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Application of a time series to analyse the evaluation of road traffic accidents in Slovakia

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Keywords: road traffic accident rate, indicators of traffic accident rates, time series, ETS method, forecasting.
Abstract: Road traffic accidents represent an important part of the road traffic system. In many cases, they may lead not only to damage to vehicles and property, but also serious injuries or even death of road traffic participants. The prevalence of road traffic accidents and the related fatality rates in a country is a significant indicator of the maturity of that country and its inhabitants. The purpose of this article was to review the prevalence of road traffic accidents and fatality rates in the Slovak Republic over the period from 2009 to 2022. The analysis was conducted by applying basic statistical methods and a time series analysis (exponential smoothing method – ETS). The ETS is a method used for forecasting a time series univariate. The focus of this method is on three time series components (error E, trend T and seasonal S), while defining how the individual components interact. The results of the analysis indicated a positive, i.e. a falling trend in road traffic accident rates, according to the numbers of persons killed/injured in road traffic accidents in Slovakia. Compared to 2009, in 2020 there was a decrease in the number of road traffic accidents by almost 54%. In 2022, the number of fatalities decreased by almost 30% compared to those in 2009. The modelling also involved a forecast of the number of persons killed/injured in road traffic accidents for a period of 5 years.

1 Introduction

Mobility and transport are of high importance for the society. Although they provide many benefits, they are also associated with a number of drawbacks, such as the greenhouse emissions, noise, water and air pollution, as well as traffic jams and accidents. Road traffic accidents are events which result not only in injuries or death of road traffic participants, but also in material damage.

According to the World Health Organization, approximately 1.3 million people die every year as a result of road traffic crashes. Other 20–50 million people suffer non-fatal injuries, while many of the injured become disabled [1]. Globally, almost 3,700 people die on roads in accidents involving cars, buses, motorcycles, bicycles, trucks or pedestrians. More than half of those killed in the crashes are pedestrians, cyclists and motorcyclists [2]. According to the information published by the European Commission, in 2022, around 20,600 people were killed in road crashes in the EU countries, which is a 3% increase compared to 2021. This was caused by the recovery of the traffic intensity after the pandemic [3].

Over the last few decades, the road traffic safety in the European Union (EU) countries has significantly improved thanks to the considerable efforts exerted at the European, regional and local levels. In years 1991–2017, and particularly after 2000, the EU witnessed a significant improvement in the field of road traffic safety in terms of the number of fatalities and injuries. Over a shorter period, in years 2001–2010, the number of deaths on roads in the EU decreased by 43% and since 2010 by additional ca 20% [4]. Nevertheless, the number of persons killed on roads across the EU has not significantly changed over the last 5 years.

The road traffic accident rate is an important indicator of the quality of the transport infrastructure and the relevant legislation; it also reflects the awareness of the road traffic rules among the inhabitants of a particular country. In the European Transport Policy, the EU has laid down ambitious long-term goals for the road traffic safety. The EU representatives issued a resolution [5,6] that is aimed at increasing the road traffic safety and approaching the zero-fatality rate on the EU roads by 2050 (Vision Zero). The resolution includes limiting the speed in residential areas to 30 km/h, implementing the zero-tolerance approach regarding the use of alcohol and other addictive substances while diving, and implementing the state-of-the-art safety features both in roads and vehicles. According to [6], the Vision Zero will be implemented through influencing the attitudes of road traffic participants, taking targeted measures aimed at high-risk road participants, creating the safe traffic area, increasing the safety of motor vehicles, ensuring fast and efficient post-crash medical care, and applying modern technologies. According to [7], there are several causes of road traffic accidents. The key ones include a speed limit violation, drunk driving, driving without a break, not paying attention to the traffic, poor quality of roads, bad weather and so on. Kurakina et al. [8] stated that the key indicator of road traffic safety is the absence of road traffic accidents. In a paper [8], authors discussed the methods for forecasting the road accident rates using the Driver-Vehicle-Road-Environment (DVRE) system. Darwish et al. [9] deal with the key factors that contribute to traffic accidents in Jordan, based on a dataset obtained from the Traffic Institute's 2021 database.

Vilaça et al. conducted a statistical survey with the aim of assessing the severity of road traffic accidents and identifying the correlations between the accidents and the road traffic participants [10]. The output of the study was a recommendation to improve the road safety standards and adopt more policies regarding the safety of transport. Authors [11] analysed 20 influential factors of road traffic crashes (e.g. drivers' behaviour and driving experience, vehicles' safety condition, vehicles' purpose, road lighting quality, road surface condition, roadside protection facilities, road terrain etc.). The key factors were identified by applying the factor analysis.

Olszewski et al. [12] examined the factors affecting the risk of death of pedestrians, cyclists, motorcyclists and moped riders in seven EU countries using the data from the CARE database. The results were presented as odds ratios of fatal accident outcomes in different countries under specific circumstances compared to the reference conditions. The safety of traffic was also discussed in [13]; authors applied the data mining algorithms, including the basket analysis, to analyse the road traffic accident rates in Hampshire, England. The modelling of the road traffic accidents in Addis Ababa by means of the adaptive regression trees was presented in [14].

Severity of road traffic accidents was examined in [15]. The decision trees and the artificial neural networks were applied to identify three main factors affecting fatality rates for road traffic accidents: not using a seat belt, drunk driving, and inappropriate lighting conditions on roads. Authors Chand et al. [16] provided a review of the sources of data on road traffic accidents, as well as the data analysing techniques and various algorithms that are used for forecasting the road traffic accidents. Authors Sze and Wong [17] presented the assessment of the risk of pedestrians suffering an injury in a road traffic accident and the analysis of the factors that contribute to fatalities and severe injuries. The correlations between the probability of death and a serious injury and all the influential factors were identified by applying the binary logistic regression.

Authors Lavrenz et al. [18] presented a review of the current state of the art regarding the use of time series models in the research into transport safety and discussed some of the basic techniques and considerations concerning the conventional time series modelling. The article [19] deals with the road traffic fatalities in India in years 1967–2015, analysed by applying the time series and the ARIMA model. Based on the forecasted numbers of fatalities in road traffic accidents, authors expect a rising trend in the number of fatalities in road traffic accidents in India over the next 10 years. Greibe [20] described the accident prediction models that are capable of the most accurate forecasting of fatality rates for urban junctions and road links. The models were based on data for 1,036 junctions and 142 km of road links in urban areas. The generalised linear modelling techniques were used to relate the accident frequencies to the explanatory variables. Jasiuniene et al. [21] conducted the evaluation of road traffic accidents on road links and junctions in Lithuania in years 2014–2018, while the road traffic accident rates were forecasted by applying the empirical Bayes method. The authors also recommended collecting detailed information on the geometrical and operational characteristics of roads that affect the risk of serious accidents.

In the article [22], the prevalence of road traffic accidents and the amounts of the collected road tax in the Czech Republic is discussed. The authors found out that despite a stable increase in the amount of the collected road tax over the years, the accident rates gradually decrease; however, that decrease is not as intensive as the increase in the collected road tax. They stated that the collected money, which should be spent on resolving the problems with the road network (road traffic safety, repairs, construction of new roads etc.), was not used exclusively for those purposes. Authors Stefko et al. [23] modelled the damage to the property and the accidents with injuries and fatalities that had happened in the Slovak Republic. They concluded that the accidents with fatalities and injuries strongly affect the property damage. They also pointed out that the expressways significantly reduce the rates of accidents in which there are fatalities. Road traffic accidents in Slovakia that happened in years 1999–2009 were analysed by authors Kalašová and Krchová [24]. They claimed that with the use of new, modern and smart systems and applications, the transport safety may be improved. The forecasts of road traffic accident rates in Poland and Slovakia, as well as the evaluation of how the COVID-19 pandemics affected their trend, were presented in [25]. The accident rates were forecasted by applying selected time series models. Authors pointed out that the pandemics caused a decrease in the road traffic accident rates in Poland by 31% and in Slovakia by 33%. Gorzelańczyk [26] analysed the number of road traffic accidents in Poland relative to the weekdays when they happened. The data was used to forecast the accident rates by 2024 based on the time series.

The road traffic safety in the Slovak Republic relates not only to the road traffic safety at the national level, but also on the European level. The key indicator of the traffic accident rates in the country is the total number of road traffic accidents and the number of persons killed in road traffic accidents. The purpose of this article was to analyse the road traffic accident rates and the number of persons killed/injured in road traffic accidents in Slovakia. The result of the analysis was the modelling of the prevalence of the number of deaths with the use of a time series and the forecasting of the number of deaths for the next 5 years.

2 Methodology

2.1 Basic terms

Slovakia (the Slovak Republic) is an inland country located in the Central Europe (Figure 1) and a member of the European Union since 2004. The territory with the total surface area of 49,035 square km is inhabited by ca 5.45 million inhabitants. Bratislava is the capital city.

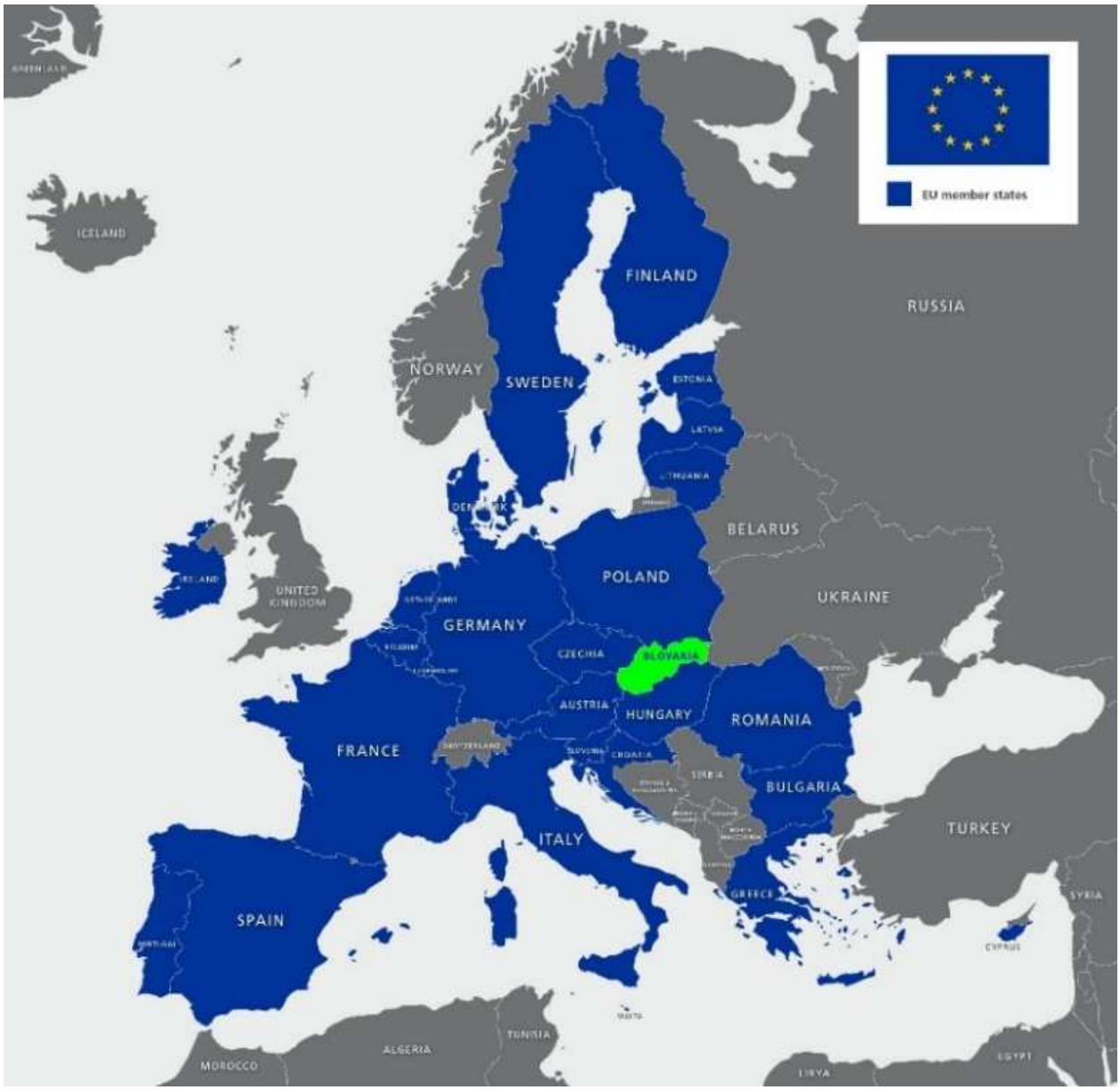


Figure 1 Location of Slovakia in the EU [Base map © maproom.net]

The road infrastructure in Slovakia consists of highways, expressways and Class I, II and III roads. The current state of the road infrastructure is characterised by a relatively dense network of roads, but with only a small proportion of highways and expressways. In 2020, the road network in Slovakia consisted of 18,130 km of roads and highways, while the highways represented 521 km [27]. 112 km of new highways and expressways are expected to be built in Slovakia by 2030.

According to [28], a traffic accident is an event caused by a moving vehicle in the road traffic with a consequence of death, injury or property damage, regardless of whether it is classified as a crime or an offence and whether it is subject to the proceedings in court or before the Penal Commission of the Traffic Inspectorate. Such events include the traffic accidents that happen at places with a limited road access (e.g. field roads and forests roads, roads in factories, in yards etc.) [28].

Severity of road traffic accidents is categorised depending on whether an accident resulted only in damage to property, or the accident participants suffered a minor or serious injury or even death. Pursuant to Act No 433/2010 Coll., supplementing Act No 513/2009 Coll. (on Road Traffic and on Amendment and Supplementation to Certain Acts), a death (killed person) means any person that is killed in an accident or dies within 30 days due to an injury caused in an accident. The number of deaths only includes the persons who die due to an injury in a traffic

accident within 24 hours after the accident. An injured person is a person who has not died, but suffered an injury in an accident and needed a medical treatment. A seriously injured person is an injured person who is hospitalised for longer than 24 hours. A person with a minor injury is a person who has suffered an injury in an accident other than a serious injury, except for the cases when a single treatment is required without a need for any specialised treatment or a sick leave [29].

As a full-value member of the EU, the Slovak Republic (SR) became a member state of the Third global ministerial conference on road traffic safety, held in Stockholm, Sweden, in February 2020, at which a new action decade was announced with the goal of increasing the safety of road traffic by 2030 [30]. In Slovakia, two medium-term strategic goals were set for the period of 2021–2030 and one long-term strategic goal was determined for the period by 2050. The first medium-term strategic goal is to halve the number of fatalities in road traffic accidents in the SR by 2030 compared to the number of fatalities in the reference year 2020. The second medium-term strategic goal is to halve the number of serious injuries in road traffic accidents in the SR by 2030 compared to the number of serious injuries in the reference year 2020. A long-term strategic goal (Vision Zero) is to reduce the number of fatalities and the number of serious injuries in road traffic accidents in the SR to zero by 2050. For the purpose of accomplishing those strategic goals, certain measures were defined for five different areas: a human factor; the risk groups of road traffic participants; road safety; vehicles and technologies; and post-crash care.

2.2 Statistical methods

The assessment of the prevalence of road traffic accidents in Slovakia was based on the data collected by the Ministry of Interior of the Slovak Republic [31].

The analysis and the assessment were carried out by applying basic statistical methods and a time series analysis. A time series means a series of observations that are comparable in their nature and location, arranged chronologically from the past to the present [32]. A time-series forecast is a quantitative forecast of the future values of a time series based on the assumption that the current development will continue in future without any changes.

In this article, the prevalence of road traffic accidents was forecasted by applying the ETS (ExponenTial Smoothing) method. The ETS is a forecasting method used for predicting a future value based on the existing (historical) values by using the exponential smoothing algorithm [33]. Hyndman [32] stated that the forecasts created with the use of the exponential smoothing methods are the weighted averages of the previous observations, while the weights exponentially decrease as the observations get older. In other words – recent observations are given relatively more weight in forecasting than the older observations. Those methods therefore enable generating reliable forecasts in a short period of time and for a wide range of time series. Such an advantage makes them very important for industrial applications. The ETS method is based on all previous observations. Their weights exponentially decrease as they become less recent. Every model consists of three components: Error, Trend and Seasonal. The Error component may be characterised as “Additive=A” or “Multiplicative=M”. Trend may be described as “None=N”, “Additive=A”, “Additive damped=Ad”, “Multiplicative=M” or “Multiplicative damped=Md”. The Seasonal component may be “None=N”, “Additive=A” or “Multiplicative=M”. There are 15 forecasting models with additive errors and 15 models with multiplicative errors. Based on the assumption of normality of the error term (Shapiro-Wilk test of normality), the ETS model can be estimated via the maximisation of likelihood. The time-series forecasting model was created with the use of the R package forecast and the ets() function [34]. The methodology is fully automatic. The only required argument for ets is the time series. With regard to choosing the most appropriate model, the conventional approach includes the application of all models and then choosing the best model based on the information criterion. The best model may be identified using the Akaike's Information Criterion (AIC). A general rule is that the lower the AIC value, the better the model is compared to a model with a higher AIC value.

3 Result and discussion

This investigation was aimed to analyse the prevalence of road traffic accidents and the number of persons killed/injured in road traffic accidents in the Slovak Republic in the period from 2001 to 2022.

3.1 Basic terms

Based on the available data, 685,984 road traffic accidents were reported in Slovakia in the period of 2001–2022. The average annual number of road traffic accidents was almost 21,182. A significant decrease in this number was observed in 2009 – from 59,008 reported accidents (in 2008) to 25,989 reported accidents (in 2009). It was caused by changes in legislation.

A graphical representation of the prevalence of road traffic accidents in Slovakia over the analysed period of 2001–2022 is shown in Figure 2. The red line represents the average annual number of road traffic accidents in the whole period of 2001–2022 (31,181.1). The red dashed line represents the average annual number of road traffic accidents in the period of 2009–2022 (14,856.4), representing a 53.6% decrease. In the long term, there is a falling trend in road traffic accidents in Slovakia.

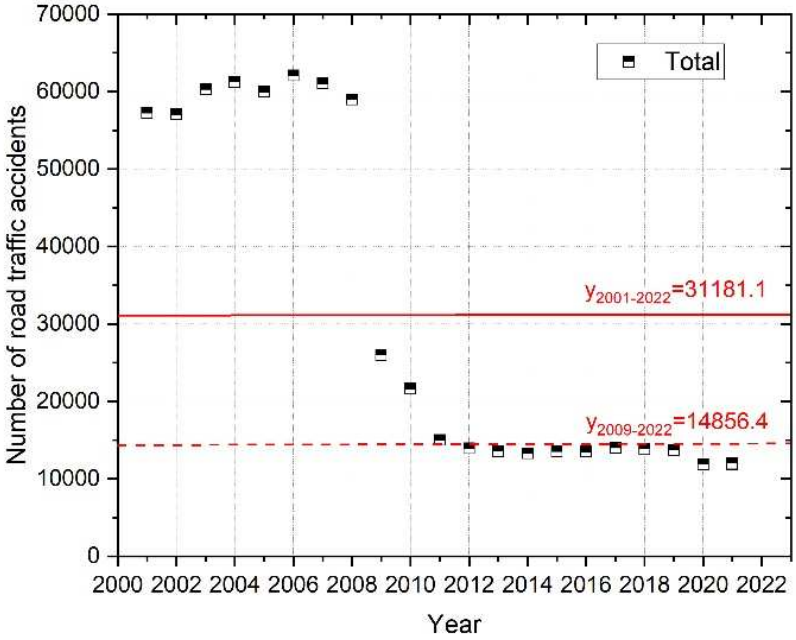


Figure 2 Prevalence of road traffic accidents in Slovakia (2001–2022)

The basic numerical characteristics of the locations of and variability in road traffic accidents are listed in Table 1.

Table 1 Numerical characteristics of road traffic accident rates in Slovakia

Period	Number	Arithmetic mean	Minimum value	Maximum value	Range	Standard deviation
2001–2022	22	31,181.1	11,875	62,070	50,195	22,350.1
2009–2022	14	14,856.4	11,875	25,989	14,114	3,983.5

Based on the time-series characteristics, it is possible to conclude, for example, that in 2003, compared to 2002, there was an increase in the number of road traffic accidents by 3,244 accidents. The pace at which the number of road traffic accidents increased in 2003, compared to 2002, is 5.69%, representing almost a 6% increase. In 2020, there was a significant decrease (by almost 14%) in road traffic accidents compared to 2019 (a decrease by 1,866 road traffic accidents), which may have been caused by a number of factors, including the lower mobility of the population due to the COVID-19 pandemics. With year 2001 being chosen as the reference year, the 2009 figures represent almost a 54.6%, decrease in the number of road traffic accidents, while the 2021 data constitute as much as a 78.9% decrease. With 2009 as the reference year, in 2022 there was a decrease in the number of road traffic accidents by 13,924 accidents – representing a 53.6% decrease.

3.2 Developments in selected indicators of road traffic accident rates in Slovakia (2009-2022)

Due to a significant decrease in the number of accidents since 2009, compared to the 2001 data, selected indicators of changes in the road traffic accident rates in Slovakia (the number of fatalities and the number of injuries) were analysed in relation to the period since 2009.

3.2.1 Developments in the number of fatalities in road traffic accidents (2009-2022)

The available data indicated that there were 3,728 fatalities in road traffic accidents reported in Slovakia in years 2009–2022. The average annual number of fatalities was almost 267. The results show that despite the reduced mobility of the population, caused by the COVID-19 pandemics, in 2020, the number of fatalities did not significantly decrease (the decrease was comparable to those of the previous periods). The basic numerical characteristics of the location of and the variability in the number of selected indicators are listed in Table 2. The focus of the analysis of changes in the number of persons killed in road traffic accidents included not only the total number of fatalities, but also the number of fatalities among cyclists and pedestrians, as well as the number of fatalities among drivers and passengers in cars and on motorcycles.

Table 2 Numerical characteristics of the number of persons killed in accidents (period 2009–2022)

Indicator (Number)	Number	Arithmetic mean	Minimum value	Maximum value	Range	Standard deviation
Drivers and passengers in cars and on motorcycles	2,503	178.8	142	231	89	29.1
Pedestrians	978	69.6	42	113	71	19.6
Cyclists	250	17.9	12	25	13	4.0
Total						
Fatalities (traffic accident participants)	3,728	266.3	223	347	124	44.3

A graphical representation of changes in the number of deaths in road traffic accidents in Slovakia over the analysed period of 2009–2022 is shown in Figure 3. In the period from 2009 to 2013, there was a significant decrease in the number of deaths, while particularly in 2013 the number of deaths reached the lowest value (223 persons), representing a 35.7% decrease compared to the value of the reference year 2009 (347 persons). A relatively sudden increase in the values that was observed in years 2014 and 2015 may be regarded as a negative phenomenon in the analysed period. However, after 2015, the curve of the numbers of deaths exhibits a slightly decreasing trend. In 2022, the number of deaths was 244, representing a decrease by 103 persons compared to the 2009 data (a 29.7% decrease).

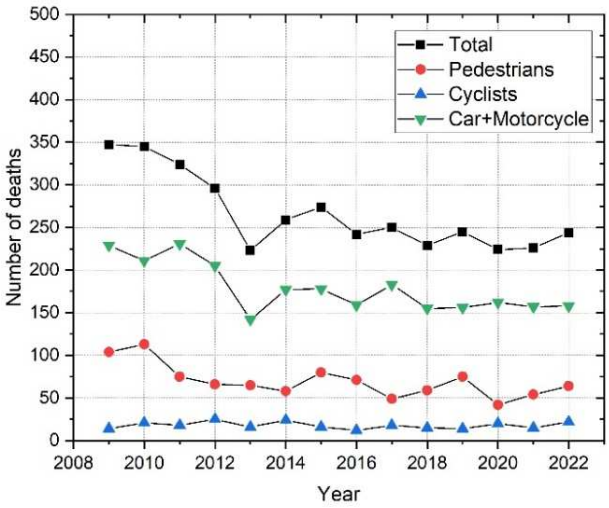


Figure 3 Numbers of deaths in road traffic accidents in Slovakia

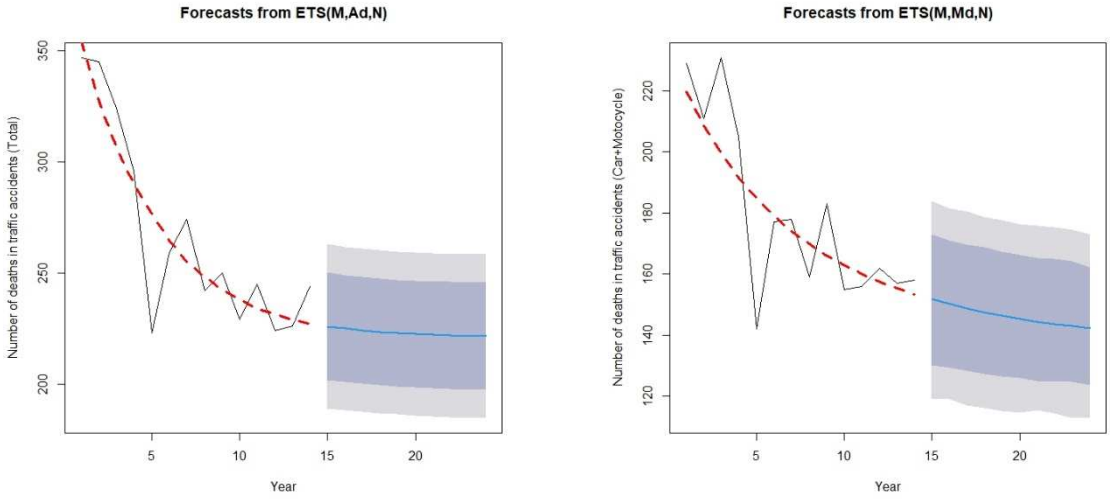
The number of persons killed in road traffic accidents was forecasted for the next period by applying the ExponenTial Smoothing method (ETS). Compliance with the data normality requirement was verified using the Shapiro-Wilk test of normality. The null hypothesis acceptance or rejection was based on a p-value. If the p-value equals to or is higher than the predetermined significance level α, then the null hypothesis is not rejected. The p-value was higher than α (α=0.05); therefore, the null hypothesis on normality was not rejected. The resulting time-series forecasting model consisted of three components: Error, Trend and Seasonal. Several different models were considered and subjected to a comparison by applying the AIC criterion. The best model was the model with the lowest AIC value (Table 3).

Table 3 List of ETS models of the forecast number of deaths (total)

ETS model	AIC	ETS model	AIC
M, M, N	135.1	M, N, N	134.0
M, Md, N	134.5	A, N, N	135.7
M, A, N	129.4	A, A, N	137.5
M, Ad, N	129.3	A, Ad, N	134.9

Note: M-multiplicative; A-Additive; N-None; Md-Multiplicative damped; Ad-Additive damped.

Apparently, the best model is the ETS(M,Ad,N) – a damped trend (Ad) with multiplicative errors (M) and no seasonality (N). The damping factor acquired a value of 0.8. A graphical representation of the original and the smoothed time series based on ETS is shown in Figure 4a. The graph shows a forecast of the number of deaths (Total) for the period of the next ten years. In addition to the point estimate of the forecast, prediction intervals were also created. The grey and blue fields show the 95% and 80% prediction intervals for the forecasts obtained from ETS.



a) *b)*

Figure 4 Developments and forecasts of a) the total number of deaths; b) the number of deaths in/on vehicles (car+motorcycle) in road traffic accidents in Slovakia

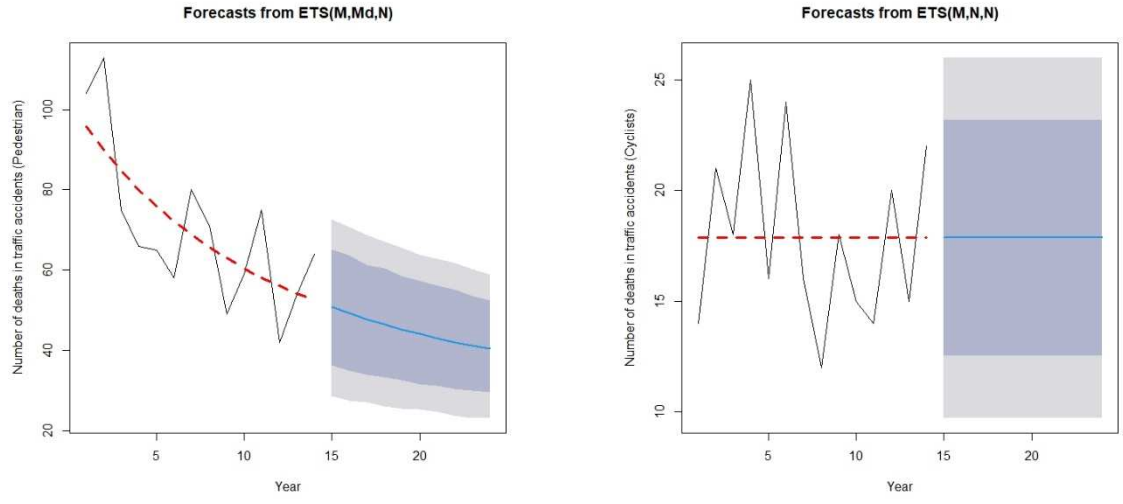
The forecast of the number of deaths in road traffic accidents in Slovakia for the period of the next 5 years and the prediction intervals for the best model ETS(M,Ad,N) are shown in Table 4.

Table 4 Forecasts of the number of deaths and the prediction intervals for the period of 5 years

Year	Forecast	80% Prediction interval		95% Prediction interval	
		Lower	Upper	Lower	Upper
2023	225.9	201.8	250.2	189.0	262.9
2024	224.9	200.8	249.0	188.1	261.8
2025	224.1	200.1	248.1	187.4	260.8
2026	223.4	199.4	247.4	186.7	260.1
2027	222.9	198.9	246.8	186.2	259.5

It may be stated that the number of deaths in road traffic accidents in Slovakia exhibits a slightly decreasing damped trend in the long run.

An analogical procedure was applied to the evaluation of the number of deaths in/on vehicles and among pedestrians and cyclists. Compliance with the data normality requirement was verified using the Shapiro-Wilk test of normality. The best model was chosen by applying the AIC criterion. In the following section, only the best models with the lowest AIC values are discussed. Figure 4b, Figure 5a and Figure 5b show the resulting best models and forecasts for the next period.



a) *b)*

Figure 5 Developments and forecasts of the number of deaths among a) pedestrians and b) cyclists in road traffic accidents in Slovakia

Apparently, the best model for the number of deaths in/on vehicles (car+motorcycle) and among pedestrians is the ETS(M,Md,N), i.e. a damped trend (Md) with multiplicative errors (M) and no seasonality (N). Based on the observations of the developments and forecasts of the number of deaths among cyclists, the best model is the ETS(M,N,N), which represents the simple exponential smoothing without a trend.

3.2.2 Developments in the number of injuries in road traffic accidents (2009-2022)

Based on the available data, a total of 93,617 persons injured in road traffic accidents were reported in Slovakia in years 2009–2022. The average annual number of injuries was almost 6,687. As much as 78,236 persons suffered minor injuries, representing almost 83.6% of the total number of injuries. The basic numerical characteristics of the locations of and the variability in the number of injuries (minor/serious) are listed in Table 5.

Table 5 Numerical characteristics of the number of injuries (period of 2009–2022)

Indicator (Number)	Number	Arithmetic mean	Minimum value	Maximum value	Range	Standard deviation
Minor injuries	78,236	5,588.3	4,462	9,274	2,664	767.3
Serious injuries	15,381	1,098.6	869	2,367	539	147.3
Total						
Injuries	93,617	6,686.9	5,373	8,534	3,161	897.7

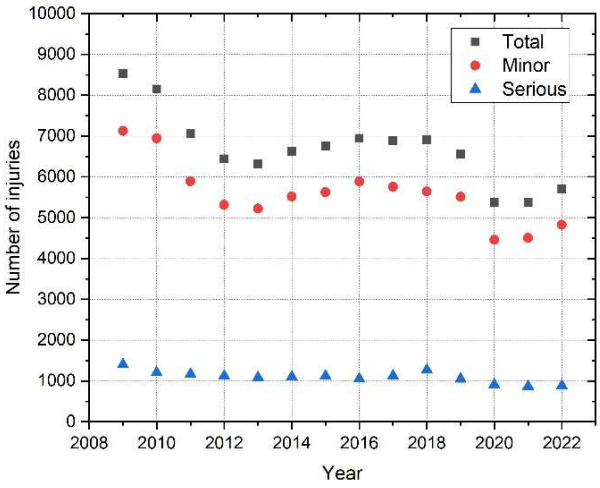


Figure 6 Developments in the number of injuries in road traffic accidents in Slovakia

A graphical representation of the numbers of persons injured in road traffic accidents in Slovakia over the analysed period is shown in Figure 6. The largest number of injuries was observed in 2009 (8,534 persons), while the lowest number was observed in 2021 (5,373 persons); compared to 2009, it represents a decrease by 3,161 persons (approximately a 37% decrease). Similarly to the previous case, there was a falling trend in the number of persons injured in road traffic accidents in Slovakia in the long run.

The number of persons with serious injuries in road traffic accidents exhibits a slightly falling trend over the period from 2009 to 2016. In years 2017 and 2018, there was an increase in the values of this indicator, while the 2018 value (1,272 persons) represents the maximum in the entire analysed period. Since 2019, the number of serious injuries has been exhibiting a falling trend. In 2022, the number of serious injuries was 882, representing a 37.4% decrease compared to the reference year 2009 (1,408 persons). Over the long term, the number of persons with minor injuries exhibits a falling trend and copies the trend of injuries (total). Considered the entire analysed period, the highest number of minor injuries was reported in 2009 (7,126 persons), while the lowest number was observed in 2022 (4,462 persons). In the period of 2014–2016, there was an increase in the number of minor injuries. In 2020, there was a significant decrease in the number of minor injuries compared to the previous year 2019 (5,515 persons) – a 19% decrease (decrease by 1,053 persons). Over the last two years 2021 and 2022, the number of minor injuries exhibited a slightly rising trend.

Figure 7 and Figure 8 show the graphical representations of the best models of the past and forecasted numbers of injuries (minor/serious) in road traffic accidents in the period of 2009–2022 by applying the ETS method. Compliance with the data normality requirement was verified using the Shapiro-Wilk test of normality.

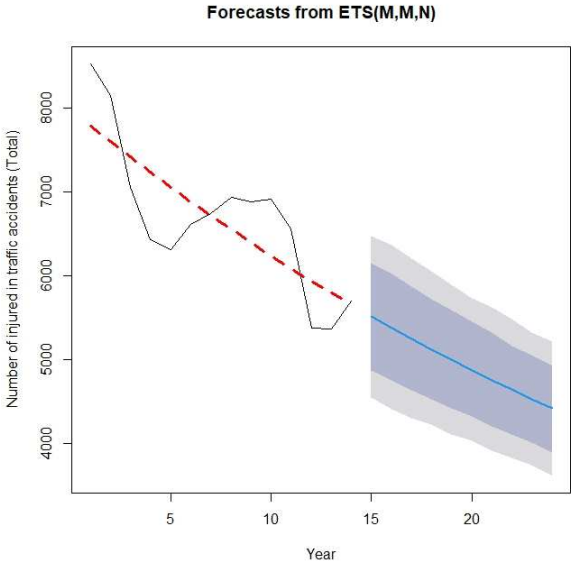
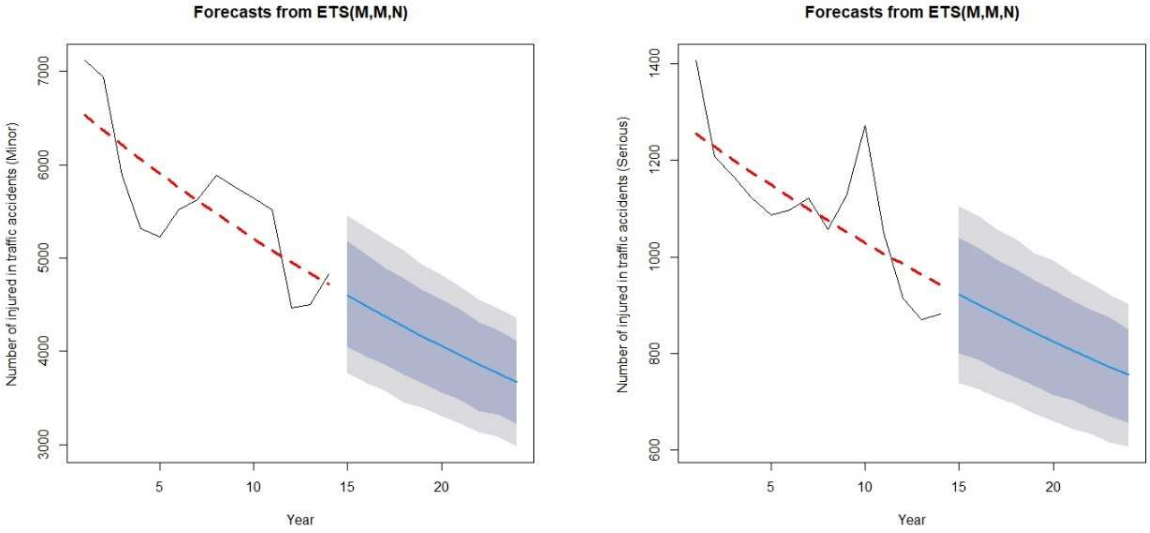


Figure 7 Developments and forecasts of the number of injuries (total) in road traffic accidents in Slovakia



a) *b)*

Figure 8 Developments and forecasts of the number of persons injured in road traffic accidents in Slovakia: a) minor injuries; b) serious injuries

It seems that in all of the cases the best model is the ETS(M,M,N), i.e. the exponential smoothing model with a multiplicative trend and error. The forecasted numbers of persons injured in road traffic accidents in Slovakia for the next 5 years, as well as the prediction intervals for the best model ETS(M,M,N), are shown in Table 6.

Table 6 Forecasts of the number of injuries and the prediction intervals for the next 5 years

Year	Forecast	80% Prediction interval		95% Prediction interval	
		Lower	Upper	Lower	Upper
2023	5,518.7	4,857.5	6,175.3	4,490.0	6,533.3
2024	5,384.4	4,750.0	6,027.5	4,423.6	6,356.7
2025	5,253.4	4,649.2	5,866.2	4,322.2	6,195.7
2026	5,125.6	4,534.1	5,711.0	4,212.6	6,034.3
2027	5,000.9	4,422.7	5,577.7	4,104.2	5,909.5

The number of persons injured in road traffic accidents in Slovakia forecasted for 2023 is 5,518.7. In the period from 1 January 2023 to 30 June 2023, there were 1,988 road traffic accidents reported with a total of 2,544 injured persons (380 serious and 2,164 minor injuries) and 107 fatalities.

4 Conclusions

The annual death toll from road traffic accidents in Slovakia is several hundreds of lives. Every year, there are also thousands of injuries and significant property damage is caused. In the National Strategy for years 2011–2020, the Slovak Republic laid down the main goal to halve the number of fatalities in road traffic accidents by 2020 compared to the number reported in 2010. In 2010, there were 345 deaths in road traffic accidents, while in 2020 there were 224 of them, representing a decrease by 121 persons. This means that the decrease represented only ca 35% and the main goal for 2011–2020 has not been accomplished.

Reducing the road traffic accident rates is very important from a societal point of view. It will result in higher safety on roads, which will consequently reduce the fatality rates, the costs of medical care of persons injured in accidents, the property damage, as well as the costs of removing the damage. A more recent medium-term strategic goal is to halve the number of persons killed in road traffic accidents in the SR by 2030 compared to that in year 2020. In 2020, there were 224 fatalities. This means that according to the target value, approximately 112 fatalities are predicted to happen in 2030. With regard to the forecast obtained from the model of the number of fatalities, which was created by applying the ETS method, there is a rising concern whether such a goal is feasible.

Despite the unaccomplished goals, there is a positive falling trend in the number of road traffic accidents, as well a falling trend in the number of persons killed or injured in road traffic accidents in Slovakia. The most frequent cause of accidents is a human failure. For this favourable trend of decreasing road traffic accidents or fatalities/injuries to continue, it is necessary, above all, to respect the traffic rules, conduct more frequent stop.

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