

# Speed as a key factor in traffic accidents

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## Abstract

Inappropriate speed has long been one of the most critical factors influencing road safety and the severity of collision consequences. The aim of this paper was to define traffic accidents caused by excessive speed, which significantly contributes to their frequency and severity. It focused on the reasons why speed is so risky, and on possible measures to reduce accident rates, including effective strategies for increasing road safety. To achieve these objectives, secondary data analysis from the databases of the Police of the Czech Republic and the Transport Research Centre was used, which was subsequently processed using linear regression analysis for trend modeling and Pearson's chi-square test for verifying statistical hypotheses. The research results showed that although the absolute number of accidents is decreasing slowly, the linear model confirmed a statistically significant downward trend in the number of fatalities, and the demographic analysis identified that young drivers exhibit a more than double tendency toward speed-related accidents compared to seniors. The main limitation of the research lies in the reliance on police statistics, which may not capture latent accident rates; therefore, the use of objective data from vehicle telematics systems is suggested for future studies.

**Keywords:** Traffic accident rate, inappropriate speed, road safety, time series analysis, regression analysis, statistical testing, demographic factors.

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## Introduction

Traffic accidents are becoming one of the main factors leading to unexpected deaths worldwide. Advances in artificial intelligence and sensor technologies enable increasingly accurate short-term prediction of traffic accidents. This makes it possible to monitor traffic in real time, detect risky situations, and implement preventive measures (Cai & Di, 2023). Traffic accidents are the leading cause of injury-related deaths and have significant economic impacts on the individuals affected, their families, and entire countries (Yahia et al., 2024). Over the

past decade, the number of traffic accidents has decreased in most developed countries. This decline is attributed to improvements in vehicle and road design, advances in medical technology and care, as well as better driver education and training. However, new evidence suggests that changes in fuel prices also have a significant impact on traffic accidents through other mediating factors, such as reduced exposure of drivers to risk due to reduced car traffic and more economical driving, for example by reducing speed on highways (Naqvi et al., 2020).

Excessive speed has been identified as a key cause of increased traffic accidents and also exacerbates their severity. Strategies to improve road safety therefore focus primarily on accurately identifying accident locations (Almoshaogeh et al., 2021). Speeding includes not only violating established limits, but also driving in a manner that is not adapted to current road conditions. Compliance with speed limits is essential for preventing accidents and mitigating their consequences. These limits set the maximum permissible speed under favorable conditions and balance the risk of accidents, safety, and enforcement capabilities. The main factors affecting speed include the width of the shoulder, the proportion of heavy vehicles, and hazards around the road. Based on the findings, adjustments to speed limits were proposed to increase safety (Rao & Chandra, 2022). Young drivers are the age group most at risk of being involved in traffic accidents. Typical causes of these accidents include lack of experience, limited driving skills, and a tendency to engage in risky behavior behind the wheel. In contrast, accidents involving older drivers are often influenced by impaired vision, weakened cognitive abilities, and reduced mobility (Luburic et al., 2023).

The aim of this thesis is to define traffic accidents caused by excessive speed, which significantly contributes to their frequency and severity. It will focus on the reasons why speed is so risky and on possible measures to reduce accidents, including effective strategies for increasing road safety. In connection with this aim, the following research questions have been set:

The answer to the first research question will focus on analyzing the impact of high speed on the frequency and severity of traffic accidents, including statistics and examples that show how speed contributes to accidents with serious consequences.

RQ1: What is the impact of high speed on the frequency and severity of traffic accidents in 2017-2023?

The second question will focus on differences in the impacts of excessive speed among different demographic groups, specifically how the behavior of young drivers differs from that of older drivers and how this affects their involvement in accidents.

RQ2: How do the impacts of excessive speed on traffic accidents differ across different demographic groups (e.g., young vs. older drivers)?

## **Literary research**

Speeding is a significant global problem that contributes to higher numbers of injuries and deaths in traffic accidents. Driving above the speed limit has been repeatedly linked to an increased incidence of collisions (Zain et al., 2022). Current research in the field of traffic safety builds on this general framework, viewing speed as a complex variable whose relationship to accident rates is not always linear and requires sophisticated statistical modeling.

This phenomenon was examined in detail by Yamada et al. (2025), who analyzed the impact of average travel speed on accident risk using a large sample of highway sections and major roads. Using negative binomial regression models, the authors found that higher average speeds paradoxically correlate with lower accident rates and that higher speed limits on highways can reduce the risk of collisions. This conclusion suggests that smooth traffic flow at higher speeds can eliminate the conflict situations typical of congestion. However, this apparent paradox must be viewed in the context of overall traffic flow balance. Stepanovic et al. (2025) focused their study on the mutual influence of traffic intensity and speed characteristics on two-lane roads. By applying negative binomial regression models to a five-year time series of data, they demonstrated that it is not only speed itself that is a critical factor, but above all its variability. With increasing differences in the speeds of individual vehicles and a greater difference between the free speed and the speed limit, the expected number of traffic accidents increases significantly.

Although higher fluidity may reduce the frequency of accidents, in the event of a collision, the kinetic energy determined by speed is decisive for the fatality of the consequences. Doecke et al. (2021) attempted to quantify the absolute risk of serious injury as a function of travel speed, using precise data from event data recorders (EDRs). Using logistic regression, they demonstrated that for all types of collisions—frontal, side, and collisions with fixed obstacles—there is a significant, nonlinear increase in the probability of serious injury or death with increasing speed. However, the validity of such studies often depends on the quality of the input data, which poses a significant methodological challenge. This problem was highlighted by Islam and Mannering (2025), who focused on the issue of bias in police estimates of pre-crash speed due to their correlation with the severity of injuries. Using a discrete-continuous econometric model, they found that while police estimates are statistically accurate for serious accidents, there is significant bias in the input data for less serious accidents, which can lead to erroneous conclusions in safety analyses.

The influence of speed is further modified by external environmental factors and human reliability. Yu et al. (2023) verified the relationship between driver failure probability and accident rates within the framework of reliability theory. Using Spearman's coefficient and regression prediction models, they confirmed the correlation that as the probability of failure increases, so does the accident rate, which is also significantly influenced by infrastructure factors such as the radius of the curve or the speed limit setting. Dynamic weather conditions also play an important role in risk prediction. Harper et al. (2021) investigated the possibilities of refining travel speed predictions during heavy rainfall using correlation analysis and the LASSO method. Their study showed that models using high-resolution local precipitation data provide significantly more accurate results than conventional measurements from a single urban rain gauge, which has a major impact on real-time traffic management. The real-world impacts of regulatory measures were then examined by Lopez et al. (2021), who evaluated the blanket

reduction of speed limits on major arteries through a comparative analysis of data before and after the measures were introduced. They found that although the regulation led to a decrease in the number of fatalities, the total number of accidents with injuries increased, indicating a positive shift in reducing the severity of accidents at the expense of their overall frequency.

A specific and high-risk factor is the influence of demographic factors, particularly the diametric differences between novice and older drivers. Řezníček and Kovač (2025) confirmed that demographic variables significantly shape the accident risk profile in the Czech Republic, particularly across age and gender categories. Using Shapiro–Wilk testing followed by Pearson/Spearman correlation, they reported strong associations between selected accident causes and demographic groups, while also noting the limitation of centralized aggregated data. Gooch et al. (2024) applied a comprehensive systemic approach to safety using negative binomial regression models to identify high-risk locations. They found that the presence of high-speed roads increases the frequency of serious accidents in both age groups, but the causes differ: while risky behavior and poor infrastructure play a major role among young people, indicators of healthy aging are key among older drivers. This conclusion is also supported by Luburić et al. (2023), who, based on an analysis of four years of data, showed that the main source of risk for young drivers is a combination of driving inexperience and deliberately seeking out dangerous situations.

Behavioral studies provide deeper insight into cognitive and psychological causes. Se et al. (2024) analyzed factors influencing injury severity using an advanced hierarchical ordered probit model. Their findings show that while inexperience and aggression increase the risk of death among young drivers, reduced reaction time, especially in poor visibility conditions, is a critical factor in the older population. Truelove et al. (2022) examined the motivations for risky behavior among young people in detail using qualitative inductive thematic analysis of focus groups. They found that legal sanctions are effective as a deterrent only for minor speeding violations, while for extremely high speeds, the main deterrent is fear of physical harm, not legislation. The cognitive aspects of this problem are further illustrated by Evans et al. (2022), who used content analysis of responses to video recordings to identify a fundamental difference in risk perception. Beginners focus on formal compliance with the rules when driving, but at higher speeds their ability to detect real risks decreases significantly, unlike experienced drivers, who are better able to predict danger even in more challenging conditions.

Based on an analysis of expert sources and methodological approaches used in the studies examined, content analysis of secondary data from publicly available statistics was selected as the most suitable method for data collection in this work. The data obtained will then be processed and evaluated using time series analysis to identify trends and statistical hypothesis testing methods (specifically, Pearson's chi-square test of independence). This combination of methods will not only describe the development of accident rates over time, but also statistically verify the significance of differences between individual demographic groups.

## **Data and methods**

This chapter presents the data sources and methodological procedures selected to achieve the objective of the thesis, which is to analyze the impact of speed on traffic accidents. The chapter is divided into two main parts. The first part focuses on the application of content

analysis for data collection and the characteristics of the secondary sources used. The second part then defines the specific methods of data processing and evaluation that will be applied to answer the research questions, including testing statistical hypotheses and time series analysis

## **Data**

The above literature review shows that for the purposes of this research, it will be most appropriate to use secondary data, which will provide a broad sample and thus ensure objective and reliable research results. The research data will be obtained from the official website of the Czech Police (2025), where statistical data on traffic accidents in the Czech Republic are published in annual reports. In addition, data will also be obtained from the Transport Research Centre portal (2025), which offers a clear statistical evaluation of traffic accidents.

To answer the first research question, content analysis of secondary data from the Czech Police and the Transport Research Centre will be used. The period under review will be from January 1, 2017, to December 31, 2023, with data monitored at annual intervals and subsequently recorded in MS Excel tables. The indicators monitored will be the total number of traffic accidents, the number of fatalities, and the number of accidents whose main cause was excessive speed. The data obtained will then be prepared for time series analysis and statistical hypothesis testing.

Content analysis will also be used to answer the second research question, with data drawn from the same databases. The trend monitored will be the proportion of accidents caused by excessive speed in specific age groups of drivers (e.g., young drivers under 24, seniors) in the same period from January 1, 2017, to December 31, 2023. This data will be collected and recorded in MS Excel tables. This ten-year period was chosen to reflect possible changes in driver behavior and accident trends over time.

All data obtained will be described in detail in the introduction to the analytical section and characterized using basic descriptive statistics. For basic orientation in the data set, the arithmetic mean of the annual number of accidents and the median will be calculated to eliminate the influence of extreme values. The mode will be determined to identify the most common type of consequences in accidents caused by speed. The degree of data variability over time will be expressed by standard deviation and variance.

## **Methods**

This subchapter describes in detail the methodological procedure for processing and evaluating secondary data, which will be implemented in the MS Excel spreadsheet environment. The initial phase of the analysis will involve the application of descriptive statistics for the basic characteristics of the sample under investigation. For a deeper insight into the issue and statistical verification of the results, more advanced analytical tools were subsequently selected that directly correspond to the research questions set. Specifically, this

involves time series analysis to examine development trends and testing statistical hypotheses to verify the significance of differences between demographic groups.

To answer the first research question, trend analysis using linear regression will be used. This method was chosen in line with current scientific approaches that use regression models to identify trends in accident rates (e.g., Zohrevandi et al., 2025).

Since we are working with annual data for the period 2017–2023, the aim of the analysis is to find the so-called trend line that best captures the main direction of accident development over time. To this end, the least squares method will be used, which will fit a linear function to the data.

Mathematically, this model is defined by the equation of a straight line:

$$y = ax + b$$

where:

- $y$  is the balanced value (theoretical number of accidents on a straight line),
- $x$  is time (year order),
- $a$  (slope) is the most important parameter, which indicates the average year-on-year change (if the number is negative, it means that accidents are decreasing on average),
- $b$  is a constant (value at the beginning).

This procedure allows us not only to graphically display whether the accident rate is decreasing or increasing, but also to use the calculated slope ( $a$ ) to accurately quantify the average annual change in the number of accidents.

Time series analysis will be primarily used to answer the first research question. The choice of this method is based on current scientific approaches in the field of road safety, as evidenced, for example, by the study by Zohrevandi et al. (2025). In it, the authors successfully applied time series analysis (specifically regression models) to identify risk periods and quantify the impact of specific factors on accident rates. In line with this approach, data on accidents caused by excessive speed will be arranged in chronological order in annual intervals for the entire period under review (Zohrevandi et al., 2025).

The aim of the analysis will be to decompose the time series, which will allow long-term trends to be separated from seasonal fluctuations. The mathematical model for decomposing the time series is based on a basic additive model, which can be defined by the following relationship:

$$x^2 = \sum_{i=1}^r \sum_{j=1}^c \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

where:

- $O_{ij}$  is the observed frequency of accidents in the  $i$ -th age group for the  $j$ -th type of cause (speed/other)
- $E_{ij}$  is the expected frequency assuming independence of variables (theoretical value if age had no influence)
- $r$  and  $c$  denote the number of rows and columns in the contingency table

The test will be performed at a significance level of  $\alpha = 0.05$ . If the calculated p-value falls below this threshold, the hypothesis that the riskiness of drivers in relation to speed is not random but is significantly influenced by their age will be confirmed, which would confirm the conclusions of foreign studies.

## Results

This chapter presents empirical findings based on an analysis of secondary data on accidents in the Czech Republic for the period from 2017 to 2023. The analysis begins with a basic statistical description of the sample of accidents caused by excessive speed. A total of 93,120 traffic accidents were identified in the Czech Police databases during the seven-year period analysed, with excessive speed determined as the main cause. Unfortunately, these accidents had a very tragic outcome, with a total of 1,184 people killed and another 3,114 participants suffering serious injuries. In terms of consequences, accidents involving only material damage or minor injuries predominated in terms of numbers, but the high number of fatalities confirms that speed is a key factor determining the severity of accidents.

A detailed analysis of specific causes within the speed category shows that the most common type of accident (*modus*) was not exceeding the speed limit indicated by road signs but rather failing to adjust speed to road conditions (e.g., ice, wet conditions), which caused 41,298 accidents. The second most common cause was failure to adjust speed to the technical condition of the road, typically the profile of a bend or descent, with 28,204 accidents. A detailed overview of the frequency of individual causes and their consequences is summarized in Table 1.

*Figure 1: Causes of accidents related to speed in the period from January 1, 2017, to December 31, 2023*

Cause	Number of accidents	Number of killed
Failure to adjust speed to road conditions	41289	274
Failure to adjust the speed to the current technical condition	28204	571
Failure to match the speed to the characteristics of the vehicle	10325	182
Not adapting speed to traffic intensity	7214	70

Other kind of excessive speed	3855	92
Other (visibility, limits, wind)	2224	95
Total	93120	1184

Source: Own processing based on data from CDV (Transport Research Center, 2025)

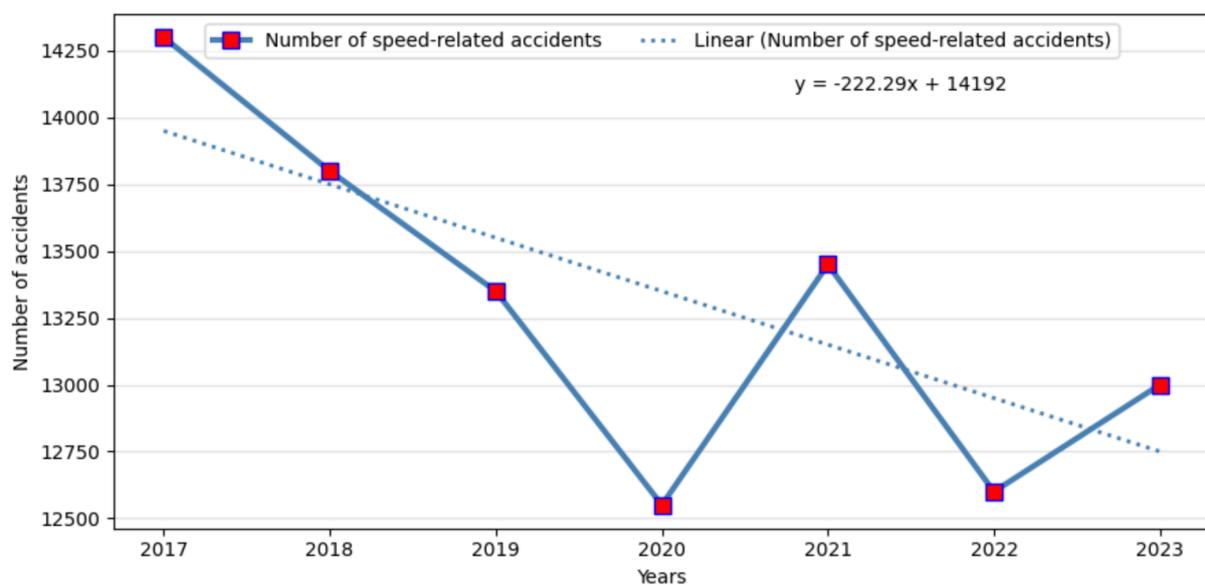
An analysis of external conditions also showed that, paradoxically, most accidents caused by speed (38,745 cases) occur on dry surfaces, suggesting that drivers take more risks in ideal conditions. In terms of visibility, most accidents, specifically 50,067 cases, occurred during the day in good visibility conditions. The degree of variability in the annual data, expressed as the standard deviation, reached a value of 643 accidents. This relatively low value in the context of the overall average indicates that the development of speed-related accidents is stable over time and does not show extreme random fluctuations.

Subsequently, attention was focused on answering the first research question, which examines the impact of high speed on the frequency and severity of accidents over time. Linear regression analysis was applied to the data to identify the long-term trend.

The development of the total number of accidents caused by excessive speed is visualized in Graph 1. A linear trend line was interpolated into the graph using the least squares method, which is defined by the equation:

$$y = -222,29x + 14192$$

*Graph 1: Development of traffic accidents related to speed in the period from January 1, 2017, to December 31, 2023*



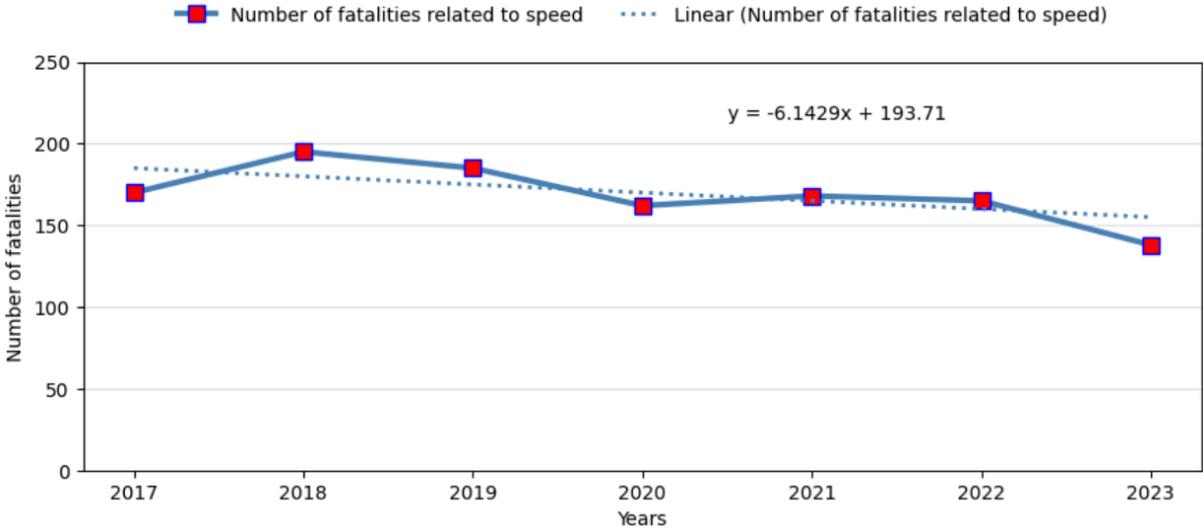
Source: Own processing based on data from CDV (Transport Research Center, 2025).

The key parameter in this equation is the slope of the line (coefficient a), which has a value of 222.29. This negative value statistically confirms the downward trend in accident rates. Interpretation of this coefficient means that during the monitored period of 2017–2023, there was an average year-on-year decrease of approximately 222 traffic accidents caused by excessive speed. Despite local fluctuations (e.g., in 2021), the overall long-term trend is positive.

The same methodology was then applied to the analysis of the severity of the consequences, specifically to the development of the number of fatalities, as shown in Graph 2. In this case, too, there is a linear downward trend, which is confirmed by the calculated regression equation:

$$y = -6,1429x + 193,71$$

Graph 2: Development of the number of speed-related fatalities in the period from January 1, 2017, to December 31, 2023



Source: Own processing based on data from CDV (Transport Research Center, 2025).

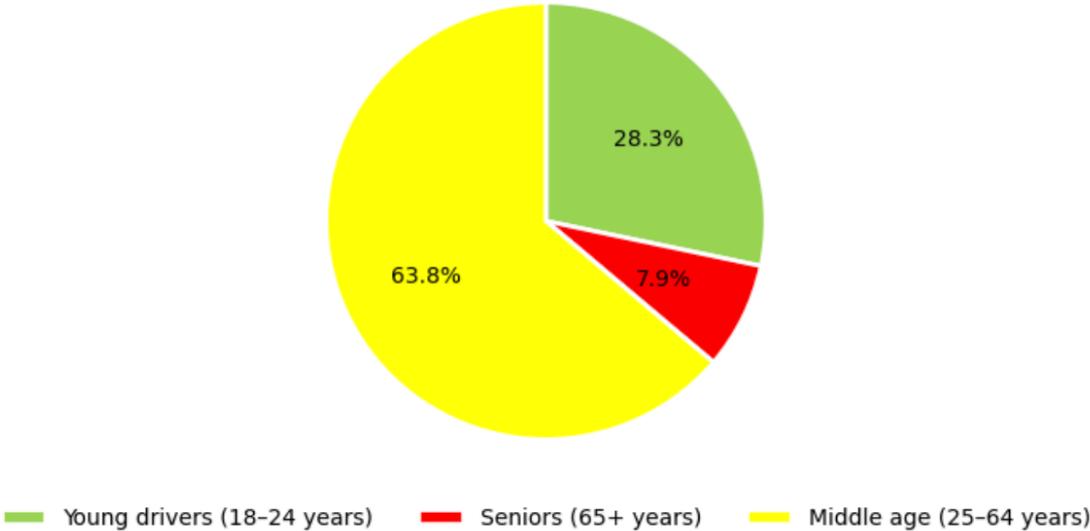
The negative trend in this case indicates that the number of victims of accidents caused by speed is decreasing at an average rate of approximately 6 people per year (more precisely 6.14). This decline is a positive sign in terms of social impact and confirms that, although speed remains a risk, the consequences of accidents are gradually being mitigated over time, which corresponds to the historical minimum measured in 2023.

After evaluating the time trends, the second part of the analysis focused on answering the second research question, i.e., identifying differences in the impacts of excessive speed

among different demographic groups. The first step was to map the overall age structure of those responsible for accidents.

The distribution of the share of individual age categories in the total number of accidents caused by speed is visualized in Graph 3.

*Graph 3: Share of age groups in traffic accidents overall in the period from January 1, 2017, to December 31, 2023*



Source: Own processing based on data from CDV (Transport Research Center, 2025).

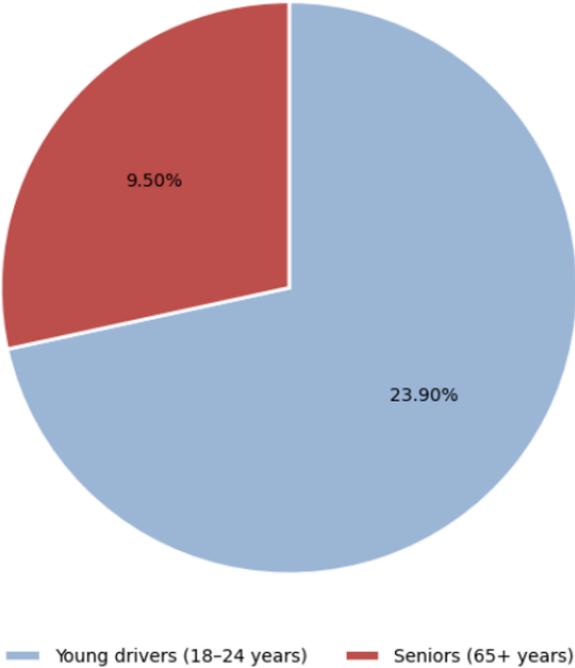
The data shows that although most accidents (approx. 64%) are caused by middle-aged drivers (25–64 years), which corresponds to their largest representation in the population and in road traffic, a significant proportion is caused by young drivers (18–24 years). They caused 26,330 accidents, which represents more than 28% of all speed-related cases. In contrast, seniors (over 65) account for less than 8% of these accidents.

This finding led to the need for a more detailed comparison of the riskiness of two key groups: young drivers and seniors. The aim was to determine whether the age of the driver statistically significantly affects the probability that an accident will be caused by excessive speed.

The database revealed that young drivers caused a total of 110,212 traffic accidents during the period under review, of which excessive speed was identified as the main cause in 26,330 cases. This means that almost every fourth accident (23.9%) involving a young driver is caused by speed. In contrast, the group of senior citizens caused a total of 78,078 accidents during the same period, but speed was the cause in only 7,392 cases. The proportion of accidents caused by speeding is significantly lower for this group, at only 9.5%.

This fundamental difference in risk profile is illustrated in Graph 4, which compares the percentage of accidents caused by speeding in both groups.

Chart 4: Share of age groups in traffic accidents related to speed in the period from January 1, 2017, to December 31, 2023



Source: Own processing based on data from CDV (Transport Research Center, 2025).

Pearson's chi-square test of independence was performed to statistically verify the significance of this difference. The input data for testing, including both observed (actual) and expected (theoretical) frequencies, are shown in Table 2.

Table 2: Contingency table of observed frequencies for the chi-square test

Age Group	Accidents – Speed (Actual)	Accidents – Other cause (real)	Accidents – Speed (expected)	Accidents – Other cause (expected)	Total accidents
Young drivers (18-24 years)	26330	83882	19739	90473	110212
Seniors (65+ years)	7392	70686	13983	64095	78078
Total	33722	154568	33722	154568	188290

Source: Own processing based on data from CDV (Transport Research Center, 2025).

Table 2 shows a fundamental difference between reality and the theoretical model of independence. While theoretically, if age and cause were independent, there should only be approximately 19,700 speed-related accidents involving young drivers, in reality, over 26,300 were recorded. This difference was subsequently reflected in the test results.

The resulting p-value of the test ( $p < 0.001$ ) is significantly lower than the specified significance level  $\alpha = 0.05$ . Based on this result, the null hypothesis was rejected and the alternative hypothesis was accepted. The statistical analysis thus clearly demonstrated that there is a strong correlation between age and the tendency to have high-speed accidents. Young drivers show a statistically significantly higher tendency to this type of accident than senior drivers.

## **Discussion of results**

*RQ1: What is the impact of high speed on the frequency and severity of traffic accidents in 2017–2023?*

The first research question focused on analyzing the impact of high speed on the frequency and severity of traffic accidents in 2017–2023. The application of linear regression analysis to the accident time series yielded statistically significant findings that require detailed interpretation.

Although a simple look at the absolute numbers for individual years may give the impression of stagnation or random fluctuations, the trend model showed that the accident rate has been declining over the long term. The determined value of the regression line slope ( $a = -222.29$ ) indicates that there is an average year-on-year decrease of more than 220 accidents caused by speed in the Czech Republic. This positive trend can be attributed to a combination of several factors, from the gradual introduction of modern active safety features in the vehicle fleet (e.g., lane departure warning systems, automatic braking) to preventive police action.

However, it is important to note that the linearity of this downward trend was disrupted in 2020 and 2021 by external factors, specifically the COVID-19 pandemic. During this period, there was a decline in overall mobility, which was naturally reflected in a lower number of accidents. Our findings on this point correspond with those of Naqvi et al. (2020), who pointed out that external economic and social factors (such as fuel prices or lockdowns) have a direct impact on accident rates through reduced driver exposure to risk. However, it is a warning sign that after the pandemic measures were lifted (in 2021/2022), there was a renewed increase, suggesting that drivers' behavioral habits have not changed permanently.

An even more significant trend was observed in the severity of consequences parameter. The regression model confirmed an average annual decrease in the number of fatalities of approximately 6 people (direction  $-6.14$ ). This result, crowned by a historic low in 2023 (138 fatalities), is key to assessing the effectiveness of safety measures. This phenomenon is fully consistent with the conclusions published in a study by Lopez et al. (2021). Based on a

comparative analysis, they demonstrated that modern speed management strategies, combined with safer vehicle design (passive safety), primarily lead to a reduction in fatal consequences. Vehicle safety is increasingly reflected in standardized rating systems that influence both manufacturers and consumer choices. Kovač et al. (2024) analyzed vehicles newly registered in the Czech Republic in 2022 and found based on content analysis combined with cluster and correlation analysis that vehicle price is not a decisive factor in achieving higher safety ratings, which supports the need to focus on enforceable safety standards rather than market-based assumptions. In other words, accidents still occur relatively frequently (minor accidents are declining more slowly), but thanks to crumple zones and airbags, the consequences for occupants are less often fatal. Our analysis confirms that this positive effect of technological progress is also evident on Czech roads.

A detailed analysis of the conditions under which accidents occur has revealed an interesting paradox. The majority of accidents caused by speed (more than 41% of cases classified as "inappropriate speed for road conditions") occur on dry surfaces and in good visibility. This result strongly supports the theory of Yamada et al. (2025) on so-called risk compensation. Drivers perceive good weather conditions and a high-quality road surface as a "safe environment," which leads to a false sense of security, underestimation of risk, and a subsequent increase in travel speed. Conversely, drivers behave more cautiously in rain or snow.

While Stepanovic et al. (2025) emphasized variability and heterogeneity of traffic flow as the main risk factor in their study, our results from the Czech environment suggest that the dominant problem here is rather individual human error in estimating physical limits in curves and on straight sections than just interaction between vehicles.

*RQ2: How do the impacts of excessive speed on traffic accidents differ across demographic groups?*

The second part of the discussion focuses on interpreting the results of the second research question, which examined differences in the impacts of excessive speed across demographic groups. The analysis confirmed the existence of significant differences in the risk profile of drivers depending on their age.

Empirical data showed that among young drivers (aged 18–24), nearly 24% of all accidents are caused by excessive speed. In contrast, among seniors (over 65), speed is the cause of only 9.5% of accidents. The statistical significance of this difference was clearly verified in the study using the chi-square test ( $p < 0.001$ ), which allows us to reject the assumption that the influence of age on this type of accident is random.

This result is not unique in the context of foreign literature and fully corresponds to the conclusions of the study by Romano et al. (2021). The authors identified speed as one of the strongest predictors of fatal accidents among novice drivers who have not yet fully automated

their driving habits. Our data validate that this phenomenon of "youthful recklessness" is also strongly present in the Czech Republic and represents a systemic problem.

The causes of this stark difference between generations can be interpreted in the context of the study by Luburić et al. (2023). While the low proportion of speed-related accidents among seniors confirms that their risk factors are more related to natural cognitive decline, slower reaction times, and problems with peripheral vision (which typically leads to accidents caused by failure to yield the right of way), the mechanism of accidents among young drivers is different. Here, it is not physical inability to control the vehicle that plays a role, but a combination of driving inexperience and, more seriously, conscious risk-seeking.

The psychological aspect of this behavior is explained in detail by Truelove et al. (2022). According to their findings, young drivers often do not consider "slight" speeding to be dangerous. However, what is most important in practice is that legislative penalties (fines, points) have less of a deterrent effect on this group than the fear of physical injury or damage to the vehicle. The high proportion of accidents caused by speeding among young drivers in our data suggests that the current system of prevention and education in driving schools in the Czech Republic is not yet able to adequately address this behavioral and psychological aspect. Instruction focuses on vehicle control and regulations, but less on the psychology of risk and crisis management at high speeds.

In conclusion, while measures for older drivers should focus on medical examinations and compensation for health limitations (Gooch et al., 2024), measures for young drivers should aim to change attitudes toward risk. Given the results and the consistently high accident rate among this group, simple repression appears to be an insufficiently effective tool.

## **Conclusion**

The aim of this seminar paper was to define traffic accidents caused by excessive speed and analyze their impact on the frequency and severity of accidents in the Czech Republic between 2017 and 2023. A secondary objective was to identify differences in risky behavior among specific demographic groups of drivers. To achieve these objectives, content analysis of secondary data from the databases of the Czech Police (2025) and the Transport Research Center (2025) was used, which was then processed using linear regression analysis and statistical hypothesis testing. Based on the results presented, it can be concluded that the objective of the thesis was achieved.

The analysis showed that excessive speed remains one of the most serious factors in accidents, but the trend over time shows positive developments. The applied linear regression analysis refuted the assumption of simple stagnation and demonstrated a statistically significant downward trend. Despite fluctuations caused by external factors (especially the COVID-19 pandemic), there has been an average year-on-year decline in the number of accidents. An even more significant shift has been observed in the severity of consequences, where the model confirmed a steady decline in the number of victims, culminating in 2023 with a historic low in

the number of fatalities. This fact suggests that although accidents cannot be completely eliminated, their fatality rate can be effectively mitigated.

The second key finding of the study is a statistically significant difference in the behavior of age groups. Using Pearson's chi-square test, the hypothesis that driver age significantly influences the tendency to engage in risky driving was confirmed at a significance level of  $p < 0.001$ . The data showed that young drivers (aged 18–24) exhibit an alarming tendency to cause accidents due to speeding, which was the cause of almost 24% of all their accidents. Compared to seniors, for whom this share is only 9.5%, this is more than double the risk. This result clearly identifies young novice drivers as the primary target group for preventive measures, which should not be limited to repression but should primarily aim to change the perception of risk.

Although the interpretation of the results is limited by the exclusive use of police statistics with a possible degree of subjectivity, the main contribution of the work lies in the application of linear regression and statistical testing, which validated the riskiness of specific groups of drivers using real data. The findings thus serve as a basis for targeting preventive campaigns, and future research should be enriched with objective data from vehicle telematics systems, which would eliminate the factor of human estimation.

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