adapted to the current traffic situation or warns drivers for a traffic jam or another traffic problem. It is also important to homogenize the speeds as much as possible, ie to reduce the speed differences between different vehicles on the motorway to a minimum. The more homogenous the speed, the smaller the chance of conflict between road users. Finally, it is important that speed limits are clear to the road user at any place and time. Particularly during road works it is important that the speed limits are applied as uniformly as possible by road users.

Accidents due to mistake during overtaking

Reducing the speed differences between vehicles may be part of the solution for these types of accident as well. As a result, the number of overtaking maneuvers will be reduced, and the remaining maneuvers will be less abrupt. In any case, a quieter traffic image is created. The dangers of overtaking on the right deserve special attention, for example through awareness campaigns.

Wear the seat belt, also in the back of the car

It is striking that of all drivers involved in the fatal accidents (and for which this information is known) about one in three (35%) didn't wear the seat belt. For the passengers in the back of the car, this was at least one in two (51%). For a substantial part of these accidents, wearing the seat belt could have saved lives. Awareness campaigns about the safety belt's protective effect remain important.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