Proposal to Supplement Official Statistical Data on Road Traffic Accidents in order to Research and Develop Modern Accident Simulation Methods and Increase Road Safety

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Abstract: Official road accident statistical databases, if adapted to vehicle technology trends, the growing prevalence of certain vehicle categories, and emerging accident types, can indirectly contribute to road safety. Selected data ranges from tabular official statistical databases were processed with spreadsheet software, and observable trends were analyzed. By analyzing and comparing road traffic accident data from Hungary, Germany and the European Union, we identified road safety trends in detail. A detailed analysis of statistical data revealed that official statistics provide very limited information on accidents involving (partially) autonomous vehicles, as well as on accidents involving Heavy Goods Vehicles that can be attributed to cargo securing issues. Based on these findings, we propose a framework to supplement existing statistics for the future, specifically accidents concerning driver assistance systems, (partially) self-driving functions, and cargo securing issues in heavy goods vehicles.

1. INTRODUCTION

Not only modern and novel accident reconstruction methods (Ignácz and Bell, 2010; Ignácz and Lakatos, 2022), but also sufficiently detailed statistical data can indirectly contribute to the improvement of road safety, thereby reducing accidents, injuries, and fatalities. Official accident statistics generally provide on the causes of road traffic accidents, for example. More detailed information, however, can be obtained from data processed and evaluated in accident research projects (International Road Transport Union (IRU) and European Commission (EC) Directorate General for Energy and Transport, 2007; Kalincsák et al., 2012) using the so-called in-depth method, among others. We consider it essential that accident statistics be recorded in accordance with new vehicle technical development trends, by changing road traffic characteristics and critical or newly emerging road traffic accident scenarios.

2. MATERIALS AND METHODS

During the research, we used publicly available Hungarian, German and EU official statistical data in tabular format. First, we examined whether relevant data from the perspective of our research area could be found, and if so, in what detail they were included in the databases.
The data were processed using spreadsheet software, and the selected information was presented as bar and trend diagrams according to our research criteria. Observed trends from these diagrams were subsequently analyzed and evaluated.

3. ROAD TRAFFIC ACCIDENT STATISTICS ANALYSIS

3.1 Road Traffic Accident Statistics in Hungary

Analyzing the statistical data from Hungary, it can be concluded that after the turn of the millennium until 2004, the number of people injured in road traffic accidents increased continuously by nearly 24%. Following that, there was a 32% decrease until 2012, resulting in a significant drop in the number of injured people to 18,979 individuals, which was well below the level seen around the turn of the millennium (22,698 people). Afterwards, there was an increase until 2018, then a decrease again, and in 2020, the fewest number of people (17,716 people) were injured on the roads of Hungary in the examined period. The number of injured people has risen again after the COVID19 pandemic, and almost 10% more people were injured on the roads in 2022 than in 2020. The number of road traffic accidents involving personal injury shows a similar trend to the number of injured persons (Fig. 1). The fewest accidents involving personal injury occurred in 2020 (13,778), however, an increase could be detected again by 2022 (14,748). Between 2022 and 2024, both the number of injured people and the number of accidents involving personal injury stagnated.

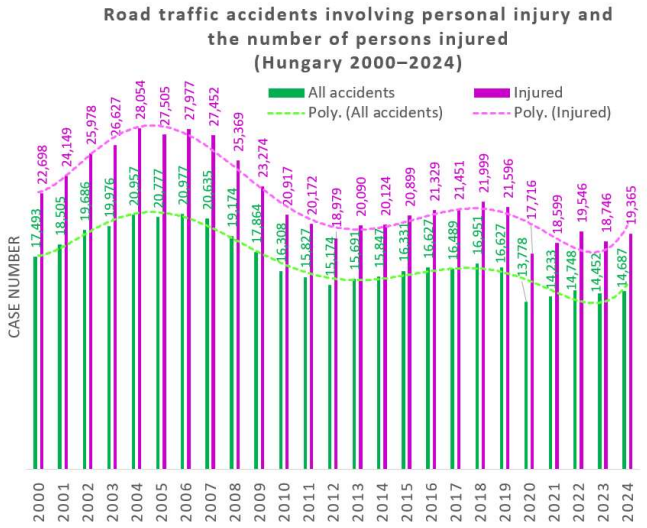

Fig. 1. Road accidents involving personal injury and the number of persons injured in Hungary (2024: preliminary data) (Source: Created by the authors, based on data from (Központi Statisztikai Hivatal (KSH), 2025))

The significant decrease in road traffic accident-related deaths since 2002 is a notable result, with deaths decreasing from 1429 to 460 people by 2020. Similar to the increase in the number of injured people, the number of people killed in road traffic accidents has also increased after the COVID19 pandemic and 537 people lost their lives on the roads in 2022. Since 2022, the annual number of fatalities has slightly decreased (Fig. 2).

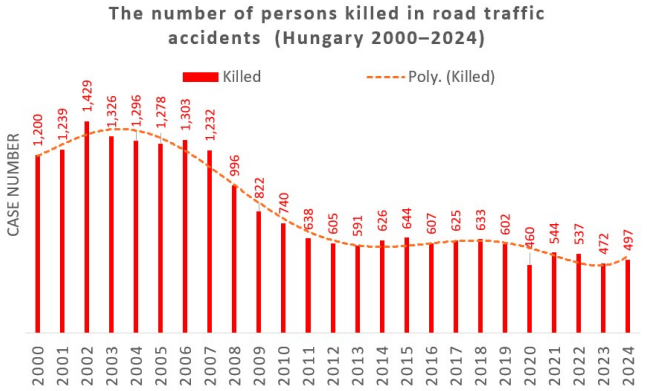

Fig. 2. The number of persons killed in road traffic accidents in Hungary (2024: preliminary data) (Source: Created by the authors, based on data from (Központi Statisztikai Hivatal (KSH), 2025))

Also of great importance is that the percentage of fatalities related to all road traffic accidents involving personal injury has significantly decreased compared to data from 2002 (7.3%) and fell back to 3.3% by 2020 (Fig. 3). This ratio slightly increased to 3.6% by 2022 but then fell to 3.4% by 2024.

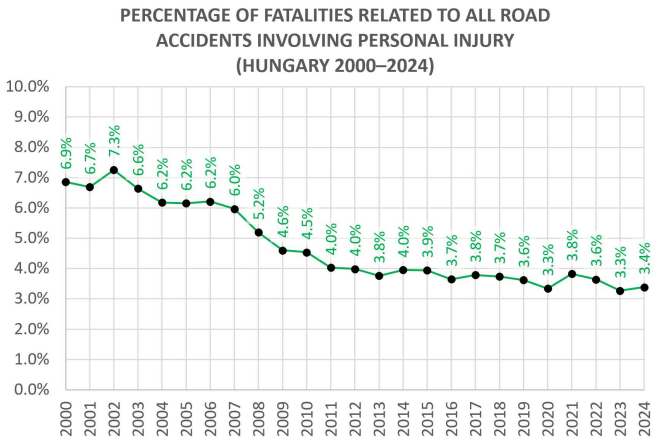

Fig. 3. Percentage of fatalities related to all road traffic accidents involving personal injury in Hungary (2024: preliminary data) (Source: Created by the authors, based on data from (Központi Statisztikai Hivatal (KSH), 2025))

3.2 Road Traffic Accident Statistics in Germany

In Germany, after the turn of the millennium, the number of people injured in personal injury accidents decreased significantly and continuously until 2010, when 26% fewer people were injured on the roads than in 2000 (Fig. 4). Subsequently, there was an increase until 2016, but after that the number of injured people started to decrease again and in 2021 there were about 13% fewer people injured on the roads than in 2010. After this, the number of injured people increased significantly again and in 2024, 13% more people were injured in road traffic collisions than in 2021.

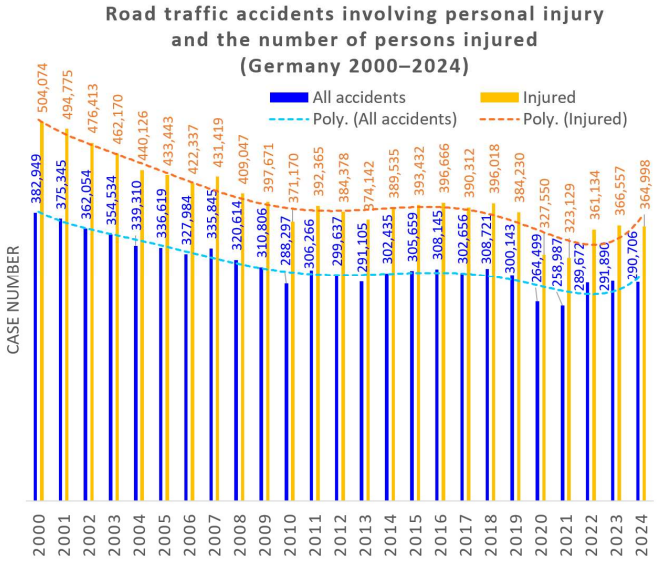

Fig. 4. Road accidents involving personal injury and the number of persons injured in Germany (Source: Created by the authors, based on data from (Statistisches Bundesamt (Destatis), 2025))

Compared to the data recorded at the turn of the millennium, the number of fatalities in road accidents in Germany decreased by nearly two-thirds from 7,503 individuals, reaching 2,562 individuals by 2021, which can be considered a significant achievement (Fig. 5). However, the number of fatalities increased again in 2022 (2,788 individuals) and has stagnated since then, up to 2024.

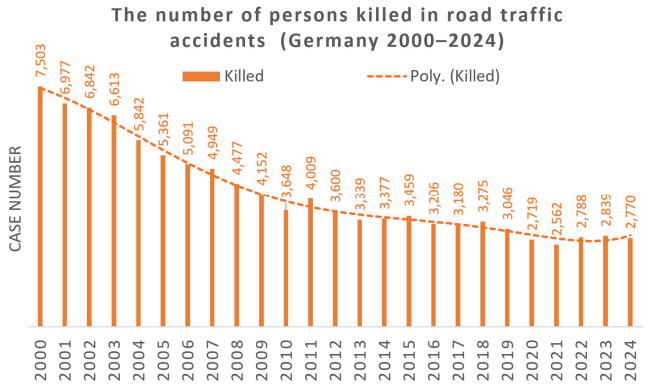

Fig. 5. The number of persons killed in road traffic accidents in Germany (Source: Created by the authors, based on data from (Statistisches Bundesamt (Destatis), 2025))

The percentage of fatalities related to all road traffic accidents involving personal injury was still 2% at the turn of the millennium, but it decreased to 1% by 2016 and remained near this level until 2024 (Fig. 6).

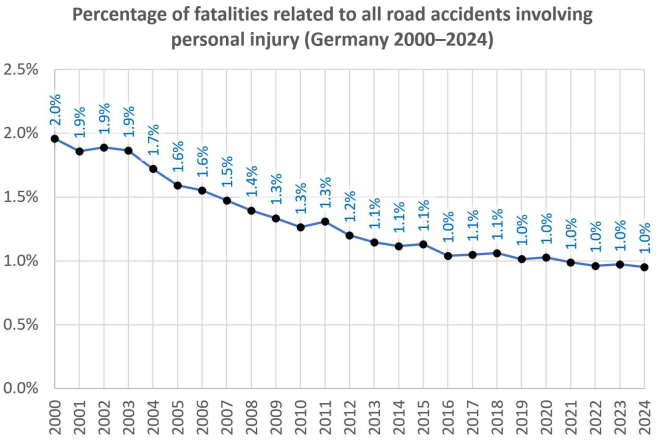

Fig. 6. Percentage of fatalities related to all road traffic accidents involving personal injury in Germany (Source: Created by the authors, based on data from (Statistisches Bundesamt (Destatis), 2025))

3.3 Road Traffic Accident Statistics in the European Union

Examining EU statistical data after 2013 (since comparable data from previous years were not available), it can be concluded that the number of road traffic accidents involving personal injury increased slightly (by 4%) until 2016. Later, in the period from 2016 to 2020, a significant decrease of 14% could be determined (Fig. 7).

The number of road traffic accidents involving personal injuries (referred to as "crashes" in the next chart) and the number of injured people have been continuously increasing from 2020 to 2024. During this period, accidents increased by 20% and the number of injured people by 22%.

The number of people injured in the aforementioned accidents followed a similar trend to the overall number of accidents, decreasing by 5% by 2023 between 2013 and 2023.

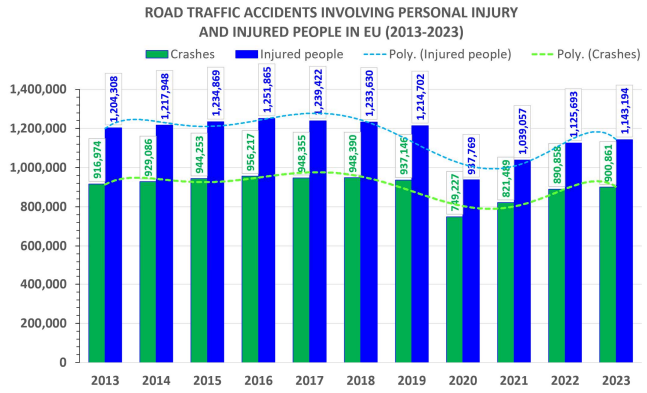

Fig. 7. Road traffic accidents involving personal injury in EU (Source: Created by the author, based on data from (Atasayar et al., 2025).

Examining the number of people who died in road traffic accidents in the period after 2013, we can conclude that accident-related deaths began to decrease significantly in 2015. In 2021, a significant reduction of 18% could be shown compared to the year 2015. After that, a 4% increase can be observed in 2022 compared to the year 2021 (Figure 8). Accidental deaths stagnated in the next two years, then a slight decrease occurred by 2024, according to preliminary data.

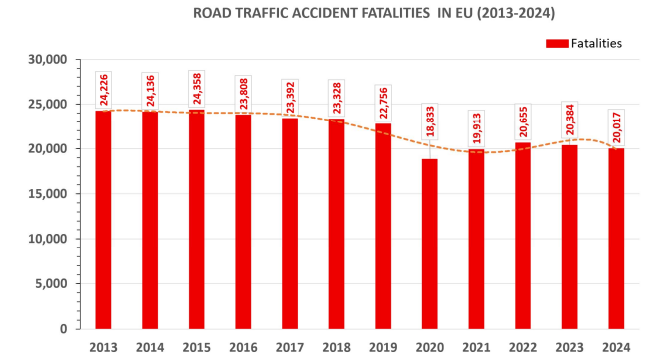

Fig. 8. Road traffic accidents fatalities in EU (2024: preliminary data) (Source: Created by the author, based on data from (Atasayar et al., 2025; Carson et al., 2025)

Examining the period from 2013 to 2024 it becomes evident that the decrease in road traffic accident fatalities in Hungary

(20%) is more significant than the decrease in Germany (17%) and the average decrease in the European Union (17%).

3.4 Statistical data on HVG cargo securing in the EU

There is limited statistical data available on road traffic accidents related to cargo securing, and most of it originates from the results of road safety research projects (International Road Transport Union (IRU) and European Commission, 2007; Kalincsák et al., 2012). For example, according to the results of the European Truck Accident Causation (ETAC) study, if the cargo is considered not only as the primary cause of the accident but also as a secondary or tertiary contributing factor, incorrect cargo securing and placement could be identified in at least 25-30% of all truck accidents (Kőfalvi, 2009). According to information from the European Commission, up to 20-25% of truck accidents can be attributed to inappropriately secured cargo (European Commission, 2014). Estimates by the European Safe Logistics Association suggest that 8,000 people a year are seriously affected by such road accidents, where the original root cause is improper load securing (European Safe Logistics Association, n.d.).

Taking the above-mentioned facts and trends into account, developments in cargo safety and the development of modern simulation procedures applicable to the field are expected to play a crucial role in the coming years and decades. These developments could also indirectly contribute to achieving the EU's long-term objectives of reducing the number of road traffic deaths to near zero by 2050 and to halve serious injuries by 2030 compared to 2020 levels in the European Union (European Commission, 2020).

4. PROPOSAL TO SUPPLEMENT THE STATISTICAL DATA

We have previously noted that the official road traffic accident statistics of the European Union, Germany and Hungary do not contain data on the presence and potential impact of ADAS systems and self-driving functions (Ignácz and Lakatos, 2022) nor on accidents involving HGVs related to cargo securing issues. In our opinion, the statistical data should be supplemented within the foreseeable future, given that ADAS systems and (partially) self-driving vehicle functions are widespread nowadays and can influence the course of vehicle accidents. Supplementing accident statistics with data on vehicle ADAS/AD systems and HGV cargo security issues would enable the targeted development of ADAS/AD systems, which would indirectly result in an increase in general road safety and help achieve the EU's goals (European Commission, 2020) in terms of reducing road traffic accident-related deaths. It would be important to supplement road traffic accident statistics with the data presented in Table 1 and Table 2.

Table 1. Proposal for supplementing road traffic accident statistical data on ADAS/AD systems

Data related to ADAS/AD systems	Accidents involving personal injury	Fatal accidents
Vehicle equipped with ADAS/AD function	case No.	case No.
ADAS/AD turned on	case No.	case No.
ADAS/AD error	case No.	case No.
ADAS/AD influence on the occurrence of an accident	case No.	case No.

Table 2. Proposal for supplementing road traffic accident statistical data on cargo securing issues

Data related to HGV cargo securing issues	Accidents involving personal injury	Fatal accidents
Cargo properly secured	case No.	case No.
Problems with cargo securing	case No.	case No.
Cargo securing equipment failure	case No.	case No.
Impact of cargo securing on accident occurrence	case No.	case No.

4. CONCLUSIONS AND PLANNED FURTHER RESEARCH

Based on the results of the analysis conducted on the basis of data from accident statistical databases, we determined that from 2013 to 2024, the decrease in road traffic accident fatalities in Hungary (20 %) is more significant than in Germany (17%) and the European Union average (17%).

When reviewing the official statistical data, we concluded that they do not contain essential information on accidents involving (partially) autonomous vehicles or HGVs with cargo securing issues. This missing data, which could be addressed in the future through the expansion of the aforementioned databases, may indirectly contribute to improving overall road traffic safety. In addition, more detailed statistical data would also be valuable for the development of novel modern accident reconstruction methods in these areas.

Accordingly, we propose that official statistical databases be supplemented in the future with data on accidents related to HGV cargo securing issues and accidents involving (partially) autonomous vehicles.

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