2011
2012

BEDRIJFSECONOMISCHE WETENSCHAPPEN

master in de verkeerskunde: verkeersveiligheid
(Interfacultaire opleiding)

Masterproef

Prediction of traffic fatalities for six countries.
Application of latent risk time series models

Promotor :
Prof. dr. Elke HERMANS

Copromotor :
De heer Kurt VAN HOUT

Dieter Loddewykx

Masterproef voorgedragen tot het bekomen van de graad van master in de verkeerskunde , afstudeerrichting verkeersveiligheid

KNOWLEDGE IN ACTION

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Preface

A lot of people asked me the past five years what the main topics of my study "transportation sciences" are. They wondered whether it focuses on learning traffic rules or whether it's a kind of extension for the driving license etc. I usually answered negatively to those suggestions and told that the two main goals of a transport scientist are to promote durable mobility and to improve traffic safety. The former focuses on avoiding useless trips from point A to B, keeping the trips as short as possible in order to use low energy transport modes (foot and bike), using collective transport modes (bus, train) etc… Unfortunately these goals don't go hand in hand with the globalisation and individualisation trends. The second goal concentrates on traffic safety, this in order to reduce fatalities and (heavy) injured traffic victims on our roads. The three "E's", education, enforcement and engineering are important here. Once, a professor told us as a joke: "You should create improvements, but make sure that you still have work the next year." In my opinion it's a pity we don't have to swear by oath we will always pursue these two goals, just as graduating law students e.g. do.

The topic of the first master practical course "case study" is usually the same topic of the master thesis. My case study's topic was a literature review of the relationship between testosterone and risk driving. During the literature review I noticed the jargon about testosterone and hormones wasn't my cup of tea. I was especially not looking forward to the data collection of testosterone with saliva or blood samples. The "risk driving" data would have been gathered by using the driving simulator. The teaching team gave students the opportunity to change their subject for the master thesis. I decided to do that although I do want to perform the testosterone/risk driving research once, but not as a master thesis. The newly chosen subject deals with time series analyses. The main goal of this thesis is to predict the 2015 number of road fatalities for six countries (Belgium, Czech Republic, Finland, Iceland, Poland and Sweden). 2015 is an intermediate time point of the 2020 European goal to reduce traffic fatalities by fifty per cent compared to the 2010 level.

Finally, it wouldn't have been possible to write this thesis without the help of several people. In first place I would like to thank Professor doctor E. Hermans and Dhr. K. Van Hout for mentoring me during this project. Further I want to extend my gratitude to Professor Tom Rye from Lund University for sending me literature about traffic fatality risk of disadvantaged children. I should also thank some prereaders of this report Veva Daniels and Pieter-Jan Lateur, both of them indicated additional points for improvement. Finally I would like to thank family and friends for their support.

Dieter Loddewykx, 24th August 2012, Leuven

Summary

This report contains four main chapters, the first is a general introduction, the second an explanation of forecasting and time series, the third presents the available research data and the fourth results of the analyses.

The first chapter focuses on traffic safety as a problem for our society (lives lost and the cost of traffic victims as a percentage of GNP). The policy objectives set in 2000 for 2010 and set in 2010 for 2020 are mentioned. The purpose of the research is indicated, this is predicting traffic fatalities for six countries by 2015 (Belgium, Czech Republic, Finland, Iceland, Poland and Sweden). This should be done aggregated as well as disaggregated by age, gender and transport mode. For Belgium an additional objective was formulated, this is combined disaggregated analysis of age and gender. It was not only the purpose to predict the fatalities, but also the fatalities per billion passenger kilometres, per 100.000 inhabitants or per 100.000 vehicles. However this could not be performed due to problems correcting the residual values. Further in chapter one, motivations for the choice of unsafety and exposure measures are given, the research questions are mentioned, a definition of risk is given, the chosen age, gender and vehicle classes are indicated, the main existing exposure classes are presented and a motivation for the choice of the six countries is given.

Chapter two starts with “what is forecasting?” and the difference between univariate and multivariate forecasting. An introduction to time series is presented and the five patterns in time series, random, trend, seasonal, cyclical and autocorrelation are mentioned. Six different regression model techniques to analyse time series are indicated, those are, linear, non-linear, ARMA (auto- regressive moving average), ARIMA (Auto-Regressive Integrated Moving Average), DRAG (Demand for Road use Accidents and their Gravity) and state space models.

In chapter two you can read a detailed presentation of the LRT (Latent Risk Time series) model that is used for the analyses of this research is given. Basically the model consists of six equations, two measurement and four state equations. There is one measurement equation for the fatality risk and one for the exposure component. Both measurement equations contain two state equations one for the level and one for the slope. Chapter two ends with some strengths of time series as a technique for future prediction.

The third chapter presents the available data that were used in the analyses. Fatalities were used as unsafety measure for the aggregated as well as disaggregated analyses. Passenger kilometres were chosen as exposure measure for the aggregated analyses. Inhabitants were used as an exposure measure for the disaggregated age and gender analyses. Finally the number of vehicles were used as exposure measure for the disaggregated vehicle class analyses.

For all available data a detailed discussion is given of the fatalities, the passenger kilometres, the inhabitants and the vehicles. Also the fatalities per billion passenger kilometres, the fatalities per 100.000 inhabitants and the fatalities per 100.000 vehicles are written out too. For Belgium the combined disaggregated available data of gender and age class are discussed. At the end of chapter three a table is shown of the 79 performed analyses out of plus minus 175 that could have been analysed.

Finally chapter four presents the predicted results of the analyses. Due to problems with the residue assumptions no predictions of the disaggregated exposure components were performed. As a consequence no predictions of the fatalities per 100.000 inhabitants or 100.000 vehicles were made.

Chapter four starts with a brief overview of the residue assumptions in regression analysis these are, independency, homoscedasticity and normality. Four options to correct the models in function of the residues listed up. These are interventions in either the measurement or state equation, skip a certain amount of data points or define a component as deterministic instead of stochastic. Further the Swedish aggregated model analysis is written out as an example for how corrections carried out. This model was chosen as example as it is the only aggregated model where residue problems were experienced.

In 4.3 the aggregated results are presented, the predicted fatality results as well as fatality results per billion passenger kilometres are discussed.

The disaggregated age, gender and vehicle class results are discussed. In respectively 4.4, 4.5 and 4.6. In 4.7 the combined disaggregated age and gender analyses for Belgium are written out. For the disaggregated analyses only traffic fatalities and not fatalities per 100.000 inhabitants or 100.000 vehicles were predicted.

In chapter 5 the results of subchapters 4.3 till 4.7 are discussed briefly.
The report ends with an overview of the additional analyses for the whole of Europe that were performed, with some limitations and with further research that could be performed. Two interesting additional types of analyses that could be investigated are the fatalities or casualties according to income class or road type.

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Samenvatting

Dit rapport bestaat uit vier hoofdstukken, het eerste is een algemene introductie, het tweede focust op voorspellen en tijdreeksen in het algemeen, het derde geeft te beschikbare onderzoeksdata weer en het vierde bespreekt de onderzoeksresultaten.

Hoofdstuk één focust op verkeersveiligheid als een probleem voor onze maatschappij (verloren levens en de kost van verkeersslachtoffers als percentage van het BBP). De beleidsdoelstellingen van 2000 voor 2010 en van 2010 voor 2020 worden aangegeven. Het onderzoeksdoel wordt vermeld, dit is het voorspellen van verkeersdoden voor zes landen in 2015 (België, Tjsechië, Finland, Ijsland, Polen en Zweden). Dit hoort zowel op geaggregeerd als gedesaggregeerd niveau voor geslacht leeftijd en vervoersmodus te gebeuren. Verder was het niet alleen het doel om verkeersdoden te voorspellen, maar ook doden per miljard passagier kilometers, per 100.000 inwoners en per 100.000 voertuigen. Hoewel dit niet kon worden uitgevoerd vanwege problemen met de residu waarden. Verder worden in hoofdstuk een de motivaties voor de keuzen van onveiligheid- en blootstellingsmaten gegeven, een definitie van risico wordt aangehaald, de gekozen leeftijd, geslacht en voertuigklassen worden vermeld, de belangrijkste gekozen blootstellingsklassen zijn vermeld en een motivatie voor de keuze van de zes landen in gegeven.

Hoofdstuk twee start met “Wat is voorspellen?” en het verschil tussen univariate en multivariate voorspellingen. Een introductie van tijdreeksen is gegeven en de vijf patronen in tijdreeksen, random/toeval, trend, seizoens, cyclische en autocorrelatie zijn aangehaald. Zes verschillende regressie modelleer technieken om tijdreeksen te analyseren worden vermeld. Deze zijn, lineair, niet-lineair, ARMA (Automatische Regressie Voortschreidend Gemiddelde / Auto- Regressive Moving Average), ARIMA (Automatische Regressie Geïntegreerd Voortschreidend Gemiddelde / Auto- Regressive Integrated Moving Average), DRAG (Vraag voor Weg gebruik ongevallen en hun Zwaartekracht / Demand for Road use Accidents and their Gravity) and “toestand ruimte” state space modellen.

Verder wordt in hoofdstuk twee een gedetailleerde presentatie van het LRT (Latente Risico Tijdreeks / Latent Risk Time series) model gegeven. Het model bestaat uit twee meet/measurement vergelijkingen en twee toestand/state vergelijkingen. Telkens een meet (measurement) vergelijking voor het dodelijke risico en voor de blootstelling. Beide meet (measurement) vergelijkingen bestaan uit twee toestand (state) vergelijkingen, één voor het peil (level) en één voor de helling (slope). Hoofdstuk twee eindigd met enkele sterktes van tijdreeksen als een techniek om te voorspellen.

Het derde hoofdstuk presenteert de beschikbare data die werden gebruikt in de analyses. Doden werden gebruikt als onveiligheidsmaat voor de geaggregeerde als de gedesaggregeerde analyses. Passagier kilometers werden gebruikt als blootstellingsmaat voor de geaggregeerde analyses. Inwoners werden gebruikt als blootstellingsmaat voor de gedesaggregeerde leeftijd en geslacht analyses. Tot slot werden het aantal voertuigen gebruikt als blootstellingsmaat voor de gedesaggregeerde voertuig analyses.

Voor alle beschikbare data is een gedetailleerde bespreking gegeven van de doden, de passagier kilometers, de inwoners en de voertuigen. Ook werden de doden per miljard passagier kilometers, de doden per 100.000 inwoners en de doden per 100.000 voertuigen uitgeschreven. Voor België werden de gecombineerde leeftijd en geslacht gegevens besproken. Op het einde van het hoofdstuk is er een tabel weergegeven die de 79 uitgevoerde analyses toont van de plus minus 175 die er konden uitgevoerd worden.

Tot slot geeft hoofdstuk vier de voorspelde resultaten van de analyses weer. Vanwege problemen met de residue aannamen werden er geen voorspellingen van de gedesaggregeerde blootstellingsmaten uitgevoerd. Bijgevolg werden er geen voorspellingen gemaakt van de doden per 100.000 inwoners of 100.000 voertuigen.

Hoofdstuk vier begint met een kort overzicht van de residue aannamen in regressie analyse deze zijn, onafhankelijkheid, homoscedasticiteit en normaliteit. Vier opties om modellen in functie van de residuen te corrigeren zijn opgesomd. Deze zijn interventies in ofwel de meet/measurement vergelijkingen ofwel de toestand (state) vergelijkingen, een aantal datapunten verwijderen of een onderdeel (component) als deterministisch in plaats van stochastisch aanschouwen. Verder is het Zweedse geaggregeerde model uitgeschreven als een voorbeeld voor hoe correcties werden uitgevoerd. Dit model was als voorbeeld gekozen omdat dit het enige geaggregeerde model is waar problemen met de residuen werden ervaren.
In 4.3 zijn de geaggregeerde resultaten besproken, zowel de resultaten voor de voorspelde doden als deresultaten voor doden per miljard voertuigkilometer zijn vermeld. De resultaten van de gedesaggregeerde analyses van leefdtijd, geslacht en voertuigmodus worden besproken in respectievelijk 4.4, 4.5 en 4.6. In 4.7 zijn de gecombineerde gedesaggregeerde resultaten van de analyse voor leeftijd en geslacht van België uitgeschreven. Voor de gedesaggregeerde analyses werden enkel de verkeersdoden en niet de doden per 100.000 inwoners of 100.000 voertuigen voorspeld.

In hoofdstuk 5 worden de resultaten van 4.3 tot en met 4.7 kort aangehaald.
Het rapport eindigd met een overzicht van de extra analyses die voor heel Europa werden uitgevoerd, met enkele beperkingen en met verder onderzoek dat zou kunnen worden uitgevoerd. Twee interessante extra analyses die onderzocht zouden kunnen worden zijn de doden en/of zwaar gewonden volgens inkomensklasse of wegtype.

Content

List of tables, figures and formulas

1 Introduction

1.1 Problem statement

The focus of this master thesis is on the prediction of traffic safety measured by traffic fatalities. In 2001 the European Commission wrote a whitepaper "European transport policy for 2010: time to decide." In this whitepaper was indicated that in the year 2000 about 40.000 people died in road traffic and over 1,7 million were injured. A quote from the whitepaper is (Commission of the European Communities, 2001): "*This is the equivalent to wiping a medium-sized town off the map*. *Every day the total number of people killed on Europe's roads is practically the same as in a medium-haul plane crash. Road accident victims, the dead or injured, costs society tens of billions of euros but the human costs are incalculable."*

In the report written by the Commission of the European Communities, (2001) is described "*One person in three will be injured in an accident at some point in their lives. The directly measurable cost of road accidents is of the order of 45 billion euros a year. The annual figure of indirect costs (including physical and psychological damage for victims and their families) are three to four times higher. The annual cost figure is put at 160 billion euros, equivalent to 2 % of the EU's GNP*."

Finally, there is another interesting quote to mention here from the Swedish vision zero initiative "*For some reasons we seem to be more tolerant towards this negative effect of deaths in order to ensure our mobility"* (Vision zero initiative, 2011). If we compare road mobility, to for example nuclear power stations or train railway systems, then the latter ones are organized with respect to the condition that they should operate based on security.

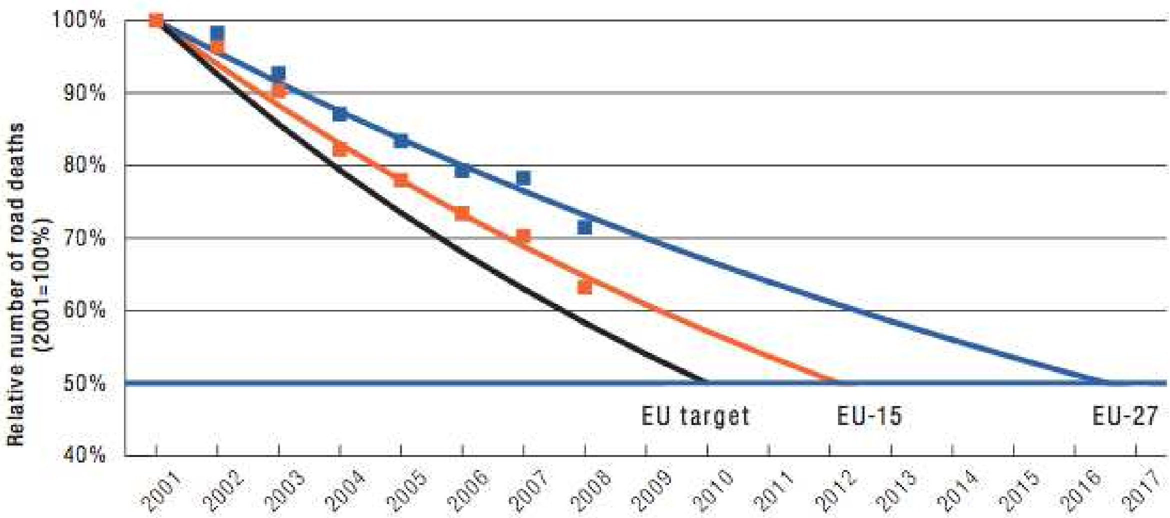


FIGURE 1: Estimated trends in road deaths in the EU15 and the EU27, based on developments in 2001-2008 (European Transport safety council, 2009).

On figure 1 is shown that in 2001 the former fifteen countries of the European Union set themselves the target to reduce the number of road deaths with fifty per cent by the year 2010. However according to the annual report of European Transport Safety Council, (2009) the fifty per cent reduction would only be achieved by 2012. In 2004 ten and in 2007 two additional countries joined the European Union. Taking those countries into account the reduction will only be achieved by 2017.

Figure 2 shows that in 2001 about 54.300 people died in road traffic. In 2010 a reduction of fifty per cent should have been achieved. This indicates a maximum of plus minus 27.000 road deaths. Unfortunately this target was not achieved, in 2010 still 30.700 deaths on the European roads were registered (European Commission Road Safety, 2011).

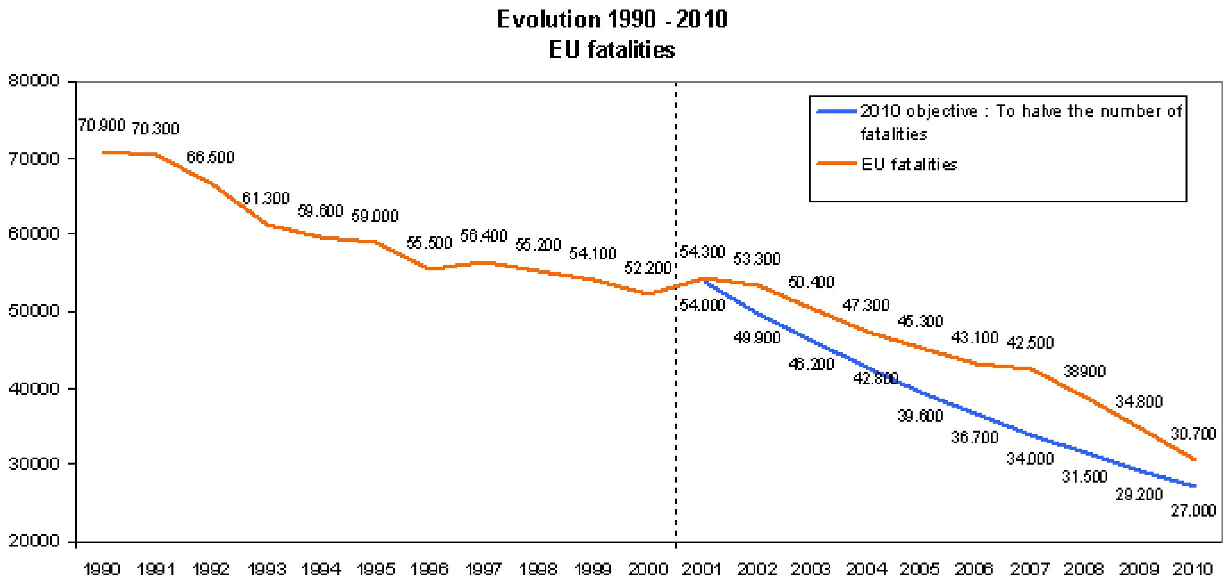


FIGURE 2: Traffic fatalities in the European Union (European Commission Road Safety, 2011).

Figure 3 shows the new objective for the year 2020 set by the European Union. The new objective was set in 2010 and started from the number of traffic deaths that occurred in that year, namely 31.000. Again a fifty per cent reduction in traffic deaths is the goal. However the provisional results of 2011 indicate a bad start in order to achieve that objective, in this thesis the goal is to present an intermediate prediction by 2015 for six countries, Belgium, the Czech Republic, Finland, Iceland, Poland and Sweden. The motivation for the choice of these countries is mentioned in subchapter 1.8

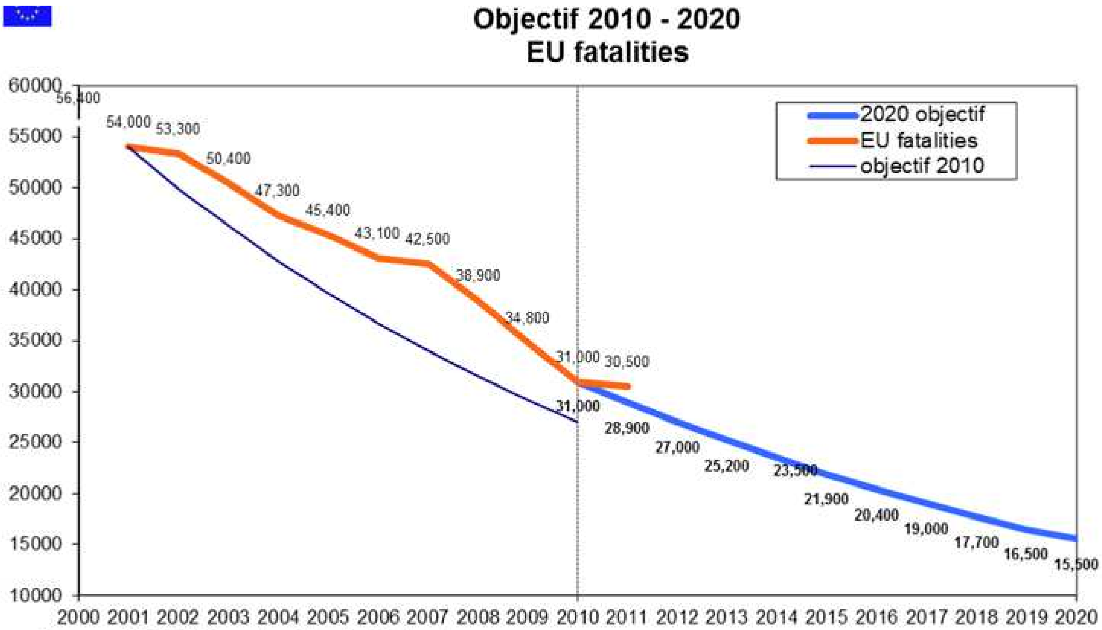


FIGURE 3: Traffic fatalities in the European Union (European Commission Road Safety, 2012)

Figure 4 shows the reduction in percentage fatalities by country. Of the six countries discussed in this report, Iceland isn't considered on figure 4, as it's not a member state of the European Union. Sweden a country that already had a low number of traffic fatalities, (European Commission Road Safety, 2012a) also reduced its traffic deaths as one of the strongest. Sweden counters the argument that when you already obtained a low number of fatalities per million inhabitants it is difficult to reduce it even further. Poland only reached a reduction of about 28 %. Finland and Belgium obtained reductions of respectively 33 % and 40 %.

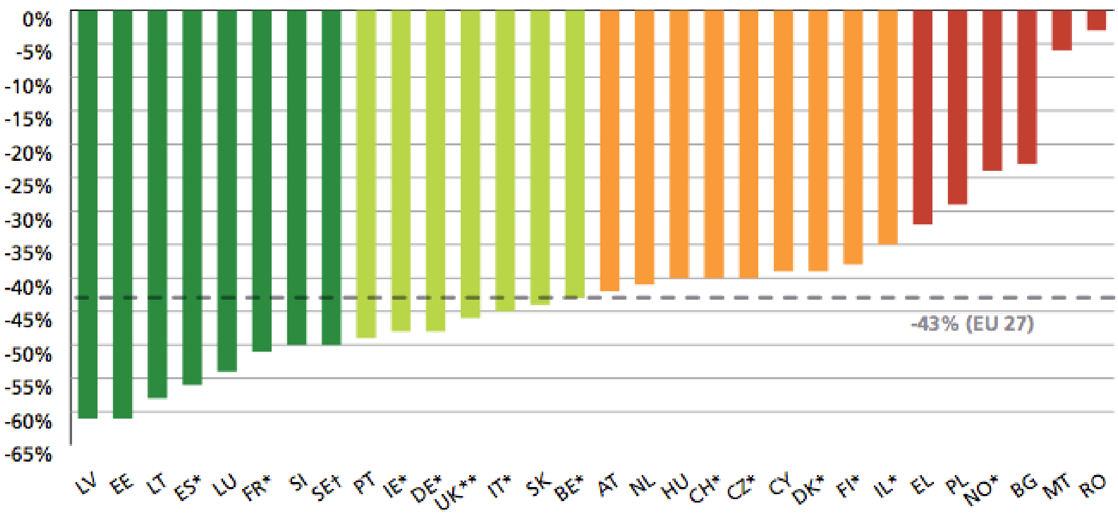


FIGURE 4: Percentage change in road deaths between 2001 and 2010 (European Transport Safety Council, 2011).

**"Provisional estimates were used for 2010 as final figures for 2010 were not yet available at the time of going to print*
***UK 2010: ETSC estimate for the UK based on EC CARE (Community database on Accidents on the Roads in Europe)*
†Sweden 2010: the definition of road deaths has changed and suicides are now excluded. The time series was adjusted so that figures for previous years exclude suicides as well."

Finally figure 5 displays the number of lives and the monetary vales that have been saved. Since 2001 till 2010 it is estimated that 102.124 lives have been saved. However if the program goals would have been achieved about 176.161 lives would have been saved during those ten years. Thanks to the reduction in fatalities there was a social benefit of almost € 150 billion. However there would have been a social benefit of over €257 billion if the target had been achieved (European Transport Safety Council, 2011).

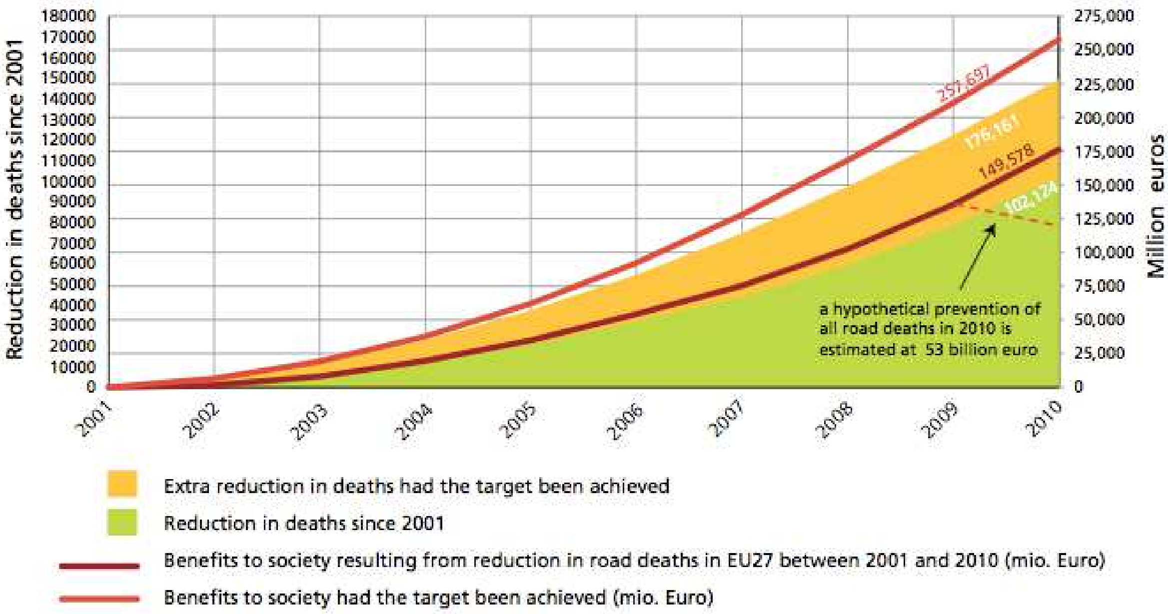


FIGURE 5: Reduction in road deaths in EU-27 2001-2010 (European Transport safety council, 2011).

Thanks to traffic safety policy a lot of lives have been saved during the first decennium of the 21th century. However in 2010 plus minus 31.000 people died in traffic. The goal to reduce the fatalities by 2020 to 15.500 will be difficult again, although it's of course better to set ourselves targets that are hard to achieve in order to do the best efforts. On the other hand targets that are too hard to achieve are demoralising.

It's already mentioned above "*For some reasons we seem to be more tolerant towards this negative effect of deaths in order to ensure our mobility"* (Vision zero initiative, 2011). This is in comparison with other systems that might have serious negative consequences, e.g. a nuclear power station.

The Dutch report "Risico's van het verkeer en vervoer: de beleving van de burger" (Ministerie van Infrastructuur & Milieu, 2011) and the report of Wildervanck & Tertoolen, (1998) indicate several reasons why people might tolerate this high price of traffic deaths and severely injured people in function of their mobility:

- People who have experienced an accident with a certain mode of transport estimate the risks for that transport mode higher.
- Do people act voluntarily or not? In situations where people place themselves voluntarily at risk, they seem to accept more risks compared to situations where they are more or less forced to accept them. Imagine your supervisor asking you to change

the electric wires on a pole of ten meters without climbing material. On the other hand you can choose to do a bungee jump from a height of forty meters.

- Influence of the person at risk. If someone beliefs to have an influence on the situation (s)he will accept more risk. If people know they can't influence the situation, then they will accept less risk. A striking point here is that most car drivers think they drive better compared to the average one. Further in case a car tends to crash it might be wondered whether the person at risk has an influence on the consequences. The driver of a car acts voluntarily and has an influence on the situation. The passenger of a car acts voluntarily, but doesn't have an influence on the situation, the same for people in an airplane. Also when people consciously break laws the risk taking is less accepted compared to when the human action is a natural phenomenon.
- Gender also plays a role. Women are more sensitive for those factors that influence the perception of risk compared to males.
- Do the accidents happen chronically or catastrophically: crashes which occur more often, but are smaller seem to be less threatening compared to crashes which occur sporadically, but haver bigger consequences. A plane crash with e.g. eighty four deaths is considered as a catastrophe, while in 2010 the same amount of people died on the European roads every day (European Commission Road Safety, 2011).
- Finally the influence of the media can't be underestimated. Catastrophic accidents seem to cause a lot more harm compared to chronic accidents. However the media spends much more attention to catastrophic accidents.

In table 1 below is displayed what the death rate per 100 million vehicle kilometres is. As you can see per 100 million kilometres 5,4 people die in car crashes compared to 0,035 in airplanes. This is a multiplicative factor of 154.

TABLE 1: Number of deaths per 100 million traveller kilometres (Ministerie van Infrastructuur & Milieu, 2011)

Risico's (2000 en 2001)		
Wegverkeer (totaal)		0,95
Motor/ bromfiets	13,8	
Fiets	6,4	
Auto	5,4	
Bus	0,07	
Veerdiensten		0,25
Luchtvaart (civiele)		0,035
Railverkeer		0,035

1.2 Purpose of the research

The discussion of the problem above indicated the fact that there are too many traffic fatalities and heavily injured people on the road. Those thousands of people have different characteristics (e.g. gender, age, the mode they travelled with) by which they can be classified. Implicitly people with different characteristics expose themselves - due to their behaviour- in different quantities to risks compared to others.

For example persons A and B (e.g. neighbours) travel each day with the same car type, take the same trajectory, in similar traffic conditions. Similar traffic conditions is mentioned because the same traffic conditions are strictly impossible. Although both persons perform similar trips with the same car type, there will be one person with a higher accident risk compared to the other.

Due to those personal characteristics there are for example more male deaths in traffic crashes compared to females. Younger people also have a higher chance to die in traffic crashes compared to elderly. Motorcyclists have a higher chance compared to car drivers, bicyclists or pedestrians etc. Further combinations are often possible. Young male motorcyclists have a higher chance to get involved in a road crashes compared to other road users (Evans, 2004).

Another point is the fact that people with specific characteristics have a higher chance to get involved in an accident. However this doesn’t indicate they have a higher chance to die or get injured in that specific accident. Younger people are less vulnerable compared to older ones. Children are also more vulnerable compared to young adults in their early twenties. Males are less vulnerable compared to females. Although young males have a lower vulnerability, they are the category that contains the highest number of deaths (Evans, 2004).

The question to be answered in this research is: ‘How will those numbers evolve in the future?’ Might it be that other road user types will become high risk groups or will the risk groups remain the same ones as they are today. These questions will be answered by the use of time series models. More specific information about time series models is presented in the second chapter.

The main goal in this research is to define an overview of high risk groups in the future for victims in traffic and transport. These risk groups are divided by age, gender and transport mode.

The risk groups can be defined absolutely and relatively. Both are important in function of this research and the relative ones are measured in function of an exposure measure. In the next subchapter possible exposure measures are mentioned.

1.3 How to measure traffic safety?

The report "Traffic safety indicators: overview and description of the existing and usable indicators" of Lammar, (2006) presents an overview of the most common used absolute and relative traffic safety indicators.

The most common absolute and relative measurement techniques for traffic safety are the number of deaths, number of injured people, number of vehicles, number of vehicles divided by number of inhabitants, injured divided by inhabitants, deaths per 10.000 or 100.000 vehicles, deaths per 100.000 inhabitants and deaths per vehicle or transport kilometre.

Also in national traffic safety statistics the following indicators are often used, traffic deaths per inhabitant, injured per inhabitant, victims per inhabitant, accidents per vehicle, deaths per vehicle, injured per vehicle, deaths per vehicle kilometre, deaths divided by total number of deaths (including deaths due to other causes).

1.3.1 Motivation for the choice of fatalities as risk component

In order to write this report there has been chosen for traffic fatalities as unsafety measure. Other options like the number of accidents or the number of light or severely injured victims were possible. Even the combination of injured people and fatalities was an option. There are two reasons why it was preferable to choose traffic fatalities and not injured victims (SafetyNet, 2008):

- One reason why fatalities were chosen is that this category suffers the least from under registration and it is the type of consequence that is of course the worst.
- On the other hand different countries can use different definitions to define a serious or light injured. While road deaths can only be misclassified if the cause of death is assigned to a traffic accident while it should not and visa versa.

1.3.2 Motivation for the choice of exposure component

It is preferable to use transport kilometres travelled by all passengers of vehicles or vehicle kilometres to measure the level of exposure. Although other options namely, vehicles or inhabitants are measured more correctly by (inter)national databanks.

Passenger kilometres give a better representation of exposure compared to vehicle kilometres. On the other hand passenger kilometres have to be questioned by a survey, while vehicles kilometres can be observed, the latter one (observation) is usually more accurate (Baarda & Goede, 2001). Vehicles and inhabitants are registered on national databanks so those measurement techniques are more accurate compared to vehicle or passenger kilometres but less preferable.

Further an important remark was made by Lammar, (2006) who mentioned that it is preferable to use vehicle kilometres as measurement technique for exposure. Unfortunately usually data only contain transport kilometres that are driven by motorised vehicles and not the kilometres driven by bicycles or walked by pedestrians. Therefore it's difficult to find correct transport kilometres of each transport mode (pedestrians, bicyclists, buses, mopeds, motorcyclists, trucks & trailers etc.) The time spend in traffic might be another option, but data about this exposure measure are difficult to find as well. In this report there has been chosen for the option of passenger kilometres (of car and bus) in function of the aggregated analyses. The number of inhabitants was chosen for the disaggregated analyses of gender and age. Finally the vehicles were chosen as exposure measure for the disaggregated analyses of transport mode. Unfortunately again for bicyclists and pedestrians there are no data available, also for other transport modes vehicle data were sometimes not available.

1.4 Research questions

Below the main research question and the sub questions are mentioned. This research is conducted in 2012 and at the start of the research it was planned to do predictions till the year 2020, however data were often only available till until 2009 therefore it was chosen to predict for the year 2015. The research questions are applied to six countries.

Main research question:

- Which aggregated trends and disaggregated sub-trends will manifest themselves in the future (2015) for groups of traffic fatalities?

Sub questions:

1. What are the aggregated trends by 2015 for the six investigated countries? (research question 1)
2. Age:
    a. Which age categor(y)(ies) will contain the most/least traffic fatalities by 2015 (absolute)?
    b. Which age categor(y)(ies) will contain the most/least traffic fatalities by 2015 per 100.000 inhabitants (relative)?
3. Gender:
    a. Which gender will contain the most/least traffic fatalities by 2015 (absolute)?
    b. Which gender will contain the most/least traffic fatalities by 2015 per 100.000 inhabitants (relative)?
4. Transport modes:
    a. Which transport mode(s) will contain the most/least traffic fatalities by 2015 (absolute)?
    b. Which transport mode(s) will contain the most traffic/least fatalities by 2015 per 100.000 vehicles (relative)?
5. Combined disaggregated analysis (only for Belgium):
    1. Which age & gender categor(y)(ies) will contain the most/least traffic fatalities by 2015 (absolute)?

2. Which age & gender categor(y)(ies) will contain the most/least traffic fatalities by 2015 per 100.000 inhabitants (relative)?

Two other interesting subdivisions that could have been investigated were traffic fatalities according to income level and road type. Christie, Towner, Cairns, & Ward, (2006) performed research to the relationship between the poverty index and child fatalities per 100.000 inhabitants. This was done for the OECD (Organisation for Economic Cooperation and Development) member countries. Further Lowe, Whitfield, Sutton, & Hardin, (2011) found the relationship that children from disadvantaged neighbourhoods are at greater risk to get killed or injured in an accident compared to children from more affluent areas. However it's not easy to find data about income classes, because usually people aren't generous to tell how much they earn. Further it wouldn't be easy to link those income data to the number of traffic fatalities who fell in the different income classes. This because no income data are registered on the European accident form, which is shown in annex 1. For the other subdivision, road type, it has to be noticed that not all travelled transport kilometres are classified according to road type. Also the traffic fatalities are not always well classified according to road type.

Finally it would be interesting to investigate different possible combinations of characteristics. It would be nice to mention for example whether it are mainly men who die on motorcycles, from the mid age category, that they have a high income and they die on motorways. Or for example old women, on a bicycle, they have a low income and they die on local roads. In this way the government policy can be applied in such a way that a focus is laid on those combinations with a high risk level. In this research however there is only one combined research done for one country (Belgium). This is the combination of gender and age, which tells us whether there are few or a lot males or females in a certain age class who die in traffic.

1.5 Definition of risk

According to the Dutch Ministry of Infrastructure & Environment, (2011), the concept of risk deals with the level of unsafety (in the numerator). This stands in relation to the level of exposure (in the denominator) of a certain danger. When the concept of risk is used, it's easier to compare different forms of safety levels. This can also be seen in formula 1.

$$Risk = \frac{Unsafety}{Exposure}$$

FORMULA 1: Risk defined as unsafety divided by the level of exposure.

The most common options for the numerator are:

- Fatalities
- Heavily injured people
- Slightly injured people
- Accidents/crashes

The chosen option in function of this research is the number of fatalities as mentioned in subchapter 1.3.1.

The most common options for the denominator are:

- Person kilometres
- Vehicle kilometres
- Time spend in traffic
- Number of vehicles
- Number of inhabitants

In subchapter 1.4 there is mentioned which disaggregated analyses will be performed, namely age, gender and transport mode. The difference between men and women is clear. However which age classes and transport modes should be taken into account is not always clear. This is discussed below in subchapter 1.6 .

1.6 Classes of unsafety

For both the level of unsafety and the level of exposure some divisions in classes are necessary. The following classifications were used:

Fatalities & exposure according to:

- Gender (two classes):
    - Male
    - Female
- Age category (six classes):
    - 0- 14 This is the age class that can't travel as car driver neither as moped driver.
    - 15 - 17 This age category represents teenagers who are not allowed to travel as car driver but are allowed to travel as moped driver.
    - 18 – 24 This represents the age category of the young adolescent drivers.
    - 25 – 49 Represents the traffic fatalities of the younger mid aged people.
    - 50 – 64 Represents the traffic fatalities of the older mid aged people.
    - ≥65 This represents the traffic fatalities of the older age.
- Transport mode
    - Pedestrians (no exposure data available)
    - Bicyclists (no exposure data available)
    - Moped drivers (not always exposure data available)
    - Motorcyclists
    - Cars
    - Buses & coaches (including trolley buses)
    - Vans and trucks (all weight classes)

The above classifications were mainly chosen because of data availability.

1.7 Classes of exposure

In the literature, exposure is seen as the most prominent determinant of traffic safety. The first option to collect exposure data in transport is by use of mechanical traffic counters, human observation or traffic camera's. The second option is by the use of surveys, face to face interviews, telephone interviews or internet/mail questionnaires. Preferable exposure measures are total distance travelled by vehicle or person, travel time and number of trips. However it's often easier to collect data of the number of inhabitants, registered vehicles, traffic counts or fuel consumption (Van den Bossche, Wets, & Brijs, 2005).
Further Bijleveld, (2008) defines exposure as: *"The potential to have accidents (or victims) is generally referred to as exposure in road safety analysis."*

Bijleveld, (2008) gives an example of exposure that explains the concept. Imagine two countries A and B. Country B has double as much fatalities due to traffic compared to A. Can it be stated that the traffic safety of country B scores twice as bad as the one of A? That's not for sure. If country B has the same quantity of square kilometres, the same road length, the same number of inhabitants, the same employee rate, the same number of travelled car and truck kilometres, the same demographic structure etc… Then you can state that the traffic safety of country B scores twice as bad as the one of A. However if all the other factors (exposure data) would be doubled in case of country B, the country would have a similar level of traffic safety as country A. Or even the other way around if the exposure data of country B would be four times as much the one of country A the traffic safety would be double as well compared to country A.

A crash occurs always on an unpredictable moment, but the total number of crashes or victims in a country can be predicted in a certain extent. If people wouldn't make any transport trips, no crashes would appear. Only when people travel, they expose themselves to the danger and they might become a traffic victim. Exposure data are a must in order to put the risk data (number of fatalities, injuries or crashes) in a context. Risk as described in 1.5 is always a ratio of an unsafety measure and an exposure measure. According to (Matensen e.a., 2010) the indicators of transport exposure are usually classified in three different groups:

- The ones that are related to the people using the roads and their behavior
- The ones that are related to the vehicles
- The ones that are related to the road infrastructure

Those three are shortly discussed below.

1.7.1 People that use the roads and their behaviour

The demographic structure of a country's population has a direct effect on the number of traffic fatalities and injuries. Next to those clear differences there are more subtle factors, e.g. when a population of different countries behaves in a different way. This might be the

result of different shapes of the road infrastructure or different traffic laws. Even the perception of a countries population on those laws has an effect.
This was once studied by A. C. Harvey & Durbin, (1986) for the evaluation of the seatbelt. In 1983 the seatbelt became compulsory in Great Britain. A rise in wearing rate combined with a decrease in fatalities and injuries was registered. In other countries the rise in seatbelt wearing rate occurred more gradually. Therefore in those countries it was difficult to separate the influence of the new law from the influence of other changes in the transport system at simultaneous moments.

1.7.2 The number of vehicles in a region or country

The travelled transport kilometres by different modes or people on a country's road is the preferable indicator for crashes and victims. These data are often not available and the number of vehicles is a good alternative. Multiplying the number of vehicles and the average number of car kilometres driven is a good alternative for the total number of travelled vehicle kilometres. However in this report this multiplication was not performed in function of the disaggregated analyses of the transport modes.
Car design has been improved in order to increase crashworthiness. This had a positive effect on the reduction of fatalities and injuries. The European crash tests of EuroNCAP (European New Car Assessment Programme) tests the vehicles at speeds of 64km. per hour. The tests are done in favour of the individual car driver and the car industry (EuroNCAP, 2012). However contradiction exists about the chosen speed of 64km per hour. In fact about eighty per cent of the car accidents occurs at a lower speed, so therefore the crash tests include the consequences of those crashes, but for the remaining twenty per cent of the crashes the consequences are not included in those tests (Peeters, 2010).

1.7.3 The length of the road network

When no data are available about transport/vehicle kilometres or the vehicle fleet, the length of the road network is another alternative. Road length is of course an approximation, as countries with safer designed roads will in general have a lower number of traffic fatalities and injuries.
However this method is somewhat paradoxical, motorways (or freeways) have a low crash rate according to vehicle kilometres. On the other hand a lot of kilometres are driven on these roads with the results that the number of crashes per kilometre are high. Further the crash consequences on freeways are worse due to higher speeds. It can be pointed out that the urbanization level of a country affects the number of traffic fatalities and injuries. The road lengths are well registered in countries, but road classifications are different in several countries.

In this report there has been worked with exposure data several times. The preferable exposure measure is person/passenger transport kilometres, these were used for the aggregated analyses. However they couldn't be used for the disaggregated analyses, so other data vehicles and inhabitants were used for those analyses. In function of the aggregated analyses it might have been preferable to use vehicle kilometres, because those data are observed and more objective. Person or passenger kilometres are most of the time asked to people through survey, in those cases the registration happens more subjectively. On the other hand if two people travel in a car then the number of passenger kilometres is twice the number of vehicle kilometres, this is also more correct compared to vehicles kilometres. Finally bicycle and pedestrians kilometres are not registered by observation, so they have to be surveyed. Often data about bicycles or pedestrians kilometres are not available, even the number of bicycles in a country is usually not registered. So as mentioned by Arthur C., (1982) data which are easily accessible are seldom desirable exposure measures. Like the number of inhabitants, vehicles or driving licenses do not represent well the number of travelled kilometres.

When the exposure data has to be linked to the risk data, the classes should preferable match one another. In this report the following classifications for the disaggregated analyses were used.

- Gender: Male and female
- Age: 0-14;15-17;18-24;25-49;50-64;≥65
- Transport mode: Pedestrians, bicyclists, moped riders, motorcycle riders, car riders, bus and coach riders, agricultural vehicle riders, lorry and heavy good/trailer riders.

As shown in subchapter 1.6 in the case of fatality data by European Commission Road Safety, (2012) the classification for goods vehicles was above and below 3.500kg. While the exposure measure for lorry vehicles had next to other weight classes the following important class division, < 3.000kg and ≥ 3.000kg (Eurostat, 2012) & (United Nations Economic Commission for Europe, 2012). The classes for semi-trailers and trailers were once more different < 5.000kg and ≥ 5.000kg (Eurostat, 2012b) (United Nations Economic Commission for Europe, 2012b) (Eurostat, 2012c) (United Nations Economic Commission for Europe, 2012c). Therefore all weight classes were taken together as will later be mentioned again in 3.4.2.

1.8 Chose for the analysed countries

There are six different countries taken into account in this study. Those are, Poland, Czech Republic, Iceland, Sweden, Finland and Belgium. These countries where chosen because two of them have in general a rather good performing traffic safety, namely Finland and Sweden. Also Iceland has a rather low number of traffic fatalities. However that country only has a population of ± 320.000 inhabitants. Poland was chosen as an east European country with a rather weak score in traffic safety. Czech Republic was chosen as another east/continental European country that is performing better. Finally Belgium scores more or less on the average of the European level, but in comparison with other western European countries it scores rather poor. An element not taken into account is the geographic locations of those countries. Three of them are situated in northern Europe. Two are situated in east continental Europe and one in western Europe. However none of the countries is situated in south Europe. Finally the DaCoTA (Data Collection Transfer and Analysis) project by Matensen e.a., (2010) already investigated Spain, Greece, Italy and the UK. This report is written in function of a master degree at a Belgian university. Belgium is also the only country that was already investigated in the DaCoTA project.

In table 2 below some basic facts of the six countries are presented.

TABLE 2: Basic numbers and characteristics of the five countries

	Inhabitants 1st January 2011	Square kilometres	Persons / square kilometre	GDP in market prices (2010)	GDP in current prices (2010)	Capital
Belgium	10.951.665[3]	30.528[3]	355	€29.000[5]	€32.600[4]	Brussels
Czech Republic	10.532.770 [3]	78.866[3]	134	€19.400[5]	€14.200[4]	Prague
Finland	5.375.276[3]	337.030[3]	16	€28.200[5]	€33.600[4]	Helsinki
Iceland	318.452[2]	103.000[3]	3	€27.200[5]	€29.900[4]	Reykjavik
Poland	38.200.037[3]	312.677[3]	122	€15.300[5]	€9.300[4]	Warschau
Sweden	9.415.570[3]	449.964[3]	21	€30.100[5]	€37.000[4]	Stockholm

[1]= (FOD Economie, KMO Middenstand en energie, 2011)
[2]= (Statistics Iceland, 2012)
[3]= (European commission Eurostat, 2012) *Population at 1th of January 2011.*
[4]= (Eurostat, 2011a) *For the year 2010.*
[5]= (Eurostat, 2011b) *For the year 2010.*
[6]= (Studiedienst van de Vlaamse Regering, 2010)

1.9 Research methods and further chapters of the report

This report started with an introductory chapter, it discussed: the problem of traffic fatalities/injuries in Europe and the purpose of this research. The two components that are present are unsafety and exposure. Further it was mentioned what the main research question and additional subquestions are. Also a brief description of the risk concept was given. The chosen risk and exposure classes were indicated. Finally the countries of this research were presented.

The second chapter is a short literature review of possible time series analyses methods. This part also focuses on the LRT (Latent Risk Time Series) model, which is the method used for the analysis in this research. The third chapter presents the data that were collected in function of the analyses. The fourth and most important chapter discusses the analyses and the results of those analyses for the selected countries. Finally the report finishes with a conclusion of the research results, limitations of this research, options for further research and a word about additional analyses that were performed.

2 Forecasting and time series models

In this chapter first of all the difference between univariate and multivariate forecasting is described. Further time series and the different patterns they can possess are discussed. Next some different time series models that exist are briefly described. Finally the LRT (Latent Risk Time series) model that is used in this research will be discussed in detail.

2.1 What is forecasting?

According to Delurgio, (1997) forecasting is necessary in order to provide accurate estimates of the future. Another interesting point mentioned by this author is:
"Reducing forecasting horizon lengths improves forecast accuracy". So predicting in the near future is easier compared to predicting in the far future.
A forecast is an estimation with a certain probability of a future value. The future value can be described. Good planning forecast includes some values like the average, a range and confidence intervals of the range. Forecasting can't be covered by only one number, a point estimation. Therefore the word 'probability' should be included in the description.
A good forecast for example is: "The next years expected number of traffic deaths for country x is 600, with a ninety five per cent probability that there will be more than 560 and less than 640 deaths". Depending on the distribution it can be assumed that there is a fifty per cent chance that more than 600 people will die and a fifty per cent chance that less than 600 people will die. Forecasting is designed in order to reduce uncertainty and risk. Delurgio, (1997) gives a description about dependent and independent demands in economics. According to that description, car crashes and their victims can be seen as dependent from the mobility. The more vehicle kilometres are driven the more people will die or get injured.

2.2 Univariate vs. multivariate forecasting methods

Time series models consist of two main categories, univariate and multivariate methods. Basically forecasting future values in a univariate way are a mathematical function of past values. The univariate models are developed for the modelling of mathematical relationships that describe, but not necessarily explain past patterns. Imagine the following quantities of energy (KwH) delivered by solar panels in one month of a year over the past ten years:
452 ; 534 ; 602 ; 378 ; 407 ; 472 ; 423 ; 578 ; 387 ; 447. It can be assumed that the sum of these values (4680) divided by ten years (468) is a good estimation of the amount of energy that will be delivered next year during that particular month. However if all values would have been ordered from the lowest till highest it might be assumed that next years value is even a bit higher.
Next to univariate models there are multivariate forecasting models. They consist on the one hand of explanatory or independent variables and on the other hand of an explained or dependent variable. They are more costly to develop and more complex compared to univariate methods.

2.3 Introduction to time series models

The purpose of time series models is to model the patterns of the past values to project them into the future. Further also describe, explain and predict in a quantitative way certain trends (Delurgio, 1997). These trends can occur in several policy domains.

Time series can be used for example in:

- Prediction of criminality (breaking and entering, armed robbery).
- Health care expenditures (van Elk, Mot, & Franses, 2010).
- Economics: Growth in GNP (Gross National Product, consumption of energy sources like coal or oil) (Andrew C. Harvey, 1991).
- Others: Biology, health care, social sciences.
- Prediction of the quantity of vehicle kilometres driven on the road (mobility management) & victims (traffic safety).

Time series are used in order to present "*repeated measurements over time*". Those can be e.g. road accidents per year, fatalities per year, vehicle kilometres per month. All those data are repeatedly measured over time at a constant interval.

Time series models can be formulated in several different ways (Andrew C. Harvey, 1991), however an interesting starting point is that time series may be decomposed in the following components.

$Observed\ series = trend + seasonal + irregural$ (Additive form)

FORMULA 2: Additive form of a time series model

$Observed\ series = \ trend \times seasonal \times irregular$ (Multiplicative form)

FORMULA 3: Multiplicative form of a time series model

Trend and seasonal patterns are described in 2.4, however shortly they indicate:

- a trend is an overall increase or decrease in a time series,
- the seasonal component indicates events that occur periodically (seasonally),
- the irregular component contains the non-systematic movements in the time series.

On the horizontal axis the time is mentioned, while on the vertical axis a certain quantity is mentioned. Andrew C. Harvey, (1991) indicated two reasons why one would model a univariate time series model. The first one is that the time series gives a description of its components of interest. What is the main movement over the past year(s) or which specific seasonal/monthly fluctuations occur? On figure 6 the monthly fluctuations of the number of traffic fatalities for the United States are shown. A remark here is that on this figure only the level of unsafety is included, not the level of exposure. The fluctuations can even be shown in function of the hour of the day as shown on figure 7. Again this figure is one without any form of exposure. The second reason to construct a univariate time series model is the prediction of future observations, this is done is this research.

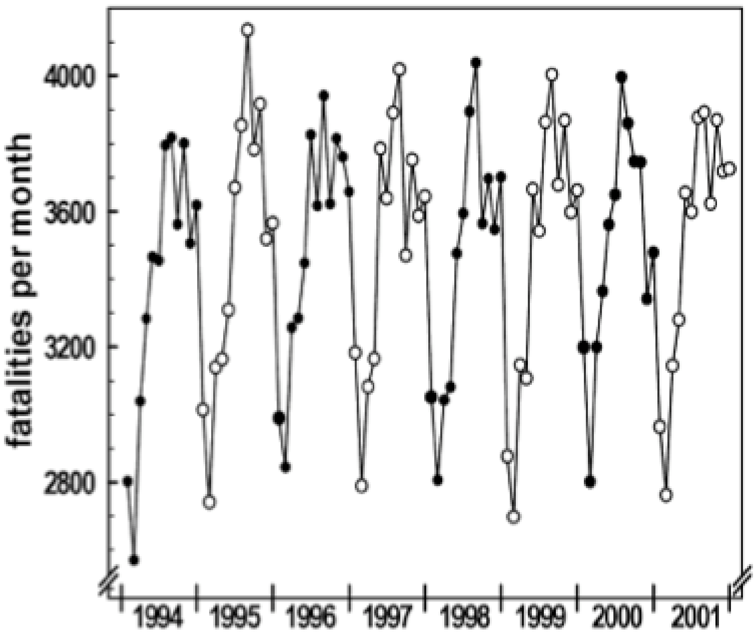


FIGURE 6: Monthly fluctuations of the number of traffic fatalities in USA (Evans, 2004)

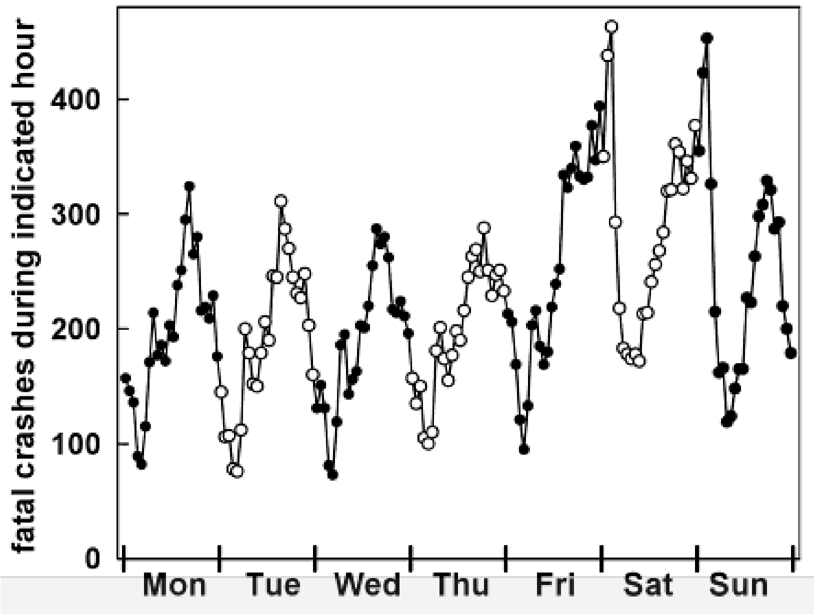


FIGURE 7: Fluctuations per hour of the day for traffic fatalities in USA (Evans, 2004)

2.4 The patterns of time series analysis

When time series are plotted, as a result different patterns are possible. The different possible patterns are the following ones (Delurgio, 1997):

1. **Random patterns**: These patterns have a constant mean and no systematic pattern. Many influences that act independently on a value influence it in such a way that non repeating and non systematic patterns are recognised around a value. This pattern can be seen in annex 2.
2. **A trend**: This is a general or overall increase or decrease in a time series. The pattern can only be called a trend when it has a duration of at least seven periods. This a kind of thumb rule. If for example the number of traffic deaths in China increases seven years after one another, there is an increasing trend in the number of traffic deaths. This has negative repercussions on society. Trends are caused due to population changes, economic growth or shrunk. A trend pattern is displayed in annex 3.
3. **Seasonal pattern**: These are events that occur periodically e.g. monthly changes in a year. The sales of ice creams or the sales of tires specially developed for winter periods have seasonal patterns. As shown on figure 6 more people die on the road during summer compared winter periods. A possible explanation therefore might be that people drive more cautiously during winter compared to summer (due to worse weather conditions). The factors that influence seasonal patterns are climate, human habits, holidays, yearly campaigns against drunk driving etc. A figure of this pattern is shown in annex 4.
4. **Cyclical patterns**: These patterns return every two to five years, but the period isn’t known. These patterns are more difficult to forecast as they are recurrent but not with specific time periods, this in contrast to seasonal patterns. Economic expansions, recessions or depressions know cyclical pattern. This pattern is displayed in annex 5.
5. A final pattern is **autocorrelation**: Correlation measures the degree of dependence or association between two variables. With autocorrelation the value of a series in a time period is related to the value of itself in the previous time period. This is also mentioned by SWOV (Stichting Wetenschappelijk Onderzoek Verkeersveiligheid), (2010) where it is stated that the observed number of traffic deaths of the previous year is often a good indicator for the number of deaths of the current year. An illustration of this is shown in annex 6.

The focus in this study will be on the trend pattern. Questions to be asked are: “How much fatalities fell in the past?” “Was there an increase or a decrease over the years?” etc. Each registered yearly data point inherently possesses the seasonal patterns. Further the pattern of the number of traffic fatalities might deal with autocorrelation and with random fluctuations. However the main interest goes to the trend in the past and how this trend will continue in the future (2015) plus what the final outcome in the number of fatalities for each country will be.

2.5 Different time series models

The main goal of road accident models is to identify the factors that can be manipulated by policy makers in order to increase traffic safety. Those factors are the variables that determine a certain phenomenon to be described, explained or predicted.
SWOV (2010) gives a brief overview of six different time series models in order to describe, explain or predict. Those six are classical linear models, non-linear models, ARMA (auto-regressive moving average), ARIMA (Auto-Regressive Integrated Moving Average), DRAG (Demand for Road use Accidents and their Gravity) and state space models. These models were applied on the traffic fatalities in the Netherlands from 1950 till 2003.
In the past classical linear and non-linear time series were used to analyse time series:

- Time is used as an independent variable in order to model the trend.
- Independent dummy variables are used to register seasonal variations.

The general linear regression model has the following structure.

$$\boldsymbol{Y_t = a + bt + \varepsilon_t \qquad \varepsilon_t \sim NID(0, \sigma_\varepsilon^2)}$$

FORMULA 4: Structure of the linear model (SWOV Stichting Wetenschappelijk Onderzoek Verkeersveiligheid, 2010).

It consists of the following components:

- y_t = dependent variable, namely the estimated number of deaths for year 't'
- a = the intercept (parameter)
- b = the shape of the regression line compared to the x-axis for year t (parameter)
- ε_t = residues wherefore:
  - they are expected to be normally and independently distributed,
  - the expected average is zero,
  - the variance of ε is the same for all values of x (homoscedastic).

The importance of the assumptions in function of correct statistical conclusions is as follows, independency, homoscedasticity and normally distributed.
The result is shown in annex 7. The residues are not independent, because before 1960 the observations were overestimated, from 1961 till 1984 the observations were underestimated and from 1985 on they were overestimated again. Forty of the fifty-four observations lie outside the 95 % confidence interval.

Also the analysis of time series with non-linear regression models often result in residues that don't meet the independency assumption. In formula 5 the non-linear model is written for time moment 1 till n.

$$\boldsymbol{Y_t = a + b_1 t + b_2 t^2 + b_3 t^3 + \varepsilon_t \qquad \varepsilon_t \sim NID(0, \sigma_\varepsilon^2)}$$

FORMULA 5: Structure of the non linear cubic model (SWOV Stichting Wetenschappelijk Onderzoek Verkeersveiligheid, 2010)

Only the component that influences the shape of the regression line is different compared to the linear regression model, b_1,b_2,b_3 = the shape of the regression line (parameters to be

estimated). Again the same residual assumptions as for the linear regression model are made.
The result of the non-linear model fits better the observed values, the difference with the linear model can be compared on the figures in annex 7 and 8. The residues on the figure of Annex 8 are smaller compared those in annex 7. However the correlation between the residues remains strong, as can be seen on the residual plot of Annex 8. There are still a lot of observed data points after one another that lie consequently under or above the estimated regression line. Still too many observations lie outside the confidence interval.

The ARMA, ARIMA and DRAG models are specially developed for the analysis of time series and they take into account in a better way the dependencies in the observations compared to the other (non-)linear models.

$$\boldsymbol{Y_t = b_1 y_{t-1} + \ldots + b_p y_{t-p} + \varepsilon_t + a_t \varepsilon_{t-1} + \ldots + a_q \varepsilon_t - q \qquad \varepsilon_t \sim NID(0, \sigma_\varepsilon^2)}$$

FORMULA 6: General structure of ARIMA model and model assumptions

The following components of the ARMA model are different from the non-linear model:

- $b_1 \ldots b_p$, $a_1 \ldots a_q$, p and q are the unknown parameters,
- the first part on the right of the equation is called the autoregressive part. In this part the dependent variable y_t is predicted on the basis of moved values of itself in time,
- the second part is called the moving average of the assumption. In this part the dependent variable is predicted on the basis of time moved values of the residues.

Model builders of ARMA models often deal with the difficult task of balancing between:

- On the one hand a useful model that fits the observed values (good fit).
- On the other hand a spare use of the parameters.

A requirement of the ARMA-models is that the average and variance of the observed time series have to be stationary over time. Otherwise the analysis can’t be performed. In most datasets these requirements aren’t met due to a trend and seasonal variability. In most developing countries an increasing trend and in most developed countries a decreasing trend in traffic fatalities is observed. On figure 6 is also shown that during winter periods there are less fatalities compared to summer periods.

These trends and seasonal patterns have to be taken out of the regression, this results in ARIMA (p,d,q) models. The “d” indicates how often differences between different observations have to be considered before stationarity is obtained. In this case residues meet the independency assumption, namely most of the observations lie between the 95% confidence interval.

A fifth model type is the class of DRAG models, an extension of the ARIMA models, but where:

- exposure, accidents and seriousness are modelled in three different steps,

- a lot of explaining variables are added to all three steps,
- the dependent and independent variable are transformed.

Next to the stationary requirements for the ARIMA models there are some disadvantages of DRAG models because:

- exposure, accidents and accident seriousness aren't simulated simultaneously,
- due to a high number of variables there are a lot of costs. Quality vs. time and money. "There are no good and bad models, there are only better and less usable models".

Finally there are the state space models also called unobserved component models or structured time series models. While the ARIMA and DRAG models suppose there is stationarity in the data, these ones don't.

Structure of the local linear trend model:

$$\boldsymbol{Y_t = a_t + \varepsilon_t} \qquad \boldsymbol{\varepsilon_t \sim NID(0, \sigma^2_\varepsilon)}$$

$$\boldsymbol{a_{t+1} = a_t + b_t + \xi_t} \qquad \boldsymbol{\xi_t \sim NID(0, \sigma^2_\xi)}$$

$$\boldsymbol{b_{t+1} = b_t + \zeta_t} \qquad \boldsymbol{\zeta_t \sim NID(0, \sigma^2_\zeta)}$$

FORMULA 7: State space model of the Dutch traffic deaths

Next to the components mentioned in previous models it consists of the following ones:

- a_t = The trend, that consists of the sum of the time varying intercept and of a time varying shape. The local linear trend model can be seen as a generalization of the classical linear regression model. So the parameters which are in the classical regression model global are allowed to be localized, so they are allowed to vary in time.
- The unknown and to estimate parameters of the local linear trend model are the variances of error.

Five different models of the factsheet of SWOV were discussed right now. Below there will be continued with a discussion of the LRT (Latent Risk Time series) model.

2.6 The latent risk time series model

As mentioned by Matensen e.a., (2010), Bijleveld, (2008) developed the LRT model (Latent Risk Time series) model. The LRT model is a specific form of the more general state-space models or structural time series models. The difference with other state space models lies in the fact that the LRT model has the characteristic to recognize explicitly the "risk conception" of road safety.

Road safety is measured by the number of people killed, the injuries or the road crashes on the road. This is the result of on the one hand the "road risk" or "level of dangerousness" of the traffic system. On the other hand there is the "exposure" to that risk or the level people are "confronted" to the risk.

The road safety indicator (e.g. fatalities) and the exposure indicator (e.g. vehicles) have to be modelled in parallel in order to analyse the road safety development.

According to Bijleveld, (2008) as mentioned by Matensen e.a., (2010), "*The development of traffic safety is the product of the respective developments of exposure and risk*", as shown in formula 8. Notice that the level of risk can also be extracted from the second formula.

$$Traffic\ volume = Exposure$$
$$Number\ of\ fatalitiees = Exposrue\ \times\ Risk$$

FORMULA 8: Traffic volume as a function of exposure and number of fatalities as a function of exposure multiplied by risk.

The equations in formula 8 represent the Latent Risk Time series model and the variables "traffic volume" and "number of fatalities" are the dependent variables. The result of "exposure" is the "traffic volume" and the results of "exposure" multiplied by "risk" results in the "number of fatalities". Therefore what we measure in real life by "traffic volume" or "number of fatalities" are a function of "exposure" or "exposure" multiplied by "risk". *"Traffic volume and fatality numbers are considered to be the manifest counterparts of "exposure" and "exposure × risk"* Matensen e.a., (2010). The "exposure" and "exposure × risk" are the latent[1] variables of the model. When the logarithms of the variables are considered the model becomes additive instead of multiplicative
Further random error terms are added to the latent variables.

$$Log\ Traffic\ volume = \log exposrue + random\ error\ in\ traffic\ volume$$
$$Log\ Number\ of\ fatalities = \log exposure + \log risk + random\ error\ of\ fatalities$$

FORMULA 9: Measurement equations of traffic volume and number of fatalities.

The formulas of formula 9 are the "measurement equations" as they define how exposure and risk can be observed. The two latent variables on the right side of the equation are further modelled in "state equations". The state equations are sub-models, they describe or explain the development of the latent variables once they are inserted in the general model. The state equation can be decomposed in e.g. trend or seasonal components.

The "real" trend/number of fatalities can't be observed, as it is inevitably contaminated with error (ε_t) at each time point. Fluctuations occur in the observed values and the "true" development of fatalities is modelled based on the state equations. Those state equations are inserted in the measurement equation and together with the measurement error term they define the observed number of fatalities. For the example below the measurement and state equations are shown for the fatality component, not for the exposure component.

$$\boldsymbol{log\ Number\ of\ Fatalities_t = log\ LatentFat._t + \ \varepsilon_t}$$

FORMULA 10: Measurement equation

[1] Latent is used to describe something which is hidden and not obvious at the moment, but which may develop further in the future (Herper Collins Publishers, 1987)

$$\boldsymbol{Level\ (Log\ LatentFat_t\ Level\ (\log LatentFat_{t-1}) +\ Slope\ (\log LatentFat_{t-1}) +\ \xi_t}$$
$$\boldsymbol{Slope\ (\log(LatentFat_t) =\ Slope(\log LatentFat_{t-1}) +\ \zeta_t}$$

FORMULA 11: State equations

In the state equations the fatality level at time point 't' is defined as the combination of the level plus the slope of the previous time points. The trend (which is the sum of level and slope) is equal to the level of the next time point.

Both exposure and risk are modelled by measurement and state equations. A general formulation of one of those variables is mentioned in formula 12 till 14. A coefficient is *stochastically (dynamic model)* in case it's allowed to very over time. On the other hand it is *deterministically* (*static model*) when no disturbance is allowed in the coefficient.

$$\boldsymbol{Y_t =\ \mu_t +\ \varepsilon_t}$$

FORMULA 12: Measurement equation

$$\boldsymbol{\mu_t =\ \mu_{t-1} +\ \nu_{t-1} +\ \xi_t}$$

FORMULA 13: State equation level

$$\boldsymbol{\nu_t =\ \nu_{t-1} +\ \zeta_t}$$

FORMULA 14: State equation slope

Measurement equation, formula 12:

Y_t = representation of the observations. This is the number of observed fatalities (unsafety) or the observed number of passenger kilometres / vehicles (exposure).

μ_t = representation of the state or trend. This is the fatality trend (risk) or the passenger kilometres / vehicles trend (exposure) for a certain year.

ε_t = measurement error. This is the difference between the observed and the estimated level of unsafety (fatalities) or level of exposure (transport kilometres).

State equation, formula 13:

μ_t = representation of the fatality trend at year t.

μ_{t-1} = intercept, value of the trend of the time point before. This is the level of unsafety (fatalities) or exposure (passenger kilometres / vehicles) of the previous time point.

v_{t-1} = slope, value by which every new time point is incremented or decremented (usually decremented in case traffic fatalities and incremented in case of passenger kilometres or number of vehicles).

ξ_t = random error term (disturbance), allow the level and slope coefficients to vary over time.

Slope equation, formula 14:

v_t = representation of the slope at year t (increase or decrease)

v_{t-1} = slope of the previous time point

ζ_t = random error term (disturbance), allow the level and slope coefficients to vary over time.

The above model (formula 12 till 14) is called the *local linear trend model* as both level and slope are allowed to vary over time, the trend can only be locally defined. Now some alternative formulas that are simplifications of the *local linear trend model* will be mentioned.

When the level is allowed to vary over time (but not the slope), we speak about a *local level model.* In this particular case the model is defined without a slope as shown in formula 15. According to the local level the trend at time point ‘t’ is made of the same value as the previous time point and the one therefore up to the first year of measurement. Further the observed values just go up and down the mean value of the first year.

$$\boldsymbol{Y_t = \mu_t + \varepsilon_t}$$

$$\boldsymbol{\mu_t = \mu_{t-1} + \xi_t}$$

FORMULA 15: Local level model

In case a slope is specified in the local level model, but treated deterministically instead of stochastically, the model is called a local level model with drift slope, as is shown in formula 16. In this case a slope is specified but the increase or decrease that occurs at each time point remains exactly the same. The trend is increasing or decreasing with the same increments/decrements and observed values switch above or under it.

$$\boldsymbol{Y_t = \mu_t + \varepsilon_t}$$

$$\boldsymbol{\mu_t = \mu_{t-1} + \nu_{t-1} + \xi_t}$$

$$\boldsymbol{\nu_t = \nu_{t-1}}$$

FORMULA 16: Local level model with drift slope

In case the level is fixed and the slope is treated stochastically we deal with a so called *smooth trend*. In this case the level is fixed and the slope moves up and down around a mean value.

$$\boldsymbol{Y_t = \mu_t + \varepsilon_t}$$

$$\boldsymbol{\mu_t = \mu_{t-1} + \nu_{t-1} + \xi_t}$$

$$\boldsymbol{\nu_t = \nu_{t-1} + \zeta_t}$$

FORMULA 17: Smooth trend model

In case both trend and slope are treated deterministically, the model is called a “*fully deterministic linear trend model*” The level and slope of a certain time point are considered to be equal to the level and slope values of the previous time point. In this case the level and slope values are identical for the whole series.

$$\boldsymbol{Y_t = \mu_t + \varepsilon_t}$$

$$\boldsymbol{\mu_t = \mu_{t-1} + \nu_{t-1}}$$

$$\boldsymbol{\nu_t = \nu_{t-1}}$$

FORMULA 18: Fully deterministic linear trend model

When formula 12 and 14 are considered again, than a negative value in the level error (ξ_t), mentions that the level value decreases compared to the previous year. In case the slope is negative there is a decrease in the time point up to the next time point. The slope becomes steeper (more decreasing) in case the slope disturbance (ζ_t) is negative. In case the slope disturbance (ζ_t) is positive the decrease slows down. If the slope is positive there is an increase, which increases even more if the slope disturbance (ζ_t) is positive. The increase is slows down in case the slope disturbance (ζ_t) is negative.

$$\boldsymbol{log\ Number\ of\ Fatalities_t = log\ LatentFat._t + \ \varepsilon_t}$$

FORMULA 10In formula 10 and 11 the measurement and state equations were mentioned for the unsafety component. However the LRT (Latent Risk Time Series model) consists of the unsafety variable as well the exposure variable. Therefore there is not just one, but two measurement equations and not two, but four state equations.

Measurement equation of the exposure component:

$$\boldsymbol{logTrafficVolume_t = logExposure_t + \ \varepsilon_t^e}$$

FORMULA 19: Measurement equation of the exposure component traffic volume

State equations of the exposure component:

$$\boldsymbol{Level(logExposure_t) = \ Level\ (\log Exposure_{t-1} + Slope\ (\log Exposure_{t-1}) + \ \ \xi_t^e}$$

$$\boldsymbol{Slope(log\ Exposure_t) = \ Slope\ (log\ Exposure_{t-1}) + \ \zeta_t^e}$$

FORMULA 20: State equations of traffic volume

Measurement equation for the fatality component:

$$\boldsymbol{logNumber\ of\ Fatalities_t = \log Exposure_t = \log Risk_t + \ \varepsilon_t^f}$$

FORMULA 21: Measurement equation of fatalities

Formula 21 is different from the measurement equation in formula 10. The reason therefore is that formula 21 includes the unobserved exposure component (exposure state).

State equations for the fatality component:

$$\boldsymbol{Level\ (\log Risk_t) = \ Level\ (logRisk_{t-1}) + \ Slope\ (\log Risk_{t-1}) + \ \xi_t^r}$$

$$\boldsymbol{Slope(log\ Risk_t) = \ Slope(log\ Risk_{t-1}) + \ \zeta_t^r}$$

FORMULA 22: State equations of fatalities

As the LRT (Latent Risk Time series model) models the observed number of fatalities and traffic volume, this is done by the measurement equations. However it also models the latent (or "true") values of exposure and unsafety risk. It's important to understand how additional explanatory variables can be inserted in the model. Most common kind of additional explanatory variables are interventions.

Explanatory variables or interventions that might influence the traffic volume or the number of fatalities can be added in three different ways:

- In the measurement equation. Here the explanatory variable is used as it might be suspected that the change in the time series is due to a change in the way it is measured and not due to a change in the exposure or unsafety itself. As mentioned by Matensen e.a., (2010) the change in the definition (from all victims who died 24 hours after the crash to all victims who died 30 days after the crash) of traffic fatalities is an example of this.
- In the level equation. In this case a permanent change (increase or decrease) in either the fatality risk or the exposure should have occurred. The risk or exposure measure

takes a kind of a step, an increase or decrease and afterwards it remains at that level. Examples are the obliged use of helmets for motorcyclists and moped drivers for fatalities. An example for a change in the level of exposure is road pricing with the consequence of a reduced number of driven kilometres.

- In the slope equation. In this case an action should have caused a change in the direction or the steepness of fatality risk or exposure. An example here is that in the beginning of the seventies there was is Western countries almost no concern about road safety, while form the mid-seventies concern was taken.

Right now some positive point of the LRT (latent risk time series model) will be mentioned.

2.7 Strengths of the time series analysis method

Matensen e.a., (2010) mention that by time series analysis it seems to be possible to use a ruler and draw a line through the measurements of the previous years in order to predict some future years. One might ask the question why a statistical model is necessary. The three main reasons why models are necessary are mentioned below.

The first one is that forecasts that are based on statistical models are simply better. If the fatality numbers of the past would form a straight line one could a draw a line through them. In that case the results of the statistical model would be similar to the line of the ruler. On the other hand often the past results don’t form a straight line, so the exact position of the line isn’t known. The statistical models find the most optimal position of the line. This is where the distances between the line itself and the observed points are minimized.

A second reason is the value of the confidence interval. Future forecasts that consist of only one number (point forecast) are not the most prominent forecasts. There is only a minimum chance that the predicted value will be exactly the same as the observed quantity in the future. Sometimes those confidence intervals aren’t a boost for motivation due to the width. As mentioned by Matensen e.a., (2010) in the DaCoTA project, for Belgium the 95 % confidence interval according to their results lies between 318 and 871. This is rather wide, on the other hand, at least you know what you can expect for the future. Another option might be to determine the 50 % confidence interval. This would predict a 50 % vs. 50 % chance that the observed values in the future will fall in a smaller confidence interval.

A third reason is the fact that traffic volume determines the number of fatalities. Our mobility level is a good determinant for how many fatalities will fall on our roads. So a change in exposure is the main cause for a change in the number of traffic injuries and fatalities. Periods of economic boosts go hand in hand with a rise in the number of traffic fatalities due to a rise in vehicle kilometres on the road. Periods of economic recession go together with a reduction in transport kilometres and a reduction in traffic victims.

3 Data collection and preparation

In this chapter the collected risk and exposure data for all six countries are discussed. Besides the risk and exposure data themselves the relationship between both is discussed. This is done by dividing fatalities by passenger kilometres, inhabitants or vehicles. The results are not discussed in this chapter, that's done in chapter four. Chapter three discusses all available data and indicates where data were kept out of the analyses due to unrealistic fluctuations.

For the aggregated analyses the data itself are shown in tables in the text and the graphs are added in the annexes. For the disaggregated analyses the data are added in the annexes and the text discusses the data. This is a choice between graphs and tables that had to be made. Graphs on the one hand give a better indication for the human eye where increases and decreases in the time series occurred, but don't give the data values themselves. Tables on the other hand give data values themselves, but don't give a visual presentation of increases and decreases in the data. This last problem was somewhat helped by adding the relative increases/decreases for each series compared to the first available data point of the series itself.

A remark to be made is that the average annual decreases are calculated in function of the number of data points, so if there are 41 data points available, the series counts 40 data intervals. In this case the total increase or decrease is divided by 40 to calculate the average yearly increase or decrease.

3.1 Aggregated analyses

The main data source for the aggregated analyses is OECD (Organisation for Economic Cooperation and Development). A remark is that the number of passenger kilometres only includes car, coach and bus kilometres. So in fact no kilometres of vans, heavy good or others types of vehicles are included.

3.1.1 Traffic fatalities in the six countries

In table 3 the fatalities of the six countries (Belgium, Czech Republic, Finland, Iceland, Poland and Sweden) are displayed. Also in annex 11 till 16 the same values are shown on graphs. The relative value is a quantity for a certain year compared to the value of the base year. These relative values show for Belgium, Finland and Sweden constant decreases over the time period from 1970 till 2009/2010. Important however is that over the whole time period Belgium has plus minus 2,5 times as many fatalities compared to Finland or Sweden. Further the average annual decreases in fatalities for Belgium, Finland and Sweden are respectively 1,81 %, 1,86 % and 1,99 %. For Czech Republic, data are only available since 1993 as the former Czechoslovakia split up in Czech Republic and Slovak Republic on the night of the 31th December 1992 and the 1th January 1993 (Nemec, Bercik, & Kuklis, 1999). The country had an average decrease in fatalities of 3,3 % per year. The amount of fatalities for the Czech

Republic are plus minus the level as those from Belgium and the amount of inhabitants of both countries are almost the same too. Iceland has due to a small population of ± 320.000 inhabitants an enormous variability in its yearly amount of traffic fatalities, so caution should be taken when interpreting its data. Iceland had an average decrease in traffic fatalities between 1970 and 2010 of 1,55 % per year. Finally Poland, had huge fluctuations in the period from 1988 till 1991 (underlined in table 3)

this period includes the fall of communism in Eastern Europe. Further serious decreases were registered in Poland from 1991 till 1993 and between 2008 and 2009. For Poland the average decrease in fatalities per year from 1990 till 2010 is 2,89 %. A remark to be mentioned here is that huge decreases in traffic fatalities are easier to obtain when initially in the base year the fatality rate (e.g. fatalities per million inhabitants) was still high, this is also called "the phenomenon of quick wins".

According to OECD (Organisation for Economic Co-operation and development), (2012) a fatality is defined as follows: *"Person killed: Any person killed immediately or dying within 30 days as a result of an injury accident. For countries that do not apply the threshold of 30 days, conversion coefficients are estimated so that comparisons on the basis of the 30 day-definition can be made".*

TABLE 3: Absolute and relative number of traffic deaths. Relative number is compared to the base year (first year) of the country itself (Organisation for Economic Co-operation and development, 2012b).

Country	Belgium		Czech Republic		Finland		Iceland		Poland		Sweden	
Variable	Fatalities		Fatalities		Fatalities		Fatalities		Fatalities		Fatalities	
1970	2.950	1,00	NA	NA	1.055	1,00	21	1,00	3.446	0,58	1.307	1,00
1971	3.070	1,04	NA	NA	1.143	1,08	24	1,14	NA	NA	1.213	0,93
1972	3.130	1,06	NA	NA	1.156	1,10	23	1,1	NA	NA	1.194	0,91
1973	2.920	0,99	NA	NA	1.086	1,03	25	1,19	NA	NA	1.177	0,9
1974	2.670	0,91	NA	NA	865	0,82	20	0,95	NA	NA	1.197	0,92
1975	2.346	0,8	NA	NA	910	0,86	33	1,57	NA	NA	1.172	0,9
1976	2.490	0,84	NA	NA	804	0,76	19	0,90	NA	NA	1.168	0,89
1977	2.520	0,85	NA	NA	709	0,67	37	1,76	NA	NA	1.031	0,79
1978	2.590	0,88	NA	NA	610	0,58	27	1,29	5.925	1,00	1.034	0,79
1979	2.330	0,79	NA	NA	650	0,62	27	1,29	5.793	0,98	926	0,71
1980	2.396	0,81	NA	NA	551	0,52	25	1,19	6.002	1,01	848	0,65
1981	2.216	0,75	NA	NA	555	0,53	24	1,14	6.107	1,03	784	0,6
1982	2.064	0,70	NA	NA	569	0,54	24	1,14	5.535	0,93	758	0,58
1983	2.090	0,71	NA	NA	604	0,57	18	0,86	5.561	0,94	779	0,6
1984	1.893	0,64	NA	NA	541	0,51	27	1,29	4.980	0,84	801	0,61
1985	1.801	0,61	NA	NA	541	0,51	24	1,14	4.688	0,79	808	0,62
1986	1.951	0,66	NA	NA	612	0,58	24	1,14	4.667	0,79	844	0,65
1987	1.922	0,65	NA	NA	581	0,55	24	1,14	4.625	0,78	787	0,6
1988	1.967	0,67	NA	NA	653	0,62	29	1,38	4.851	0,82	813	0,62
1989	1.993	0,68	NA	NA	734	0,7	28	1,33	6.724	1,13	904	0,69
1990	1.976	0,67	NA	NA	649	0,62	24	1,14	7.333	1,24	772	0,59
1991	1.874	0,64	NA	NA	632	0,6	27	1,29	7.901	1,33	745	0,57
1992	1.672	0,57	NA	NA	601	0,57	21	1,00	6.946	1,17	759	0,58
1993	1.660	0,56	1.524	1,00	484	0,46	17	0,81	6.341	1,07	632	0,48
1994	1.692	0,57	1.637	1,07	480	0,45	12	0,57	6.744	1,14	589	0,45
1995	1.505	0,51	1.588	1,04	441	0,42	24	1,14	6.900	1,16	572	0,44
1996	1.356	0,46	1.568	1,03	404	0,38	10	0,48	6.359	1,07	537	0,41
1997	1.364	0,46	1.597	1,05	438	0,42	15	0,71	7.312	1,23	541	0,41
1998	1.500	0,51	1.360	0,89	400	0,38	27	1,29	7.080	1,19	531	0,41
1999	1.397	0,47	1.455	0,95	431	0,41	21	1,00	6.730	1,14	580	0,44
2000	1.470	0,50	1.486	0,98	396	0,38	32	1,52	6.294	1,06	591	0,45
2001	1.486	0,50	1.334	0,88	433	0,41	24	1,14	5.534	0,93	583	0,45
2002	1.353	0,46	1.431	0,94	415	0,39	29	1,38	5.827	0,98	560	0,43
2003	1.216	0,41	1.447	0,95	379	0,36	23	1,10	5.640	0,95	529	0,4
2004	1.163	0,39	1.382	0,91	375	0,36	23	1,10	5.712	0,96	480	0,37
2005	1.089	0,37	1.286	0,84	379	0,36	19	0,9	5.444	0,92	440	0,34
2006	1.069	0,36	1.063	0,70	336	0,32	31	1,48	5.243	0,88	445	0,34
2007	1.067	0,36	1.222	0,80	380	0,36	15	0,71	5.583	0,94	471	0,36
2008	944	0,32	1.076	0,71	344	0,33	12	0,57	5.437	0,92	397	0,3
2009	943	0,32	901	0,59	279	0,26	17	0,81	4.572	0,77	358	0,27
2010	812	0,28	802	0,53	272	0,26	8	0,38	3.907	0,66	266	0,2

3.1.2 Million passenger kilometres driven

Table 4 shows the number of passenger kilometres travelled in the six countries, both the absolute and relative quantities are displayed. Annex 17 till 22 display the same data on graphs. For Iceland data were only available from 1989 and for Czech Republic from 1993 due to the split of Czechoslovakia. In Sweden a total increase in passenger kilometres of 67 % was registered over 40 years (yearly increase of 1,68 %).

For Belgium an average 3,18 % increase per year caused an increase over 40 years of 124% (more as double). Finland had an average yearly increase of 3,3 % and a total of 132 % over 40 years. For the Czech Republic only 17 years of data are available. The total increase of 25 % is the equivalent of an annual increase of 1,56 %. Further Iceland had a total increase of 90 % over 21 years (20 intervals) the yearly average equivalent is a 4,5% increase.

Finally in the case of Poland an average 24,66 % annual increase is registered and a total increase over 40 years of 1062 %. Mentioned in another way, in Poland there would have been driven over ten times as many kilometres in 2009 compared to 1970. This is a rather unrealistic value, therefore for Poland the decision was made to consider only the data between 1990 and 2009. This way the enormous increase in passenger kilometres between 1883 and 1886 and the huge fatality fluctuations discussed in 3.1.1 are somewhat eliminated. The Polish recent big increase in passenger kilometres and big decrease in fatalities that are also underlined in table 3 and 4 were taken into account.

TABLE 4: Total number of absolute and relative passenger kilometres by country and year (Organisation for Economic Co-operation and development, 2012c).

Coun-try	Belgium		Czech Republic		Finland		Iceland		Poland		Sweden	
Year	Million Passenger kilometre		Million Passenger kilometre		Million Passenger kilometre		Million Passenger kilometre		Million Passenger kilometre		Million Passenger kilometre	
1970	58.576	1,00	NA	NA	31.200	1,00	NA	NA	29.140	1,00	64.600	1,00
1971	59.759	1,02	NA	NA	32.400	1,04	NA	NA	32.384	1,11	66.600	1,03
1972	62.664	1,07	NA	NA	34.100	1,09	NA	NA	36.767	1,26	68.900	1,07
1973	64.578	1,10	NA	NA	35.800	1,15	NA	NA	40.968	1,41	72.400	1,12
1974	66.742	1,14	NA	NA	37.500	1,20	NA	NA	43.069	1,48	69.500	1,08
1975	67.159	1,15	NA	NA	39.200	1,26	NA	NA	45.792	1,57	73.100	1,13
1976	69.069	1,18	NA	NA	40.100	1,29	NA	NA	48.274	1,66	74.900	1,16
1977	72.094	1,23	NA	NA	40.400	1,29	NA	NA	48.639	1,67	76.500	1,18
1978	73.137	1,25	NA	NA	41.100	1,32	NA	NA	48.925	1,68	76.800	1,19
1979	75.760	1,29	NA	NA	41.800	1,34	NA	NA	47.659	1,64	76.900	1,19
1980	74.451	1,27	NA	NA	43.300	1,39	NA	NA	49.223	1,69	74.700	1,16
1981	75.684	1,29	NA	NA	44.400	1,42	NA	NA	48.514	1,66	74.900	1,16
1982	75.285	1,29	NA	NA	46.000	1,47	NA	NA	47.305	1,62	76.000	1,18
1983	75.172	1,28	NA	NA	47.900	1,54	NA	NA	<u>48.975</u>	<u>1,68</u>	77.500	1,2
1984	75.862	1,3	NA	NA	49.800	1,6	NA	NA	<u>52.384</u>	<u>1,8</u>	79.800	1,24
1985	76.326	1,3	NA	NA	52.300	1,68	NA	NA	<u>92.088</u>	<u>3,16</u>	80.600	1,25
1986	77.408	1,32	NA	NA	53.700	1,72	NA	NA	<u>96.080</u>	<u>3,3</u>	83.400	1,29
1987	80.440	1,37	NA	NA	54.600	1,75	NA	NA	100.997	3,47	87.500	1,35
1988	83.173	1,42	NA	NA	57.100	1,83	NA	NA	109.073	3,74	93.000	1,44
1989	86.155	1,47	NA	NA	58.400	1,87	2.966	1	114.063	3,91	98.100	1,52
1990	92.158	1,57	NA	NA	59.700	1,91	3.004	1,01	114.400	3,93	95.600	1,48
1991	93.322	1,59	NA	NA	58.700	1,88	3.314	1,12	122.820	4,21	96.200	1,49
1992	94.748	1,62	NA	NA	58.500	1,88	3.334	1,12	127.608	4,38	97.300	1,51
1993	98.474	1,68	65.297	1	57.700	1,85	3.326	1,12	132.111	4,53	95.100	1,47
1994	101.497	1,73	63.233	0,97	57.600	1,85	3.433	1,16	136.562	4,69	96.200	1,49
1995	104.228	1,78	65.473	1	58.000	1,86	3.467	1,17	144.724	4,97	97.300	1,51
1996	104.096	1,78	65.875	1,01	58.400	1,87	3.659	1,23	155.584	5,34	97.800	1,51
1997	107.343	1,83	65.534	1	59.900	1,92	3.739	1,26	165.128	5,67	97.900	1,52
1998	112.960	1,93	68.461	1,05	61.100	1,96	3.854	1,3	175.135	6,01	98.600	1,53
1999	116.460	1,99	71.049	1,09	62.500	2	4.115	1,39	176.250	6,05	100.600	1,56
2000	119.400	2,04	73.291	1,12	63.400	2,03	4.250	1,43	181.435	6,23	101.400	1,57
2001	121.470	2,07	74.078	1,13	64.700	2,07	4.458	1,5	188.696	6,48	102.000	1,58
2002	123.960	2,12	74.958	1,15	66.000	2,12	4.583	1,55	196.695	6,75	104.700	1,62
2003	124.730	2,13	76.809	1,18	67.260	2,16	4.711	1,59	202.396	6,95	105.400	1,63
2004	126.800	2,16	76.086	1,17	68.545	2,2	4.855	1,64	211.618	7,26	105.900	1,64
2005	126.960	2,17	77.248	1,18	69.450	2,23	5.145	1,73	226.614	7,78	106.100	1,64
2006	127.990	2,19	79.131	1,21	69.995	2,24	5.455	1,84	<u>247.388</u>	<u>8,49</u>	105.700	1,64
2007	132.300	2,26	81.059	1,24	71.325	2,29	5.730	1,93	<u>266.619</u>	<u>9,15</u>	108.100	1,67
2008	131.270	2,24	81.749	1,25	70.940	2,27	5.585	1,88	<u>300.294</u>	<u>10,3</u>	106.900	1,65
2009	131.470	2,24	81.784	1,25	71.870	2,3	5.646	1,9	309.414	10,6	107.900	1,67
2010	NA	NA	NA	NA	72.285	2,32	NA	NA	319.504	10,9	107.800	1,67
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	N	NA

3.1.3 per billion passenger kilometres

Above the available risk data represented by fatalities and exposure data represented by passenger kilometres were discussed. The combination of both gives a perfect representation of the relative traffic safety in a country. Whereas the fatalities and million (1.000.000) passenger kilometres could only be compared relatively, right now the fatalities per billion passenger kilometres (1.000.000.000) can also be compared absolutely. There has been chosen for a billion instead of a million passenger kilometres as it’s easier to read that there fell 12 deaths per billion passenger kilometres instead of 0,012 deaths per million passenger kilometres. From annex 23 till 28 the fatalities per billion passenger kilometres are shown on graphs, below the same data are mentioned in table 5 for Finland, Poland and Sweden fatality as well as passenger kilometres data were available for 2010, for Belgium, Czech Republic and Iceland only fatality data were available for 2010. Therefore only for the former three countries the relationships between both were calculated.

Belgium had an average annual decrease of 2,2 % fatalities per billion passenger kilometres over a period of 40 years. For **Finland** and **Sweden** those numbers are respectively 2,23 % and 2,2 % over a 41 years period. Although the Swedish performance was already strong in 1970, the fatalities per billion passenger kilometres still decreased at the same level as for Belgium and Finland. More important even is the fact that for Sweden the proportion of decrease in fatalities is bigger than the increase in passenger kilometres, this compared to Finland and Belgium again.

In the case of the **Czech Republic** since 1993 till 2009 the decrease in fatalities per billion passenger kilometres was stronger compared to Belgium, Finland or Sweden. A reduction of 3,31 % per year was achieved. The total decrease in fatalities was 41 % in 2009 and even 47 % in 2010 compared to the 1993 level. The increase in passenger kilometres was 25 % in 2009 compared to 1993. So the proportion of reduction in fatalities is larger compared to the increase in passenger kilometres.

For **Iceland** an average yearly decrease of 3,4 % fatalities per billion passenger kilometres was obtained. Again caution should be taken when interpreting these data, as fatality data in Iceland are low and contain high fluctuations.

Finally in the case of **Poland** risk and exposure data were available from 1970 but only used from 1990 due to unrealistic fluctuations in the first twenty years. The average decrease for Poland in fatalities per billion passenger kilometres was 4,05% per year (81% in total), this is the strongest annual decrease of all countries, again “quick wins” play a roll here.

A good comparison in traffic safety of the countries can be made when comparing the absolute instead of the relative values.

Sweden is the best performing country over the whole period with 20,23 fatalities per billion passenger kilometres in 1970 and only 2,47 in 2010 (3,32 in 2009).
The runner up of the six countries discussed is Iceland with 9,44 fatalities per billion passenger kilometres in 1989 and 3,01 in 2009 (remark: low fatality values in Iceland data!).
Third is Finland with 33,81 fatalities per billion passenger kilometres in 1970 and 3,76 in 2010 (3,88 in 2009).
Fourth is Belgium with 50,36 fatalities per billion passenger kilometres in 1970 and 7,18 in 2009.
The Czech Republic had 23,34 fatalities per billion passenger kilometres in 1993 and 11,02 in 2009.
Finally Poland had 64,10 fatalities per billion passenger kilometres in 1990 and 12,23 in 2010 (14,78 in 2009).

In subchapter 3.1.4 a comparison is made for all countries fatalities per billion passenger kilometres in 2009.

TABLE 5: Fatalities per billion passenger kilometres. Absolute and relative quantity, relative quantity is compared to the base year of the country itself. (Organisation for Economic Co-operation and Development, 2012b) & (Organisation for Economic Co-operation and Development, 2012d)

Million Passenger kilometres	Belgium	Belgium fraction	Chez Republic	Chez Republic fraction	Finland	Finland fraction	Iceland	Iceland fraction	Poland	Poland fraction	Sweden	Sweden fraction
1970	50,36	1,00	NA	NA	33,81	1,00	NA	NA	Not Used	Not Used	20,23	1,00
1971	51,37	1,02	NA	NA	35,28	1,04	NA	NA	Not Used	Not Used	18,21	0,90
1972	49,95	0,99	NA	NA	33,90	1,00	NA	NA	Not Used	Not Used	17,33	0,86
1973	45,22	0,90	NA	NA	30,34	0,90	NA	NA	Not Used	Not Used	16,26	0,80
1974	40,00	0,79	NA	NA	23,07	0,68	NA	NA	Not Used	Not Used	17,22	0,85
1975	34,93	0,69	NA	NA	23,21	0,69	NA	NA	Not Used	Not Used	16,03	0,79
1976	36,05	0,72	NA	NA	20,05	0,59	NA	NA	Not Used	Not Used	15,59	0,77
1977	34,95	0,69	NA	NA	17,55	0,52	NA	NA	Not Used	Not Used	13,48	0,67
1978	35,41	0,70	NA	NA	14,84	0,44	NA	NA	Not Used	Not Used	13,46	0,67
1979	30,76	0,61	NA	NA	15,55	0,46	NA	NA	Not Used	Not Used	12,04	0,60
1980	32,18	0,64	NA	NA	12,73	0,38	NA	NA	Not Used	Not Used	11,35	0,56
1981	29,28	0,58	NA	NA	12,50	0,37	NA	NA	Not Used	Not Used	10,47	0,52
1982	27,42	0,54	NA	NA	12,37	0,37	NA	NA	Not Used	Not Used	9,97	0,49
1983	27,80	0,55	NA	NA	12,61	0,37	NA	NA	Not Used	Not Used	10,05	0,50
1984	24,95	0,50	NA	NA	10,86	0,32	NA	NA	Not Used	Not Used	10,04	0,50
1985	23,60	0,47	NA	NA	10,34	0,31	NA	NA	Not Used	Not Used	10,02	0,50
1986	25,20	0,50	NA	NA	11,40	0,34	NA	NA	Not Used	Not Used	10,12	0,50
1987	23,89	0,47	NA	NA	10,64	0,31	NA	NA	Not Used	Not Used	8,99	0,44
1988	23,65	0,47	NA	NA	11,44	0,34	NA	NA	Not Used	Not Used	8,74	0,43
1989	23,13	0,46	NA	NA	12,57	0,37	9,44	1,00	Not Used	Not Used	9,22	0,46
1990	21,44	0,43	NA	NA	10,87	0,32	7,99	0,85	6,10	1,00	8,08	0,40
1991	20,08	0,40	NA	NA	10,77	0,32	8,15	0,86	64,33	1,00	7,74	0,38
1992	17,65	0,35	NA	NA	10,27	0,30	6,30	0,67	54,43	0,85	7,80	0,39
1993	16,86	0,33	23,34	1,00	8,39	0,25	5,11	0,54	48,00	0,75	6,65	0,33
1994	16,67	0,33	25,89	1,11	8,33	0,25	3,50	0,37	49,38	0,77	6,12	0,30
1995	14,44	0,29	24,25	1,04	7,60	0,22	6,92	0,73	47,68	0,74	5,88	0,29
1996	13,03	0,26	23,80	1,02	6,92	0,20	2,73	0,29	40,87	0,64	5,49	0,27
1997	12,71	0,25	24,37	1,04	7,31	0,22	4,01	0,42	44,28	0,69	5,53	0,27
1998	13,28	0,26	19,87	0,85	6,55	0,19	7,01	0,74	40,43	0,63	5,39	0,27
1999	12,00	0,24	20,48	0,88	6,90	0,20	5,10	0,54	38,18	0,60	5,77	0,28
2000	12,31	0,24	20,28	0,87	6,25	0,18	7,53	0,80	34,69	0,54	5,83	0,29
2001	12,23	0,24	18,01	0,77	6,69	0,20	5,38	0,57	29,33	0,46	5,72	0,28
2002	10,91	0,22	19,09	0,82	6,29	0,19	6,33	0,67	29,62	0,46	5,35	0,26
2003	9,75	0,19	18,84	0,81	5,63	0,17	4,88	0,52	27,87	0,43	5,02	0,25
2004	9,17	0,18	18,16	0,78	5,47	0,16	4,74	0,50	26,99	0,42	4,53	0,22
2005	8,58	0,17	16,65	0,71	5,46	0,16	3,69	0,39	24,02	0,37	4,15	0,20
2006	8,35	0,17	13,43	0,58	4,80	0,14	5,68	0,60	21,19	0,33	4,21	0,21
2007	8,07	0,16	15,08	0,65	5,33	0,16	2,62	0,28	20,94	0,33	4,36	0,22
2008	7,19	0,14	13,16	0,56	4,85	0,14	2,15	0,23	18,11	0,28	3,71	0,18
2009	7,18	0,14	11,02	0,47	3,88	0,11	3,01	0,32	14,78	0,23	3,32	0,16
2010	NA	NA	NA	NA	3,76	0,11	NA	NA	12,23	0,19	2,47	0,12

3.1.4 Comparison of the fatality rate of the six countries

Table 6 presents the relationship of fatalities per billion passenger kilometres for all six countries for the year 2009. If the same amount of kilometres in Belgium and the Czech Republic are driven for example then in Belgium there only fall 65 % of the number of fatalities compared to Czech Republic. On the other hand there will fall 85 % more (factor 1,85) fatalities in Belgium compared to Finland for the same amount of kilometres driven. For Poland there are more as twice (factor 2,06) as many fatalities compared to Belgium for the same amount of passenger kilometres driven. On the other hand in Iceland and Sweden there are 2,38 and 2,16 times as many passenger kilometres driven compared to Belgium for the same amount of deaths. Once again caution has to be taken with the data of Iceland due to the low fatality values.

For all other countries relationships (as shown in table 6) similar conclusions can be formulated. The biggest difference is the one between Poland and Sweden, as you have 4,45 times as much chance to die in traffic in Poland compared to Sweden for the same amount of kilometres driven. The ratios of Iceland were not considered when assigning the biggest ratio between two countries. In Iceland there are even less deaths per million passenger kilometres compared to Sweden, as a consequence the ratio between Poland and Iceland is even bigger.

TABLE 6: (Organisation for Economic Co-operation and development, 2012) **(Organisation for Economic Co-operation and development, 2012)**

	Belgium	Czech Rep	Finland	Iceland	Poland	Sweden
Belgium	1	0,65	1,85	2,38	0,49	2,16
Czech Rep	1,53	1	2,84	3,66	0,75	3,32
Finland	0,54	0,35	1	1,29	0,26	1,17
Iceland	0,42	0,27	0,78	1	0,20	0,91
Poland	2,06	1,34	3,81	4,91	1	4,45
Sweden	0,46	0,30	0,85	1,10	0,22	1

3.1.5 Aggregated data of Iceland over three to five years

It has been already indicated that caution should be taken when interpreting the low fatality values of Iceland. In order to remove the high fluctuations in the data they were aggregated over three years. Fatality data of Iceland are available from 1970 till 2010, unfortunately exposure data are only available from 1989 till 2009. In the analysis the three year aggregation has been used, therefore it was possible to create seven data points.

Other options like a four or five year aggregated data series or even a moving average of three, four or five years were considered. The moving average was eliminated as such a series contains inherently 66 %, 75 % or 80 % data from the preliminary data point or the following data point. The four or five year aggregations were also eliminated based on available data points. When the data would be aggregated over five years, only four data points would be available. When the data would be aggregated over four years, only five data points would be available. With a three year aggregation seven data points are available.

Annex 29 till 34 show the three and five year aggregated graphs of the fatalities, million passenger kilometres and fatalities per billion passenger kilometres.

The purpose of the aggregation of fatalities is to create a trend that is constantly decreasing or increasing over larger periods. Table 7 shows the three and five year aggregations. A small decrease over the whole period in both cases is recorded. Unfortunately the relative frequencies indicate that the fluctuations remain big.

TABLE 7: Aggregated fatalities of Iceland over three and five years. Columns two and five contain the absolute values and columns three and six the relative ones. (Organisation for Economic Co-operation and Development, 2012b)

Years	Iceland absolute 5 yeas	Iceland fraction 5 years	Year	Iceland absolute 3 years	Iceland fraction 3 years
/	/	/	1971-73	72	1,00
/	/	/	1974-76	72	1,00
/	/	/	1977-79	91	1,26
/	/	/	1980-82	73	1,01
/	/	/	1983-85	69	0,96
1970-74	113	1,00	1986-88	77	1,07
1975-79	143	1,27	1989-91	79	1,10
1980-84	118	1,04	1992-94	50	0,69
1985-89	129	1,14	1995-97	49	0,68
1990-94	101	0,89	1998-00	80	1,11
1995-99	97	0,86	2001-03	76	1,06
2000-04	131	1,16	2004-06	73	1,01
2005-09	94	0,83	2007-09	44	0,61

Not only fatalities, but also the passenger kilometres had to be aggregated in order to create a consistent data set where fatalities per billion passenger kilometres could be calculated. The aggregation of passenger kilometres itself is not mentioned, the fatalities per billion passenger kilometres are shown in table 8.

As passenger kilometre data were only available from 1989, the first three fatality data points of the five year aggregation and the first five points of the three year aggregation had to be dropped. The results for the three and five year aggregation show a decrease in fatality rate. Unfortunately as for table 7, high variability in the data remains present.

TABLE 8: Aggregated fatalities per billion passenger kilometres for Iceland over three and five years. Columns two and five contain the absolute values and columns three and six the relative ones.

Years	Iceland 5	Iceland fraction 5	Year	Iceland 3	Iceland fraction 3
/	/	/	1989-91	8,51	1,00
/	/	/	1992-94	4,95	0,58
/	/	/	1995-97	4,51	0,53
1990-94	6,15	1,00	1998-00	6,55	0,77
1995-99	5,15	0,84	2001-03	5,53	0,65
2000-04	5,73	0,93	2004-06	4,72	0,56
2005-09	3,41	0,55	2007-09	2,59	0,30

For Iceland only aggregated analyses will be performed, over three years. No disaggregated analyses in function of age, gender and transport mode will be carried out for Iceland.

Subchapter 3.1 discussed the data availability of the aggregated data. In subchapters 3.2 , 3.3 , 3.4 and 3.5 the disaggregated data will be discussed.

Annex 35 till 49 show the disaggregated fatality and inhabitant data according to age. From annex 50 till 55 the disaggregated fatality and inhabitant data are shown according to gender. From annex 56 till 70 the disaggregated fatality data and vehicle data are displayed according to transport mode. Finally annex 71 till 76 contain the combined disaggregated data for age and gender (only for Belgium).

Next to fatality and exposure data, annexes are added that display the fatalities per 100.000 inhabitants or vehicles. This is done for all three disaggregated analyses and for the combined disaggregated analyses of age and gender for Belgium. Subchapter 3.2 starts with the disaggregated available data of age for all countries except Iceland.

3.2 Disaggregated data availability of age

In this subparagraph the available age disaggregated data are discussed. From annex 35 till 39 the fatalities in each country are shown by age. The classes (<15; 15-17; 18-24; 25-49; 50-64; >64) were already mentioned in subchapter 1.6 and were chosen in function of data availability on the website of the European Commission for Road Safety. From annex 40 till 44 the inhabitants in each country of the six different age classes are shown. The data were extracted from the Eurostat website.

Finally both risk and exposure data for each country are combined in one table that displays the fatalities per 100.000 inhabitants for the six age classes. These last tables that are the most important ones are shown in annex 45 till 49. The following three subchapters discuss the content of the tables.

3.2.1 Available traffic fatality data according to age classes

In alphabetical order (Belgium, Czech Republic, Finland, Poland and Sweden) fatality tables according to age class are shown in annex 35 till 39. For Belgium and Finland data are available from 1991 till 2010, for Sweden from 1991 till 2009, for Czech Republic from 1994 till 2010 and for Poland from 2000 till 2010. The European accident report was used from 1991 onward, this might be the reason why fatality data are available from then on (Matensen e.a., 2010).

For all five countries and all age classes a decrease in traffic fatalities has been registered. Table 9 below displays for each country the age classes from strongest till weakest reduction in traffic fatalities. The data in table 9 are ordinal as the magnitudes of the reductions aren’t mentioned. Most of the time the decrease is the strongest for the age class ‘<15’, followed by ‘15 -17’ and ‘18 – 24’. The ones with the fourth and fifth strongest reduction for all countries in general are ‘>64’ and ‘25-49’. Finally the age class ‘50-64’ usually has the weakest reduction in traffic fatalities. Europe has focussed the last decennia on children to reduce their fatality rate (European Commission Road Safety, 2012b), table 9 shows the result of these efforts.

TABLE 9: Age classes classified according to strongest till weakest reduction in traffic fatalities by country (European Commission Road Safety, 2012a).

Age class / Country	Strongest	2th strongest	3th strongest	3th weakest	2th weakest	Weakest
Belgium	15-17	<15	18-24	>64	25-49	50-64
Czech Rep	<15	15-17	18-24	25-49	>64	50-64
Finland	<15	15-17	18-24 & >64	18-24 & >64	50-64	25-49
Poland	<15	15-17	25-49	18-24	>64	50-64
Sweden	<15	25-49	>64	18-24	50-64	15-17

Specific for **Belgium** the largest decrease of 71 % in 2010 compared to 1991 is recorded in the age class '15-17', followed by the age class '<15', with a 67 % reduction. These reductions are equal to yearly reductions of 3,74 % and 3,53 %. The third strongest reduction was achieved for the age class '18-24', 59 % reduction in 2010 compared to 1991. Of course if a certain age class had a lot of fatalities in 1991 it's easier to achieve a stronger decrease. That's not only the case for countries as a whole, but also for different disaggregated class divisions. Further there are the age classes '>64', '25-49' and '50-64' which achieved reductions of respectively 56 % (yearly 2,95 %), 53 % (yearly 2,79%) and 45 % (yearly 2,37 %).

For **Czech Republic** in 2010 compared to 1994, a reduction of 81 % of fatalities was achieved in the age class '<15'. This is a 5,06 % average annual reduction, which is the second strongest annual reduction of all age classes and countries. A reduction of 69 % of fatalities for the age class '15-17' was a good performance too, this corresponds to an average reduction of 4,28 % per year. The third strongest reduction with 55 % is for the age class '18-24'. This is equal to a yearly reduction of 3,25 %, better than the Belgium annual decrease of 3,11 % for the same age category. Finally the age categories '25-49', '>64', and '50-64' obtained reductions of respectively 51 %, 44 % and 38 %. These correspond to average yearly decreases of 3,16 %, 2,74 % and 2,39 %.

For **Finland** once more the strongest reduction is for the age class '<15'. A reduction of 81 % compared to the 1991 level (4,26 % per year). The other reductions lie far behind with the age classes '15-17', '18-24' and '>64' where respectively 61 %, 59 % and 59% of the fatalities were reduced from the quantities that fell in 1991. These are equal to yearly reductions of 3,21 % and twice 3,11 %. The weakest reductions were once more for the age classes '50-64' with 53% (yearly 2,79 %) and '25-49' with 51 % reductions (yearly 2,68 %) compared to the 1991 level.

For **Poland** the best performances were once more achieved by the age classes '<15' and '15-17' with reductions of respectively 58 % (yearly 5,81 %) and 50 % (yearly 5,02%). These are the strongest and third strongest average annual reductions of all countries and age classes. The third strongest reduction of 46,5 % was achieved by the age class '25-49' (yearly 4,65 %). The other reductions were 34 % (yearly 3,4 %), 32 % (yearly 3,23 %) and 21 % (yearly 2,06 %) for the age classes '18-24','>64' and '50-64'.

Finally in **Sweden** an enormous reduction of 75 % (yearly 4,17 %) for the youngest age class was achieved. The second strongest reduction for this country was achieved by the age class '25-49', with a decrease of 59 % (yearly 3,28 %). Further the age classes '>64' and '18-24' achieved reductions of respectively 56 % (yearly 3,12 %) and 55 % (yearly 3,05 %). Finally the age classes '50-64' and '15-17' obtained reductions of 22% (yearly

1,21 %) and 17 % (yearly 0,96 %). A remark for Sweden is that the fluctuations for several age classes are high, due to low fatality values. The '15-17' year old age class would have achieved a reduction of 57 % instead of 17 % if the 2008 number instead of the 2009 was considered.

Absolute number of the fatality data can't be compared with each other as no exposure measure is used..

3.2.2 Inhabitant data available according to age classes

This subchapter focuses on the increases and decreases of inhabitants for the six age classes mentioned in 3.2.1. The tables in annex 40 till 44 present these data for the five countries in alphabetical order. Data for all countries and age classes were available from 1991 till 2011. In table 10 below the age classes are ordered according to strongest increase in inhabitants till strongest decrease. *The age classes wherefore a decrease was registered are written in italics*. Again the data in table 10 are ordinal, so no magnitudes are mentioned.

The '50-64' and '>64' age classes are the ones with the largest increases. For economical reasons these increases are rather frightening. It's even more alarming that the age class '50-64' is the one with the largest increases as these people will still live several years and pensions will have to be paid for them by relatively small working populations at lower ages. A focus on the two youngest age classes indicate that especially in Czech Republic and Poland the decreases in these age classes were huge.

TABLE 10: Age classes classified according to strongest increase till strongest decrease in inhabitants by country. The age classes wherefore decreases were registered are written in italics (Eurostat, 2012d) (Eurostat, 2012e)(Eurostat, 2012f).

Age class / Country	Strongest inhabitants increase ⇔Strongest inhabitants decrease					
Belgium	50-64	>64	25-49	<15	15-17	*18-24*
Czech Rep	50-64	>64	25-49	*18-24*	*<15*	*15-17*
Finland	50-64	>64	15-17	18-24	*<15*	*25-49*
Poland	50-64	>64	18-24	25-49	*15-17*	*<15*
Sweden	50-64	>64	18-24	15-17	25-49	<15

For **Belgium** in particular the largest increases in population were registered in the age class '50-64' and '>64', with increases of 26 % and 25 %. This is equal to yearly increases of 1,29 % and 1,27 %. Also the age class '25-49' had a small increase of 4,3% (yearly 0,22 %). In function of this research it wasn't verified whether the rise within the '25-49' age class was equal over all ages or whether the older people in this age class knew a stronger increase. The age classes '<15' and '15-17' knew a decrease in first instance. However since 2009 for the former and since 2002 for the latter they knew a recovery and in 2011 populations of both classes were back at the 1991 level. Finally for the age class '18-24' a decrease was registered from 1991 till 1998, till a level 88 % compared to the one of 1991. Since 2006 however this age class also knows a recovery and it increased again till 94 % in comparison to the 1991 level.

For **Czech republic** as for Belgium the age classes with the strongest increases are '50-64' and '>64' with increases of 37 % and 26 % that point out to yearly increases of 1,87% and 1,28 %. Further an increase 6 % (yearly 0,31 %) was registered for the age class '25-49'. Again it was not verified whether the increase was equal over the whole age class or not. For the age class '18-24' an increase of 26 % was registered from 1991 till 1998, but from 1998 till 2011 it decreased till a level of 95 % compared to the 1991 quantity. Finally for the age classes '<15' and '15-17' enormous deceases are registered of respectively 30 % (yearly -1,51 %) and 41 % (yearly -2,03 %).

For **Finland** again the age classes '50-64' and '>64' are the ones with the largest increases, from 1991 till 2011, 48 % and 40 % rises were registered. This is equal to average annual increases of 2,42 % and 1,99 %. A small increase of 2 % in inhabitants was registered from 1991 till 1994 for the age category '25-49', however from 1995 on it decreased slowly till in 2011, 89 % of the 1991 quantity was left. A rather strong decrease of 6% for the age class '18-24' was registered from 1991 till 1994. From then on the inhabitants of this age category rose slowly again and in 2011 it had just reached the 1991 level again. The age class '15-17' first knew an increase of 10 % from 1991 till 2000 than a decrease of 8 % till 2003. This was once more followed by an increase of 8% till 2008 and the last years a decrease of 3 % was registered again. Finally the age class '<15' knew in first instance a small increase of 1 % from 1991 till 1994. From 1996 till 2011 a 9 % reduction till in 2011, 92 % of the 1991 level was recorded.

For **Poland** once more giant increases of 41 % and 33,5 % in inhabitants were registered for the age classes '50-64' and '>64'. This corresponds to an average annual increase of respectively 2,06 % and 1,67 %. Further the age class '25-49' knew a slow increase with 4 % from 1991 till 1996. It decreased from 2000 till 2007 back to the level of 1991. From 2009 till 2011 it increased again with 2 %. The age class '18-24' also had a fluctuating pattern, in first instance it rose with 29 % from 1991 till 2004 (yearly increase of 2,23 %). From 2005 however it started decreasing (2,86 % a year) till in 2011 only 9 % surplus remained compared to the 1991 level. As was the case for Czech Republic strong decreases in the two youngest age classes were registered, 40 % for the age class '<15' and 23 % for the age class '15-17'. For the age class '<15' this is equal to a yearly decrease of 1,98 %. The age class '15-17' first rose with 14 % between 1991 and 2000. This was followed by a decrease of 37 % from 2001 till 2011 which corresponds to a yearly decrease of 3,7 %.

Finally **Sweden** is the only country where no decreases in any age class were recorded. However the strongest increases were once more registered for the age classes '50-64' (36 %) and '>64' (14 %). For the age class '50-64' this is equal to an average yearly increase of 2,06 %. The oldest class remained constant till 2003, from 2004 on it started increasing with 1,75 % a year, which caused the total increase of 14 %. The age category '25-49' remained plus minus constant over the whole time series. The '18-24' age category knew a decrease of 14 % in first instance from 1991 till 2001. From 2002 on it started increasing with a total of 22 % (2,44 % a year). Till 2011 the age class reached an 8 % surplus compared to the 1991 level. Further the age class '15-17' first knew a fall with 10 % from 1991 till 1994. Then it remained plus minus constant till 2000, as from then on it started increasing with 17 % (1,7 % a year) over an eleven year period.

3.2.3 Fatalities per 100.000 inhabitants according to age class

This subchapter is more important compared to the two before as it combines both their data. Only for the years where fatality as well as inhabitant data are available the calculations were made to generate the following data structure $\frac{Risk}{Exposure}$. From annex 45 till 49 the tables of all five countries are presented in alphabetical order and contain the data of the six age classes.

Table 11 below presents the decreases of the six age classes from strongest till weakest for all five countries. For none of the age classes of any country an increase in fatalities per 100.000 inhabitants was recorded. The strongest reduction was most of the time achieved by the age class under 15. The age class '18-24' is always mentioned in one of the three right columns of the table. This immediately indicates that there is still work to do for this age class. The age class over 64 is usually somewhere in the middle compared to the other age classes. The performance of the three other age classes depends on the country. A remark is that the data in table 11 are once more ordinal, so the rank order is important, but no values are mentioned here. In the case of Belgium for example, it can't be seen in table 11 that the decreases for the age classes '18-24', '50-64' and '25-49' lie close to each other with reductions of 56 %, 55 %, and 54 %.

TABLE 11: Ordering of the six age classes for the five countries according to strongest till weakest reduction of fatalities per 100.000 inhabitants (European Commission Road Safety, 2012a) (Eurostat, 2012d) (Eurostat, 2012e)(Eurostat, 2012f).

Age class / country	Strongest reduction in fatalities / 100.000 inhabitants		⇔		Weakest reduction in fatalities / 100.000 inhabitants	
Belgium	15-17	<15	>64	18-24	50-64	25-49
Czech Rep	<15	50-64	>64	18-24	25-49	15-17
Finland	<15	>64	50-64	15-17	18-24	25-49
Poland	<15 & 25-49	<15 & 25-49	50-64	>64	15-17	18-24
Sweden	<15	>64	25-49	18-24	50-64	15-17

Where table 11 presents the rank order according to percentage reduction, table 12 displays the order of the age classes according to fatalities per 100.000 inhabitants for the year 2010 (2009 for Sweden). For all countries the age class '<15' had the lowest number of fatalities per 100.000 inhabitants in 2010. The fatalities per 100.000 inhabitants for age class '15-17' were usually low, however due to the fact that in Finland and Sweden other age classes are performing well too, the age class '15-17' is not scoring as second best in those two countries. The age class with the highest number of fatalities per 100.000 inhabitants in all countries is the 18 till 24 years age group. This is once more a good indicator at the age group at which government policies should focus. The second worst performing age class in traffic fatalities per 100.000 inhabitants is the one over 64 years old.

TABLE 12: Ordering of the six age classes for the five countries according to lowest till highest number of fatalities per 100.000 inhabitants in 2010. For Sweden 2009 data were used. (European Commission Road Safety, 2012a) (Eurostat, 2012d) (Eurostat, 2012e)(Eurostat, 2012f).

Age class / country	Lowest nr. of fatalities / 100.000 inhabitants in 2010 (Sweden 2009)				Highest nr. of fatalities / 100.000 inhabitants in 2010 (Sweden 2009)	
Belgium	<15	15-17	50-64	>64	25-49	18-24
Czech Rep	<15	15-17	50-64	25-49	>64	18-24
Finland	<15	50-64	25-49	15-17	>64	18-24
Poland	<15	15-17	25-49	50-64	>64	18-24
Sweden	<15	25-49	50-64	64>	15-17	18-24

The following paragraphs discuss the percentage reduction and the fatality rate of 2010 (2009 for Sweden) for each country individually.

Belgium relative: For Belgium, the strongest reduction of fatalities per 100.000 inhabitants was achieved by the age class '15-17', a decrease of 72 % is the equivalent of an average decrease of 3,79 % per year. The age class with the weakest decrease is

'25-49', 54% (2,87 % per year). The age classes with the second and third strongest decreases are '>15' and '>64'. They achieved reductions of 67 % (3,53 % per year) and 64 % (3,39% per year). The classes with the second and third weakest reductions are '50-64' and '18-24', with decreases of respectively 55 % (2,92 % per year) and 56% (2,95 % per year).

Where in subchapters 3.2.1 and 3.2.2 the age classes could only be ranked according to relative increases/decreases they can now be ranked absolute, as shown in table 12.

Belgium absolute: In the case of Belgium (2010) the number of fatalities per 100.000 inhabitants is the lowest for the age class '<15' with 1,26 deaths. For the age classes '15-17' and '50-64' there were respectively 5,5 and 5,94 traffic fatalities per 100.000 inhabitants. Further in the age classes '>64' and '25-49' there were 8,23 and 9,15 deaths per 100.000 inhabitants. Finally for the age class '18-24' there were 18,4 traffic fatalities per 100.000 inhabitants. So for this last age class there were more than twice as many traffic fatalities for the same number of inhabitants as for the age class with the second most fatalities. The '18-24' age class has also the highest number of fatalities per 100.000 inhabitants for all countries and age classes.

Czech Republic relative: In Czech Republic the age class '<15' achieved with 72 % the strongest reduction over the time period 1994 till 2010. This is equal to a yearly reduction of 4,49 %, which is the third strongest yearly reduction of all countries and age classes. All other age classes obtained reductions that lie close to each other. The age class '15-17' obtained the lowest reduction, 51 % (3,17 % per year). The other four age classes '18-24', '25-49', '50-64', and '>64', obtained average yearly reductions in fatalities per 100.000 inhabitants of 3,37 % (total reduction of 54 %), 3,33 % (total reduction of 53 %), 3,46% (total reduction of 55 %) and 3,39 (total reduction of 54 %).

Czech Republic absolute: The absolute rank order for the year 2010 classifies the age categories as mentioned in table 12. As for Belgium the least traffic fatalities per 100.000 inhabitants fell in the age class '<15' with 1,14 deaths. This is the third lowest number for all countries and age classes. Further the age classes '15-17' and '50-64' had fatality rates of 4,82 deaths and 6,5 deaths per 100.000 people. In comparison with the same age classes of Belgium the oldest one lies over the Belgian rate, and the youngest one lies under the Belgian rate. Further the age classes '25-49' and '>64' had fatality rates of 8,41 and 10,76 fatalities per 100.000 inhabitants. Finally for the age class '18-24', 12,97 fatalities per 100.000 inhabitants fell which is only two third compared to the same age class for Belgium.

Finland Relative: In this country the strongest yearly reduction was once more achieved by the youngest age class, 4,15 %. This is the equivalent of a total reduction of

79 % traffic fatalities per 100.000 inhabitants. The weakest reduction of 46 % from 1991 till 2010 (2,4 % per year) was obtained by the age class '25-49'. The other four age classes achieved average yearly reductions between 3 % and 4 %. These age classes '>64', '50-64', '15-17' and '18-24' obtained reductions of respectively 3,67 % (70 % total reduction), 3,6 % (68 % total reduction), 3,36 % (64 % total reduction) and 3,07 % (56 % total reduction).

Finland absolute: For the year 2010 the absolute number of fatalities per 100.000 people was once more recorded by the youngest age class, 0,79 deaths. This is the second lowest quantity for all countries and age classes. The second and third lowest number was obtained by the age classes '50-64' and '25-49', with respectively 4,04 and 5,37 deaths per 100.000 inhabitants. Further the age classes '15-17' and '>64' achieved values of 6,5 and 7,03 fatalities per 100.000 inhabitants. Finally once again the '18-24' age class had the highest number of fatalities per 100.000 inhabitants with 10,24 deaths.

Poland relative: For Poland the strongest reductions in fatalities per 100.000 people were achieved by the age classes '<15' and '25-49', both 4,52 % as yearly average and 45% in total. These are the two strongest reductions of all countries and age classes, especially for the latter one this is a remarkable reduction. Almost half the fatalities per 100.000 inhabitants were reduced in eleven years (2000 till 2010). Also the age class '50-64' obtained an enormously strong reduction of 4,24 % on average year or in total 42%. Further the age classes '>64', '15-17' and '18-24' obtained average yearly reductions of 3,88%, 2,93% and 2,68 % or in total 39 %, 29 % and 27 %.

Poland absolute: The absolute number of traffic fatalities in 2010 still scores badly although strong reductions were achieved in the first decennium of the 21^{th} century. The age classes '18-24' and '>64' registered the second a third highest value fatalities per 100.000 inhabitants of all countries and age classes in 2010, 16,77 and 13,06 fatalities per 100.000 inhabitants. The age class '<15' had 1,94 deaths per 100.000 inhabitants, this is good but it's the poorest performance of all countries for this age class. Also for the age classes '50-64' and '25-49' the poorest performances for all countries were achieved. In 2010 they had 10,99 and 10,27 deaths per 100.000 inhabitants. Finally the age class '15-17' had 8,42 deaths for each 100.000 people. This is once again the poorest performance of all countries. So only for the age class '18-24' there is one country, (Belgium 18,4) which had more fatalities per 100.000 inhabitants in 2010, for all other age classes Poland had the poorest performance.

Sweden relative: For this country the percentage reductions still score quite well although the performance for all age classes was already good in 1991. The strongest yearly reduction in fatalities per 100.000 inhabitants was once more achieved for the age class '<15', with a 4,16 % reduction on average per year, this corresponds to a total reduction of 75 % over 18 years changes. The reduction for the '15-17' age class was small (1,54 % per year, total reduction of 28 %) although this is due to the fact that in 2009 the number of fatalities in this age group was exceptionally high. In 2008 it was lower and probably in 2010 too, as the total number of fatalities in Sweden decreased from 358 in 2009 to 266 in 2010. Unfortunately disaggregated 2010 fatality data weren't available yet on the website of the European Commission for Road Safety. The four other age classes '18-24', '25-49', '50-64' and '>64' achieved reductions of respectively 55% (3,07 % a year), 59 % (3,3% a year), 43 % (2,4 % a year) and 55 % (3,3 % a year). The reduction for the age class "50-64" is together with the Finish age class '25-49' the second lowest yearly reduction.

Sweden absolute: Sweden had already a good performance for most age classes in 1991. In 2009 the youngest age class under 15 had 0,58 deaths per 100.000 inhabitants, this is the lowest value of all countries and age classes. In 2009 the '15-17' year old age class had 6,54 deaths per 100.000 inhabitants, however in 2008 it had only 3,33. The age group '18-24' in general a high risk group, had 7,24 deaths per 100.000 citizens, in Poland this would be the second best performing age group while in Sweden it is the worst performing. Also the age group '25-49' had only 3,28 fatalities per 100.000 citizens in 2009, only Finland comes in the neighbourhood of Sweden with 5,37 (2010), while the other countries have two or even three times as many fatalities per 100.000 inhabitants for this age class (Belgium 9,15, Czech Republic 8,41 and Poland 10,27). The age class '50-64' once again obtained an excellent score with 4 fatalities for each 100.000 people. Finland has reached almost the same value (4,04), Belgium and Czech Republic obtained a level of ±1.5 times as much as Sweden (Belgium 5,94), (Czech Republic 6,5) and Poland 2,5 times as much as Sweden (10,99).

As Sweden has such an excellent performance on traffic safety there are some remarkable facts to mention. The country had fewer fatalities per 100.000 inhabitants in 1991 compared to Poland and Belgium in 2010 for the age class "18-24". For the age group '25-49' there were fewer fatalities in 1991 compared to Belgium, Czech Republic and Poland in 2010. Finally the Swedish '50-64' age group had already fewer fatalities per 100.000 inhabitants compared to Poland in 2010. A conclusion or statement that follows from these ideas is that traffic safety is a long-term work and it can't be improved in just one or a few years. It takes several years of hard work and big effort.

3.3 Disaggregated data availability of gender

This subchapter focuses on the disaggregated available data of gender for all five countries. In annex 50 and 51 the female and male fatalities for all countries from 1991 till 2010 are shown. Again for Czech Republic data were available from 1994, for Poland from 2000 and for Sweden till 2009. Further in annex 52 and 53 the female and male inhabitants over all years are displayed for all countries. Finally annex 54 and 55 show the fatalities per 100.000 inhabitants for all countries. Just as it was the case for the fatalities according to age classes these last annexes are the most important ones as they combine the content of the annexes 50 till 53. Subchapter 3.3.1 discusses the fatalities according to gender, subchapter 3.3.2 the inhabitants according to gender and subchapter 3.3.3 the gender fatalities per 100.000 inhabitants.

3.3.1 Available traffic fatality data according to gender classes

In annex 50 the female fatalities for all five countries are shown while in annex 51 the male fatalities are indicated. Strictly the absolute values can't be compared as an exposure measure is necessary. The exposure measures are male and female inhabitants. As both exposure measures almost contain the same number, the fatalities without exposure measure are a good approximation of the female and male fatalities per 100.000 inhabitants. For all five countries the reduction in female fatalities was stronger compared to the reduction in male fatalities, although for all countries there died two to three times more males compared to females at their base year. An interesting remark is that in both Central/Eastern European countries, the ratio male vs. female fatalities was higher compared to the ratio in the Scandinavian countries. The Belgian ratio male vs. female was in between both of them.

For **Belgium** the decrease in male fatalities was 54 % while the reduction for female fatalities was a bit larger, 59 %. So in 1991, 2,8 men for each woman died and in 2010 the ratio increased to 3,1 men for each woman. The average yearly reductions are 2,86% for men and 3,09 % for women. The former one is the third weakest reduction of all countries and gender classes.

In 2010 compared to 1994, 51 % less males and 55 % less females died in the **Czech Republic**. This corresponds to average yearly reductions of 3,19 % and 3,46 %. The latter one is the second strongest reduction of all countries and gender classes. Further the ratio male vs. female fatalities increased from 3,12 to 3,43.

For **Finland** total reductions of 52 % for males and 67 % for females were achieved between 1991 and 2010. This is the equivalent of average reductions of 2,73 % and 3,54% per year. The former one is the weakest reduction of all countries and age classes, while the latter one is the strongest reduction of all countries and age classes. As a consequence the ratio male vs. female fatalities increased again from 2,03 to exactly 3.

Further for **Poland** from 2000 till 2010 the total registered decreases were 29 % for males and 31 % for females. This is equal to average decreases of 3,24 % and 3,44 % per year. Further the ratio male vs. female fatalities increased once more from 3,18 to 3,26.

Finally for **Sweden** total decreases of 50 % for males and 57 % for females were registered over a period of 19 years (1991 till 2009). This is the equivalent of yearly reductions of 2,77 % and 3,18 %. The ratio male vs. female fatalities increased from 2,47 to 2,89.

3.3.2 Available inhabitant data according to gender classes

In annex 52 and 53 the inhabitants of the five countries are presented by gender. For all countries and gender classes except the class "Poland Males" increases in inhabitants were measured.

For **Belgium** an increases of 10 % for males and 9,3 % for females were registered. The average yearly equivalents are 0,50 % and 0,46 % growths. In case only the data from 1991 till 2010 and not 2011 are taken into account, the growths are 8,84 % and 8,25 %. The 1991 - 2010 period is the same period as the one for which fatality data are available.

For the **Czech Republic** the male growth was 3,36 % and the female growth 1,14 % over the period 1991 till 2011. These values are the equivalents of 0,17 % and 0,06 % yearly growths. If only the 1994 till 2010 data are considered the growths are 2,75 % and 0,66%.

Finland had growth rates of 8,75 % and 6,4 % over the 21 year period. The average annual growth rates are 0,44 % and 0,32 %. If the last data point is left out, the increases are reduced to 8,2 % and 5,99 %.

The male inhabitants of **Poland** are the only class for which a decrease is registered. However the decrease is only -0,87 % (-0,04 % a year) over a period of 21 years. The female inhabitants in Poland increased a bit from 1991 till 2011 with 0,91 %, or yearly 0,05 %.

Finally the increases in males and females in **Sweden** are 10,51 % and 8,71 %, this corresponds to average yearly increases of 0,53 % and 0,44 %. The increases are once more reduced to 8,48 % and 7,04 % if data from 2010 and 2011 are left out, as no fatality data are available for these two years.

The main explanation (at least for Belgium) for the stronger rise in males compared to females is the rise in life expectancy of males compared to females (Federale overheidsdienst economie, 2012). A possible explanation for the decrease in male inhabitants for Poland might be the emigration of men to West European countries to find work in construction sector. However as is mentioned in subchapter 3.2.2 there are enormous decreases in inhabitants in the low age classes in Poland and the Czech Republic. This also causes the stagnation of the inhabitants in these countries.

3.3.3 Fatalities per 100.000 inhabitants according to gender classes

Again as for the disaggregated data for age, only for those years in the time series were both risk and exposure data were available, the combined data points as $\frac{Risk}{Exposure}$ were calculated. In annex 54 and 55 the male and female fatalities per 100.000 inhabitants are shown. Table 13 is an interesting table where the fatalities per 100.000 inhabitants for 1991 and 2010 are displayed. Also the total absolute decreases and average yearly absolute decreases are indicated. Finally the total percentage and average yearly percentage decreases are shown.

Whereas in **Belgium** in 1991 there still died yearly 28,27 males and 9,64 females per 100.000 inhabitants in traffic, these numbers were reduced to 11,84 and 3,87 in 2010. As for all countries the absolute decrease in fatalities per 100.000 people is bigger for males, but the relative decrease in traffic fatalities per 100.000 people is stronger for females as can be seen in table 13. The relative decrease for females was the second strongest for all countries and gender classes. The ratio male vs. female deaths increased from 2,93 to 3,22 males for each female.

For the **Czech Republic** the male fatalities per 100.000 inhabitants decreased from 24,7 to almost 11,77 and for females it decreased from 7,47 to 3,31. The absolute decrease for males is over three times as big as the one for females (see table 13). The relative decrease is a bit smaller for males, this is shown in columns six and seven of table 13. The yearly relative decrease for males is the second weakest one after the male reduction for Poland. The ratio male vs. female fatalities increased from 3,31 to 3,56.

In the case of **Finland** the male fatalities decreased from 17,48 to 7,77 fatalities per 100.000 citizens while for females these numbers were 8,09 and 2,49. Again the absolute decreases were stronger for males compared to females, -9,7 and -5,59. On the other hand the relative decrease was only 56 % for males but over 69 % for females. The latter one corresponds to an average yearly reduction of 3,64 %, this is the strongest average yearly reduction of all countries and age classes.

Poland had for males as well as for females the weakest average annual reductions, with respectively 1,51 % and 1,63 % per year. The male fatalities per 100.000 people reduced between 2001 and 2010, from 22,67 to 16,15. For females these values were 6,71 and 4,63. Again the absolute reduction was three times as much for males, but the relative reduction was with 31 % again stronger for females compared to the one for males, 28%.

Finally for **Sweden** the absolute reduction for males between 1991 and 2009 was -6,71 and for females -2,97. In this case the absolute reduction for males was more then twice as big as the one for females. The relative reduction was 54 % for males and 60 % for females. The latter one corresponds to an annual decrease of 3,16 % which is the third strongest of all countries and age classes.

Table 13 shows for all gender classes the absolute decreases in total and per year and the relative decreases in total and per year.

TABLE 13: Overview of absolute and relative decreases in fatalities per 100.000 inhabitants for males and females (European Commission Road Safety, 2012a) (Eurostat, 2012d) (Eurostat, 2012e)(Eurostat, 2012f).

	1991	2010	Absolute decrease	Absolute decrease per year	Percentage decrease	Percentage decrease per year
Belgium (M)	28,27	11,84	-16,43	-0,86	-58,12 %	-3,06 %
Belgium (F)	9,64	3,67	-5,96	-0,31	-61,89 %	-3,26 %
Czech Rep. (M)	24,70	11,77	-12,93	-0,81	-52,36 %	-2,76 %
Czech Rep. (F)	7,47	3,31	-4,16	-0,26	-55,71 %	-2,93 %
Finland (M)	17,48	7,77	-9,70	-0,51	-55,53 %	-2,92 %
Finland (F)	8,09	2,49	-5,59	-0,29	-69,16 %	-3,64 %
Poland (M)	22,67	16,15	-6,51	-0,72	-28,74 %	-1,51 %
Poland (F)	6,71	4,63	-2,08	-0,23	-31,01 %	-1,63 %
Sweden (M)	12,49	5,78	-6,71	-0,37	-53,73 %	-2,83 %
Sweden (F)	4,95	1,98	-2,97	-0,16	-60,02 %	-3,16 %

A remark to be made is that more males die in traffic although there are less male inhabitants. On the other hand males usually travel more transport kilometres (Janssens, Moons, Nuyts, & Wets, 2009). Plus women usually travel more by public transport (Janssens e.a., 2009), which is a safer transport mode compared to e.g. car or bike (Vlaams Ministerie van Mobiliteit en Openbare Werken Departement Mobiliteit en Openbare Werken (MOW) Afdeling Beleid Mobiliteit en Verkeersveiligheid (BMV), 2008). The following question might be asked: "What if men and women used all transport modes in the same proportions?" This is an interesting question for future research.

3.4 Disaggregated data availability of transport mode

The previous subchapters, 3.1 , 3.2 and 3.3 discussed the aggregated available data and the disaggregated available age and gender data. This subchapter focuses on the available data for the third disaggregated analysis of transport mode. Again for the risk component fatalities were used, while for the exposure component no inhabitants but stock of vehicles were used.

The fatalities according to transport mode are mentioned for the five countries in alphabetical order from annex 56 till 60. The stock of vehicles are also displayed for the five countries in alphabetical order from annex 61 till 65. Finally the fatalities per 100.000 vehicles are added from annex 66 till 70.

Two remarks about the available data should be made, as those points have their consequences in function of the analyses in chapter four.

The first one deals with the exposure component of bicyclists, pedestrians and mopeds. Data about how much kilometres pedestrians have been walking and how much kilometres bicyclists have been cycling during a year are hard to find. Also the time spend in traffic by these modes is not registered. Further no data about the number of bicycles in any country were found. For the other vehicle classes the used exposure component is the number of vehicles for a specific vehicle type. Therefore no exposure data are available that can be linked to pedestrian and bicycle fatalities. Also for mopeds there were only three countries for which vehicle data are available (Czech Republic, Finland and Poland).

The second remark deals with the fit of the weight classes for different types of good vehicles.
Table 14 presents the available classes of fatalities and vehicles for good vehicles. For the fatalities there are two classes, under 3.500 kilogram and over 3.500 kilogram. On the other hand for the vehicle data three different types of vehicles with each time different weight classes were mentioned on the Eurostat as well as the UNECE (United Nations Economic Commission for Europe) website. The first one are the 'lorries' with eight different weight classes. Further there are the 'semi-trailers' with five different weight classes, finally the 'trailers' contain four different classes.

In first instance the idea was to form a compromise for the exposure component. On the one hand, the classes till 2.999 kg. for lorries and the classes under 5.000 kg. for semi-trailers and trailers would be added up. On the other hand the classes for lorries over 3.000 kg. and semi-trailers and trailers over 5.000 kg. could be added up. The first sum would be linked to fatality data for good vehicles under 3.500 kg, the second one to fatality data over 3.500 kg.

However this is strictly not correct, so finally the decision was made to combine all risk and exposure classes in one class for 'vans & trucks'. The category 'vans and trucks' contains the data of all fatalities and vehicles with the main purpose of good transport. Only for Belgium no data of semi-trailers and trailers were available from 2000 till 2010 and for the Czech Republic an enormous decrease (646.924 to 72.876) in the 'trailer' category was registered between 1996 and 1997. Therefore for these two countries only the 'lorries' where considered. As a consequence the results of these two countries should not be compared to the three other countries 'vans & trucks fatalities per 100.000 vehicles'. As can be seen in annex 61 and 62 the class for Belgium and Czech Republic is defined as 'lorries', while in annex 63 till 65, for Finland, Poland and Sweden, the class is defined as 'vans & trucks' which contains lorries as well as semi-trailers and trailers.

An additional remark about the data is that the weights of some 'lorry' classes are similar to the weights of cars. However according to UNECE (United Nations Economic Commission for Europe) (2012e), the classification should be made as follows:

- *"Passenger road motor vehicle: A road motor vehicle, exclusively designed or primarily, to carry one or more persons. Vehicles designed for the transport of both passengers and goods should be classified either among the passenger road vehicles or among the goods road vehicles, depending on their primary purpose, as determined either by their technical characteristics or by their category for tax purposes."*
- "*Passenger car*: *Road motor vehicle, other than a motor cycle, intended for the transport of passengers and seating not more than nine persons (including the driver). The term passenger car therefore covers taxis and hired vehicles, provided that they have fewer than ten seats.*"

Therefore it can be assumed that no cars were misclassified in good vehicle classes. The distinction between motorcycles and mopeds has been made as follows (United Nations Economic Commission for Europe 2012e):

- *"Motorcycle: Two-wheeled road motor vehicle with or without side-car, including motor scooter, or three-wheeled road motor vehicle not exceeding 400 kg (900 lb) unladen weight. All such vehicles with a cylinder capacity of 50 cc or over are included, as are those under 50 cc which do not meet the definition of moped."*
- *"Moped: Two- or three-wheeled road vehicle which is fitted with an engine having a cylinder capacity of less than 50cc (3.05 cu.in) and a maximum authorized design speed in accordance with national regulations."*

In total 40 different combinations of vehicle classes and countries were considered to analyse. This was done for five countries and eight vehicle classes. The vehicle classes were, vans and trucks, buses and coaches, cars, motorcyclists, moped riders, agricultural vehicles, bicyclists and pedestrians.

As mentioned above no exposure measure was available for bicyclists and pedestrians, so twelve combinations were excluded. Another exclusion criterion was when a certain fatality class had zero fatalities for at least one data point the analysis. In that case it was impossible to perform the analysis by the computer. The program used for the analyses is the free source software "R statistics http://www.r-project.org/".

As a consequence for the category "agricultural vehicles", there are four countries (Belgium, Czech Republic, Finland and Sweden) where zero fatalities for at least one data point were registered. Also for the vehicle class "buses and coaches" the same four countries have at least one data point wherefore no fatalities were registered. Again no analyses could be carried out for these country vehicle class combinations. Further for Belgium no vehicle fleet data for the class "mopeds" was available. Finally for Sweden the vehicle class "mopeds" had only vehicle data from 2001 till 2009. For Belgium and Sweden no analyses in function of "mopeds" were performed. Of the 40 considered vehicles class/country combinations twenty were excluded. This leaves twenty others available wherefore analyses were performed. Unfortunately of those twenty remaining there are several with high fluctuations in their fatality data, this due to low fatality values.

In 3.4.1 the available data of the risk component (fatalities) will be discussed. The data of the exposure component (vehicles) are discussed in subchapter 3.4.2. Finally the combination of both fatality data and vehicle data are discussed in 3.4.3. As for the previous disaggregated analyses the last is the most important part, as it combines 3.4.1 and 3.4.2.

3.4.1 Available traffic fatality data according to vehicle classes

In annex 56 till 60 the fatalities for all five countries (in alphabetical order) and for all eight vehicle classes are displayed.

For **Belgium** the fatalities for '*vans & trucks'* reduced from 59 to 48. This is equal to a total relative reduction of 19 % from 1992 till 2010. However for seven years in between more people died in this transport mode compared to the 1991 level. The conclusion should be made that this vehicle class is subjected to medium high variability in the data.

There fell six fatalities in '*buses and coaches'* in 1991 and only one in 2010, however the analysis for this vehicle type was not performed as in 2005 and 2006 zero fatalities were registered.
The '*car'* fatalities decreased from 1.138 in 1991 to 443 in 2010. The absolute decrease is 695 and the average annual decrease is 36,58. The relative decreases are 61% in total and 3,21% as average per year.
In 1991 114 '*motorcyclists'* died on the Belgian roads while in 2010 this value was reduced to 102. The latter one is the lowest number in the whole series and corresponds to 89 % (11 % decrease) of the former one. However the highest number of fatalities for this vehicle class occurred in 2002 with 158, this is 39 % over the base year value of 1991. Again rather high fluctuations for this vehicle class have been registered.
For the '*moped'* riders less fluctuating results are recorded. In 1991 101 people died, while in 2010 only 22 died. The latter one is just 22% of the former one and the 78 % reduction corresponds to an average annual decrease of 4,12 %.
Finally for the *agricultural* vehicles no analysis was performed due to the presence of zero fatalities in 2001 and low values in the fatality data over the whole series.
For the '*bicyclists* '166 fatalities were recorded 1991 and 79 in 2010. The bicycle deaths correspond to 8,86 % of the total number of fatalities in 1991 and 7,4 % in 2010.
For the '*pedestrians'* 288 deaths were recorded in 1991 and 106 in 2010. The pedestrians counted for 15,37 % of the total number of 1874 fatalities in 1991 and 11,24 % of the 943 in 2010. Unfortunately bicyclists and pedestrians account for plus minus twenty per cent of the of the total amount of traffic deaths and no analyses could be performed for them.
Another important remark for Belgium is that from 2003 till 2010 a lot of fatalities were classified as "other or unknown". Especially for 2004 this number was high with 148, which corresponded to 12,74 % of the total amount of fatalities (1.162) in 2004. This has its repercussions on the number of fatalities in all the other vehicles classes. Decreases are measured in those data, but they are due to a lack in classification quality.

In **Czech Republic** for the vehicle class '*vans & trucks'*, 35 deaths were recorded in 1994 and 45 in 2010. The highest value was recorded in 2004 with 67 deaths. There was only one year (1997) where less fatalities fell compared to the base year 1994. This vehicle class is just as for Belgium subjected to medium high fluctuations.
The class '*buses and coaches'* has extreme low values and in 2005 and 2008 no fatalities were registered, so no analysis was carried out.
For the '*car'* fatalities higher values are available, this causes a more constant decrease compared to the previous two vehicle classes. In 1991 there were 853 deaths while in 2010 there were only 403. This is a total reduction of 53 % and an average yearly reduction of 3,3 %.

For the '*motorcycle'* fatalities the 1991 level was the lowest of all years in the time series. Only 73 deaths fell in 1994 and 92 in 2010. The three highest values were registered in the years 2007, 2008 and 2002, with respectively 136, 121 and 117 fatalities.
Also for '*moped'* riders as for motorcyclists high variability in the fatality data are present. There were nine deaths in 1994 and seven in 2010, by this transport mode. In between six data points had a lower number compared to 1991 and seven a higher value. The mopeds fatalities are once more subjected to low fatality data.
Deaths that fell in '*agricultural'* vehicles knew again low values and high fluctuations and no analysis has been performed as in 2008 there died zero people in this transport mode.
The transport class '*bicyclists'* had 155 fatalities in 1991 and 80 in 2010. These values are equal to 9,47 % and 8,88 % of the total number of traffic deaths for Czech Republic.
Finally for '*pedestrians'* 502 and 168 deaths were recorded in 1991 and 2010. These are the equivalent of 30,67 % and 18,65 % of all fatalities. Unfortunately again over 40% in 1991 and almost 30 % in 2010 of all fatality data could not be analysed.

In the vehicle class '*vans & trucks*' for **Finland** the deaths were reduced from 30 in 1991 to 18 in 2010. Once more medium high variability in the data was present, but no rise above the 1991 value was registered.
For '*buses and coaches*' again for several years zero fatalities fell and no analysis was carried out. For the buses and coaches a giant increase occurred in 2004, 24 deaths, of all other years the maximum is five.
Again as for Belgium and Czech Republic the '*car'* fatalities knew a more constant decrease from 333 in 1991 till 159 in 2010. This is a total decrease of 52 % and an average annual decrease of 2,75%.
For the Finnish '*motorcyclists'* a decrease in fatalities was measured from 34 to 18. The lowest values were however achieved in 1997 and 1998 with respectively eight and nine. While in 2005 and 2007 data values of 32 were recorded, so once again high variability is present in these data.
Also for '*moped'* rider fatalities again high data variability is recorded. Positive however is that in the last few years the absolute value remains under the values of the first five to eight years as can be seen in annex 58.
Finally for the '*agricultural vehicles'* low values were recorded and in 2005 zero fatalities for this transport mode were registered, so again analysis was performed.
As for Belgium and Czech Republic the '*bicyclist'* and '*pedestrian'* traffic deaths form a high proportion in the total quantity of traffic fatalities. In 1991, 71 bicyclists died and 130 pedestrians. This is 11,23 % and 20,57 % of all 632 traffic fatalities. In 2010 26 bicyclists and 35 pedestrians died, which corresponds to 9,56 % and 12,87 % of the total

number of 272 traffic deaths. In total plus minus 32 % in 1991 and 22 % in 2010 of all fatality data could not be analysed.

Poland is a bigger country with a poorer performance in traffic safety. Of course higher values were registered and as a consequence this is the only country where time series for 'agricultural vehicles' and 'buses and coaches' were analysed. Polish traffic fatality data were available from 2000 till 2010.
The class '*vans & trucks'* recorded a decrease from 225 to 142 between 2000 and 2010. Although five data points in between registered a higher value, during the last four years constant decreases has been recorded.
For '*buses and coaches'* the traffic fatalities decreased from 50 to 14 in eleven years. Again three years recorded a higher value compared to 2000, but the last five years enormous decreases have been manifested.
The '*car'* fatalities knew a constant decrease from 2.710 in 2000 to 1.853 in 2010. This is equal to a total decrease of 32 % and an average annual decrease of 3,16 %.
The '*motorcycle'* fatalities do not follow the regular decreasing trend. Here an increase from 178 to 259 was recorded. This is equal to a total increase of 45,5 % and an average yearly increase of 4,55 %. The value for 2009 was even higher as the one of 2010 with 290 fatalities, this is 63 % higher compared to the 2000 value.
For the '*moped'* rider fatalities again high variability is present in the data. For all years except 2008 and 2010 a lower value compared to the base year 1991 has been recorded.
Finally for the '*agricultural vehicles'* fluctuations in the data are present, but an overall decrease in the data is present. In 2000 80 people died while in 2010 only 23. This is a total decrease of 71 % and an average annual decrease of 7,13 %.
The '*bicycle'* fatalities decreased from 692 to 280, these values are 10,99 % and 7,17 % of the total number of fatalities in 2000 and 2010. The total amounts of traffic fatalities for these two years were 6.294 and 3.907.
The percentage share for '*pedestrian's* is once more bigger compared to bicyclists. With 2.256 and 1.236 pedestrian fatalities, a share of 35,84 % and 31,64 % of all fatalities in respectively 2000 and 2010 was recorded.

Finally for **Sweden** the vehicle class '*vans & trucks'* counted 30 deaths in 1991 and 10 in 2009. This is a 67 % reduction and an average yearly reduction of 3,7 %. Fluctuations in the data were present, but no years rose above the 1991 value.
The class '*buses and coaches'* had once more low values and several years with zero fatalities were recorded. So no time series analysis could be carried by the computer.
The '*car'* fatalities in Sweden knew a constant decrease from 1991 till 2009 although again in some years small increases compared to the previous year(s) were measured. In 1991, 459 car occupants died while in 2009 this number was reduced to 219. The

absolute reduction is 240 (yearly average of 13,33 per year). The relative decrease is 52% and the relative average annual decrease 2,9 %.
For '*motorcycle*' fatalities an increase of 27 % was measured from 1991 till 2009 (average yearly increase of 1,5 %). The absolute rise was from 37 to 47, however again high variability is present in this data. In 1994, 31 people died while in 2004, 56 people died, these are the lowest and highest values for this vehicle category.
Also the deaths of '*moped*' riders recorded low values with high fluctuations, absolute values between eight and seventeen were registered.
Finally again the class '*agricultural*' vehicles knows low values with high variability. The value zero was measured three times, so the computer could not analyse the data.
Additionally 68 '*bicyclists*' died in 1991 (in 1992 76) and 20 in 2009.
Also 125 '*pedestrians*' died in 1991 (in 1992 138) and 44 in 2010. In the year 2009 these values correspond to 5,59 % (for bicyclists) and 12,29 % (for pedestrians) of the total amount of traffic fatalities.

3.4.2 Available vehicle data according to vehicle classes

The bicyclist and pedestrian fatality data couldn't be analysed due to a lack in exposure data for these transport modes. For the other six categories most of the time data were available, Table 17 at the end of this chapter shows for which countries and vehicle classes analyses were performed.

In **Belgium** the number of '*lorries*' increased from 366.725 to 690.837. This class isn't indicated as 'vans & trucks' because no data about 'trailers' and 'semi-trailers' were available from 2000 till 2010. The absolute increase is 324.112, this is equal to an average increase of just over 18.000 vehicles per year. The relative increase from 1992 till 2010 is 88 % and the average increase is 4,91 % per year.
The number of '*buses and coaches*' increased from 15.378 to 16.226, these data won't be used as some data points recorded zero fatalities.
More important is the absolute increase in '*cars*' with 1.306.000 vehicles, or an average increase of 68.737 per year (from 3.970.000 to 5.276.000). The relative increase over 20 years is 33 % and the average annual increase 1,73 %.
The number of '*motorcycle vehicles*' increased with a factor 2,81 from 149.000 in 1991 to 419.000 in 2010 (8,4% per year).
No data about the number of '*moped vehicles*' were available. Finally the agricultural vehicles increased from 38.808 to 46.673, however these last values won't be used as some data points in the fatality series recorded "zero" fatalities.

Vehicle data for **Czech Republic** are available from 1993 while fatality data are only available from 1994. On the website of Eurostat and on the one of UNECE a huge

decrease in 'trailers' between 1996 and 1997 (from 895.685 to 338.494) was registered for this country. Therefore only the 'lorries' were considered and the vehicle class is not defined as 'vans and trucks'. The number of '*lorries'* in Czech Republic increased from 169.531 to 584.921. This is a total increase of factor 3,45 and an average yearly increase of 14,41 %.
The number of '*buses and coaches*' remained constant from 1993 till 2010, these data were neither used, as the fatality data contain data points with zero fatalities.
More important is the increase in '*cars'* from 2.833.143 to 4.496.000. An absolute increase of 1.662.857 vehicles in total and an average of 97.815 per year has been registered. The relative increases are 59 % and 3,45 % per year.
The number of '*motorcycle's* doubled from 400.968 to 924.291, this is equal to an average yearly increase of 30.783. This is also an increase by factor 2,31 and an average increase of 7,68 % per year.
Further the number of '*moped'* vehicles decreased from 508.771 to 478.000. The analysis was performed for the mopeds although a serious change in the data was registered between 1998 and 1999, from 519.818 to 454.100. Finally the agricultural vehicles remained plus minus constant, these data were not used again as the fatality data contain data points with values zero.

While for Belgium and the Czech Republic only the 'lorries' were considered, for **Finland** the 'lorries', 'semi-trailers' and 'trailers' were combined in one class 'vans & trucks'. The number of '*vans & trucks'* in Finland doubled from 628.390 to 1.293.058, this is equal to an average annual increase of 5,6 % over a period of 20 years.
The number of '*buses and coaches'* increased with 52 % from 8.968 to 13.650, but weren't used in the analysis as fatality data points included the value zero.
The quantity of '*cars'* rose from 1.923.000 to 2.877.484. This is a 50 % increase and an average yearly increase of 2,6%.
The strongest rise for Finnish vehicles was registered in the class of '*motorcycles'* from 62.000 to 227.000, this is a multiplication by factor 3,66 and the annual increases are on average 14 %.
Further the vehicles in the class '*mopeds*' increased from 103.000 to 260.000. This is once more a strong increase by factor 2,52 and the corresponding annual increases are 8%.
Finally the number of '*agricultural vehicles'* increased by a factor 2,51 but as for Belgium and Czech Republic the fatality data contain years with the value zero and no analysis was performed.

For **Poland** again as for Finland the quantities of the three classes of good vehicles were added up to one class defined '*vans & trucks'*. The vehicles in this class doubled from

1.750.724 to 3.558.111 (increase by factor 2,03). The yearly increase corresponds to an average 5,43 % per year.

The number of '*cars'* increased from 6.112.171 to 17.240.000. This is an increase by factor 2,82 and an average yearly increase of 9,58 %. This increase is at least three times stronger compared to the increase of cars for other countries. Remarkable is that the increase in car vehicles in stronger than the one in 'vans & trucks'.

Poland is the only country wherefore a decrease in '*motorcycles'* has been registered (from 1.235.640 to 1.013.000). The lowest value in 2005 was even 754.000 (61 % compared to the base year) as can be seen in annex 58.

For '*moped vehicles'* data were only available from 1995 till 2010 instead of 1991. An increase from 750.000 to 922.000 was registered (23 %).

Further Poland is the only country for which analyses were performed of '*buses and coaches*' and for '*agricultural vehicles'*. For the former a rise in vehicles from 86.951 to 97.371 (12 % and yearly 0,63 %) was recorded. For the latter the rise was stronger, in increase by factor 2,4 between 1991 and 2000 and again a rise by factor 2,23 in 2010 compared to 2000. All analyses for Poland were performed from 2000 till 2010 as fatality data were only available for this time period.

Finally for **Sweden** only three analyses were performed for the following vehicle classes 'vans & trucks', 'cars' and 'motorcycles'. The first category is once more formed by the combination of 'lorries' 'semi-Trailers' and 'trailers'.

The '*vans & trucks'* increased between 1991 and 2009 with 68 %, from 750.691 to 1.259.965 (3,77 % on average per year).

The quantity of the class '*buses and coaches'* decreased with 8 %, but wasn't used as the fatality data contains data points where the value zero is recorded. In Sweden the rise in cars is the lowest for all countries with 20 % between 1991 and 2010 (3.619.000 to 4.335.000). This is a yearly increase of just over one per cent.

On the other hand the number of '*motorcycles'* increased enormously by a factor 6,17 (yearly increase of 29 %) from 45.000 to 277.630.

The '*mopeds'* and '*agricultural vehicles'* also recorded enormous increases, but were not analysed. Mopeds due to the fact that vehicle data were only available from 2001 till 2009 and, agricultural vehicles due the fact that fatality data contained several times zero fatalities.

In 3.4.1 the fatalities by transport mode and in 3.4.2 the number of vehicles were discussed. The third part in 3.4.3 combines these data again and is the most important one of the three. Only for those twenty combinations for which good fitting risk and exposure data were available the data are discussed. Table 17 at the end of chapter three displays an overview of all analyses that were carried out.

3.4.3 Fatalities per 100.000 vehicles according to vehicle classes

For **Belgium** the fatality and vehicle data of three transport modes were linked to one another. These were, lorries, cars and motorcycles.
The *'fatalities per 100.000 lorry vehicles'* decreased with almost 50 % from 1992 till 2010 (from 13,63 to 6,95 fatalities per 100.000 vehicles).
The *'fatalities per 100.000 cars'* reduced with 71 % between 1991 and 2010 (from 28,66 to 8,4). This is equal to an average yearly decrease of 3,72%.
The *'motorcycle fatalities per 100.000 motorcycle vehicles'* decreased by 3,59 % on average per year. The total decrease for motorcycles from 1991 till 2010 was 68 % (from 76,51 to 24,34). Only in Sweden in 1991 and in Poland in 2010 more people died per 100.000 motorcycle vehicles.

For **Czech Republic**, fatality and vehicle data were linked for four different modes. These are, lorries, cars, motorcycles and mopeds. The fitting time period between fatality and vehicle data for all transport modes is 1994 till 2010.
The *'lorries'* registered a total relative decrease of 59 % (3,72 % per year). The absolute reduction was from 18,99 to 7,69 deaths per 100.000 vehicles.
For *'cars'* a decrease of 69 % over 17 years was achieved, with 4,33 % per year the reduction is stronger as the one for 'vans & trucks'. The registered absolute decrease was from 29,17 to 8,96 fatalities for each 100.000 vehicles.
For *'motorcyclists'*, the average yearly reduction was 2,82 %, weaker as those of lorries and cars. The absolute reduction was also lower with minus 8,17 fatalities per 100.000 vehicles from 18,12 to 9,55. On the other hand it's remarkable that in 1994 more car occupants died compared to motorcycle riders per 100.000 vehicles, 29,17 vs. 18,12.
Finally the fatalities per 100.000 *'moped vehicles'* in Czech Republic was extremely low, 1,77 in 1994 and 1,47 in 2010. The highest rate in between, (2002) was also low with just 3,83 fatalities per 100.000 mopeds. The question might be asked whether the vehicles were correctly assigned to this vehicle class.

For **Finland** for the same four vehicles as for Czech Republic fatality and vehicle data were linked. Contrary to Belgium and Czech Republic the vehicle class *'vans & trucks'* exists here of the three combined classes 'lorries', 'semi-Trailers' and 'trailers'.
The absolute as well as the relative reduction was the strongest for *'motorcycle'* fatalities per 100.000 vehicles. The absolute quantities decreased from 54,84 to 7,93 and the relative reduction was 86 % in total and 4,5 % on average per year.

The absolute values for *'vans and trucks'* were the lowest in 1991 (4,77) as well as in 2010 (1,39). While 'vans & trucks' had the lowest absolute values in 1991 and 2010, the strongest reductions where achieved by the motorcyclists, with 87 % in total and a yearly average decrease of 4,59 %. The absolute decrease for this mode was from 27,18 to 3,46.

Finally '*cars*' ad '*mopeds*' obtained the weakest relative reduction of all transport modes (68 % in total and 3,58 % on average per year). Where in 1991 there were still 17,32 fatalities per 100.000 car vehicles, in 2010 there were only 5,53 deaths per 100.000 cars. For 'mopeds' there fell 27,18 fatalities per 100.000 vehicles in 1991 and 8,74 in 2010.

For **Poland** for all six vehicle class analyses were performed, as fatality data were only available from 2000 till 2010, so the period of the time series was limited to 11 years.
The Polish '*motorcycle*' vehicles are the only vehicle type of all countries for which a increase in fatalities per 100.000 vehicles has been registered. As can be seen in annex 69 the rise isn't a one year coincidence.
The fatalities by '*car*' decreased by 60 % in total or 6,04 % per year. The absolute decrease was from 27,12 to 10,75 fatalities per 100.000 car vehicles.
Extreme strong reductions were achieved for '*buses and coaches*' and for '*Agricultural vehicles*', respectively from 60,54 to 14,38 and from 83,28 to 10,72 fatalities per 100.000 vehicles. Over ten years these are relative reductions of 76 % and 87 %.
The vehicle class '*vans and trucks*' includes once more 'lorries', 'semi-trailers' and 'trailers' and the absolute reduction in fatalities per 100.000 'vans & truck' vehicles was from 9 to 4. This is a 56 % reduction over 10 years. For this mode the highest level of 9,8 fatalities per 100.000 vehicles was registered in 2002.
Finally the reduction of the vehicle class '*mopeds*' in fatalities per 100.000 vehicles was the weakest (not taking into account the rise for motorcycles) with a 29 % decrease over ten years. The absolute values were 12,7 and 9, however in 2006 the highest level was registered with 16,86 deaths per 100.000 vehicles.

Finally for **Sweden** only for three vehicle classes fatality and vehicle data were linked. The category 'vans & trucks' existed once more of three combined vehicle types, 'lorries', 'semi-Trailers' and 'trailers'.

The largest decreases in fatalities per 100.000 vehicles were obtained by the classes '*vans and trucks*' with 80 % and '*motorcycles*' with 79 %. The absolute decrease in fatalities per 100.000 vehicles was however a lot bigger for the latter one (82,22 to 16,93) compared to the former one 4,0 to 0,79). The average yearly decreases for 'vans & trucks' were 4,45 % relative and 0,18 absolute. For 'motorcyclists' the average decreases per year were 4,41 % relative and 3,63 absolute.

For the class 'car' vehicles a decrease of 60 %, from 1991 till 2009 in fatalities per 100.000 vehicles had been achieved. The absolute values decreased from 12,68 to 5,09. Finally the average annual decrease was 3,33 %.

Some other interesting facts to mention are:
For Finland and Sweden the average yearly reductions in fatalities per 100.000 vehicles were stronger for 'vans & trucks' compared to those of 'cars', while for the other countries the yearly reduction in cars was stronger.
The reduction for motorcyclist in fatalities per 100.000 vehicles was only in Finland the strongest compared to the other transport modes. In each country in 2010 (2009 for Sweden) the transport mode motorcycle remained the one with the highest fatality rate. This immediately indicates on which mode government policies should focus.
The vehicle class 'vans and trucks' was in 2010 (2009 for Sweden) the mode with the lowest fatality rate. As these vehicles are the heaviest ones this is rather logic. Only in the Czech Republic there was one exception, for moped riders there were 1,46 fatalities per 100.000 vehicles, while 7,69 riders per 100.000 'lorries' died. It's however important to remember that 'semi-trailers' and 'trailers' were excluded from the vehicle data in the case of Czech Republic.

Till here the aggregated and the three different disaggregated data sets were discussed. Another additional analysis has been carried out for Belgium, the combined disaggregated analyses of age and gender. This could have been carried out for the other countries too, however this wasn't done, as in that case 48 additional analyses should have been performed. More alternatives were: the combination of age and transport mode or gender and transport mode. Finally the combination of all three disaggregated characteristics (age, gender and transport mode) could have been carried out. However for all these possible combinations only the Belgian age and gender combination has been investigated.

3.5 Combined disaggregated data availability of age and gender for Belgium

As the age division existed of six age classes and the gender division of two, twelve additional analyses were performed for Belgium. The data are added in annex 71 till 76. Annex 71 and 72 contain the female and male fatality data by age class. Further annex 73 and 74 contain the inhabitant data by age class for females and males. Finally annex 75 and 76 possess the fatality data per 100.000 inhabitants by age class for females and males. Fatality data are available from 1991 till 2009 and inhabitant data are available from 1991 till 2011. Only where both fatality and exposure data were available the fatalities per 100.000 inhabitants were calculated.

3.5.1 Belgium's combined disaggregated data of gender and age, fatality data

Annex 71 and 72 present the fatality data for Belgium by age and gender. For all age and gender class combinations reductions in fatalities are registered. Unfortunately in some classes (usually those with fewer fatalities) high fluctuations of fatalities are present which makes accurate predictions difficult.

Table 14 displays the absolute and relative decreases in total and per year for all twelve age and gender classes. The strongest relative reductions were achieved for both sexes under the age of 15 (73 % for males and 62 % for females) and for males between 15 and 17 (69 %). Other strong reductions were achieved for both sexes in the age class between 18 and 24 (males 62 % and females 60 %). Of course if a high number of fatalities fell in 1991 for a certain age class it has been easier to reduce the value. For the age class '25-49' a male reduction of 44 % and a female reduction of 54 % have been achieved. For the age class '50-64' rather strong reductions were achieved for females, but weak reductions for males. Finally for the oldest age class similar reductions were achieved. As all age and gender classes contain the same amount of observed years (1991-2009), all age and gender classes have relative reductions that are the same to one another as the total reductions are.

TABLE 14: (Yearly) absolute and (yearly) relative reductions in fatalities per age class and gender for Belgium from 1991 till 2009 (Federale overheidsdienst Algemene directie statistiek en economie, 2012).

	1991	2009	Absolute decrease	Yearly absolute decrease	Relative decrease	Yearly relative decrease
Male <15	45	12	-33	-1,83	-73,33 %	-4,07 %
Female <15	26	10	-16	-0,89	-61,54 %	-3,42 %
Male 15-17	55	17	-38	-2,11	-69,09 %	-3,84 %
Female 15-17	18	10	-8	-0,44	-44,44 %	-2,47 %
Male 18-24	346	132	-214	-11,89	-61,85 %	-3,44 %
Female 18-24	75	30	-45	-2,50	-60,00 %	-3,33 %
Male 25-49	568	319	-249	-13,83	-43,84 %	-2,44 %
Female 25-49	156	72	-84	-4,67	-53,85 %	-2,99 %
Male 50-64	148	120	-28	-1,56	-18,92 %	-1,05 %
Female 50-64	78	39	-39	-2,17	-50,00 %	-2,78 %
Male >64	148	120	-28	-1,56	-49,03 %	-2,72 %
Female >64	78	39	-39	-2,17	-49,29 %	-2,74 %

3.5.2 Belgium's combined disaggregated data of gender and age, inhabitant data

Subchapter 3.5.1 focussed on the combined fatality data for gender and age, this subchapter discusses the combined inhabitant data for gender and age of Belgium. The tables with female and male inhabitants are presented respectively in annex 73 and 74. The values in table 14 show the increases and decreases in inhabitants from 1991 till

2011. However fatality data were only available from 1991 till 2009, therefore in subchapter 3.5.3 only data from 1991 till 2009 are generated.
For the youngest age class a small increase for males as well as for females has been registered. For both sexes 2011 was the first year since 1991 with a deviation of more than two per cent from the base year. The ratio males vs. females was 1,05 in 1991 and 1,045 in 2011.

For the age class '15-17' a small decrease for both sexes of ±5 % has been registered from 1901 till 2000, 2001. A small increase for both sexes of ±5 % has been registered from 2007 till 2009. By 2011 however the increase of plus minus 5 % was lost and it turned back to the level of 1991. The ratio male vs. female was 1,051 in 1991 and 1,046 in 2011.

The inhabitants of both sexes for the age class '18-24' reduced from 1991 till 1999, till a level of plus minus 88 % compared to the 1991 level. From 2000 on the inhabitants of both sexes started increasing slowly. In 2011 93 % for males and 95 % for females inhabitants compared to 1991 were obtained again. The ratio male vs. female decreased from 1,039 to 1,017.

For the age class '25-49' small increases over the 21 year period were registered. There were 3,43 % more males in 2011 compared to 1991 and 5,21 % more females. However absolute, in 2011 more males still remained compared to females as the ratio was 1,035 in 1991 and 1,017 in 2011.

For the age class '50-64' enormous increases of 29 % for males and 23 % for females were recorded over the 21 year period. The ratio males vs. females increased from 0,948 to 0,99.

Finally for the oldest age class the ratio male vs. female increased from 0,65 to 0,73. The increase in males was 34 % while the increase in females was 20 % over the 21 year period.

A final remark is that for the four youngest age classes the absolute number of inhabitants was higher for males in 1991 as well as in 2011. However the increase of women compared to men was stronger or the decrease of women was weaker compared to men. However the absolute values for males were higher in 1991 and they remained higher compared to women in 2011.

TABLE 15: (Yearly) absolute and (yearly) relative increases/decreases in inhabitants by gender and age class for Belgium, from 1991 till 2011 (Eurostat, 2012d) (Eurostat, 2012e)(Eurostat, 2012f).

	1991	2011	Absolute increase/ decrease	Yearly absolute increase/ decrease	Relative increase/ decrease	Yearly relative increase/ decrease
Male <15	927.645	948.867	21222	1061	2,29 %	0,11 %
Female <15	883.626	907.662	24036	1202	2,72 %	0,14 %
Male 15-17	190.789	191.481	692	35	0,36 %	0,02 %
Female 15-17	181.593	183.023	1430	72	0,79 %	0,04 %
Male 18-24	512.526	477.988	-34538	-1727	-6,74 %	-0,34 %
Female 18-24	493.159	470.204	-22955	-1148	-4,65 %	-0,23 %
Male 25-49	1.831.805	1.894.561	62756	3138	3,43 %	0,17 %
Female 25-49	1.770.407	1.862.603	92196	4610	5,21 %	0,26 %
Male 50-64	824.584	1.060.659	236075	11804	28,63 %	1,43 %
Female 50-64	870.159	1.071.413	201254	10063	23,13 %	1,16 %
Male >64	593.336	796.678	203342	10167	34,27 %	1,71 %
Female >64	907.346	1.086.127	178781	8939	19,70 %	0,99 %

This subchapter discussed the male and female inhabitants by age classes. However as it was the case for the previous three disaggregated available data sets the last part is the most important one. 3.5.3 combines 3.5.1 and 0 in the number of male or female fatalities by age class per 100.000 inhabitants.

3.5.3 Belgium's combined disaggregated data of gender and age, fatalities per 100.000 inhabitants

The fatalities per 100.000 inhabitants are shown in annex 75 and 76. Again for some combined age and gender classes rather high fluctuations are present in the data as shown by the relative quantities. For example in the class under 15 years for female fatalities per 100.000 inhabitants a rise of 62 % was registered between 1997 and 1998. This was due to a strong rise in fatality data (25 to 41). However the overall trend for all combined age and gender classes is a decrease.

For the age classes '25-49' and '50-64' the relative decreases were stronger for females than for males. For the other four age classes the relative decreases were stronger for men than for women, although for the '18-24' age class the relative decrease was almost the same. The absolute decreases were always bigger for males than for females. However for the age class '50-64' the absolute decrease was just 1,19 times stronger for males than for females while for the age class '25-49' the absolute decrease was 4,52 times stronger for males than for females. Of course if more people with certain characteristics died in 1991, it's easier to reduce that number, these are once more the so called "quick wins".

TABLE 16: (Yearly) absolute and (yearly) relative increases/decreases in fatalities per 100.000 inhabitants by gender and age class for Belgium, from 1991 till 2011 (Federale overheidsdienst Algemene directie statistiek en economie, 2012) (Eurostat, 2012d) (Eurostat, 2012e)(Eurostat, 2012f).

	1991	2011	Absolute decrease	Yearly absolute decrease	Relative decrease	Yearly relative decrease
Male <15	4,85	1,29	-3,56	-0,20	-73,34 %	-4,07 %
Female <15	2,94	1,13	-1,82	-0,10	-61,69 %	-3,43 %
Male 15-17	28,83	8,52	-20,31	-1,13	-70,44 %	-3,91 %
Female 15-17	9,91	5,23	-4,68	-0,26	-47,24 %	-2,62 %
Male 18-24	67,51	28,67	-38,84	-2,16	-57,53 %	-3,20 %
Female 18-24	15,21	6,61	-8,60	-0,48	-56,52 %	-3,14 %
Male 25-49	31,01	16,87	-14,14	-0,79	-45,60 %	-2,53 %
Female 25-49	8,81	3,88	-4,94	-0,27	-56,02 %	-3,11 %
Male 50-64	17,95	11,78	-6,17	-0,34	-34,36 %	-1,91 %
Female 50-64	8,96	3,79	-5,17	-0,29	-57,71 %	-3,21 %
Male >64	34,72	13,62	-21,10	-1,17	-60,78 %	-3,38 %
Female >64	15,43	6,66	-8,77	-0,49	-56,82 %	-3,16 %

Before discussing the results of the analyses a final remark should be made. The better the traffic safety in a country or a certain disaggregated group (age, gender or transport mode) and the smaller the magnitude of the group, the worse the forecast of the model. This is because percentage data variability is larger by small quantities. The worse the traffic safety of a country or disaggregated group (age, gender or transport mode) and the bigger the magnitude of the country/group itself the better the forecast. This is because percentage data variability is smaller by large quantities.

Finally table 17 on the next page shows where fore analyses were performed. In total 79 analyses were carried out:

- Seven for aggregated analyses (Iceland was done twice, one time for one year and one time for three years aggregated).
- Thirty disaggregated analyses for the age classes
- Ten disaggregated analyses for the gender classes
- Twenty disaggregated analyses for the transport mode classes
- Twelve combined disaggregated analyses for gender and age classes (these analyses were only done for Belgium)

TABLE 17: Overview of all performed analyses[2]

	Belgium	Czech R.	Finland	Iceland	Poland	Sweden
Aggregated						
One year	Yes	Yes	Yes	Yes	Yes	Yes
Three years	No	No	No	Yes	No	No
Disaggregated: Age class						
<15	Yes	Yes	Yes	No	Yes	Yes
15-17	Yes	Yes	Yes	No	Yes	Yes
18-24	Yes	Yes	Yes	No	Yes	Yes
25-49	Yes	Yes	Yes	No	Yes	Yes
50-64	Yes	Yes	Yes	No	Yes	Yes
>64	Yes	Yes	Yes	No	Yes	Yes
Disaggregated: Gender						
Females	Yes	Yes	Yes	No	Yes	Yes
Males	Yes	Yes	Yes	No	Yes	Yes
Disaggregated: Transport mode						
Vans & Trucks	Yes	Yes	Yes	No	Yes	Yes
Coaches & buses	No	No	No	No	Yes	No
Cars	Yes	Yes	Yes	No	Yes	Yes
Motorcycles	Yes	Yes	Yes	No	Yes	Yes
Mopeds	No	Yes	Yes	No	Yes	No
Agricultural	No	No	No	No	Yes	No
Bicycles	No	No	No	No	No	No
Pedestrians	No	No	No	No	No	No
Combined disaggregated: Gender and age class						
Female <15	Yes	No	No	No	No	No
Female 15-17	Yes	No	No	No	No	No
Female 18-24	Yes	No	No	No	No	No
Female 25-49	Yes	No	No	No	No	No
Female 50-64	Yes	No	No	No	No	No
Female >64	Yes	No	No	No	No	No
Male <15	Yes	No	No	No	No	No
Male 15-17	Yes	No	No	No	No	No
Male 18-24	Yes	No	No	No	No	No
Male 25-49	Yes	No	No	No	No	No
Male 50-64	Yes	No	No	No	No	No
Male >64	Yes	No	No	No	No	No

[2] In total 79 models haven been analysed, for each of them there were several documents/pages of output. Only a limited amount of all these data are added in this report. You can always ask me to send you a link in order to have access to all output. dieter.loddewykx@gmail.com

4 Results of the data analyses

This final and most important chapter discusses the results of the analyses performed with the LRT (Latent Risk Time series) model presented in chapter two and the data presented in chapter three. In figure 2 and 3 the European reduction targets age shown, therefore the focus of the results will mostly be on these targets. So in the results the observed data from 2000 till 2009 or 2010 will be discussed and the predicted data till 2015 will be discussed. Other data before the years 2000 are most of the time left out of the discussion in chapter four.

4.1 Back to the policy objective and research questions

Let’s first quickly repeat the policy objective and the research questions. On figure 3 is shown that in Europe there fell 34.800 fatalities in 2009 and 31.000 in 2010. The 2020 objective is to reduce fatalities with 50% compared to the 2010 value, so to reduce till 15.500 fatalities. However in this report, predictions until 2015 are made in order to formulate intermediate goal achievements. One might think that in 2015 a 25% reduction should be achieved. This isn’t correct as the “phenomenon of quick wins” is taken into account when defining the objectives for 2011 until 2020. For 2015 the objective is to reduce the fatalities until a level of 21.900. This is 9.100 under the 2010 value, 12.900 under the 2009 value and only 6.400 above the 2020 objective of 15.500 fatalities. Therefore by 2015 compared to the 2010 fatality number, a reduction of 29,35 % instead of 25 % should be achieved. Compared to 2009, in 2015 a reduction of 37,07% should be achieved.

In 1.4 the research questions are formulated in such a way that they pose the question what the absolute and relative trends by 2015 are (increases, decreases or stable). These fatality trend questions will be answered, but additionally the questions will be solved which countries and disaggregated classes will meet the European objective to reduce fatalities by 2015 with 29,35 % or 37,07 %. In chapter three fatalities, exposure and fatalities in function of exposure were discussed. Unfortunately troubles with the residue assumptions of the exposure component made it for the disaggregated analyses impossible to obtain good fitting results. Therefore only for the aggregated analyses the residuals of the fatality as well as the exposure component were corrected. For the disaggregated analyses only fatalities are discussed, as the residuals of the exposure component were not corrected. No fatalities in function of 100.000 inhabitants or 100.000 vehicles are discussed for the disaggregated analyses.

4.2 Residual assumptions, options to correct them and example for Sweden

The model should meet the residual assumptions of independency, homoscedasticity and normality, these are explained below in 4.2.1. Further criteria for the goodness of fit, namely AIC (Akaike Information Criterion) and Log Likelihood should be optimized, therefore AIC should be minimized and Log Likelihood should be maximized. If these two values evolve the other way around after a model adaptation, than the better fit of the model in function of the observed values doesn't compensate the additional complexity of the model itself. Finally the MSE (Mean square error) should be minimized, this is a value that calculates the "distance" between the estimated model values and the observed values. In 4.2.1 the residual assumptions are mentioned, while in 4.2.2 the option to adopt models and improve the residuals are discussed, finally 4.2.3 focuses on the Swedish aggregated model as an example to optimize a model.

4.2.1 Residual assumptions

The three residual assumptions are independency, homoscedasticity and normality. For a simple linear model with one intercept value *(a)*, one independent value *(b)* that determines the slope and a model error for the unexplained variance, it looks like this:

$$\boldsymbol{Y_t = a + bt + \varepsilon_t} \qquad\qquad \boldsymbol{\varepsilon_t \sim NID(0, \sigma_\varepsilon^2)}$$

FORMULA 23: Basic linear model and the four assumption

The model assumptions are mentioned on the right, normally and independent distributed with expected average zero and a constant variance. The Independency, homoscedasticity and normality (average zero and constant variance) are explained below.

Independency indicates that there exists no correlation between the value of ε for a certain x value (or year) and the value of ε for another x value (another year). As a consequence the y value for a certain x value should not be correlated to the y value of another x value. When you verify the lower graph of Annex 7x 7 you see that several data points (years) lie on the same side as the previous or the following year. This is either above or below the model prediction line and indicate that the value of one year is related the value of another year. Here the independency assumption isn't met. On the other and the residual plots of annex 9 (second graph of this annex) and annex 10 (third graph of this annex) show that there are several residue values for which the year before and after do not lie on the same side of the predicted model line. Here the independency assumption is met.

Homoscedasticity indicates that the range between the highest and lowest y values are similar for all x values. Figure 8 below is subjected to heteroscedasticity as for low x values the range between the highest and lowest y values is small, while for high x values the range between the highest and smallest y lowest is big. Let's give an example of this. Imagine a situation where cars don't have a display where the driver can see the driven car kilometres. If someone estimates to drive 50.000 kilometres per year, his/her real driven kilometres might be e.g. 45.000 km. as well as 55.000 km. This is equal to a standard deviation of + or – 5.000 km. However if someone indicates to drive only 5.000 kilometre per year, it's unlikely that (s)he will have a standard deviation of 5.000. In that case (s)he would in fact drive 0 or 10.000 kilometres. In case of homoscedasticity for all x values a similar range in the y values is present.

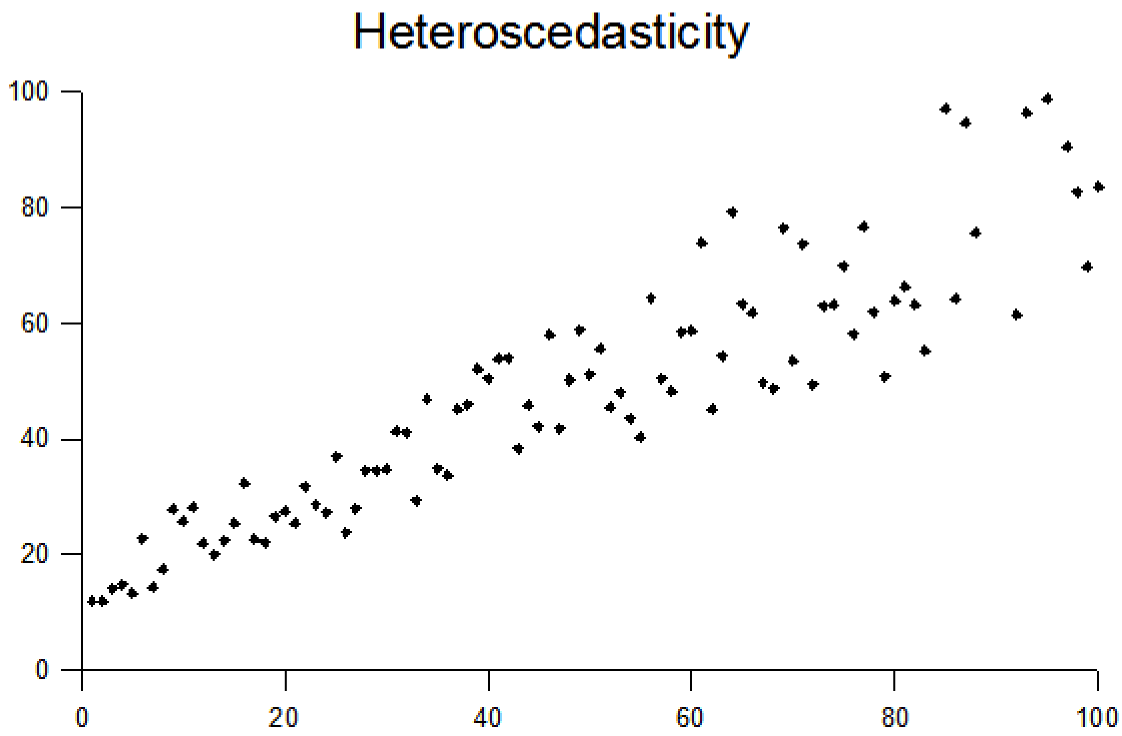


FIGURE 8: Example of heteroscedasticity

Residuals that meet the principle of normality (average zero and constant variance assumptions) indicate that all residue values (or observed values) are distributed normal as a Gauss curve around the predicted model line. For a simple linear model figure 9 shows the principle of normality.

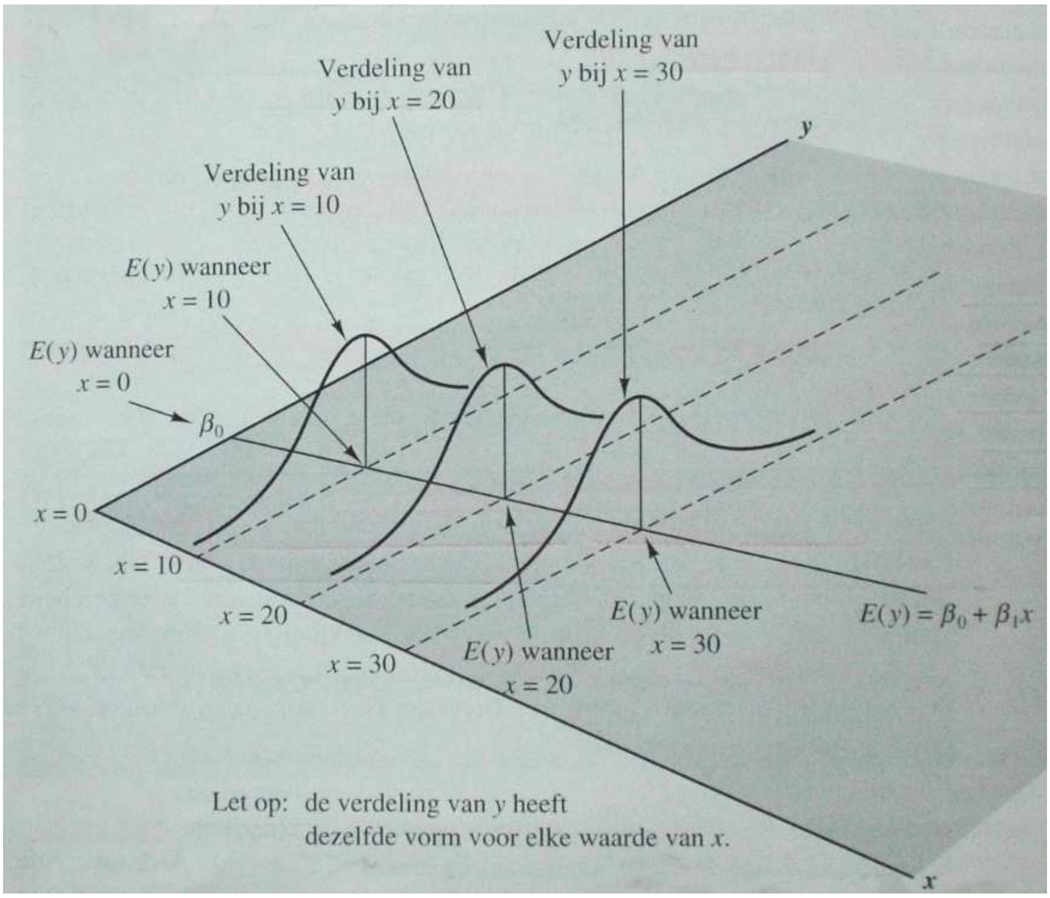


FIGURE 9: Visualisation of the model assumption (Anderson, Sweeney, & Williams, 1998)

4.2.2 Option to correct the residuals

In case the residue assumptions aren't met there are some options as mentioned by Matensen e.a., (2010) to improve model quality so the residue assumptions would be met, these are discussed in this subchapter. An example of the code that should be inserted in the computer program "R statistics" which is used for the analyses is shown in annex 102.

There are in general **four options** to improve model quality, interventions in either measurement or state equations. Skip a certain amount of observations and finally define a component as deterministic instead of stochastic (level or slope of unsafety or exposure). The options will be discussed below.

The first option is to add interventions either in the measurement or in the state equations. The interventions should be inserted at structural breaks in the measurement. "*It is important to realize that whatever is specified as an intervention does therefore not anymore form the basis of forecasting future developments*." Matensen e.a., (2010).

1. There are two different ways to add an intervention in a measurement equation. This should be done when you expect that the change in the series is due to the way is has been measured and not because the phenomenon itself changed. Or when you want to treat outliers, interventions might be added in the measurement equations too.
   - In the example of the Swedish code in annex 102 the following codes were used to add a measurement interventions for one specific year:

     "SwedenPKM [3]<-NA"

     "SwedenPKM [4]<-NA"

     This excluded the input values for passenger kilometres in the years 1973 and 1974, as the first model value was 1970. It's also possible to add a one year intervention in the measurement equation for the fatality component, this by adding e.g. the following code "*SwedenFAT[12]<-NA*". In this case the twelfth measurement for fatalities would be excluded.

     These interventions can be applied when you believe fatalities or exposure has been under or overestimated for one particular year or for some years.

   - On the other hand, if a permanent change in the measurement manifests itself an alternative code should be used. This might happen e.g. when a country defines a traffic fatality as someone who died 30 days after a crash instead of seven days or 24 hours. In this case a dummy variable should be inserted in the model, an example is given below:

     "SwedenFAT <- c(rep(1,times= 23),rep(0,times=0,18))"

     The numbers "23" and "18" indicate that there would be 23 time points before and 18 after the change in measurement. As the Swedish model covers the period from 1970 till 2010 the measurement change would have occurred between 1992 and 1993, although this is only an example.

     These were two options to add interventions in the measurement equation of either exposure or fatalities. The second alternative is that interventions are inserted in the state equations.

2. The second alternative is to add an intervention in either the level or the slope state equation of the fatality risk or the exposure component. Remind that there are four state equations two for the fatality and two for the exposure component, each time one level and one slope state equation.
   - When a permanent change in fatalities (e.g. helmet wearing law for motorcyclists) or exposure (e.g. road pricing) is registered. So the change occurred due to the phenomenon itself and not due to the measurement technique, an intervention

should be added in the level state equation. This should be seen as a "jump" in the data, a sudden increase or decrease that occurs and afterwards the increases or decreases continue in the same proportion as it was before the intervention.

Two examples of state interventions one for the exposure level and one for the fatality level are shown below. The years are just examples, but an intervention in the exposure level must be defined as "*component 1*" and an intervention in the fatality risk level must indicated as "*component 3*".

Example of intervention in the level state equation of exposure:

"Interventions = list (list (timepoint = 2002,
component = 1,
label = "2002 exposure level")),"

Example of intervention in the level state equation of fatality risk:

"Interventions = list (list (timepoint = 1998,
component = 3,
label = "1998 fatalities level")),"

- On the other hand if there occurred a change in direction of the development of fatality risk or exposure an intervention should be added in the slope of fatality risk or exposure. Two examples of this are given below one for the fatality risk and one for the exposure. Again the years are just examples, but "component 2" must be written in the code for an intervention in the slope of exposure, while "component 4" must be written for an intervention in the slope of fatality risk. An example of an intervention in the code is shown in annex 102.

Example of intervention in the slope state equation of exposure:

"Interventions = list (list (timepoint = 1993,
component = 2,
label = "1993 exposure level")),"

Example of intervention in the slope state equation of fatality risk:

"Interventions = list (list (timepoint = 2006,
component = 4,
label = "2006 fatalities level")),"

3. The third of the four techniques to improve model quality is to skip one or more data points. In this case the exposure as well as the fatality risk component are deleted. This is done by adding the following command in the code, "*Skipobs = 12*". Again an example is given in annex 102, the year is once more just an example.

4. The fourth alternative is to fix one or more of the four components. Here the disturbance in the variance is forced to be zero, the component is defined to be deterministic instead of stochastic.

Important is that the purpose is not to keep on trying improving your model by adding more and more changes or deleting more and more data. The purpose is to improve the models just enough so they meet the residue assumptions, considering other model parameters at the same time.

4.2.3 Application of model interventions in the case of the Swedish aggregated analysis

All aggregated models of Belgium, Czech Republic, Finland, Poland and Iceland met the residual assumptions (independency, homoscedasticity and normality). For the Iceland's model of the three year aggregation one intervention has been carried out. For the Swedish model however four interventions in the state equations were inserted in the model. Therefore this is used as example how interventions were integrated in the model in order to improve the model quality and to meet the residue assumptions. Before discussing the interventions of the Swedish aggregated model an important remark should be made.

When someone performs data analyses you can strictly do three things. The first one is describing your data, the second explaining it and the third predicting. The first one is carried out in chapter three, where all used data are thoroughly discussed. The main purpose of this report however is to predict until 2015, an intermediate time point of the 2020 European goal to reduce fatalities by 50 %. Matensen e.a., (2010) however made the important remark in function of the DaCoTA (Data Collection Transfer and Analysis) project:

"*The selection of candidates for interventions should be based on the results of the analyses of the auxiliary residuals (values <-2 or >+2) as well as on knowledge of the measures that have been adopted to improve road safety in the country analysed*"

However, considering the "knowledge part" it should be indicated that explaining data is only done a little in this research and the performed interventions are based on the residuals. Only some general known changes in history were considered e.g.: For the Polish aggregated analysis data were considered from 1990 on, due to the fall of communism. For the Czech Republic data of the aggregated analysis was only considered from 1993 as in 1992 the Republic was still a part of Czechoslovakia. The oil crisis of 1974 and the recent economic crisis that started in 2008 are other elements that might explain changes in passenger kilometres or traffic fatalities. However most of the changes were carried out in function of model improvements and often no explanation for the change in data has been given.

Annex 77 shows the residue values of the first Swedish model that was run. Also the AIC (Akaike Information Criterion), Log Likelihood and MSE (Mean Square Error) values are indicated. Annex 78 and 79 show the graphs of the predicted values of exposure and fatalities. Further annex 80 and 81 show the standardised residuals for passenger kilometres and fatalities. Annex 82 and 83 show the output auxiliary residual graphs (measurement equations). Finally annex 98 till 101 show the state auxiliary residual graphs for the levels and slopes of the passenger kilometres as well as the fatalities.

As can be seen in annex 77 the residue values of the independency assumption for the fatality risk component as well as the exposure component were fine. However the exposure residue values indicated that the passenger kilometres component was subjected to heteroscedasticity, while it should be homoscedastic. Further the normality assumption wasn’t met by the values for passenger kilometres. As shown in anne x82 the 1973 and 1974 passenger kilometre values registered extreme values in the output auxiliary residuals (measurement equation). However the oil crisis in 1974 is a good argument to say that no change occurred in the way passenger kilometres were measured, but the change occurred in the phenomenon itself. Therefore an intervention was added in the level of passenger kilometres. This also showed an extreme value in 1974 as can be seen in annex 84.

The result of the intervention is shown in annex 88, where the residue, AIC, Log Likelihood and MSE values for the second Swedish model run are indicated. Again no problems are registered for the independency assumptions. The problem for the heteroscedasticity of passenger kilometres was removed (p = 0,186622). Unfortunately the p value for the normality assumption became worse (From 0,00259631 to 2,9925E-05). Therefore another intervention was added, this time in the slope of the exposure component for the year 1989, this is based on the extremely negative value in the state auxiliary residue plot.

The result of this intervention is shown in annex 89, this is once more a table with the residue, the AIC, Log Likelihood and MSE values. All residue problems for the exposure component were solved. Unfortunately interventions on the exposure component also influence the fatality component. This is shown on the graph of annex 93 where model estimations and confidence intervals are left out for the years 1974 and 1989 due to the interventions in the exposure component. Because of the interventions in function of the passenger kilometres, the residuals of the independency assumption for the fatality component were not met anymore.

Therefore an intervention was added in the level state equation for the fatality component. The intervention was inserted in the recent year 2010. In 2009 there still fell 358 fatalities in Sweden while in 2010 there were only 266. This was an exceptionally strong reduction compared to the years before. The intervention could also be added to the measurement equation or the slope state equation, as both the “output auxiliary residual" plot and the "state auxiliary residual" plots show an extreme value for this year. However by far as know no change in measurement method was applied in 2010. For the year 2011 it's unrealistic that that the decrease of 2010 compared to 2009 will be achieved once more, therefore the intervention was set in the state equation. The result of this intervention is shown in annex 90. Troubles with the independency assumption of the fatality risk component remained and therefore one more intervention was added in the level state equation of the risk component for the year 1999. Finally no residue problems were present anymore. The final output with the residue, the AIC, the Log Likelihood and the MSE value is shown in annex 91. The graphs of the prediction of passenger kilometres and fatalities are shown respectively in annex 92 and 93. The two standardised residuals, the two output auxiliary residuals and the four state auxiliary residual plots are shown in annex 94 till 101.

Finally the confidence interval for the 2015 prediction of the Swedish fatalities decreased from [84;276] in the initial model to [160;274] in the final model. The point estimation was 153 in the initial model and 210 in the last model run.

No residue values of the other countries results showed troubles. Only for the three years aggregated analysis of Iceland one intervention was performed. This because troubles were experienced in the homoscedasticity residues for fatalities (p value = 0,034175) which is rather logic due to low values. The intervention was added in the fourth time point of the fatality risk level component. Unfortunately the AIC value rose and the Log Likelihood value decreased, but heteroscedasticity was removed (p value= 0,9216). An additional point is that the 2015 fatalities CI interval decreased. Initially this was (11 till 110 with a point estimation of 35) after the intervention was added it became (18 till 57 with a point estimation of 32).
A remark is that for Iceland's three year aggregated analysis seven data points (21 years from 1989 till 2009) are available. Therefore a prediction for only two data points or six years has been made (2010 -12 and 2013 -15).

An important remark is that for the aggregated analyses the residuals of the fatality as well as the passenger kilometres were corrected. Therefore the forecast of fatalities and fatalities per billion passenger kilometres are discussed in 4.3 . A lot of troubles were experienced however correcting the disaggregated analyses for inhabitants or vehicles. As it was mentioned the corrections for the passenger kilometres component were automatically applied to the fatality component. This usually had the consequence that good fitting model and observed data of the fatality component were excluded from the model. Therefore for the disaggregated analyses only the fatality residual values were corrected. As a consequence for the disaggregated analyses only the forecasted fatalities could be discussed and not the fatalities per 100.000 inhabitants or vehicles.

4.3 Results of the aggregated analysis

In this subchapter the predictions for fatalities and fatalities per billion passenger kilometres will be discussed, the predictions for passenger kilometres won't. Table 18a and table 18b below show the number of predicted fatalities for the aggregated analyses of the six countries. The results are discussed in between both tables.

TABLE 18a: Forecast fatalities in Belgium, Czech republic and Finland. Observed values are mentioned in bold. The fraction values for the model predictions are based on the last available observed value.

	Fatalities Belgium		Fatalities CzechRepublic		Fatalities Finland	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**1470**	**1,000**	**1486**	**1,000**	**396**	**1,000**
2001	**1486**	**1,011**	**1334**	**1,011**	**433**	**1,093**
2002	**1353**	**0,920**	**1431**	**0,920**	**415**	**1,048**
2003	**1216**	**0,827**	**1447**	**0,827**	**379**	**0,957**
2004	**1163**	**0,791**	**1382**	**0,791**	**375**	**0,947**
2005	**1089**	**0,741**	**1286**	**0,741**	**379**	**0,957**
2006	**1069**	**0,727**	**1063**	**0,727**	**336**	**0,848**
2007	**1067**	**0,726**	**1222**	**0,726**	**380**	**0,960**
2008	**944**	**0,642**	**1076**	**0,642**	**344**	**0,869**
2009	**943**	**0,641**	**901**	**0,641**	**279**	**0,705**
2010	896	0,950	904	1,003	**272**	**0,687**
2011	863	0,915	840	0,933	259	0,952
2012	831	0,881	781	0,867	241	0,888
2013	800	0,848	726	0,806	225	0,827
2014	771	0,818	675	0,750	210	0,771
2015	742	0,787	628	0,697	196	0,719
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	798	0,846	763	0,847		
2011	739	0,784	683	0,758	215	0,789
2012	689	0,731	605	0,671	185	0,682
2013	644	0,683	531	0,589	157	0,577
2014	603	0,639	463	0,514	131	0,481
2015	565	0,599	402	0,446	107	0,395
	Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	1006	1,067	1070	1,188		
2011	1007	1,068	1034	1,148	312	1,148
2012	1002	1,063	1009	1,120	314	1,155
2013	994	1,054	994	1,103	323	1,186
2014	984	1,043	985	1,093	337	1,238
2015	974	1,033	982	1,090	356	1,310

Table 18a above shows the predicted values of fatalities for Belgium, the Czech Republic and Finland. While table 18b below displays the predicted fatalities for Iceland, Poland and Sweden. The **observed values are mentioned in bold** while the model values for the future predictions and lower 2,5 % as well as upper 97,5 % confidence interval are not indicated in bold. The future relative fraction values are based on the latest observed values. This is done as the estimated model values (see e.g. bleu line in annex 79) for the 2000 till 2010 period were only shown on graphs in the model output. The model estimations themselves are not given, therefore the future forecasted fraction values are based on the latest observed value.

In the case of **Belgium** the predicted value for 2015 is 742 traffic deaths. The relative value 0,787 is equal to a 21,3 % reduction (3,55 % per year) and is based on the observed value of 2009 of 943 fatalities. This is 16,77 % above the objective to reduce fatalities by 37,07 % between 2009 and 2015. As shown on the graph in annex 103 and by the fraction value in table 18a, the trend is decreasing just as for al other countries. The lower 2,5% limit and upper 97,5 % limit indicate that there is chance of 95 % that there will be between 565 and 974 fatalities in 2015. The lower limit corresponds to a 40,1 % reduction, which is just better as the target value (37,07 % reduction). The upper limit lies above the 2010 observed value. Therefore one can't say with 97,5 % certainty that there will be less fatalities in 2015 as there were in 2010.

According to the LRT models prediction the **Czech Republic** would achieve over six years' time a reduction of 30,3%, which is 6,77 % above the target value. This corresponds to an average yearly reduction of 5,05 %. In case the lower 2,5 % value would be achieved only 402 fatalities would remain, this corresponds to a decrease of 55,4 %. In annex 105 the graph shows that the decreasing trend from 2000 till 2009 will be continued till 2015. The upper 97,5 % CI is set at 982 traffic deaths, 9 per cent above the 2010 level. So we aren't certain by 97,5 % there will fall less fatalities in 2015 as there were in 2010.

While for Belgium and Czech Republic data were available till 2009, for **Finland** there were data till 2010. So the objective is to achieve a 29,35 % decrease in 2015 compared to the 2010 level. In 2010 there fell 272 fatalities in Finland while according to the model this would be reduced to 196 in 2015, a 28,1 % reduction (5,62 % per year). This reduction is just 1,25 % above the target value. Finland is next to Iceland the only country wherefore the 2015 upper 97,5 % CI value of predicted fatalities in 2015 increases. This is also shown in annex 107.

Further in **Iceland** the estimated value for 2015 is thirteen fatalities instead of seventeen in 2009, see also annex 109. However the 2010 value was already exceptionally low with just eight fatalities. For 2010, no passenger kilometre data were available for Iceland otherwise the value would have been included in the model.

Polish data were available again till 2010, however due to fall of communism data were only used from 1990 on, to predict future values. A decrease of 37,9 % has been achieved between 2000 and 2010 (6294 till 3.907 fatalities). The 2010 target value of 50% that was set in 2000 wasn't achieved. On the other hand for 2015 the model predicts a decrease in Poland of 30 % (till 2.733 fatalities), this would be better as the European goal of 29,35 %. The model estimation is probably influenced by the recent strong decreases of 2009 and 2010. The 2015 upper 97,5 % CI lies above the 2010 observed value, again, we are not sure there will fall less fatalities in 2015 as there were in 2010. The decreasing trend is shown in annex 113.

Finally in **Sweden** traffic fatalities would be reduced till 210 in 2015 compared to 266 in 2010. This is a 21,1 % reduction over five years or 4,22 % per year. The lower 2,5 % limit is set at 160 fatalities, or just over 60 % compared to the 2010 observed value. The upper 97,5 % CI is 274, above the 2010 value so we are not certain by 97,5 % there will be less fatalities in 2015 as there were in 2010. Notice once more that in case no model adjustments would have been carried out for Sweden the predicted point estimation was 152 instead of 210. Also for Sweden the decreasing trend is displayed in annex 115.

TABLE 18b: Forecast fatalities in Iceland, Poland and Sweden. Observed values are mentioned in bold. The fraction values for the model predictions are based on the last available observed value.

	Fatalities Iceland		Fatalities Poland		Fatalities Sweden	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**32**	**1,000**	**6294**	**1,000**	**591**	**1,000**
2001	**24**	**0,750**	**5534**	**0,879**	**583**	**0,986**
2002	**29**	**0,906**	**5827**	**0,926**	**560**	**0,948**
2003	**23**	**0,719**	**5640**	**0,896**	**529**	**0,895**
2004	**23**	**0,719**	**5712**	**0,908**	**480**	**0,812**
2005	**19**	**0,594**	**5444**	**0,865**	**440**	**0,745**
2006	**31**	**0,969**	**5243**	**0,833**	**445**	**0,753**
2007	**15**	**0,469**	**5583**	**0,887**	**471**	**0,797**
2008	**12**	**0,375**	**5437**	**0,864**	**397**	**0,672**
2009	**17**	**0,531**	**4572**	**0,726**	**358**	**0,606**
2010	15	0,873	**3907**	**0,621**	**266**	**0,450**
2011	14	0,850	3682	0,942	253	0,951
2012	14	0,829	3417	0,875	242	0,910
2013	14	0,808	3172	0,812	230	0,865
2014	13	0,787	2944	0,754	220	0,827
2015	13	0,767	2733	0,700	210	0,789
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	9	0,521				
2011	8	0,454	3133	0,802	218	0,820
2012	7	0,398	2753	0,705	202	0,759
2013	6	0,352	2417	0,619	188	0,707
2014	5	0,313	2116	0,542	173	0,650
2015	5	0,278	1847	0,473	160	0,602
	Upper(97.50%)forecast		Upper(97.50%)forecast		Upper(97.50%)forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	25	1,461				
2011	27	1,594	4326	1,107	294	1,105
2012	29	1,723	4243	1,086	289	1,086
2013	31	1,851	4164	1,066	283	1,064
2014	34	1,980	4097	1,049	278	1,045
2015	36	2,112	4045	1,035	274	1,030

According to model predictions the strongest average yearly reduction would be achieved by Poland, 6 %. On second and third place there are Finland and Czech Republic with reductions of respectively 5,62 % and 5,05 % per year. Sweden would obtain between 2010 and 2015 average yearly reduction of 4,22 %. Finally Iceland and Belgium would obtain between 2009 and 2015 reductions of respectively 3,88% and 3,55 % per year.

The tables mentioned above gave an answer to the first sub question of all research questions: "What are the aggregated trends by 2015 for the six investigated countries?" In the tables 19a and 19b an additional effort for that research question is done, as the fatalities per billion passenger kilometres are predicted for each country. Where for tables 18a and 18b only the fraction values (reductions) could be compared in tables 19a and 19b the absolute values can also be compared.

TABLE 19a: Forecast fatalities per billion pas. km. in Belgium Czech Republic and Finland. Observed values are mentioned in bold. The fraction values for the model predictions are based on the last available observed value.

	Fatalities /billion pas. km. Belgium		Fatalities /billion pas. km. CzechRepublic		Fatalities /billion pas. km. Finland	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**12,31**	**1,000**	**20,28**	**1,000**	**6,25**	**1,000**
2001	**12,23**	**0,994**	**18,01**	**0,888**	**6,69**	**1,071**
2002	**10,91**	**0,886**	**19,09**	**0,942**	**6,29**	**1,007**
2003	**9,75**	**0,792**	**18,84**	**0,929**	**5,63**	**0,902**
2004	**9,17**	**0,745**	**18,16**	**0,896**	**5,47**	**0,876**
2005	**8,58**	**0,697**	**16,65**	**0,821**	**5,46**	**0,874**
2006	**8,35**	**0,678**	**13,43**	**0,663**	**4,80**	**0,769**
2007	**8,07**	**0,656**	**15,08**	**0,744**	**5,33**	**0,853**
2008	**7,19**	**0,584**	**13,16**	**0,649**	**4,85**	**0,776**
2009	**7,17**	**0,582**	**11,02**	**0,543**	**3,88**	**0,622**
2010	6,75	0,941	10,93	0,993	**3,76**	**0,602**
2011	6,46	0,901	10,05	0,912	3,56	0,946
2012	6,18	0,862	9,24	0,838	3,30	0,876
2013	5,91	0,824	8,49	0,770	3,05	0,811
2014	5,66	0,789	7,80	0,708	2,83	0,751
2015	5,41	0,755	7,17	0,651	2,62	0,696
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	6,22	0,868	9,60	0,871		
2011	5,84	0,815	8,62	0,782	3,03	0,804
2012	5,53	0,771	7,64	0,694	2,66	0,706
2013	5,27	0,735	6,72	0,610	2,30	0,611
2014	5,03	0,702	5,86	0,532	1,97	0,523
2015	4,83	0,674	5,07	0,461	1,66	0,442
	Upper(97.50%)forecast		Upper(97.50%)forecast		Upper(97.50%)forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	7,33	1,022	12,46	1,131		
2011	7,14	0,996	11,72	1,064	4,19	1,113
2012	6,91	0,964	11,16	1,013	4,09	1,086
2013	6,64	0,926	10,73	0,974	4,05	1,076
2014	6,36	0,887	10,39	0,943	4,06	1,080
2015	6,07	0,847	10,13	0,919	4,12	1,094

In **Belgium** the decrease in fatalities per billion passenger kilometres was 41,8 % over a period of ten years (2000 - 2009). This is plus minus six per cent stronger compared the fatality decrease of 35,9 %. Hereof we can conclude that the reduction in fatalities per billion passenger kilometres was mainly achieved by the reduction in fatalities and not by the increase in passenger kilometres. By 2015 the decreasing trend (see also annex 104) would be continued, with a point estimated reduction of once more 24,5 %. Further there is 95% chance that there will fall between 4,83 and 6,07 traffic fatalities per billion passenger kilometres in 2015.

For the **Czech Republic** the same 95 % confidence interval is 5,07 till 10,13 fatalities per billion passenger kilometres. As het upper limit for Belgium lies above the lower limit for the Czech Republic it's not shore that in 2015 there will fall more fatalities per billion passenger kilometres in the Czech Republic as in Belgium. The reduction in fatalities per billion kilometre is however stronger for the Czech Republic as for Belgium. Between 2000 and 2009, a 55,7 % decrease was achieved. According to the model a reduction of 34,9 % (5,82 % per year) between 2009 and 2015 would be achieved. The point estimation by 2015 for Czech Republic is 7,17 deaths per billion passenger kilometres, the decreasing trend is also displayed in annex 106.

In **Finland** the point estimation for 2015 is only 2,62 traffic fatalities per billion kilometres, while in 2010 the value was 3,88. A reduction of 30,4 % (6,08 % per year) would be achieved in just a five year period. The upper 97,5 % confidence interval shows a small increase in fatalities per billion passenger kilometres. As this 2015 upper limit of 4,12 fatalities per billion kilometres remains under the Belgian, Czech Republic and Polish lower limit, there will fall less fatalities according to the 95 % confidence interval in Finland compared to Belgium or Czech Republic. The Finnish trend is visualized in annex 108.

In **Iceland** the fatalities per billion passenger kilometres decreased between 2000 and 2009 from 7,53 to 3,01 (60 % reduction). From 2010 till 2015 another reduction of 37,2% (average 6,2 % per year) would be achieved. However caution should be taken when interpreting these data as the number of fatalities in Iceland is low and high variability is present. The confidence intervals for 2015 are also big (2,5 % lower limit = 0,78 and 97,5 % upper limit =4,58). The absolute value of Iceland's upper limit is 4,58, this is under the Belgian, Czech Republics and Polish lower limits of 4,83, 5,07 and 4,78. So according to 95 % confidence interval, in 2015 there will be less fatalities per billion passenger kilometres in Iceland compared to Belgium, Czech Republic and Poland. With Finland and Sweden no significant differences are measured.

For **Poland** a 50,1 % reduction in just five years (10,02 % per year) would be achieved between 2010 and 2015. This is equal to a decrease from 12,23 to 6,10 fatal traffic victims per billion passenger kilometres. Between 2000 and 2010 the reduction was 64,7%. The fact that the 2007-2010 reduction was almost as strong as the 2000–2007 reduction might influence the model results for future predictions. The 2015 Polish 2,5% lower limit of 4,78 fatalities per billion kilometre is above the Finnish, Icelands and Swedish upper limits of 4,12, 4,58 and 2,12 fatalities per billion passenger kilometre. As a consequence according to 95 % confidence interval there will fall more fatalities in Poland as in these three countries. With Belgium and Czech Republic no significant differences are measured.

Finally for **Sweden** in 2015 the estimated fatalities per billion passenger kilometres is 1,91, while in 2010 this value was 2,47. The Swedish upper limit of 2,12 in 2015 is below the Belgian, Czech Republic and Polish lower limits of 4,83, 5,07 and 4,78. According to 95% confidence interval there will be less fatalities in 2015 in Sweden compared to the three other countries. While with Finland and Iceland no significant differences are measured.

It’s once more worth to mention all predicted average annual reductions of the six countries. Poland 10,02 %, Iceland, 6,02 % Finland 6,08 % Sweden 4,54 %, Czech Republic 5,82 % and Belgium 4,08 %.

The strongest reduction between 2009/2010 and 2015 is predicted for Poland while the weakest for Belgium. This is the case for fatalities as well as fatalities per billion passenger kilometres. Above an answer is given to the first research question, plus the link to the European targets has been made.

TABLE 19b: Forecast fatalities per billion passenger km. in Iceland, Poland and Sweden. Observed values are mentioned in bold. The fraction values for the model predictions are based on the last available observed value.

	Fatalities Iceland		Fatalities Poland		Fatalities Sweden	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**7,53**	**1,000**	**34,69**	**1,000**	**5,83**	**1,000**
2001	**5,38**	**0,715**	**29,33**	**0,845**	**5,72**	**0,981**
2002	**6,33**	**0,840**	**29,62**	**0,854**	**5,35**	**0,918**
2003	**4,88**	**0,648**	**27,87**	**0,803**	**5,02**	**0,861**
2004	**4,74**	**0,629**	**26,99**	**0,778**	**4,53**	**0,777**
2005	**3,69**	**0,490**	**24,02**	**0,693**	**4,15**	**0,712**
2006	**5,68**	**0,755**	**21,19**	**0,611**	**4,21**	**0,722**
2007	**2,62**	**0,348**	**20,94**	**0,604**	**4,36**	**0,748**
2008	**2,15**	**0,285**	**18,11**	**0,522**	**3,71**	**0,636**
2009	**3,01**	**0,400**	**14,78**	**0,426**	**3,32**	**0,569**
2010	2,53	0,840	**12,23**	**0,353**	**2,47**	**0,424**
2011	2,39	0,793	10,78	0,881	2,34	0,947
2012	2,25	0,748	9,35	0,764	2,22	0,899
2013	2,13	0,706	8,11	0,663	2,11	0,854
2014	2,00	0,666	7,03	0,575	2,01	0,814
2015	1,89	0,628	6,10	0,499	1,91	0,773
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	1,60	0,530				
2011	1,37	0,454	9,65	0,789	2,08	0,842
2012	1,18	0,393	8,12	0,664	1,98	0,802
2013	1,03	0,341	6,82	0,558	1,88	0,761
2014	0,89	0,297	5,72	0,468	1,79	0,725
2015	0,78	0,259	4,78	0,391	1,71	0,692
	Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	4,02	1,333				
2011	4,17	1,384	12,04	0,984	2,63	1,065
2012	4,29	1,425	10,75	0,879	2,5	1,012
2013	4,40	1,461	9,63	0,787	2,37	0,960
2014	4,49	1,493	8,64	0,707	2,25	0,911
2015	4,58	1,522	7,77	0,636	2,12	0,858

An additional analysis was carried out for Iceland. All fatalities and passenger kilometres were aggregated over three years in order to reduce data variability, this goal was not really achieved, although it wasn’t measured objectively.

The predicted number of fatalities for the three year aggregation 2013-2015 would be 32 (point estimation). The upper 97,5 % confidence interval value is 57 and the 2,5 % lower value is 18 (all aggregated over three years). The sum of fatalities for the single year model predictions of 2013, 2014 and 2015 is 40. So according to the three year aggregated model a stronger reduction in fatalities would be achieved compared single year aggregated model.

For the fatalities per billion passenger kilometres the estimated value is 1,57 (Lower 2,5% CI: 0,96 ; Upper 97,5% CI: 2,57). The average of the single year models prediction is 2,01 $[(2{,}13 + 2{,}00 + 1{,}89) \div 3]$. So for both the fatalities and the fatalities per billion passenger kilometre the single year model predictions predict higher values compared to the three years aggregated prediction.

TABLE 20: Forecast fatalities (billion passenger kilometre) Iceland (3 year aggregated)

	Fatalities (3 years)		Fatalities/billion pas.km (3 years)	
1989-91	**79**	**1,000**	**8,51**	**1,000**
1992-94	**50**	**0,633**	**4,95**	**0,582**
1995-97	**49**	**0,620**	**4,51**	**0,530**
1998-00	**80**	**1,013**	**6,55**	**0,769**
2001-03	**76**	**0,962**	**5,53**	**0,649**
2004-06	**73**	**0,924**	**4,72**	**0,555**
2007-09	**44**	**0,557**	**2,59**	**0,305**
2010-12	41	0,924	2,19	0,843
2013-15	32	0,728	1,57	0,606
	Lower (2.50%) forecast		Lower (2.50%) forecast	
2010-12	28,24	0,642	1,59	0,612
2013-15	17,87	0,406	0,96	0,371
	Upper (97.50%) forecast		Upper (97.50%) forecast	
2010-12	58,53	1,330	3,02	1,379
2013-15	57,38	1,304	2,57	1,174

Till here the results of the aggregated analyses are discussed. Below there will be continued with the disaggregated analyses. For the disaggregated analyses just as in chapter three, only tables are added in the annexes and results are discussed in the text. While for the aggregated analyses tables were added in the text and graphs in the annexes.

As already mentioned in subchapter 4.2.3 for the disaggregated analyses only the fatality residuals were corrected and only the predicted fatalities will be discussed in the next subchapters. When attempt to correct residue values of inhabitants or vehicles it often didn’t help. Further another problem was that when corrections were added in function of independency, heteroscedasticity or normality for the inhabitants or vehicles automatically the corrections were also applied on the fatality risk component. This usually had negative consequences on the model quality for the fatality component. The fatalities per 100.000 inhabitants or passenger kilometre won’t be discussed. Unfortunately this has the consequence that only fraction values and no absolute values can be compared. Even when comparing fraction values, (percentage decreases) caution should be taken, as it’s more difficult the reduce fatalities when the number of deaths per 100.000 inhabitants or vehicles is already low. In annex 117 an overview is given of all problems experienced with residue values after the first model run.

4.4 Results of the disaggregated analyses, age class

As data were available for six different age classes, for those six different age classes predictions were made (<15 ; 15-17 ; 18-24 ; 25-49 ; 50-64 ; >64). Again for each age class the goal should be to reduce fatalities by 29,35 % in 2015 compared to the 2010 level or by 37,07 % in 2015 compared to the 2009 level. Important remark is that it should be easier to achieve stronger reductions for those age classes that didn't obtain strong reductions the past years, due to the phenomenon of "quick wins". Further it should be mentioned that the model estimations for those years were observed data are available were only given as output in graphs, the absolute values itself were not given (see e.g. bleu line in annex 79). Therefore the latest observed value is used as basis to calculate the fraction values of the forecasted values.

4.4.1 Results disaggregated age class analyses, Belgium

In annex 118 the Belgian results for the fatality forecasts are shown. The two youngest age classes recorded less than 100 fatalities in the last observed year (2010). Due to low values high variability is present in these data.

For the **youngest age class** e.g. there fell 52 deaths in 2000 and 23 in 2010, however the highest number was registered in 2001 (63 or 21% increase compared to 2000) and the lowest in 2009 (16 deaths 31 % compared to 2000). With a 56 % reduction the European target of 50 % has been achieved between 2000 and 2010. In the future another strong reduction of 53 % (from 23 to 11) would be achieved between 2010 and 2015, this is according to the point estimation. The lower 2,5 % forecast predicts a 74 % reduction till 6 fatalities, while the upper 97,5 % forecast predicts only a 9 % reduction till 21 deaths. It's 97,5 % sure there will fall less fatalities in 2015 compared to 2010 as the upper 97,5 % CI lies under the observed value of 2010.

Also the **age category 15 till 17** is subjected to low absolute values, 55 deaths fell in 2000 and 21 in 2010. This is a 62 % reduction and the European target of 50 % was achieved. Remarkable is that according to the point estimation a small increase is predicted till 25 fatalities in 2015. The lower 2,5 % CI predicts 15 fatalities in 2015 while the upper 97,5% CI predicts a strong increase till 42 deaths. Again the CI are wide, probably due to low absolute values.

In 2000 there fell 328 deaths in the **age class 18 till 24**, while in 2010 there were only 171 fatalities. This is equal to a 48 % reduction, however in 2009 only 147 fatalities fell, which is 55 % under the 2000 level. The European target has been plus minus achieved. For the future the model predicts a reduction of only 20 %, till 137 fatalities based on the 2010 observed value. This is about 10 % above the target value of 121. The lower 2,5 %

CI predicts a reduction till 87 deaths (49 % reduction in 5 years) and the upper 97,5 % CI predicts an increase with 26 % till 215 fatalities.

The **25 till 49 years old age class** registered 608 fatalities in 2000 and 343 in 2010. With a 44 % reduction the European target to reduce fatalities by 50 % was almost achieved. The point estimation for 2015 is 257 fatalities. This is 25 % reduction compared to the 343 deaths that fell in 2010. As a consequence the 29,35 % reduction would not be achieved for this age class. The lower 2,5 % CI prediction for 2015 is 171 deaths (minus 50 % in five years time) and the upper 97,5 % CI is set at 387 traffic fatalities by 2015, a 13 % rise.

For the age class between **50 and 64 years** old a reduction of 30 % (from 176 to 124 fatalities) has been achieved over the time period 2000 till 2010. The highest recorded fatality number was in 1991, 192 deaths. The last few years the observed fatality number went a bit up and down therefore the prediction by 2015 is that the traffic fatalities for this age class would remain plus minus stable. There would be a reduction of only 5 % over 5 years, from 124 to 118. The lower 2,5 % CI in 2015 is 98 traffic fatalities, a 21 % decrease compared to the 2010 observed value. The upper 97,5 % CI in 2015 is 143 traffic deaths, this is equal to a 15 % increase. Two interventions were carried out for this age class. They were inserted one by one, the first intervention inserted in the risk level of 1993 didn’t remove all independency problems. Therefore a second intervention was inserted into the level state equation for the risk component in the year 1999. Without these intervention the models point prediction for 2015 was 123 fatalities instead of 118. (Lower 2,5 % CI: 108 ; upper 97,5 % CI: 139).

Finally the **oldest age class** registered a decrease between 2000 and 2010 of 36 % fatalities, 14 % under the European goal. The absolute decrease was from 238 to 153 traffic fatalities, while the registered value was the highest in 1991 with 264 traffic deaths. By 2015 the traffic fatalities would once more decrease by 22 % to an absolute level of 135. The lower 2,5 % CI predicts 79 fatalities (29 % reduction), while the upper 97,5 % forecast predicts an increase till 166 fatalities (9 % above 2010 value). One intervention of the year 1991 was skipped out of the fatality data as it lay far above the other values, see also annex 35. Initially without the sipped observation the prediction for 2015 was 130 fatalities with a lower 2,5 % CI of 107 and an upper 97,5 % CI of 158.

It’s valuable to mention the average yearly reductions for all Belgian age classes. This based to the point estimation for 2015 and the observed value of 2010. For youngest age class the average yearly reduction would be 10,5 %. The only class with a rise in the point estimation is the one from 15 till 17 years old, the average annual increase in fatalities would be 3,94 %. However the two youngest age classes age subjected to extreme low values so caution should be taken when interpreting these data. The 18-24 years old age class would record an average decrease of 4 % traffic fatalities between 2010 and 2015. The age class 25-49 would obtain a strong reduction of 5 % per year. The 50-64 years old age class on the other hand would only achieve a reduction of minus 0,9 % on average per year. Finally the oldest age class would obtain a reduction of 2,4% on average per year.

If the upper 97,5 % CI lies under the observed value for 2010, one can be sure for 97,5% that there will fall less fatalities in 2015 as in 2010. This is only the case for the youngest age class. For all other age classes the upper 97,5 % CI lies above the 2010 observed value. As the youngest age class recorded traffic fatalities is subjected to low values and high fluctuations, also for this age class the decrease is uncertain.

Below there will be continued with the prediction of fatalities in Czech Republic according to the age classes. In 0 two overview tables are shown of the (average annual) reductions by age class for all age classes and countries between 2010 and 2015.

4.4.2 Results disaggregated age class analyses, Czech Republic

In the case of Czech Republic again predictions for the six age classes were carried out and no predictions were made for the fatalities per 100.000 inhabitants. The results are shown in annex 119. Again for the two youngest age classes extreme low absolute values were measured and predicted, caution should be taken interpreting these fraction values.

The youngest age class **under 15** achieved a reduction of 69 %, this in a time period of only eleven years. In 2000 there still fell 54 death children, while in 2010 there died only 17. The point estimation of the model predicts this number would reduce to only six traffic deaths by 2015 (62 % reduction). However due to the low values it might be realistic to think the value would stagnate. According to lower 2,5 % CI it would even reduce to four deaths and according to upper 97,5 % CI it would reduce to ten fatalities.

For the age class **15 till 17** the traffic fatalities reduced from 44 in 2000 till only 17 in 2010. In 2008 and 2009 there even were respectively 14 and 13 fatalities. Contrary to the youngest age class according the model predicts the fatalities would stabilize around the latest observed value, 16 fatalities would die in 2015 (a 5 % reduction as far is it is worth indicating this percentage value). The prediction for the lower 2,5 % CI is 10 fatalities, while the prediction for the upper 2,5 % CI is 25 traffic deaths.

For the other four age classes higher values were measured so the relative decreases make more sense. For the age class **18 till 24**, a reduction of 52 % was recorded between 2000 and 2010 (from 258 traffic fatalities to 125). The European target to reduce fatalities by 50 % was met by this age class. By 2015 another 35 % reduction would be achieved according to the model (81 traffic fatalities in 2015, 125 in 2010). According to the lower 2,5 % forecast CI a reduction of 62 % would be achieved, till 48 deaths. According to the upper 97,5 % CI there would be a small increase till 138 fatalities, this is equal to an 11 % increase.

In the age class **25 till 49**, a 45 % reduction was achieved between 2000 and 2010, from 595 to 329 traffic fatalities. Besides the oldest age class this is the only one who didn't meet the European goal to reduce traffic fatalities by 50 %. Also to the 2015 goal to reduce traffic fatalities by 29,35 % would just not be achieved according to the model prediction, the prediction is a reduction of 28 % or from 329 to 237 deaths. The 2015 lower 2,5 % CI is set at 159 fatalities, a 52 % reduction compared to 2010. The 2015 upper 97,5 % CI is set at 355 fatalities, an 8 % increase compared to 2010.

The age class **50 till 64** just achieved the European target to reduce fatalities by 50%, where there still fell 286 deaths in 2000 in 2010 it was reduced to 142. However between 2007 and 2010 the strongest reduction of 30 % was achieved. This might explain the strong decrease for 2015 according to the models prediction, 58 % till only 59 traffic fatalities. The lower 2,5 % forecast is set at 34 traffic fatalities, a 76 % decrease and the upper 97,5 % forecast is set at 104 fatalities, a 26 % decrease.

Finally the **oldest age class** registered a decrease in traffic fatalities from 243 in 2000 to 172 in 2010. The highest recorded value was 247 in 2004 and the lowest 167 in 2009. According to the model point estimation in 2015 there would still fall 118 fatalities (32 % reduction). The European target of 29,35 % would just be obtained. The lower 2,5 % CI forecast value is 101 (41 % reduction), while the upper 97,5 % forecast is 137 fatalities in 2015 (20 %) reduction. On e intervention was inserted in the exposure level state equation for the year 2002, this intervention also has an influence on the fatalities and after the intervention the fatality component residuals were fine. The first model run recorded the same model predictions for 2015, for the point estimation as well as the lower and upper CI.

Again as it was mentioned for Belgium, in the cases where the upper 97,5 % CI lies under the 2010 observed value there is 97,5 % chance that the 2015 value will be under the 2010 observed value. For the Czech Republic this is the case for the youngest age class and the two oldest ones, however for the youngest one this is again uncertain due to low fatality values with high variability.

As was done for Belgium it's worth to mention the average yearly decreases between 2010 and 2015, they are also indicated in 0. For the age class under 15 years old this was -12,38 % while for the 15 till 17 years old age class this would be only -0,9 % per year. For the adolescents between 18 and 24 the average yearly decrease in fatalities would be 7,02% and for the 25 till 49 years old age class. Finally the two oldest age classes (50-64 and >64) would achieve reductions of 11,62 % and 6,31 % on average per year.

4.4.3 Results disaggregated age class analyses, Finland

The Finnish age class model predictions are shown in annex 120. In this case not only the observed 2010 fatalities of the two youngest age classes registered low values, but all age classes did. Not one age class recorded more than 100 traffic fatalities in 2010. Therefore for some age classes only absolute values will be mentioned in the text, however the total and average annual decreases between 2010 and 2015 are mentioned in 0

The age class covering the children **under 15** recorded a decrease from 20 to 7 fatalities between 2000 and 2010. The highest value, 22 was registered in 2003, the lowest 5, in 2006. This immediately indicates that this age class is subjected to high fluctuations. According to model predictions the fatality number would remain constant at seven. The lower 2,5 % CI is set at four and the upper 97,5 % forecast at ten. The years 1998 and 2006 were excluded from the analysis after independency problems, this by using the following command, "*FinlandFAT15 [8] <- NA*" and "*FinlandFAT15 [8] <- NA*" Without the intervention the prediction of the 2015 fatalities would be six, with lower 2,5 % CI of four and upper 97,5 % CI of nine.

For the age **class 15-17** there fell 16 fatalities in 2000 and 13 in 2010. The highest measured value was 26 in 2008 and the lowest 12 in 2003. The predicted fatalities would be constant at 20 or 21 fatalities per year, for 2011 till 2015. The confidence interval is rather wide, with the lower 2,5 % CI that is set at eight fatalities in 2015 and the upper 97,5 % CI at 50 fatalities in 2015. This last value is rather unrealistic.

Also the age class **18 till 24** is subjected to high fluctuations in fatalities. The 2000 value was 51 and the 2010 value 48. The European target to reduce fatalities by 50 % is definitely not achieved. The highest recorded fatality number during those eleven years was 75 in 2007, the lowest was the one of 2010. The model predicts a slight decrease by 2015 to 38 fatalities. The lower 2,5 % CI according to the model prediction is 28 fatalities in 2015 and the upper 97,5 % CI is 51 fatalities. Due to independency problems a correction was added, the 1991 was considered as not available just as was done for the age class under 15 years old. The initial model prediction of fatalities by 2015 was 44 traffic deaths, with a lower 2,5 % CI of 23 and an upper 97,5 % CI of 87.

For the age class **25 till 49** has more value to add percentages compared to the previous categories. In 2000, 132 people died within this age group, while in 2010 there only fell

93. This is a reduction of 30 %, still 20 % under the European target to reduce fatalities by 50 %. The highest recorded number of fatalities was 140 in 2005 and the lowest 84 in 2009. The model predicts for 2015 a decrease to 64 fatalities, this is the equivalent of 31%, the target value of 29,35 % is just met according to this point estimation. The lower 2,5 % CI prediction predicts a value of 45 and the upper 97,5 % CI a value of 91. The former is a decrease of 51 % while the latter a decrease 2 %.

The second oldest Finnish age class from **50 years till 64** years registered a decrease from 71 traffic deaths in 2000 to 47 in 2010. The highest value was recorded in 2003 (79 fatalities) the lowest in 2009 (46 fatalities). The model predicts the decrease will continue and by 2015 there would be 35 traffic fatalities left in this age class, 26 % under the 2010 observed value. The European target of 29,35 % wouldn't be achieved. The lower 2,5 % CI is predicted to be 21 (minus 55 %) deaths and the upper 97,5 % 58 (plus 24%).

Finally the **oldest age class** existing of people of 65 year and older also recorded a decrease in traffic deaths between 2000 and 2010, from 106 to 64 traffic fatalities. Fluctuations in in between those years occurred but not above the 2000 fatality number or under the one of 2010. For 2015 a slight decrease is predicted till 53 fatalities, this is equal to a 17 % reduction according to the point estimation. The upper 97,5 % CI value is 73 (plus 14 %) and the lower 2,5 % CI is 39 (minus 39 %).

Again as for Belgium and the Czech Republic, for those age classes where the 97,5 % CI remains under the observed value of 2010 a reduction would be achieved by a certainty of 97,5 %. This would only be achieved by the age class from 25 till 49 years old. The upper 97,5 % CI of the other age classes lie above the 2010 observed value.

Again as for Belgium and the Czech Republic, the Finnish total and yearly average percentage reductions are mentioned in 0. Below there will be continued with the description of the Polish results according to age class.

4.4.4 Results disaggregated age class analyses, Poland

The results of the Polish predictions are displayed in annex 121. As in 2010 for all six age classes there were more as 100 fatalities observed, so it's worth to mention the percentages.

The Polish **youngest age class** obtained a reduction of 58 % traffic deaths between 2000 and 2010. The European target was met and the recorded absolute values were 267 in 2000 and 112 in 2010. The model point estimation predicts, by 2015 the fatalities would be reduced further with 44 %, till an absolute value of 63. According to the lower

2,5 % CI a reduction of 56 % till 44 fatalities would be achieved and according to the upper 97,5 % confidence interval the reduction would be only 29 % till 80 fatalities.

The age class **15 till 17** achieved a reduction of just over 50 % between 2000 and 2010, from 245 till 122 traffic deaths. The lowest value has been registered in 2009, 120 traffic fatalities. The European target to reduce fatalities by fifty per cent was just met by this age class. For the remaining four Polish age categories still to discuss below, the fifty per cent target wasn't achieved. The model predicts a decrease of once more 49 % by 2015 for this age class, from 122 till 62 fatalities. As half the reduction between 2000 and 2010 had been achieved between 2007 and 2010 this might have an influence on the model predictions. However one might not know whether from 2011 on the same reductions could be achieved. The CI are wide, only 14 fatalities (88 % reduction) according to the lower 2,5 % CI and 269 fatalities according to the upper 97,5 % CI (increase by factor 2,69).

The age class **18 till 24** still counted 1.026 traffic deaths in 2000, while in 2000 the number was reduced to 677, a 34 % reduction over an eleven year period. The class failed to meet the European target of 513 fatalities for this age class. In the 2000 till 2004 period the average yearly reduction was 4,36 % and from 2004 till 2010 the average yearly reduction was 2,83 %. So it's not the case that additional efforts were made starting from 2004 on when the country joined the E.U. The models point estimation predicts that 494 traffic deaths would fall in 2015, a 27 % reduction, the European target of 29,35 wouldn't be achieved. The lower 2,5 % CI value is set at 295 fatalities (56 % decrease) and the upper 97,5 % CI value is set at 828 (22 % increase compared to the 2010 observed value).

The fourth age class (from **25 till 49** years old) still recorded 2.654 traffic fatalities in 2000, while the number was reduced to 1.419 in 2010, a 47 % reduction. Between 2000 and 2004 a 15 % (3,81 % per year) reduction was achieved and between 2004 and 2010 a 32 % (5,22 % per year) reduction was achieved. Contrary to the previous age class this one achieved a weaker reduction before the E.U. membership and a stronger during the E.U membership. According to the models point prediction in 2015 there would fall 792 fatalities, a 44 % reduction compared to 2010. The lower 2,5 % CI value is set at 453 fatalities, this is a 68 % reduction compared to the traffic fatalities that fell in 2010. The upper 97,5 % CI is set at 1.384 fatalities, which is just under the 2010 observed value.

In the **50 till 64 years old age class** a reduction of 21 % has been achieved. However rather high variability in the data are present. In 2000 there fell 1.097 and in 2004, 1.104, while in the three years in between the recorded value was plus minus 950. The highest values were recorded in 2007 and 2008 with respectively 1.140 and 1.163 fatalities. However in the most recent years, 2009 and 2010 the traffic deaths decreased to 970 and 871 deaths. Therefore the models also predicts a rather strong reduction till 366 fatalities, a 58 % decrease compared to 2010. However the lower and upper CI take into account the fluctuations of the past years. As the consequence the lower 2,5 % CI is set at only 108 traffic fatalities, while the upper is set at 1.241, both are rather unrealistic.

Finally for the **oldest age class** a decrease from 965 to 674 traffic deaths was registered between 2000 and 2010. This is the equivalent of a decrease of 32 %. The average annual decrease from 2000 till 2004 was only 0,75 % while from 2004 till 2010 (when Poland joined the E.U.) it was 4,87 %. So of the four oldest age classes who didn't achieve the European target (a 50 % reduction in 2010 compared to 2000), only the 18 till 24 years old class recorded a stronger decrease in the years before Poland joined the E.U. compared with the years after. By 2015 the models point estimation predicts a further decrease till 445 traffic deaths. This is minus 34 % compared to the 2010 observed value. By this decrease the European target (minus 29,45 %) would be met. The lower 2,5 % CI is set at 272 traffic fatalities (minus 60 % compared to 2010) and the upper 97,5 % CI is set at 731 fatalities (eight per cent above the 2010 value).

For not one Polish age class an increase has been predicted and the average annual percentage reductions for the six age classes were the following ones. Under 15; 8,78 % decrease, between 15 and 17; 9,87 % decrease, between 18 and 24; 5,39 % decrease, between 25 and 49; 8,84 % decrease, between 50 and 64; 11,6 % decrease and finally for the age class over 64 an average decrease of 6,78 % per year has been registered.

For the age classes where the predicted upper 97,5 % CI lies under the observed value of 2010, there is 97,5 % chance that there will be less fatalities in 2015 compared to 2010. This is the case to the youngest age class and for the age class from 25 till 49 years old.

4.4.5 Results disaggregated age class analyses, Sweden

In annex 122 the forecasted fatalities for Sweden by 2015 are shown. A remark to be made is that the latest available data point for Sweden was 2009 instead of 2010, so the values for 2010 are predicted values. The only age class that recorded at least 100 traffic fatalities in 2010 was the one between 25 and 49 years old. Also for the two oldest age classes it's worth to mention percentage values. However for the three youngest age classes, the absolute values are so low that percentage values are rather useless.

The **youngest age class** recorded 19 fatalities in 2000 and 9 in 2010. The highest number in between was registered in 2003, 21 traffic deaths. The lowest was registered in 2008, six traffic deaths. The model forecast for 2015 is that the number would decrease again over five years from nine to six. The lower 2,5 % CI is set at four fatalities while the upper 97,5 % CI at ten fatalities in 2015.
On the one hand everybody knows that in the future there will fall at least some traffic fatalities and it will be difficult to remove all of them. On the other hand every fatal traffic victim is one too much and governments and societies should really aim to achieve zero fatalities. Certainly when the fatal victims are young and a lot life years with economical productivity and personal pleasure were still to come.

The **age class 15-17** recorded 16 traffic fatalities in 2000 and 25 in 2010. The 2010 value was the highest one, the one for 2009 was the lowest, 13 deaths. The European target value (50 % reduction) was achieved by the youngest age class, the target value wasn't achieved by this age class. However it should be mentioned again that the absolute values are low. For 2011 the model predicted 20 traffic deaths and this would continue to decrease till 15 in 2015. The lower 2,5 % CI for 2015 is eight traffic fatalities while the upper 97,5 % CI is 26.

The third youngest age class from **18 till 24** years, still had 102 fatalities in 2000, while in 2010 there only fell 60 traffic deaths. A decrease of 41 %, the European target was to reduce fatalities between 2000 and 2009, by 45,93 % ($[(54.000 - 29.200) / 54.000] * 100$) This is also shown on figure 2. Although the fluctuations in the data aren't that big, the confidence intervals are extremely wide. The lower 2,5 % CI is only five fatalities (91 % reduction), while the upper 97,5% CI records 153 traffic deaths (153 % increase), this by 2015. Both values are unrealistic. The point estimation is a bit more realistic, as it predicts that there would fall 28 fatalities in 2015, however this still would correspond to a rather strong reduction of 53 % over six years, while the European target is the reduce fatalities between 2009 and 2015 with 37,07 %.

The third oldest age class from **25 till 49** years old recorded 202 traffic fatalities in 2000 while this number was reduced to 100 in 2010. A reduction of 50 % while the European target for between 2000 and 2009 was to achieve a reduction of 45,93 %. According to the models future point estimation this number would be reduced to 60, which is minus 40 % over six years time, the European target of a 37,07 % reduction would be achieved. The 2,5 % CI indicates that there would only fall 32 deaths (68 % reduction compared to 2010) while the upper 97,5 % CI predicts an increase of eleven deaths (11% above the 2010 value).

Further the age class **50 till 64** registered 98 traffic deaths in 2000 and 72 in 2009. The highest value was 108 in 2001 and the lowest one 70 in 2008. By 2015 the decrease would continue, as the models point estimation predicts 50 fatalities, which is equal to a decrease of 31 % over six years. The European target is to reduce fatalities by 37,07 % between 2009 and 2015. The 2,5 % lower CI is 37 fatalities (48 % decrease), while the upper 97,5 % forecast is 67 traffic deaths by 2015 (7 % decrease).

Finally for the **oldest age class** there fell 154 traffic fatalities in 2000 and 92 in 2009. Fluctuations were present between 2000 and 2010, but no higher or lower values were recorded. The reduction is equal to 40 % which was insufficient to reach the target value of 45,93 %. By 2015 the decrease would continue and there would only fall 56 traffic deaths according to the models point estimation. This reduction of 39 % is just sufficient to reach the target value of 37,07 % between 2009 and 2015. By 2015 the lower 2,5 % CI is set at 48 fatalities (48 % decrease), while the upper 97,5 % CI is set at 65 fatalities (30 % decrease). The confidence interval is rather small for this age class.

The age classes where the upper 97,5 % CI in 2015 lies under the 2010 observed value are the two oldest ones. For the four youngest age classes the upper 97,5 % CI lies above the 2010 observed value.
The weakest decrease per year is for the youngest age class, (-5,14 %). The second weakest reduction would be for the age class 25-49, -6,73 % on average per year. These two wouldn't achieve the target of a total reduction of 37,07 % between 2009 and 2015, this is also shown in table 22. The four other age classes 15-17, 18-24, 50-64 and over 64, would achieve reductions of respectively 6,81 %, 8,8 %, 6,73 % and 6,58 % per year, enough to reach the reduction of 37,078 % between 2009 and 2015.
In subchapter 0 the average yearly reduction and the total reduction in traffic fatalities between 2010 or 2009 and 2015 are once more mentioned. This is done for all age classes and all five countries.

4.4.6 Overview of average annual and total decreases

Table 21 gives the overview of the average annual decrease/increase in traffic fatalities for all six age classes and all five countries. Remind that these values are not in function of a certain exposure measure.

TABLE 21: Average yearly reduction in fatalities by age class in percentage between 2010 and 2015 (2009 for Sweden).

Age class / country	<15	15-17	18-24	25-49	50-64	>64
Belgium	~~**-10,5 %**~~	~~+ 3,94 %~~	- 4 %	- 5,01 %	- 0,92 %	- 2,4 %
Czech Rep	~~**-12,38 %**~~	~~- 0,97 %~~	**- 7,02 %**	- 5,57 %	**-11,62 %**	**- 6,31 %**
Finland	~~-0,99 %~~	~~+11,66 %~~	~~- 4,28 %~~	~~**- 6,15 %**~~	~~- 5,15 %~~	~~- 3,33 %~~
Poland	**- 8,78 %**	**- 9,87 %**	- 5,39 %	**- 8,83 %**	**- 11,6 %**	**- 6,78 %**
Sweden	~~- 5,14 %~~	~~**-6,81 %**~~	~~**- 8,8 %**~~	**- 6,73 %**	~~- 5,09 %~~	~~**- 6,58 %**~~

Legend: ~~Classes subjected to low values (2010 observed value under 100 fatalities)~~

Classes that would achieve the 2015 target compared to 2010

* Swedish reductions are based on the observed fatalities of 2009 instead of 2010, therefore reductions in 2015 of 37,07 % instead of 29,35 % should be achieved.

Further table 22 gives once more an overview of the total percentage reductions of all six age classes and all five countries.

TABLE 22: Total reductions in percentages for age class between 2010 and 2015 (2009 for Sweden)

Age class / country	<15	15-17	18-24	25-49	50-64	>64
Belgium	~~**- 53 %**~~	~~+ 20%~~	- 20 %	- 25 %	- 5 %	- 22 %
Czech Rep	~~**- 62 %**~~	~~- 5 %~~	**- 35 %**	- 28 %	**- 58 %**	**- 32 %**
Finland	~~- 5 %~~	~~+ 58 %~~	~~- 21 %~~	~~**- 31 %**~~	~~- 26 %~~	~~- 17 %~~
Poland	**- 44 %**	**- 49 %**	- 27 %	**- 44 %**	**- 58 %**	**- 34 %**
Sweden	~~- 31 %*~~	~~**- 41 %**~~	~~**- 53 %**~~	**- 40 %**	~~- 31 %*~~	~~**- 39 %**~~

Legend: ~~Classes subjected to low values (2010 observed value under 100 fatalities)~~

Classes that would achieve the 2015 target compared to 2010

* Swedish reduction are based on the observed fatalities of 2009 instead of 2010, therefore reductions in 2015 of 37,07 % instead of 29,35 % should be achieved.

The tables above and subchapter 4.4 as a whole, give an answer to research question 2a, "*Which age categor(y)(ies) will contain the most/least traffic fatalities by 2015 (absolute)?*". However research question 2b couldn't be answered as no inhabitant evolutions were predicted "*Which age categor(y)(ies) will contain the most/least traffic fatalities by 2015 per 100.000 inhabitants (relative)?*".

In subchapter 4.5 the predicted fatalities according the gender class for the five countries are discussed. Again as for the disaggregated age class discussion only the residue values of the fatalities were corrected.

4.5 Results of disaggregated analyses gender

The results of the disaggregated analyses by gender are shown in annex 123 and 124. Unfortunately for those years where observed values are available, the estimated model values are only shown on a graph (see e.g. the blue line again at annex 93). So only the observed values are available and not the model values for 1991 till 2010. Therefore the latest observed value is used as basis to calculate the fraction values of the forecasted years.

As there are plus minus as much males as females it's also possible to compare the absolute values with one another (not between different countries). There has been chosen to predict male and female data of one country at once. In function of the comparison it's better than discussing first all predicted male data and afterwards discussing all predicted female data or visa versa. Again the observed values are mentioned from 2000 onwards as the European target value to reduce fatalities with 50% by 2010 was set in 2000. Data for Sweden are only available till 2009.

4.5.1 Results disaggregated gender classes

In **Belgium** the registered fatalities in 2000 where 1.102 for males and 367 for females, while in 2010 these numbers were decreased to 629 and 203. For the male class no higher or lower values in between were recorded, while for females there fell 384 deaths in 2001. The relative decreases were 43 % for males and 45 % for females. Both of them didn't achieve the European target to reduce fatalities by 50 % during that eleven year period.

The forecasted value according to the point estimation by 2015 is 461 traffic fatalities for males and 150 for females. This corresponds to total decreases between 2010 and 2015 of 27 % and 26 %. So were between 2000 and 2010 there still was a little stronger decrease in traffic deaths for females, the model predicts a stronger reduction for males in the future. For males the lower 2,5 % CI is 378, or 40 % below the registered 2010 fatalities. The upper 97,5 % CI is set at 562 traffic fatalities or a decrease by 11 %. For females the lower 2,5 % CI is estimated to be 103 by 2015, while the upper 97,5 % CI is estimated at a value of 219, an eight per cent increase compared to the 2010 observed value. The male 97,5 % CI value lies under the 2010 observed value, so there is 97,5 % certainty there will be less male fatalities in 2015 as there were in 2010. However the female upper 97,5 % CI value lies above the 2010 observed value, so there is no certainty whether there will be less female fatalities in Belgium by 2015 as in 2010. In 2010 there died 3,1 males for each female and by 2015 this would reduce slightly to 3,07. The absolute decrease would be 168 for males and 53 for females.

For the **Czech Republic** the recorded traffic fatality number for males and females in 2000 were 1.118 and 368. In 2010 the there still fell 607 male fatalities and 177 female fatalities. For females no higher or lower values were measured in between. For males however there fell 1.122 traffic deaths in 2003. For males the reduction between 2000 till 2010 is 46 % while for females the reduction was 52 %. So while Czech females met the target, Czech males didn't. As the absolute value for males lies higher the 50 % target value wasn't achieved for the whole country.
By 2015 according to the model point estimation, there would still remain male 460 fatalities and 126 female fatalities. For males this would be a reduction of 24 % while for females this corresponds to a reduction of 29 % between 2010 and 2015. For males the lower 2,5 % CI is estimated to be 309 fatalities, a 49 % decrease and the upper 97,5% CI is estimated to be 686, a 13 % increase. For females the lower 2,5 % CI is estimated at 91 fatalities (49 % decrease) while the upper 97,5 % CI is set at 175 . For females the 97,5 % upper CI remains just under the 2010 measured value (so it's 97,5 % sure there will fall less female traffic fatalities in the Czech republic by 2015 as there were in 2010). On the other hand for males the upper 97,5 % CI lies above the 2010 observed value.

In 2010 3,43 males for each female died in traffic, while in 2015 according to the models point estimation this would increase to 3,65. The absolute decreases are 147 for males and 51 for females. For both males and females the residues were corrected. For males an intervention was inserted in the level state equation for the year 2003 and independency problems were removed. For females the normality problems were removed after considering the 2006 fatality value as "not available".

In **Finland** there fell 263 males and 133 females on the roads in 2000. In 2010 these numbers were reduced to 204 and 68. For males the highest recorded value was 303 in 2003 and for females 137 in 2001. For the Finnish males the fatalities remained plus minus stable (still 265 fatalities in 2008) however the last two available time points (2009 and 2010) decreases were recorded of 21 % and 22 % compared to 2000. Also for females there still fell 101 deaths in 2007. So the decreases 22 % by males and 49 % by females for the 2010 observed values compared to the 2000 observed values were not achieved even over all eleven years.

In the future the model point estimations predict 148 male and 40 female traffic fatalities. These are reductions of respectively 28 % and 41 % compared to the 2010 observed values. For males the lower 2,5 % CI for 2015 is set at 116 fatalities, this is a 43 % decrease compared to 2010 observed value. The upper 97,5 % CI is predicted to be 187 traffic fatalities, a decrease of eight per cent. So as the 97,5 % upper value remains under the 2010 observed value, we can be 97,5 % sure there will fall less fatalities in 2015 as in 2010. For females the lower 2,5 % CI is estimated to be 29 fatalities, a 58 % reduction would be achieved in that case. So there is only 2,5 % chance that there will be less then 29 female traffic fatalities in Finland by 2015. The upper 97,5 % CI is set at 56 fatalities, as a consequence there is 97,5 % chance there will be less traffic fatalities in 2015 compared to the 2010 observed value. While in 2010 there died three male for each female this number would be increased to 3,7. The absolute decreases are 56 for males and 28 for females.

The fourth country is **Poland**, where 4.886 male and 1.398 female fatalities were registered in 2000. In 2010 those numbers were reduced to 2.977 for males and 913 for females. For males a decrease of 39 % during the period 2000 till 2010 had been achieved, while for females the reduction of the observed values was 35 % over the eleven years time.

In the future, the model predicted point estimations of 1.823 male and 371 female traffic fatalities. These correspond to decreases of 39 % and 59 % over just five years time. Initially the Polish female model didn't meet the homoscedastic residue assumption and it predicted a point estimation of 369 fatalities. The lower the 2,5 % CI was 131 and the upper 97,5 % CI was 1.036. After adding interventions in the slope of 2008 and the level of 2007 (both in state equations for the fatality risk) the CI became smaller (Lower 2,5% CI: 290 and upper 97,5 % CI: 475). In the corrected model the female upper 97,5 % CI lies 48 % below the 2010 level, this would be a strong decrease. For males the lower 2,5% CI value is set at 1.030 and the upper 97,5 % CI is set at 3.228 fatalities. For males the upper 97,5 % lies eight per cent above the 2010 observed value. In 2010 there died 3,26 males for each female, in 2015 this would be 4,91. Further the absolute decrease for males would be 1.154 and for females 542.

Finally in **Sweden** the male fatalities were reduced with 39 %, from 438 to 266 fatalities. This is equal to a reduction of 39 %, which was not enough to reach the European objective of 45,93 % between 2000 and 2009. For females there still fell 153 fatalities in 2000 while this number was reduced to 92 in 2009. This is equal to a reduction of 40 %, just not enough to meet the European target value of 45,93 %.

For the future the model predicts a point estimation of 133 male traffic fatalities by 2015, a reduction of 50 % compared to the 2010 observed value. In a period of five years this would be rather strong. However the upper 97,5 % CI is set at 232 fatalities a reduction of only 13 %, while the lower 2,5 % CI value is set at 76 fatalities, which is equal to a 71% reduction. For females the models point estimation is 57 fatalities, a reduction of 38%. The lower 2,5 % CI is 38 fatalities, or a 59 % reduction. The upper 97,5 % value is estimated to be 86 fatalities, which is only 6 % below the 2010 observed value. According to the point estimations, the European target value to reduce traffic fatalities by 37,07 % between 2009 and 2015 would be met by males as well as by females. In both cases the upper 97,5 % CI lies under the 2010 observed value, so we are 97,5 sure there will fall less male and female fatalities in 2015 compared to 2010. Further in 2010 there died 2,89 males for each female while in 2015 this would be 2,33. The absolute decrease for males would be 133 and for females 33.

Finally the initial male model suffered independency problems and the 2006 fatality value was considered as "not available". In the initial model the predicted point estimation was 135, while in the corrected the prediction is 133 (Lower 2,5 % CI: 79 ; Upper 97,5% CI 230).

4.5.2 Overview of average annual and total decreases

In 4.5.2 there is once more an overview given of the average annual reduction in male and female fatalities (columns four and five). The total reductions between 2010 (2009 for Sweden) and 2015 are mentioned in columns two and three. Again the legend explains for which classes less then 100 fatalities were observed in 2010 and which classes would met the 2015 European target value according to the models point estimation.

TABLE 23: Total an average yearly reductions for gender class in percentage (total reductions for 2009 are from Sweden).

	Male (total reduction)	Female (total reduction)	Male average annual reduction	Female average annual reduction
Belgium	- 27 %	- 26 %	- 5,35 %	- 5,22 %
Czech Rep.	- 24 %	- 29 %	- 4,84 %	- 5,76 %
Finland	- 28 %	~~- 41 %~~	- 5,53 %	~~- 8,18 %~~
Poland	**- 39 %**	**- 59 %**	**- 7,75 %**	**- 11,87 %**
Sweden	**- 50 %**	~~- 38 %~~	**- 8,35 %**	~~- 6,28 %~~

Legend: ~~Classes subjected to low values (2010 observed value under 100 fatalities)~~

Classes that would achieve the 2015 target compared to 2010

* Swedish reductions are based on the observed fatalities of 2009 instead of 2010, therefore reductions in 2015 of 37,07 % instead of 29,35 % should be achieved.

The tables in annex 123 and 124, 4.5.1 and 4.5.2 give an answer to research question 3a *"Which gender will contain the most/least traffic fatalities by 2015 (absolute)?"* Unfortunately again the residue values for the predicted inhabitants didn't meet the residue assumption, therefore no fatalities per 100.000 inhabitants could be predicted. Research questions 3b is not answered, *"Which gender will contain the most/least traffic fatalities by 2015 per 100.000 inhabitants (relative)?"*. However as males and females contain almost the same inhabitant values we can say that in each country there will be more male as female fatalities in 2015. This is however based on the absolute prediction of all male and female fatalities in the five countries and not on prediction of fatalities per 100.000 inhabitants.

4.6 Results of disaggregated analyses transport mode

The third and last disaggregated classes that were analysed are the classes of transport modes. In annex 125 till 129, the future forecasts of fatalities by transport mode are mentioned for Belgium, Czech Republic, Finland, Poland and Sweden. Again as for the forecasts of the age and gender classes the fraction values of the future forecast are based on the observed values of 2010. This is done because the model output only gives values for the forecasted years. Of the years were observed data are available for (1991 till 2010, 2009 for Sweden) the model values of the "real" evolution in fatalities are only shown on graphs. Below the evolution of fatalities of twenty classes are discussed. In total forty analyses were considered, however the reason why twenty were left out is mentioned in subchapter 3.4 Again only the fatalities were predicted as the residue values of the vehicle data couldn't be corrected. The predicted fatalities by transport mode will be discussed below for all five countries in alphabetical order.

4.6.1 Results disaggregated vehicle class analyses, Belgium

For Belgium three analyses were performed, good vehicles, cars and motorcycles. The results of the Belgian predictions for transport mode fatalities are mentioned in annex 125.

In the case of "**vans & trucks**" (of all weights), there fell 72 deaths in 2000 and 48 in 2010 this is a reduction of 33 %. This was 17 % above the European target value. The highest recorded values in between were 76 in 2001 and 74 in 2007. Although high variability is present in the data, the models point estimation predicts a decrease in fatalities from 48 fatalities in 2010 to 32 in 2015, a reduction of 34 %. Therefore the European target of a 29,35 % reduction would be achieved. On the other hand the upper 97,5 % CI predicts an increase till 98 fatalities, an increase by factor 2,04 compared to 2010. The lower 2,5 % CI predicts a decrease to 10 fatalities, a 79 % decrease compared to 2010. So the confidence intervals are set extremely wide.

In 2000 there still fell 922 **car** traffic deaths, while in 2010 this number was reduced to 443. This is a decrease by 52 %, which was just enough to meet the European target. The models point estimation predicts a further but less pronounced decrease with 12 % by 2015, this till a level of 390 traffic fatalities. The decrease of 12 % still lies 17 % above the European target of a 29,35 % decrease. The lower 2,5 % CI prediction is 195 fatalities, which is equal to a reduction of 56 % compared to 2010. On the other hand the upper 97,5 % CI predicts an increase in fatalities till a level of 783 fatalities, this is 77 % above the observed 2010 value. Finally one intervention was added in the slope of the risk component in the year 1997 this due to independency problems.

Finally for **motorcyclists** 118 fatalities were recorded in 2000. A 50 % reduction by 2010 was far from achieved as the values fluctuate up and down. However the motorcycle vehicle was also the transport with the largest increase in the vehicles, factor 2,81. Unfortunately we can't compare the fatalities per 100.000 transport vehicles. The models point estimation indicates a stagnation in fatalities for this mode, 106 fatalities in 2015 are predicted. The lower 2,5 % forecast value is set at 72 fatalities or a 30 % reduction. The upper 97,5 % CI is set at a value of 157 (54 % above the 2010 observed value).

For non of the Belgian transport modes the upper 97,5 % CI lies under the 2010 observed value. So there is no guarantee that there will fall less fatalities in 2015 compared to 2010 for a certain transport mode.

An important remark is that for Belgium a lot of fatalities were classified in the category "others or unknown" in the last few years. This has the negative repercussion that the decreases in fatalities are not a "real" decrease in fatalities. Partly the decreases were caused by a lack of good classification. This is also shown in annex 56. The next subchapter discusses the predicted fatalities by transport mode for the Czech Republic.

4.6.2 Results disaggregated vehicle class analyses, Czech Republic

Four transport modes were analysed for the Czech Republican vehicles. Those were good vehicles (vans & trucks), cars, motorcycles and mopeds. The results of the predictions are mentioned in annex 126.

For "**vans & trucks**" as the category received that name in chapter three, there fell 66 fatalities in 2000 and 45 in 2010, this is equal to a 30 % reduction, under the European target value of 50 %. The highest number was recorded in 2004, 67 fatalities, and the lowest in 2010. However also in 2008 and 2009 there fell 45 fatalities in good vehicles, the same amount as in 2010. By 2015 the models point estimation predicts 46 deaths, so plus minus constant. According to the lower 2,5 % CI there would fall 20 fatalities (55 % decrease), while according to the upper 97,5 % confidence interval there would fall 104 fatalities (increase by factor 2,32).

In 2000, 784 people died on the Czech Republic roads in a **car** this value was reduced to 403 in 2010. The 49 % reduction was just not enough to reach the European target of 50%. The highest value has been measured in 2003, 758 fatalities, the lowest in 2010.
By 2015 the model predicts the decrease would continue till a value of 125 deaths, this would be equal to a 44 % reduction. The European target, a reduction of 29,35 % between 2010 and 2015 would be met. According to the lower 2,5 % CI there would only fall 125 fatalities (69 % reduction) while according to the upper 97,5 % there would fall

409 fatalities. This is just 2 % above the 2010 number of observed fatalities. Probably if a two tailed ɑ value of 0,10 (0,05 on each side) instead of 0,05 ɑ value (0,025 on each side) was used there would be a significant difference, however this was not tested.

In 2000 exactly 100 **motorcycle** deaths were measured on the Czech Republic roads. In 2010 there were 92. However it shouldn't be said that the European target wasn't met based on these values, as in 2002 there fell 117 deaths and in 2009 only 85. By 2015 the models point estimation predicts there would be 84 fatalities (9 % decrease compared to 2010). It might be assumed that this is plus minus status quo. According to the lower 2,5% CI, 46 motorcyclists would die, while the upper 97,5 % CI predicts 155 motorcycle fatalities. This is again a rider wide confidence interval. The former lies 50 % under the 2010 observed value, while the latter lies 68 % above. As the model predicts plus minus a status quo, the European target won't be achieved.

Finally for the **moped** vehicles there fell sixteen fatalities in 2000 and seven in 2010. According to the models point estimation the fatalities would be reduced to four. The lower 2,5 % CI is estimated to be just one fatality, while the upper 97,5 % CI value is set at ten. These are extreme low values and the question should be asked whether some motorcycle fatalities should have been classified as a moped driver.

As for Belgium, in the Czech Republic non of the predicted upper 97,5 % values by 2015 lie under the observed values of 2010. So there we aren't certain by 97,5 % that there will be less fatalities in 2015 as there were in 2010, although for car fatalities the upper 97,5% CI lies only 2 % above the observed 2010 value. Below there will be continued with the fatality predictions for Finland.

4.6.3 Results disaggregated vehicle class analyses, Finland

The results of the Finnish predictions are mentioned in annex 127. Analyses of four different transport modes were performed, good vehicles or "vans & trucks", cars, motorcycles and mopeds. However only the fatality values for car vehicles lie most of the time over 100, so for the other vehicle types it isn't that valuable to mention percentage values.

The Finnish **good vehicles** (all weights) recorded 25 traffic fatalities in 2000, while in 2010 there fell 18. The lowest value in between was 10 recorded for the year 2008. The model prediction is in this case a bit weird, as the models point estimation for the 2015 fatalities comes out at 36 fatalities. As described in subchapter 3.4.1 and shown in annex 58 non of the observed values between 1991 and 2010 registered such a high value. The upper 97,5 % CI predicts even 98 fatalities, the prediction of the lower 2,5 % CI is more realistic, 13 traffic deaths.

For the Finnish **car** fatalities there were 224 deaths in 2000 and 159 in 2010. This reduction of 29 % isn't enough to meet the European target of a 50 % decrease. The highest value was recorded in 2002, 267 fatalities. In 2008 however there still fell 202 deaths in cars, this is only 10 % below the value of 2000. Strong decreases were achieved in the two last available data points of 2009 and 2010. As we don't know whether these last decreases were exceptions, they were not taken out of the model by an intervention. Therefore the models prediction is that the decrease will continue in the future. So the models point estimated prediction is 108 fatalities by 2010, a decrease of 32 % over five years. The European target of minus 29,35 % would be met in this case. The lower 2,5 % CI is set at a value of 58 and the upper 97,5 % CI is set at 202 fatalities. These values are respectively minus 64 % and plus 27 % compared to 2010 observed value.

The third vehicle class **motorcycles,** suffers from low absolute values, just as the first (good vehicles) and the last (mopeds) does. In 2000 there fell ten fatalities and in 2010, eighteen, of course the European target isn't met by these values. The 2000 value was the lowest of all and it seemed to be difficult to reduce it even further. In annex 58 the observed fatalities are shown and the model prediction is shown in annex 127. According to the model point estimation there would fall seventeen motorcycle fatalities in 2015 (7% decrease). The lower 2,5 % CI is set at six fatalities (69 % decrease) while the upper 97,5 % CI is set at 50 fatalities, a multiplication by factor 2,76 compared to the 2010 observed value.

Finally the **moped vehicles** recorded nine traffic deaths in 2000 and again nine in 2010. The highest value was recorded in 2004 with fourteen and the lowest in 2005 with four. The model predicts that from 2011 till 2015 there will fall plus minus ten or eleven deaths. By 2015 the lower 2,5 % CI is set at a value of six (minus 34 %) while the upper 97,5 % CI value is set at eighteen (multiplication by a factor 2,03).

As was the case for Belgium and Czech Republic not one upper 97,5 % CI remained under the observed value of 2010. Therefore for non of the vehicle classes we can be 97,5 % certain there will be less fatalities in 2015 as there were in 2010. For the good vehicles, motorcycles and mopeds the values were actually too low to carry out accurate time series predictions.

Below the forecasted traffic fatalities by transport mode in Poland are written out.

4.6.4 Results disaggregated vehicle class analyses, Poland

The results of the Polish prediction are mentioned in annex 128. This country is bigger and there fall more fatalities for each transport mode. Next to the analyses of good vehicles, cars, motorcycles and mopeds analyses could be performed for bus & coach vehicles and also for agricultural vehicles. The two latter however were subjected to rather low values, so as a consequence these two time series aren’t so much worth. Also for the class of moped driver fatalities the absolute values are rather low.

An important remark for the Polish **good vehicles** is that on the website of the European commission for road safety no data were available about traffic fatalities that fell in “vans”. Only for “heavy good vehicles” data were available. For all other countries the fatalities that fell in the class of “vans” was added to the one of “heavy good vehicles”. This was initially done because the weight classes of fatalities on the one hand and vehicles on the other didn’t match with each another. Unfortunately as already described, due to troubles with residue analyses for the exposure measure no predictions were made therefore.

So for the class “heavy good vehicles” there fell 225 fatalities in 2000, and in 2010, 142. This is equal to a reduction of 37 % and the European objective of 50 % wasn’t met. The highest measured value however was 270 in 2002 and the lowest 136 in 2009. For the future a continued decrease is expected till 70 fatalities by 2015, this would be a rather strong reduction of 47 %. The lower 2,5 % CI even predicts a value of only 30 deaths (minus 79%) on the other hand the upper 97,5% value predicts 184 fatalities which is 29 % above the 2010 measured value.

The **car** fatalities were reduced from 2.710 in 2000 till 1.853 in 2010. This is equal to a 32 % reduction and just as for good vehicles the European target of 50 % wasn’t achieved. In 2008 however there still fell 2.540 car traffic fatalities, this is only 6 % under the value of 2000. So the strongest reductions were achieved in 2009 and 2010. As it’s not known whether these last values are exceptions or not, they were not indicated as exceptionally by adding an intervention. The consequence is however that the strong reduction is continued in the model prediction till 2015. For 2015 the models point estimation is 1.108 fatalities, 40 % under the observed number of 2000. The lower 2,5% CI is predicted to be 600 deaths (68 % decrease compared to 2010) while the upper 97,5 % value is estimated to be 2.048 (an 11 % increase).

Contrary to most observed values for all other transport modes and countries, the Polish **motorcycle** fatalities recorded an increase. In 2000 178 fatalities were recorded, while in 2010 there fell 259 motorcycle fatalities. This is an increase by 46 %, far away from

European target value of 89 fatalities for this transport mode. In 2008 and 2009 there even fell respectively 262 and 290 traffic deaths by this mode.

In the future the model predicts the increase would continue till 342 deaths, which is 32% above the observed value of 2010. Again this is far away from the target value of 183, what would be equal to a 29,45 % reduction compared to 2010. The lower 2,5 % CI predicts a decrease till 146 deaths, a reduction of 44 %. The upper 97,5 % predicts an increase till 801 fatalities, this value is unrealistic.

For the transport mode **mopeds** there fell 75 fatalities in 2000 and 83 in 2010 an increase of eleven per cent. The target value for 2010 compared to 2000 was 38 fatalities. The lowest observed value between 2000 and 2010 was 51 in 2004 and the highest 87 in 2008. Just as for motorcyclists by 2015 an increase in fatalities till 111 is predicted for this transport mode, 34 % above the measured 2010 value. This while the goal for 2015 compared to 2010 should be to reduce traffic fatalities for this mode till a level of 59 deaths. The lower 2,5 % confidence interval predicts a reduction till 35 fatalities (58 % reduction), but the upper 97,5 % predicts 358 fatalities, this last value is again unrealistic.

Further there are the transport modes “bus & coach” and “agricultural vehicles”. Due to low values it’s for both of them rather useless to mention percentage values.

For the vehicle class “**bus & coach**” vehicles there were 50 fatalities recorded in 2000 and only 14 in 2010. Higher values as the one for 2000 were registered in 2001, 2003 and 2005 with respectively 59, 51 and 52 fatalities. Comparing the 2000 level with the one of 2010 a reduction of 72 % had been achieved. By 2015 the models point estimation predicts a further decrease till seven deaths. The lower 2,5 % CI is set at 2 fatalities while the upper 97,5 % CI is set at, 29 fatalities. Again rather low absolute values and wide confidence interval are present.

Finally the **agricultural** vehicles counted 80 traffic deaths in 2000 and only 23 in 2010. This is equal to a total reduction of 71 %, of course the values are rather low again. In the future a further reduction to 14 fatalities is predicted by the models point estimation. The lower 2,5 % CI is set at six fatalities while the upper 97,5 % CI is set at 32 traffic fatalities. This is once more a wide confidence interval.

As it was the case for the previous countries, non of the Polish transport modes upper 97,5 % model estimation lies under the observed value of 2010. Therefore it can’t be stated for one or more modes that there will by significantly less fatalities (with 97,5 % certainty) in 2015 as there were in 2010.
In 4.6.5 the predicted results of the transport modes for Sweden are discussed.

4.6.5 Results disaggregated vehicle class analyses, Sweden

The results of the Swedish prediction are mentioned in annex 129. For three vehicles classes fatalities were predicted, vans & trucks, cars and motorcycles. Again for the vans & trucks and for the motorcycles low absolute values were measured.

For the first transport mode (**vans & trucks**) there fell 24 deaths in 2000 and only 10 in 2009. No higher or lower values were measured in between and this reduction is equal to 58 %. The European target to reduce fatalities between 2000 and 2009 with 45,93 % was met. The model predicted an increase from ten to twelve deaths in 2011 and a decrease till nine in 2015 (plus minus status quo). The lower 2,5 % CI is estimated to be four while the upper 97,5 % CI would be 22. So according to the models prediction there is 2,5 % chance that there will fall more than 22 traffic fatalities in 2015 in vans & trucks.
For the vehicle class vans & trucks the command *"SwedenFATTrucksAllWeight" [1]<-NA" w*as added to the code, in order to correct independency problems. The first data point was left out of the analysis. In 1991, 30 fatalities were recorded (see annex 60) and this caused initially troubles with the independency assumption of the residuals. Of the initial model the predicted fatalities for was twelve, (lower 2,5 %CI: 7 and upper 97,5 % CI: 19).

The Swedish **car** fatalities were reduced with 44 %, which was just under the European objective to reduce fatalities by 45,93 % between 2000 and 2009. The absolute values were 393 and 219. The decrease would manifest itself and continue in 2010 till 2015, with 37 %, which would be just the value of the European goal, to reduce fatalities between 2009 and 2015 with 37,07 %. The lower 2,5 % CI value is set at 65 this is equal to a 70 % decrease compared to 2010. The upper 97,5 % CI value is set at 295 traffic fatalities, this is about 35 % above the 2010 observed number.

Finally for the **motorcyclists** an increase in fatalities had been measured between 2000 and 2009. In 2000 there fell 39 traffic deaths while in 2009 there were 47. The lowest value was 37, in 2002 and the highest 60 in 2007. The European goal, a reduction of 45,93% is not achieved. For the future a small increase has even been predicted, in 2010 the model predicted 56 fatalities and in 2015, 66. The lower 2,5 % CI is predicted to be 54 and the upper 97,5 % CI is predicted to be 82 in 2015. The conclusion for this final model is that it doesn't expect a decrease in the future.

Finally, again for non of the three Swedish vehicle classes the upper 97,5 % CI value lies under the observed value for 2010. So again we can't tell by 97,5 % certainty that there will be less fatalities in 2015 as there were in 2010 by the three transport modes.

In subchapter 4.6.6 an overview is once more given of the total increases/decreases and average annual increases/decreases in percentages. This is just as for the age and gender analyses done for all countries and vehicle classes.

4.6.6 Overview of average annual and total decreases

TABLE 24 24 shows the average annual increases/decreases in fatalities by all transport modes and countries, while table 25 shows the total increases/decreases in fatalities. Table 25 shows the same values as table 24, but multiplied by five (six in the case of Sweden).

TABLE 24: Average yearly reduction in fatalities for transport mode by percentage between 2010 and 2015.

	Vans & trucks	Cars	Motorcycles	Mopeds	Bus & coach	Agricul-tural
Belgium	**~~- 6,86 %~~**	- 2,38 %	+ 0,77 %	/	/	/
Czech Rep	~~+ 0,48 %~~	**- 8,77 %**	~~- 1,75 %~~	~~-9,16 %~~	/	/
Finland	~~+20,07 %~~	**- 6,4 %**	~~- 1,37 %~~	~~- 3,15 %~~	/	/
Poland	**- 8,04 %**	**- 9,49 %**	+ 6,39 %	~~+ 6,85 %~~	**~~- 10,6 %~~**	**~~- 7,56 %~~**
Sweden	~~- 1,39 %~~	**- 6,12 %**	~~+ 6,89 %~~	/	/	/

Legend: ~~Classes subjected to low values (2010 observed value under 100 fatalities)~~

Classes that would achieve the 2015 target compared to 2010

* Swedish reductions are based on the observed fatalities of 2009 instead of 2010, therefore reductions in 2015 of 37,07 % instead of 29,35 % should be achieved.

For Belgium the only transport mode that would achieve a reduction of at least 29,45 % from 2010 till 2015 is the “vans & trucks” category, minus 34 %. Unfortunately this class is also subjected to small values. For cars a small decrease and for motorcycles a small increase is predicted.

For the Czech Republic the two classes that would achieve a reduction of at least 29,45% are the one of cars and for mopeds, this according to the models point estimation. Reductions of minus 44 % and minus 46 % would be achieved, unfortunately the latter one is subjected to low absolute values.

For Finland again there is only one vehicle class that would achieve at least a 29,45 % decrease, again it’s the one for cars.

Further for Poland there are four classes that would achieve the European target value of minus 29,45 % between 2010 and 2015. The classes are, vans & trucks, cars, buses and coaches and agricultural vehicles.

Finally for Sweden there is only one of the three vehicle classes that would achieve the European target value of 37,07 %, again it’s the one for cars. This target is a reduction that should be obtained between 2009 and 2015.

TABLE 25: Total reductions in percentages for transport mode between 2010 and 2015 (2009 for Sweden)

	Vans & trucks	Cars	Motorcycles	Mopeds	Bus & coach	Agricul-tural
Belgium	~~**- 34 %**~~	- 12 %	+ 4 %	/	/	/
Czech Rep	~~+ 2 %~~	**- 44 %**	~~- 9 %~~	~~**- 46 %**~~	/	/
Finland	~~+ 100 %~~	**- 32 %**	~~- 7 %~~	~~+ 16 %~~	/	/
Poland	**- 47 %**	**- 40 %**	+ 32 %	~~+ 34 %~~	~~**- 53 %**~~	~~**- 48 %**~~
Sweden	~~- 8 %~~	**- 37 %**	~~+ 41 %~~	/	/	/

Legend: ~~Classes subjected to low values (2010 observed value under 100 fatalities)~~

Classes that would achieve the 2015 target compared to 2010

* Swedish reductions are based on the observed fatalities of 2009 instead of 2010, therefore reductions in 2015 of 37,07 % instead of 29,35 % should be achieved.

A general remark to be made is that the reductions in fatalities by the transport modes would be lower compared to those of the age and gender classes. This might be because of the fact that rather strong reductions were achieved in bicycle and pedestrian fatalities. As a consequence the reductions for some other modes might have been smaller in the past.

A final thing to mention is that once more research question 4a, *"Which transport mode(s) will contain the most/least traffic fatalities by 2015 (absolute)?"* was answered in this subchapter, bus unfortunately research question 4b wasn't *"Which transport mode(s) will contain the most traffic/least fatalities by 2015 per 100.000 vehicles (relative)?"* This was once more due to problems when the correcting of the residues of the vehicles.
Till here the three disaggregated fatality forecasts for all five countries were discussed Right now, there will be continued with the results of the combined disaggregated analyses. This has only been done for Belgium.

4.7 Results of the combined disaggregated analyses age and gender for Belgium

The results of the female age classes for Belgium are mentioned in annex 130, while the results of the male age class for Belgium are shown in annex 131. Once more the estimated values for the future are based on the last available data point (2009). As there are plus minus as much males as females, male vs. female fatalities might be compared for each age class individually. Only for the oldest age class the proportion of males is rather low compared to females. Contrary to the gender division here the females will be discussed first and thereafter the males.

4.7.1 Results of the combined disaggregated analyses (gender & age class) for females in Belgium

For the female age classes all of them contain low absolute values. For the oldest age class and the age class 25-49 it's still worth to mention percentages, but for the other age classes this is rather useless, although it will be sometimes mentioned.

The **youngest female age class** recorded 24 traffic deaths in 2000 and only ten in 2009. The highest value in between was 28 in 2001 and the lowest was ten in 2004 and 2009. Between 2000 and 2009 according to the European target a reduction of minus 45,93 % should have been achieved. This age class met that reduction as it decreased with 58 %, however the absolute values are low. For the future the models point estimation predicts nine traffic deaths by 2015. The lower 2,5 % CI is set at a value four and the upper 97,5 % CI a value of 23. One intervention was added in 1998, in the level state equation for the fatality component. Thanks to this intervention the problems with the independency assumption were removed. Without the intervention the predicted fatalities by 2015 would be five, (Lower 2,5 % CI: 2 ; Upper 97,5 % CI: 15).

The female **15 till 17** years old age class registered eighteen traffic fatalities in 2000 and ten in 2009, this was a reduction of 44 %. In fact it's not worth to mention that percentage value as there were six years with less fatalities counted between 2000 and 2009 compared to the value of 2000. The model predicted for 2010 a value of eight deaths and this would decrease slowly till six fatal victims in 2015. The lower 2,5 % CI is two deaths and the upper 97,5 % CI is thirteen deaths, both in the year 2015.

Further for the female age class **18 till 24** there fell 84 fatal victims in 2000, while this number was reduced to 30 in 2009. This is a decrease 64 %, and the European target of a 45,93 % reduction has been met. Since 2003 however the absolute fatality value of female deaths stayed plus minus at the same level. So as a consequence the model predicted for 2015 a slight increase for this age class till 34 fatal victims. The lower 2,5% confidence interval is predicted to be 17 fatalities while the upper 97,5 % CI would be 69 fatalities. The former is a reduction of 45 %, the latter an increase by 130 %, both compared to the 2010 number of fatalities. One intervention was carried out in the level state equation for the year 2003. Again this was done in order to remove independency problems. Without the intervention the predicted value would be 21 (Lower 2,5% CI: 8 ; Upper 97,5 % CI 55).

The age class **25 till 49** registered 115 fatal victims in 2000 and 72 in 2009. The highest value in between was however 140 for the year 2001 and the lowest 70 for the year 2008. Based on the 2000 and 2009 values there is a difference of 37 percent points, while based on the 2001 and 2008 values the difference is 61 % percent points based on the 2000 value. Unfortunately the model estimated values are not given in the output,

they form a line, which lies always somewhere under the higher and above the lower observed values.
By 2015 the model predicts a further decrease of 35 %, this is just insufficient for the European target value of 37,07 % between 2009 and 2015. According to the lower 2,5 % CI value the fatal victims would be decreases till 22 (69 % decrease), while the upper 97,5 % forecast predicts a 34 % increase till 94 fatalities.

For the female age class **50 till 64**, 41 fatal victims were registered in 2000 while in 2009 there were 39 female traffic deaths in this age class. The highest recorded value was 54 in 2002 while the lowest was 35 in 2004. In first instance intervention were carried out in the state equations to remove the independency problems. Unfortunately four corrections in the fatality measurement equation were necessary (inserted one by on in the model) to remove the problem of independency. This was done for the years 1993, 1995, 1996 and 2000.
In the final model the prediction for 2015 predicts a decrease in fatalities till 28, a decrease of 28,21 % compared to the 39 fatalities in 2010, the European target was 37,07 %. The lower 2,5 % CI is predicted to be 23 while the upper 97,5 % CI would be 34 traffic deaths. For the initial model without model corrections the point estimation was 32, the lower 2,5 % CI 24, and the upper 97,5% CI was 49 deaths.

Finally for the **oldest female age class**, 83 fatalities were registered in 2000 and 71 in 2009. This decrease of 14 % lies far behind the European target of 45,93 %. However the highest value was 97 in 2001 and the lowest 54 in 2008, a difference of 52 % percent points based on the 2000 value.
The model predicts a further small decrease between 2009 and 2010 from 71 till 51 traffic deaths. This is a decrease of 28 % over six years. The lower 2,5 % CI is set at a value of 41 (43 % decrease) and the upper 97,5 % CI is set at 64 fatalities (10 % decrease).

For all female age classes the oldest category is the only one wherefore the upper 97,5% CI value lies under the observed value of 2010. Therefore this is the only class where it is sure by 97,5 % that there will be less fatalities in 2015 as there were in 2010. Further the only age class that would achieve the European target of a 37,07 % reduction between 2009 and 2015 is the 15 till 17 years old one.
Below in subchapter 4.7.2 the male fatalities according to age class for Belgium are discussed.

4.7.2 Results of the combined disaggregated analyses (gender & age class) for males in Belgium

The overview of the results for these analyses are shown in annex 131. For the four oldest age classes it's worth to mention percentage values as the observed values lie most of the time above 100 fatal victims. For the two youngest age classes this isn't the case, therefore for these two it's rather useless to mention percentage values.

The **youngest age class** recorded 28 fatal victims in 2000 and 12 in 2009, a reduction of 57 %, again the absolute values are low. The highest observed value was 35 in 2001 and 12 in 2003 and 2009. The European target to reduce fatalities by 45,93 % was met. The model predicted that the 2010 value would be 15 while the number of traffic deaths in 2015 would be 10. The lower 2,5 % CI was set at a value of 7 and the upper 97,5 % CI was set at a value of 16 fatalities.

The male age class from **15 till 17** recorded 37 fatal victims in 2000 and 17 in 2009, a reduction of 54 %, however low values are once more measured. The highest value was 42 fatal victims in 2002 and the lowest 13 in 2006. This is a difference of 79 per cent points based on the 2000 value. The models point estimation predicts that till 2015 fatalities would remain constant at 16 fatalities (5 % decrease compared to the 2010 observed value). The lower 2,5 % CI is predicted to be 6 while the upper 97,5 % CI is predicted to be 41.

Further for the male age class **18 till 24** years old there fell 243 fatal victims in 2000 and 132 in 2009. No higher or lower values were measured in between. The European target value (45,03 % reduction from 2000 till 2009) had been met as the decrease is equal to 46 %. The model predicts a less pronounced decrease for the future, 117 fatal victims. This is equal to a decrease of 12 % compared to the 2009 value, which remains far under the European objective to reduce fatalities with 37,07 % by 2015. The lower 2,5 % CI is set at a value of 78, this is equal to a decrease of 61 %, while the upper 97,5% CI is predicted to be 175 an increase of 33%.

The age class **25 till 49** recorded 493 traffic fatalities in 2000 and this was reduced to 319 in 2009. This is equal to a reduction of 35 %, which is plus minus 10 % under the European target value for the 2000 – 2009 time period. By 2015 a further decrease is predicted till 240 fatalities, which is equal to a reduction of 24 %. For the European target of 37,07 % a 13 % stronger decrease should be achieved. According to the lower 2,5 % CI there would be 172 traffic deaths, this is a reduction of 45 % compared to the 2009 observed value. On the other hand the upper 97,5 % CI is predicted to be 335 fatalities by 2015, a seven per cent increase.

In order to correct model normality problem in the fatality component, first an intervention was added, however this didn't help so a correction was added in the measurement equation for fatality risk in 2003. This caused an independency problem, so another was correction in the measurement equation had to be inserted in 1996. After that intervention, independency still wasn't achieved, so one final correction in the measurement equation had to be inserted in 1993. Of the initial model the models point prediction was 288 instead of 240, the lower 2,5 % CI 217 and the upper 97,5 % CI 382.

Further the age class **50 till 64** years old registered in 2000, 135 traffic deaths and 120 in 2009. This is a difference of eleven per cent, under the target of 45,93 %. The highest value of 146 was recorded in 2001, the lowest of 94 was recorded in 2003. This is a difference of 38 per cent points based on the 2000 value.
For 2015 the model point estimation predicts a decrease till 100 fatalities, a reduction of 16 per cent compared to 2009. This is even not half the reduction of the 37,07 % that should be achieved. The lower 2,5 % CI forecast value is 87, a decrease of 28 % compared to the 2009 value. The upper 97,5 % CI is predicted to be 116, which is equal to a three per cent decrease.

Finally the age class of the **oldest men (>64)** registered 155 traffic deaths in 2000 and 105 in 2009, a 32 % reduction. The highest value of 167 was registered in 2001 while the lowest one, 95 was registered in 2008. This is a difference of 49 % per cent points again based on the 2000 value.
The mode predicts a decrease till 79 fatalities for 2015, based on the 2009 value this is a reduction of 25 %. According to the lower 2,5 % CI there would fall 59 fatalities in 2015 (44 % decrease) while according to the upper 97,5 % CI there would be 105 fatalities, this value is equal to the 2009 observed value.

For the Belgian male age classes, only the two oldest classes recorded an upper 97,5% CI that lies under the 2009 observed value. Therefore only for these age classes there is 97,5 % certainty that the 2015 observed value of traffic fatalities will be the one of 2009.
Right now the rates of male vs. female fatalities will be indicated one by one. The comparison for 2009 and 2015 is made.
For the youngest age class there fell 12 males and 10 female deaths since 2009. While in 2015 these values would be 10 and 9.
For the age class 15 till 17, there were 17 male and 10 female fatalities recorded in 2009, while in 2015 these values would be respectively 16 and 6. As a consequence the ratio male vs. female fatalities would increase from 1,7 to 2,67.
Further the age class 18 till 24 had 132 male and 32 female fatalities in 2009. For males this would reduce to 117 while for females it would remain plus minus constant at 34 traffic deaths. The ratio would decrease from 4,4 to 3,44.

For the age class 25 till 49, 319 male fatalities were recorded in 2009 and 72 females. These values would be reduced in 2015 till respectively 240 and 46. The ratio male vs. female fatalities would increase from 4,43 to 5,22.
In case of the age class 50 till 64 there fell 120 male and 39 female fatalities in 2009. By 2015 there would fall 100 male and 28 female fatalities. The ratio increased once more from 3,08 to 3,57 fatalities.
Finally the age class over 64 recorded 105 male and 71 female fatalities in 2009 and in 2015 these numbers would be 79 and 51. The ratio would increase from 1,48 to 1,55.

4.7.3 Overview of average annual and total decreases

In table 26 the fatality reduction over the 2009 till 2015 period are shown in columns two and three. The average annual reductions are shown in in the third column for females and the fifth for males. The total reductions are shown in the second column for females and the fourth for males.
The only age combined gender class that would reach the objective to reduce fatalities with at least 37,07 % is the female age class from 15 till 17 years old. Only one age class would record an increase according to the model prediction and that is the 18 till 24 years old female class.

TABLE 26: Total and average annual reduction in fatalities by gender and age class for Belgium (latest available value was 2009)

	Belgium females total reduction	Belgium females average annual reduction	Belgium males total reduction	Belgium males average annual reduction
<15	- 8 %	- 1,39 %	- 15 %	- 2,56 %
15-17	**- 44 %**	**- 7,36 %**	- 5 %	- 0,84 %
18-24	+ 13 %	+ 2,1 %	- 12 %	- 1,93 %
25-49	- 35 %	- 5,9 %	- 24 %	- 4,14 %
50-64	- 28, %	- 4,7 %	- 16 %	- 2,71 %
>64	- 28 %	- 4,7 %	- 25 %	- 4,16 %

Legend: ~~Classes subjected to low values (2009 observed value under 100 fatalities)~~
Classes that would achieve the 2015 target compared to 2009

Research question 5a has been answered, "*Which age & gender categor(y)(ies) will contain the most/least traffic fatalities by 2015 (absolute)?,* while research question 5b wasn't Which age & gender categor(y)(ies) will contain the most/least traffic fatalities by 2015 per 100.000 inhabitants (relative)?

Often model predictions were based on the values from 1991 till 2010 or 2009. However as already mentioned in figure 2 the European goals were shown to reduce fatalities by 2010 with 50 % compared to the 2000 level. In figure 3 the goal for 2020 is mentioned. Considering these figures in the results data were only taken into account from 2000 onwards.

5 Main conclusions of the research results

Aggregated analyses (Finland, Poland & Sweden 2010-2015: target value = -29,45 % ; Belgium, Czech Republic & Iceland 2009-2015: target value = -37,07 %)

Prediction of traffic fatalities

For each of the six nations a decrease in fatalities for the year 2015 is predicted. Poland (-30 %) is the only country that would reach the target. Finland would almost reach the target value (-28 %). Sweden would achieve a reduction of plus minus 70 % of the assumed goal. The reductions for Belgium and Czech Republic are respectively almost three fifth and just over four fifth of the target value. Finally in Iceland over three fifth of the reduction that should be achieved is obtained. For Iceland's three years aggregated analysis a little stronger reduction of plus minus 70 per cent is predicted.

Prediction of traffic fatalities per billion passenger kilometres

No target values for the traffic deaths per billion passenger kilometres were indicated. However the average annual reductions in fatalities per billion passenger kilometres are as follows, Poland 10,02 %, Finland 6,08 %, Iceland, 6,02 %, the Czech Republic 5,82 %, Sweden 4,54 %, and Belgium 4,08 %. For the first, second and fifth country these reductions are based on the period 2010-2015, for the third, fourth and sixth country on 2009-2015. The Iceland's three year aggregated analysis predicts an average annual reduction of 6,57 % in fatalities per billion passenger kilometres. In Belgium, the Czech Republic, Poland and Sweden there is 97,5 % certainty. There will fall less traffic deaths per billion passenger kilometres in 2015 as in 2010.

Disaggregated analyses (Sweden: 2009–2015: target value = - 37,07 % ; other countries 2010–2015: target value = -29,45%)

Age classes (<15 ; 15-17 ; 18-24 ; 25-49 ; 50-64 ; >64)

Belgium: The youngest age class would achieve the target value, minus 53 % is predicted. The age class 15-17 would register a rise of almost 20 %. From youngest to oldest the other age classes would achieve decreases of 20 %, 25 %, 5 % and 22 %.

Czech Republic: The age classes 15-17 and 25-49 wouldn't reach the target value, decreases of respectively 5 % and 28 % are predicted. The other four age classes would meet the target value with reductions from the youngest to the oldest age class of respectively, 62 %, 35 %, 58 % and 32 %.

Finland: In Finland the 25-49 years old age class would reduce fatalities by 31 %, the only age class that would meet the target. The age class 15-17 would record an increase of over 50 %. From the youngest to the oldest the four other classes would obtain reductions of 5 %, 21 %, 26 % and 17 %.

Poland: Only the age class 18-24 wouldn't reach the target reduction, a 27 % decrease is predicted. All other age classes would achieve a decrease of at least 29 %. From the youngest to the oldest the decreases would be, 44 %, 49 %, 44 %, 58 % and 34 %.

Sweden: In Sweden two age classes, <15 and 50-64 wouldn't meet the goal, decreases of 31 % for both are expected. The other four classes would achieve the target with reductions from the youngest to the oldest class of 41 %, 53 %, 40 % and 39 %.

Disaggregated analyses, gender classes (male & female)

Male: Only in Poland and Sweden male fatalities would be reduced according to the European targets, minus 39 % and 50 % (the latter over six years). For Belgium, the Czech Republic and Finland reductions would be respectively 41 %, 59 % and 38 %.

Female: In Sweden, Poland and Finland the reduction would be respectively 38 % (over six years), 59 % and 41 %. Although for Swedish and Finish female fatalities absolute values are low. In Belgium and Czech Republic the reduction would be respectively 26 % and 29 %.

Gender classes (male & female)

Belgium (3 modes): Only 'vans & trucks' would reach the target value, minus 34 % is the estimated reduction, but the class is subjected to low values. For cars a decrease of minus 12 % and for motorcyclists a small increase of 4 % is predicted.

Czech Republic (4 modes): For cars and mopeds the target values would be reached, minus 44 % and 46 % respectively. The latter one is subjected to low absolute values. For motorcyclists a small decrease of 9 % is expected and the traffic deaths that fall in 'vans & trucks' would stagnate (+2 %). Both are subjected to low absolute values.

Finland (4 modes): Again the car fatalities could reach the target value with a reduction of 32 %. Motorcyclist deaths would reduce by 7 %, moped deaths increase by 16 % and deaths that fell in 'vans & trucks' would double. However the last three are all subjected to low absolute values again.

Poland (6 modes): In Poland four classes, cars, 'vans & trucks', 'buses & coaches' and agricultural vehicles would achieve the target values with reductions of respectively 40%, 47 % 53 % and 48 %. The latter two are again subjected to low absolute values. Motorcycle and moped fatalities would both increase by plus minus one third.

Sweden (3 modes): In Sweden again only the car fatalities would reach the European reduction target, minus 37 %. The 'vans & trucks' fatalities would decrease with 8 % and motorcycle fatalities would increase with 41%.

Combined disaggregated analyses Belgium: (same age and gender classes,
(2009-2015: target value = 37,07 %)

Males: Not one male age class would reach the target value. The reductions from youngest to oldest age class would be, 15 %, 5 %, 12 %, 24 %, 16 % and 25 %

Females: Only the 15-17 years old age class would reach the target, with a 44 % decrease. The age class 18-24 would register a 13 % increase. The other classes from the youngest till the oldest would achieve decreases of respectively 8 %, 35 % and twice 28 %.

6 Additional analyses performed

In subchapter 1.8 a motivation for the choice of countries was given. The DaCoTA project by Matensen e.a., (2010) treated three southern countries (Spain, Italy and Greece) and the United Kingdom as one of the SUN (Sweden, United Kingdom and Netherlands) countries, which are the three best performing countries in traffic safety in the world. Further Belgium was discussed in the DaCoTA project. As the research is investigated at a Belgian university this country was investigated again. Further Sweden was considered as another SUN country (the one with the best performing traffic safety). Two other Scandinavian countries (Finland and Iceland) with a good performance were chosen. Finally Poland and Czech Republic are two Central/Eastern European countries. The former has a rather poor performance and the latter a better performance in traffic safety.

However there are several countries which were not evaluated. From the four countries with the highest population only two were analysed United Kingdom and Italy, France and Germany were not. What about two most recent E.U. members Romania and Bulgaria who joined in 2007? What about the other nation of the former Czechoslovakia, the Slovak Republic? Of the countries who joined the E.U. in 2004 Poland is the biggest according to population. However on second and third place there are Czech Republic and Hungary, the latter country is not analysed. Just as all other countries who joined in 2004. Slovenia, Lithuania, Latvia, Estonia, Malta and Cyprus. Further there are some other medium sized countries of the former E.U. that were not analysed, the Netherlands, a SUN country and nation number six of the former fifteen or nation number eight of the 27 countries in the E.U according to population. Further there are also Portugal, Austria, Denmark and Ireland. Finally of the former fifteen the smallest country according to population is Luxembourg.

The teaching team did not ask me to perform these analyses, however all those countries were not analysed and I didn’t like that idea. Therefore I prepared the data and run the analyses all one time. Also for Norway and Switserland aggregated analyses were run. Unfortunately for some countries (e.g. Portugal and Greece), no vehicle data were available and no disaggregated analyses for good vehicles were performed for non of the countries. Also for Bulgaria and Lithuania no disaggregated fatality data were available on the website of the European Commission for Road Safety, so no analyses were performed. For several countries only a limited amount of fatality data were available, Hungary e.g. from 2003 till 2010 or Latvia from 2006 till 2009. In those cases a limited amount of years were predicted, the following rule of thumb was used:

- two data years available → one year prediction,
- three data years available → two years prediction,

- four data years available → two years prediction,
- five data years available → three years prediction,
- six data years available →three years prediction,
- seven data years available → four years prediction,
- eight data years available → four years prediction,
- nine data years available → five years prediction, till 2014 of 2015, till 2014 or 2015, depending whether the last available data point was 2009 or 2010,
- ten data years available → five years prediction, till 2014 or 2015, depending whether the last available data point was 2009 or 2010,
- eleven or more data years available → prediction till 2015.

The same sources as for the six discussed countries in this report were used. So fatalities were always used for the risk component (European Commission Road Safety, 2012a). Passenger kilometres (Organisation for Economic Co-operation and development, 2012c) were used as exposure component for the aggregated analyses. Inhabitants were used as exposure component for the disaggregated analyses of age and gender (Eurostat, 2012d)(Eurostat, 2012e)(Eurostat, 2012f). The same six age classes as for the other countries were used. Finally vehicles were used as exposure component for the disaggregated analysis of transport mode.

The data have been run one time for all analyses, unfortunately corrections in function of the residual assumptions are not done yet. As already mentioned in this report, you can send me an email dieter.loddewykx@gmail.com and ask me to send you a link and share the results or the data. Feel free to correct the analyses and to report for all countries the predicted number of fatalities or fatalities in function of a certain exposure. At least we will know than which countries, age groups, gender or transport modes are in need of additional efforts. Only in that way the 2020 goal of 15.500 fatalities in the whole of Europe can be achieved. In 2020 new goals should be set to reduce the traffic fatalities (and injuries) even further.

7 Research limitations and future research

7.1 Research limitations

As it was already mentioned a few times in the report the main limitations for these kinds of researches are good data and good fitting data between the unsafety and exposure component.

Better might be that not only the fatalities are considered, but also the heavy injured persons are included in the analysis. As a consequence higher values are available and lower fluctuations in the data would be present. Especially for small countries and for several disaggregated analyses.

Further better exposure data should be available. However the only way to achieve this is by distributing smartphones for all European citizens, so their trip behaviour can be analysed. Caution should be taken with privacy laws as these data may only be used in order to measure the number of driven kilometres or the time spend in traffic. Also the type of transport mode that is used should be recognized by the smartphones. Otherwise never perfect data will be available that count our driven/walked kilometres or our time spend in traffic.

7.2 Further research

The attempt I made by running the data already one time for all European countries is a good step in order to become predictions for the whole of Europe. However all those models should still be corrected in function of the residual assumptions.

Other options for further research are already mentioned in the introduction chapter. It might be interesting to find out whether poor people have a higher chance to die in traffic compared to the average. Or rich people might have a lower chance to die in traffic compared to the average. Christie e.a., (2006) investigated for the OECD countries the relationship between the poverty index of children and the fatalities per 100.000 of children. Lowe e.a., (2011) found that children in disadvantaged neighbourhoods are at greater risk of being killed or injured compared to children from more affluent neighbourhoods.

Also the type of road where traffic victims fell is interesting to investigate. Do the most victims fall on freeways, on urban/city road or on local roads? Important here is that different countries might define similar roads different. Or the other way around they might classify roads with a different visual perspective in the same category. Further the available road classifications over the whole of Europe are not the same.

Another option for further research are combinations of the above mentioned classifications. It might be interesting to know on which type of road will fall the most fatalities/injuries for a certain type of road user.

A final suggestion I would like to mention is that it might be interesting to survey peoples attitude towards risk taking behaviour. Those people should be categorised in e.g. five classes from low to high risk searching behaviour. This should be done for several thousands of people e.g. 18 year olds. Some years later one could verifier how many of those people died in (traffic) accidents. This way the link could be made how many people died according to which class of attitude towards risk taking they belonged.

Reference list

Anderson, D. R., Sweeney, D. J., & Williams, T. A. (1998). *Statistiek voor economie en bedrijfskunde* (6e oplage april 2006.). Den Haag.

Arthur C., W. (1982). The concept of exposure to the risk of a road traffic accident and an overview of exposure data collection methods. *Accident Analysis & Prevention*, *14*(5), 337–340. doi:10.1016/0001-4575(82)90010-0.

Baarda, D. B., & Goede, M. P. M. D. (2001). *Basisboek Methoden en Technieken. handleiding voor het opzetten en uitvoeren van onderzoek*. Utrecht. Verkregen van http://en.scientificcommons.org/59508372.

Bijleveld, F. (2008). Time series analysis in road safety research using state space methods. *ProefschriftSWOV.dvi*. Verkregen december 14, 2011, van https://docs.google.com/viewer?a=v&q=cache:WoEE6I3ktLcJ:www.swov.nl/NL/Actueel/persberichten/Samenvatting_Proefschrift_FBij.pdf+time+series+analysis+in+road+safety+research+using+state+space+methods&hl=nl&gl=be&pid=bl&srcid=ADGEESiDnIQtxZXtdVYHp0Nhm2JSm4KQEPQSVKf9NBDK-WDb-mxtBFAyaz-hBw6SckqcBCyaa-RY-VYcvrUp-la8s4K-kDeKGZsWccOeGsTUkuitbZKWePefk-ZPz56zAVNpCMKHPfn8&sig=AHIEtbSvbA9Ai8lAczv7mrbFxvZi6_ewxw.

Christie, N., Towner, E., Cairns, S., & Ward, H. (2006). *Children's Road Traffic Safety: An International Survey of Policy and Practice* (p. 214). University College London. Verkregen van http://scholar.googleusercontent.com/scholar?q=cache:UyXX15BjxBsJ:scholar.google.com/+Children%E2%80%99s+Road+Traffic+Safety:+An+International+Survey+of+Policy+and+Practice&hl=nl&as_sdt=0&as_vis=1.

Commission of the European Communities. (2001, 12). Witboek - Het Europese vervoersbeleid tot het jaar 2010: tijd om te kiezen. text/html; charset=UTF-8. Verkregen december 12, 2011, van http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52001DC0370:NL:HTML

Delurgio, S. A. (1997). *Forecasting, Principles, and Application* (Har/Dsk.). Mcgraw-Hill College. Verkregen van http://www.amazon.com/Forecasting-Principles-Application-w-disk/dp/0075611201.

EuroNCAP. (2012). START | Euro NCAP. Verkregen van http://nl.euroncap.com/home_nl.aspx.

European commission Eurostat. (2012). Eurostat Your key to European statistics. *Statistics by theme*. Verkregen januari 28, 2012, van http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes.

European Commission Road Safety. (2011). EU - Road safety - Trends. Verkregen december 13, 2011, van http://ec.europa.eu/transport/road_safety/specialist/statistics/trends/index_en.htm.

European Commission Road Safety. (2012a). EU - Road safety - CARE database – reports and graphics. Verkregen januari 5, 2012, van http://ec.europa.eu/transport/road_safety/specialist/statistics/care_reports_graphics/index_en.htm.

European Commission Road Safety. (2012b). EU - Road safety - Children. Verkregen juli 23, 2012, van http://ec.europa.eu/transport/road_safety/users/children/index_en.htm

European Transport safety council. (2009). 2010 On the horizon 3th road safety PIN report. Verkregen januari 5, 2012, van http://www.google.be/url?sa=t&rct=j&q=etsc%20annual%20report&source=web&cd=1&ved=0CB0QFjAA&url=http%3A%2F%2Fwww.etsc.eu%2Fdocuments%2FETSC%2520PIN%2520Annual%2520Report%25202009.pdf&ei=8dUET8X0Ds2r-QaCiey1AQ&usg=AFQjCNE41rQ413TG5U63rC5nQ4UykcfUeg&cad=rja.

European Transport safety council. (2011, 21). Road safety target outcome 100.000 fewer orad deaths since 2001 5the Road safety PIN report. Verkregen januari 5, 2012, van http://www.google.be/url?sa=t&rct=j&q=etsc%20annual%20report&source=web&cd=3&ved=0CCwQFjAC&url=http%3A%2F%2Fwww.etsc.eu%2Fdocuments%2Fpin%2Freport.pdf&ei=8dUET8X0Ds2r-QaCiey1AQ&usg=AFQjCNHgAKiTbGX0j2psh8034fBDuKXuJA.

Eurostat. (2011a). GDP and main components - Current prices. Verkregen januari 28, 2012, van http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_gdp_c&lang=en.

Eurostat. (2011b). Gross domestic product - Market prices. Verkregen januari 28, 2012, van http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tec00001&plugin=1.

Eurostat. (2012a, 13). Lorries, by load capacity. Verkregen juli 16, 2012, van http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=road_eqs_lornum&lang=en.

Eurostat. (2012b, 13). Trailers, by load capacity. Verkregen juli 16, 2012, van http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=road_eqs_trailn&lang=en.

Eurostat. (2012c, 13). Semi-trailers, by load capacity. Verkregen juli 16, 2012, van http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=road_eqs_semitt&lang=en.

Eurostat. (2012d, 23). Population on 1 January by broad age group and sex. Verkregen juli 20, 2012, van http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_pjanbroad&lang=en.

Eurostat. (2012e, 23). Population on 1 January by five years age groups and sex. Verkregen juli 20, 2012, van http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_pjangroup&lang=en.

Eurostat. (2012f, 23). Population on 1 January by age and sex. Verkregen juli 20, 2012, van http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_pjan&lang=en
Eurostat. (2012g). Road tractors by type of motor energy. Verkregen augustus 3, 2012, van http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=road_eqs_roaene&lang=en.

Eurostat. (2012h, juli 13). Motor coaches, buses and trolley buses, by age. Verkregen augustus 3, 2012, van http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=road_eqs_busage&lang=en.

Eurostat. (2012i, juli 13). Passenger cars, by motor energy. Verkregen augustus 3, 2012, van http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=road_eqs_carmot&lang=en.

Eurostat. (2012j, juli 13). Motorcycles, by power of vehicles. Verkregen augustus 3, 2012, van http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=road_eqs_motorc&lang=en.

Eurostat. (2012k, juli 13). Mopeds. Verkregen augustus 3, 2012, van http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=road_eqs_mopeds&lang=en.

Evans, L. (2004). *Traffic safety*. Science Serving Society. Verkregen van http://books.google.be/books?id=pOKzRLqIj1oC&printsec=frontcover&dq=Leonard+Evans+Traffic+Safety&hl=nl&ei=O8T5TfSYEM7oOdjpmKUE&sa=X&oi=book_result&ct=result&resnum=1&ved=0CCoQ6AEwAA#v=onepage&q&f=false.

Federale overheidsdienst Algemene directie statistiek en economie. (2012). Verkeersongevallen en –slachtoffers Verkeersdoden naar geslacht en leeftijd in België. Verkregen juli 21, 2012, van http://statbel.fgov.be/nl/statistieken/cijfers/verkeer_vervoer/verkeer/ongevallen_slachtoffers/.

Federale overheidsdienst economie. (2012). Sterftetafels en levensverwachting. Verkregen januari 28, 2012, van http://statbel.fgov.be/nl/statistieken/cijfers/bevolking/structuur/woonplaats/oppervlakte_dichtheid/.

Harvey, A. C., & Durbin, J. (1986). The Effects of Seat Belt Legislation on British Road Casualties: A Case Study in Structural Timete Series Modelling. *Journal of the Royal Statistical Society. Series A (General)*, *149*(3), 187–227. doi:10.2307/2981553.

Harvey, Andrew C. (1991). *Forecasting, structural time series models and the Kalman filter*. Camebridge: Cambridge University Press. Verkregen van http://books.google.nl/books?hl=nl&lr=&id=Kc6tnRHBwLcC&oi=fnd&pg=PR9&dq=time+series+models&ots=I2RRVx_XKJ&sig=OyaoNDAzXZ-cTfWcOuUFPSaDeSU#v=onepage&q=time%20series%20models&f=false.

Herper Collins Publishers. (2006). *Collins Cobuild English Dictionary* (5th edition 2006.). Glasgow: HarperCollins Publishers.

Janssens, D., Moons, E., Nuyts, E., & Wets, G. (2009). *Onderzoek verplaatsingsgedrag Vlaanderen 3 (2007-2008)*. Diepenbeek België: Insituut voor Mobiliteit. Verkregen van http://www.mobielvlaanderen.be/ovg/ovg03.php?a=19&nav=10

Lammar, P. (2006). Verkeersveiligheidsindicatoren: overzicht en omschrijving van bestaande en bruikbare indicatoren. *Steunpunt Verkeersveiligheid*.

Lowe, C., Whitfield, G., Sutton, L., & Hardin, J. (2011). *Road User Safety and Disadvantage*. London: Department for Transport. Verkregen van https://dspace.lboro.ac.uk/dspace-jspui/handle/2134/8040.

Matensen, H. (IBSR), Dupont, E., Broughton, J., Knowles, J. (TRL), Bijleveld, F., Antoniou, C. (SWOV), Lassarre, S. (NTUA), e.a. (2010). Forecasting road traffic fatalities in European countries: model and first results. Deliverable 4.2 of the EC FP7 project DaCoTA.

Ministerie van Infrastructuur & Milieu, M. van I. en. (2011, februari 10). Risico's van het verkeer en vervoer: de beleving van de burger - Rapport - Rijksoverheid.nl. Rapport. Verkregen december 12, 2011, van http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2011/02/10/risico-s-van-het-verkeer-en-vervoer.html.

Nemec, J., Bercik, P., & Kuklis, P. (1999). Local Governmet in Slovakia: Decentralization: Experiments and Reforms. Verkregen juli 19, 2012, van http://scholar.googleusercontent.com/scholar?q=cache:zON524AVOogJ:scholar.google.com/+Czechoslovakia+split&hl=nl&as_sdt=0.

Organisation for Economic Co-operation and development. (2012a). Road injury accidents (Fatalities). Verkregen februari 6, 2012, van http://stats.oecd.org/ViewHTML.aspx?Theme=ROAD_INJURY_ACCIDENTS&DatasetCode=ROAD_INJURY_ACCIDENTS.

Organisation for Economic Co-operation and development. (2012b). Inland passenger transport (million P-km). Verkregen februari 6, 2012, van http://stats.oecd.org/ViewHTML.aspx?Theme=INLAND_PASSENGER_TRANSPORT&DatasetCode=INLAND_PASSENGER_TRANSPORT.

Peeters, K. (2010). *De file voorbij*. Antwerpen: Uitgeverij Vrijdag.

SafetyNet. (2008). *Estimation Real Number of Road Accident Casualties*. Loughborough University. Verkregen van http://ec.europa.eu/transport/wcm/road_safety/erso/safetynet/content/safetynet.htm

Statistics Iceland. (2012). Statistics Iceland. Verkregen januari 28, 2012, van http://www.statice.is/.

Studiedienst van de Vlaamse Regering. (2010). Economische structuur: Bruto Binnenlands Product per inwoner volgens het ESR95 rekenstelsel. Verkregen januari 29, 2012, van http://www4dar.vlaanderen.be/sites/svr/Cijfers/Pages/Excel.aspx.

SWOV Wetenschappelijk Onderzoek Verkeersveiligheid. (2010). Factsheet_De analyse van tijdreeksen. Verkregen december 28, 2011, van http://www.swov.nl/rapport/Factsheets/NL/Factsheet_Tijdreeksanalyse.pdf.

United Nations Economic Commission for Europe. (2012a). Number of Lorries by country and year. Verkregen juli 16, 2012, van http://w3.unece.org/pxweb/dialog/varval.asp?ma=ZZZ_TRRoadLori_r&path=../database/STAT/40-TRTRANS/02-TRRoadFleet/&lang=1&ti=Number+of+Lorries+at+31+December+by+Country%2C+Load+capacity++and+Time.

United Nations Economic Commission for Europe. (2012b). Number of trailers by country and year. Verkregen juli 16, 2012, van http://w3.unece.org/pxweb/dialog/Saveshow.asp?lang=1.

United Nations Economic Commission for Europe. (2012c). Number of Semi-trailers by country and year. Verkregen juli 16, 2012, van http://w3.unece.org/pxweb/dialog/Saveshow.asp?lang=1.

United Nations Economic Commission for Europe. (2012d, 18). Powered Two Wheelers. Verkregen augustus 3, 2012, van http://w3.unece.org/pxweb/dialog/varval.asp?ma=ZZZ_TRMtMpFlt_r&path=../database/STAT/40-TRTRANS/02-TRRoadFleet/&lang=1&ti=Powered+Two+Wheelers.

United Nations Economic Commission for Europe. (2012e, april 27). Road Vehicle Fleet at 31 December by Country, Type of Vehicle, Age Group and Time. Verkregen augustus 3, 2012, van http://w3.unece.org/pxweb/dialog/varval.asp?ma=01_TRRoadtypVeh_r&path=../database/STAT/40-TRTRANS/02-TRRoadFleet/&lang=1&ti=Road+Vehicle+Fleet+at+31+December+by+Country%2C+Type+of+Vehicle%2C+Age+Group+and+Time.

Van den Bossche, F., Wets, G., & Brijs, T. (2005). The role of exposure in the analysis of road accidents: a Belgian case-study. *Steunpunt Mobiliteit & Openbare Werken, spoor Verkeersveiligheid - The role of exposure in the analysis of road accidents: a Belgian case-study*. Verkregen februari 5, 2012, van http://www.steunpuntmowverkeersveiligheid.be/nl/content.php?e=49.

van Elk, R., Mot, E., & Franses, P. H. (2010). Modeling healthcare expenditures: overview of the literature and evidence from a panel time-series model. *Expert Review of Pharmacoeconomics & Outcomes Research*, *10*(1), 25–35. doi:10.1586/ERP.09.72.

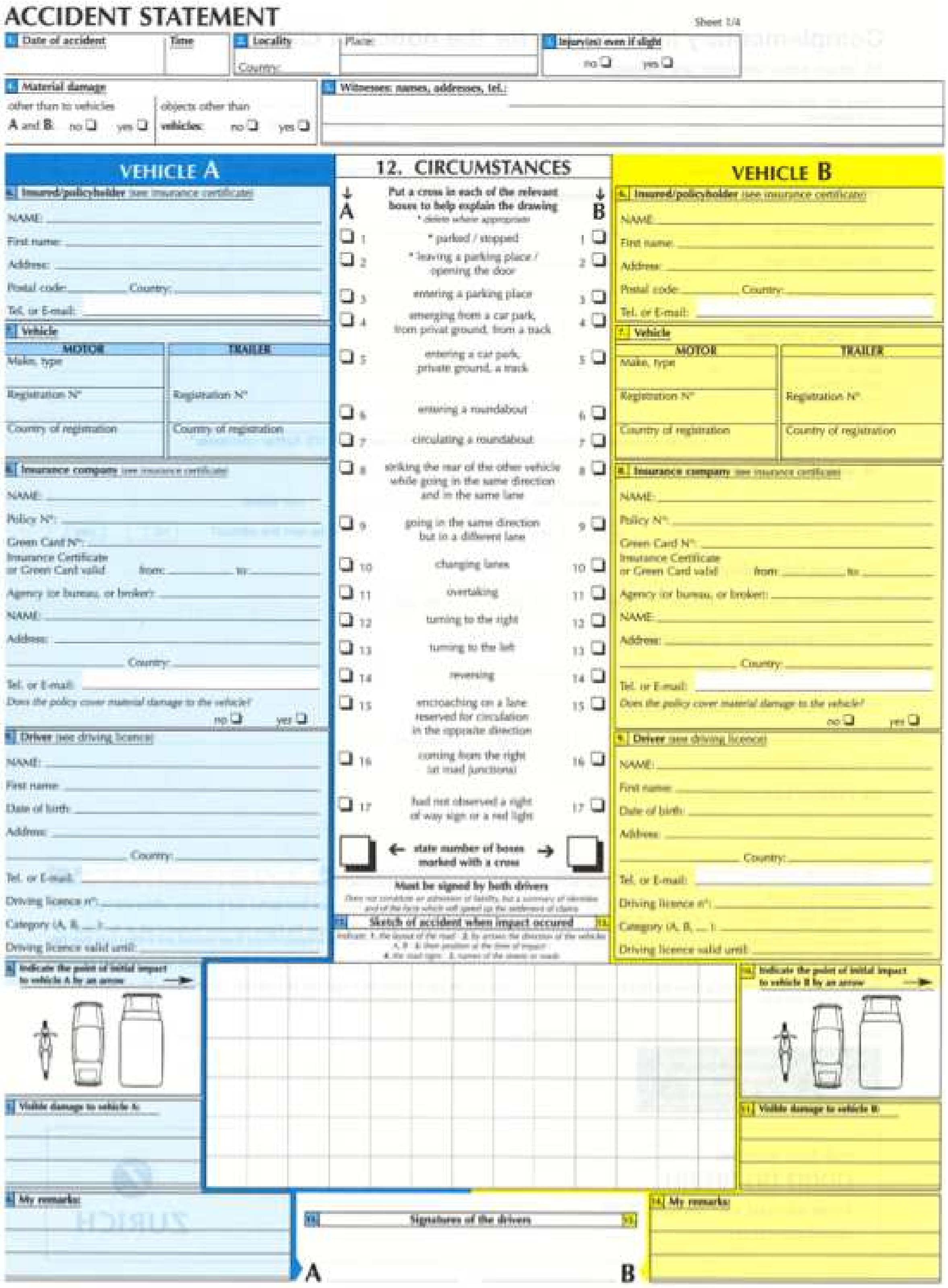
Vision zero initiative. (2011). Vision Zero Initiative Trafic safety by Sweden. Verkregen december 13, 2011, van http://www.visionzeroinitiative.com/.

Vlaams Ministerie van Mobiliteit en Openbare Werken Departement Mobiliteit en Openbare Werken (MOW) Afdeling Beleid Mobiliteit en Verkeersveiligheid (BMV). (2008). *Verkeersveiligheidsplan Vlaanderen* (p. 249). Brussel. Verkregen van http://www.mobielvlaanderen.be/beleidsplanning.php?a=14.

Wildervanck, C., & Tertoolen, G. (1998). *Mens op weg: begrippenkader□: beleidsvisie mobiliteit en gedrag*. Adviesdienst Verkeer en Vervoer.

Annexes

Annex 1: European accident form



ACCIDENT STATEMENT

Sheet 1/4

1. Date of accident — Time
2. Locality — Country: — Place:
3. Injury(ies) even if slight — no ❑ yes ❑
4. Material damage other than to vehicles A and B: no ❑ yes ❑ — objects other than vehicles: no ❑ yes ❑
5. Witnesses: names, addresses, tel.:

VEHICLE A

6. Insured/policyholder (see insurance certificate)
NAME:
First name:
Address:
Postal code: Country:
Tel. or E-mail:

7. Vehicle
MOTOR — Make, type — Registration N° — Country of registration
TRAILER — Registration N° — Country of registration

8. Insurance company (see insurance certificate)
NAME:
Policy N°:
Green Card N°:
Insurance Certificate or Green Card valid from: to:
Agency (or bureau, or broker):
NAME:
Address:
Country:
Tel. or E-mail:
Does the policy cover material damage to the vehicle? no ❑ yes ❑

9. Driver (see driving licence)
NAME:
First name:
Date of birth:
Address:
Country:
Tel. or E-mail:
Driving licence n°:
Category (A, B, ...):
Driving licence valid until:

10. Indicate the point of initial impact to vehicle A by an arrow →

11. Visible damage to vehicle A:

14. My remarks:

12. CIRCUMSTANCES

Put a cross in each of the relevant boxes to help explain the drawing
* delete where appropriate

A		B
❑ 1	* parked / stopped	1 ❑
❑ 2	* leaving a parking place / opening the door	2 ❑
❑ 3	entering a parking place	3 ❑
❑ 4	emerging from a car park, from private ground, from a track	4 ❑
❑ 5	entering a car park, private ground, a track	5 ❑
❑ 6	entering a roundabout	6 ❑
❑ 7	circulating a roundabout	7 ❑
❑ 8	striking the rear of the other vehicle while going in the same direction and in the same lane	8 ❑
❑ 9	going in the same direction but in a different lane	9 ❑
❑ 10	changing lanes	10 ❑
❑ 11	overtaking	11 ❑
❑ 12	turning to the right	12 ❑
❑ 13	turning to the left	13 ❑
❑ 14	reversing	14 ❑
❑ 15	encroaching on a lane reserved for circulation in the opposite direction	15 ❑
❑ 16	coming from the right (at road junctions)	16 ❑
❑ 17	had not observed a right of way sign or a red light	17 ❑
❑	← state number of boxes marked with a cross →	❑

Must be signed by both drivers

13. Sketch of accident when impact occurred

15. Signatures of the drivers

A — B

VEHICLE B

6. Insured/policyholder (see insurance certificate)
NAME:
First name:
Address:
Postal code: Country:
Tel. or E-mail:

7. Vehicle
MOTOR — Make, type — Registration N° — Country of registration
TRAILER — Registration N° — Country of registration

8. Insurance company (see insurance certificate)
NAME:
Policy N°:
Green Card N°:
Insurance Certificate or Green Card valid from: to:
Agency (or bureau, or broker):
NAME:
Address:
Country:
Tel. or E-mail:
Does the policy cover material damage to the vehicle? no ❑ yes ❑

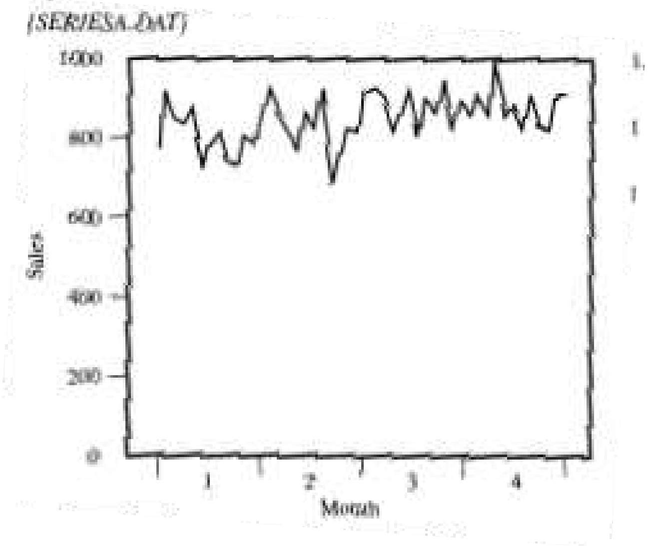
9. Driver (see driving licence)
NAME:
First name:
Date of birth:
Address:
Country:
Tel. or E-mail:
Driving licence n°:
Category (A, B, ...):
Driving licence valid until:

10. Indicate the point of initial impact to vehicle B by an arrow →

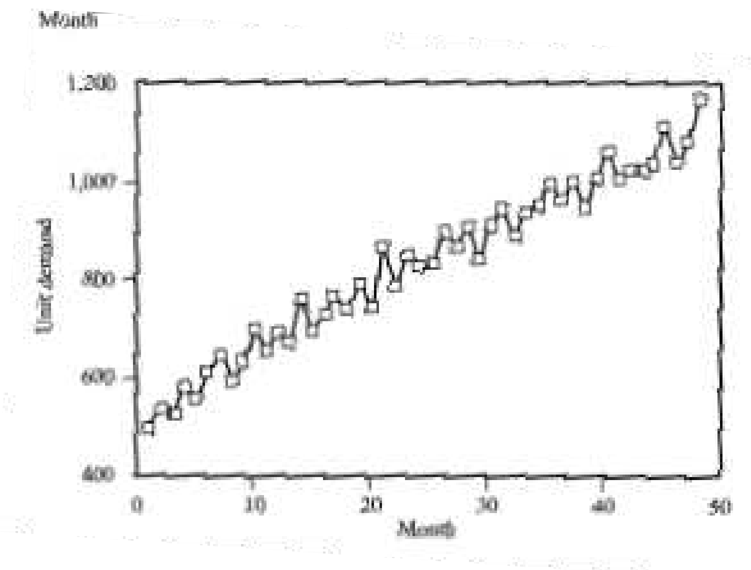
11. Visible damage to vehicle B:

14. My remarks:

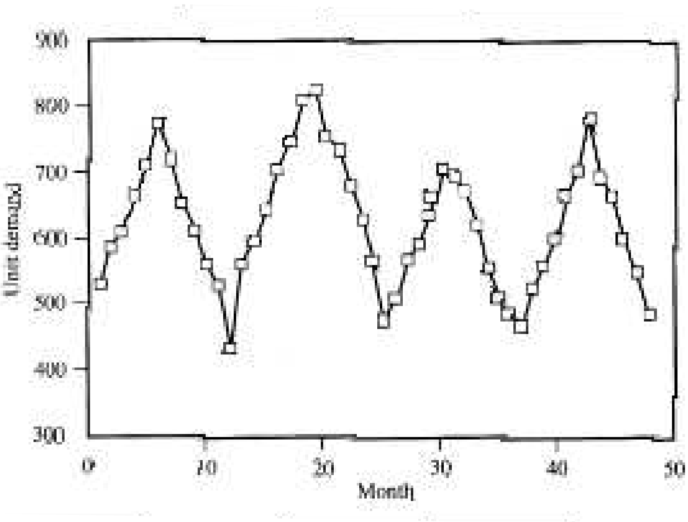
Annex 2: Figure of a random pattern (Delurgio, 1997) Data from (Seriesa.dat demand for printer paper, a series with random sales).



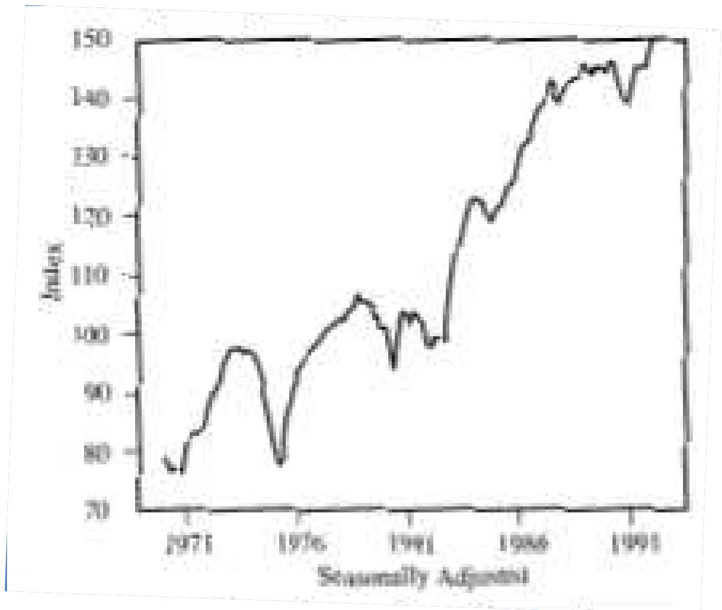
Annex 3: Figure of a trend pattern (Delurgio, 1997). Data from (Seriesc.dat demand for advanced microcomputers).



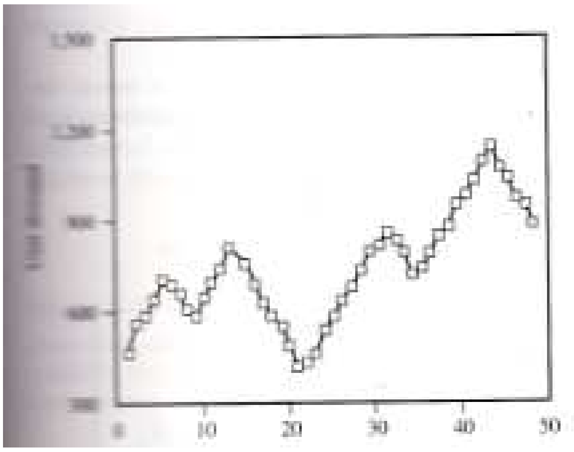
Annex 4: Figure of a seasonal pattern (Delurgio, 1997). Data from (Seriesc.dat, demand for a brand of diet soft drink).



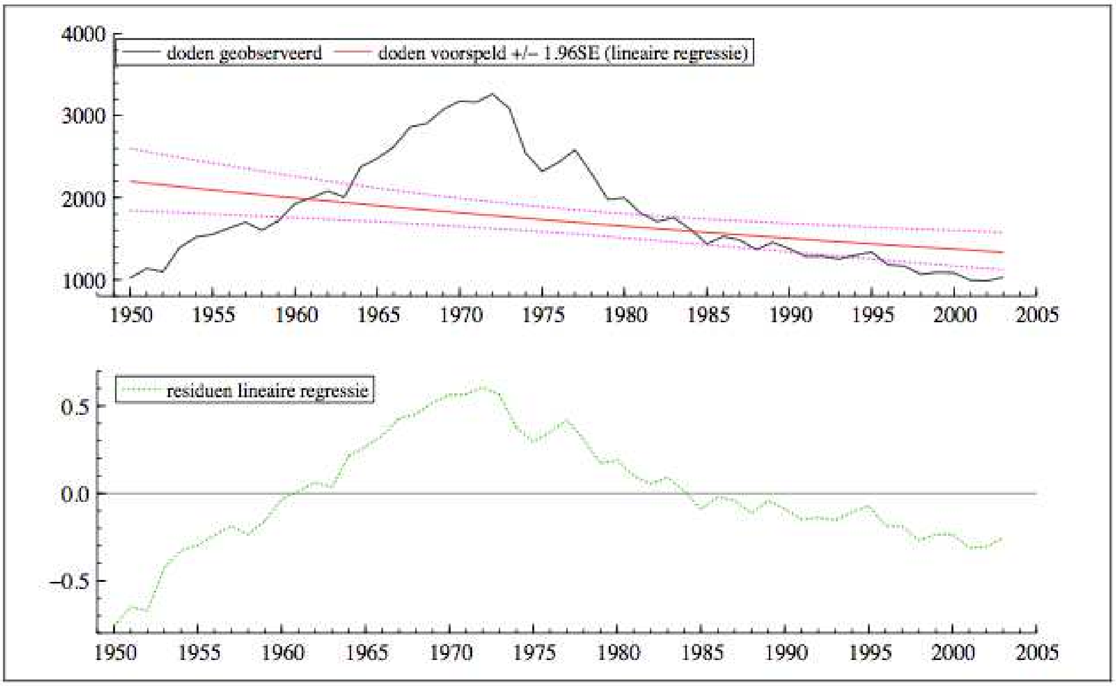
Annex 5: Figure of a cyclical pattern (Delurgio, 1997). Data from (Leadin.dat Composite index of 11 leading economic indicators).



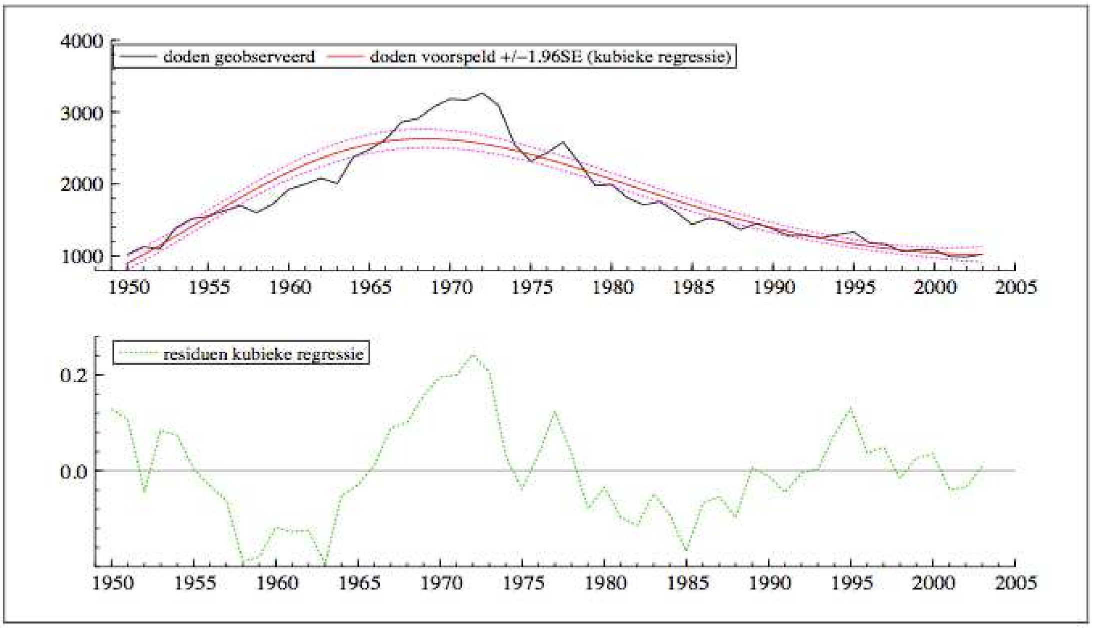
Annex 6: Figure of an auto correlated pattern (Delurgio, 1997) Data from (SeriesB.Dat)



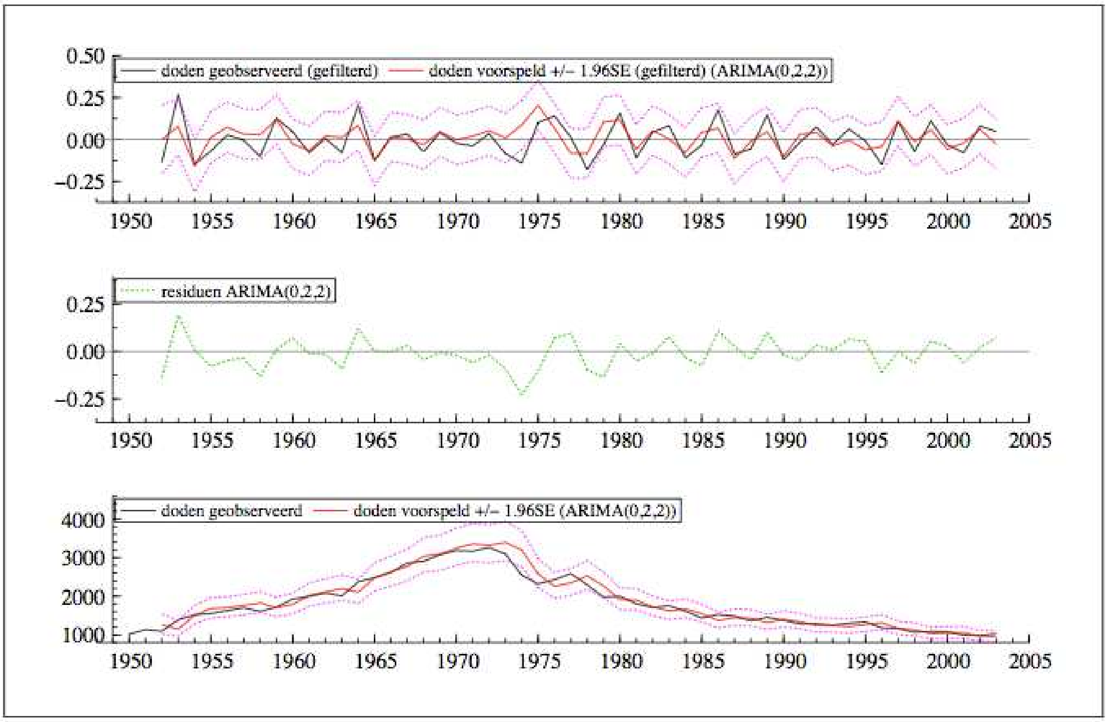
Annex 7: Linear regression model applied for the number of traffic deaths in the Netherlands (SWOV Wetenschappelijk Onderzoek Verkeersveiligheid, 2010).



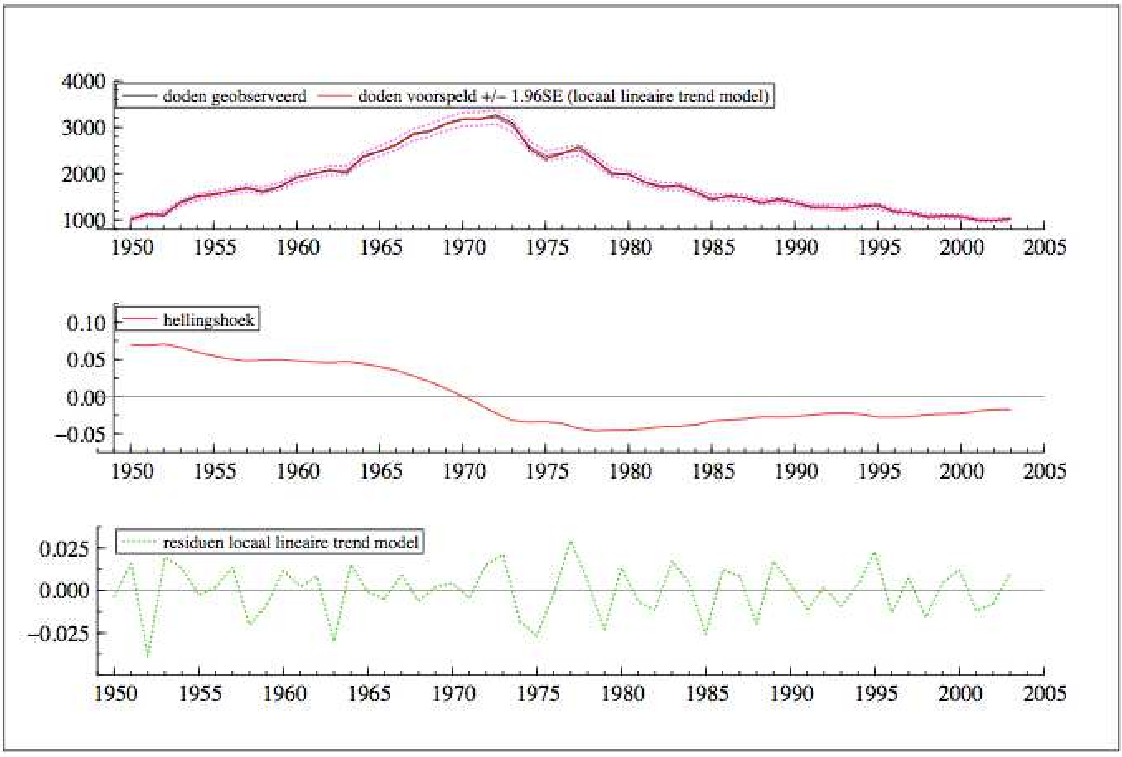
Annex 8: Kubic regression analysis for the number of traffic deaths in the Netherlands (SWOV Wetenschappelijk Onderzoek Verkeersveiligheid, 2010).



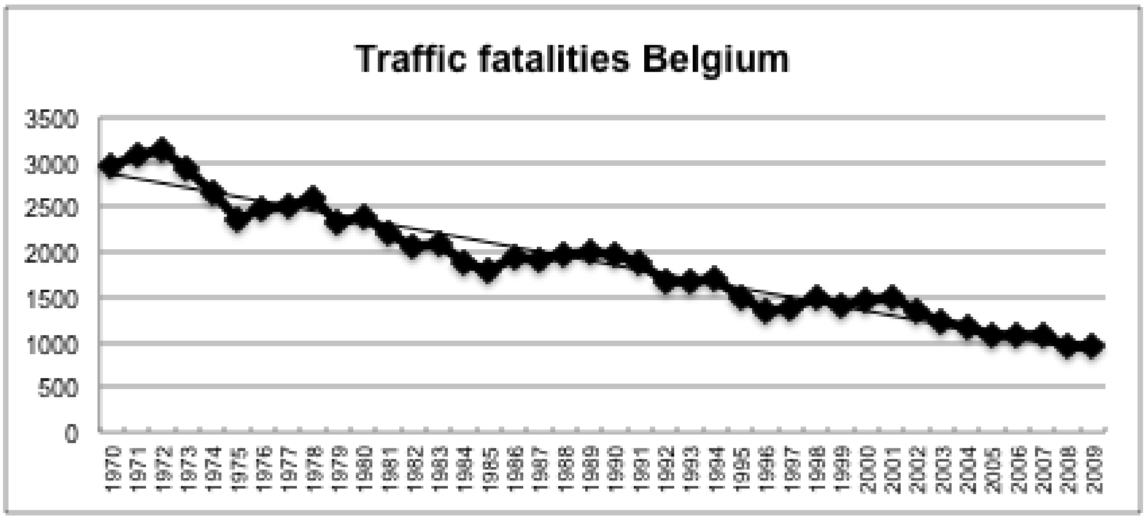
Annex 9: AMIRA analysis for the number of traffic deaths in the Netherlands (SWOV Wetenschappelijk Onderzoek Verkeersveiligheid, 2010).



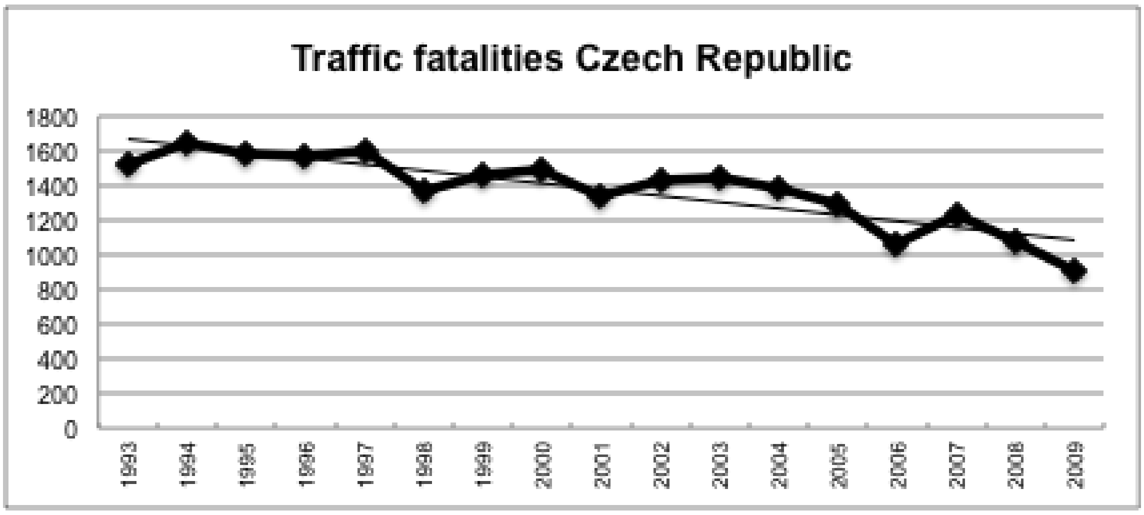
Annex 10: Results of the local linear trend model of traffic deaths in the Netherlands (SWOV Wetenschappelijk Onderzoek Verkeersveiligheid, 2010).



Annex 11: Number of traffic fatalities in Belgium. (Organisation for Economic Co-operation and development, 2012a)



Annex 12: Number of traffic fatalities in Czech Republic (Organisation for Economic Co-operation and development, 2012a)

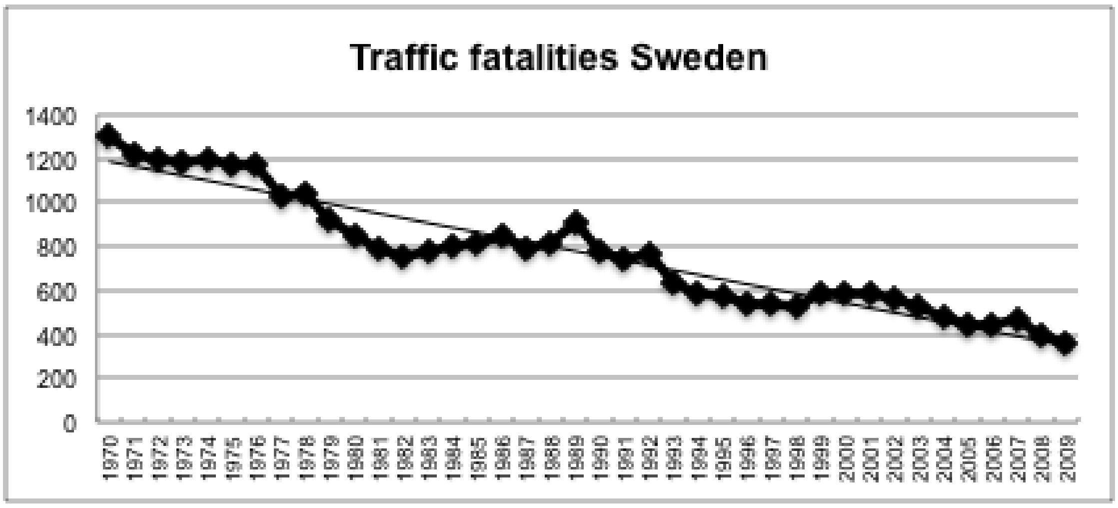


Annex 13: Number of traffic fatalities in Finland. (Organisation for Economic Co-operation and development, 2012a)

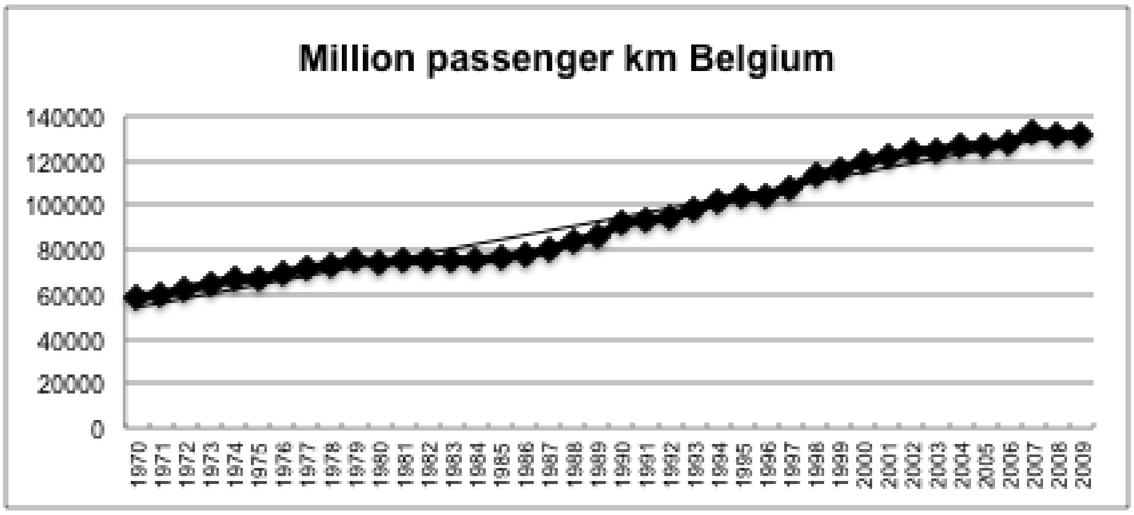
Annex 14: Number of traffic fatalities in Iceland (Organisation for Economic Co-operation and development, 2012a)

Annex 15: Number of traffic fatalities in Poland (Organisation for Economic Co-operation and development, 2012a)

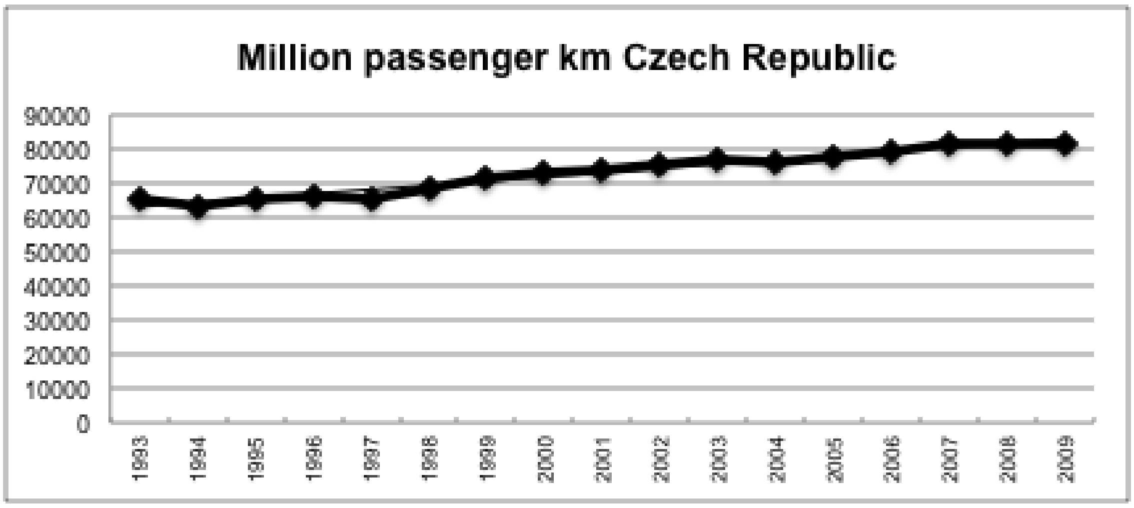
Annex 16: Number of traffic fatalities in Sweden. (Organisation for Economic Co-operation and development, 2012a)



Annex 17: Driven million passenger kilometres in Belgium (Organisation for Economic Co-operation and development, 2012b)

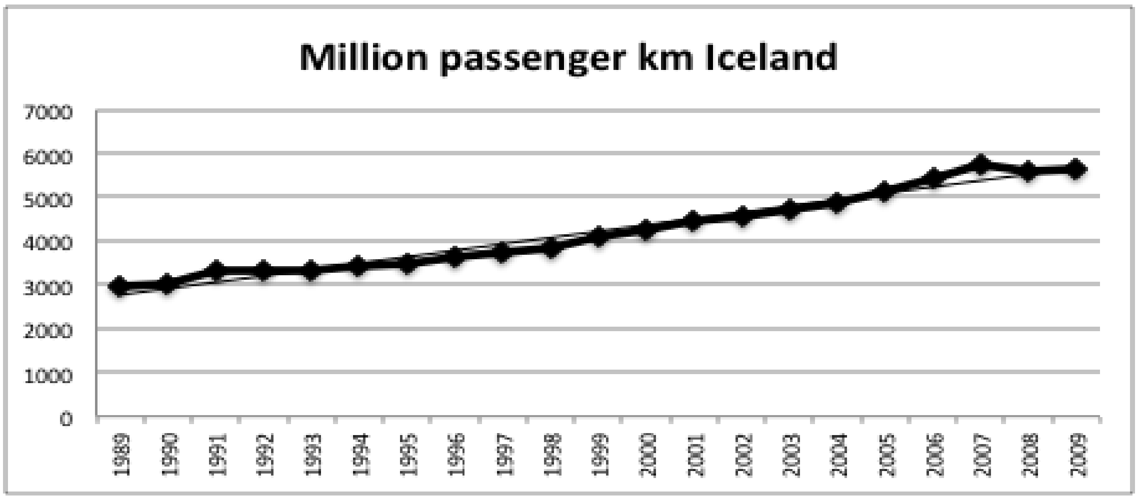


Annex 18: Driven million passenger kilometres in Czech Republic (Organisation for Economic Co-operation and development, 2012b)



Annex 19: Driven million passenger kilometres in Finland (Organisation for Economic Co-operation and development, 2012b)

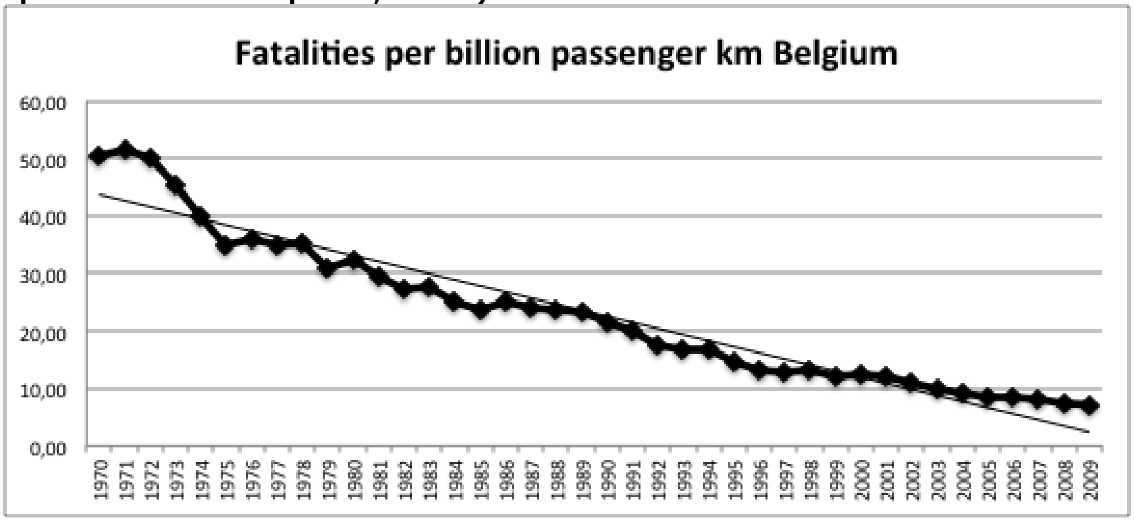
Annex 20: Driven million passenger kilometres in Iceland (Organisation for Economic Co-operation and development, 2012b)



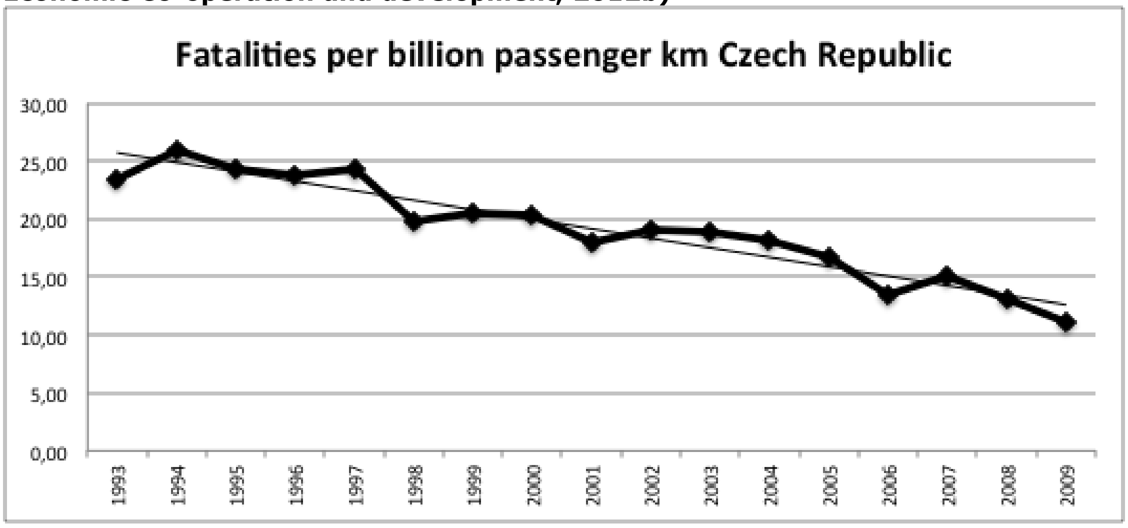
Annex 21: Driven million passenger kilometres in Poland (Organisation for Economic Co-operation and development, 2012b)

Annex 22: Driven million passenger kilometres in Sweden (Organisation for Economic Co-operation and development, 2012b)

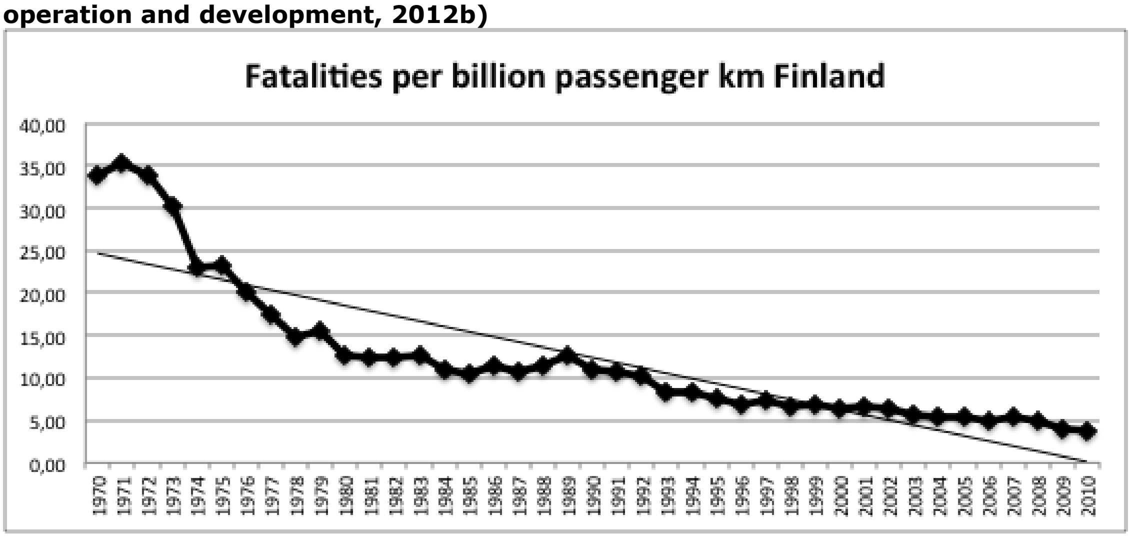
Annex 23: Traffic fatalities per billion passenger kilometres for Belgium (Organisation for Economic Co-operation and development, 2012a) & (Organisation for Economic Co-operation and development, 2012b)



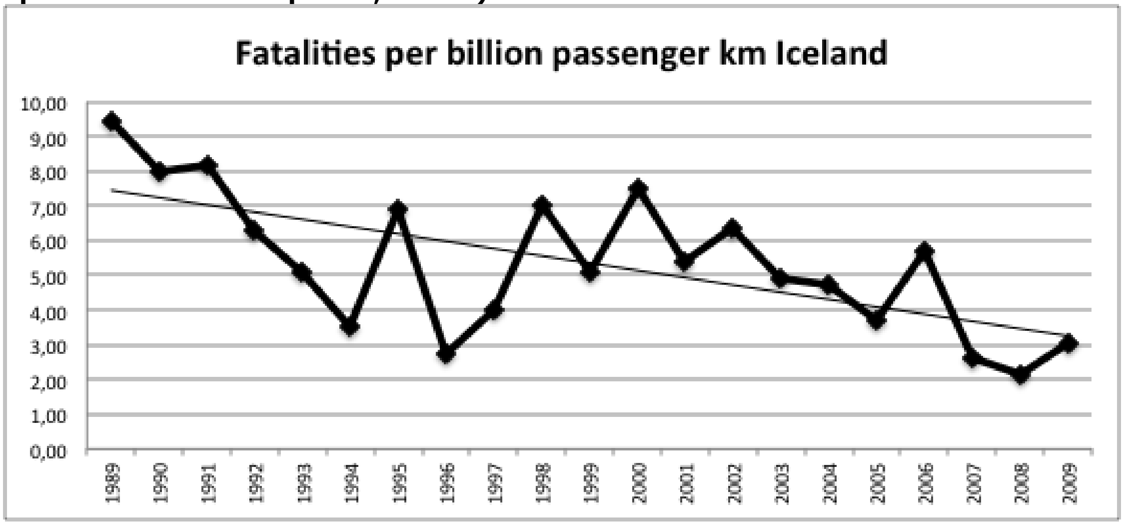
Annex 24: Traffic fatalities per billion passenger kilometres in Czech Republic (Organisation for Economic Co-operation and development, 2012a) & (Organisation for Economic Co-operation and development, 2012b)



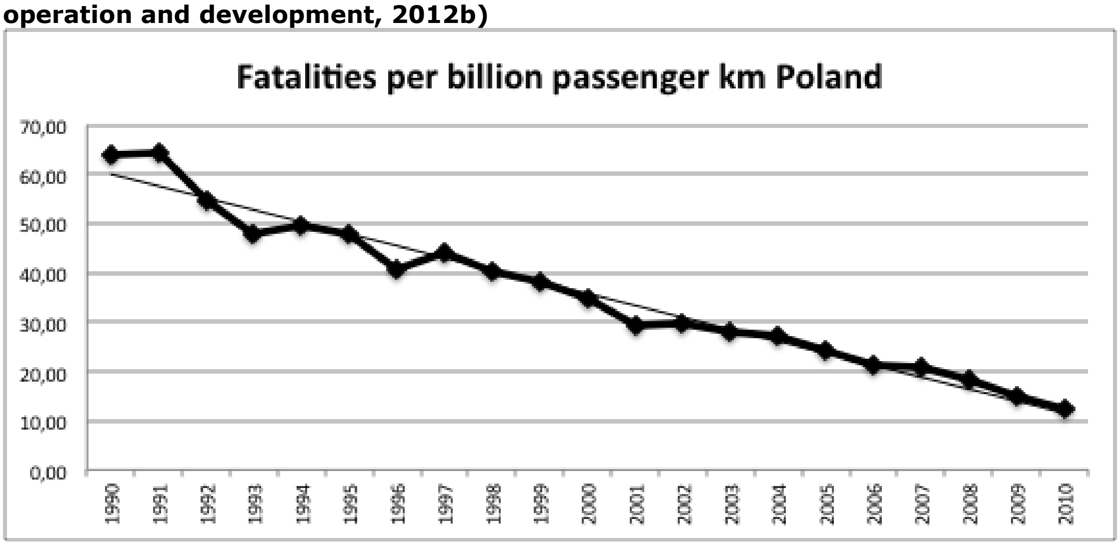
Annex 25: Traffic fatalities per billion passenger kilometres for Finland (Organisation for Economic Co-operation and development, 2012a) & (Organisation for Economic Co-operation and development, 2012b)



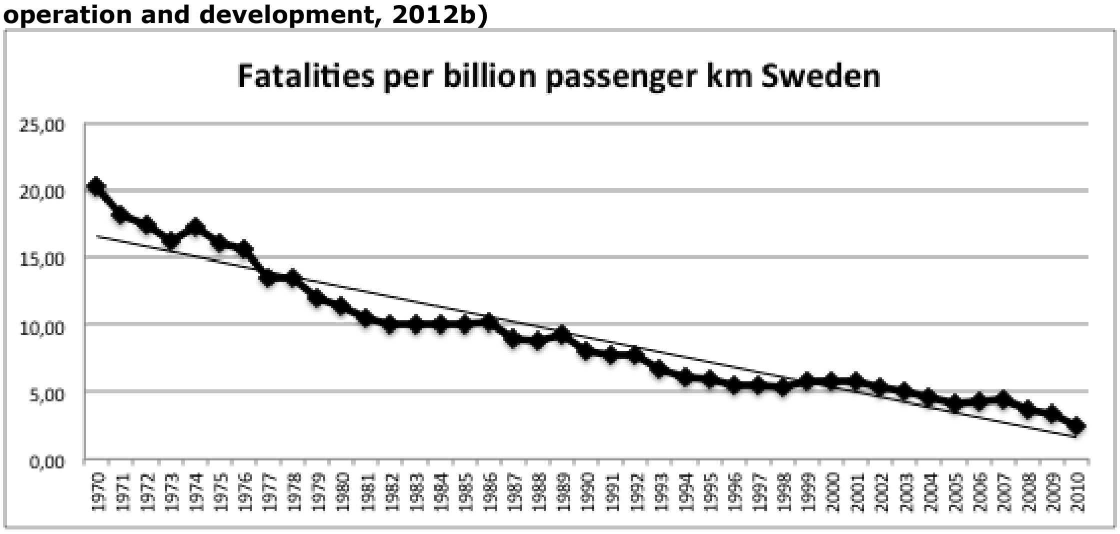
Annex 26: Traffic fatalities per billion passenger kilometres for Iceland (Organisation for Economic Co-operation and development, 2012a) & (Organisation for Economic Co-operation and development, 2012b)



Annex 27: Traffic fatalities per billion passenger kilometres for Poland (Organisation for Economic Co-operation and development, 2012a) & (Organisation for Economic Co-operation and development, 2012b)



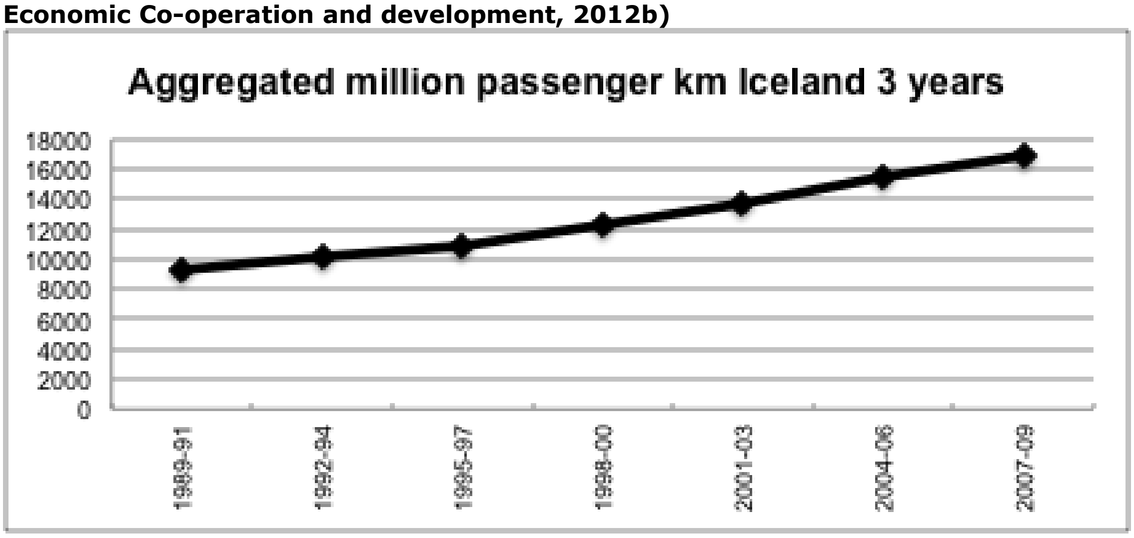
Annex 28: Traffic fatalities per billion passenger kilometres for Sweden (Organisation for Economic Co-operation and development, 2012a) & (Organisation for Economic Co-operation and development, 2012b)



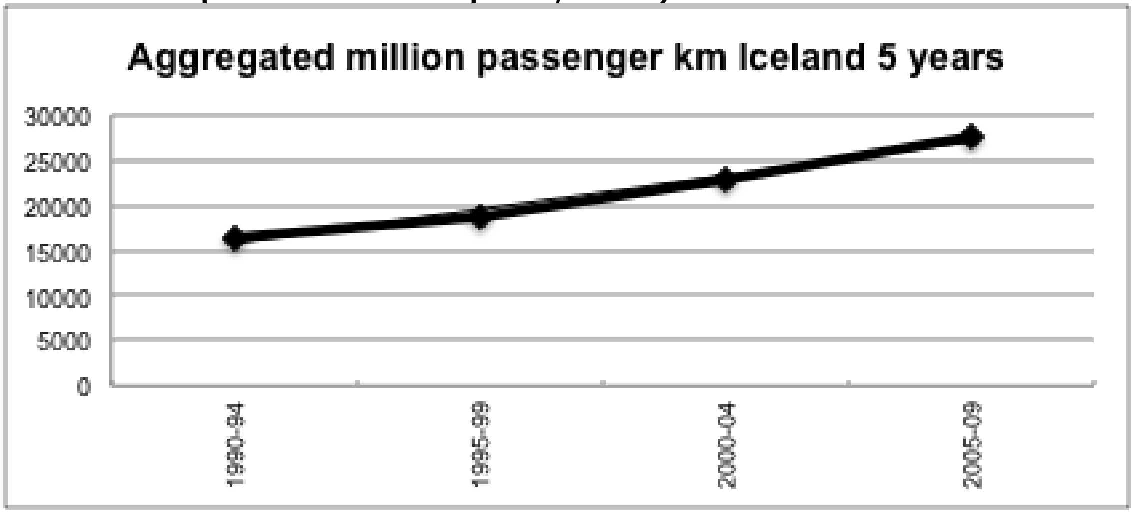
Annex 29: Aggregated traffic fatalities of Iceland over five years (Organisation for Economic Co-operation and development, 2012a)

Annex 30: Aggregated traffic fatalities of Iceland over three years (Organisation for Economic Co-operation and development, 2012a)

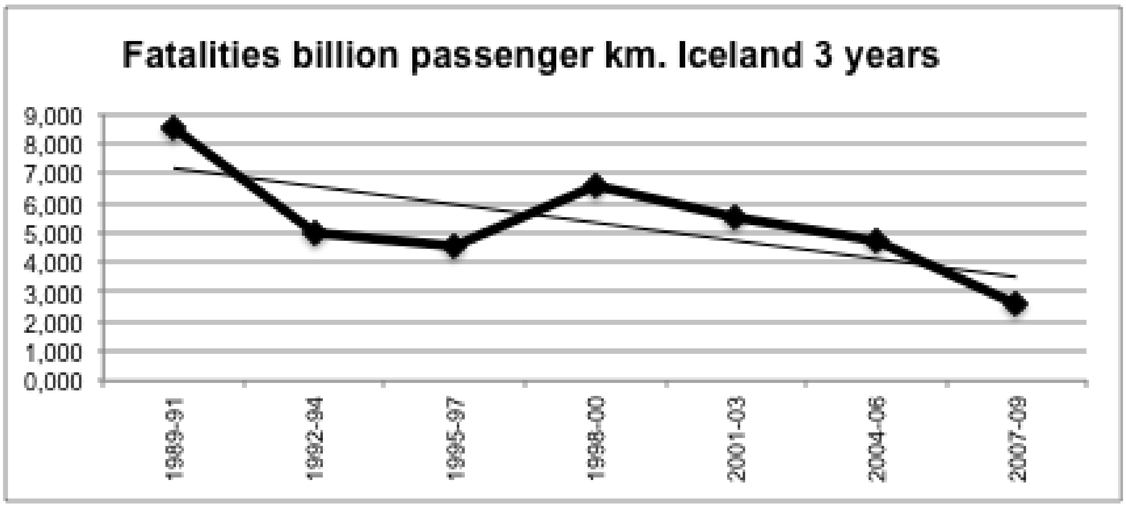
Annex 31: Aggregated driven million passenger kilometres in Iceland (Organisation for Economic Co-operation and development, 2012b)



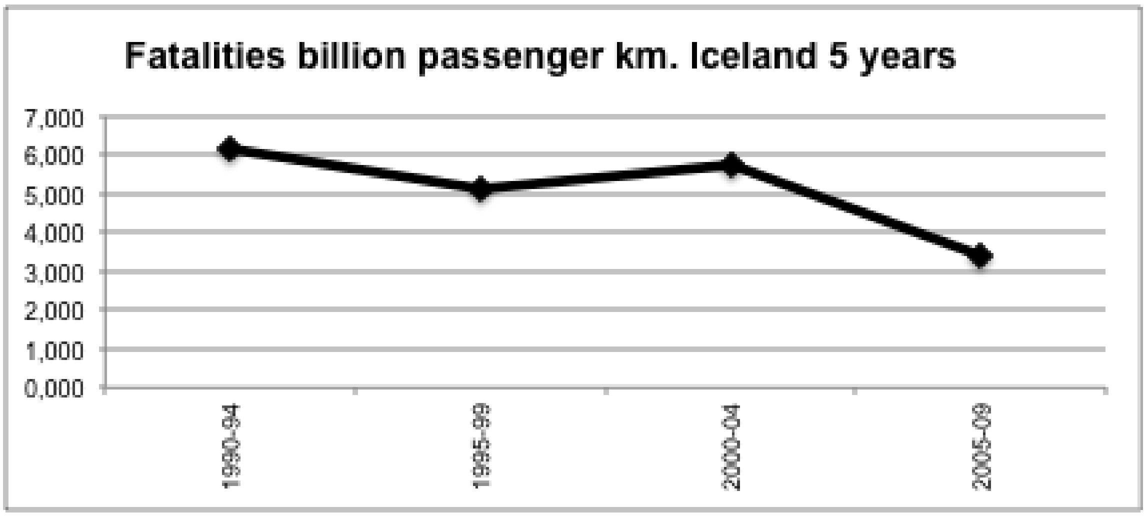
Annex 32: Aggregated driven million passenger kilometres in Iceland (Organisation for Economic Co-operation and development, 2012b)



Annex 33: Traffic fatalities per billion passenger kilometres for Iceland aggregated over three years (Organisation for Economic Co-operation and development, 2012a) & (Organisation for Economic Co-operation and development, 2012b)



Annex 34: Traffic fatalities per billion passenger kilometres for Iceland aggregated over three years (Organisation for Economic Co-operation and development, 2012a) & (Organisation for Economic Co-operation and development, 2012b)



Annex 35: Absolute and relative number of fatalities per year by age for Belgium. The relative numbers are based on the first data point of each age category (European Commission Road Safety, 2012a).

Country & Age	Belgium <15		Belgium 15-17		Belgium 18-24		Belgium 25-49		Belgium 50-64		Belgium 64>	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	69	1,00	73	1,00	421	1,00	724	1,00	226	1,00	347	1,00
1992	90	1,30	68	0,93	392	0,93	637	0,88	196	0,87	277	0,80
1993	63	0,91	55	0,75	363	0,86	655	0,90	237	1,05	277	0,80
1994	67	0,97	53	0,73	385	0,91	676	0,93	211	0,93	290	0,84
1995	77	1,12	55	0,75	288	0,68	600	0,83	178	0,79	237	0,68
1996	53	0,77	54	0,74	261	0,62	550	0,76	162	0,72	267	0,77
1997	54	0,78	50	0,68	252	0,60	578	0,80	183	0,81	237	0,68
1998	87	1,26	49	0,67	297	0,71	610	0,84	185	0,82	260	0,75
1999	65	0,94	39	0,53	287	0,68	580	0,80	189	0,84	233	0,67
2000	52	0,75	55	0,75	328	0,78	608	0,84	176	0,78	238	0,69
2001	63	0,91	46	0,63	281	0,67	632	0,87	192	0,85	264	0,76
2002	36	0,52	47	0,64	262	0,62	568	0,78	171	0,76	210	0,61
2003	32	0,46	39	0,53	241	0,57	484	0,67	166	0,73	240	0,69
2004	26	0,38	32	0,44	240	0,57	509	0,70	150	0,66	201	0,58
2005	37	0,54	31	0,42	196	0,47	473	0,65	160	0,71	186	0,54
2006	32	0,46	21	0,29	195	0,46	482	0,67	141	0,62	193	0,56
2007	30	0,43	27	0,37	215	0,51	464	0,64	159	0,70	170	0,49
2008	35	0,51	28	0,38	177	0,42	411	0,57	139	0,62	149	0,43
2009	16	0,23	21	0,29	147	0,35	355	0,49	150	0,66	163	0,47
2010	23	0,33	21	0,29	171	0,41	343	0,47	124	0,55	153	0,44

Annex 36: Absolute and relative number of fatalities per year by age for Czech Republic. The relative numbers are based on the first data point of each age category (European Commission Road Safety, 2012a).

Country & Age	Czech Republic <15		Czech Republic 15-17		Czech Republic 18-24		Czech Republic 25-49		Czech Republic 50-64		Czech Republic 64>	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994	88	1,00	54	1,00	280	1,00	665	1,00	230	1,00	306	1,00
1995	64	0,73	54	1,00	280	1,00	633	0,95	249	1,08	293	0,96
1996	45	0,51	41	0,76	270	0,96	660	0,99	252	1,10	278	0,91
1997	67	0,76	47	0,87	331	1,18	602	0,91	277	1,20	255	0,83
1998	39	0,44	45	0,83	264	0,94	530	0,80	225	0,98	236	0,77
1999	48	0,55	40	0,74	267	0,95	610	0,92	259	1,13	219	0,72
2000	54	0,61	44	0,81	258	0,92	595	0,89	286	1,24	243	0,79
2001	38	0,43	37	0,69	236	0,84	519	0,78	252	1,10	241	0,79
2002	46	0,52	33	0,61	222	0,79	615	0,92	291	1,27	211	0,69
2003	38	0,43	41	0,76	243	0,87	612	0,92	268	1,17	231	0,75
2004	27	0,31	28	0,52	219	0,78	587	0,88	273	1,19	247	0,81
2005	41	0,47	31	0,57	223	0,80	520	0,78	264	1,15	202	0,66
2006	32	0,36	18	0,33	183	0,65	432	0,65	215	0,93	173	0,57
2007	25	0,28	29	0,54	190	0,68	523	0,79	230	1,00	201	0,66
2008	19	0,22	14	0,26	193	0,69	437	0,66	209	0,91	186	0,61
2009	16	0,18	13	0,24	133	0,48	405	0,61	166	0,72	167	0,55
2010	17	0,19	17	0,31	125	0,45	329	0,49	142	0,62	172	0,56

Annex 37: Absolute and relative number of fatalities per year by age for Finland. The relative numbers are based on the first data point of each age category (European Commission Road Safety, 2012a).

Country & Age	Finland <15		Finland 15-17		Finland 18-24		Finland 25-49		Finland 50-64		Finland 64>	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	36	1,00	33	1,00	116	1,00	191	1,00	100	1	156	1,00
1992	46	1,28	38	1,15	94	0,81	189	0,99	78	0,78	156	1,00
1993	30	0,83	25	0,76	72	0,62	173	0,91	66	0,66	118	0,76
1994	39	1,08	23	0,70	73	0,63	162	0,85	67	0,67	116	0,74
1995	28	0,78	25	0,76	57	0,49	146	0,76	66	0,66	119	0,76
1996	31	0,86	26	0,79	70	0,60	110	0,58	65	0,65	102	0,65
1997	34	0,94	17	0,52	57	0,49	123	0,64	84	0,84	123	0,79
1998	16	0,44	22	0,67	58	0,50	132	0,69	68	0,68	104	0,67
1999	26	0,72	17	0,52	62	0,53	144	0,75	86	0,86	96	0,62
2000	20	0,56	16	0,48	51	0,44	132	0,69	71	0,71	106	0,68
2001	19	0,53	20	0,61	84	0,72	137	0,72	77	0,77	96	0,62
2002	18	0,50	15	0,45	73	0,63	131	0,69	79	0,79	99	0,63
2003	22	0,61	12	0,36	59	0,51	124	0,65	66	0,66	96	0,62
2004	13	0,36	21	0,64	74	0,64	109	0,57	61	0,61	97	0,62
2005	21	0,58	16	0,48	53	0,46	140	0,73	58	0,58	91	0,58
2006	5	0,14	21	0,64	67	0,58	104	0,54	68	0,68	71	0,46
2007	14	0,39	18	0,55	75	0,65	118	0,62	76	0,76	79	0,51
2008	8	0,22	26	0,79	50	0,43	111	0,58	56	0,56	93	0,60
2009	6	0,17	23	0,70	51	0,44	84	0,44	46	0,46	69	0,44
2010	7	0,19	13	0,39	48	0,41	93	0,49	47	0,47	64	0,41

Annex 38: Absolute and relative number of fatalities per year by age for Poland. The relative numbers are based on the first data point of each age category (European Commission Road Safety, 2012a).

Country & Age	Poland <15		Poland 15-17		Poland 18-24		Poland 25-49		Poland 50-64		Poland 64>	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1995	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1996	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1997	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1998	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1999	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2000	267	1,00	245	1,00	1026	1,00	2654	1,00	1097	1,00	995	1,00
2001	262	0,98	204	0,83	894	0,87	2312	0,87	952	0,87	910	0,91
2002	248	0,93	204	0,83	958	0,93	2346	0,88	946	0,86	976	0,98
2003	231	0,87	154	0,63	908	0,88	2352	0,89	953	0,87	885	0,89
2004	228	0,85	153	0,62	851	0,83	2250	0,85	1104	1,01	965	0,97
2005	167	0,63	148	0,60	933	0,91	2100	0,79	1030	0,94	931	0,94
2006	151	0,57	150	0,61	895	0,87	1959	0,74	1054	0,96	888	0,89
2007	157	0,59	181	0,74	953	0,93	2112	0,80	1140	1,04	945	0,95
2008	146	0,55	185	0,76	948	0,92	1982	0,75	1163	1,06	962	0,97
2009	128	0,48	120	0,49	833	0,81	1668	0,63	970	0,88	810	0,81
2010	112	0,42	122	0,50	677	0,66	1419	0,53	871	0,79	674	0,68

Annex 39: Absolute and relative number of fatalities per year by age for Sweden. The relative values are based on the first data point of each age category (European Commission Road Safety, 2012a).

Country & Age	Sweden <15		Sweden 15-17		Sweden 18-24		Sweden 25-49		Sweden 50-64		Sweden >64	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	36	1,00	30	1,00	133	1,00	244	1,00	92	1,00	210	1,00
1992	37	1,03	21	0,70	134	1,01	234	0,96	121	1,32	212	1,01
1993	25	0,69	28	0,93	91	0,68	205	0,84	92	1,00	191	0,91
1994	34	0,94	12	0,40	82	0,62	176	0,72	87	0,95	198	0,94
1995	33	0,92	18	0,60	78	0,59	167	0,68	99	1,08	175	0,83
1996	22	0,61	29	0,97	67	0,50	146	0,60	92	1,00	181	0,86
1997	24	0,67	14	0,47	67	0,50	178	0,73	87	0,95	171	0,81
1998	25	0,69	16	0,53	76	0,57	167	0,68	99	1,08	148	0,70
1999	37	1,03	16	0,53	73	0,55	167	0,68	114	1,24	173	0,82
2000	19	0,53	16	0,53	102	0,77	202	0,83	98	1,07	154	0,73
2001	18	0,50	22	0,73	100	0,75	188	0,77	108	1,17	147	0,70
2002	18	0,50	20	0,67	100	0,75	180	0,74	103	1,12	139	0,66
2003	21	0,58	23	0,77	93	0,70	181	0,74	93	1,01	118	0,56
2004	14	0,39	19	0,63	78	0,59	159	0,65	71	0,77	139	0,66
2005	10	0,28	19	0,63	67	0,50	153	0,63	84	0,91	104	0,50
2006	16	0,44	24	0,80	75	0,56	142	0,58	93	1,01	95	0,45
2007	10	0,28	22	0,73	86	0,65	148	0,61	100	1,09	105	0,50
2008	6	0,17	13	0,43	64	0,48	142	0,58	70	0,76	102	0,49
2009	9	0,17	25	0,43	60	0,48	100	0,58	72	0,76	92	0,49
2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 40: Absolute and relative number of inhabitants per age class in Belgium (1th January). The relative values are based on the first data point of each age category (Eurostat, 2012e) (Eurostat, 2012d) (Eurostat, 2012f).

Country & age	Belgium <15		Belgium 15-17		Belgium 18-24		Belgium 25-49		Belgium 50-64		Belgium >64	
Year (1e jan.)	Inhabitants	Fraction	Inhabitants	Fraction	Inhabitants	Fraction	Inhabitants	Fraction	Inhabitants	Fraction	Inhabitants	Fraction
1991	1.811.271	1,00	372.382	1,00	1.005.685	1,00	3.602.212	1,00	1.694.743	1,00	1.500.682	1,00
1992	1.821.262	1,01	363.841	0,98	986.455	0,98	3.658.714	1,02	1.665.940	0,98	1.525.785	1,02
1993	1.829.407	1,01	362.234	0,97	968.524	0,96	3.709.687	1,03	1.648.464	0,97	1.550.003	1,03
1994	1.830.804	1,01	366.020	0,98	948.094	0,94	3.741.071	1,04	1.642.967	0,97	1.571.675	1,05
1995	1.826.830	1,01	370.021	0,99	929.337	0,92	3.765.127	1,05	1.642.714	0,97	1.596.545	1,06
1996	1.817.010	1,00	373.098	1,00	910.080	0,90	3.781.526	1,05	1.635.731	0,97	1.625.602	1,08
1997	1.811.212	1,00	375.723	1,01	893.966	0,89	3.783.938	1,05	1.652.301	0,97	1.653.086	1,10
1998	1.807.303	1,00	373.513	1,00	883.208	0,88	3.780.346	1,05	1.669.303	0,98	1.678.591	1,12
1999	1.805.250	1,00	367.725	0,99	880.165	0,88	3.771.095	1,05	1.692.064	1,00	1.697.453	1,13
2000	1.804.785	1,00	361.246	0,97	882.674	0,88	3.761.322	1,04	1.713.965	1,01	1.715.093	1,14
2001	1.805.090	1,00	356.414	0,96	886.374	0,88	3.746.335	1,04	1.739.466	1,03	1.729.735	1,15
2002	1.805.245	1,00	358.484	0,96	887.592	0,88	3.746.816	1,04	1.765.196	1,04	1.746.392	1,16
2003	1.802.699	1,00	362.267	0,97	888.173	0,88	3.745.494	1,04	1.794.821	1,06	1.762.390	1,17
2004	1.797.439	0,99	369.935	0,99	886.088	0,88	3.741.071	1,04	1.821.768	1,07	1.780.120	1,19
2005	1.794.858	0,99	375.075	1,01	885.873	0,88	3.736.432	1,04	1.854.114	1,09	1.799.500	1,20
2006	1.796.102	0,99	383.344	1,03	886.428	0,88	3.739.061	1,04	1.897.430	1,12	1.809.017	1,21
2007	1.797.729	0,99	390.057	1,05	890.475	0,89	3.742.667	1,04	1.953.544	1,15	1.810.062	1,21
2008	1.800.455	0,99	394.052	1,06	898.779	0,89	3.748.484	1,04	2.005.370	1,18	1.819.726	1,21
2009	1.814.876	1,00	390.737	1,05	914.049	0,91	3.749.245	1,04	2.047.395	1,21	1.836.778	1,22
2010	1.832.234	1,01	381.922	1,03	929.428	0,92	3.747.312	1,04	2.088.850	1,23	1.860.159	1,24
2011	1.856.529	1,02	374.504	1,01	948.192	0,94	3.757.164	1,04	2.132.072	1,26	1.882.805	1,25

Annex 41: Absolute and relative number of inhabitants per age class in Czech Republic (1th January). The relative values are based on the first data point of each age category (Eurostat, 2012e) (Eurostat, 2012d) (Eurostat, 2012f).

Country & Age	Czech Republic <15		Czech Republic 15-17		Czech Republic 18-24		Czech Republic 25-49		Czech Republic 50-64		Czech Republic > 64	
Year	Inhabitants	Frac-tion	Inhabitants	Frac-tion	Inhabitants	Frac-tion	Inhabitants	Frac-tion	Inhabitants	Frac-tion	Inhabitants	Frac-tion
1991	2.175.638	1,00	551.664	1,00	993.595	1,00	3.701.683	1,00	1.579.969	1,00	1.302.058	1,00
1992	2.120.802	0,97	557.684	1,01	1.034.600	1,04	3.707.313	1,00	1.577.191	1,00	1.314.958	1,01
1993	2.064.545	0,95	546.264	0,99	1.091.556	1,10	3.711.099	1,00	1.583.975	1,00	1.328.258	1,02
1994	2.009.833	0,92	533.160	0,97	1.145.796	1,15	3.696.973	1,00	1.605.408	1,02	1.342.843	1,03
1995	1.948.024	0,90	519.152	0,94	1.189.607	1,20	3.688.395	1,00	1.631.751	1,03	1.356.232	1,04
1996	1.893.259	0,87	492.514	0,89	1.222.068	1,23	3.693.402	1,00	1.647.821	1,04	1.372.280	1,05
1997	1.842.679	0,85	459.713	0,83	1.245.434	1,25	3.674.691	0,99	1.698.372	1,07	1.388.248	1,07
1998	1.795.032	0,83	430.523	0,78	1.253.731	1,26	3.662.292	0,99	1.755.685	1,11	1.401.862	1,08
1999	1.751.471	0,81	414.626	0,75	1.228.639	1,24	3.671.486	0,99	1.811.961	1,15	1.411.438	1,08
2000	1.707.205	0,78	407.627	0,74	1.181.171	1,19	3.700.361	1,00	1.863.656	1,18	1.418.078	1,09
2001	1.664.434	0,77	402.411	0,73	1.132.470	1,14	3.722.695	1,01	1.921.533	1,22	1.423.003	1,09
2002	1.621.862	0,75	400.135	0,73	1.083.813	1,09	3.710.451	1,00	1.975.618	1,25	1.414.557	1,09
2003	1.589.766	0,73	395.721	0,72	1.043.315	1,05	3.724.429	1,01	2.032.076	1,29	1.417.962	1,09
2004	1.554.475	0,71	393.465	0,71	1.010.635	1,02	3.749.193	1,01	2.080.495	1,32	1.423.192	1,09
2005	1.526.946	0,70	389.410	0,71	976.572	0,98	3.769.104	1,02	2.123.915	1,34	1.434.630	1,10
2006	1.501.331	0,69	390.180	0,71	961.872	0,97	3.785.407	1,02	2.155.898	1,36	1.456.391	1,12
2007	1.479.514	0,68	387.273	0,70	958.927	0,97	3.795.246	1,03	2.183.792	1,38	1.482.437	1,14
2008	1.476.923	0,68	382.195	0,69	963.966	0,97	3.839.460	1,04	2.205.752	1,40	1.512.834	1,16
2009	1.480.007	0,68	373.973	0,68	970.776	0,98	3.883.827	1,05	2.202.807	1,39	1.556.152	1,20
2010	1.494.370	0,69	352.641	0,64	964.090	0,97	3.913.188	1,06	2.183.641	1,38	1.598.883	1,23
2011	1.518.142	0,70	327.548	0,59	947.111	0,95	3.933.387	1,06	2.170.756	1,37	1.635.826	1,26

Annex 42: Absolute and relative number of inhabitants per age class in Finland (1th January). The relative values are based on the first data point of each age category (Eurostat, 2012e) (Eurostat, 2012d) (Eurostat, 2012f).

Country & Age	Finland <15		Finland 15-17		Finland 18-24		Finland 25-49		Finland 50-64		Finland > 64	
Year	Inhabitants	Frac-tion	Inhabitants	Frac-tion	Inhabitants	Frac-tion	Inhabitants	Frac-tion	Inhabitants	Frac-tion	Inhabitants	Frac-tion
1991	964.203	1,00	183.854	1,00	463.137	1,00	1.931.970	1,00	782.349	1,00	672.965	1,00
1992	965.598	1,00	194.255	1,06	448.255	0,97	1.936.947	1,00	799.197	1,02	684.750	1,02
1993	968.280	1,00	198.098	1,08	438.431	0,95	1.960.930	1,01	793.992	1,01	695.251	1,03
1994	970.729	1,01	197.790	1,08	434.210	0,94	1.970.387	1,02	798.668	1,02	706.128	1,05
1995	972.244	1,01	195.578	1,06	435.511	0,94	1.969.517	1,02	806.186	1,03	719.718	1,07
1996	971.770	1,01	194.096	1,06	438.073	0,95	1.952.541	1,01	827.929	1,06	732.417	1,09
1997	968.567	1,00	194.185	1,06	441.788	0,95	1.924.196	1,00	860.429	1,10	743.155	1,10
1998	961.350	1,00	197.226	1,07	447.576	0,97	1.892.869	0,98	895.840	1,15	752.488	1,12
1999	951.145	0,99	200.890	1,09	455.427	0,98	1.859.721	0,96	933.643	1,19	758.820	1,13
2000	943.001	0,98	202.461	1,10	457.811	0,99	1.833.883	0,95	966.978	1,24	767.168	1,14
2001	936.333	0,97	199.026	1,08	459.982	0,99	1.813.430	0,94	995.146	1,27	777.198	1,15
2002	931.587	0,97	193.192	1,05	461.627	1,00	1.800.447	0,93	1.020.677	1,30	787.371	1,17
2003	927.009	0,96	188.053	1,02	462.339	1,00	1.784.231	0,92	1.046.099	1,34	798.564	1,19
2004	920.097	0,95	188.615	1,03	462.010	1,00	1.770.767	0,92	1.065.048	1,36	813.195	1,21
2005	914.560	0,95	191.208	1,04	460.261	0,99	1.756.713	0,91	1.082.929	1,38	830.940	1,23
2006	906.904	0,94	196.794	1,07	458.084	0,99	1.744.795	0,90	1.107.838	1,42	841.165	1,25
2007	901.181	0,93	198.532	1,08	458.819	0,99	1.734.315	0,90	1.115.391	1,43	868.717	1,29
2008	894.590	0,93	201.435	1,10	457.751	0,99	1.730.678	0,90	1.140.799	1,46	875.231	1,30
2009	891.162	0,92	200.398	1,09	458.219	0,99	1.732.525	0,90	1.151.942	1,47	892.068	1,33
2010	888.323	0,92	200.133	1,09	458.975	0,99	1.730.467	0,90	1.163.088	1,49	910.441	1,35
2011	887.677	0,92	196.619	1,07	463.245	1,00	1.726.017	0,89	1.160.677	1,48	941.041	1,40

Annex 43: Absolute and relative number of inhabitants per age class in Poland (1th January). The relative values are based on the first data point of each age category (Eurostat, 2012e) (Eurostat, 2012d) (Eurostat, 2012f).

Country & Age	Poland <15		Poland 15-17		Poland 18-24		Poland 25-49		Poland 50-64		Poland > 64	
Year	Inhabitants	Fraction	Inhabitants	Fraction	Inhabitants	Fraction	Inhabitants	Fraction	Inhabitants	Fraction	Inhabitants	Fraction
1991	9.522.733	1,00	1.795.979	1,00	3.579.397	1,00	13.662.317	1,00	5.738.515	1,00	3.884.219	1,00
1992	9.410.851	0,99	1.864.363	1,04	3.659.235	1,02	13.744.605	1,01	5.673.205	0,99	3.956.967	1,02
1993	9.277.067	0,97	1.897.849	1,06	3.770.984	1,05	13.843.735	1,01	5.596.759	0,98	4.031.714	1,04
1994	9.111.377	0,96	1.920.709	1,07	3.895.807	1,09	13.954.758	1,02	5.496.338	0,96	4.125.718	1,06
1995	8.922.504	0,94	1.934.767	1,08	4.037.876	1,13	14.055.036	1,03	5.410.967	0,94	4.219.447	1,09
1996	8.678.164	0,91	1.966.639	1,10	4.144.739	1,16	14.171.083	1,04	5.314.045	0,93	4.334.729	1,12
1997	8.446.059	0,89	1.971.458	1,10	4.248.170	1,19	14.189.898	1,04	5.357.890	0,93	4.425.866	1,14
1998	8.169.516	0,86	1.996.022	1,11	4.339.303	1,21	14.188.922	1,04	5.447.529	0,95	4.518.687	1,16
1999	7.861.047	0,83	2.027.589	1,13	4.428.651	1,24	14.159.877	1,04	5.595.283	0,98	4.594.536	1,18
2000	7.557.615	0,79	2.056.207	1,14	4.478.034	1,25	14.150.811	1,04	5.747.243	1,00	4.663.649	1,20
2001	7.294.451	0,77	2.038.454	1,14	4.432.653	1,24	13.876.038	1,02	5.886.584	1,03	4.725.775	1,22
2002	7.039.224	0,74	1.956.931	1,09	4.506.169	1,26	13.851.326	1,01	6.077.679	1,06	4.810.868	1,24
2003	6.804.264	0,71	1.859.421	1,04	4.568.801	1,28	13.813.850	1,01	6.284.520	1,10	4.887.675	1,26
2004	6.580.171	0,69	1.769.637	0,99	4.603.229	1,29	13.785.536	1,01	6.500.716	1,13	4.951.319	1,27
2005	6.377.237	0,67	1.709.830	0,95	4.577.403	1,28	13.772.756	1,01	6.718.336	1,17	5.018.273	1,29
2006	6.189.175	0,65	1.674.624	0,93	4.510.686	1,26	13.748.631	1,01	6.958.116	1,21	5.075.823	1,31
2007	6.022.360	0,63	1.638.207	0,91	4.435.958	1,24	13.709.934	1,00	7.202.510	1,26	5.116.510	1,32
2008	5.900.878	0,62	1.587.052	0,88	4.320.682	1,21	13.710.254	1,00	7.465.399	1,30	5.131.376	1,32
2009	5.829.440	0,61	1.520.229	0,85	4.176.801	1,17	13.752.147	1,01	7.710.972	1,34	5.146.287	1,32
2010	5.782.777	0,61	1.448.494	0,81	4.037.794	1,13	13.813.559	1,01	7.923.235	1,38	5.161.470	1,33
2011	5.758.505	0,60	1.381.651	0,77	3.886.691	1,09	13.891.226	1,02	8.097.400	1,41	5.184.564	1,33

Annex 44: Absolute and relative number of inhabitants per age class in Sweden (1th January). The relative values are based on the first data point of each age category (Eurostat, 2012e) (Eurostat, 2012d) (Eurostat, 2012f).

Country & Age	Sweden <15		Sweden 15-17		Sweden 18-24		Sweden 25-49		Sweden 50-64		Sweden > 64	
Year	Inhabitants	Frac-tion	Inhabitants	Frac-tion	Inhabitants	Frac-tion	Inhabitants	Frac-tion	Inhabitants	Frac-tion	Inhabitants	Frac-tion
1991	1.548.202	1,00	332.114	1,00	832.167	1,00	3.045.655	1,00	1.306.296	1,00	1.526.196	1,00
1992	1.577.126	1,02	322.008	0,97	819.543	0,98	3.078.529	1,01	1.315.167	1,01	1.531.747	1,00
1993	1.605.974	1,04	308.642	0,93	809.303	0,97	3.094.550	1,02	1.339.008	1,03	1.534.536	1,01
1994	1.635.518	1,06	299.212	0,90	802.400	0,96	3.098.914	1,02	1.372.948	1,05	1.536.117	1,01
1995	1.662.665	1,07	299.456	0,90	797.882	0,96	3.096.364	1,02	1.419.899	1,09	1.540.115	1,01
1996	1.665.362	1,08	301.776	0,91	785.145	0,94	3.077.092	1,01	1.464.789	1,12	1.543.332	1,01
1997	1.661.425	1,07	303.854	0,91	765.268	0,92	3.059.568	1,00	1.511.088	1,16	1.543.296	1,01
1998	1.654.452	1,07	302.374	0,91	749.713	0,90	3.043.926	1,00	1.554.786	1,19	1.542.374	1,01
1999	1.648.462	1,06	298.837	0,90	738.495	0,89	3.030.186	0,99	1.600.686	1,23	1.537.656	1,01
2000	1.639.701	1,06	300.385	0,90	724.678	0,87	3.022.945	0,99	1.641.162	1,26	1.532.555	1,00
2001	1.630.798	1,05	306.981	0,92	718.321	0,86	3.020.179	0,99	1.675.626	1,28	1.530.887	1,00
2002	1.620.275	1,05	317.991	0,96	716.703	0,86	3.019.933	0,99	1.702.162	1,30	1.532.064	1,00
2003	1.611.925	1,04	328.985	0,99	720.245	0,87	3.018.101	0,99	1.727.737	1,32	1.533.795	1,00
2004	1.598.990	1,03	342.446	1,03	730.871	0,88	3.012.389	0,99	1.749.720	1,34	1.541.254	1,01
2005	1.583.581	1,02	355.572	1,07	741.437	0,89	3.011.711	0,99	1.764.756	1,35	1.554.335	1,02
2006	1.560.776	1,01	373.463	1,12	752.185	0,90	3.013.369	0,99	1.782.582	1,36	1.565.377	1,03
2007	1.549.587	1,00	384.333	1,16	776.966	0,93	3.021.933	0,99	1.799.001	1,38	1.581.437	1,04
2008	1.541.733	1,00	389.919	1,17	804.635	0,97	3.034.460	1,00	1.803.767	1,38	1.608.413	1,05
2009	1.542.402	1,00	382.437	1,15	839.306	1,01	3.049.286	1,00	1.797.835	1,38	1.645.081	1,08
2010	1.549.442	1,00	371.651	1,12	872.335	1,05	3.070.532	1,01	1.785.945	1,37	1.690.777	1,11
2011	1.564.959	1,01	354.135	1,07	896.486	1,08	3.092.427	1,02	1.770.317	1,36	1.737.246	1,14

Annex 45: Absolute and relative number of fatalities per 100.000 inhabitants for Belgium. The relative values are based on the first data point of each age category (European Commission Road Safety, 2012a) (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

Country & age	Belgium <15		Belgium 15-17		Belgium 18-24		Belgium 25-49		Belgium 50-64		Belgium >64	
Year (1e jan.)	Fat/Inh	Frac-tion	Fat/Inh	Frac-tion	Fat/Inh	Fract-ion	Fat/Inh	Fract-ion	Fat/Inh	Fract-ion	Fat/Inh	Frac-tion
1991	3,81	1,00	19,60	1,00	41,86	1,00	20,10	1,00	13,34	1,00	23,12	1,00
1992	4,94	1,30	18,69	0,95	39,74	0,95	17,41	0,87	11,77	0,88	18,15	0,79
1993	3,44	0,90	15,18	0,77	37,48	0,90	17,66	0,88	14,38	1,08	17,87	0,77
1994	3,66	0,96	14,48	0,74	40,61	0,97	18,07	0,90	12,84	0,96	18,45	0,80
1995	4,21	1,11	14,86	0,76	30,99	0,74	15,94	0,79	10,84	0,81	14,84	0,64
1996	2,92	0,77	14,47	0,74	28,68	0,69	14,54	0,72	9,90	0,74	16,42	0,71
1997	2,98	0,78	13,31	0,68	28,19	0,67	15,28	0,76	11,08	0,83	14,34	0,62
1998	4,81	1,26	13,12	0,67	33,63	0,80	16,14	0,80	11,08	0,83	15,49	0,67
1999	3,60	0,95	10,61	0,54	32,61	0,78	15,38	0,77	11,17	0,84	13,73	0,59
2000	2,88	0,76	15,23	0,78	37,16	0,89	16,16	0,80	10,27	0,77	13,88	0,60
2001	3,49	0,92	12,91	0,66	31,70	0,76	16,87	0,84	11,04	0,83	15,26	0,66
2002	1,99	0,52	13,11	0,67	29,52	0,71	15,16	0,75	9,69	0,73	12,02	0,52
2003	1,78	0,47	10,77	0,55	27,13	0,65	12,92	0,64	9,25	0,69	13,62	0,59
2004	1,45	0,38	8,65	0,44	27,09	0,65	13,61	0,68	8,23	0,62	11,29	0,49
2005	2,06	0,54	8,27	0,42	22,13	0,53	12,66	0,63	8,63	0,65	10,34	0,45
2006	1,78	0,47	5,48	0,28	22,00	0,53	12,89	0,64	7,43	0,56	10,67	0,46
2007	1,67	0,44	6,92	0,35	24,14	0,58	12,40	0,62	8,14	0,61	9,39	0,41
2008	1,94	0,51	7,11	0,36	19,69	0,47	10,96	0,55	6,93	0,52	8,19	0,35
2009	0,88	0,23	5,37	0,27	16,08	0,38	9,47	0,47	7,33	0,55	8,87	0,38
2010	1,26	0,33	5,50	0,28	18,40	0,44	9,15	0,46	5,94	0,45	8,23	0,36
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 46: Absolute and relative number of fatalities per 100.000 inhabitants for Czech Republic. The relative values are based on the first data point of each age category (European Commission Road Safety, 2012a) (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

Country & age	Czech Rep. <15		Czech Rep. 15-17		Czech Rep. 18-24		Czech Rep. 25-49		Czech Rep. 50-64		Czech Rep. >64	
Year (1e jan.)	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994	4,38	1,00	10,13	1,00	24,44	1,00	17,99	1,00	14,33	1,00	22,79	1,00
1995	3,29	0,75	10,40	1,03	23,54	0,96	17,16	0,95	15,26	1,07	21,60	0,95
1996	2,38	0,54	8,32	0,82	22,09	0,90	17,87	0,99	15,29	1,07	20,26	0,89
1997	3,64	0,83	10,22	1,01	26,58	1,09	16,38	0,91	16,31	1,14	18,37	0,81
1998	2,17	0,50	10,45	1,03	21,06	0,86	14,47	0,80	12,82	0,89	16,83	0,74
1999	2,74	0,63	9,65	0,95	21,73	0,89	16,61	0,92	14,29	1,00	15,52	0,68
2000	3,16	0,72	10,79	1,07	21,84	0,89	16,08	0,89	15,35	1,07	17,14	0,75
2001	2,28	0,52	9,19	0,91	20,84	0,85	13,94	0,78	13,11	0,92	16,94	0,74
2002	2,84	0,65	8,25	0,81	20,48	0,84	16,57	0,92	14,73	1,03	14,92	0,65
2003	2,39	0,55	10,36	1,02	23,29	0,95	16,43	0,91	13,19	0,92	16,29	0,71
2004	1,74	0,40	7,12	0,70	21,67	0,89	15,66	0,87	13,12	0,92	17,36	0,76
2005	2,69	0,61	7,96	0,79	22,83	0,93	13,80	0,77	12,43	0,87	14,08	0,62
2006	2,13	0,49	4,61	0,46	19,03	0,78	11,41	0,63	9,97	0,70	11,88	0,52
2007	1,69	0,39	7,49	0,74	19,81	0,81	13,78	0,77	10,53	0,74	13,56	0,60
2008	1,29	0,29	3,66	0,36	20,02	0,82	11,38	0,63	9,48	0,66	12,29	0,54
2009	1,08	0,25	3,48	0,34	13,70	0,56	10,43	0,58	7,54	0,53	10,73	0,47
2010	1,14	0,26	4,82	0,48	12,97	0,53	8,41	0,47	6,50	0,45	10,76	0,47
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 47: Absolute and relative number of fatalities per 100.000 inhabitants for Finland. The relative values are based on the first data point of each age category (European Commission Road Safety, 2012a) (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

Country & age	Finland <15		Finland 15-17		Finland 18-24		Finland 25-49		Finland 50-64		Finland >64	
Year (1e jan.)	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction
1991	3,73	1,00	17,95	1,00	25,05	1,00	9,89	1,00	12,78	1,00	23,18	1,00
1992	4,76	1,28	19,56	1,09	20,97	0,84	9,76	0,99	9,76	0,76	22,78	0,98
1993	3,10	0,83	12,62	0,70	16,42	0,66	8,82	0,89	8,31	0,65	16,97	0,73
1994	4,02	1,08	11,63	0,65	16,81	0,67	8,22	0,83	8,39	0,66	16,43	0,71
1995	2,88	0,77	12,78	0,71	13,09	0,52	7,41	0,75	8,19	0,64	16,53	0,71
1996	3,19	0,85	13,40	0,75	15,98	0,64	5,63	0,57	7,85	0,61	13,93	0,60
1997	3,51	0,94	8,75	0,49	12,90	0,52	6,39	0,65	9,76	0,76	16,55	0,71
1998	1,66	0,45	11,15	0,62	12,96	0,52	6,97	0,71	7,59	0,59	13,82	0,60
1999	2,73	0,73	8,46	0,47	13,61	0,54	7,74	0,78	9,21	0,72	12,65	0,55
2000	2,12	0,57	7,90	0,44	11,14	0,44	7,20	0,73	7,34	0,57	13,82	0,60
2001	2,03	0,54	10,05	0,56	18,26	0,73	7,55	0,76	7,74	0,61	12,35	0,53
2002	1,93	0,52	7,76	0,43	15,81	0,63	7,28	0,74	7,74	0,61	12,57	0,54
2003	2,37	0,64	6,38	0,36	12,76	0,51	6,95	0,70	6,31	0,49	12,02	0,52
2004	1,41	0,38	11,13	0,62	16,02	0,64	6,16	0,62	5,73	0,45	11,93	0,51
2005	2,30	0,61	8,37	0,47	11,52	0,46	7,97	0,81	5,36	0,42	10,95	0,47
2006	0,55	0,15	10,67	0,59	14,63	0,58	5,96	0,60	6,14	0,48	8,44	0,36
2007	1,55	0,42	9,07	0,51	16,35	0,65	6,80	0,69	6,81	0,53	9,09	0,39
2008	0,89	0,24	12,91	0,72	10,92	0,44	6,41	0,65	4,91	0,38	10,63	0,46
2009	0,67	0,18	11,48	0,64	11,13	0,44	4,85	0,49	3,99	0,31	7,73	0,33
2010	0,79	0,21	6,50	0,36	10,46	0,42	5,37	0,54	4,04	0,32	7,03	0,30
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 48: Absolute and relative number of fatalities per 100.000 inhabitants for Poland. The relative values are based on the first data point of each age category (European Commission Road Safety, 2012a) (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

Country & age	Poland <15		Poland 15-17		Poland 18-24		Poland 25-49		Poland 50-64		Poland >	
Year (1e jan.)	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1995	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1996	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1997	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1998	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1999	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2000	3,53	1,00	11,92	1,00	22,91	1,00	18,76	1,00	19,09	1,00	21,34	1,00
2001	3,59	1,02	10,01	0,84	20,17	0,88	16,66	0,89	16,17	0,85	19,26	0,90
2002	3,52	1,00	10,42	0,87	21,26	0,93	16,94	0,90	15,57	0,82	20,29	0,95
2003	3,39	0,96	8,28	0,70	19,87	0,87	17,03	0,91	15,16	0,79	18,11	0,85
2004	3,46	0,98	8,65	0,73	18,49	0,81	16,32	0,87	16,98	0,89	19,49	0,91
2005	2,62	0,74	8,66	0,73	20,38	0,89	15,25	0,81	15,33	0,80	18,55	0,87
2006	2,44	0,69	8,96	0,75	19,84	0,87	14,25	0,76	15,15	0,79	17,49	0,82
2007	2,61	0,74	11,05	0,93	21,48	0,94	15,40	0,82	15,83	0,83	18,47	0,87
2008	2,47	0,70	11,66	0,98	21,94	0,96	14,46	0,77	15,58	0,82	18,75	0,88
2009	2,20	0,62	7,89	0,66	19,94	0,87	12,13	0,65	12,58	0,66	15,74	0,74
2010	1,94	0,55	8,42	0,71	16,77	0,73	10,27	0,55	10,99	0,58	13,06	0,61
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 49: Absolute and relative number of fatalities per 100.000 inhabitants for Finland. The relative values are based on the first data point of each age category (European Commission Road Safety, 2012a) (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

Country & age	Sweden <15		Sweden 15-17		Sweden 18-24		Sweden 25-49		Sweden 50-64		Sweden > 64	
Year (1e jan.)	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction	Fat/Inh	Fraction
1991	2,33	1,00	9,03	1,00	15,98	1,00	8,01	1,00	7,04	1,00	13,76	1,00
1992	2,35	1,01	6,52	0,72	16,35	1,02	7,60	0,95	9,20	1,31	13,84	1,01
1993	1,56	0,67	9,07	1,00	11,24	0,70	6,62	0,83	6,87	0,98	12,45	0,90
1994	2,08	0,89	4,01	0,44	10,22	0,64	5,68	0,71	6,34	0,90	12,89	0,94
1995	1,98	0,85	6,01	0,67	9,78	0,61	5,39	0,67	6,97	0,99	11,36	0,83
1996	1,32	0,57	9,61	1,06	8,53	0,53	4,74	0,59	6,28	0,89	11,73	0,85
1997	1,44	0,62	4,61	0,51	8,76	0,55	5,82	0,73	5,76	0,82	11,08	0,81
1998	1,51	0,65	5,29	0,59	10,14	0,63	5,49	0,68	6,37	0,90	9,60	0,70
1999	2,24	0,97	5,35	0,59	9,88	0,62	5,51	0,69	7,12	1,01	11,25	0,82
2000	1,16	0,50	5,33	0,59	14,08	0,88	6,68	0,83	5,97	0,85	10,05	0,73
2001	1,10	0,47	7,17	0,79	13,92	0,87	6,22	0,78	6,45	0,92	9,60	0,70
2002	1,11	0,48	6,29	0,70	13,95	0,87	5,96	0,74	6,05	0,86	9,07	0,66
2003	1,30	0,56	6,99	0,77	12,91	0,81	6,00	0,75	5,38	0,76	7,69	0,56
2004	0,88	0,38	5,55	0,61	10,67	0,67	5,28	0,66	4,06	0,58	9,02	0,66
2005	0,63	0,27	5,34	0,59	9,04	0,57	5,08	0,63	4,76	0,68	6,69	0,49
2006	1,03	0,44	6,43	0,71	9,97	0,62	4,71	0,59	5,22	0,74	6,07	0,44
2007	0,65	0,28	5,72	0,63	11,07	0,69	4,90	0,61	5,56	0,79	6,64	0,48
2008	0,39	0,17	3,33	0,37	7,95	0,50	4,68	0,58	3,88	0,55	6,34	0,46
2009	0,58	0,25	6,54	0,72	7,15	0,45	3,28	0,41	4,00	0,57	5,59	0,41
2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 50: Absolute and relative number of female fatalities. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a).

Country	Belgium		Czech Republic		Finland		Poland		Sweden	
Year	Female Fatalities	Frac-tion	Female Fatalities	Frac-tion	Female Fatalities	Frac-tion	Female Fatalities	Frac-tion	Female Fatalities	Frac-tion
1991	492	1,00	NA	NA	208	1,00	NA	NA	215	1,00
1992	445	0,90	NA	NA	200	0,96	NA	NA	228	1,06
1993	423	0,86	NA	NA	147	0,71	NA	NA	193	0,90
1994	422	0,86	397	1,00	150	0,72	NA	NA	180	0,84
1995	354	0,72	397	1,00	113	0,54	NA	NA	167	0,78
1996	336	0,68	380	0,96	126	0,61	NA	NA	161	0,75
1997	345	0,70	353	0,89	150	0,72	NA	NA	136	0,63
1998	419	0,85	315	0,79	111	0,53	NA	NA	121	0,56
1999	376	0,76	345	0,87	131	0,63	NA	NA	158	0,73
2000	367	0,75	368	0,93	133	0,64	1.398	1,00	153	0,71
2001	384	0,78	338	0,85	137	0,66	1.322	0,95	149	0,69
2002	341	0,69	352	0,89	114	0,55	1.363	0,97	137	0,64
2003	299	0,61	325	0,82	107	0,51	1.324	0,95	138	0,64
2004	250	0,51	326	0,82	118	0,57	1.291	0,92	116	0,54
2005	260	0,53	298	0,75	96	0,46	1.243	0,89	113	0,53
2006	248	0,50	225	0,57	95	0,46	1.232	0,88	112	0,52
2007	215	0,44	275	0,69	101	0,49	1.333	0,95	127	0,59
2008	221	0,45	259	0,65	79	0,38	1.321	0,94	111	0,52
2009	234	0,48	225	0,57	71	0,34	1.109	0,79	92	0,43
2010	203	0,41	177	0,45	68	0,33	913	0,65	NA	NA
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 51: Absolute and relative number of male fatalities. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a).

Country	Belgium		Czech Republic		Finland		Poland		Sweden	
Year	Male Fatalities	Frac-tion	Male Fatalities	Frac-tion	Male Fatalities	Frac-tion	Male Fatalities	Frac-tion	Male Fatalities	Frac-tion
1991	1.380	1,00	NA	NA	424	1,00	NA	NA	530	1,00
1992	1.225	0,89	NA	NA	401	0,95	NA	NA	531	1,00
1993	1.237	0,90	NA	NA	337	0,79	NA	NA	439	0,83
1994	1.270	0,92	1.240	1,00	330	0,78	NA	NA	408	0,77
1995	1.094	0,79	1.191	0,96	328	0,77	NA	NA	403	0,76
1996	1.020	0,74	1.190	0,96	278	0,66	NA	NA	376	0,71
1997	1.018	0,74	1.244	1,00	288	0,68	NA	NA	404	0,76
1998	1.080	0,78	1.045	0,84	289	0,68	NA	NA	410	0,77
1999	1.021	0,74	1.110	0,90	300	0,71	NA	NA	422	0,80
2000	1.102	0,80	1.118	0,90	263	0,62	4.886	1,00	438	0,83
2001	1.102	0,80	995	0,80	296	0,70	4.202	0,86	433	0,82
2002	962	0,70	1.078	0,87	301	0,71	4.448	0,91	423	0,80
2003	911	0,66	1.122	0,90	272	0,64	4.299	0,88	391	0,74
2004	908	0,66	1.056	0,85	257	0,61	4.395	0,90	364	0,69
2005	823	0,60	988	0,80	283	0,67	4.175	0,85	324	0,61
2006	818	0,59	838	0,68	241	0,57	3.993	0,82	333	0,63
2007	850	0,62	946	0,76	279	0,66	4.241	0,87	344	0,65
2008	717	0,52	817	0,66	265	0,63	4.099	0,84	286	0,54
2009	705	0,51	659	0,53	208	0,49	3.456	0,71	266	0,50
2010	629	0,46	607	0,49	204	0,48	2.977	0,61	NA	NA
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 52: Absolute and relative number of female inhabitants. The relative values for all countries are based on the first data point of each category (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

Country	Belgium		Czech Republic		Finland		Poland		Sweden	
Year	Female Inhabitants	Frac-tion	Female Inhabitants	Frac-tion	Female Inhabitants	Frac-tion	Female Inhabitants	Frac-tion	Female Inhabitants	Frac-tion
1991	5.106.290	1,00	5.303.641	1,00	2.572.274	1,00	19.577.208	1,00	4.346.613	1,00
1992	5.122.765	1,00	5.306.546	1,00	2.585.960	1,01	19.647.898	1,00	4.373.497	1,01
1993	5.144.847	1,01	5.312.284	1,00	2.597.700	1,01	19.710.130	1,01	4.397.428	1,01
1994	5.160.407	1,01	5.314.716	1,00	2.607.716	1,01	19.758.399	1,01	4.424.155	1,02
1995	5.175.903	1,01	5.312.697	1,00	2.617.105	1,02	19.802.557	1,01	4.460.127	1,03
1996	5.184.262	1,02	5.304.829	1,00	2.625.125	1,02	19.823.369	1,01	4.471.425	1,03
1997	5.198.446	1,02	5.297.052	1,00	2.631.724	1,02	19.842.642	1,01	4.474.782	1,03
1998	5.209.592	1,02	5.290.395	1,00	2.638.251	1,03	19.858.815	1,01	4.475.712	1,03
1999	5.220.034	1,02	5.284.186	1,00	2.643.571	1,03	19.868.726	1,01	4.478.703	1,03
2000	5.233.071	1,02	5.277.036	0,99	2.648.276	1,03	19.870.135	1,01	4.481.308	1,03
2001	5.245.395	1,03	5.269.815	0,99	2.651.774	1,03	19.716.616	1,01	4.490.039	1,03
2002	5.267.437	1,03	5.238.450	0,99	2.657.304	1,03	19.717.034	1,01	4.500.683	1,04
2003	5.288.959	1,04	5.236.563	0,99	2.661.379	1,03	19.711.782	1,01	4.513.681	1,04
2004	5.309.245	1,04	5.236.715	0,99	2.666.839	1,04	19.704.178	1,01	4.529.014	1,04
2005	5.334.527	1,04	5.239.664	0,99	2.674.534	1,04	19.703.582	1,01	4.545.081	1,05
2006	5.367.561	1,05	5.248.431	0,99	2.683.230	1,04	19.703.200	1,01	4.561.202	1,05
2007	5.403.126	1,06	5.261.005	0,99	2.693.213	1,05	19.698.704	1,01	4.589.734	1,06
2008	5.442.557	1,07	5.298.196	1,00	2.703.697	1,05	19.704.140	1,01	4.619.006	1,06
2009	5.484.429	1,07	5.331.165	1,01	2.714.661	1,06	19.720.950	1,01	4.652.637	1,07
2010	5.527.684	1,08	5.349.616	1,01	2.726.360	1,06	19.738.587	1,01	4.691.668	1,08
2011	5.581.032	1,09	5.363.971	1,01	2.736.860	1,06	19.755.664	1,01	4.725.326	1,09

Annex 53: Absolute and relative number of male inhabitants. The relative values for all countries are based on the first data point of each category (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

Country	Belgium		Czech Republic		Finland		Poland		Sweden	
Year	Male Inhabitants	Frac-tion	Male Inhabitants	Frac-tion	Male Inhabitants	Frac-tion	Male Inhabitants	Frac-tion	Male Inhabitants	Frac-tion
1991	4.880.685	1,00	5.000.966	1,00	18.605.952	1,00	2.426.204	1,00	4.244.017	1,00
1992	4.899.232	1,00	5.006.002	1,00	18.661.328	1,00	2.443.042	1,01	4.270.623	1,01
1993	4.923.472	1,01	5.013.413	1,00	18.707.978	1,01	2.457.282	1,01	4.294.585	1,01
1994	4.940.224	1,01	5.019.297	1,00	18.746.308	1,01	2.470.196	1,02	4.320.954	1,02
1995	4.954.671	1,02	5.020.464	1,00	18.778.040	1,01	2.481.649	1,02	4.356.254	1,03
1996	4.958.785	1,02	5.016.515	1,00	18.786.030	1,01	2.491.701	1,03	4.366.071	1,03
1997	4.971.780	1,02	5.012.085	1,00	18.796.699	1,01	2.500.596	1,03	4.369.717	1,03
1998	4.982.672	1,02	5.008.730	1,00	18.801.164	1,01	2.509.098	1,03	4.371.913	1,03
1999	4.993.718	1,02	5.005.435	1,00	18.798.257	1,01	2.516.075	1,04	4.375.619	1,03
2000	5.006.014	1,03	5.001.062	1,00	18.783.424	1,01	2.523.026	1,04	4.380.118	1,03
2001	5.018.019	1,03	4.996.731	1,00	18.537.339	1,00	2.529.341	1,04	4.392.753	1,04
2002	5.042.288	1,03	4.967.986	0,99	18.525.163	1,00	2.537.597	1,05	4.408.445	1,04
2003	5.066.885	1,04	4.966.706	0,99	18.506.749	0,99	2.544.916	1,05	4.427.107	1,04
2004	5.087.176	1,04	4.974.740	0,99	18.486.430	0,99	2.552.893	1,05	4.446.656	1,05
2005	5.111.325	1,05	4.980.913	1,00	18.470.253	0,99	2.562.077	1,06	4.466.311	1,05
2006	5.143.821	1,05	5.002.648	1,00	18.453.855	0,99	2.572.350	1,06	4.486.550	1,06
2007	5.181.408	1,06	5.026.184	1,01	18.426.775	0,99	2.583.742	1,06	4.523.523	1,07
2008	5.224.309	1,07	5.082.934	1,02	18.411.501	0,99	2.596.787	1,07	4.563.921	1,08
2009	5.268.651	1,08	5.136.377	1,03	18.414.926	0,99	2.611.653	1,08	4.603.710	1,08
2010	5.312.221	1,09	5.157.197	1,03	18.428.742	0,99	2.625.067	1,08	4.649.014	1,10
2011	5.370.234	1,10	5.168.799	1,03	18.444.373	0,99	2.638.416	1,09	4.690.244	1,11

Annex 54: Absolute and relative number of female fatalities per 100.000 inhabitants. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a) (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

Country	Belgium Female		Czech Republic Female		Finland Female		Poland Female		Sweden Female	
Year	Fat/ 100000 Inhabitants	Frac-tion	Fat/ 100000 Inhabitants	Frac-tion	Fat/ 100000 Inhabitants	Frac-tion	Fat/ 100000 Inhabitants	Frac-tion	Fat/ 100000 Inhabitants	Frac-tion
1991	9,64	1,00	NA	NA	8,09	1,00	NA	NA	4,95	1,00
1992	8,69	0,90	NA	NA	7,73	0,96	NA	NA	5,21	1,05
1993	8,22	0,85	NA	NA	5,66	0,70	NA	NA	4,39	0,89
1994	8,18	0,85	7,47	1,00	5,75	0,71	NA	NA	4,07	0,82
1995	6,84	0,71	7,47	1,00	4,32	0,53	NA	NA	3,74	0,76
1996	6,48	0,67	7,16	0,96	4,80	0,59	NA	NA	3,60	0,73
1997	6,64	0,69	6,66	0,89	5,70	0,70	NA	NA	3,04	0,61
1998	8,04	0,83	5,95	0,80	4,21	0,52	NA	NA	2,70	0,55
1999	7,20	0,75	6,53	0,87	4,96	0,61	NA	NA	3,53	0,71
2000	7,01	0,73	6,97	0,93	5,02	0,62	7,04	1,00	3,41	0,69
2001	7,32	0,76	6,41	0,86	5,17	0,64	6,71	0,95	3,32	0,67
2002	6,47	0,67	6,72	0,90	4,29	0,53	6,91	0,98	3,04	0,62
2003	5,65	0,59	6,21	0,83	4,02	0,50	6,72	0,95	3,06	0,62
2004	4,71	0,49	6,23	0,83	4,42	0,55	6,55	0,93	2,56	0,52
2005	4,87	0,51	5,69	0,76	3,59	0,44	6,31	0,90	2,49	0,50
2006	4,62	0,48	4,29	0,57	3,54	0,44	6,25	0,89	2,46	0,50
2007	3,98	0,41	5,23	0,70	3,75	0,46	6,77	0,96	2,77	0,56
2008	4,06	0,42	4,89	0,65	2,92	0,36	6,70	0,95	2,40	0,49
2009	4,27	0,44	4,22	0,57	2,62	0,32	5,62	0,80	1,98	0,40
2010	3,67	0,38	3,31	0,44	2,49	0,31	4,63	0,66	NA	NA
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 55: Absolute and relative number of male fatalities per 100.000 inhabitants. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a) (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

Country	Belgium Male		Czech Republic Male		Finland Male		Poland Male		Sweden Male	
Year	Fat/ 100000 Inhabitants	Frac-tion	Fat/ 100000 Inhabitants	Frac-tion	Fat/ 100000 Inhabitants	Frac-tion	Fat/ 100000 Inhabitants	Frac-tion	Fat/ 100000 Inhabitants	Frac-tion
1991	28,27	1,00	NA	NA	17,48	1,00	NA	NA	12,49	1,00
1992	25,00	0,88	NA	NA	16,41	0,94	NA	NA	12,43	1,00
1993	25,12	0,89	NA	NA	13,71	0,78	NA	NA	10,22	0,82
1994	25,71	0,91	24,70	1,00	13,36	0,76	NA	NA	9,44	0,76
1995	22,08	0,78	23,72	0,96	13,22	0,76	NA	NA	9,25	0,74
1996	20,57	0,73	23,72	0,96	11,16	0,64	NA	NA	8,61	0,69
1997	20,48	0,72	24,82	1,00	11,52	0,66	NA	NA	9,25	0,74
1998	21,68	0,77	20,86	0,84	11,52	0,66	NA	NA	9,38	0,75
1999	20,45	0,72	22,18	0,90	11,92	0,68	NA	NA	9,64	0,77
2000	22,01	0,78	22,36	0,90	10,42	0,60	26,01	1,00	10,00	0,80
2001	21,96	0,78	19,91	0,81	11,70	0,67	22,67	0,87	9,86	0,79
2002	19,08	0,67	21,70	0,88	11,86	0,68	24,01	0,92	9,60	0,77
2003	17,98	0,64	22,59	0,91	10,69	0,61	23,23	0,89	8,83	0,71
2004	17,85	0,63	21,23	0,86	10,07	0,58	23,77	0,91	8,19	0,66
2005	16,10	0,57	19,84	0,80	11,05	0,63	22,60	0,87	7,25	0,58
2006	15,90	0,56	16,75	0,68	9,37	0,54	21,64	0,83	7,42	0,59
2007	16,40	0,58	18,82	0,76	10,80	0,62	23,02	0,88	7,60	0,61
2008	13,72	0,49	16,07	0,65	10,20	0,58	22,26	0,86	6,27	0,50
2009	13,38	0,47	12,83	0,52	7,96	0,46	18,77	0,72	5,78	0,46
2010	11,84	0,42	11,77	0,48	7,77	0,44	16,15	0,62	NA	NA
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 56: Absolute and relative number of fatalities according to transport mode for Belgium. The relative values for each transport mode are based on the first data point of each category (European Commission Road Safety, 2012a).

Country & Vehicle	Belgium Vans & Trucks All weights		Belgium Buses & coaches		Belgium Cars		Belgium Motorcyclists		Belgium Moped drivers	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	59	1,00	6	1,00	1138	1,00	114	1,00	101	1,00
1992	50	0,85	7	1,17	1039	0,91	92	0,81	98	0,97
1993	33	0,56	13	2,17	1041	0,91	147	1,29	87	0,86
1994	46	0,78	4	0,67	1058	0,93	141	1,24	93	0,92
1995	44	0,75	3	0,50	928	0,82	116	1,02	71	0,70
1996	39	0,66	9	1,50	853	0,75	107	0,94	67	0,66
1997	45	0,76	10	1,67	844	0,74	125	1,10	68	0,67
1998	55	0,93	7	1,17	936	0,82	121	1,06	78	0,77
1999	62	1,05	4	0,67	851	0,75	142	1,25	56	0,55
2000	72	1,22	8	1,33	922	0,81	118	1,04	66	0,65
2001	76	1,29	9	1,50	899	0,79	147	1,29	63	0,62
2002	55	0,93	9	1,50	779	0,68	158	1,39	68	0,67
2003	42	0,71	1	0,17	688	0,60	124	1,09	45	0,45
2004	50	0,85	5	0,83	623	0,55	120	1,05	33	0,33
2005	60	1,02	0	0,00	624	0,55	123	1,08	30	0,30
2006	50	0,85	0	0,00	589	0,52	130	1,14	36	0,36
2007	74	1,25	4	0,67	550	0,48	139	1,22	26	0,26
2008	65	1,10	2	0,33	479	0,42	108	0,95	32	0,32
2009	63	1,07	1	0,17	464	0,41	137	1,20	25	0,25
2010	48	0,81	1	0,17	443	0,39	102	0,89	22	0,22

Annex 56 (continued): Absolute and relative number of fatalities according to transport mode for Belgium. The relative values for each transport mode are based on the first data point of each category (European Commission Road Safety, 2012a).

Country & Vehicle	Belgium Bicyclists		Belgium Pedestrians		Belgium Agricultural		Belgium other & unknown	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	166	1,00	280	1,00	4	1,00	6	1,00
1992	147	0,89	233	0,83	2	0,50	0	0,00
1993	137	0,83	199	0,71	1	0,25	0	0,00
1994	151	0,91	197	0,70	4	1,00	0	0,00
1995	128	0,77	149	0,53	3	0,75	2	0,33
1996	121	0,73	154	0,55	2	0,50	2	0,33
1997	122	0,73	142	0,51	2	0,50	2	0,33
1998	135	0,81	162	0,58	3	0,75	4	0,67
1999	122	0,73	154	0,55	4	1,00	0	0,00
2000	134	0,81	142	0,51	5	1,25	2	0,33
2001	130	0,78	158	0,56	0	0,00	0	0,00
2002	105	0,63	127	0,45	1	0,25	2	0,33
2003	110	0,66	113	0,40	2	0,50	88	14,67
2004	79	0,48	101	0,36	3	0,75	148	24,67
2005	71	0,43	108	0,39	1	0,25	72	12,00
2006	92	0,55	122	0,44	2	0,50	48	8,00
2007	90	0,54	104	0,37	3	0,75	81	13,50
2008	86	0,52	99	0,35	3	0,75	70	11,67
2009	89	0,54	101	0,36	1	0,25	63	10,50
2010	70	0,42	106	0,38	3	0,75	45	7,50

Annex 57: Absolute and relative number of fatalities according to transport mode for Czech Republic. The relative values for each transport mode are based on the first data point of each category (European Commission Road Safety, 2012a).

Country & Vehicle	Czech Republic Vans & Trucks All weights		Czech Republic Buses & coaches		Czech Republic Cars		Czech Republic Motorcyclists		Czech Republic Moped drivers	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994	35	1,00	4	1,00	853	1,00	73	1,00	9	1,00
1995	39	1,11	5	1,25	839	0,98	83	1,14	14	1,56
1996	48	1,37	7	1,75	818	0,96	75	1,03	11	1,22
1997	34	0,97	7	1,75	859	1,01	84	1,15	10	1,11
1998	35	1,00	5	1,25	750	0,88	84	1,15	7	0,78
1999	49	1,40	15	3,75	775	0,91	108	1,48	10	1,11
2000	66	1,89	2	0,50	784	0,92	100	1,37	16	1,78
2001	49	1,40	7	1,75	715	0,84	86	1,18	9	1,00
2002	52	1,49	6	1,50	759	0,89	117	1,60	17	1,89
2003	49	1,40	29	7,25	798	0,94	101	1,38	11	1,22
2004	67	1,91	17	4,25	779	0,91	97	1,33	5	0,56
2005	62	1,77	0	0,00	679	0,80	116	1,59	8	0,89
2006	53	1,51	10	2,50	567	0,66	113	1,55	3	0,33
2007	66	1,89	2	0,50	661	0,77	136	1,86	3	0,33
2008	45	1,29	0	0,00	573	0,67	121	1,66	2	0,22
2009	45	1,29	3	0,75	497	0,58	85	1,16	9	1,00
2010	45	1,29	1	0,25	403	0,47	92	1,26	7	0,78

Annex 57 (continued): Absolute and relative number of fatalities according to transport mode for Czech Republic. The relative values for each transport mode are based on the first data point of each category (European Commission Road Safety, 2012a).

Country & Vehicle	Czech Republic Bicyclists		Czech Republic Pedestrians		Czech Republic Agricultural		Czech Republic other & unknown	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA
1994	155	1,00	502	1,00	5	1,00	1	1,00
1995	174	1,12	425	0,85	4	0,80	5	5,00
1996	159	1,03	446	0,89	4	0,80	2	2,00
1997	172	1,11	424	0,84	3	0,60	4	4,00
1998	131	0,85	330	0,66	8	1,60	10	10,00
1999	142	0,92	342	0,68	9	1,80	5	5,00
2000	151	0,97	362	0,72	4	0,80	1	1,00
2001	141	0,91	322	0,64	3	0,60	1	1,00
2002	160	1,03	308	0,61	9	1,80	2	2,00
2003	159	1,03	290	0,58	6	1,20	4	4,00
2004	131	0,85	281	0,56	4	0,80	1	1,00
2005	115	0,74	298	0,59	6	1,20	2	2,00
2006	110	0,71	202	0,40	4	0,80	1	1,00
2007	116	0,75	232	0,46	3	0,60	2	2,00
2008	93	0,60	238	0,47	0	0,00	4	4,00
2009	84	0,54	176	0,35	1	0,20	1	1,00
2010	80	0,52	168	0,33	4	0,80	2	2,00

Annex 58: Absolute and relative number of fatalities according to transport mode for Finland. The relative values for each transport mode are based on the first data point of each category (European Commission Road Safety, 2012a).

Country & Vehicle	Finland Vans & Trucks All weights		Finland Buses & coaches		Finland Cars		Finland Motorcyclists		Finland Moped drivers	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	30	1,00	2	1,00	333	1,00	34	1,00	28	1,00
1992	21	0,70	2	1,00	320	0,96	22	0,65	15	0,54
1993	24	0,80	1	0,50	274	0,82	13	0,38	13	0,46
1994	30	1,00	0	0,00	262	0,79	10	0,29	22	0,79
1995	19	0,63	0	0,00	231	0,69	13	0,38	20	0,71
1996	17	0,57	0	0,00	227	0,68	16	0,47	17	0,61
1997	26	0,87	2	1,00	247	0,74	8	0,24	16	0,57
1998	17	0,57	3	1,50	232	0,70	9	0,26	16	0,57
1999	14	0,47	5	2,50	251	0,75	13	0,38	8	0,29
2000	25	0,83	0	0,00	224	0,67	10	0,29	9	0,32
2001	15	0,50	3	1,50	262	0,79	16	0,47	7	0,25
2002	17	0,57	3	1,50	267	0,80	22	0,65	7	0,25
2003	24	0,80	0	0,00	217	0,65	23	0,68	12	0,43
2004	16	0,53	24	12,00	221	0,66	22	0,65	14	0,50
2005	18	0,60	2	1,00	231	0,69	32	0,94	4	0,14
2006	10	0,33	2	1,00	203	0,61	26	0,76	13	0,46
2007	19	0,63	0	0,00	241	0,72	32	0,94	11	0,39
2008	14	0,47	0	0,00	202	0,61	36	1,06	13	0,46
2009	16	0,53	1	0,50	165	0,50	27	0,79	11	0,39
2010	18	0,60	0	0,00	159	0,48	18	0,53	9	0,32

Annex 58 (continued): Absolute and relative number of fatalities according to transport mode for Finland. The relative values for each transport mode are based on the first data point of each category (European Commission Road Safety, 2012a).

Country & Vehicle	Finland Bicyclists		Finland Pedestrians		Finland Agricultural		Finland other	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	71	1,00	130	1,00	2	1,00	2	1,00
1992	88	1,24	116	0,89	7	3,50	10	5,00
1993	67	0,94	86	0,66	3	1,50	3	1,50
1994	63	0,89	87	0,67	1	0,50	5	2,50
1995	74	1,04	72	0,55	5	2,50	7	3,50
1996	46	0,65	70	0,54	5	2,50	6	3,00
1997	61	0,86	69	0,53	4	2,00	5	2,50
1998	54	0,76	62	0,48	1	0,50	6	3,00
1999	63	0,89	67	0,52	3	1,50	7	3,50
2000	53	0,75	62	0,48	4	2,00	9	4,50
2001	59	0,83	62	0,48	2	1,00	7	3,50
2002	53	0,75	40	0,31	2	1,00	4	2,00
2003	39	0,55	59	0,45	3	1,50	2	1,00
2004	26	0,37	49	0,38	1	0,50	2	1,00
2005	43	0,61	45	0,35	0	0,00	3	1,50
2006	29	0,41	49	0,38	2	1,00	2	1,00
2007	22	0,31	48	0,37	2	1,00	5	2,50
2008	18	0,25	53	0,41	6	3,00	2	1,00
2009	20	0,28	30	0,23	4	2,00	5	2,50
2010	26	0,37	35	0,27	2	1,00	5	2,50

Annex 59: Absolute and relative number of fatalities according to transport mode for Poland. The relative values for each transport mode are based on the first data point of each category (European Commission Road Safety, 2012a).

Country & Vehicle	Poland Vans & Trucks All weights		Poland Buses & coaches		Poland Cars		Poland Motorcyclists		Poland Moped drivers	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1995	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1996	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1997	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1998	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1999	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2000	225	1,00	50	1,00	2710	1,00	178	1,00	75	1,00
2001	243	1,08	59	1,18	2438	0,90	169	0,95	63	0,84
2002	270	1,20	43	0,86	2548	0,94	167	0,94	59	0,79
2003	264	1,17	51	1,02	2541	0,94	145	0,81	54	0,72
2004	229	1,02	43	0,86	2459	0,91	181	1,02	51	0,68
2005	217	0,96	52	1,04	2526	0,93	157	0,88	53	0,71
2006	227	1,01	15	0,30	2392	0,88	164	0,92	57	0,76
2007	198	0,88	17	0,34	2582	0,95	215	1,21	59	0,79
2008	175	0,78	11	0,22	2540	0,94	262	1,47	87	1,16
2009	136	0,60	19	0,38	2179	0,80	290	1,63	68	0,91
2010	142	0,63	14	0,28	1853	0,68	259	1,46	83	1,11

Annex 59 (continued): Absolute and relative number of fatalities according to transport mode for Poland. The relative values for each transport mode are based on the first data point of each category (European Commission Road Safety, 2012a).

Country & Vehicle	Poland Bicyclists		Poland Pedestrians		Poland Agricultural		Poland other	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA	NA	NA
1995	NA	NA	NA	NA	NA	NA	NA	NA
1996	NA	NA	NA	NA	NA	NA	NA	NA
1997	NA	NA	NA	NA	NA	NA	NA	NA
1998	NA	NA	NA	NA	NA	NA	NA	NA
1999	NA	NA	NA	NA	NA	NA	NA	NA
2000	692	1,00	2256	1,00	80	1,00	28	1,00
2001	610	0,88	1866	0,83	61	0,76	25	0,89
2002	681	0,98	1987	0,88	51	0,64	20	0,71
2003	647	0,93	1879	0,83	45	0,56	16	0,57
2004	691	1,00	1987	0,88	57	0,71	14	0,50
2005	603	0,87	1756	0,78	67	0,84	13	0,46
2006	509	0,74	1802	0,80	23	0,29	24	0,86
2007	498	0,72	1951	0,86	43	0,54	18	0,64
2008	433	0,63	1882	0,83	29	0,36	18	0,64
2009	371	0,54	1467	0,65	23	0,29	17	0,61
2010	280	0,40	1236	0,55	23	0,29	15	0,54

Annex 60: Absolute and relative number of fatalities according to transport mode for Sweden. The relative values for each transport mode are based on the first data point of each category (European Commission Road Safety, 2012a).

Country & Vehicle	Sweden Vans & Trucks All weights		Sweden Buses & coaches		Sweden Cars		Sweden Motorcyclists		Sweden Moped drivers	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	30	1,00	1	1,00	459	1,00	37	1,00	12	1,00
1992	17	0,57	2	2,00	466	1,02	33	0,89	17	1,42
1993	15	0,50	4	4,00	389	0,85	42	1,14	14	1,17
1994	17	0,57	0	0,00	391	0,85	31	0,84	10	0,83
1995	18	0,60	5	5,00	371	0,81	32	0,86	9	0,75
1996	19	0,63	6	6,00	331	0,72	40	1,08	14	1,17
1997	23	0,77	0	0,00	348	0,76	36	0,97	13	1,08
1998	15	0,50	3	3,00	327	0,71	40	1,08	12	1,00
1999	19	0,63	1	1,00	372	0,81	36	0,97	12	1,00
2000	24	0,80	0	0,00	393	0,86	39	1,05	10	0,83
2001	20	0,67	6	6,00	373	0,81	38	1,03	9	0,75
2002	21	0,70	5	5,00	379	0,83	37	1,00	12	1,00
2003	19	0,63	10	10,00	349	0,76	47	1,27	9	0,75
2004	10	0,33	4	4,00	288	0,63	56	1,51	18	1,50
2005	17	0,57	1	1,00	273	0,59	46	1,24	8	0,67
2006	16	0,53	10	10,00	261	0,57	55	1,49	15	1,25
2007	15	0,50	6	6,00	279	0,61	60	1,62	14	1,17
2008	16	0,53	1	1,00	234	0,51	51	1,38	11	0,92
2009	10	0,33	0	0,00	219	0,48	47	1,27	11	0,92
2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 60 (continued): Absolute and relative number of fatalities according to transport mode for Sweden. The relative values for each transport mode are based on the first data point of each category (European Commission Road Safety, 2012a).

Country & Vehicle	Sweden Bicyclists		Sweden Pedestrians		Sweden Agricultural		Sweden other	
Year	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction	Fatalities	Fraction
1991	68	1,00	125	1,00	5	1,00	8	1,00
1992	76	1,12	138	1,10	4	0,80	6	0,75
1993	70	1,03	94	0,75	2	0,40	2	0,25
1994	52	0,76	86	0,69	1	0,20	1	0,13
1995	57	0,84	71	0,57	5	1,00	4	0,50
1996	49	0,72	74	0,59	0	0,00	4	0,50
1997	42	0,62	72	0,58	3	0,60	4	0,50
1998	58	0,85	69	0,55	3	0,60	4	0,50
1999	45	0,66	86	0,69	6	1,20	3	0,38
2000	47	0,69	73	0,58	4	0,80	1	0,13
2001	43	0,63	87	0,70	0	0,00	7	0,88
2002	42	0,62	58	0,46	3	0,60	3	0,38
2003	35	0,51	55	0,44	2	0,40	3	0,38
2004	27	0,40	67	0,54	5	1,00	5	0,63
2005	38	0,56	50	0,40	1	0,20	6	0,75
2006	26	0,38	55	0,44	3	0,60	4	0,50
2007	33	0,49	58	0,46	1	0,20	5	0,63
2008	30	0,44	45	0,36	0	0,00	9	1,13
2009	20	0,29	44	0,35	1	0,20	6	0,75
2010	NA	NA	NA	NA	NA	NA	NA	NA

Annex 61: Absolute and relative number of vehicles according to transport mode for Belgium. The relative values for each transport mode are based on the first data point of each category (Eurostat, 2012a),(Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g), (United Nations Economic Commission for Europe, 2012e), (United Nations Economic Commission for Europe, 2012d).

Country & Vehicle	Belgium LORRIES All weights		Belgium Buses & coaches		Belgium Cars		Belgium Motorcycles	
Year	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction
1991	NA	NA	15.378	1,00	3.970.000	1,00	149.000	1,00
1992	366.725	1,00	14.930	0,97	4.021.000	1,01	162.000	1,09
1993	375.018	1,02	14.794	0,96	4.110.000	1,04	175.000	1,17
1994	390.591	1,07	14.880	0,97	4.210.000	1,06	187.000	1,26
1995	402.389	1,10	14.667	0,95	4.273.000	1,08	200.000	1,34
1996	416.716	1,14	14.660	0,95	4.339.000	1,09	212.000	1,42
1997	435.230	1,19	14.667	0,95	4.415.000	1,11	225.000	1,51
1998	453.122	1,24	14.588	0,95	4.492.000	1,13	241.000	1,62
1999	480.033	1,31	14.673	0,95	4.584.000	1,15	261.000	1,75
2000	502.979	1,37	14.722	0,96	4.678.000	1,18	278.000	1,87
2001	526.334	1,44	14.676	0,95	4.740.000	1,19	294.000	1,97
2002	540.637	1,47	14.769	0,96	4.787.000	1,21	306.000	2,05
2003	556.397	1,52	15.060	0,98	4.821.000	1,21	319.000	2,14
2004	578.124	1,58	15.328	1,00	4.874.000	1,23	322.000	2,16
2005	604.437	1,65	15.391	1,00	4.919.000	1,24	346.000	2,32
2006	623.250	1,70	15.329	1,00	4.976.000	1,25	360.000	2,42
2007	642.687	1,75	15.479	1,01	5.049.000	1,27	374.000	2,51
2008	662.780	1,81	15.992	1,04	5.131.000	1,29	388.000	2,60
2009	676.644	1,85	16.061	1,04	5.193.000	1,31	404.000	2,71
2010	690.837[3]	1,88	16.226[2]	1,06	5.276.000[2]	1,33	419.000[2]	2,81

[3] Source: United Nations Economic Commission for Europe.

Annex 61 (continued): Absolute and relative number of vehicles according to transport mode for Belgium. The relative values for each transport mode are based on the first data point of each category (Eurostat, 2012a),(Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g), (United Nations Economic Commission for Europe, 2012e), (United Nations Economic Commission for Europe, 2012d).

Country & Vehicle	Belgium Mopeds		Belgium Bicycles		Belgium Pedestrians		Belgium Agricultural vehicles	
Year	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction
1991	NA	NA	NA	NA	NA	NA	38.808	1,00
1992	NA	NA	NA	NA	NA	NA	38.922	1,00
1993	NA	NA	NA	NA	NA	NA	37.894	0,98
1994	NA	NA	NA	NA	NA	NA	38.888	1,00
1995	NA	NA	NA	NA	NA	NA	40.074	1,03
1996	NA	NA	NA	NA	NA	NA	40.444	1,04
1997	NA	NA	NA	NA	NA	NA	41.346	1,07
1998	NA	NA	NA	NA	NA	NA	42.342	1,09
1999	NA	NA	NA	NA	NA	NA	44.055	1,14
2000	NA	NA	NA	NA	NA	NA	45.452	1,17
2001	NA	NA	NA	NA	NA	NA	46.302	1,19
2002	NA	NA	NA	NA	NA	NA	46.789	1,21
2003	NA	NA	NA	NA	NA	NA	47.102	1,21
2004	NA	NA	NA	NA	NA	NA	47.394	1,22
2005	NA	NA	NA	NA	NA	NA	47.646	1,23
2006	NA	NA	NA	NA	NA	NA	47.164	1,22
2007	NA	NA	NA	NA	NA	NA	48.060	1,24
2008	NA	NA	NA	NA	NA	NA	49.109	1,27
2009	NA	NA	NA	NA	NA	NA	47.418	1,22
2010	NA	NA	NA	NA	NA	NA	46.673[4]	1,20

[4] Source: United Nations Economic Commission for Europe.

Annex 62: Absolute and relative number of vehicles according to transport mode for Czech Republic. The relative values for each transport mode are based on the first data point of each category (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

Country & Vehicle	Czech Republic LORRIES All weights		Czech Republic Buses & coaches		Czech Republic Cars		Czech Republic Motorcycles	
Year	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA
1993	169.531	1,00	19.203	1,00	2.833.143	1,00	400.968	1,00
1994	184.278	1,09	19.756	1,03	2.923.916	1,03	402.882	1,00
1995	202.929	1,20	20.474	1,07	3.043.320	1,07	404.000	1,01
1996	225.477	1,33	21.200	1,10	3.192.532	1,13	918.200	2,29
1997	246.621	1,45	20.755	1,08	3.391.541	1,20	929.600	2,32
1998	260.276	1,54	19.960	1,04	3.492.961	1,23	927.000	2,31
1999	268.259	1,58	18.981	0,99	3.440.000	1,21	800.000	2,00
2000	275.617	1,63	18.259	0,95	3.438.900	1,21	748.100	1,87
2001	296.412	1,75	18.384	0,96	3.529.800	1,25	755.500	1,88
2002	323.434	1,91	21.340	1,11	3.647.100	1,29	760.000	1,90
2003	340.094	2,01	20.627	1,07	3.706.012	1,31	752.000	1,88
2004	371.437	2,19	19.948	1,04	3.816.000	1,35	757.000	1,89
2005	415.101	2,45	20.134	1,05	3.959.000	1,40	794.000	1,98
2006	468.282	2,76	20.331	1,06	4.109.000	1,45	823.000	2,05
2007	533.916	3,15	20.416	1,06	4.280.000	1,51	860.000	2,14
2008	589.598	3,48	20.375	1,06	4.423.000	1,56	893.000	2,23
2009	587.032	3,46	19.943	1,04	4.435.000	1,57	903.000	2,25
2010	584.921	3,45	19.653	1,02	4.496.000	1,59	924.291	2,31

Annex 62 (continued): Absolute and relative number of vehicles according to transport mode for Czech Republic. The relative values for each transport mode are based on the first data point of each category (Eurostat, 2012a), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

Country & Vehicle	Czech Republic Mopeds		Czech Republic Bicycles		Czech Republic Pedestrians		Czech Republic Agricultural vehicles	
Year	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA
1993	508.771	1,00	NA	NA	NA	NA	14.433	1,00
1994	509.463	1,00	NA	NA	NA	NA	15.357	1,06
1995	511.000	1,00	NA	NA	NA	NA	16.382	1,14
1996	512.038	1,01	NA	NA	NA	NA	17.482	1,21
1997	519.737	1,02	NA	NA	NA	NA	18.751	1,30
1998	519.818	1,02	NA	NA	NA	NA	20.035	1,39
1999	454.100	0,89	NA	NA	NA	NA	21.151	1,47
2000	430.500	0,85	NA	NA	NA	NA	22.669	1,57
2001	438.000	0,86	NA	NA	NA	NA	24.823	1,72
2002	444.000	0,87	NA	NA	NA	NA	26.061	1,81
2003	438.000	0,86	NA	NA	NA	NA	25.652	1,78
2004	439.000	0,86	NA	NA	NA	NA	24.769	1,72
2005	460.000	0,90	NA	NA	NA	NA	24.060	1,67
2006	469.000	0,92	NA	NA	NA	NA	22.622	1,57
2007	476.000	0,94	NA	NA	NA	NA	20.915	1,45
2008	478.000	0,94	NA	NA	NA	NA	17.814	1,23
2009	473.000	0,93	NA	NA	NA	NA	14.735	1,02
2010	478.000	0,94	NA	NA	NA	NA	13.045	0,90

Annex 63: Absolute and relative number of vehicles according to transport mode for Finland. The relative values for each transport mode are based on the first data point of each category (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012c), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

Country & Vehicle	Finland Vans & Trucks All weights		Finland Buses & coaches		Finland Cars		Finland Motorcycles	
Year	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction
1991	628.390	1,00	8.968	1,00	1.923.000	NA	62.000	1,00
1992	641.781	1,02	8.665	0,97	1.936.000	NA	64.000	1,03
1993	642.454	1,02	8.255	0,92	1.873.000	1,00	64.000	1,03
1994	653.279	1,04	8.054	0,90	1.873.000	1,00	64.000	1,03
1995	670.478	1,07	8.083	0,90	1.901.000	1,01	65.000	1,05
1996	693.576	1,10	8.233	0,92	1.943.000	1,04	66.000	1,06
1997	720.373	1,15	8.450	0,94	1.948.000	1,04	69.000	1,11
1998	757.890	1,21	9.040	1,01	2.021.000	1,08	73.000	1,18
1999	793.312	1,26	9.487	1,06	2.083.000	1,11	80.000	1,29
2000	827.563	1,32	9.852	1,10	2.135.000	1,14	91.000	1,47
2001	858.933	1,37	9.769	1,09	2.161.000	1,15	102.811[5]	1,66
2002	890.003	1,42	10.005	1,12	2.195.000	1,17	116.021[5]	1,87
2003	922.985	1,47	10.358	1,15	2.275.000	1,21	129.670[5]	2,10
2004	981.177	1,56	10.716	1,19	2.347.000	1,25	142.703[5]	2,31
2005	1.034.003	1,65	10.912	1,22	2.430.000	1,30	156.000	2,52
2006	1.072.112	1,71	11.189	1,25	2.506.000	1,34	172.000	2,77
2007	1.125.491	1,79	11.543	1,29	2.570.000	1,37	188.000	3,03
2008	1.190.586	1,89	12.276	1,37	2.700.000	1,44	204.000	3,29
2009	1.239.557	1,97	13.017	1,45	2.777.000	1,48	216.000	3,48
2010	1.293.058	2,06	13.650	1,52	2.877.484	1,54	227.000	3,66

[5] Source: United Nations Economic Commission for Europe.

Annex 63 (continued): Absolute and relative number of vehicles according to transport mode for Finland. The relative values for each transport mode are based on the first data point of each category (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012c), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

Country & Vehicle	Finland Mopeds		Finland Bicycles		Finland Pedestrians		Finland Agricultural vehicles	
Year	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction
1991	103.000	NA	NA	NA	NA	NA	NA	NA
1992	99.000	NA	NA	NA	NA	NA	NA	NA
1993	94.000	1,00	NA	NA	NA	NA	NA	NA
1994	88.000	0,94	NA	NA	NA	NA	NA	NA
1995	94.000	1,00	NA	NA	NA	NA	3.822	1,00
1996	96.000	1,02	NA	NA	NA	NA	4.464	1,17
1997	98.000	1,04	NA	NA	NA	NA	5.069	1,33
1998	101.000	1,07	NA	NA	NA	NA	5.253	1,37
1999	103.000	1,10	NA	NA	NA	NA	5.209	1,36
2000	103.000	1,10	NA	NA	NA	NA	5.309	1,39
2001	103.000	1,10	NA	NA	NA	NA	5.271	1,38
2002	108.000	1,15	NA	NA	NA	NA	5.385	1,41
2003	116.000	1,23	NA	NA	NA	NA	5.558	1,45
2004	129.000	1,37	NA	NA	NA	NA	5.890	1,54
2005	145.000	1,54	NA	NA	NA	NA	6.064	1,59
2006	166.000	1,77	NA	NA	NA	NA	6.225	1,63
2007	188.000	2,00	NA	NA	NA	NA	7.147	1,87
2008	217.000	2,31	NA	NA	NA	NA	8.354	2,19
2009	240.000	2,55	NA	NA	NA	NA	8.966	2,35
2010	260.000	2,77	NA	NA	NA	NA	9.601	2,51

Annex 64: Absolute and relative number of vehicles according to transport mode for Poland. The relative values for each transport mode are based on the first data point of each category (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012c), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

Country & Vehicle	Poland Vans & Trucks All weights		Poland Buses & coaches		Poland Cars		Poland Motorcycles	
Year	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction
1991	1.750.724	1,00	86.951	1,00	6.112.171	1,00	1.235.640	1,00
1992	1.650.859	0,94	86.578	1,00	6.504.716	1,06	1.134.466	0,92
1993	1.681.745	0,96	86.154	0,99	6.770.557	1,11	1.067.634	0,86
1994	1.748.207	1,00	86.852	1,00	7.153.141	1,17	1.008.410	0,82
1995	1.996.319	1,14	85.413	0,98	7.517.266	1,23	929.269	0,75
1996	2.072.320	1,18	85.596	0,98	8.054.448	1,32	875.663	0,71
1997	2.145.145	1,23	81.788	0,94	8.533.449	1,40	842.358	0,68
1998	2.226.480	1,27	80.827	0,93	8.890.763	1,45	819.902	0,66
1999	2.302.837	1,32	78.958	0,91	9.283.000	1,52	804.000	0,65
2000	2.500.141	1,43	82.590	0,95	9.991.300	1,63	802.600	0,65
2001	2.610.216	1,49	82.500	0,95	10.503.100	1,72	845.500	0,68
2002	2.754.770	1,57	83.389	0,96	11.028.900	1,80	868.900	0,70
2003	2.866.026	1,64	82.769	0,95	11.243.800	1,84	845.500	0,68
2004	2.934.278	1,68	82.845	0,95	11.975.000	1,96	836.000	0,68
2005	2.786.442	1,59	80.175	0,92	12.339.000	2,02	754.000	0,61
2006	2.887.124	1,65	83.668	0,96	13.384.000	2,19	784.000	0,63
2007	3.031.283	1,73	87.999	1,01	14.589.000	2,39	825.000	0,67
2008	3.260.800	1,86	92.792	1,07	16.080.000	2,63	909.000	0,74
2009	3.374.467	1,93	95.745	1,10	16.495.000	2,70	975.000	0,79
2010	3.558.111	2,03	97.371	1,12	17.240.000	2,82	1.013.000	0,82

Annex 64 (continued): Absolute and relative number of vehicles according to transport mode for Poland. The relative values for each transport mode are based on the first data point of each category (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012c), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

Country & Vehicle	Poland Mopeds		Poland Bicycles		Poland Pedestrians		Poland Agricultural vehicles	
Year	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction
1991	NA	NA	NA	NA	NA	NA	39.992	1,00
1992	NA	NA	NA	NA	NA	NA	41.453	1,04
1993	NA	NA	NA	NA	NA	NA	46.373	1,16
1994	NA	NA	NA	NA	NA	NA	51.404	1,29
1995	750.000	1,00	NA	NA	NA	NA	55.388	1,38
1996	773.416	1,03	NA	NA	NA	NA	60.460	1,51
1997	763.365	1,02	NA	NA	NA	NA	65.947	1,65
1998	743.611	0,99	NA	NA	NA	NA	78.239	1,96
1999	637.000	0,85	NA	NA	NA	NA	85.013	2,13
2000	590.400	0,79	NA	NA	NA	NA	96.060	2,40
2001	400.500	0,53	NA	NA	NA	NA	103.138	2,58
2002	391.300	0,52	NA	NA	NA	NA	110.783	2,77
2003	400.500	0,53	NA	NA	NA	NA	121.657	3,04
2004	310.000	0,41	NA	NA	NA	NA	128.682	3,22
2005	338.000	0,45	NA	NA	NA	NA	126.604	3,17
2006	338.000	0,45	NA	NA	NA	NA	146.364	3,66
2007	525.000	0,70	NA	NA	NA	NA	175.480	4,39
2008	698.000	0,93	NA	NA	NA	NA	198.020	4,95
2009	834.000	1,11	NA	NA	NA	NA	201.282	5,03
2010	922.000	1,23	NA	NA	NA	NA	214.581	5,37

Annex 65: Absolute and relative number of vehicles according to transport mode for Sweden. The relative values for each transport mode are based on the first data point of each category (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012c), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

	Sweden Vans & Trucks All weights		Sweden Buses & coaches		Sweden Cars		Sweden Motorcycles	
Year	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction
1991	750.691	1,00	14.555	1,00	3.619.000	1,00	45.000	1,00
1992	753.922	1,00	14.252	0,98	3.587.000	0,99	48.000	1,07
1993	759.106	1,01	14.127	0,97	3.566.000	0,99	52.000	1,16
1994	765.400	1,02	14.293	0,98	3.594.000	0,99	57.000	1,27
1995	778.725	1,04	14.577	1,00	3.631.000	1,00	63.000	1,40
1996	788.073	1,05	14.753	1,01	3.655.000	1,01	76.000	1,69
1997	806.017	1,07	14.838	1,02	3.702.000	1,02	91.000	2,02
1998	839.868	1,12	14.924	1,03	3.791.000	1,05	101.000	2,24
1999	863.201	1,15	14.869	1,02	3.890.000	1,07	119.870	2,66
2000	900.660	1,20	14.417	0,99	3.999.000	1,11	139.920	3,11
2001	938.249	1,25	14.246	0,98	4.019.000	1,11	158.620	3,52
2002	968.751	1,29	14.013	0,96	4.043.000	1,12	174.510	3,88
2003	999.940	1,33	13.742	0,94	4.075.000	1,13	187.850	4,17
2004	1.041.070	1,39	13.363	0,92	4.113.000	1,14	205.570	4,57
2005	1.089.666	1,45	13.477	0,93	4.154.000	1,15	225.040	5,00
2006	1.137.836	1,52	13.643	0,94	4.202.000	1,16	245.040	5,45
2007	1.197.488	1,60	13.315	0,91	4.258.000	1,18	259.020	5,76
2008	1.232.693	1,64	13.474	0,93	4.279.000	1,18	269.300	5,98
2009	1.259.965	1,68	13.407	0,92	4.301.000	1,19	277.630	6,17
2010	NA	NA	NA	NA	4.335.000	1,20	NA	NA

Annex 65 (continued): Absolute and relative number of vehicles according to transport mode for Sweden. The relative values for each transport mode are based on the first data point of each category (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012c), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

	Sweden Mopeds		Sweden Bicycles		Sweden Pedestrians		Sweden Agricultural vehicles	
Year	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction	Vehicles	Fraction
1991	NA	NA	NA	NA	NA	NA	3.353	1,00
1992	NA	NA	NA	NA	NA	NA	3.471	1,04
1993	NA	NA	NA	NA	NA	NA	3.819	1,14
1994	NA	NA	NA	NA	NA	NA	4.375	1,30
1995	NA	NA	NA	NA	NA	NA	4.989	1,49
1996	NA	NA	NA	NA	NA	NA	4.957	1,48
1997	NA	NA	NA	NA	NA	NA	5.506	1,64
1998	NA	NA	NA	NA	NA	NA	6.163	1,84
1999	NA	NA	NA	NA	NA	NA	6.488	1,93
2000	NA	NA	NA	NA	NA	NA	6.707	2,00
2001	11.370	1,00	NA	NA	NA	NA	6.648	1,98
2002	19.380	1,70	NA	NA	NA	NA	6.737	2,01
2003	26.470	2,33	NA	NA	NA	NA	6.667	1,99
2004	42.000	3,69	NA	NA	NA	NA	6.977	2,08
2005	58.470	5,14	NA	NA	NA	NA	7.156	2,13
2006	75.400	6,63	NA	NA	NA	NA	7.818	2,33
2007	84.880	7,47	NA	NA	NA	NA	8.368	2,50
2008	92.810	8,16	NA	NA	NA	NA	8.163	2,43
2009	91.680	8,06	NA	NA	NA	NA	8.005	2,39
2010	NA	NA	NA	NA	NA	NA	NA	NA

Annex 66: Absolute and relative number of fatalities per 100.000 vehicles for Belgium. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a), (Eurostat, 2012a),(Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g), (United Nations Economic Commission for Europe, 2012e), (United Nations Economic Commission for Europe, 2012d).

Country & Vehicle	Belgium LORRIES All weights		Belgium Buses & coaches		Belgium Cars		Belgium Motorcycles	
Year	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction
1991	NA	NA	39,02	1,00	28,66	1,00	76,51	1,00
1992	13,63	1,00	46,89	1,20	25,84	0,90	56,79	0,74
1993	8,80	0,65	87,87	2,25	25,33	0,88	84,00	1,10
1994	11,78	0,86	26,88	0,69	25,13	0,88	75,40	0,99
1995	10,93	0,80	20,45	0,52	21,72	0,76	58,00	0,76
1996	9,36	0,69	61,39	1,57	19,66	0,69	50,47	0,66
1997	10,34	0,76	68,18	1,75	19,12	0,67	55,56	0,73
1998	12,14	0,89	47,98	1,23	20,84	0,73	50,21	0,66
1999	12,92	0,95	27,26	0,70	18,56	0,65	54,41	0,71
2000	14,31	1,05	54,34	1,39	19,71	0,69	42,45	0,55
2001	14,44	1,06	61,32	1,57	18,97	0,66	50,00	0,65
2002	10,17	0,75	60,94	1,56	16,27	0,57	51,63	0,67
2003	7,55	0,55	6,64	0,17	14,27	0,50	38,87	0,51
2004	8,65	0,63	32,62	0,84	12,78	0,45	37,27	0,49
2005	9,93	0,73	0,00	0,00	12,69	0,44	35,55	0,46
2006	8,02	0,59	0,00	0,00	11,84	0,41	36,11	0,47
2007	11,51	0,84	25,84	0,66	10,89	0,38	37,17	0,49
2008	9,81	0,72	12,51	0,32	9,34	0,33	27,84	0,36
2009	9,31	0,68	6,23	0,16	8,94	0,31	33,91	0,44
2010	6,95	0,51	6,16	0,16	8,40	0,29	24,34	0,32

Annex 66 (continued): Absolute and relative number of fatalities per 100.000 vehicles for Belgium. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a), (Eurostat, 2012a),(Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g), (United Nations Economic Commission for Europe, 2012e), (United Nations Economic Commission for Europe, 2012d).

Country & Vehicle	Belgium Mopeds		Belgium Bicycles		Belgium Pedestrians		Belgium Agricultural vehicles	
Year	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction
1991	NA	NA	NA	NA	NA	NA	10,31	1,00
1992	NA	NA	NA	NA	NA	NA	5,14	0,50
1993	NA	NA	NA	NA	NA	NA	2,64	0,26
1994	NA	NA	NA	NA	NA	NA	10,29	1,00
1995	NA	NA	NA	NA	NA	NA	7,49	0,73
1996	NA	NA	NA	NA	NA	NA	4,95	0,48
1997	NA	NA	NA	NA	NA	NA	4,84	0,47
1998	NA	NA	NA	NA	NA	NA	7,09	0,69
1999	NA	NA	NA	NA	NA	NA	9,08	0,88
2000	NA	NA	NA	NA	NA	NA	11,00	1,07
2001	NA	NA	NA	NA	NA	NA	0,00	0,00
2002	NA	NA	NA	NA	NA	NA	2,14	0,21
2003	NA	NA	NA	NA	NA	NA	4,25	0,41
2004	NA	NA	NA	NA	NA	NA	6,33	0,61
2005	NA	NA	NA	NA	NA	NA	2,10	0,20
2006	NA	NA	NA	NA	NA	NA	4,24	0,41
2007	NA	NA	NA	NA	NA	NA	6,24	0,61
2008	NA	NA	NA	NA	NA	NA	6,11	0,59
2009	NA	NA	NA	NA	NA	NA	2,11	0,20
2010	NA	NA	NA	NA	NA	NA	6,43	0,62

Annex 67: Absolute and relative number of fatalities per 100.000 vehicles for Czech Republic. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a), (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

Country & Vehicle	Czech Republic LORRIES All weights		Czech Republic Buses & coaches		Czech Republic Cars		Czech Republic Motorcycles	
Year	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA
1994	18,99	1,00	20,25	1,00	29,17	1,00	18,12	1,00
1995	21,16	1,11	25,31	1,25	28,69	0,98	20,60	1,14
1996	26,05	1,37	35,43	1,75	27,98	0,96	18,62	1,03
1997	18,45	0,97	35,43	1,75	29,38	1,01	20,85	1,15
1998	18,99	1,00	25,31	1,25	25,65	0,88	20,85	1,15
1999	26,59	1,40	75,93	3,75	26,51	0,91	26,81	1,48
2000	35,82	1,89	10,12	0,50	26,81	0,92	24,82	1,37
2001	26,59	1,40	35,43	1,75	24,45	0,84	21,35	1,18
2002	28,22	1,49	30,37	1,50	25,96	0,89	29,04	1,60
2003	26,59	1,40	146,79	7,25	27,29	0,94	25,07	1,38
2004	36,36	1,91	86,05	4,25	26,64	0,91	24,08	1,33
2005	33,64	1,77	0,00	0,00	23,22	0,80	28,79	1,59
2006	28,76	1,51	50,62	2,50	19,39	0,66	28,05	1,55
2007	35,82	1,89	10,12	0,50	22,61	0,77	33,76	1,86
2008	24,42	1,29	0,00	0,00	19,60	0,67	30,03	1,66
2009	24,42	1,29	15,19	0,75	17,00	0,58	21,10	1,16
2010	24,42	1,29	5,06	0,25	13,78	0,47	22,84	1,26

Annex 67 (continued): Absolute and relative number of fatalities per 100.000 vehicles for Czech Republic. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a), (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

Country & Vehicle	Czech Republic Mopeds		Czech Republic Bicycles		Czech Republic Pedestrians		Czech Republic Agricultural vehicles	
Year	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA
1994	1,77	1,00	NA	NA	NA	NA	32,56	1,00
1995	2,74	1,55	NA	NA	NA	NA	24,42	0,75
1996	2,15	1,22	NA	NA	NA	NA	22,88	0,70
1997	1,92	1,09	NA	NA	NA	NA	16,00	0,49
1998	1,35	0,76	NA	NA	NA	NA	39,93	1,23
1999	2,20	1,25	NA	NA	NA	NA	42,55	1,31
2000	3,72	2,10	NA	NA	NA	NA	17,65	0,54
2001	2,05	1,16	NA	NA	NA	NA	12,09	0,37
2002	3,83	2,17	NA	NA	NA	NA	34,53	1,06
2003	2,51	1,42	NA	NA	NA	NA	23,39	0,72
2004	1,14	0,64	NA	NA	NA	NA	16,15	0,50
2005	1,74	0,98	NA	NA	NA	NA	24,94	0,77
2006	0,64	0,36	NA	NA	NA	NA	17,68	0,54
2007	0,63	0,36	NA	NA	NA	NA	14,34	0,44
2008	0,42	0,24	NA	NA	NA	NA	0,00	0,00
2009	1,90	1,08	NA	NA	NA	NA	6,79	0,21
2010	1,46	0,83	NA	NA	NA	NA	30,66	0,94

Annex 68: Absolute and relative number of fatalities per 100.000 vehicles for Finland. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a), (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012c), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

Country & Vehicle	Finland Vans & Trucks All weights		Finland Buses & coaches		Finland Cars		Finland Motorcycles	
Year	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction
1991	4,77	1,00	22,30	1,00	17,32	1,00	54,84	1,00
1992	3,34	0,70	23,08	1,03	16,53	0,95	34,38	0,63
1993	3,82	0,80	12,11	0,54	14,63	0,84	20,31	0,37
1994	4,77	1,00	0,00	0,00	13,99	0,81	15,63	0,28
1995	3,02	0,63	0,00	0,00	12,15	0,70	20,00	0,36
1996	2,71	0,57	0,00	0,00	11,68	0,67	24,24	0,44
1997	4,14	0,87	23,67	1,06	12,68	0,73	11,59	0,21
1998	2,71	0,57	33,19	1,49	11,48	0,66	12,33	0,22
1999	2,23	0,47	52,70	2,36	12,05	0,70	16,25	0,30
2000	3,98	0,83	0,00	0,00	10,49	0,61	10,99	0,20
2001	2,39	0,50	30,71	1,38	12,12	0,70	15,56	0,28
2002	2,71	0,57	29,99	1,34	12,16	0,70	18,96	0,35
2003	3,82	0,80	0,00	0,00	9,54	0,55	17,74	0,32
2004	2,55	0,53	223,96	10,04	9,42	0,54	15,42	0,28
2005	2,86	0,60	18,33	0,82	9,51	0,55	20,51	0,37
2006	1,59	0,33	17,87	0,80	8,10	0,47	15,12	0,28
2007	3,02	0,63	0,00	0,00	9,38	0,54	17,02	0,31
2008	2,23	0,47	0,00	0,00	7,48	0,43	17,65	0,32
2009	2,55	0,53	7,68	0,34	5,94	0,34	12,50	0,23
2010	2,86	0,60	0,00	0,00	5,53	0,32	7,93	0,14

Annex 68 (continued): Absolute and relative number of fatalities per 100.000 vehicles for Finland. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a), (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012c), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

Country & Vehicle	Finland Mopeds		Finland Bicycles		Finland Pedestrians		Finland Agricultural vehicles	
Year	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction
1991	27,18	1,00	NA	NA	NA	NA	NA	NA
1992	14,56	0,54	NA	NA	NA	NA	NA	NA
1993	12,62	0,46	NA	NA	NA	NA	NA	NA
1994	21,36	0,79	NA	NA	NA	NA	NA	NA
1995	19,42	0,71	NA	NA	NA	NA	130,82	1,00
1996	16,50	0,61	NA	NA	NA	NA	112,01	0,86
1997	15,53	0,57	NA	NA	NA	NA	78,91	0,60
1998	15,53	0,57	NA	NA	NA	NA	19,04	0,15
1999	7,77	0,29	NA	NA	NA	NA	57,59	0,44
2000	8,74	0,32	NA	NA	NA	NA	75,34	0,58
2001	6,80	0,25	NA	NA	NA	NA	37,94	0,29
2002	6,80	0,25	NA	NA	NA	NA	37,14	0,28
2003	11,65	0,43	NA	NA	NA	NA	53,98	0,41
2004	13,59	0,50	NA	NA	NA	NA	16,98	0,13
2005	3,88	0,14	NA	NA	NA	NA	0,00	0,00
2006	12,62	0,46	NA	NA	NA	NA	32,13	0,25
2007	10,68	0,39	NA	NA	NA	NA	27,98	0,21
2008	12,62	0,46	NA	NA	NA	NA	71,82	0,55
2009	10,68	0,39	NA	NA	NA	NA	44,61	0,34
2010	8,74	0,32	NA	NA	NA	NA	20,83	0,16

Annex 69: Absolute and relative number of fatalities per 100.000 vehicles for Poland. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a), (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012c), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

Country & Vehicle	Poland Vans & Trucks All weights		Poland Buses & coaches		Poland Cars		Poland Motorcycles	
Year	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA	NA	NA
1995	NA	NA	NA	NA	NA	NA	NA	NA
1996	NA	NA	NA	NA	NA	NA	NA	NA
1997	NA	NA	NA	NA	NA	NA	NA	NA
1998	NA	NA	NA	NA	NA	NA	NA	NA
1999	NA	NA	NA	NA	NA	NA	NA	NA
2000	9,00	1,00	60,54	1,00	27,12	1,00	22,18	1,00
2001	9,31	1,03	71,52	1,18	23,21	0,86	19,99	0,90
2002	9,80	1,09	51,57	0,85	23,10	0,85	19,22	0,87
2003	9,21	1,02	61,62	1,02	22,60	0,83	17,15	0,77
2004	7,80	0,87	51,90	0,86	20,53	0,76	21,65	0,98
2005	7,79	0,87	64,86	1,07	20,47	0,75	20,82	0,94
2006	7,86	0,87	17,93	0,30	17,87	0,66	20,92	0,94
2007	6,53	0,73	19,32	0,32	17,70	0,65	26,06	1,18
2008	5,37	0,60	11,85	0,20	15,80	0,58	28,82	1,30
2009	4,03	0,45	19,84	0,33	13,21	0,49	29,74	1,34
2010	3,99	0,44	14,38	0,24	10,75	0,40	25,57	1,15

Annex 69 (continued): Absolute and relative number of fatalities per 100.000 vehicles for Poland. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a), (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012c), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

Country & Vehicle	Poland Mopeds		Poland Bicycles		Poland Pedestrians		Poland Agricultural vehicles	
Year	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction
1991	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA	NA	NA
1995	NA	NA	NA	NA	NA	NA	NA	NA
1996	NA	NA	NA	NA	NA	NA	NA	NA
1997	NA	NA	NA	NA	NA	NA	NA	NA
1998	NA	NA	NA	NA	NA	NA	NA	NA
1999	NA	NA	NA	NA	NA	NA	NA	NA
2000	12,70	1,00	NA	NA	NA	NA	83,28	1,00
2001	15,73	1,24	NA	NA	NA	NA	59,14	0,71
2002	15,08	1,19	NA	NA	NA	NA	46,04	0,55
2003	13,48	1,06	NA	NA	NA	NA	36,99	0,44
2004	16,45	1,30	NA	NA	NA	NA	44,30	0,53
2005	15,68	1,23	NA	NA	NA	NA	52,92	0,64
2006	16,86	1,33	NA	NA	NA	NA	15,71	0,19
2007	11,24	0,88	NA	NA	NA	NA	24,50	0,29
2008	12,46	0,98	NA	NA	NA	NA	14,64	0,18
2009	8,15	0,64	NA	NA	NA	NA	11,43	0,14
2010	9,00	0,71	NA	NA	NA	NA	10,72	0,13

Annex 70: Absolute and relative number of fatalities per 100.000 vehicles for Sweden. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a), (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012c), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

	Sweden Vans & Trucks All weights		Sweden Buses & coaches		Sweden Cars		Sweden Motorcycles	
Year	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction
1991	4,00	1,00	6,87	1,00	12,68	1,00	82,22	1,00
1992	2,25	0,56	14,03	2,04	12,99	1,02	68,75	0,84
1993	1,98	0,49	28,31	4,12	10,91	0,86	80,77	0,98
1994	2,22	0,56	0,00	0,00	10,88	0,86	54,39	0,66
1995	2,31	0,58	34,30	4,99	10,22	0,81	50,79	0,62
1996	2,41	0,60	40,67	5,92	9,06	0,71	52,63	0,64
1997	2,85	0,71	0,00	0,00	9,40	0,74	39,56	0,48
1998	1,79	0,45	20,10	2,93	8,63	0,68	39,60	0,48
1999	2,20	0,55	6,73	0,98	9,56	0,75	30,03	0,37
2000	2,66	0,67	0,00	0,00	9,83	0,77	27,87	0,34
2001	2,13	0,53	42,12	6,13	9,28	0,73	23,96	0,29
2002	2,17	0,54	35,68	5,19	9,37	0,74	21,20	0,26
2003	1,90	0,48	72,77	10,59	8,56	0,68	25,02	0,30
2004	0,96	0,24	29,93	4,36	7,00	0,55	27,24	0,33
2005	1,56	0,39	7,42	1,08	6,57	0,52	20,44	0,25
2006	1,41	0,35	73,30	10,67	6,21	0,49	22,45	0,27
2007	1,25	0,31	45,06	6,56	6,55	0,52	23,16	0,28
2008	1,30	0,32	7,42	1,08	5,47	0,43	18,94	0,23
2009	0,79	0,20	0,00	0,00	5,09	0,40	16,93	0,21
2010	NA	NA	NA	NA	NA	NA	NA	NA

Annex 70 (continued): Absolute and relative number of fatalities per 100.000 vehicles for Sweden. The relative values for all countries are based on the first data point of each category (European Commission Road Safety, 2012a), (Eurostat, 2012a), (Eurostat, 2012b), (Eurostat, 2012c), (Eurostat, 2012h), (Eurostat, 2012i), (Eurostat, 2012j), (Eurostat, 2012k), (Eurostat, 2012g).

	Sweden Mopeds		Sweden Bicycles		Sweden Pedestrians		Sweden Agricultural vehicles	
Year	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction	Fat/100.000 vehicles	Fraction
1991	NA	NA	NA	NA	NA	NA	149,12	1,00
1992	NA	NA	NA	NA	NA	NA	115,24	0,77
1993	NA	NA	NA	NA	NA	NA	52,37	0,35
1994	NA	NA	NA	NA	NA	NA	22,86	0,15
1995	NA	NA	NA	NA	NA	NA	100,22	0,67
1996	NA	NA	NA	NA	NA	NA	0,00	0,00
1997	NA	NA	NA	NA	NA	NA	54,49	0,37
1998	NA	NA	NA	NA	NA	NA	48,68	0,33
1999	NA	NA	NA	NA	NA	NA	92,48	0,62
2000	NA	NA	NA	NA	NA	NA	59,64	0,40
2001	79,16	1,00	NA	NA	NA	NA	0,00	0,00
2002	61,92	0,78	NA	NA	NA	NA	44,53	0,30
2003	34,00	0,43	NA	NA	NA	NA	30,00	0,20
2004	42,86	0,54	NA	NA	NA	NA	71,66	0,48
2005	13,68	0,17	NA	NA	NA	NA	13,97	0,09
2006	19,89	0,25	NA	NA	NA	NA	38,37	0,26
2007	16,49	0,21	NA	NA	NA	NA	11,95	0,08
2008	11,85	0,15	NA	NA	NA	NA	0,00	0,00
2009	12,00	0,15	NA	NA	NA	NA	12,49	0,08
2010	NA	NA	NA	NA	NA	NA	NA	NA

Annex 71: Absolute and relative number of female fatalities by age for Belgium. The relative values are based on the first data point of each age category (Federale overheidsdienst Algemene directie statistiek en economie, 2012)

Country & Age	Belgium <15		Belgium 15-17		Belgium 18-24		Belgium 25-49		Belgium 50-64		Belgium 64>	
Year	Female fatalities	Frac-tion	Female fatalities	Frac-tion	Female fatalities	Frac-tion	Female fatalities	Frac-tion	Female fatalities	Frac-tion	Female fatalities	Frac-tion
1991	26	1,00	18	1,00	75	1,00	156	1,00	78	1,00	140	1,00
1992	33	1,27	19	1,06	86	1,15	138	0,88	64	0,82	105	0,75
1993	24	0,92	14	0,78	61	0,81	133	0,85	84	1,08	104	0,74
1994	25	0,96	19	1,06	68	0,91	132	0,85	64	0,82	111	0,79
1995	28	1,08	12	0,67	61	0,81	121	0,78	44	0,56	87	0,62
1996	17	0,65	13	0,72	46	0,61	119	0,76	42	0,54	96	0,69
1997	25	0,96	22	1,22	52	0,69	105	0,67	57	0,73	84	0,60
1998	41	1,58	9	0,50	58	0,77	132	0,85	65	0,83	108	0,77
1999	27	1,04	13	0,72	68	0,91	112	0,72	58	0,74	97	0,69
2000	24	0,92	18	1,00	84	1,12	115	0,74	41	0,53	83	0,59
2001	28	1,08	11	0,61	59	0,79	140	0,90	46	0,59	97	0,69
2002	20	0,77	7	0,39	57	0,76	127	0,81	54	0,69	86	0,61
2003	16	0,62	8	0,44	36	0,48	91	0,58	46	0,59	80	0,57
2004	10	0,38	7	0,39	33	0,44	98	0,63	35	0,45	66	0,47
2005	13	0,50	8	0,44	29	0,39	80	0,51	46	0,59	84	0,60
2006	13	0,50	8	0,44	27	0,36	82	0,53	39	0,50	79	0,56
2007	11	0,42	3	0,17	26	0,35	76	0,49	37	0,47	62	0,44
2008	12	0,46	14	0,78	33	0,44	70	0,45	38	0,49	54	0,39
2009	10	0,38	10	0,56	30	0,40	72	0,46	39	0,50	71	0,51
2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 72: Absolute and relative number of male fatalities by age for Belgium. The relative values are based on the first data point of each age category (Federale overheidsdienst Algemene directie statistiek en economie, 2012)

Country & Age	Belgium <15		Belgium 15-17		Belgium 18-24		Belgium 25-49		Belgium 50-64		Belgium 64>	
Year	Male fatalities	Frac-tion	Male fatalities	Frac-tion	Male fatalities	Frac-tion	Male fatalities	Frac-tion	Male fatalities	Frac-tion	Male fatalities	Frac-tion
1991	45	1,00	55	1,00	346	1,00	568	1,00	148	1,00	206	1,00
1992	57	1,27	49	0,89	306	0,88	499	0,88	132	0,89	172	0,83
1993	39	0,87	41	0,75	302	0,87	522	0,92	153	1,03	173	0,84
1994	42	0,93	34	0,62	317	0,92	544	0,96	147	0,99	179	0,87
1995	49	1,09	43	0,78	227	0,66	479	0,84	134	0,91	149	0,72
1996	36	0,80	41	0,75	215	0,62	431	0,76	120	0,81	171	0,83
1997	29	0,64	27	0,49	200	0,58	473	0,83	126	0,85	153	0,74
1998	46	1,02	40	0,73	239	0,69	478	0,84	120	0,81	152	0,74
1999	38	0,84	26	0,47	219	0,63	468	0,82	131	0,89	136	0,66
2000	28	0,62	37	0,67	243	0,70	493	0,87	135	0,91	155	0,75
2001	35	0,78	35	0,64	222	0,64	492	0,87	146	0,99	167	0,81
2002	20	0,44	42	0,76	213	0,62	452	0,80	124	0,84	139	0,67
2003	12	0,27	30	0,55	181	0,52	334	0,59	94	0,64	152	0,74
2004	16	0,36	25	0,45	206	0,60	410	0,72	114	0,77	135	0,66
2005	24	0,53	23	0,42	167	0,48	393	0,69	113	0,76	102	0,50
2006	18	0,40	13	0,24	169	0,49	404	0,71	101	0,68	114	0,55
2007	19	0,42	24	0,44	188	0,54	388	0,68	121	0,82	108	0,52
2008	23	0,51	14	0,25	144	0,42	340	0,60	101	0,68	95	0,46
2009	12	0,27	17	0,31	132	0,38	319	0,56	120	0,81	105	0,51
2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 73: Absolute and relative number of female inhabitants by age for Belgium. The relative values are based on the first data point of each age category (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

Country & Age	Belgium <15		Belgium 15-17		Belgium 18-24		Belgium 25-49		Belgium 50-64		Belgium 64>	
Year	Female Inhabitants	Frac-tion	Female Inhabitants	Frac-tion	Female Inhabitants	Frac-tion	Female Inhabitants	Frac-tion	Female Inhabitants	Frac-tion	Female Inhabitants	Frac-tion
1991	883.626	1,00	181.593	1,00	493.159	1,00	1.770.407	1,00	870.159	1,00	907.346	1,00
1992	888.432	1,01	177.600	0,98	483.487	0,98	1.798.319	1,02	854.281	0,98	920.646	1,01
1993	892.436	1,01	177.170	0,98	475.108	0,96	1.822.952	1,03	844.040	0,97	933.141	1,03
1994	893.078	1,01	179.363	0,99	465.164	0,94	1.838.828	1,04	839.551	0,96	944.423	1,04
1995	891.455	1,01	180.899	1,00	456.695	0,93	1.851.950	1,05	837.752	0,96	957.152	1,05
1996	886.500	1,00	182.436	1,00	448.270	0,91	1.862.015	1,05	832.723	0,96	972.318	1,07
1997	884.087	1,00	183.377	1,01	440.741	0,89	1.864.973	1,05	838.997	0,96	986.271	1,09
1998	882.294	1,00	182.606	1,01	435.308	0,88	1.864.769	1,05	845.663	0,97	998.952	1,10
1999	881.436	1,00	179.364	0,99	434.399	0,88	1.861.033	1,05	855.980	0,98	1.007.822	1,11
2000	881.497	1,00	176.393	0,97	435.871	0,88	1.857.711	1,05	865.643	0,99	1.015.956	1,12
2001	881.872	1,00	174.117	0,96	437.914	0,89	1.851.557	1,05	877.338	1,01	1.022.597	1,13
2002	882.572	1,00	174.926	0,96	438.360	0,89	1.852.134	1,05	889.467	1,02	1.029.978	1,14
2003	881.237	1,00	176.683	0,97	438.606	0,89	1.852.189	1,05	903.578	1,04	1.036.666	1,14
2004	878.838	0,99	180.394	0,99	437.929	0,89	1.851.747	1,05	916.224	1,05	1.044.113	1,15
2005	877.367	0,99	183.236	1,01	438.535	0,89	1.850.243	1,05	931.893	1,07	1.053.253	1,16
2006	877.957	0,99	187.296	1,03	439.086	0,89	1.852.734	1,05	953.708	1,10	1.056.780	1,16
2007	879.051	0,99	190.659	1,05	441.581	0,90	1.854.171	1,05	981.985	1,13	1.055.679	1,16
2008	880.369	1,00	192.681	1,06	445.856	0,90	1.857.088	1,05	1.007.771	1,16	1.058.792	1,17
2009	887.118	1,00	191.216	1,05	453.662	0,92	1.857.975	1,05	1.028.760	1,18	1.065.698	1,17
2010	895.783	1,01	186.706	1,03	460.919	0,93	1.858.192	1,05	1.050.140	1,21	1.075.944	1,19
2011	907.662	1,03	183.023	1,01	470.204	0,95	1.862.603	1,05	1.071.413	1,23	1.086.127	1,20

Annex 74: Absolute and relative number of male inhabitants by age for Belgium. The relative values are based on the first data point of each age category (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

Country & Age	Belgium <15		Belgium 15-17		Belgium 18-24		Belgium 25-49		Belgium 50-64		Belgium 64>	
Year	Male Inhabitants	Frac-tion	Male Inhabitants	Frac-tion	Male Inhabitants	Frac-tion	Male Inhabitants	Frac-tion	Male Inhabitants	Frac-tion	Male Inhabitants	Frac-tion
1991	927.645	1,00	190.789	1,00	512.526	1,00	1.831.805	1,00	824.584	1,00	593.336	1,00
1992	932.830	1,01	186.241	0,98	502.968	0,98	1.860.395	1,02	811.659	0,98	605.139	1,02
1993	936.971	1,01	185.064	0,97	493.416	0,96	1.886.735	1,03	804.424	0,98	616.862	1,04
1994	937.726	1,01	186.657	0,98	482.930	0,94	1.902.243	1,04	803.416	0,97	627.252	1,06
1995	935.375	1,01	189.122	0,99	472.642	0,92	1.913.177	1,04	804.962	0,98	639.393	1,08
1996	930.510	1,00	190.662	1,00	461.810	0,90	1.919.511	1,05	803.008	0,97	653.284	1,10
1997	927.125	1,00	192.346	1,01	453.225	0,88	1.918.965	1,05	813.304	0,99	666.815	1,12
1998	925.009	1,00	190.907	1,00	447.900	0,87	1.915.577	1,05	823.640	1,00	679.639	1,15
1999	923.814	1,00	188.361	0,99	445.766	0,87	1.910.062	1,04	836.084	1,01	689.631	1,16
2000	923.288	1,00	184.853	0,97	446.803	0,87	1.903.611	1,04	848.322	1,03	699.137	1,18
2001	923.218	1,00	182.297	0,96	448.460	0,87	1.894.778	1,03	862.128	1,05	707.138	1,19
2002	922.673	0,99	183.558	0,96	449.232	0,88	1.894.682	1,03	875.729	1,06	716.414	1,21
2003	921.462	0,99	185.584	0,97	449.567	0,88	1.893.305	1,03	891.243	1,08	725.724	1,22
2004	918.601	0,99	189.541	0,99	448.159	0,87	1.889.324	1,03	905.544	1,10	736.007	1,24
2005	917.491	0,99	191.839	1,01	447.338	0,87	1.886.189	1,03	922.221	1,12	746.247	1,26
2006	918.145	0,99	196.048	1,03	447.342	0,87	1.886.327	1,03	943.722	1,14	752.237	1,27
2007	918.678	0,99	199.398	1,05	448.894	0,88	1.888.496	1,03	971.559	1,18	754.383	1,27
2008	920.086	0,99	201.371	1,06	452.923	0,88	1.891.396	1,03	997.599	1,21	760.934	1,28
2009	927.758	1,00	199.521	1,05	460.387	0,90	1.891.270	1,03	1.018.635	1,24	771.080	1,30
2010	936.451	1,01	195.216	1,02	468.509	0,91	1.889.120	1,03	1.038.710	1,26	784.215	1,32
2011	948.867	1,02	191.481	1,00	477.988	0,93	1.894.561	1,03	1.060.659	1,29	796.678	1,34

Annex 75: Absolute and relative number of female fatalities per 100000 inhabitants by age for Belgium. The relative values are based on the first data point of each age category (Federale overheidsdienst Algemene directie statistiek en economie, 2012) (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

Country & Age	Belgium Female <15		Belgium Female 15-17		Belgium Female 18-24		Belgium Female 25-49		Belgium Female 50-64		Belgium Female 64>	
Year	Fat/100000 Inhabitants	Frac-tion	Fat/100000 Inhabitants	Frac-tion	Fat/100000 Inhabitants	Frac-tion	Fat/100000 Inhabitants	Frac-tion	Fat/100000 Inhabitants	Frac-tion	Fat/100000 Inhabitants	Frac-tion
1991	2,94	1,00	9,91	1,00	15,21	1,00	8,81	1,00	8,96	1,00	15,43	1,00
1992	3,71	1,26	10,70	1,08	17,79	1,17	7,67	0,87	7,49	0,84	11,41	0,74
1993	2,69	0,91	7,90	0,80	12,84	0,84	7,30	0,83	9,95	1,11	11,15	0,72
1994	2,80	0,95	10,59	1,07	14,62	0,96	7,18	0,81	7,62	0,85	11,75	0,76
1995	3,14	1,07	6,63	0,67	13,36	0,88	6,53	0,74	5,25	0,59	9,09	0,59
1996	1,92	0,65	7,13	0,72	10,26	0,67	6,39	0,73	5,04	0,56	9,87	0,64
1997	2,83	0,96	12,00	1,21	11,80	0,78	5,63	0,64	6,79	0,76	8,52	0,55
1998	4,65	1,58	4,93	0,50	13,32	0,88	7,08	0,80	7,69	0,86	10,81	0,70
1999	3,06	1,04	7,25	0,73	15,65	1,03	6,02	0,68	6,78	0,76	9,62	0,62
2000	2,72	0,93	10,20	1,03	19,27	1,27	6,19	0,70	4,74	0,53	8,17	0,53
2001	3,18	1,08	6,32	0,64	13,47	0,89	7,56	0,86	5,24	0,58	9,49	0,61
2002	2,27	0,77	4,00	0,40	13,00	0,86	6,86	0,78	6,07	0,68	8,35	0,54
2003	1,82	0,62	4,53	0,46	8,21	0,54	4,91	0,56	5,09	0,57	7,72	0,50
2004	1,14	0,39	3,88	0,39	7,54	0,50	5,29	0,60	3,82	0,43	6,32	0,41
2005	1,48	0,50	4,37	0,44	6,61	0,43	4,32	0,49	4,94	0,55	7,98	0,52
2006	1,48	0,50	4,27	0,43	6,15	0,40	4,43	0,50	4,09	0,46	7,48	0,48
2007	1,25	0,43	1,57	0,16	5,89	0,39	4,10	0,47	3,77	0,42	5,87	0,38
2008	1,36	0,46	7,27	0,73	7,40	0,49	3,77	0,43	3,77	0,42	5,10	0,33
2009	1,13	0,38	5,23	0,53	6,61	0,43	3,88	0,44	3,79	0,42	6,66	0,43
2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 76: Absolute and relative number of male fatalities per 100000 inhabitants by age for Belgium. The relative values are based on the first data point of each age category (Federale overheidsdienst Algemene directie statistiek en economie, 2012) (Eurostat, 2012e) (Eurostat, 2012d) & (Eurostat, 2012f).

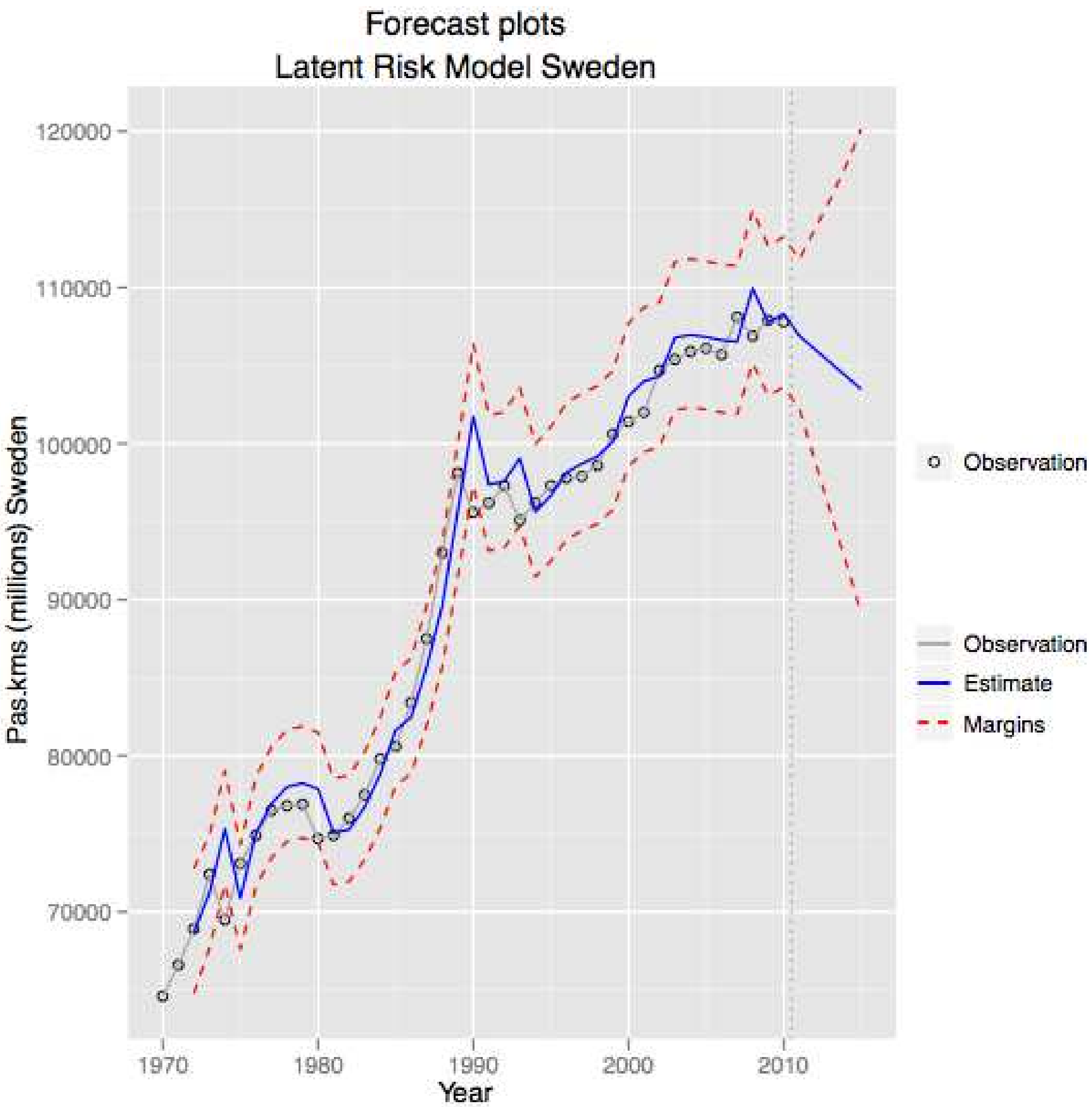
Country & Age	Belgium Male <15		Belgium Male 15-17		Belgium Male 18-24		Belgium Male 25-49		Belgium Male 50-64		Belgium Male 64>	
Year	Fat/100000 Inhabitants	Frac-tion	Fat/100000 Inhabitants	Frac-tion	Fat/100000 Inhabitants	Frac-tion	Fat/100000 Inhabitants	Frac-tion	Fat/100000 Inhabitants	Frac-tion	Fat/100000 Inhabitants	Frac-tion
1991	4,85	1,00	28,83	1,00	67,51	1,00	31,01	1,00	17,95	1,00	34,72	1,00
1992	6,11	1,26	26,31	0,91	60,84	0,90	26,82	0,87	16,26	0,91	28,42	0,82
1993	4,16	0,86	22,15	0,77	61,21	0,91	27,67	0,89	19,02	1,06	28,05	0,81
1994	4,48	0,92	18,22	0,63	65,64	0,97	28,60	0,92	18,30	1,02	28,54	0,82
1995	5,24	1,08	22,74	0,79	48,03	0,71	25,04	0,81	16,65	0,93	23,30	0,67
1996	3,87	0,80	21,50	0,75	46,56	0,69	22,45	0,72	14,94	0,83	26,18	0,75
1997	3,13	0,64	14,04	0,49	44,13	0,65	24,65	0,79	15,49	0,86	22,94	0,66
1998	4,97	1,03	20,95	0,73	53,36	0,79	24,95	0,80	14,57	0,81	22,36	0,64
1999	4,11	0,85	13,80	0,48	49,13	0,73	24,50	0,79	15,67	0,87	19,72	0,57
2000	3,03	0,63	20,02	0,69	54,39	0,81	25,90	0,84	15,91	0,89	22,17	0,64
2001	3,79	0,78	19,20	0,67	49,50	0,73	25,97	0,84	16,93	0,94	23,62	0,68
2002	2,17	0,45	22,88	0,79	47,41	0,70	23,86	0,77	14,16	0,79	19,40	0,56
2003	1,30	0,27	16,17	0,56	40,26	0,60	17,64	0,57	10,55	0,59	20,94	0,60
2004	1,74	0,36	13,19	0,46	45,97	0,68	21,70	0,70	12,59	0,70	18,34	0,53
2005	2,62	0,54	11,99	0,42	37,33	0,55	20,84	0,67	12,25	0,68	13,67	0,39
2006	1,96	0,40	6,63	0,23	37,78	0,56	21,42	0,69	10,70	0,60	15,15	0,44
2007	2,07	0,43	12,04	0,42	41,88	0,62	20,55	0,66	12,45	0,69	14,32	0,41
2008	2,50	0,52	6,95	0,24	31,79	0,47	17,98	0,58	10,12	0,56	12,48	0,36
2009	1,29	0,27	8,52	0,30	28,67	0,42	16,87	0,54	11,78	0,66	13,62	0,39
2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Annex 77: Output first model run Swedish aggregated analysis

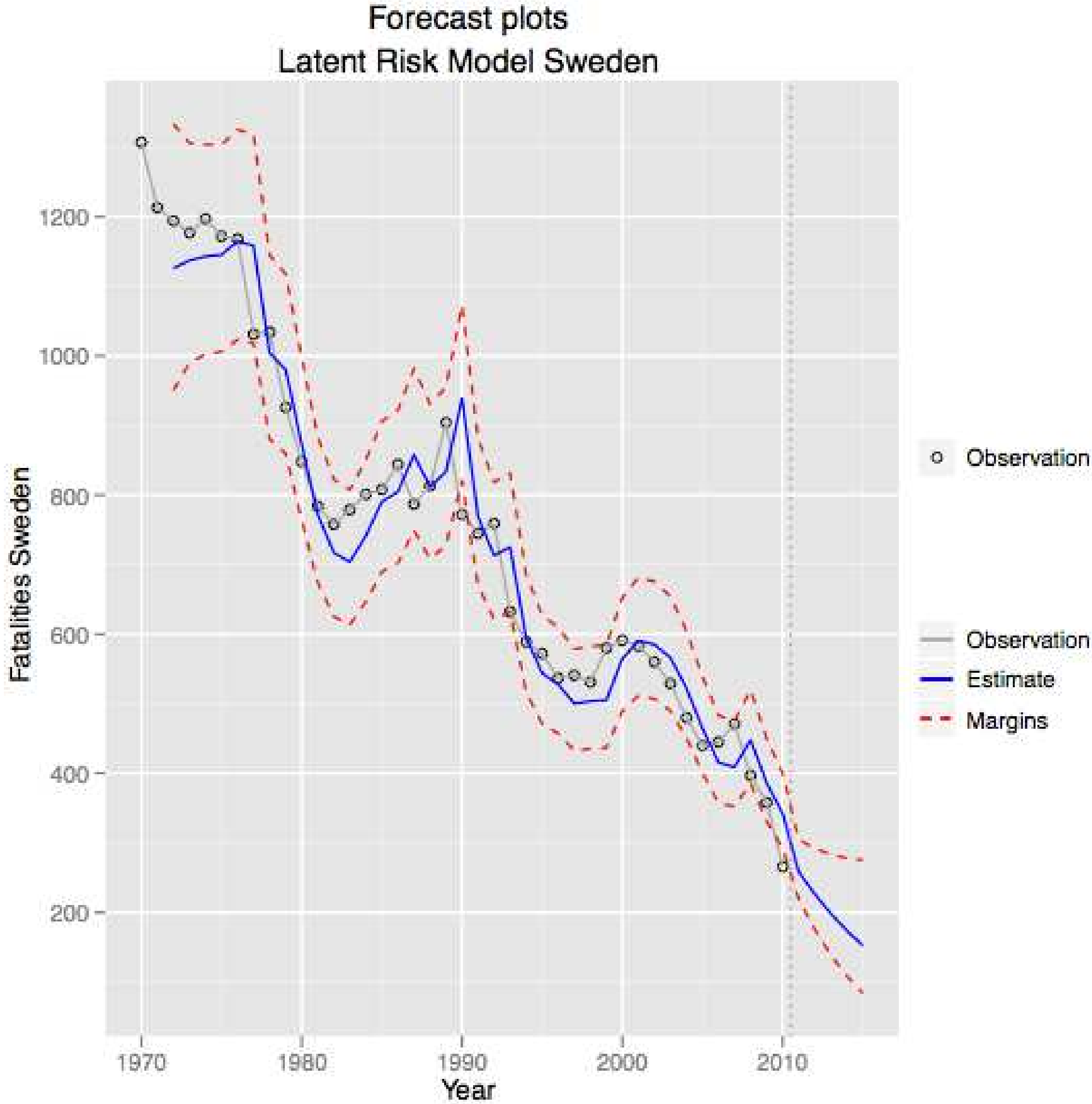
Residual analysis					
Box-Ljung tests (independency tests, p value under 0,05 is defined as not independent)					
Variable 1:Pas.kms (millions) Sweden					
Lag	X-square	df	p value		
3	0,328769	1	0,566385		
4	0,538295	2	0,76403		
5	0,588623	3	0,899032		
Variable 2:Fatalities Sweden					
Lag	X-square	df	p value		
3	0,8251	1	0,363693		
4	3,6186	2	0,163769		
5	4,96886	3	0,174092		
Heteroscedasticity tests (p value over 0,05 is defined as homoscedastisch, under 0,05					
Nr	H	df num	Df den	P value	Label
1	0,235033	13	13	0,0137992	Pas.kms(millions)
2	1,5983	13	13	0,409015	Fatalities Sweden
Standardised Residual Normality tests (p values over 0,05 indicate normal residual					
Nr	Skewness	Kurtosis	N	p value	Label
1	-1,0272	4,76268	11,9073	0,0025963	Pas.kms(millions)
2	-0,721959	3,04594	3,39139	0,183472	Fatalities Sweden
Auxiliary Residual tests					
Output Auxiliary Residual Normality tests (residuals for measurement equations)					
Nr	Skewness	Kurtosis	N	p value	Label
1	0,105685	6,85158	21,9774	1,6891E-05	Pas.kms(millions)
2	0,0365283	2,93591	0,015861	0,992101	Fatalities Sweden
State Auxiliary Residual Normality tests (residuals for state equations)					
Nr	Skewness	Kurtosis	N	p value	Label
1	-0,327888	3,58241	1,28737	0,525352	Level exposure
2	-0,278733	2,37134	0,025389	0,987386	Slope exposure
3	-0,640423	2,70573	0,151053	0,927255	Level risk
4	-1,39905	4,46132	5,53298	0,0628822	Slope risk

log likelihood	182,058
AIC	-363,677
Box-Ljung test 1 Pas.kms (millions) Sweden	0,328769
Box-Ljung test 2 Pas.kms (millions) Sweden	0,538295
Box-Ljung test 3 Pas.kms (millions) Sweden	0,588623
Box-Ljung test 1 Fatalities Sweden	0,8251
Box-Ljung test 2 Fatalities Sweden	3,6186
Box-Ljung test 3 Fatalities Sweden	4,96886
Heteroscedasticity Test Pas.kms (millions) Sweden	0,235033*
Heteroscedasticity Test Fatalities Sweden	1,5983
Normality Test standard Residuals Pas.kms (millions)	11,9073**
Normality Test standard Residuals Fatalities Sweden	3,39139
Normality Test output Aux Res Pas.kms (millions)	21,9774***
Normality Test output Aux Res Fatalities Sweden	0,0158617
Normality Test State Aux Res Level exposure	1,2 8737
Normality Test State Aux Res Slope exposure	0,025389
Normality Test State Aux Res Level risk	0,151053
Normality Test State Aux Res Slope risk	5,53298
MSE Pas.kms (millions) Sweden	2819652,60184118
MSE Fatalities Sweden	2646,21152500048

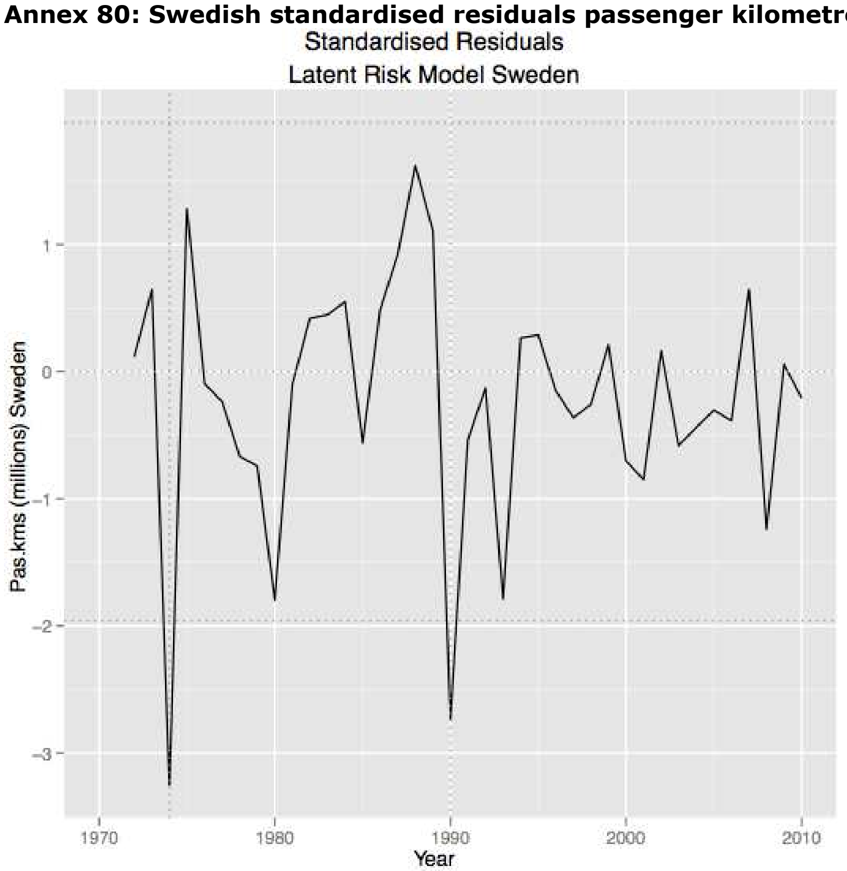
Annex 78: Graph of predicted passenger kilometres in Sweden (after 1th model run)



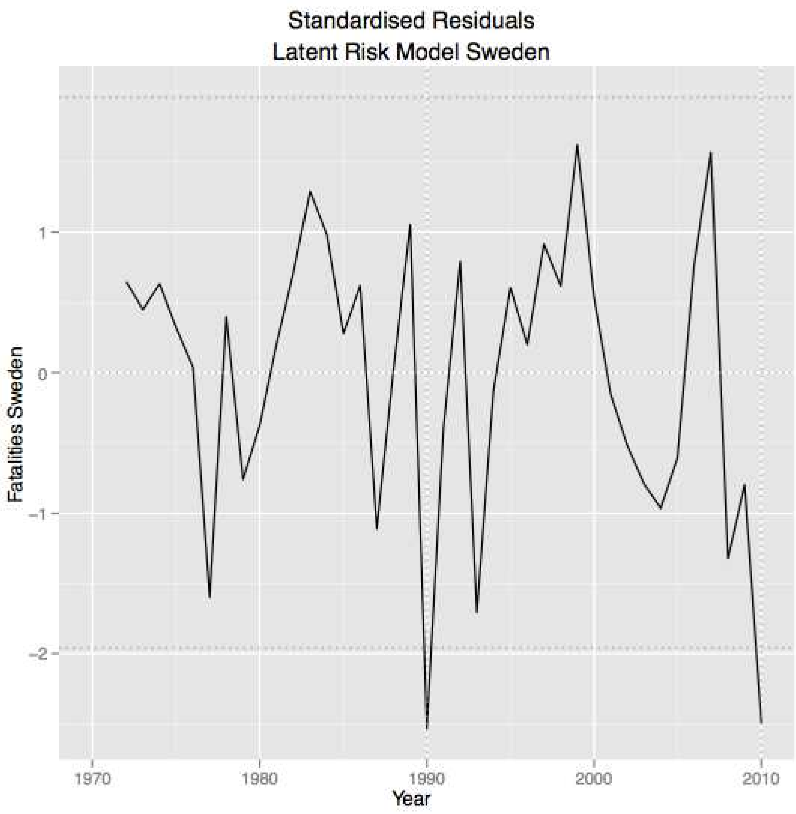
Annex 79: Graph of predicted fatalities in Sweden (after 1th model run)



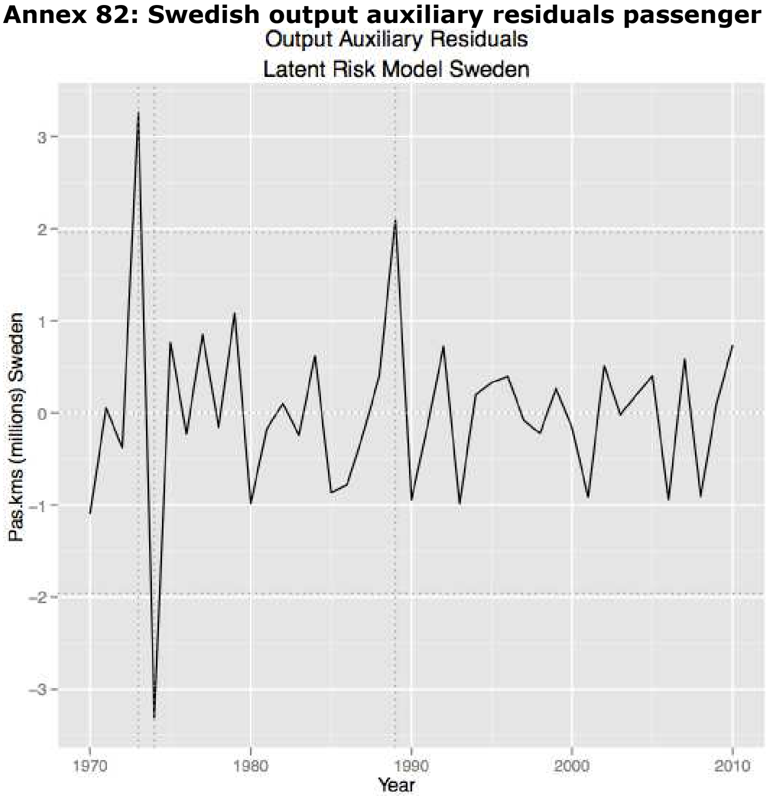
Annex 80: Swedish standardised residuals passenger kilometres (after 1th model run)



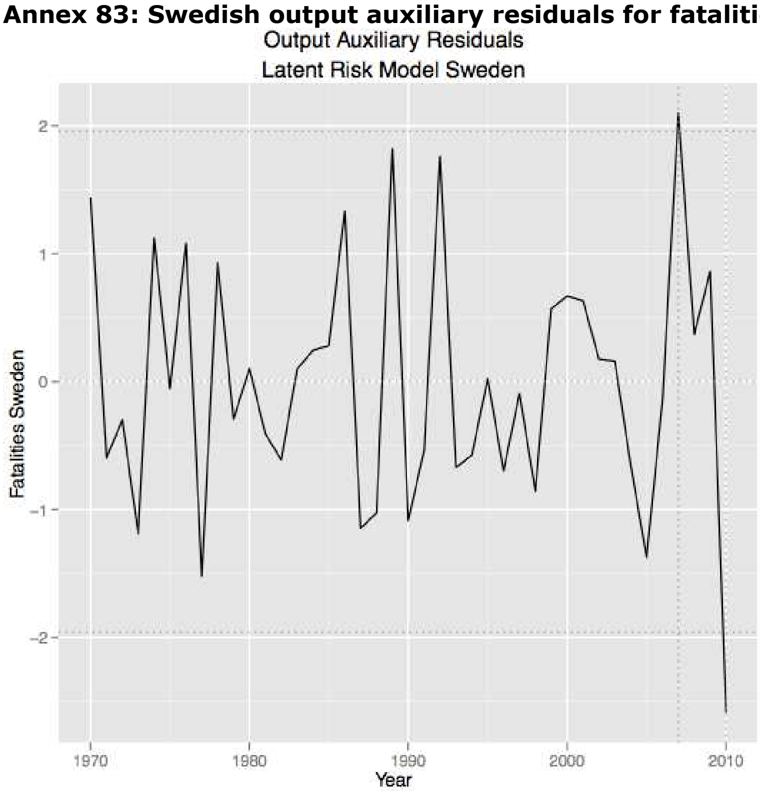
Annex 81: Swedish standardised residuals fatalities (after 1th model run)



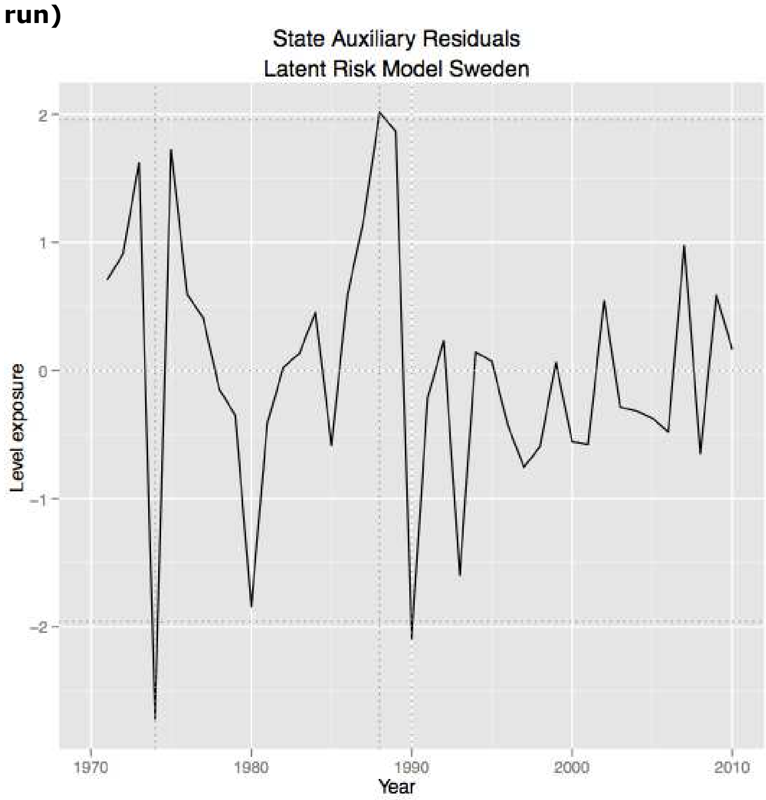
Annex 82: Swedish output auxiliary residuals passenger kilometres (after 1th model run)



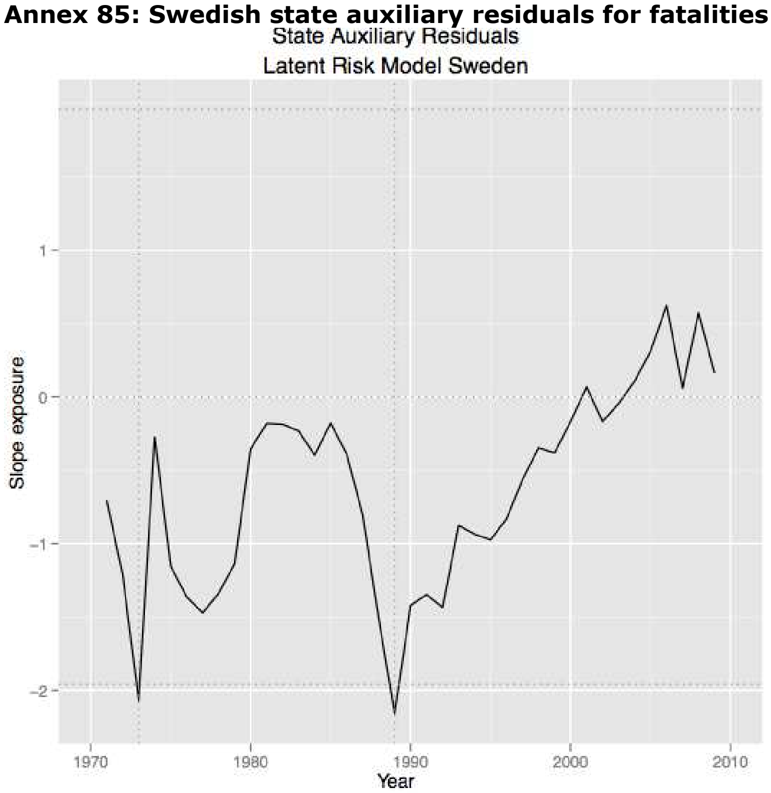
Annex 83: Swedish output auxiliary residuals for fatalities (after 1th model run)



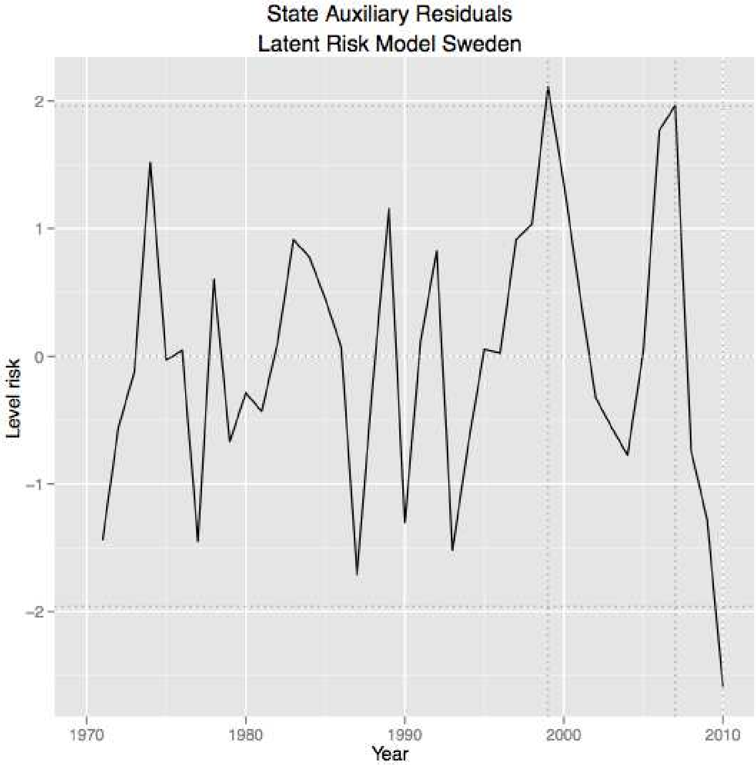
Annex 84: Swedish state auxiliary residuals for passenger kilometre (after 1th model run)



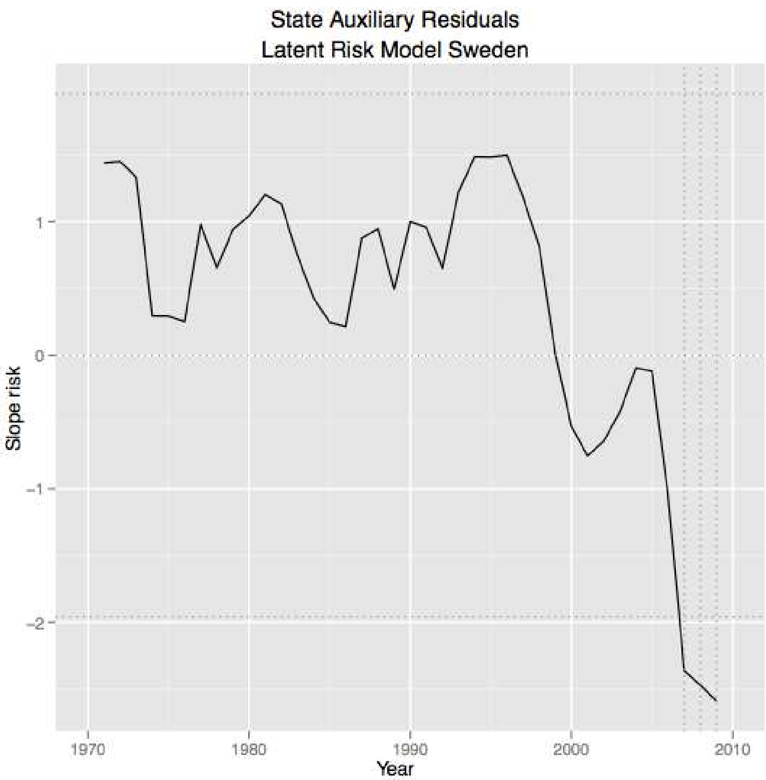
Annex 85: Swedish state auxiliary residuals for fatalities (after 1th model run)



Annex 86: Swedish state auxiliary residuals for passenger km. (after 1th model run)



Annex 87: Swedish state auxiliary residuals for fatalities (after 1th model run)



Annex 88: Output second model run Swedish aggregated analysis

Residual analysis					
Box-Ljung tests					
Variable 1: Pas.kms (millions) Sweden					
Lag	X-square	df	p value		
3	0,256593	1	0,612471		
4	1,86161	2	0,394236		
5	1,8636	3	0,601193		
Variable 2: Fatalities Sweden					
Lag	X-square	df	p value		
3	2,41012	1	0,120553		
4	4,2544	2	0,11917		
5	4,41236	3	0,220242		
Heteroscedasticity tests					
Nr	H	df num	df den	p value	Label
1	0,469872	13	13	0,186622	Pas.kms (millions)
2	1,74581	13	13	0,327438	Fatalities Sweden
Standardised Residual Normality tests					
Nr	Skewness	Kurtosis	N	p value	Label
1	-1,25465	5,61944	20,8336	2,9925E-05	Pas.kms (millions)
2	-0,79126	3,97103	5,45818	0,0652788	Fatalities Sweden
Auxiliary Residual tests					
Output Auxiliary Residual Normality tests					
Nr	Skewness	Kurtosis	N	p value	Label
1	0,146459	2,63165	0,42044	0,810406	Pas.kms (millions)
2	-0,586219	4,27365	5,29492	0,0708309	Fatalities Sweden
State Auxiliary Residual Normality tests					
Nr	Skewness	Kurtosis	N	p value	Label
1	-0,698273	3,82301	4,57839	0,101348	Level exposure
2	-0,834398	4,43449	7,18004	0,0275977	Slope exposure
3	-0,512676	3,34424	1,78983	0,408642	Level risk
4	-1,02766	3,03896	1,21084	0,545846	Slope risk

log likelihood	178,669
AIC	-356,9
Box-Ljung test 1 Pas.kms (millions) Sweden	0,256593
Box-Ljung test 2 Pas.kms (millions) Sweden	1,86161
Box-Ljung test 3 Pas.kms (millions) Sweden	1,8636
Box-Ljung test 1 Fatalities Sweden	2,41012
Box-Ljung test 2 Fatalities Sweden	4,2544
Box-Ljung test 3 Fatalities Sweden	4,41236
Heteroscedasticity Test Pas.kms (millions) Sweden	0,469872
Heteroscedasticity Test Fatalities Sweden	1,74581
Normality Test standard Residuals Pas.kms (millions)	20,8336***
Normality Test standard Residuals Fatalities Sweden	5,45818
Normality Test output Aux Res Pas.kms (millions)	0,42044
Normality Test output Aux Res Fatalities Sweden	5,29492
Normality Test State Aux Res Level exposure	4,57839
Normality Test State Aux Res Slope exposure	7,18004*
Normality Test State Aux Res Level risk	1,78983
MSE Pas.kms (millions) Sweden	2819627,12347777
MSE Fatalities Sweden	2646,2116994186

Annex 89: Output third model run Swedish aggregated analysis

Residual analysis					
Box-Ljung tests					
Variable 1: Pas.kms (millions) Sweden					
Lag	X-square	df	p value		
3	1,00922	1	0.315089		
4	1,62444	2	0.443871		
5	1,69075	3	0.638992		
Variable 2: Fatalities Sweden					
Lag	X-square	df	p value		
3	4,68576	1	0,0304137		
4	6,24076	2	0,0441403		
5	6,32418	3	0,0968606		
Heteroscedasticity tests					
Nr	H	df num	df den	p value	Label
1	0,48755	13	13	0,208612	Pas.kms (millions)
2	1,82569	13	13	0,290592	Fatalities Sweden
Standardised Residual Normality tests					
Nr	Skewness	Kurtosis	N	p value	Label
1	-0,315176	2,13155	1,7753	0,411621	Pas.kms (millions)
2	-0,829059	4,33466	6,98481	0,0304277	Fatalities Sweden
Auxiliary Residual tests					
Output Auxiliary Residual Normality tests					
Nr	Skewness	Kurtosis	N	p value	Label
1	-0,207655	2,08495	1,6323	0,44213	Pas.kms (millions)
2	-0,486127	3,83013	2,8992	0,234664	Fatalities Sweden
State Auxiliary Residual Normality tests					
Nr	Skewness	Kurtosis	N	p value	Label
1	-0,659623	3,2588	2,92303	0,231885	Level exposure
2	0,153636	2,57797	0,379056	0,827349	Slope exposure
3	-0,353313	3,21666	0,824321	0,662218	Level risk
4	-1,07916	3,16965	1,58959	0,451675	Slope risk
log likelihood				174,526	
AIC				-348,613	
Box-Ljung test 1 Pas.kms (millions) Sweden				1,00922	
Box-Ljung test 2 Pas.kms (millions) Sweden				1,62444	
Box-Ljung test 3 Pas.kms (millions) Sweden				1,69075	
Box-Ljung test 1 Fatalities Sweden				4,68576*	
Box-Ljung test 2 Fatalities Sweden				6,24076*	
Box-Ljung test 3 Fatalities Sweden				6,32418	
Heteroscedasticity Test Pas.kms (millions) Sweden				0,48755	
Heteroscedasticity Test Fatalities Sweden				1,82569	
Normality Test standard Residuals Pas.kms (millions)				1,7753	
Normality Test standard Residuals Fatalities Sweden				6,98481*	
Normality Test output Aux Res Pas.kms (millions)				1,6323	
Normality Test output Aux Res Fatalities Sweden				2,8992	
Normality Test State Aux Res Level exposure				2,92303	
Normality Test State Aux Res Slope exposure				0,379056	
Normality Test State Aux Res Level risk				0,824321	
Normality Test State Aux Res Slope risk				1,58959	
MSE Pas.kms (millions) Sweden				2819598,31784691	
MSE Fatalities Sweden				2646,21812333056	

Annex 90: Output fourth model run Swedish aggregated analysis

Residual analysis					
Box-Ljung tests					
Variable 1: Pas.kms (millions) Sweden					
Lag	X-square	df	p value		
3	0,914669	1	0,338879		
4	1,55447	2	0,459676		
5	1,60596	3	0,658039		
Variable 2: Fatalities Sweden					
Lag	X-square	df	p value		
3	4,75749	1	0,029171		
4	7,07381	2	0,0291033		
5	8,87744	3	0,0309656		
Heteroscedasticity tests					
Nr	H	df num	df den	p value	Label
1	0,4803	13	13	0,199467	Pas.kms (millions)
2	2,00864	12	12	0,241305	Fatalities Sweden
Standardised Residual Normality tests					
Nr	Skewness	Kurtosis	N	p value	Label
1	-0,286258	2,08874	1,78551	0,409527	Pas.kms (millions)
2	-0,138987	2,38605	0,681301	0,711308	Fatalities Sweden
Auxiliary Residual tests					
Output Auxiliary Residual Normality tests					
Nr	Skewness	Kurtosis	N	p value	Label
1	-0,17757	2,0337	1,65293	0,437592	Pas.kms (millions)
2	0,32021	2,20325	1,78878	0,408858	Fatalities Sweden
State Auxiliary Residual Normality tests					
Nr	Skewness	Kurtosis	N	p value	Label
1	-0,595581	3,20446	2,37496	0,304988	Level exposure
2	0,148568	2,62521	0,322822	0,850942	Slope exposure
3	0,34867	2,10289	1,86436	0,393694	Level risk
4	-0,512984	2,26641	1,13966	0,65623	Slope risk

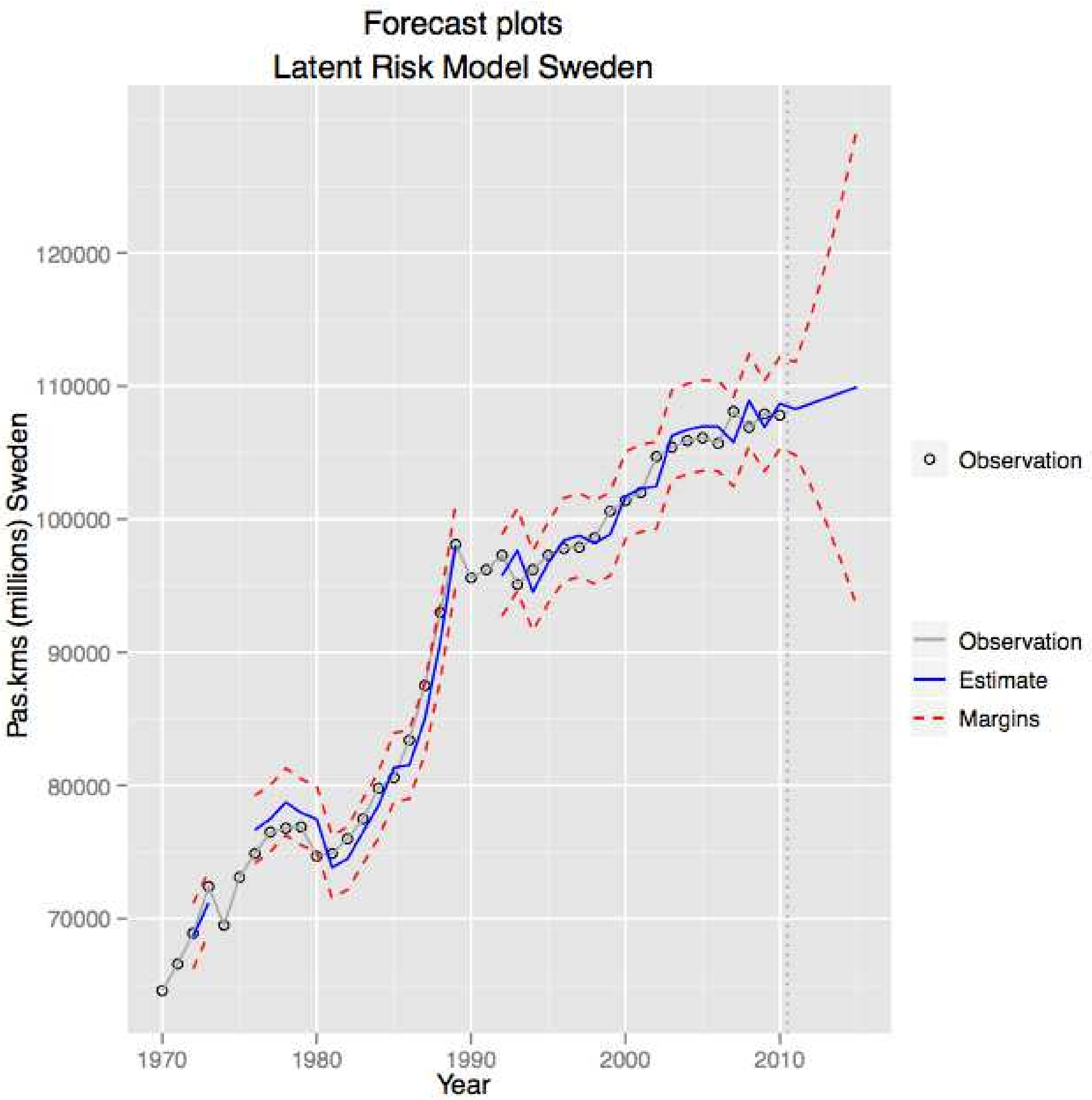
log likelihood	170,504
AIC	-340,569
Box-Ljung test 1 Pas.kms (millions) Sweden	0,914669
Box-Ljung test 2 Pas.kms (millions) Sweden	1,55447
Box-Ljung test 3 Pas.kms (millions) Sweden	1,60596
Box-Ljung test 1 Fatalities Sweden	4,75749*
Box-Ljung test 2 Fatalities Sweden	7,07381*
Box-Ljung test 3 Fatalities Sweden	8,87744*
Heteroscedasticity Test Pas.kms (millions) Sweden	0,4803
Heteroscedasticity Test Fatalities Sweden	2,00864
Normality Test standard Residuals Pas.kms (millions)	1,78551
Normality Test standard Residuals Fatalities Sweden	0,681301
Normality Test output Aux Res Pas.kms (millions)	1,65293
Normality Test output Aux Res Fatalities Sweden	1,78878
Normality Test State Aux Res Level exposure	2,37496
Normality Test State Aux Res Slope exposure	0,322822
Normality Test State Aux Res Level risk	1,86436
Normality Test State Aux Res Slope risk	1,13966
MSE Pas.kms (millions) Sweden	11497072,4007083
MSE Fatalities Sweden	3872,45305205263

Annex 91: Output fifth model run Swedish aggregated analysis

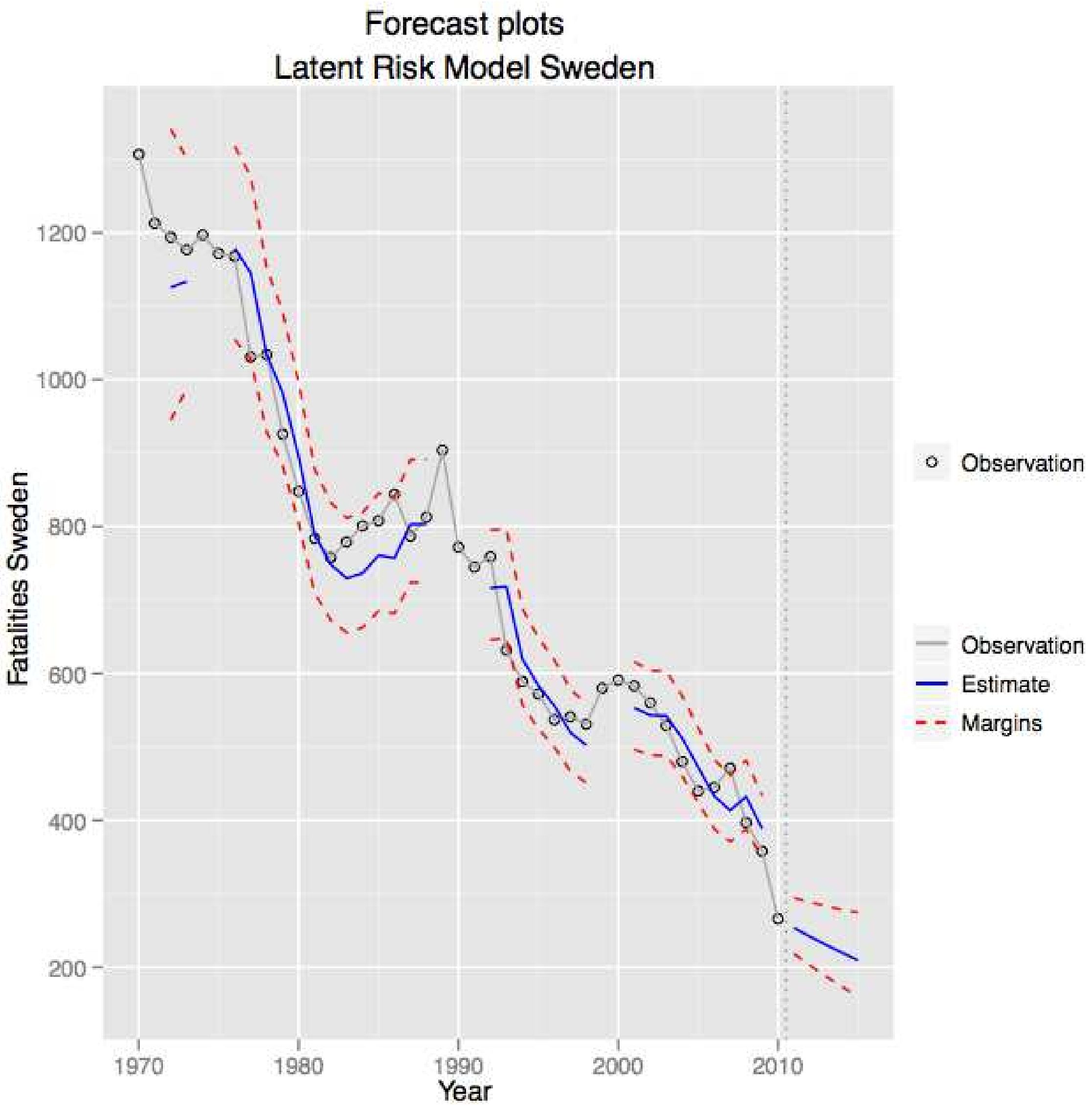
Residual analysis					
Box-Ljung tests					
Variable 1: Pas.kms (millions) Sweden					
Lag	X-square	df	p value		
3	1,67259	1	0,195912		
4	2,53543	2	0,281474		
5	2,62736	3	0,452714		
Variable 2: Fatalities Sweden					
Lag	X-square	df	p value		
3	3,3087	1	0,0689141		
4	4,87022	2	0,0875881		
5	5,35475	3	0,147589		
Heteroscedasticity tests					
Nr	H	df num	df den	p value	Label
1	0,449777	13	13	0,162947	Pas.kms (millions)
2	1,11664	12	12	0,851579	Fatalities Sweden
Standardised Residual Normality tests					
Nr	Skewness	Kurtosis	N	p value	Label
1	-0,260722	2,17036	1,48031	0,47704	Pas.kms (millions)
2	-0,161291	2,40779	0,663213	0,71777	Fatalities Sweden
Auxiliary Residual tests					
Output Auxiliary Residual Normality tests					
Nr	Skewness	Kurtosis	N	p value	Label
1	-0,190851	1,91372	2,0707	0,355102	Pas.kms (millions)
2	0,378653	2,18705	2,14663	0,341874	Fatalities Sweden
State Auxiliary Residual Normality tests					
Nr	Skewness	Kurtosis	N	p value	Label
1	-0,600933	3,12782	2,36141	0,307063	Level exposure
2	0,216154	2,67137	0,403976	0,817105	Slope exposure
3	0,266352	2,21507	1,28703	0,525441	Level risk
4	0,0070637	2,41281	0,264951	0,875924	Slope risk

log likelihood	163,918
AIC	-327,398
Box-Ljung test 1 Pas.kms (millions) Sweden	1,67259
Box-Ljung test 2 Pas.kms (millions) Sweden	2,53543
Box-Ljung test 3 Pas.kms (millions) Sweden	2,62736
Box-Ljung test 1 Fatalities Sweden	3,3087
Box-Ljung test 2 Fatalities Sweden	4,87022
Box-Ljung test 3 Fatalities Sweden	5,35475
Heteroscedasticity Test Pas.kms (millions) Sweden	0,449777
Heteroscedasticity Test Fatalities Sweden	1,11664
Normality Test standard Residuals Pas.kms (millions)	1,48031
Normality Test standard Residuals Fatalities Sweden	0,663213
Normality Test output Aux Res Pas.kms (millions)	2,0707
Normality Test output Aux Res Fatalities Sweden	2,14663
Normality Test State Aux Res Level exposure	2,36141
Normality Test State Aux Res Slope exposure	0,403976
Normality Test State Aux Res Level risk	1,28703
Normality Test State Aux Res Slope risk	0,264951
MSE Pas.kms (millions) Sweden	2819618,87251288
MSE Fatalities Sweden	2646,21266161272

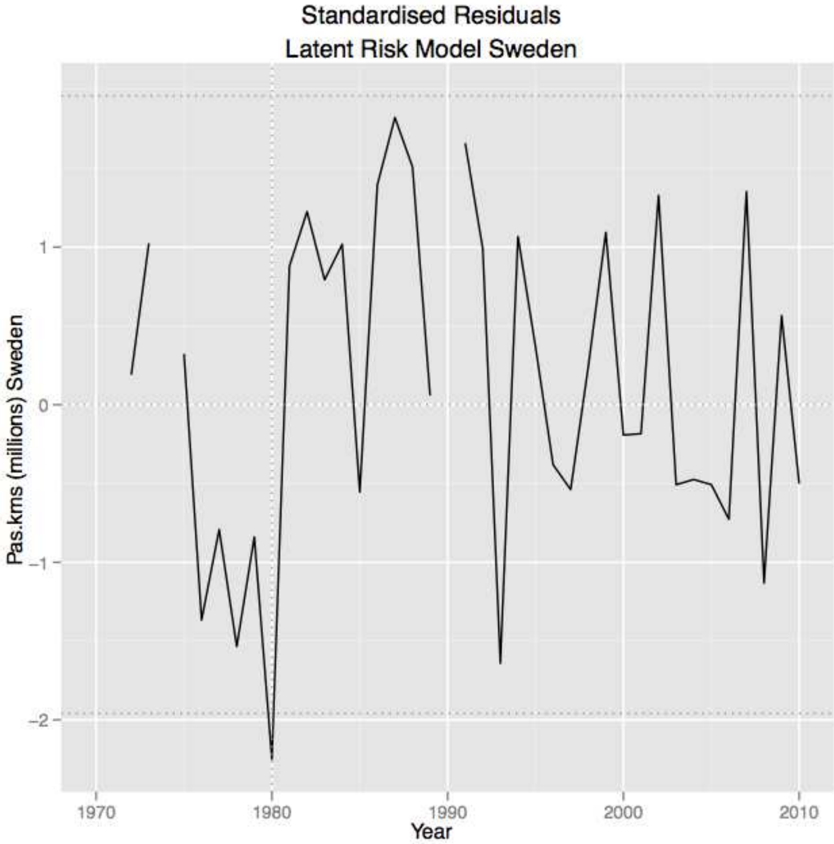
Annex 92: Graph of predicted passenger kilometres in Sweden (after 5th model run)



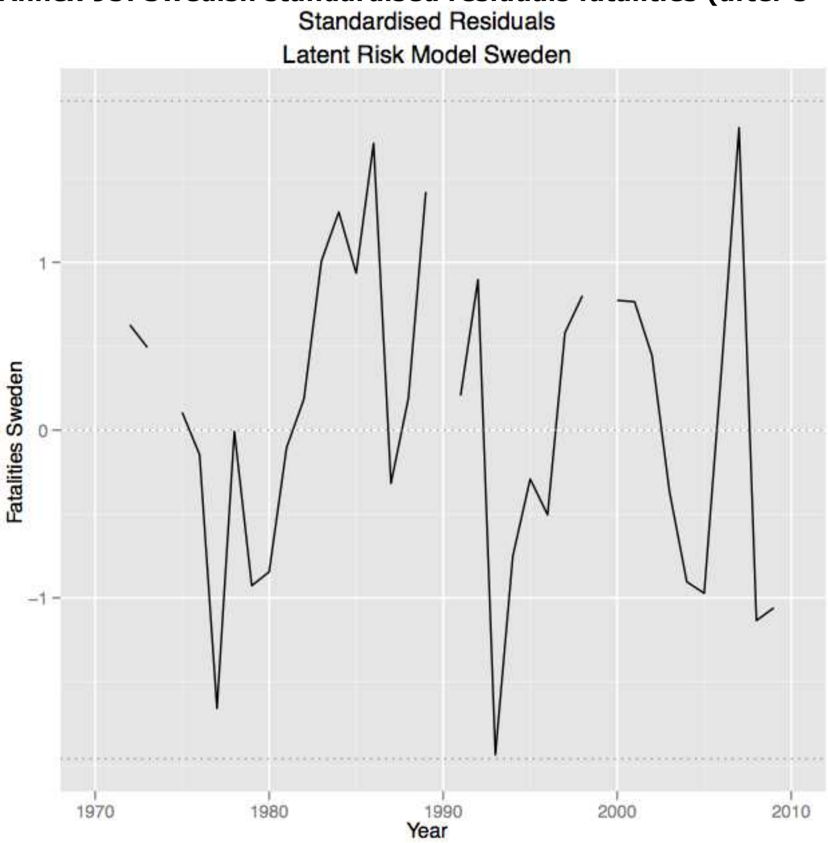
Annex 93: Graph of predicted fatalities in Sweden (after 5th model run)



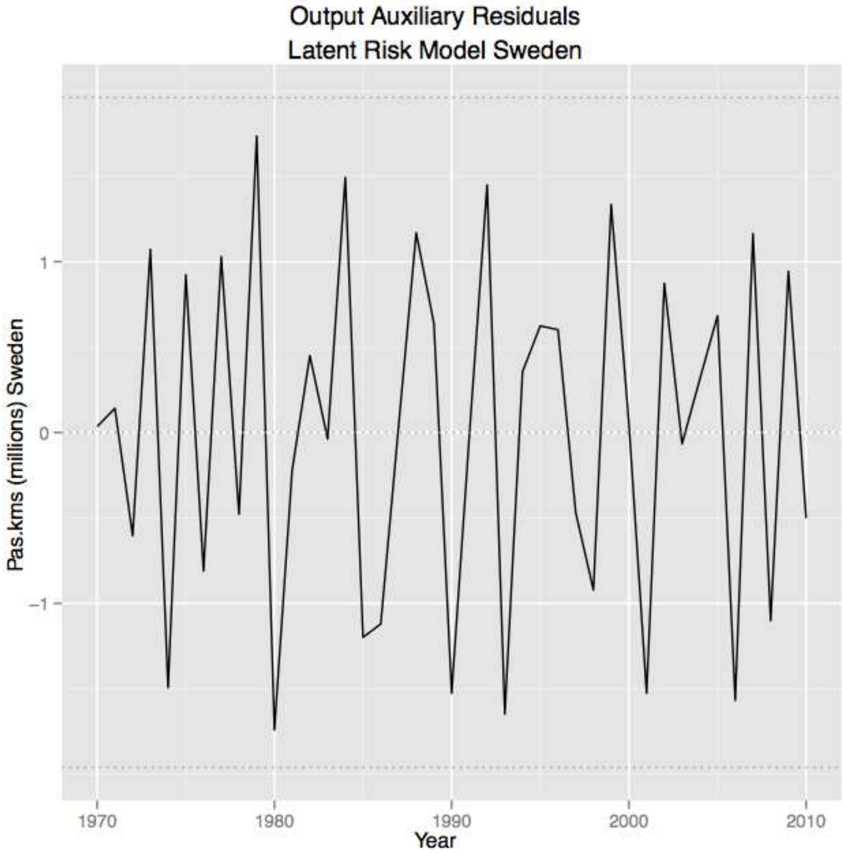
Annex 94: Swedish standardised residuals passenger kilometres (after 5th model run)



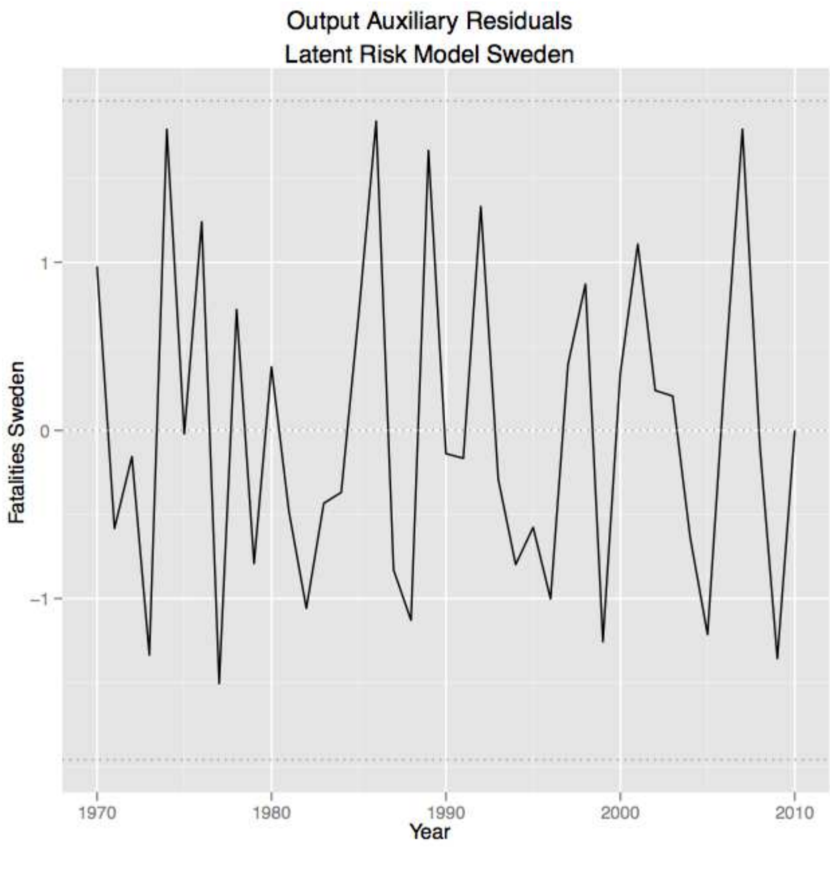
Annex 95: Swedish standardised residuals fatalities (after 5th model run)



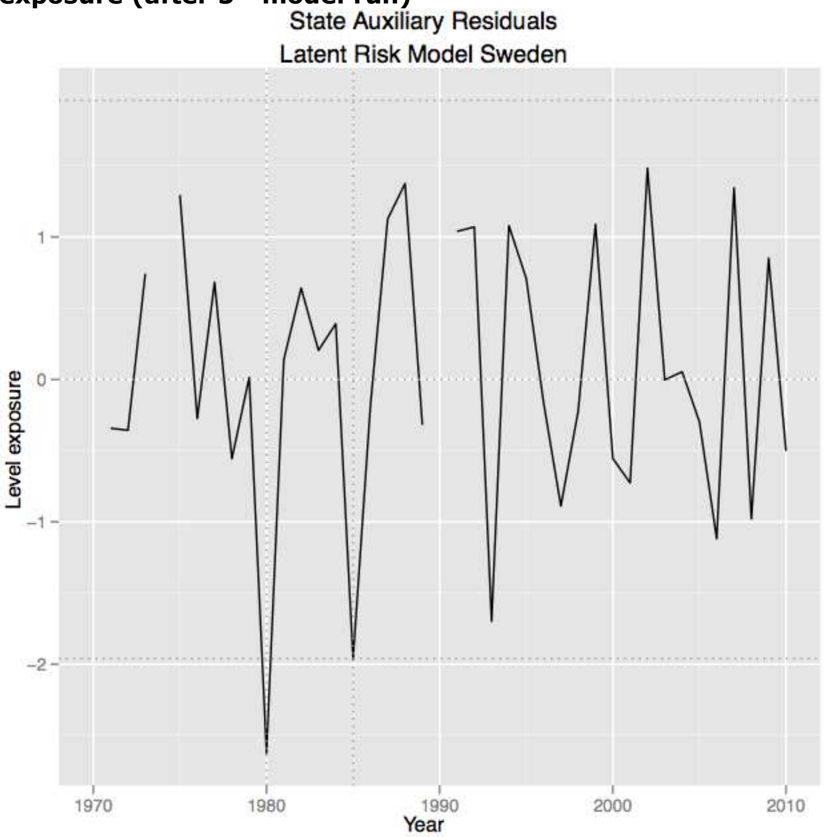
Annex 96: Swedish output auxiliary residuals passenger kilometres (after 5th model run)



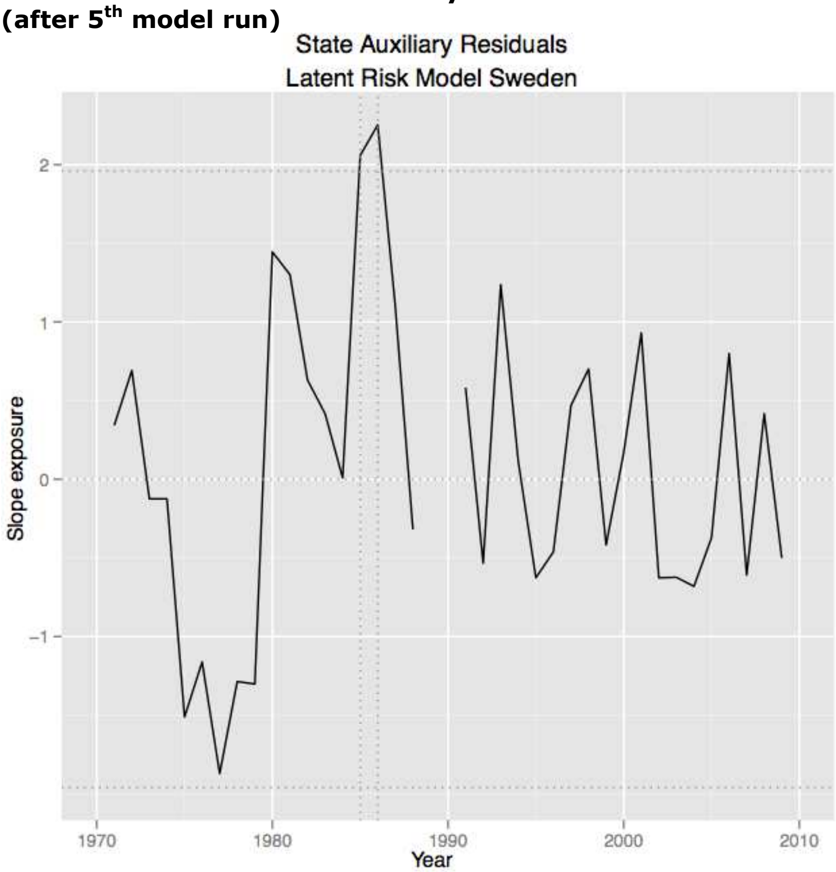
Annex 97: Swedish output auxiliary residuals for fatalities (after 5th model run)



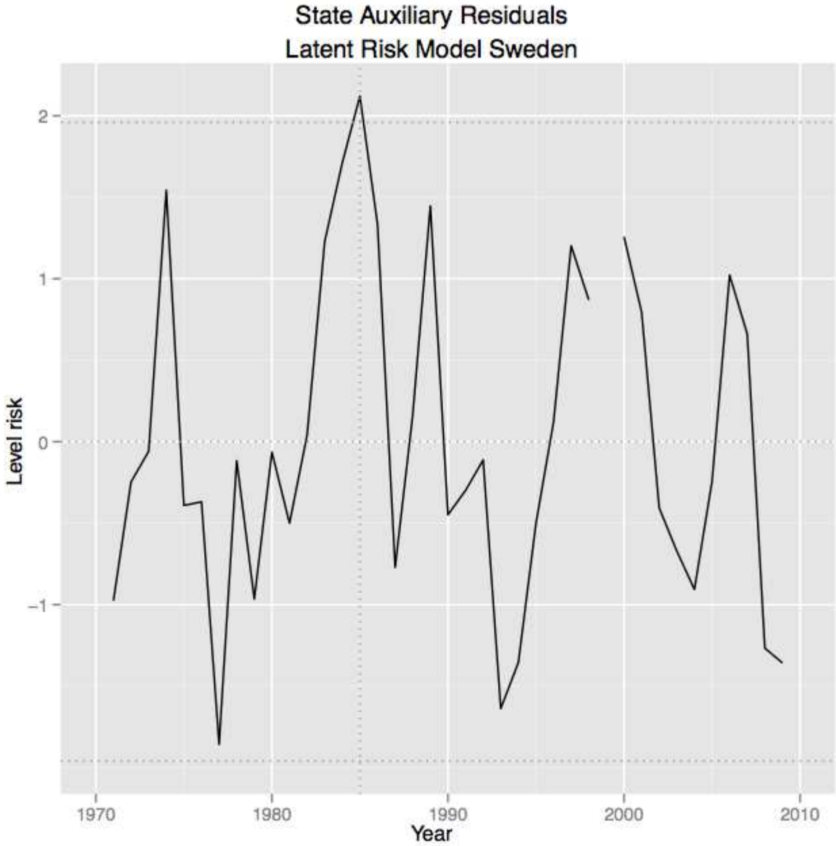
Annex 98: Swedish state auxiliary residuals for passenger kilometres and for level exposure (after 5th model run)



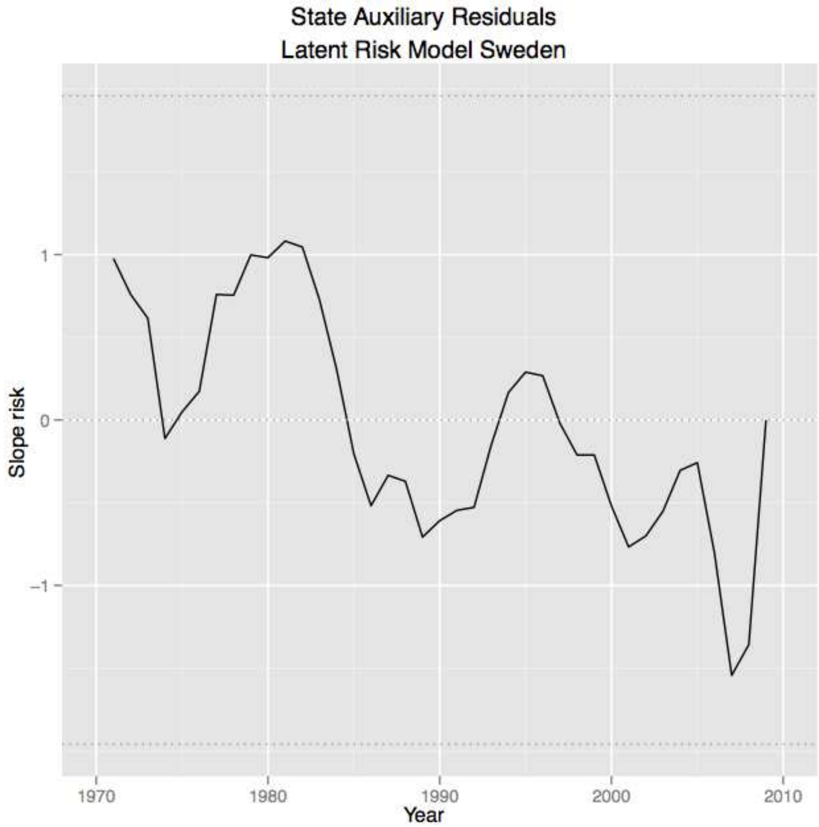
Annex 99: Swedish state auxiliary residuals for fatalities and for slope exposure (after 5th model run)



Annex 100: Swedish state auxiliary residuals for passenger kilometre and for level risk (after 5th model run)



Annex 101: Swedish state auxiliary residuals for fatalities and for slope risk (after 5th model run)



Annex 102: Example of the inserted model code in R statistics, example of Swedish aggregated model with one model intervention

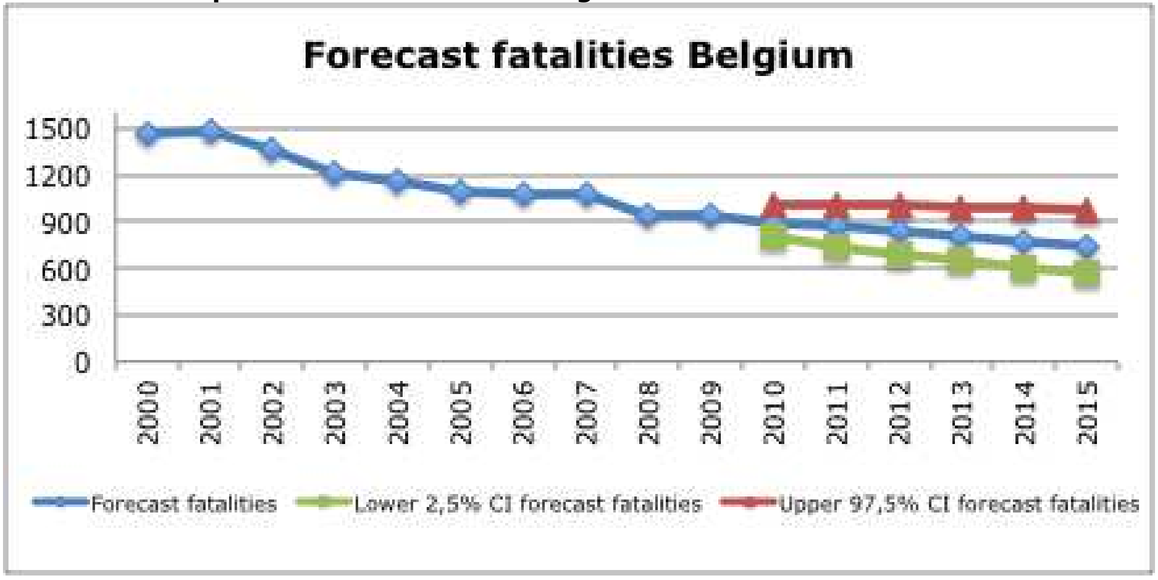
```
library (dlm)
library (ggplot2)
library (gdata)

Sys.getenv("R_USER")
DaCoTADir<-"G:/DaCoTA R-Stuff/"
DaCoTADir

DaCoTACodeDir<-paste(DaCoTADir,"Rcode/",sep="")
DaCoTADataDir<-paste(DaCoTADir,"Rdata/",sep="")

DaCoTACodeDir
DaCoTADataDir

library(numDeriv)

source(paste(DaCoTACodeDir,"DaCoTAStateSpaceIncludes.R",sep=""))
DaCoTA.setPlotStyle()
setwd(paste(DaCoTACodeDir,"Results",sep=""))
country<-"Sweden"

SwedenFAT.dat<-read.delim(paste(DaCoTADataDir,"SwedenFAT.dat",sep=""),sep="")
endYear<-SwedenFAT.dat[dim(SwedenFAT.dat)[1],"YEAR"]
SwedenFAT<-ts(SwedenFAT.dat$SwedenFAT,start=1970,end=endYear,frequency=1,names=c("Fatalities Sweden"))

SwedenPKM.dat<-read.delim(paste(DaCoTADataDir,"SwedenPKM.dat",sep=""),sep="")
SwedenPKM<-ts(SwedenPKM.dat$SwedenPKM,start=1970,end=endYear,frequency=1,names=c("Passenger Kilometrage (million)
Sweden"))

SwedenFAT<-SwedenFAT[1:41]
SwedenPKM<-SwedenPKM[1:41]

my.year<-seq(1970,2010)

qplot(ylim=c(0,max(SwedenFAT,na.rm=TRUE)),xlim=c(1970,2010),my.year,SwedenFAT,xlab="Year",ylab="Fatalities", main=paste
("Fatalities in", country))
```

```
qplot(ylim=c(0,max(SwedenPKM,na.rm=TRUE)),xlim=c(1970,2010),my.year,SwedenPKM,xlab="Year",ylab="Passenger
kms",main=paste
("Passenger kms(millions) in", country))

jpeg(paste(country,"RawDatac%01d.jpg",sep=""))

qplot(ylim=c(0,max(SwedenFAT,na.rm=TRUE)),xlim=c(1970,2010),my.year,SwedenFAT,xlab="Year",ylab=paste("Fatalities",     country),
main
=paste("Plot of fatalities in",country))

qplot(ylim=c(0,max(SwedenPKM,na.rm=TRUE)),xlim=c(1970,2010),my.year,SwedenPKM,xlab="Year",ylab="Passenger
kms",main=paste ("Plot
of passenger kms (per million) in", country))
dev.off()

save.image(paste(DaCoTACodeDir,"Results/Sweden2010.Rdata",sep=""),ascii=TRUE)

DaCoTADir<-"G:/DaCoTA R-Stuff/"
DaCoTACodeDir<-paste(DaCoTADir,"Rcode/",sep="")
DaCoTADataDir<-paste(DaCoTADir,"Rdata/",sep="")
load(paste(DaCoTACodeDir,"Results/Sweden2010.Rdata",sep=""))

DaCoTADir<-"G:/DaCoTA R-Stuff/"
DaCoTACodeDir<-paste(DaCoTADir,"Rcode/",sep="")
DaCoTADataDir<-paste(DaCoTADir,"Rdata/",sep="")
source(paste(DaCoTACodeDir,"DaCoTAStateSpaceIncludes.R",sep=""))
DaCoTA.setPlotStyle()
setwd(paste(DaCoTACodeDir,"Results",sep=""))
country<-"Sweden"

SwedenPKM [3] <-NA
SwedenPKM [4 ]<-NA
SwedenTwoLev<-cbind(SwedenPKM,SwedenFAT)
```

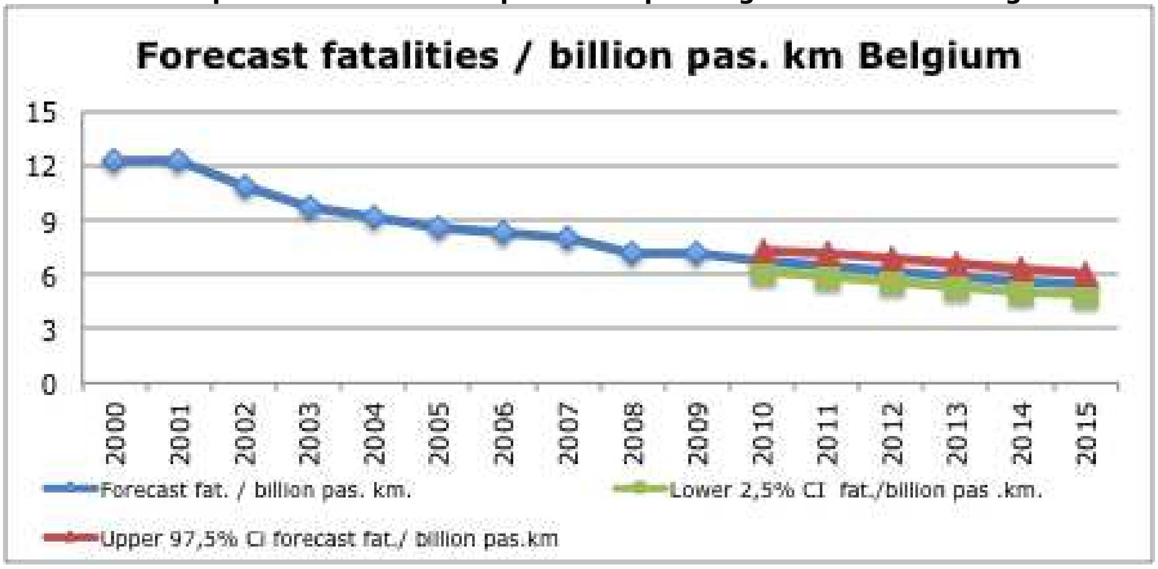
```
ModelType<- "LRT"

ModelNumber <- "1"
ModelName <- paste (ModelType, country, ModelNumber, sep="")
setwd(paste(DaCoTACodeDir,"Results",ModelName, "\\",sep=""))

LRTSweden1 <-fitDaCoTAModel (func = LRTmodel,
                        jobDescription= "Latent Risk Model Sweden",
                        Start=1970,
                        End=2010,
                        data = t(log(SwedenTwoLev)),
                        var = t(cbind (0, 1/SwedenFAT)),
                        variableNames = c("Pas.kms (millions) Sweden", "Fatalities Sweden"),
                        skipobs = 1
                        interventions = list ( list ( timepoint = 1974,
                                                      component = 1,
                                                      label =  "1990 mobility level")),
                        forecasts = 5,
                        nsamples=5)
PresentModel <- LRTSweden1

sink(file=paste (ModelName, ".txt",sep=""),append = FALSE, type = c("output", "message"),split = TRUE)+
pdf(paste(ModelName, ".pdf", sep=""),onefile=TRUE)

DaCoTA.standardOutput (PresentModel)
Sink (file=NULL)
DaCoTA.standardOutput (PresentModel, transform=exp)
dev.off()

jpeg(paste(ModelName,"ForecastPlotsEXP%01d.jpg",sep=""))
DaCoTA.forecastplots(PresentModel,transform=exp)
dev.off()

jpeg(paste(ModelName,"StatePlotsEXPc%01d.jpg", sep=""))
DaCoTA.smoothedstateplots(PresentModel, transform=exp)
dev.off()
```

```
DaCoTA.modelTable (PresentModel, alpha = 0.05,
                      file = paste ("modelTable", ModelName, ".txt", sep=""),
                      doAppend = FALSE)

DaCoTA.exportForecasts (PresentModel, file=paste ("frcstLOG", ModelName, ".csv", sep=""))
DaCoTA.exportForecasts (PresentModel, transform=exp, file=paste ("frcstEXP", ModelName, ".csv", sep=""))

DaCoTA.modelCriteria (PresentModel, transform=exp,
                        file = paste ("ModelCriteria",
                        ModelName, ".txt", sep=""),
                        doAppend = FALSE)
for (n in c(5)) {
forecastobsModel  <-fitDaCoTAModel (func = LRTmodel,
                     jobDescription= "Sweden LRT (full)",
                     Start=1970,
                     End=2010,
                     data = t(log(SwedenTwoLev)),
                     var = t(cbind (0, 1/SwedenFAT)),
                     variableNames = c("Pas.kms (millions) Sweden", "Fatalities Sweden"),
                     forecastobs = n,
                     doLRtests = FALSE,
                     nsamples=5)
DaCoTA.modelCriteria (forecastobsModel , transform=exp,
                          file = paste ("ModelCriteria", ModelName, ".txt", sep=""),
                          doAppend = TRUE)
jpeg(paste(ModelName, "ForecastObsPlots", n ,"years p%01d.jpg", sep=""))
DaCoTA.forecastplots(forecastobsModel, transform=exp)
dev.off()
}
ls()
save.image(paste(DaCoTACodeDir, "Results",sep=""),ascii=TRUE)
```

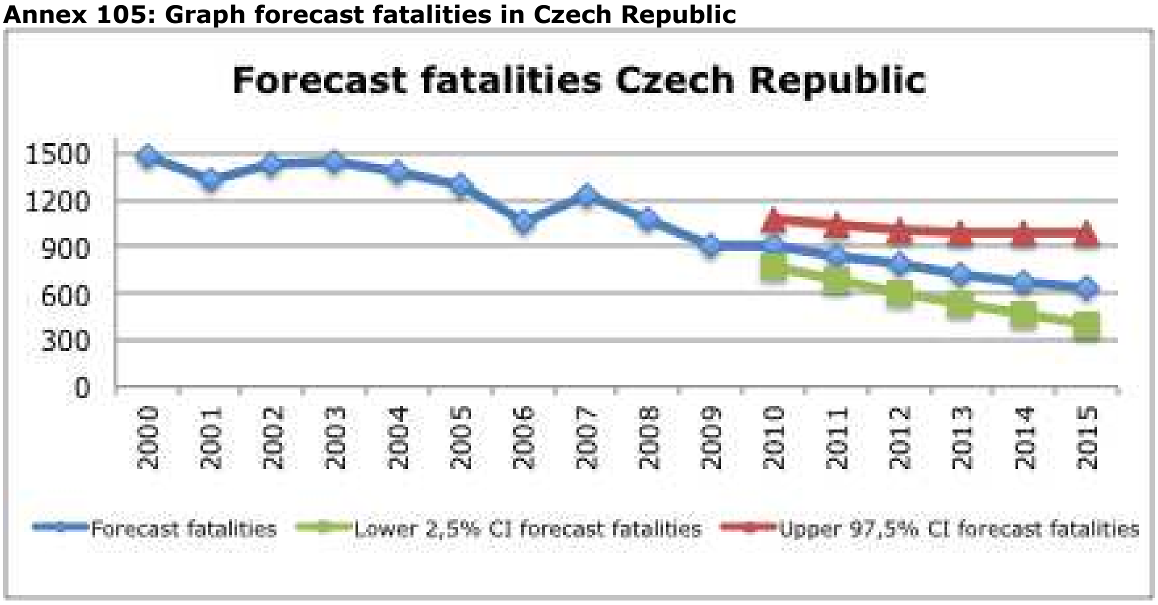
Annex 103: Graph forecast fatalities in Belgium



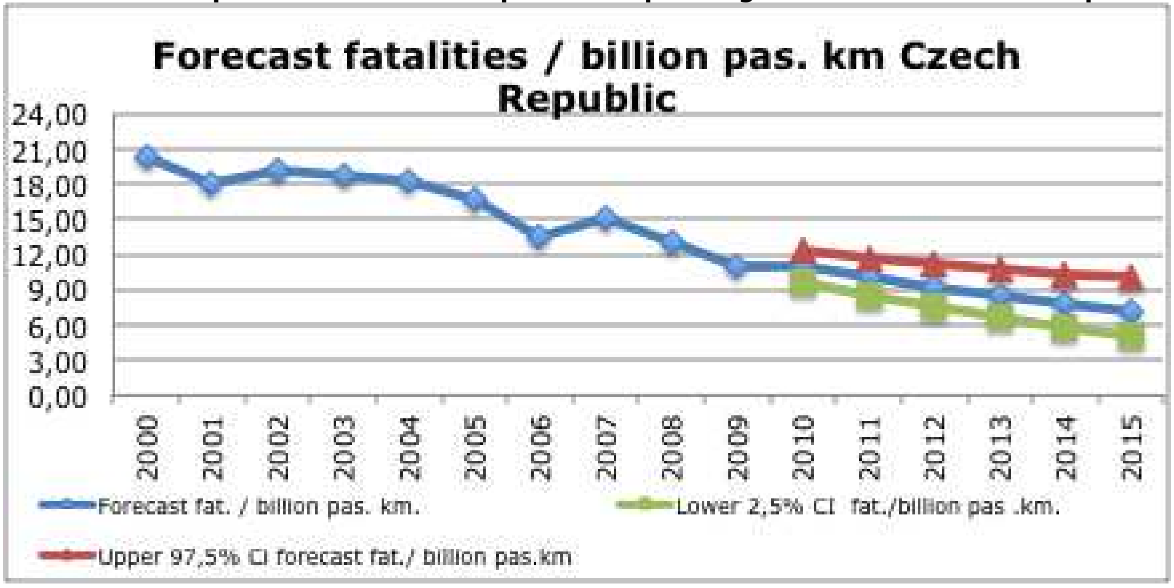
Annex 104: Graph forecast fatalities per billion passenger kilometre in Belgium



Annex 105: Graph forecast fatalities in Czech Republic

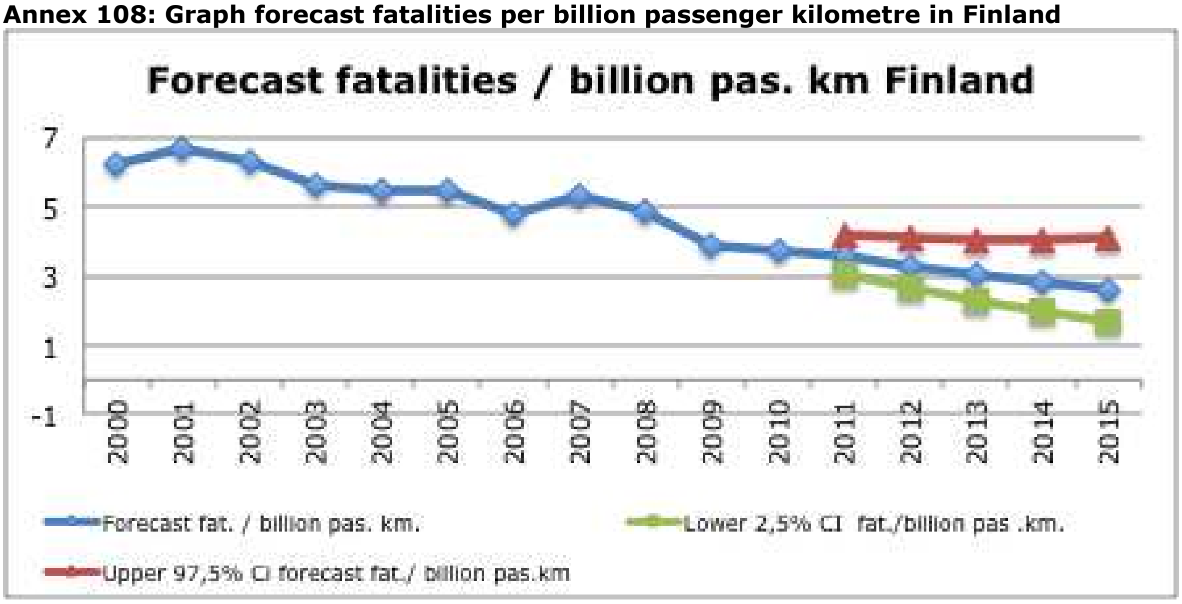


Annex 106: Graph forecast fatalities per billion passenger kilometre in Czech Republic

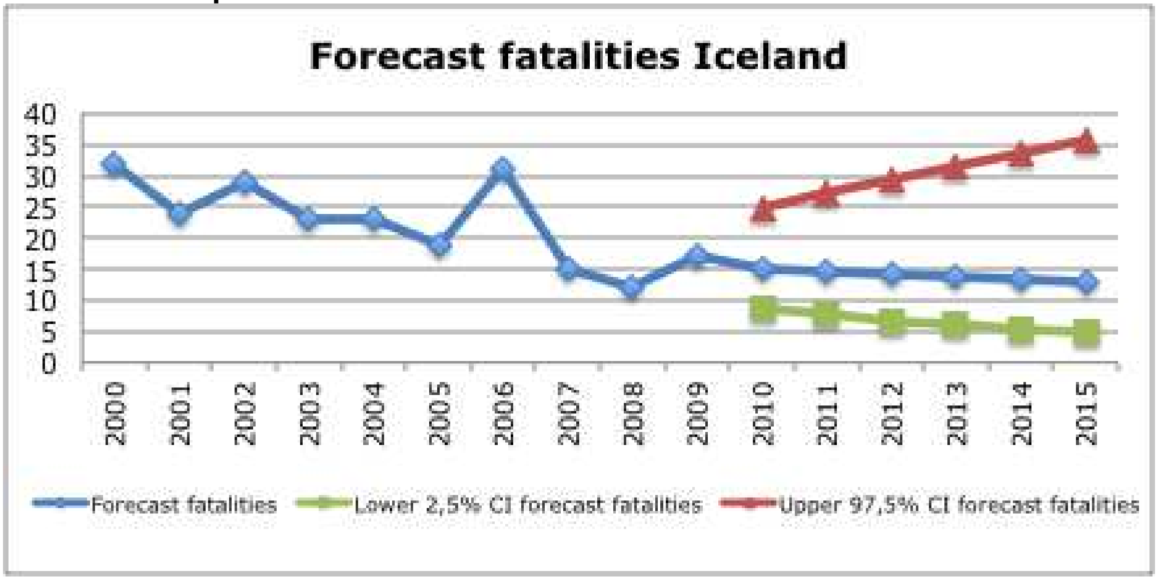


Annex 107: Graph forecast fatalities in Finland

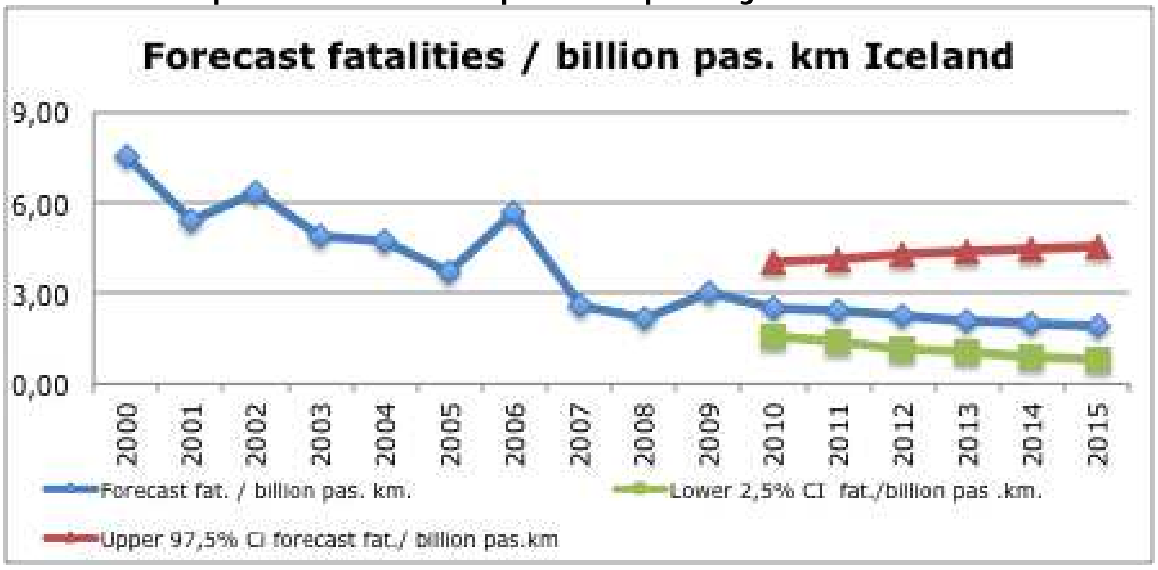
Annex 108: Graph forecast fatalities per billion passenger kilometre in Finland



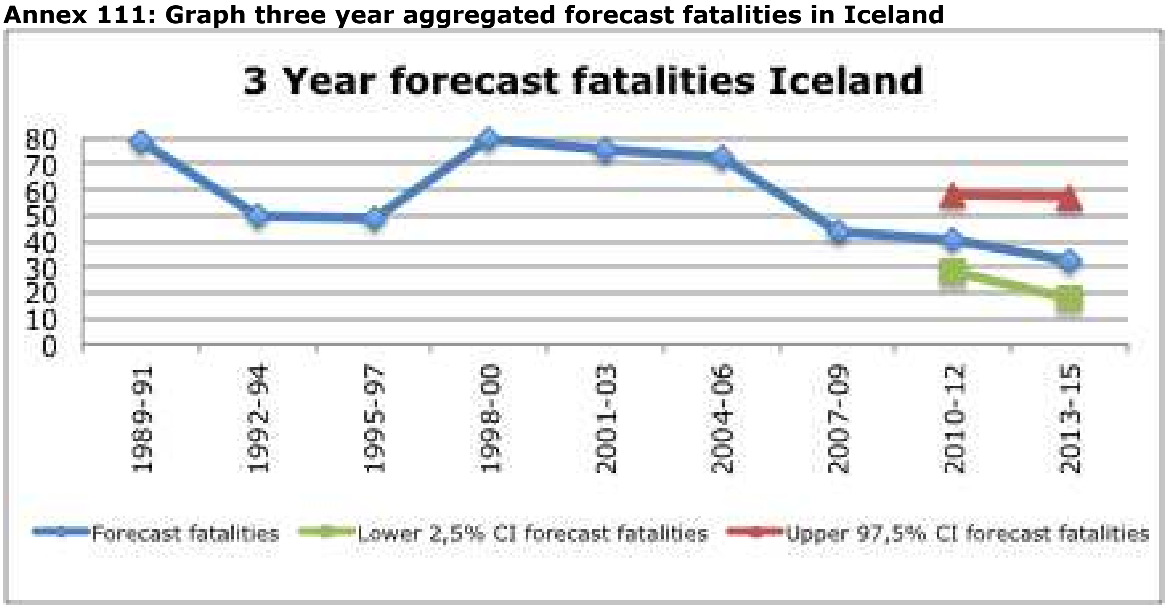
Annex 109: Graph forecast fatalities in Iceland



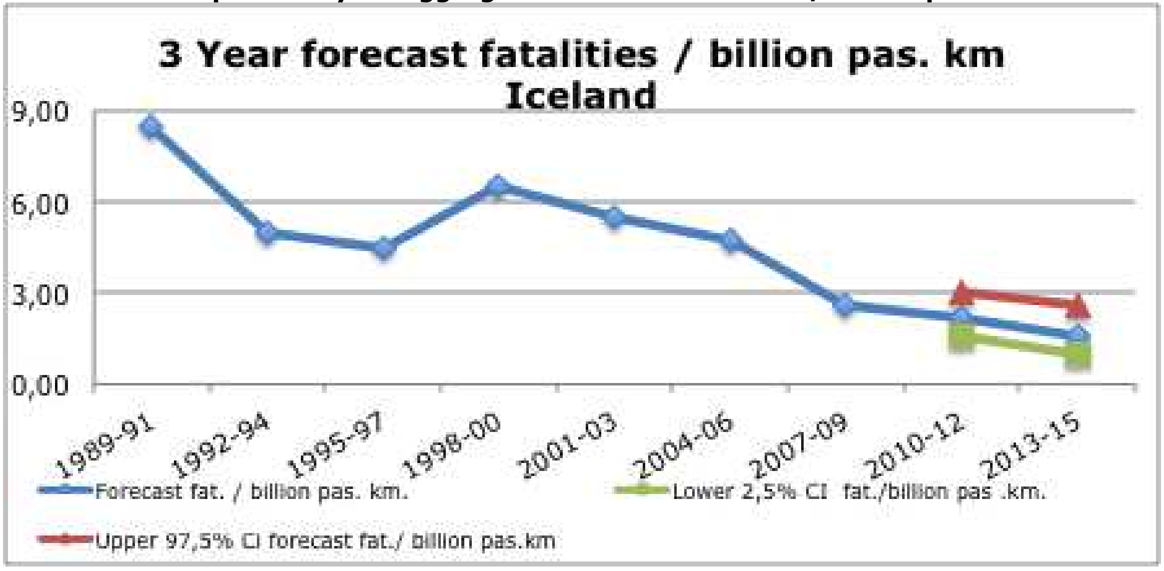
Annex 110: Graph forecast fatalities per billion passenger kilometre in Iceland



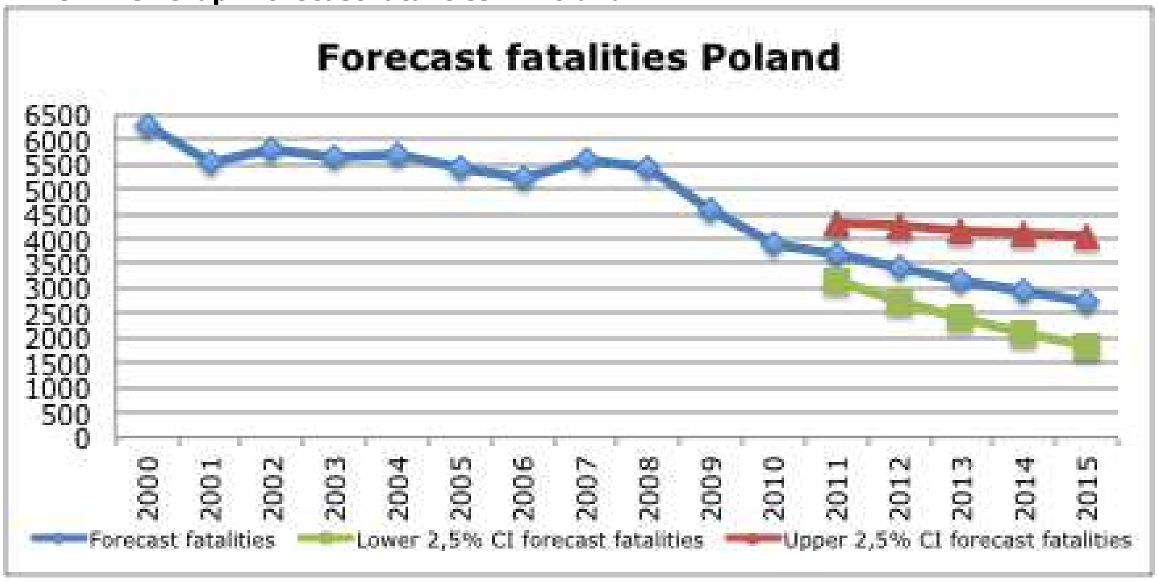
Annex 111: Graph three year aggregated forecast fatalities in Iceland



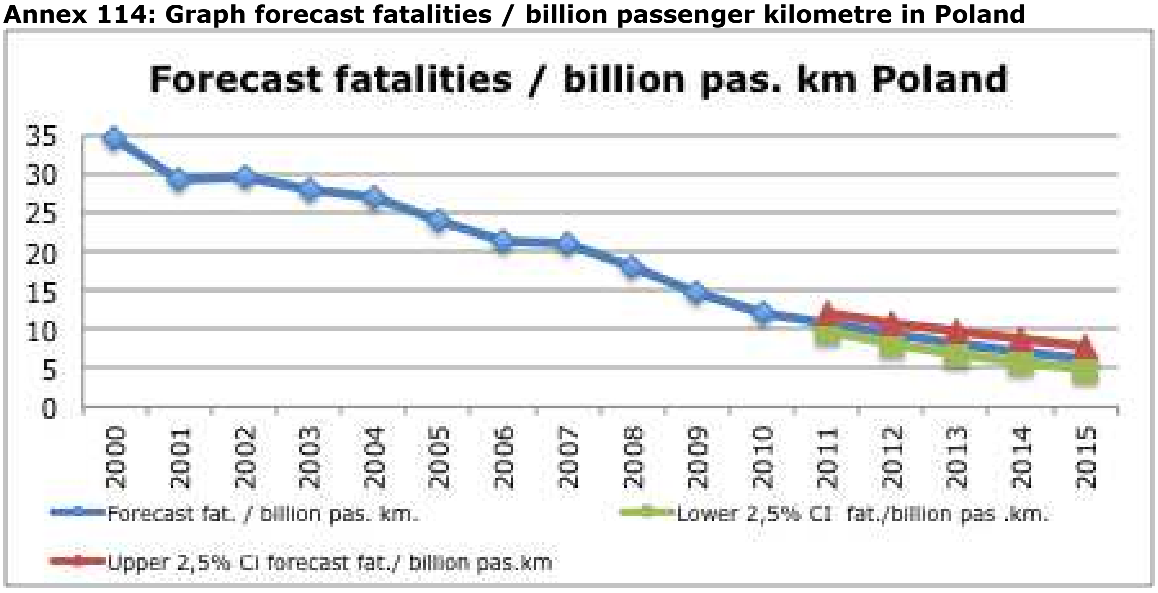
Annex 112: Graph three year aggregated forecast fatalities / billion pas. km. in Iceland



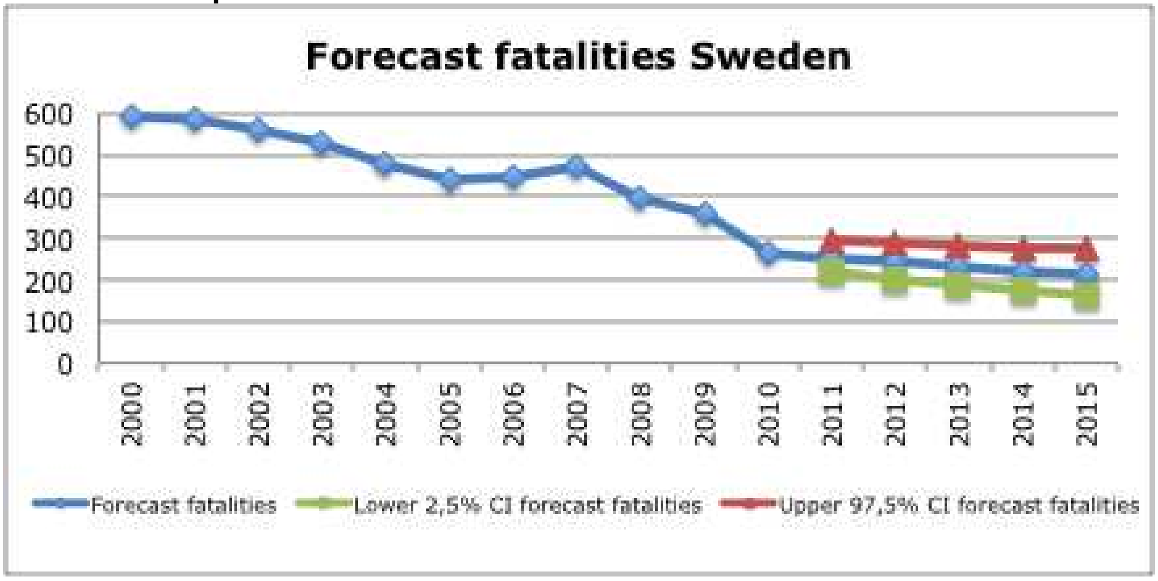
Annex 113: Graph forecast fatalities in Poland



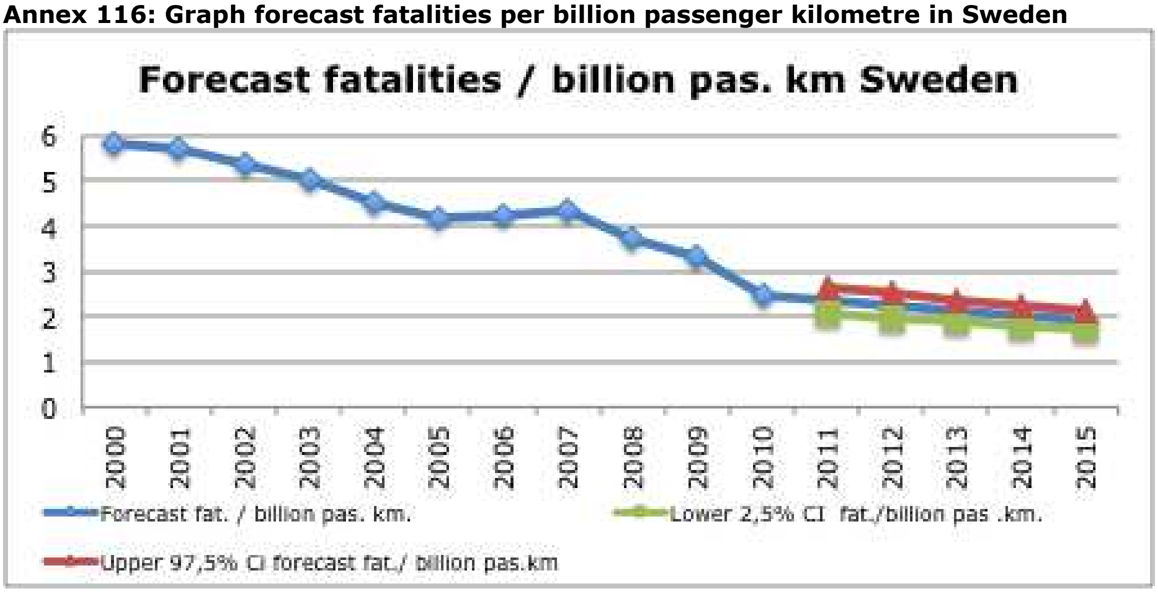
Annex 114: Graph forecast fatalities / billion passenger kilometre in Poland



Annex 115: Graph forecast fatalities in Sweden



Annex 116: Graph forecast fatalities per billion passenger kilometre in Sweden



Annex 117: Overview of the residue problems for the disaggregated anallyses

Problems with exposure component residuals		**Problems with fatality component residuals**	
Disaggregated analyses AGE			
Belgium			
< 15	No	< 15	No
15-17	Yes (I)	15-17	No
18-24	Yes (I)	18-24	No
25-49	Yes (I,H)	25-49	No
50-64	No	50-64	Yes (I)
> 64	Yes (I)	> 64	Yes (I)
Czech Republic			
< 15	Yes (I,H)	< 15	No
15-17	No	15-17	No
18-24	Yes (I)	18-24	No
25-49	Yes (I)	25-49	No
50-64	Yes (N)	50-64	No
> 64	Yes (H)	> 64	Yes (I)
Finland			
< 15	Yes (I)	< 15	Yes (I)
15-17	Yes (I)	15-17	No
18-24	Yes (I,H)	18-24	Yes (I)
25-49	Yes (H)	25-49	No
50-64	No	50-64	No
> 64	Yes (N:ME)	> 64	No
Poland			
< 15	Yes (I,H)	< 15	No
15-17	Yes(I, N:ME, N:LE)	15-17	No
18-24	Yes (N)	18-24	No
25-49	No	25-49	No
50-64	No	50-64	No
> 64	No	> 64	No
Sweden			
< 15	Yes (N , N: SE)	< 15	No
15-17	Yes (I)	15-17	No
18-24	No	18-24	No
25-49	Yes (I)	25-49	No
50-64	Yes (I)	50-64	No
> 64	Yes (I,H)	> 64	No
Disaggregated analyses Gender			
Belgium			
Female	No	Female	No
Male	No	Male	No
Czech Republic			
Female	Yes (H)	Female	Yes (N)
Male	Yes (H)	Male	Yes (I)
Finland			
Female	Yes (I)	Female	No
Male	Yes (I)	Male	No
Poland			
Female	Yes (N: LE)	Female	Yes (H)
Male	No	Male	No
Sweden			

Female	Yes (N, N:ME, N:LE)	Female	No
Male	Yes (N, N:LE)	Male	Yes (I)
Disaggregated analyses Transport mode			
Belgium			
Lorries	No	Vans & trucks	No
Cars	No	Cars	Yes (I)
Motorcycles	Yes (H, N:ME)	Motorcycles	No
Czech Republic			
Lorries	No	Vans & trucks	No
Cars	Yes (I)	Cars	No
Motorcycles	No	Motorcycles	No
Mopeds	Yes (N, N: LE)	Mopeds	No
Finland			
Vans & trucks	No	Vans & trucks	No
Cars	Yes (N: LE)	Cars	No
Motorcycles	Yes (I)	Motorcycles	No
Mopeds	Yes (N, N:ME, N:	Mopeds	No
Poland			
Vans & trucks	No	Vans & trucks	No
Cars	No	Cars	No
Motorcycles	No	Motorcycles	No
Mopeds	No	Mopeds	No
Bus & coach	No	Bus & coach	No
Agricultural	Yes (I)	Agricultural	No
Sweden			
Vans & trucks	No	Vans & trucks	Yes (I)
Cars	Yes (N)	Cars	No
Motorcycles	Yes (H)	Motorcycles	No
Combined disaggregated analyses AGE & Gender			
Belgium			
Female < 15	No	Female < 15	Yes (I)
Female 15-17	Yes (I)	Female 15-17	No
Female 18-24	Yes (I)	Female 18-24	Yes (I)
Female 25-49	Yes (I,H)	Female 25-49	No
Female 50-64	No	Female 50-64	Yes (I)
Female > 64	Yes (I)	Female > 64	No
Male < 15	Yes (N: LE)	Male < 15	No
Male 15-17	Yes (I)	Male 15-17	No
Male 18-24	Yes (I, N: ME)	Male 18-24	No
Male 25-49	Yes (I,H)	Male 25-49	Yes (N)
Male 50-64	No	Male 50-64	No
Male > 64	Yes (I)	Male > 64	No

Problems with 47 of the 72 residue assumptions for the inhabitants and vehicles
Problems with 15 of the 72 residue assumptions for the fatalities
I = Independency problems
H = Heteroscedastic problems
N = Normality problems
N:ME = Normality measurement equation Exposure
N:MF = Normality measurement equation Fatalities
N: LE = Normality in the Level state equation for Exposure
N: SE = Normality in the Slope state equation for Exposure
N: LF = Normality in the Level state equation for Fatalities
N: SF = Normality in the Slope state equation for Fatalities

Annex 118: Forecast fatalities according to age class in Belgium

	Belgium Fat. <15		Belgium Fat. 15-17		Belgium Fat. 18-24		Belgium Fat. 25-49		Belgium Fat. 50-64		Belgium Fat. >64	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**52**	**1,00**	**55**	**1,00**	**328**	**1,00**	**608**	**1,00**	**176**	**1,00**	**238**	**1,00**
2001	**63**	**1,21**	**46**	**0,84**	**281**	**0,86**	**632**	**1,04**	**192**	**1,09**	**264**	**1,11**
2002	**36**	**0,69**	**47**	**0,85**	**262**	**0,80**	**568**	**0,93**	**171**	**0,97**	**210**	**0,88**
2003	**32**	**0,62**	**39**	**0,71**	**241**	**0,73**	**484**	**0,80**	**166**	**0,94**	**240**	**1,01**
2004	**26**	**0,50**	**32**	**0,58**	**240**	**0,73**	**509**	**0,84**	**150**	**0,85**	**201**	**0,84**
2005	**37**	**0,71**	**31**	**0,56**	**196**	**0,60**	**473**	**0,78**	**160**	**0,91**	**186**	**0,78**
2006	**32**	**0,62**	**21**	**0,38**	**195**	**0,59**	**482**	**0,79**	**141**	**0,80**	**193**	**0,81**
2007	**30**	**0,58**	**27**	**0,49**	**215**	**0,66**	**464**	**0,76**	**159**	**0,90**	**170**	**0,71**
2008	**35**	**0,67**	**28**	**0,51**	**177**	**0,54**	**411**	**0,68**	**139**	**0,79**	**149**	**0,63**
2009	**16**	**0,31**	**21**	**0,38**	**147**	**0,45**	**355**	**0,58**	**150**	**0,85**	**163**	**0,68**
2010	**23**	**0,44**	**21**	**0,38**	**171**	**0,52**	**343**	**0,56**	**124**	**0,70**	**153**	**0,64**
2011	19	0,81	24	1,13	158	0,93	326	0,95	133	1,07	149	0,98
2012	16	0,71	24	1,14	153	0,89	307	0,90	129	1,04	145	0,95
2013	14	0,62	24	1,16	147	0,86	290	0,84	125	1,01	142	0,93
2014	12	0,54	25	1,18	142	0,83	273	0,80	122	0,98	138	0,90
2015	11	0,47	25	1,20	137	0,80	257	0,75	118	0,95	135	0,88
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	12	0,52	20	0,94	127	0,74	281	0,82	121	0,97	135	0,88
2012	10	0,43	19	0,91	114	0,67	249	0,72	115	0,93	130	0,85
2013	8	0,36	18	0,86	104	0,61	220	0,64	110	0,88	123	0,81
2014	7	0,30	17	0,79	95	0,56	194	0,57	104	0,84	116	0,76
2015	6	0,25	15	0,72	87	0,51	171	0,50	98	0,79	109	0,71
	Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	29	1,27	28	1,34	198	1,16	379	1,11	146	1,18	165	1,08
2012	27	1,16	30	1,43	204	1,19	380	1,11	145	1,17	163	1,07
2013	24	1,06	33	1,57	208	1,22	381	1,11	143	1,16	163	1,06
2014	23	0,98	37	1,75	212	1,24	383	1,12	143	1,15	164	1,07
2015	21	0,91	42	1,99	215	1,26	387	1,13	143	1,15	166	1,09

Annex 119: Forecast fatalities according to age class in Czech Republic

	Czech R. Fat. <15		Czech R. Fat.15-17		Czech R. Fat.18-24		Czech R. Fat.25-49		Czech R. Fat.50-64		Czech R. Fat. >64	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**54**	**1,00**	**44**	**1,00**	**258**	**1,00**	**595**	**1,00**	**286**	**1,00**	**243**	**1,00**
2001	**38**	**0,70**	**37**	**0,84**	**236**	**0,91**	**519**	**0,87**	**252**	**0,88**	**241**	**0,99**
2002	**46**	**0,85**	**33**	**0,75**	**222**	**0,86**	**615**	**1,03**	**291**	**1,02**	**211**	**0,87**
2003	**38**	**0,70**	**41**	**0,93**	**243**	**0,94**	**612**	**1,03**	**268**	**0,94**	**231**	**0,95**
2004	**27**	**0,50**	**28**	**0,64**	**219**	**0,85**	**587**	**0,99**	**273**	**0,95**	**247**	**1,02**
2005	**41**	**0,76**	**31**	**0,70**	**223**	**0,86**	**520**	**0,87**	**264**	**0,92**	**202**	**0,83**
2006	**32**	**0,59**	**18**	**0,41**	**183**	**0,71**	**432**	**0,73**	**215**	**0,75**	**173**	**0,71**
2007	**25**	**0,46**	**29**	**0,66**	**190**	**0,74**	**523**	**0,88**	**230**	**0,80**	**201**	**0,83**
2008	**19**	**0,35**	**14**	**0,32**	**193**	**0,75**	**437**	**0,73**	**209**	**0,73**	**186**	**0,77**
2009	**16**	**0,30**	**13**	**0,30**	**133**	**0,52**	**405**	**0,68**	**166**	**0,58**	**167**	**0,69**
2010	**17**	**0,31**	**17**	**0,39**	**125**	**0,48**	**329**	**0,55**	**142**	**0,50**	**172**	**0,71**
2011	13	*0,78*	18	1,04	123	*0,98*	330	1,00	122	0,86	152	0,88
2012	11	*0,65*	17	1,01	111	*0,88*	304	0,92	102	0,72	142	0,83
2013	9	*0,54*	17	0,99	100	*0,80*	280	0,85	85	0,60	134	0,78
2014	8	*0,46*	17	0,97	90	*0,72*	258	0,78	71	0,50	125	0,73
2015	6	*0,38*	16	0,95	81	*0,65*	237	0,72	59	0,42	118	0,68
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	9	0,55	14	0,84	98	0,78	270	0,82	102	0,72	138	0,80
2012	8	0,45	13	0,79	83	0,67	239	0,73	80	0,56	128	0,75
2013	6	0,37	13	0,74	70	0,56	210	0,64	61	0,43	119	0,69
2014	5	0,30	12	0,68	58	0,46	183	0,56	46	0,32	110	0,64
2015	4	0,24	10	0,62	48	0,38	159	0,48	34	0,24	101	0,59
	Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	19	1,09	22	1,28	153	1,22	405	1,23	144	1,02	166	0,97
2012	16	0,93	22	1,30	147	1,17	387	1,18	129	0,91	158	0,92
2013	14	0,80	23	1,33	143	1,14	374	1,14	118	0,83	150	0,87
2014	12	0,69	24	1,39	140	1,12	363	1,10	110	0,78	143	0,83
2015	10	0,59	25	1,47	138	1,11	355	1,08	104	0,74	137	0,80

Annex 120: Forecast fatalities according to age class in Finland

	Finland Fat. <15		Finland Fat. 15-17		Finland Fat. 18-24		Finland Fat. 25-49		Finland Fat. 50-64		Finland Fat. >64	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**20**	**1,00**	**16**	**1,00**	**51**	**1,00**	**132**	**1,00**	**71**	**1,00**	**106**	**1,00**
2001	**19**	**0,95**	**20**	**1,25**	**84**	**1,65**	**137**	**1,04**	**77**	**1,08**	**96**	**0,91**
2002	**18**	**0,90**	**15**	**0,94**	**73**	**1,43**	**131**	**0,99**	**79**	**1,11**	**99**	**0,93**
2003	**22**	**1,10**	**12**	**0,75**	**59**	**1,16**	**124**	**0,94**	**66**	**0,93**	**96**	**0,91**
2004	**13**	**0,65**	**21**	**1,31**	**74**	**1,45**	**109**	**0,83**	**61**	**0,86**	**97**	**0,92**
2005	**21**	**1,05**	**16**	**1,00**	**53**	**1,04**	**140**	**1,06**	**58**	**0,82**	**91**	**0,86**
2006	**5**	**0,25**	**21**	**1,31**	**67**	**1,31**	**104**	**0,79**	**68**	**0,96**	**71**	**0,67**
2007	**14**	**0,70**	**18**	**1,13**	**75**	**1,47**	**118**	**0,89**	**76**	**1,07**	**79**	**0,75**
2008	**8**	**0,40**	**26**	**1,63**	**50**	**0,98**	**111**	**0,84**	**56**	**0,79**	**93**	**0,88**
2009	**6**	**0,30**	**23**	**1,44**	**51**	**1,00**	**84**	**0,64**	**46**	**0,65**	**69**	**0,65**
2010	**7**	**0,35**	**13**	**0,81**	**48**	**0,94**	**93**	**0,70**	**47**	**0,66**	**64**	**0,60**
2011	9	1,25	20	1,56	46	0,97	84	0,90	47	0,99	65	1,02
2012	8	1,17	20	1,57	44	0,92	79	0,85	43	0,92	62	0,97
2013	8	1,09	20	1,57	42	0,87	74	0,79	40	0,86	59	0,92
2014	7	1,02	21	1,58	40	0,83	69	0,74	38	0,80	56	0,88
2015	7	0,95	21	1,58	38	0,79	64	0,69	35	0,74	53	0,83
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	7	0,94	14	1,06	39	0,82	76	0,81	39	0,84	56	0,88
2012	6	0,86	12	0,96	37	0,76	68	0,73	35	0,74	52	0,81
2013	5	0,78	11	0,85	34	0,70	60	0,65	30	0,64	47	0,74
2014	5	0,70	10	0,75	31	0,64	53	0,57	25	0,54	43	0,67
2015	4	0,63	8	0,65	28	0,58	45	0,49	21	0,45	39	0,61
	Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	12	1,66	30	2,29	55	1,14	93	1,00	55	1,17	75	1,18
2012	11	1,59	33	2,55	53	1,11	91	0,97	54	1,15	74	1,16
2013	11	1,52	38	2,89	52	1,09	90	0,96	54	1,15	73	1,15
2014	10	1,47	43	3,32	51	1,07	90	0,97	56	1,18	73	1,14
2015	10	1,43	50	3,86	51	1,06	91	0,98	58	1,24	73	1,14

Annex 121: Forecast fatalities according to age class in Poland

	Poland Fat. <15		Poland Fat. 15-17		Poland Fat. 18-24		Poland Fat. 25-49		Poland Fat. 50-64		Poland Fat. >64	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**267**	**1,00**	**245**	**1,00**	**1026**	**1,00**	**2654**	**1,00**	**1097**	**1,00**	**995**	**1,00**
2001	**262**	**0,98**	**204**	**0,83**	**894**	**0,87**	**2312**	**0,87**	**952**	**0,87**	**910**	**0,91**
2002	**248**	**0,93**	**204**	**0,83**	**958**	**0,93**	**2346**	**0,88**	**946**	**0,86**	**976**	**0,98**
2003	**231**	**0,87**	**154**	**0,63**	**908**	**0,88**	**2352**	**0,89**	**953**	**0,87**	**885**	**0,89**
2004	**228**	**0,85**	**153**	**0,62**	**851**	**0,83**	**2250**	**0,85**	**1104**	**1,01**	**965**	**0,97**
2005	**167**	**0,63**	**148**	**0,60**	**933**	**0,91**	**2100**	**0,79**	**1030**	**0,94**	**931**	**0,94**
2006	**151**	**0,57**	**150**	**0,61**	**895**	**0,87**	**1959**	**0,74**	**1054**	**0,96**	**888**	**0,89**
2007	**157**	**0,59**	**181**	**0,74**	**953**	**0,93**	**2112**	**0,80**	**1140**	**1,04**	**945**	**0,95**
2008	**146**	**0,55**	**185**	**0,76**	**948**	**0,92**	**1982**	**0,75**	**1163**	**1,06**	**962**	**0,97**
2009	**128**	**0,48**	**120**	**0,49**	**833**	**0,81**	**1668**	**0,63**	**970**	**0,88**	**810**	**0,81**
2010	**112**	**0,42**	**122**	**0,50**	**677**	**0,66**	**1419**	**0,53**	**871**	**0,79**	**674**	**0,68**
2011	100	0,89	107	0,87	648	0,96	1291	0,91	726	0,83	633	0,94
2012	89	0,80	93	0,76	606	0,89	1143	0,81	612	0,70	580	0,86
2013	79	0,71	81	0,67	566	0,84	1011	0,71	515	0,59	531	0,79
2014	71	0,63	71	0,58	529	0,78	895	0,63	434	0,50	486	0,72
2015	63	0,56	62	0,51	494	0,73	792	0,56	366	0,42	445	0,66
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	88	0,78	78	0,64	536	0,79	1113	0,78	594	0,68	532	0,79
2012	76	0,68	56	0,46	460	0,68	916	0,65	412	0,47	452	0,67
2013	66	0,59	37	0,31	397	0,59	737	0,52	273	0,31	383	0,57
2014	57	0,51	23	0,19	343	0,51	582	0,41	174	0,20	323	0,48
2015	49	0,44	14	0,12	295	0,44	453	0,32	108	0,12	272	0,40
	Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	114	1,02	145	1,19	784	1,16	1498	1,06	888	1,02	752	1,12
2012	104	0,93	154	1,26	798	1,18	1426	1,00	908	1,04	744	1,10
2013	95	0,85	177	1,45	808	1,19	1388	0,98	973	1,12	736	1,09
2014	87	0,78	213	1,75	817	1,21	1376	0,97	1081	1,24	731	1,09
2015	80	0,71	269	2,21	828	1,22	1384	0,98	1241	1,42	731	1,08

Annex 122: Forecast fatalities according to age class in Sweden

	Sweden Fat. <15		Sweden Fat. 15-17		Sweden Fat. 18-24		Sweden Fat. 25-49		Sweden Fat. 50-64		Sweden Fat. >64	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**19**	**1,00**	**16**	**1,00**	**102**	**1,00**	**202**	**1,00**	**98**	**1,00**	**154**	**1,00**
2001	**18**	**0,95**	**22**	**1,38**	**100**	**0,98**	**188**	**0,93**	**108**	**1,10**	**147**	**0,95**
2002	**18**	**0,95**	**20**	**1,25**	**100**	**0,98**	**180**	**0,89**	**103**	**1,05**	**139**	**0,90**
2003	**21**	**1,11**	**23**	**1,44**	**93**	**0,91**	**181**	**0,90**	**93**	**0,95**	**118**	**0,77**
2004	**14**	**0,74**	**19**	**1,19**	**78**	**0,76**	**159**	**0,79**	**71**	**0,72**	**139**	**0,90**
2005	**10**	**0,53**	**19**	**1,19**	**67**	**0,66**	**153**	**0,76**	**84**	**0,86**	**104**	**0,68**
2006	**16**	**0,84**	**24**	**1,50**	**75**	**0,74**	**142**	**0,70**	**93**	**0,95**	**95**	**0,62**
2007	**10**	**0,53**	**22**	**1,38**	**86**	**0,84**	**148**	**0,73**	**100**	**1,02**	**105**	**0,68**
2008	**6**	**0,32**	**13**	**0,81**	**64**	**0,63**	**142**	**0,70**	**70**	**0,71**	**102**	**0,66**
2009	**9**	**0,47**	**25**	**1,56**	**60**	**0,59**	**100**	**0,50**	**72**	**0,73**	**92**	**0,60**
2010	9	0,98	20	0,79	53	0,88	102	1,02	69	0,96	83	0,90
2011	8	0,91	19	0,74	47	0,78	91	0,91	65	0,90	77	0,83
2012	8	0,85	18	0,70	41	0,69	82	0,82	61	0,84	71	0,77
2013	7	0,79	17	0,66	36	0,61	74	0,74	57	0,79	65	0,71
2014	7	0,74	16	0,63	32	0,53	66	0,66	53	0,74	60	0,66
2015	6	0,69	15	0,59	28	0,47	60	0,60	50	0,69	56	0,61
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	6	0,70	15	0,60	37	0,62	86	0,86	58	0,81	76	0,83
2011	6	0,64	14	0,55	27	0,45	73	0,73	54	0,75	70	0,76
2012	5	0,58	12	0,50	19	0,31	61	0,61	50	0,69	64	0,69
2013	5	0,53	11	0,44	13	0,21	50	0,50	45	0,63	58	0,63
2014	4	0,47	10	0,38	8	0,14	40	0,40	41	0,57	53	0,57
2015	4	0,42	8	0,33	5	0,09	32	0,32	37	0,52	48	0,52
	Upper 97.50% forecast		Upper 97.50% forecast		Upper 97.50% forecast		Upper 97.50% forecast		Upper 97.50% forecast		Upper 97.50% forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	12	1,37	26	1,03	74	1,24	120	1,20	82	1,14	91	0,99
2011	12	1,30	25	1,00	80	1,33	114	1,14	78	1,08	84	0,92
2012	11	1,25	25	0,99	90	1,50	111	1,11	74	1,03	79	0,86
2013	11	1,20	25	1,00	104	1,74	110	1,10	71	0,99	74	0,80
2014	10	1,17	26	1,02	125	2,08	110	1,10	69	0,96	69	0,75
2015	10	1,14	26	1,06	153	2,56	111	1,11	67	0,93	65	0,70

Annex 123: Forecast fatalities according to gender for females

	Female fat. Belgium		Female fat. Czech Rep.		Female Fat. Finland		Female fat. Poland		Female fat. Sweden	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**367**	**1,00**	**368**	**1,00**	**133**	**1,00**	**1398**	**1,00**	**153**	**1,00**
2001	**384**	**1,05**	**338**	**0,92**	**137**	**1,03**	**1322**	**0,95**	**149**	**0,97**
2002	**341**	**0,93**	**352**	**0,96**	**114**	**0,86**	**1363**	**0,97**	**137**	**0,90**
2003	**299**	**0,81**	**325**	**0,88**	**107**	**0,80**	**1324**	**0,95**	**138**	**0,90**
2004	**250**	**0,68**	**326**	**0,89**	**118**	**0,89**	**1291**	**0,92**	**116**	**0,76**
2005	**260**	**0,71**	**298**	**0,81**	**96**	**0,72**	**1243**	**0,89**	**113**	**0,74**
2006	**248**	**0,68**	**225**	**0,61**	**95**	**0,71**	**1232**	**0,88**	**112**	**0,73**
2007	**215**	**0,59**	**275**	**0,75**	**101**	**0,76**	**1333**	**0,95**	**127**	**0,83**
2008	**221**	**0,60**	**259**	**0,70**	**79**	**0,59**	**1321**	**0,94**	**111**	**0,73**
2009	**234**	**0,64**	**225**	**0,61**	**71**	**0,53**	**1109**	**0,79**	**92**	**0,60**
2010	**203**	**0,55**	**177**	**0,48**	**68**	**0,51**	**913**	**0,65**	87	0,94
2011	193	0,95	179	1,01	61	0,90	765	0,84	80	0,87
2012	181	0,89	164	0,93	55	0,81	639	0,70	74	0,80
2013	170	0,84	150	0,85	50	0,73	533	0,58	68	0,74
2014	160	0,79	138	0,78	45	0,66	445	0,49	62	0,68
2015	150	0,74	126	0,71	40	0,59	371	0,41	57	0,62
	Lower 2,5% forecast		Lower 2,5% forecast		Lower 2,5% forecast		Lower 2,5% forecast		Lower 2,5% forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	N App.	N App.	N App.	N App.	N App.	N App.	N App.	N App.	76	0,829
2011	161	0,79	156	0,88	52	0,76	694	0,76	68	0,74
2012	143	0,70	138	0,78	45	0,67	559	0,61	60	0,65
2013	128	0,63	122	0,69	39	0,58	449	0,49	52	0,56
2014	115	0,56	105	0,60	34	0,50	361	0,40	45	0,49
2015	103	0,51	91	0,51	29	0,42	290	0,32	38	0,41
	Upper 2,5% forecast		Upper 2,5% forecast		Upper 2,5% forecast		Upper 2,5% forecast		Upper 2,5% forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	N App.	N App.	N App.	N App.	N App.	N App.	N App.	N App.	99	1,075
2011	232	1,14	206	1,16	73	1,07	844	0,92	94	1,02
2012	230	1,13	194	1,10	67	0,99	730	0,80	91	0,98
2013	227	1,12	186	1,05	63	0,92	632	0,69	88	0,96
2014	223	1,10	180	1,01	59	0,87	548	0,60	87	0,94
2015	219	1,08	175	0,99	56	0,83	475	0,52	86	0,94

Annex 124: Forecast fatalities according to gender for males

	Male fat. Belgium		Male fat. Czech Rep.		Male Fat. Finland		Male fat. Poland		Male fat. Sweden	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**1102**	**1,00**	**1118**	**1,00**	**263**	**1,00**	**4886**	**1,00**	**438**	**1,00**
2001	**1102**	**1,00**	**995**	**0,89**	**296**	**1,13**	**4202**	**0,86**	**433**	**0,99**
2002	**962**	**0,87**	**1078**	**0,96**	**301**	**1,14**	**4448**	**0,91**	**423**	**0,97**
2003	**911**	**0,83**	**1122**	**1,00**	**272**	**1,03**	**4299**	**0,88**	**391**	**0,89**
2004	**908**	**0,82**	**1056**	**0,94**	**257**	**0,98**	**4395**	**0,90**	**364**	**0,83**
2005	**823**	**0,75**	**988**	**0,88**	**283**	**1,08**	**4175**	**0,85**	**324**	**0,74**
2006	**818**	**0,74**	**838**	**0,75**	**241**	**0,92**	**3993**	**0,82**	**333**	**0,76**
2007	**850**	**0,77**	**946**	**0,85**	**279**	**1,06**	**4241**	**0,87**	**344**	**0,79**
2008	**717**	**0,65**	**817**	**0,73**	**265**	**1,01**	**4099**	**0,84**	**286**	**0,65**
2009	**705**	**0,64**	**659**	**0,59**	**208**	**0,79**	**3456**	**0,71**	**266**	**0,61**
2010	**629**	**0,57**	**607**	**0,54**	**204**	**0,78**	**2977**	**0,61**	230	0,87
2011	601	0,96	595	0,98	193	0,94	2712	0,91	206	0,78
2012	562	0,89	558	0,92	180	0,88	2455	0,82	185	0,69
2013	526	0,84	523	0,86	169	0,83	2223	0,75	166	0,62
2014	492	0,78	491	0,81	158	0,77	2013	0,68	148	0,56
2015	461	0,73	460	0,76	148	0,72	1823	0,61	133	0,50
	Lower 2,5% forecast		Lower 2,5% forecast		Lower 2,5% forecast		Lower 2,5% forecast		Lower 2,5% forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	N App.	N App.	N App.	N App.	N App.	N App.	N App.	N App.	212	0,795
2011	535	0,85	524	0,86	180	0,88	2290	0,77	178	0,67
2012	493	0,78	473	0,78	164	0,80	1895	0,64	147	0,55
2013	453	0,72	417	0,69	148	0,72	1560	0,52	119	0,45
2014	415	0,66	361	0,60	131	0,64	1273	0,43	96	0,36
2015	378	0,60	309	0,51	116	0,57	1030	0,35	76	0,29
	Upper 2,5% forecast		Upper 2,5% forecast		Upper 2,5% forecast		Upper 2,5% forecast		Upper 2,5% forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	N App.	N App.	N App.	N App.	N App.	N App.	N App.	N App.	251	0,943
2011	675	1,07	676	1,11	206	1,01	3211	1,08	239	0,90
2012	641	1,02	659	1,08	198	0,97	3182	1,07	232	0,87
2013	611	0,97	657	1,08	193	0,94	3169	1,06	229	0,86
2014	585	0,93	666	1,10	189	0,93	3183	1,07	229	0,86
2015	562	0,89	686	1,13	187	0,92	3228	1,08	232	0,87

Annex 125: Forecast fatalities according to transport mode for Belgium

	Belgium Fat. Cars		Belgium Fat. Lorries		Belgium Fat.Motorcycle	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**922**	**1,00**	**72**	**1,00**	**118**	**1,00**
2001	**899**	**0,98**	**76**	**1,06**	**147**	**1,25**
2002	**779**	**0,84**	**55**	**0,76**	**158**	**1,34**
2003	**688**	**0,75**	**42**	**0,58**	**124**	**1,05**
2004	**623**	**0,68**	**50**	**0,69**	**120**	**1,02**
2005	**624**	**0,68**	**60**	**0,83**	**123**	**1,04**
2006	**589**	**0,64**	**50**	**0,69**	**130**	**1,10**
2007	**550**	**0,60**	**74**	**1,03**	**139**	**1,18**
2008	**479**	**0,52**	**65**	**0,90**	**108**	**0,92**
2009	**464**	**0,50**	**63**	**0,88**	**137**	**1,16**
2010	**443**	**0,48**	**48**	**0,67**	**102**	**0,86**
2011	438	0,99	42	0,88	114	1,12
2012	425	0,96	39	0,81	112	1,10
2013	413	0,93	36	0,76	110	1,08
2014	402	0,91	34	0,71	108	1,06
2015	390	0,88	32	0,66	106	1,04
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	384	0,87	27	0,56	90	0,88
2012	336	0,76	21	0,44	86	0,84
2013	286	0,65	17	0,35	81	0,79
2014	238	0,54	13	0,27	76	0,75
2015	195	0,44	10	0,21	72	0,70
	Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	500	1,13	66	1,37	145	1,42
2012	538	1,22	73	1,51	147	1,44
2013	597	1,35	80	1,67	149	1,46
2014	677	1,53	88	1,84	153	1,50
2015	783	1,77	98	2,04	157	1,54

Annex 126: Forecast fatalities according to transport mode for Czech Republic

	Czech R. Fat. Cars		Czech R. Fat. Lorries		Czech R.Fat. Motorcycle		Czech R. Fat. Mopeds	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**784**	**1,00**	**66**	**1,00**	**100**	**1,00**	**16**	**1,00**
2001	**715**	**0,91**	**49**	**0,74**	**86**	**0,86**	**9**	**0,56**
2002	**759**	**0,97**	**52**	**0,79**	**117**	**1,17**	**17**	**1,06**
2003	**798**	**1,02**	**49**	**0,74**	**101**	**1,01**	**11**	**0,69**
2004	**779**	**0,99**	**67**	**1,02**	**97**	**0,97**	**5**	**0,31**
2005	**679**	**0,87**	**62**	**0,94**	**116**	**1,16**	**8**	**0,50**
2006	**567**	**0,72**	**53**	**0,80**	**113**	**1,13**	**3**	**0,19**
2007	**661**	**0,84**	**66**	**1,00**	**136**	**1,36**	**3**	**0,19**
2008	**573**	**0,73**	**45**	**0,68**	**121**	**1,21**	**2**	**0,13**
2009	**497**	**0,63**	**45**	**0,68**	**85**	**0,85**	**9**	**0,56**
2010	**403**	**0,51**	**45**	**0,68**	**92**	**0,92**	**7**	**0,44**
2011	378	0,94	48	1,07	96	1,04	5	0,72
2012	333	0,83	48	1,06	93	1,01	5	0,67
2013	293	0,73	47	1,05	90	0,98	4	0,62
2014	257	0,64	47	1,04	87	0,94	4	0,58
2015	226	0,56	46	1,02	84	0,91	4	0,54
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	312	0,77	34	0,76	73	0,80	3	0,42
2012	254	0,63	31	0,69	66	0,72	2	0,36
2013	204	0,51	27	0,61	59	0,64	2	0,30
2014	161	0,40	24	0,53	52	0,57	2	0,25
2015	125	0,31	20	0,45	46	0,50	1	0,21
	Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction		
2011	459	1,14	68	1,51	126	1,37	8	1,21
2012	435	1,08	74	1,64	130	1,42	9	1,25
2013	421	1,04	81	1,81	137	1,49	9	1,30
2014	412	1,02	92	2,03	145	1,57	9	1,34
2015	409	1,02	104	2,32	155	1,68	10	1,39

Annex 127: Forecast fatalities according to transport mode for Finland

	Finland Fat. Cars		Finland Fat. Vans &trucks		Finland Fat. Motorcycle		Finland Fat. Mopeds	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**224**	**1,00**	**25**	**1,00**	**10**	**1,00**	**9**	**1,00**
2001	**262**	**1,17**	**15**	**0,60**	**16**	**1,60**	**7**	**0,78**
2002	**267**	**1,19**	**17**	**0,68**	**22**	**2,20**	**7**	**0,78**
2003	**217**	**0,97**	**24**	**0,96**	**23**	**2,30**	**12**	**1,33**
2004	**221**	**0,99**	**16**	**0,64**	**22**	**2,20**	**14**	**1,56**
2005	**231**	**1,03**	**18**	**0,72**	**32**	**3,20**	**4**	**0,44**
2006	**203**	**0,91**	**10**	**0,40**	**26**	**2,60**	**13**	**1,44**
2007	**241**	**1,08**	**19**	**0,76**	**32**	**3,20**	**11**	**1,22**
2008	**202**	**0,90**	**14**	**0,56**	**36**	**3,60**	**13**	**1,44**
2009	**165**	**0,74**	**16**	**0,64**	**27**	**2,70**	**11**	**1,22**
2010	**159**	**0,71**	**18**	**0,72**	**18**	**1,80**	**9**	**1,00**
2011	152	0,96	26	1,44	24	1,34	11	1,22
2012	140	0,88	28	1,56	22	1,23	11	1,21
2013	128	0,81	31	1,70	20	1,12	11	1,19
2014	118	0,74	33	1,84	18	1,02	11	1,17
2015	108	0,68	36	2,00	17	0,93	10	1,16
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	125	0,79	17	0,97	18	1,01	8	0,89
2012	106	0,67	17	0,93	14	0,80	8	0,85
2013	88	0,55	16	0,88	11	0,61	7	0,79
2014	72	0,45	15	0,81	8	0,44	7	0,73
2015	58	0,36	13	0,74	6	0,31	6	0,66
	Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction		
2011	185	1,16	39	2,14	32	1,80	15	1,68
2012	184	1,16	47	2,62	34	1,88	15	1,72
2013	187	1,18	59	3,29	37	2,06	16	1,79
2014	193	1,22	76	4,20	42	2,35	17	1,89
2015	202	1,27	98	5,46	50	2,76	18	2,03

Annex 128: Forecast fatalities according to transport mode for Poland

	Poland Fat. Cars		Poland Fat. Heavy good		Poland Fat. Motorcycle	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**2710**	**1,00**	**225**	**1,00**	**178**	**1,00**
2001	**2438**	**0,90**	**243**	**1,08**	**169**	**0,95**
2002	**2548**	**0,94**	**270**	**1,20**	**167**	**0,94**
2003	**2541**	**0,94**	**264**	**1,17**	**145**	**0,81**
2004	**2459**	**0,91**	**229**	**1,02**	**181**	**1,02**
2005	**2526**	**0,93**	**217**	**0,96**	**157**	**0,88**
2006	**2392**	**0,88**	**227**	**1,01**	**164**	**0,92**
2007	**2582**	**0,95**	**198**	**0,88**	**215**	**1,21**
2008	**2540**	**0,94**	**175**	**0,78**	**262**	**1,47**
2009	**2179**	**0,80**	**136**	**0,60**	**290**	**1,63**
2010	**1853**	**0,68**	**142**	**0,63**	**259**	**1,46**
2011	1688	0,91	120	0,85	280	1,08
2012	1519	0,82	107	0,75	295	1,14
2013	1368	0,74	95	0,67	310	1,20
2014	1231	0,66	84	0,59	325	1,26
2015	1108	0,60	75	0,53	342	1,32
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	1437	0,78	95	0,67	208	0,80
2012	1176	0,63	74	0,52	189	0,73
2013	950	0,51	56	0,40	173	0,67
2014	759	0,41	42	0,29	159	0,61
2015	600	0,32	30	0,21	146	0,56
	Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	1982	1,07	152	1,07	379	1,46
2012	1963	1,06	154	1,08	459	1,77
2013	1968	1,06	160	1,13	553	2,13
2014	1996	1,08	170	1,20	665	2,57
2015	2048	1,11	184	1,29	801	3,09

Annex 128 (continued): Forecast fatalities according to transport mode for Poland

	Poland Fat. Mopeds		Poland Fat. Bus& coach		Poland Fat. Agricultural	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**75**	**1,00**	**50**	**1,00**	**80**	**1,00**
2001	**63**	**0,84**	**59**	**1,18**	**61**	**0,76**
2002	**59**	**0,79**	**43**	**0,86**	**51**	**0,64**
2003	**54**	**0,72**	**51**	**1,02**	**45**	**0,56**
2004	**51**	**0,68**	**43**	**0,86**	**57**	**0,71**
2005	**53**	**0,71**	**52**	**1,04**	**67**	**0,84**
2006	**57**	**0,76**	**15**	**0,30**	**23**	**0,29**
2007	**59**	**0,79**	**17**	**0,34**	**43**	**0,54**
2008	**87**	**1,16**	**11**	**0,22**	**29**	**0,36**
2009	**68**	**0,91**	**19**	**0,38**	**23**	**0,29**
2010	**83**	**1,11**	**14**	**0,28**	**23**	**0,29**
2011	88	1,06	12	0,84	22	0,96
2012	93	1,12	10	0,73	20	0,86
2013	99	1,19	9	0,63	18	0,77
2014	105	1,27	8	0,54	16	0,69
2015	111	1,34	7	0,47	14	0,62
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	68	0,82	6	0,40	13	0,57
2012	61	0,73	4	0,29	11	0,48
2013	52	0,63	3	0,21	9	0,40
2014	43	0,52	2	0,15	8	0,34
2015	35	0,42	2	0,11	6	0,28
	Upper (97.50%) forecast		Upper (97.50%) forecast		Upper (97.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2011	113	1,36	25	1,75	37	1,61
2012	143	1,73	25	1,81	36	1,55
2013	189	2,27	26	1,87	34	1,48
2014	256	3,09	27	1,95	33	1,43
2015	358	4,32	29	2,05	32	1,37

Annex 129: Forecast fatalities according to transport mode for Sweden

	Sweden Fat. Cars		Sweden Fat. Vans & trucks		Sweden Fat. Motorcycle	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**393**	**1,00**	**24**	**1,00**	**39**	**1,00**
2001	**373**	**0,95**	**20**	**0,83**	**38**	**0,97**
2002	**379**	**0,96**	**21**	**0,88**	**37**	**0,95**
2003	**349**	**0,89**	**19**	**0,79**	**47**	**1,21**
2004	**288**	**0,73**	**10**	**0,42**	**56**	**1,44**
2005	**273**	**0,69**	**17**	**0,71**	**46**	**1,18**
2006	**261**	**0,66**	**16**	**0,67**	**55**	**1,41**
2007	**279**	**0,71**	**15**	**0,63**	**60**	**1,54**
2008	**234**	**0,60**	**16**	**0,67**	**51**	**1,31**
2009	**219**	**0,56**	**10**	**0,42**	**47**	**1,21**
2010	205	0,94	12	1,24	56	1,20
2011	190	0,87	12	1,17	58	1,24
2012	175	0,80	11	1,10	60	1,28
2013	162	0,74	10	1,03	62	1,32
2014	150	0,68	10	0,97	64	1,37
2015	139	0,63	9	0,92	66	1,41
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
	178	0,81	9	0,88	49	1,04
2011	151	0,69	8	0,77	50	1,06
2012	126	0,57	7	0,66	51	1,08
2013	102	0,47	6	0,56	52	1,11
2014	82	0,38	5	0,47	53	1,13
2015	65	0,30	4	0,39	54	1,15
	Upper 97.50% forecast		Upper 97.50% forecast		Upper 97.50% forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
	237	1,08	17	1,73	65	1,38
2011	238	1,09	18	1,77	68	1,44
2012	245	1,12	18	1,83	71	1,51
2013	257	1,17	19	1,91	74	1,58
2014	273	1,25	20	2,02	78	1,66
2015	295	1,35	22	2,15	82	1,74

Annex 130: Belgium forecast female fatalities by age class (<15;15-17;18-24)

	Belgium Female Fat. <15		Belgium Female Fat. 15-17		Belgium Female Fat. 18-24	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**24**	**1,00**	**18**	**1,00**	**84**	**1,00**
2001	**28**	**1,17**	**11**	**0,61**	**59**	**0,70**
2002	**20**	**0,83**	**7**	**0,39**	**57**	**0,68**
2003	**16**	**0,67**	**8**	**0,44**	**36**	**0,43**
2004	**10**	**0,42**	**7**	**0,39**	**33**	**0,39**
2005	**13**	**0,54**	**8**	**0,44**	**29**	**0,35**
2006	**13**	**0,54**	**8**	**0,44**	**27**	**0,32**
2007	**11**	**0,46**	**3**	**0,17**	**26**	**0,31**
2008	**12**	**0,50**	**14**	**0,78**	**33**	**0,39**
2009	**10**	**0,42**	**10**	**0,56**	**30**	**0,36**
2010	10	1,01	8	0,83	31	1,03
2011	10	0,99	8	0,76	31	1,05
2012	10	0,97	7	0,71	32	1,07
2013	10	0,95	7	0,65	33	1,09
2014	9	0,93	6	0,60	33	1,11
2015	9	0,92	6	0,56	34	1,13
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	7	0,68	5	0,55	22	0,73
2011	6	0,61	5	0,49	21	0,68
2012	6	0,55	4	0,42	19	0,65
2013	5	0,49	4	0,36	18	0,61
2014	4	0,43	3	0,30	17	0,58
2015	4	0,37	2	0,25	17	0,55
	Upper 97.50% forecast		Upper 97.50% forecast		Upper 97.50% forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	15	1,50	12	1,25	44	1,46
2011	16	1,59	12	1,20	48	1,61
2012	17	1,71	12	1,18	53	1,76
2013	19	1,86	12	1,18	58	1,93
2014	21	2,05	12	1,21	63	2,10
2015	23	2,28	13	1,26	69	2,30

Annex 130 (continued): Belgium forecast female fatalities by age class (25-49;50-64;>64)

	Belgium Female Fat. 25-49		Belgium Female Fat. 50-64		Belgium Female Fat. >64	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**115**	**1,00**	**41**	**1,00**	**83**	**1,00**
2001	**140**	**1,22**	**46**	**1,12**	**97**	**1,17**
2002	**127**	**1,10**	**54**	**1,32**	**86**	**1,04**
2003	**91**	**0,79**	**46**	**1,12**	**80**	**0,96**
2004	**98**	**0,85**	**35**	**0,85**	**66**	**0,80**
2005	**80**	**0,70**	**46**	**1,12**	**84**	**1,01**
2006	**82**	**0,71**	**39**	**0,95**	**79**	**0,95**
2007	**76**	**0,66**	**37**	**0,90**	**62**	**0,75**
2008	**70**	**0,61**	**38**	**0,93**	**54**	**0,65**
2009	**72**	**0,63**	**39**	**0,95**	**71**	**0,86**
2010	64	0,89	34	0,88	61	0,86
2011	60	0,83	33	0,84	59	0,83
2012	56	0,78	32	0,81	57	0,80
2013	53	0,73	30	0,77	55	0,77
2014	50	0,69	29	0,74	53	0,74
2015	46	0,65	28	0,71	51	0,72
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	51	0,71	30	0,76	51	0,71
2011	44	0,61	28	0,72	48	0,68
2012	38	0,52	27	0,68	46	0,65
2013	32	0,44	25	0,65	44	0,63
2014	27	0,37	24	0,61	42	0,60
2015	22	0,31	23	0,58	41	0,57
	Upper 97.50% forecast		Upper 97.50% forecast		Upper 97.50% forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	80	1,11	40	1,02	74	1,04
2011	82	1,13	39	0,99	72	1,01
2012	84	1,17	37	0,96	70	0,98
2013	87	1,21	36	0,93	68	0,95
2014	91	1,27	35	0,90	66	0,93
2015	97	1,34	34	0,87	64	0,90

Annex 131: Belgium forecast male fatalities by age class (<15;15-17;18-24)

	Belgium Male Fat. <15		Belgium Male Fat. 15-17		Belgium Male Fat. 18-24	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**28**	**1,00**	**37**	**1,00**	**243**	**1,00**
2001	**35**	**1,25**	**35**	**0,95**	**222**	**0,91**
2002	**20**	**0,71**	**42**	**1,14**	**213**	**0,88**
2003	**12**	**0,43**	**30**	**0,81**	**181**	**0,74**
2004	**16**	**0,57**	**25**	**0,68**	**206**	**0,85**
2005	**24**	**0,86**	**23**	**0,62**	**167**	**0,69**
2006	**18**	**0,64**	**13**	**0,35**	**169**	**0,70**
2007	**19**	**0,68**	**24**	**0,65**	**188**	**0,77**
2008	**23**	**0,82**	**14**	**0,38**	**144**	**0,59**
2009	**12**	**0,43**	**17**	**0,46**	**132**	**0,54**
2010	15	1,22	17	0,98	138	1,05
2011	14	1,13	17	0,97	134	1,01
2012	13	1,05	16	0,97	129	0,98
2013	12	0,98	16	0,96	125	0,95
2014	11	0,91	16	0,96	121	0,91
2015	10	0,85	16	0,95	117	0,88
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	10	0,84	13	0,78	111	0,84
2011	9	0,78	12	0,72	103	0,78
2012	9	0,71	11	0,64	96	0,73
2013	8	0,65	9	0,54	89	0,68
2014	7	0,60	8	0,46	83	0,63
2015	7	0,55	6	0,37	78	0,59
	Upper 97.50% forecast		Upper 97.50% forecast		Upper 97.50% forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	21	1,77	21	1,23	172	1,30
2011	20	1,66	22	1,32	173	1,31
2012	19	1,56	25	1,48	174	1,32
2013	18	1,47	29	1,70	174	1,32
2014	17	1,39	34	2,01	175	1,32
2015	16	1,31	41	2,42	175	1,33

Annex 131 (continued): Belgium forecast male fatalities by age class (25-49;50-64;>64)

	Belgium Male Fat. 25-49		Belgium Male Fat. 50-64		Belgium Male Fat. >64	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2000	**493**	**1,00**	**135**	**1,00**	**155**	**1,00**
2001	**492**	**1,00**	**146**	**1,08**	**167**	**1,08**
2002	**452**	**0,92**	**124**	**0,92**	**139**	**0,90**
2003	**334**	**0,68**	**94**	**0,70**	**152**	**0,98**
2004	**410**	**0,83**	**114**	**0,84**	**135**	**0,87**
2005	**393**	**0,80**	**113**	**0,84**	**102**	**0,66**
2006	**404**	**0,82**	**101**	**0,75**	**114**	**0,74**
2007	**388**	**0,79**	**121**	**0,90**	**108**	**0,70**
2008	**340**	**0,69**	**101**	**0,75**	**95**	**0,61**
2009	**319**	**0,65**	**120**	**0,89**	**105**	**0,68**
2010	314	1,00	108	0,90	96	0,91
2011	297	0,95	106	0,89	92	0,88
2012	282	0,90	105	0,87	89	0,84
2013	267	0,85	103	0,86	85	0,81
2014	253	0,81	102	0,85	82	0,78
2015	240	0,76	100	0,84	79	0,75
	Lower (2.50%) forecast		Lower (2.50%) forecast		Lower (2.50%) forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	283	0,90	96	0,80	82	0,78
2011	259	0,82	94	0,79	77	0,73
2012	235	0,75	92	0,77	72	0,69
2013	213	0,68	91	0,75	67	0,64
2014	191	0,61	89	0,74	63	0,60
2015	172	0,55	87	0,72	59	0,56
	Upper 97.50% forecast		Upper 97.50% forecast		Upper 97.50% forecast	
	Absolute	Fraction	Absolute	Fraction	Absolute	Fraction
2010	348	1,11	121	1,01	111	1,09
2011	342	1,09	120	1,00	110	1,08
2012	338	1,08	119	0,99	109	1,06
2013	335	1,07	118	0,98	108	1,05
2014	334	1,07	117	0,98	107	1,04
2015	335	1,07	116	0,97	105	1,02

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Loddewykx, Dieter

Datum: **24/08/2012**