Analysis of Road Safety Trends 2012

Management by Objectives for Road Safety Work, Towards the 2020 Interim targets

TRAFIKVERKET
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Towards Zero Together

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Foreword

The progress towards the road safety objectives for road traffic in 2020 is monitored through annual reports. This report is the fifth annual follow-up. The report describes and analyses road safety trends in 2012. As in previous years, the results are analysed on the basis of the number of fatalities and injured and a number of designated indicators. The report will form the basis for the 2013 results conference in Stockholm on 24 April.

The report was produced by an analysis group consisting of analysts from the Swedish Transport Agency, the Swedish National Road and Transport Research Institute (VTI), and the Swedish Transport Administration. The following analysts have participated in the work:Jan Ifver and Peter Larsson (the Swedish Transport Agency), Anna Vadeby and Åsa Forsman (VTI), and Magnus Lindholm, Johan Strandroth, Simon Sternlund and Ylva Berg (the Swedish Transport Administration).

Summary

According to a decision by the Riksdag in 2009, the number of fatalities on the roads should be halved between 2007 and 2020. This is equivalent to a maximum of 220 fatalities in 2020.The number of those seriously injured on the roads is to be reduced by a quarter. In 2012 a review of targets and indicators was conducted to ensure that targets and follow-up methods are always as relevant and updated as possible. The review was based on the new interim target on EU level of halving the total number of fatalities on the roads between 2010 and 2020.This would correspond to a more stringent interim target of maximum 133 fatalities in 2020. Any such adjustment to the Swedish target level has not been decided, and the interim target of maximum 220 fatalities applies. However, the indicator structure was adjusted in 2012.

This report describes and analyses road safety trends on the basis of the number of fatalities and injured and on ten indicators. It will form a basis for the work which will lead to meeting the objectives by 2020, and will be presented at the 2013 results conference. The table below shows the present (2012) position for the various indicators as well as an assessment of whether their rate of change is sufficient for reaching the target by 2020.

Indicator	Starting point	2012	Target year 2020	Trend
Number of fatalities on the roads	440	286	220	In line with the required trend
Number of seriously injured on the roads	5 500	4 400	4 100	In line with the required trend
Percentage of traffic volume within speed limits, national road network	43%	46%	80%	Not in line with the required trend
Percentage of traffic volume within speed limits, municipal road network (2012: starting year for index)	63%	63%	80%	Starting year for the measurement – the trend cannot be assessed
Percentage of traffic volume with sober drivers	99,71%	99,77%	99,90%	In line with the required trend
Percentage of those wearing a seat belt in the front seat of passenger cars	96%	98%	99%	In line with the required trend
Percentage of cyclists wearing a helmet	27%	33%	70%	Not in line with the required trend
Percentage of moped riders wearing a correct helmet	96%	96%	99%	Starting year for the measurement – the trend cannot be assessed
Percentage of new passenger cars with the highest Euro NCAP score.	20%	46%	80%	In line with the required trend
Percentage of safe motorcycles (ABS)	9%	28%	70%	In line with the required trend
Percentage of traffic volume on roads with speed limit above 80 km/h with median barriers	Approx. 50%	71%	75%	In line with the required trend
Percentage of safe pedestrian, cycle and moped passages in urban areas	Approx. 25%	-	Not defined	Not measured, no target
Percentage of municipalities with a good quality of maintenance of pedestrian and cycle paths	-	-	Not defined	Not measured, no target

It is estimated that 286 persons died in road traffic accidents in 2012. This is a 10% decline in the number of fatalities compared to 2011.To achieve the objective of no more than 220 fatalities in 2020, an annual decrease of 5% is required. Between 2008 and 2012 the average annual decrease was 8%. The number of seriously injured also decreased between 2011 and 2012, from 4,500 to 4,400.Thus the results of both fatalities and seriously injured are in line with the required trend.

Certain external factors are deemed to affect the results for 2012. Preliminary figures show that the total traffic volume has declined by approximately 0.6% between 2011 and 2012. The dominating group is passenger cars, which currently account for roughly 82% of the total traffic volume on Swedish roads. The traffic volume of passenger cars increased until 2008 and has since levelled out and even declined slightly. This may be a contributory factor for the favourable trend of fatalities over recent years. In addition, the improved method for identifying suicides in road traffic has resulted in allowing the exclusion of more fatalities from the statistics on road traffic accidents. It is also essential to emphasise that in relation to the targets which apply at the EU level – equivalent to a maximum of 133 fatalities in Sweden in 2020 – the number of fatalities is significantly higher than necessary.

The positive trend towards the 2020 targets can partly be explained by gradual improvements in vehicle population, infrastructure and not least lower speed levels. Both the Safe national roads and Safe vehicles indicators are improving at a sufficient rate. Road design in the municipal road network has long been developing towards greater safety as well. Developments in these areas are a good thing in themselves, but when they are combined they can strengthen each other. A certain level of safety in the vehicle can only have its full effect when it is combined with the right type of road design. The figures for drunk driving and use of seat belts are assessed as developing at the correct pace, and it appears as though it will be possible to attain the targets of 2020 if the work's level of ambition is maintained.

Speed measurements during 2012 show that the average speeds on the national road network have declined significantly since the measurement in 2004. Despite a decline in average speeds, compliance with speed limits emains at an unacceptably low level. During the period many roads with heavy traffic have got median barriers and higher speed limit, while many roads with less traffic and lower road safety standards got a lower speed limit. All in all, the average speed limit of traffic on the national road network was unchanged between 2004 and 2012 (the Swedish Transport Administration, 2012). It is generally the case that the lower the speed limit, the greater the violations. Road users also find it most difficult to comply with the speed limit within the new speed classes 60 km/h and 80 km/h on the national road network which were introduced after 2004.This is a part of the explanation for why the percentage within speed limit is not in line with the required trend. The compliance of speed limits specifically is one of the largest and most important challenges we envisage in the future, despite the good trend. Not even 50% of the traffic on the national road network complies with the speed limits, and the situation is even worse for heavy vehicles. For the tougher EU target, which would correspond to a maximum of 133 fatalities in 2020, good compliance of speed limits will be even more decisive – particularly as the new speed limits are set for attaining an optimal system effect of safer roads and vehicles. We also see a risk in that the speed review which managed to reconcile requirements of accessibility and safety in a good manner is not continuing at the same pace as earlier.

Safe cycling has been identified as the most important area for attaining the target of seriously injured in 2020. This will become particularly important, as a strategy for greater cycling has been implemented. Municipalities need to initiate a systematic method of working, with a focus on the seriously injured. This involves focused work on getting cyclists to start wearing a helmet, but also providing infrastructure which takes into account the needs of unprotected road users. In this context national maintainers of roads work also have an important responsibility which should not be forgotten.

Content

1 Introduction

According to a decision by the Riksdag in 2009, the number of fatalities on the roads should be halved between 2007 and 2020 (Government Bill 2008/09:93) Objectives for future travel and transport).This means that the number of fatalities in 2020 must not exceed 220.The decision also means that the number of serious injuries in road traffic is to be reduced by a quarter during the same period. This decision further specifies that the targets be reviewed in 2012 and 2016,in order to ensure that road safety work always maintains the most relevant and motivating targets possible.

In order to achieve the road safety targets, the management of road safety work is by objectives. This means that there are targets to follow-up for several indicators and that road safety trends and target fulfilment are evaluated at annual results conferences. The aim of this working method is to bring a long-term and systematic approach to road safety work. The method has been prepared and developed continuously in cooperation between a number of organisations. The organisations which participated in the preparation include the Swedish National Police Board, Sweden's National Society for Road Safety (NTF), Toyota Sweden AB, Folksam, the Swedish Work Environment Authority, the Swedish Association of Local Authorities and Regions (SALAR), Svenska taxiförbundet (the Swedish Taxi Association), the Swedish Bus and Coach Federation (BR), the Swedish Association of Road Transport Companies and the Swedish Road Administration.

Follow-up of the indicators is key for management by objectives. Each indicator has a target value which should be obtained in 2020. Together, these targets make up an overall target for road safety trends. The following indicators are currently being followed-up within the framework of management by objectives (target levels are presented in section 4)

- Compliance with speed limits, national road network
- Compliance with speed limits, municipal road network
- Sober traffic
- Use of seat belts
- Use of helmets
  - Cycle helmets
  - Moped helmets
- Safe passenger cars
- Safe motorcycles (ABS)
- Safe national roads
- Safe pedestrian, cycle and moped passages in urban areas
- Maintenance of pedestrian and cycle paths

1.1 Aim

The analysis report describes and analyses road safety trends in 2012 by reporting and analysing the situation of number of fatalities and seriously injured as well as each of the ten indicators.

The trend of the indicators will also be analysed from a system perspective, which shows how the indicators are connected. This illustrates that the effects of the indicators sometimes create synergies with each other and sometimes overlap with each other. It is also intended to identify which indicators are the most important ones to change in order to improve road safety and achieve the interim target by 2020.The report is further to serve as a basis for the 2013 results conference and for continued planning of road safety work in Sweden.

1.2 Starting points

The starting point of the analysis is the targets and indicators which form the basis of the interim targets. These were formulated by the former Swedish Road Administration in collaboration with a number of national organisations, see the report "Management by Objectives for Road Safety Work" (the Swedish Road Administration, publication 2008:31).

The targets and indicators were reviewed in 2012 so that targets and follow-up methods can continue to be as relevant and updated as possible. The review was based on the new interim target on EU level of halving the total number of fatalities on the roads between 2010 and 2020. For Sweden this corresponds to a target of maximum 133 fatalities in 2020.

The analysis shows that a stricter target in accordance with the EU target would provide a challenging – but not unrealistic – new interim target to work towards. This conclusion is largely based on that safety features of vehicles will develop very favorably up until 2020.Therefore, during the review the Swedish Transport Administration proposed a stricter interim target in line with the EU target. In addition, indicators and certain target levels were updated (the Swedish Transport Administration, 2012:124).

The new target level in accordance with the review has not been adopted yet, and therefore the results are analysed based on the current target of maximum 220 fatalities in 2020. However, the target which applies throughout the EU is illustrated in the summary diagrams. On the other hand, the new structure of indicators proposed by the review in 2012 is used. The analysis group assesses that the revised structure of indicators governs the road safety work towards existing interim targets in a better manner.

2 Number of fatalities and seriously injured

In May 2009 the Riksdag decided as an interim target for road safety trends that the number of fatalities should be halved and that the number of seriously injured is to be reduced by a quarter between 2007 and 2020. Measures which aim to improve the road safety of children should particularly be prioritised.

The number of fatalities and injured in road traffic depend on a series of different factors, including traffic volume, external factors and road safety measures. There is also a random variation from year to year in the outcome for fatalities and injuries. This relative change is not so significant for injury figures, but for fatality figures it may be as much as 10%.

2.1 Fatalities

Fatality in a road traffic accident constitutes a person who dies within 30 days as a result of the accident. Road traffic accident refers to an accident which occurs on a public road, in which at least one vehicle in movement is involved and causes personal injury.

In the past, suicides have by definition been included in Sweden's official statistics on road traffic fatalities. As of 2010, however, the remit of Transport Analysis[1] includes reporting the number of suicides separately. It has therefore been decided that the definition of fatalities in road traffic accidents will be adapted to what applies for other types of traffic as well as in most other European countries. Thus suicides have been excluded from official statistics on fatalities in road traffic accidents since 2010. This in turn implies that, since 2010, statistics in this area have not been fully comparable with previous years' statistics. For 2012 it is estimated that approximately 36 fatalities occurred through suicide[2] – all drivers or pedestrians. For 2011, 23 fatalities were excluded from the statistics for this reason. The large increase in suicides is probably not real, but depends rather on greater resources, expertise and opportunities to investigate such circumstances.

The analysis group believes that it is important to ensure that the number of suicides is identified and reported separately in the official statistics with a method which is equally good qualitatively and equally robust as that which was used at the end of 2012. The method should be the same between the years so that comparisons are not obstructed by these cases being identified with a changed method.

Other fatalities not included in the official statistics are pedestrians who have died from injuries sustained through falls in the road environment (9 individuals) or after having been hit by a tram (3 individuals). These are not either included in the following analysis.

[1] Transport Analysis (previously SIKA) is responsible for official statistics in the area of communication.
[2] What classifies as suicide is described in "Metod för suicidklassning av dödsfall i transportsystemet" (Method for suicide classification of fatalities in the transport system), Publication 2011:128

	2006–2008	2012	Target year 2020	Estimated trend towards target
Number of fatalities	440	286	220	In line with the required trend

For 2012 the number of fatalities is estimated at 286 persons, which is 33 less than in 2011. Compared with the mean value[3] for 2006–2008, the number of fatalities has dropped by 35%. To achieve the objective of no more than 220 fatalities in 2020, an annual decrease of 5% is required. Between 2008 and 2012 the average annual decrease was 8%. This means that the number of fatalities for the period from 2008 to 2012 is still well below the curve for achieving the target by 2020.

In the review of interim targets and indicators of safety on roads (the Swedish Transport Administration, 2012:124) which was conducted in 2012, it is described that a revision of the targets to a maximum of 133 fatalities in traffic accidents by 2020 would be reasonable. An important factor for this assessment is a forecast which indicates that you end up below the current interim target without taking any additional measures, besides those which already form part of the existing plans. A new halving target would correspond to the EU target of halving the number of traffic fatalities between 2010 and 2020. A curve on a possible new necessary trend of the number of fatalities has therefore been added in figure 1. This shows that the number of fatalities is currently significantly higher than that required for attaining this target.

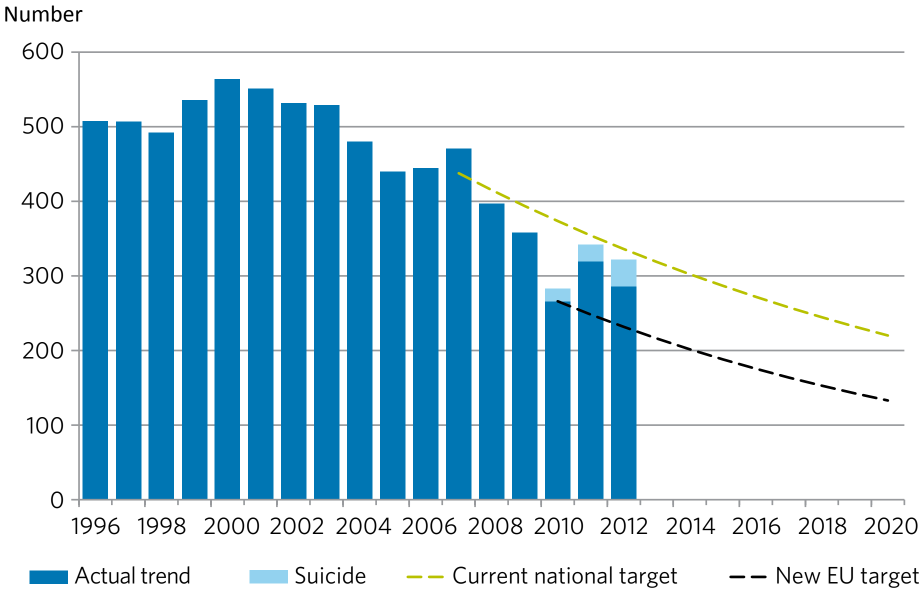


Figure 1. *Number of fatalities in road traffic accidents 1996-2012 (2010-2012 excl./incl. suicides) and the required trend up to 2020. Source: STRADA*

In 2012 the number of cyclist fatalities increased slightly. The number of fatalities decreased for other categories of road users. The relative decrease was greatest for the number of motorcyclist fatalities, which decreased by 30%, from 46 to 31 compared to 2011.

[3] In order to even out annual variations, a mean value for 2006–2008 is used as a base year. Read more in Chapter 3, External factors.

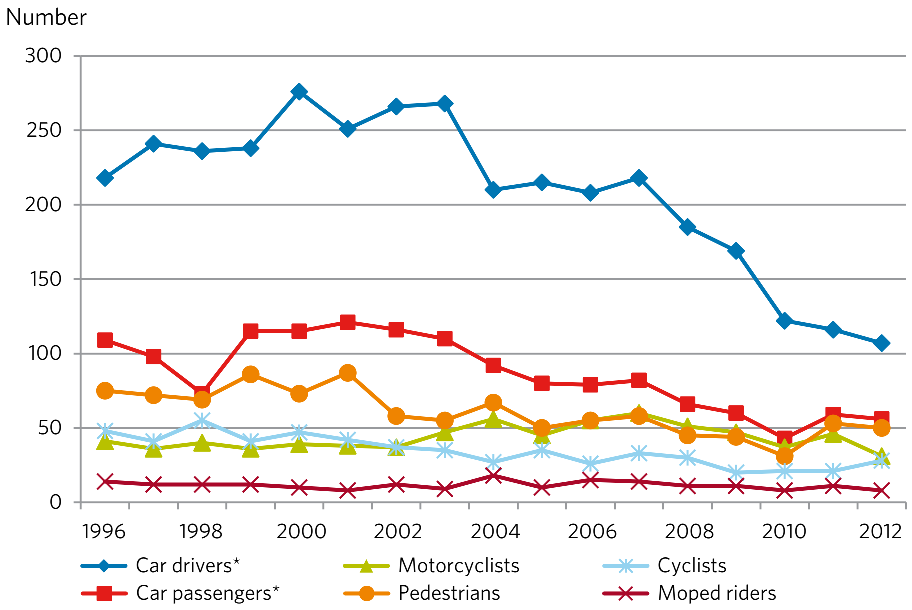


Figure 2. *The number of fatalities by road user category. 1996-2012.* Here car refers to passenger car, lorry and bus. Source: STRADA*

During the period from 1996 to 2012 the total number of fatalities decreased by 43%. The relative decrease was least for the number of motorcyclist fatalities, which decreased by 22%, from 1996 to 2012. Other road user categories decreased by between 32% and 50% during the same period. One reason why the number of motorcyclist fatalities did not decrease to the same degree as other road user categories may be that the volume of motorcycle traffic more than doubled during this period.

In 2012, 17 children aged between 0 and 17 were killed, which translates to a reduction of 67% compared with 1996. Of these children 10 were aged between 15 and 17 and 6 were aged between 10 and 14. One child was below the age of 10.

2.2 Seriously injured

The definition of a seriously injured person is of someone who has suffered an injury through a road traffic accident leading to at least 1% medical impairment. “Medical impairment” is a term used by insurers to assess degrees of disability regardless of the cause. However, a problem of using medical impairment as a measure is that often it takes a long time between injury and declared impairment. Consequently, using the measure directly means a delay of several years. Therefore, a method is instead used (the Swedish Transport Agency, 2009) which entails that the number of persons with medical impairment is forecast based on the injuries reported by the hospital to STRADA[4] and by using a risk matrix developed by Folksam.

[4]Swedish Traffic Accident Data Acquisition, an information system for data on injuries and accidents throughout the road transport system.

	2007	2012	Target year 2020	Estimated trend towards target
Forecast number of people seriously injured	5 500	4 400	4 100	In line with the required trend

The forecast number of seriously injured for 2007 is estimated to approximately 5,500 persons and for 2012 to approximately 4,400. The interim target means that the number of seriously injured may be maximum 4,100 in 2020, which corresponds to an annual rate of decline by almost 3%. From 2007 the number of seriously injured has declined by 20%, which is well below the required trend.

Pedestrians who are seriously injured following falls in the road traffic environment are not included in official statistics. If this type of accident had been included in the estimates, the number of seriously injured would amount to approximately 8,000 in 2012. As almost one in every two persons seriously injured in the road transport system in 2012 was a pedestrian who fell, this problem is nonetheless significant enough to warrant mentioning. In figure 3 we can see an increase in the number of accidents involving pedestrian falls. Almost half of these type of accidents take place during the period January–March.

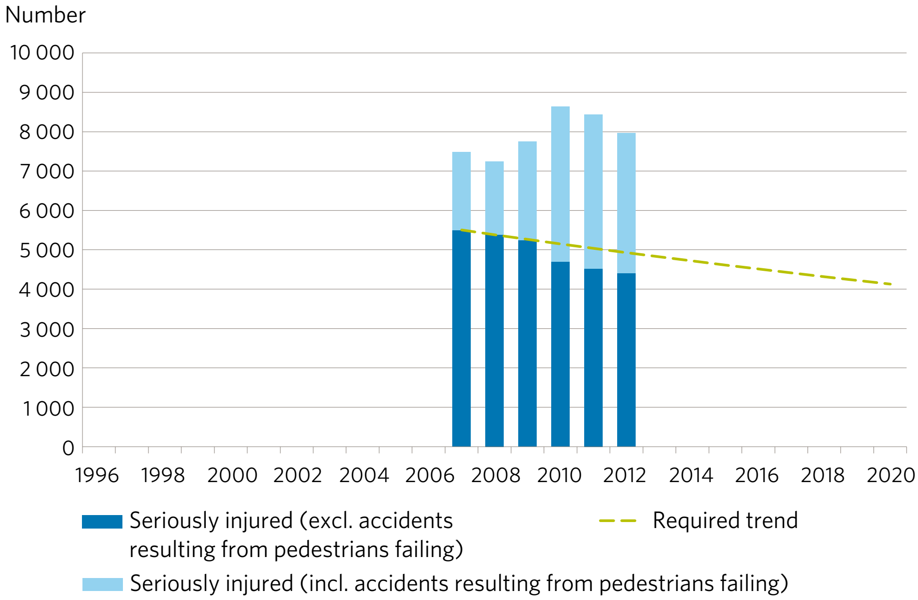


Figure 3. *Forecast number of people seriously injured 2007–2012 and the required trend up to 2020 (incl./excl. pedestrians falling in the road traffic environment). Source: STRADA*

Approximately 650 children aged between 0 and 17 are estimated to have suffered serious injuries in 2012, which is 42% less than 2007.

Many people with a low degree of medical impairment do not see themselves as seriously injured. For this reason, the number of very seriously injured is also reported. A very seriously injured person is someone who has sustained a medical impairment of at least 10%. In 2012 approximately 630 people were so seriously injured that they sustained a medical impairment of 10% or more.

The difference between people with different degrees of medical impairment is that those who have a higher degree more often have brain injuries. Of all injuries leading to a medical impairment of at least 1% in drivers of passenger cars, brain injuries accounted for 5%, while brain injuries accounted for 18% of injuries leading to a 10% or higher medical impairment in drivers of passenger cars. The correspon-ding figures for injured cyclists were 6% and 27% respectively.

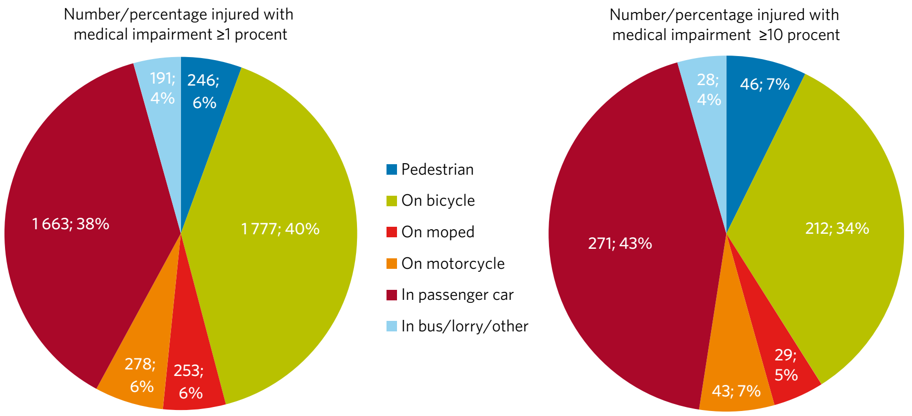


Figure 4. *Number/percentage of seriously injured (≥1 % /(≥10 %) divided by mode of transport, 2012. Source: STRADA*

Drivers of passenger cars are the group of road users that make up the biggest share of the very seriously injured, namely 43%. By far the most common type of injury leading to a medical impairment of 10% or more in drivers of passenger cars is whiplash. Approximately 55% of the very seriously injured drivers of passenger cars have got whiplash. The second most common type where brain injuries, which 18% suffered. Cyclists also made up a significant share of the very seriously injured. More than one in three of those seriously injured in 2012 were cyclists. Cyclists often suffer injuries to the head (41%). Other common injuries that lead to permanent disabilities are wrist and collar bone fractures (37%).

Almost as many moped riders as motorcyclists were very seriously injured, despite the fact that the volume of motorcycle traffic is more than twice that of moped traf-fic. In both groups it was brain injuries that most often led to permanent disabilities. Moped riders and motorcyclists have suffered very serious leg or arm injuries almost as often. The percentage of pedestrians who were very seriously injured after being hit by vehicles is much greater than their percentage of personal traffic volume. In this group too it was brain injuries that most often led to permanent disabilities of at least 10%.

2.2.1 Seriously injured according to PAR[5]

Changes within the road user groups over a longer period of time can be demonstrated by means of information from the National Board of Health and Welfare's Patient Register, PAR. This contains information about the number of road users who have been injured so seriously that they have been hospitalised[6] for more than 24 hours (Transport Analysis, 2013). Statistics are available from 1998 to 2011.

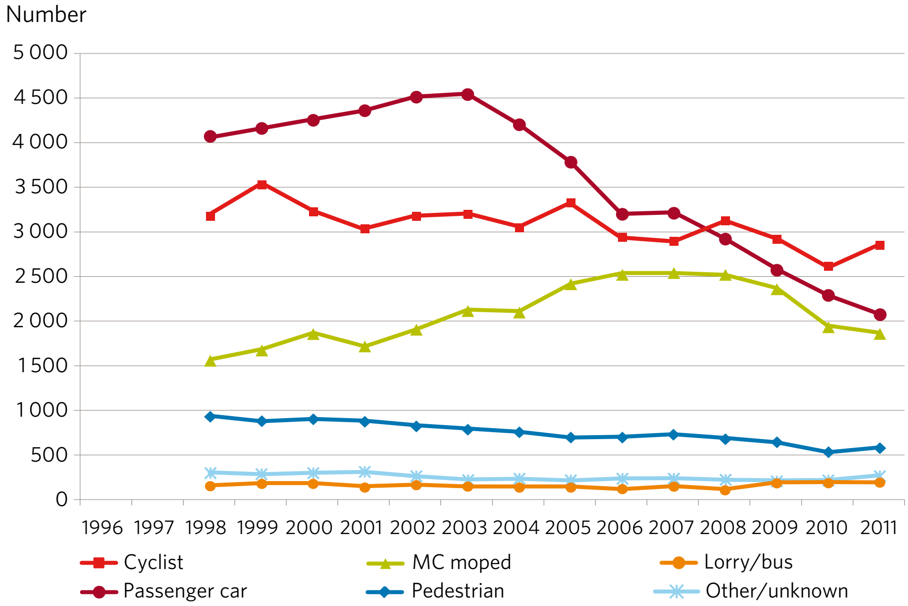


Figure 5. *The number of people seriously injured (hospitalised for at least 24 hours) divided by mode of transport, 1998–2011. Source: PAR*

Up to 2007, more of those seriously injured had been travelling in a passenger car than by any other mode of transport. The number of seriously injured drivers of passenger cars increased up to and including the year 2003. Since then the number has shown a striking decrease. Between 1998 and 2011, the number of seriously injured drivers of passenger cars dropped by 47%. This means that cyclists are now the road user group that accounts for the biggest number of seriously injured. More than a third of road users admitted to hospital in 2011 were cyclists.

2.3 International comparison

In July 2010, the European Commission decided that the number of fatalities should be halved between 2010 and 2020.In 2010, there were 31,029 fatalities in the EU, which means that the number of fatalities should decrease to a maximum of 15,515 by 2020. According to preliminary data, the number of fatalities declined in 2011 by 2% and by an additional 9% in 2012[7].

[5] The National Board of Health and Welfare's Patient Register
[6] Admitted to hospital is the official term for what is colloquially called being put in hospital.
[7] http://europa.eu/rapid/press-release_IP-13-236_sv.htm

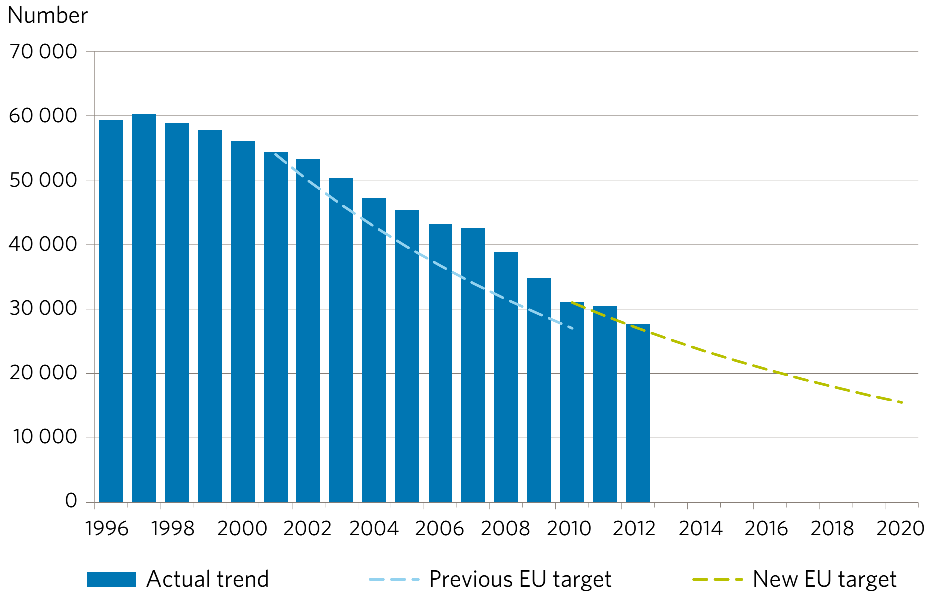


Figure 6. *The number of fatalities in the EU, 1996–2012 and required trend up to 2020. Preliminary data for 2011 and 2012. Source: CARE*

Sweden, the UK and the Netherlands have the lowest number of fatalities per capita within the EU (with the exception of Malta in 2012). Between 2010 and 2012 the number of fatalities per capita was unchanged in the Netherlands while the number of fatalities per capita increased in Sweden and decreased in the UK.

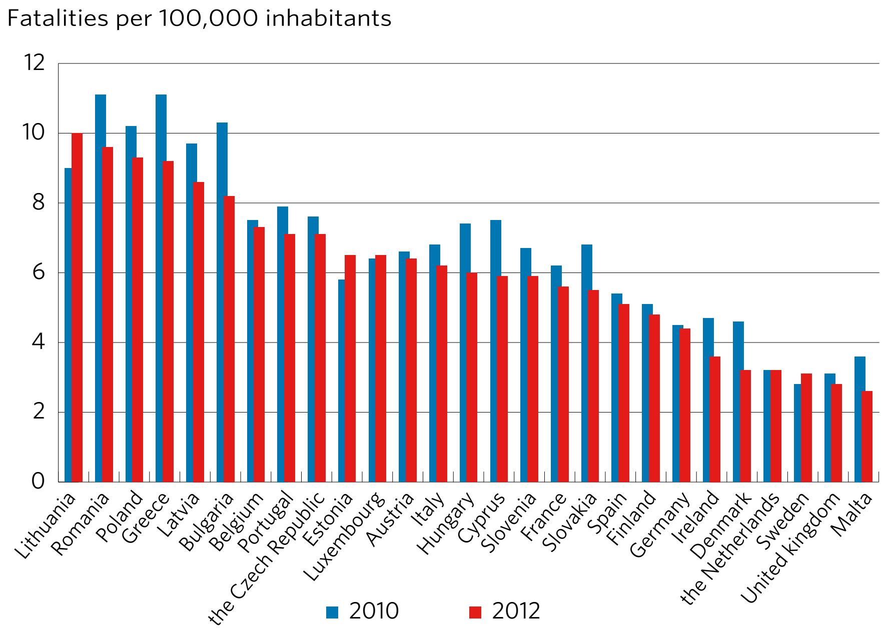


Figure 7. *Number of fatalities per 100,000 inhabitants for the 27 countries within the EU, 2011 and 2012. Source: CARE*

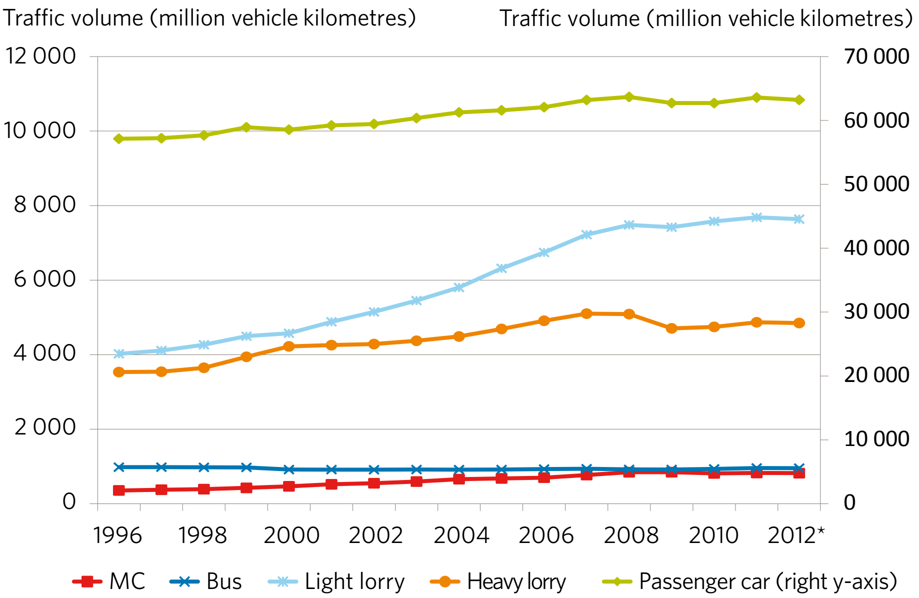
In Sweden, Denmark, Norway and Finland, the number of fatalities has decreased by 32%, 46%, 23% and 27% respectively during the period from 2007 to 2011. According to preliminary data, the decrease from 2011 to 2012 for each country was 9%, 21%, 13% and 12% respectively.

3 External factors

There are a number of external factors that affect road safety, but which are outside the scope of what you can affect within the real road safety work. Some of these factors can have a direct impact on road safety, for example, the weather. Other factors, such as the age structure of the population, affect the structure of different modes of transport, which in turn are significant for the development of number of fatalities and injured in road traffic. This chapter presents some external factors, and their trend in 2012 will particularly be studied.

An important external factor is the size and structure of traffic volume. Preliminary figures for 2012 show that the total traffic volume has declined by approximately 0.6% compared to 2011. Figure 8 shows how traffic volume for different types of vehicles has evolved between 1996 and 2012. The dominating group is passenger cars, which now account for about 82% of the total traffic volume on Swedish roads. If you consider the entire period, the traffic volume of passenger cars increased until 2008 and has since levelled out and even declined slightly. This may be a contributory factor for the favourable trend of fatalities over recent years. Traffic volume for light lorries, heavy lorries and motorcycles also indicates a similar pattern, with an increase up to 2008, followed by a levelling out or decrease. Bus traffic has been at a stable level at approximately 1,000 million vehicle kilometres per year throughout the period.

The number of motorcycles on the road increased slightly between 2011 and 2012, from approximately 305,000 to approximately 307,000[8]. Since 2009 the number of motorcycles was slightly above 300,000. The number of mopeds of class I has been reported separately since 2007[9]. During that period, the number of mopeds on the road was greatest in 2009, with approximately 135,000, but the number declined since then to roughly 109,000 in 2012. Between 2011 and 2012 the number declined by approximately 7%.



* Data for 2011 and 2012 is preliminary and has been calculated upwards with the Swedish Transport Administration's change factors for passenger cars (passenger car, MC, light lorry) and heavy vehicles (heavy lorry, bus).

Figure 8. *Traffic volume by vehicle type, 1996–2012 (Millions of vehicle kilometres). Note that the traffic volume for passenger cars is displayed on the right y-axis. Source: Transport Analysis and VTI.*

[8] Refers to the number of registered motorcycles on the roads on 30 June of each year in accordance with the vehicle register. Source: Transport Analysis/SCB.

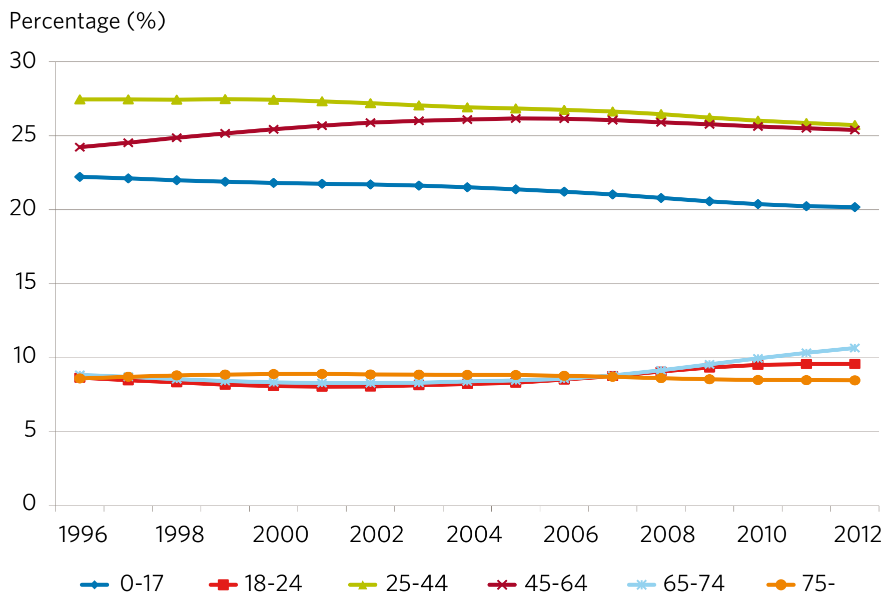
[9] Moped class II is not registered.

The composition of the population in terms of gender, age, education and other characteristics largely determines the structure of different modes of transport which in turn affect road safety.

The risk of fatality varies for different age groups. In addition to people of different ages choosing different modes of transport, risk is also affected by behaviours (how large risks you take on the road) and the physical ability to, for example, cope with a collision. A study by the agency Transport Analysis (2011) states that the group which clearly has the highest risk of fatality is those aged above 75. Risk in this context refers to the number of fatalities in relation to the distance travelled on roads. All vehicle types are included, even pedestrians and cyclists. The high risk for the 75+ age group depends on, among other things, the fact that they are more fragile if an accident occurs and that often they move as unprotected road users. The age group 18 to 24 comes next, and here in the first instance men account for the high risk. The group with least risk of a fatality in a road accident is children between the age 7 to 14, followed by the groups 45–64 years and 25–44 years.

Naturally, the size and share of population of different age groups change very slowly over time. Figure 9 shows the trend between 1996 and 2012. In total the number of inhabitants increased by approximately 8% during the period. The percentage of people above 75 has been stable between 8% and 9%, while the group 65–74 has increased with a few percentage points. The percentage of persons between 18 and 24 has also increased during the period, while the groups 0–17 and 25–44 have declined.

Population forecasts by SCB show that the percentage of people above the age of 75 will increase up to 2020, which indicates a higher number of road fatalities. However the group 18–24 will decrease, which may compensate slightly for the greater percentage of elderly.



Figur 9. *Befolkningens åldersfördelning, 1996–2012. Källa: SCB.*

Experiences from several countries indicate that there is a link between the number of traffic fatalities and economic development, where an economic slowdown is often followed by a reduction in traffic fatalities (Wiklund et al., 2011, chapter 2). To a certain extent the link may depend on lower travelling during a recession, but this is not the complete explanation.

There are several hypotheses on the link between the economy and road safety, most of which relate to changes in travelling patterns. There are probably several different effects which can impact road safety in different directions, so it is very difficult to investigate the causation.

As a measure of economic development in this context, the size of unemployment is often used. Figure 10 shows statistics of the Swedish Public Employment Service on the percentage of people who are openly unemployed or participate in programmes with activity support. The change between 2011 and 2012 is relatively small; there has been an increase of approximately 0.2 percentage points. During the period as a whole, 1996–2012, unemployment has varied quite a lot. It was lowest in 2007 and 2008 and then increased relatively strongly in 2009. It has then remained at quite a high level. This may have contributed to the relatively low traffic fatalities over recent years. However, you should remember that unemployment is one of many factors which are important for fatality figures, and there is also a large random variation between the years which affects the actual result.

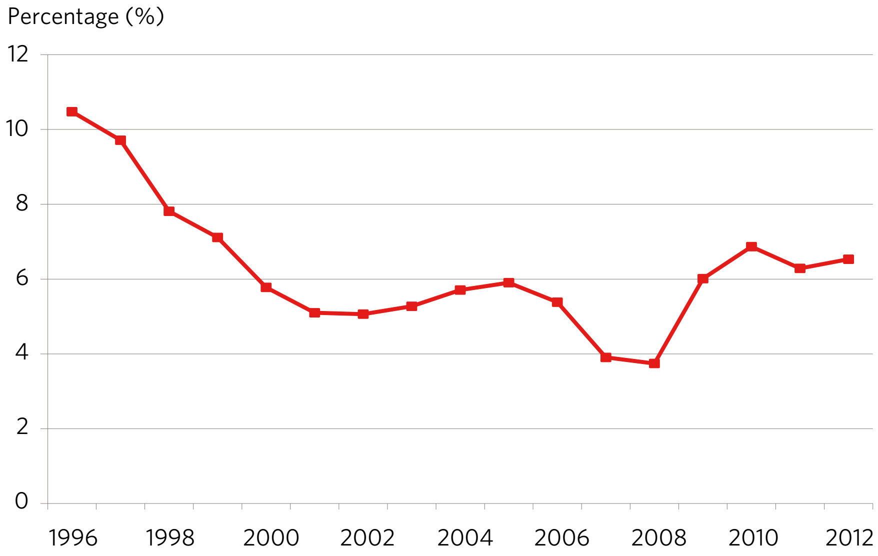


Figure 10. *Total unemployment (open unemployment plus participants in programmes, percentage of the population), 1996-2012. Source: The Swedish Public Employment Service (www.arbetsformedlingen.se).*

The weather can have a large effect on the traffic during quite short periods and in limited places, for example, during temporary downpour or slippery conditions. It is however very difficult to investigate the magnitude of the impact such temporary and local weather phenomena have on road safety, and how much they impact the national statistics. However, when it comes to the winter season it has been observed that winter road conditions and low temperatures mean reduced traffic and lower speeds. Winters with heavy snowfall mean large amounts of snow along the roadside, which leads to fewer serious single-vehicle accidents. If you study snow depth maps of the Swedish Meteorological and Hydrological Institute (SMHI), you can see that 2010 and 2011 had heavy snowfall, while the amount of snowfall was at a more normal level during 2012. There is no reason to believe that the winter weather of 2012 has affected road safety in any special direction.

4 Follow-up of road safety performance indicators

4.1 Compliance with speed limits – national road network

	2004	2012	Target year 2020	Estimated trend towards target
Percentage of traffic volume within speed limits, national road network	43%	46%	80%	Not in line with required trend
Average journey speed (km/h)	82 km/h	78 km/h	77 km/h	In line with the required trend

The target is for 80% of traffic volume to take place within the legal speed limits by 2020.The target for average journey speed was equivalent to a decline by 5 km/h when the indicator was developed (2007). Reduced speed is deemed to be among the indicators which have the greatest potential to reduce the number of fatalities.

Performing nationwide measurements of speeds levels is very resource-demanding. In 2012 the Swedish Transport Administration conducted one of the three measurements planned for 2020. The latest measurement before 2012 was conducted in 2004.

4.1.1 Trends towards the 2020 target

Figure 11 presents the observed level of percentage of traffic volume within the speed limit on the national road network. The percentage of traffic volume within the permitted speed in 2012 was 46% for national roads. The corresponding result for 2004 was 43%, which shows that the percentage who comply with the legal speed limit has increased by approximately 3 percentage points. Despite the improvement, the outcome is 14 percentage points below the required trend for attaining the target.

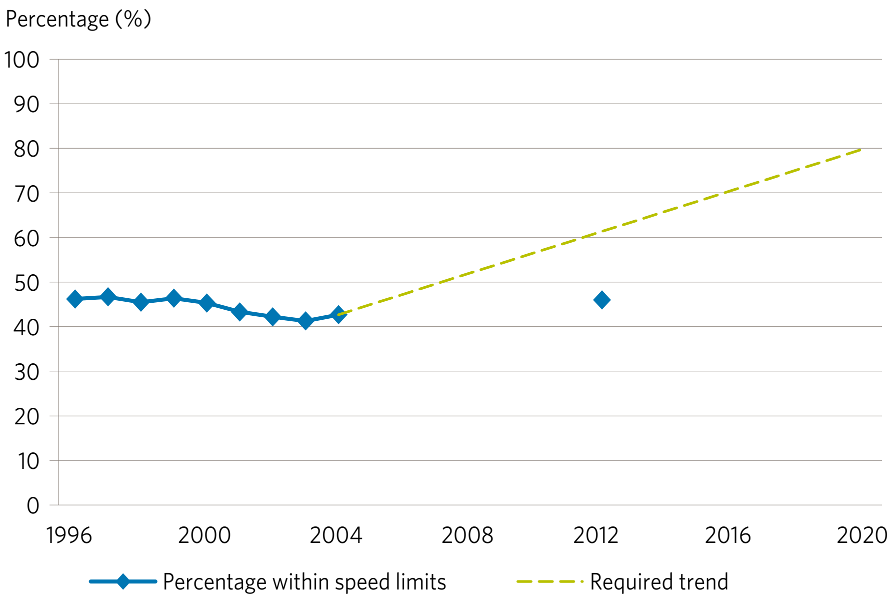


Figure 11. *The percentage of the traffic volume travelling within the speed limit on national road network, 1996–2004 and 2012, and required trend to 2020. Source: The Swedish Transport Administration*

The average speed has declined from 82 to 78 km/h (target 77 km/h) since 2004. This corresponds to a decline of approximately 5%, which is better than the required trend.

4.1.2 Analysis and discussion

The percentage of traffic within the legal speed limit has increased consistently between 2004 and 2012, except among motorcycles where the level has decreased by 6%. Heavy lorries are the vehicle class with the lowest percentage of traffic volume within the legal speed limit, taking into account that the legal maximum speed of lorries is 80 km/h. Therefore, for lorries everything above 80 km/h constitutes a violation for speeds above 80 km/h.

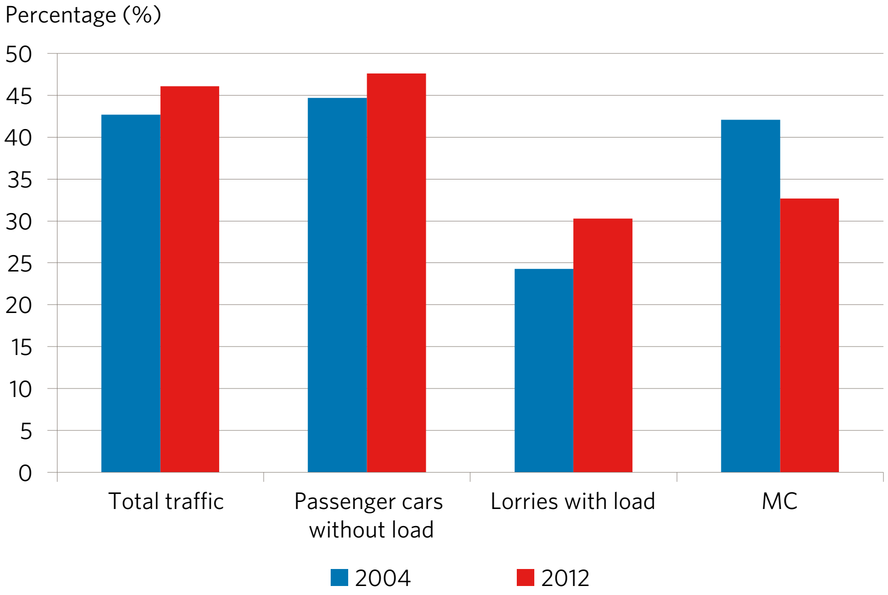


Figure 12. *Percentage of traffic volume within permitted speed limit on national road network divided by type of vehicle, 2004 and 2012. Source: The Swedish Transport Administration*

The measurement results show that few heavy lorries drive within the legal maximum speed of 80 km/h on roads with speed limits above 80 km/h – from 38% on the 90 km/h roads which do not have median barriers yet, to only 9% on 120 km/h roads. It is also here that most heavy lorries are driven, which is why heavy lorries with load have the lowest percentage within the permitted speed limit. Motorcyclists mainly drive faster than passenger cars within the lower speed limits. It is also on that part of the road network that the largest percentage of motorcycle traffic can be found. As a result of the heavier motorcycle traffic in the lower speed classes, the weighted average journey speed is lowest for motorcycles, 76.7 km/h compared to 78.5 km/h and 78.3 km/h for passenger cars and lorries respectively.

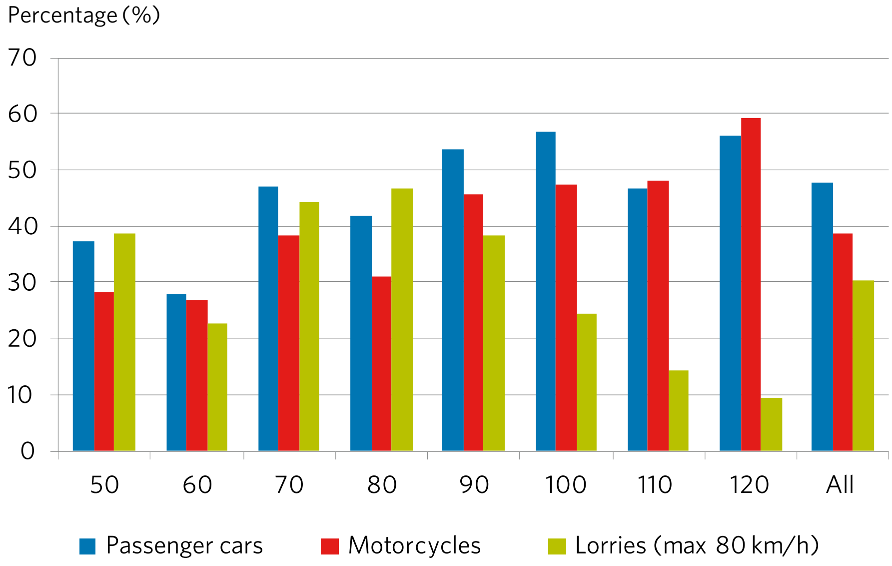


Figure 13. *Percentage of traffic volume within permitted speed limit on national road network divided by speed limit and type of vehicle, 2012.*

Drivers who knowingly drive at speeds clearly above the current speed limits constitute a significant part of the problem view of fatalities, particularly among motorcyclists where approximately a third were at more than 30 km/h above and for another third the speed has been between 10 km/h and 30 km/h above the speed limit. The speed measurement shows that approximately 2% of the passenger cars have driven more than 30 km/h too fast, the corresponding figure for motorcyclists was almost 8%. It is thus clear that the road users who drive the fastest are over represented in fatalities.

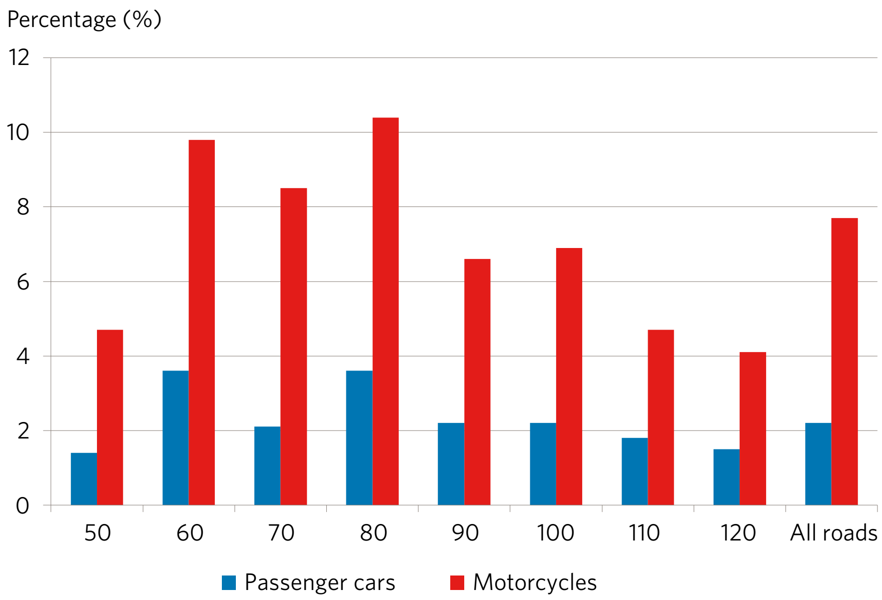


Figure 14. *Percentage of traffic volume conducted more than 30 km/h above the permitted speed limit among passenger cars and motorcycles within different speed classes, national road network, 2012. Source: The Swedish Transport Administration*

Since 2004 the Swedish Transport Administration has made extensive changes to speed limits on the national road network. However estimates show that the average speed limit in relation to traffic volume (kilometres driven) has not changed. The large amount of 90 km/h roads which were lowered to 80 km/h are weighted upwards by the fact that roads with heavy traffic have got median barriers and a speed limit of 100 km/h. It is generally the case that the lower the speed limit, the greater the violations. Road users also find it most difficult to comply with the legal speed limit within the new speed classes 60 km/h and 80 km/h which were introduced after 2004. This is a part of the explanation for why the percentage within speed limit is not in line with the required trend.

The reduced average speed from 82 km/h to 78 km/h cannot be explained by changed speed limits as the average speed limit is largely unchanged. In this context reduced speeds are deemed to be a result of better driving methods, where automatic speed control with speed cameras has also been very important. The measurements show that the average speed has declined by approximately 4% for the roughly 3,000 km equipped with speed cameras. An assessment is also that speed cameras have had spill-over effects on the rest of the road network. Speed violations reported by the Police through manual supervision have been unchanged since 2004. Increased fines have also been added since the latest speed measurement in 2004.

Even though the measurement results from the speed investigation in 2012 reveal lower speeds which are in line with the required trend, we still have a long way to go for compliance with the target of 80% in 2020. For the tougher EU target of maximum 133 fatalities in 2020, high compliance with the speed limits is even more decisive – especially as speed is very important for optimising the effect of other safety systems. Speed limits weighted based on the road's safety standard and vehicle's safety system entail overlapping system benefits, which has been the starting point of the speed revisions of recent years. Speed cameras are assessed as being the most important tool for attaining a high level of compliance with speed limits. Greater use of speed cameras on the national road network is particularly important on 80 km/h roads, where compliance of speed limits is currently low and 80 km/h is the highest speed limit where there are no median barriers. New and greater use on the municipal road network is also required, particularly on the 40 km/h and 60 km/h roads. It is also important to support correct behaviour among drivers by stimulating the introduction of Intelligent Speed Adaptation (ISA) in vehicles by, among other things, new insurance solutions. The introduction of ISA as a part of Euro NCAP's safety classification of vehicles will also be important.

4.2 Compliance with speed limits – municipal road network

	2012	2011	Target year 2020	Estimated trend towards target
Percentage of traffic volume within speed limits, municipal road network	63*%	63%	80%	Starting year for the measurement – the trend cannot be assessed

*Starting year for the measurements. The measurements are not nationwide but are assessed as being of an adequate quality to allow follow-up of the change over time.

The target is for 80% of traffic volume to take place within the legal speed limits by 2020. Greater compliance with speed limits and lower speeds are assessed as having a large potential for decreasing the number of road fatalities. Similar to the national road network, speed is many times a prerequisite for attaining the full impact of other measures. When speed is adjusted based on the road's safety standard and the vehicle's safety system, the road safety effects of the different measures are optimised.

The speeds on the municipal road network were last measured in 2003 in the same extensive and resource-demanding measurement as for the national road network. In the major speed investigation of 2012 only national roads were included. A new series of measurements of speeds on the municipal road network was initiated in 2012 as a basis for monitoring the change in percentage of traffic volume within the speed limit and average journey speed. The measurement series is based on measurements of 3 measurement locations in each of the 23 districts, see Vadeby and Anund (2013). Only the municipal main road network and streets with speed limits between 40 km/h and 70 km/h were studied. The intention is for the speed to be measured annually at the same points and during the same time period. The measurements do not aim to estimate the total level of percentage of traffic volume within the speed limit in Sweden in a representative manner, but they are assessed as being of an adequate quality to allow follow-up of the change over time and provide an approximate level.

4.2.1 Trends towards the 2020 target

Figure 15 shows the percentage of traffic volume within the speed limit on the municipal road network in 2012 according to the measurements. The results show that 63% of the traffic volume takes place within the legal speed limit. As 2012 is the starting year for the measurements, there is no basis to assess whether the trend is moving at the right pace.

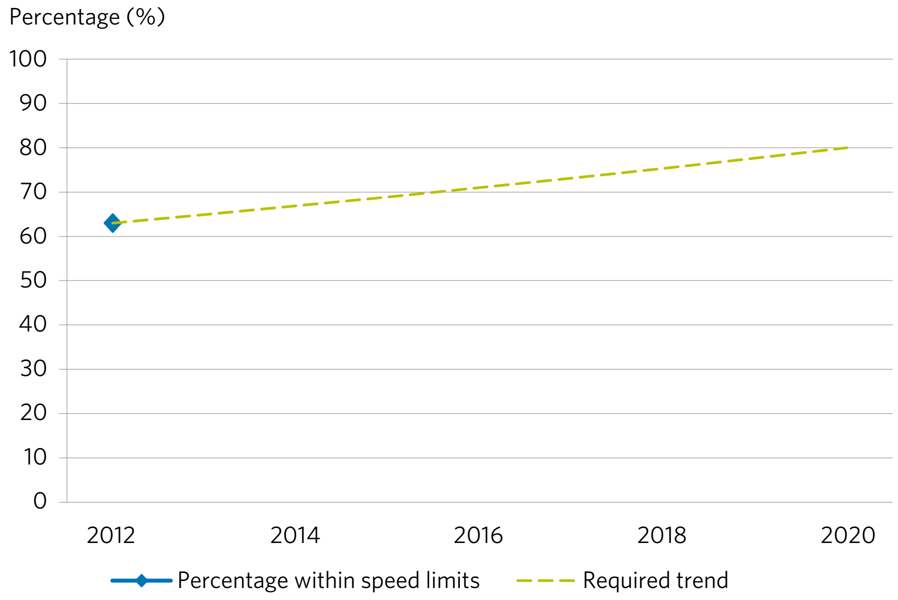


Figure 15. *The percentage of traffic volume within the speed limit on the municipal road network in 2012, and required trend to 2020. Source: NTF and VTI.*

4.2.2 Analysis and discussion

Figure 16 shows the results from the measurements in 2012 divided by speed limit and vehicle type. With the measurement method which is used, it is not possible to distinguish between motorcycles and mopeds, and they end up in the same group. As the group contains vehicles with different speed limits, it is not possible to interpret the significance of the percentage who comply with the displayed speed limit. Therefore these results are not presented. However, motorcycles and mopeds are included in the total estimates. In total for all the speed limits, 92% of the vehicles are passenger cars, 2% mopeds and motorcycles, 4% lorries and buses and 1% lorries with load. On roads where the speed limit is 40 km/h, 53% of the traffic drives within the legal speed limit. On roads where the speed limit is 50 km/h, 59% comply with the speed limit, at 60 km/h it is 63% and at 70 km/h it is 79%. Thus, the compliance of speed limits is highest on roads with a speed limit of 70 km/h and lowest on roads with a speed limit of 40 km/h. The compliance is also slightly better during the daytime. Then 64% of the traffic in total drives within the legal speed limit, while the corresponding share during the night is 58%.

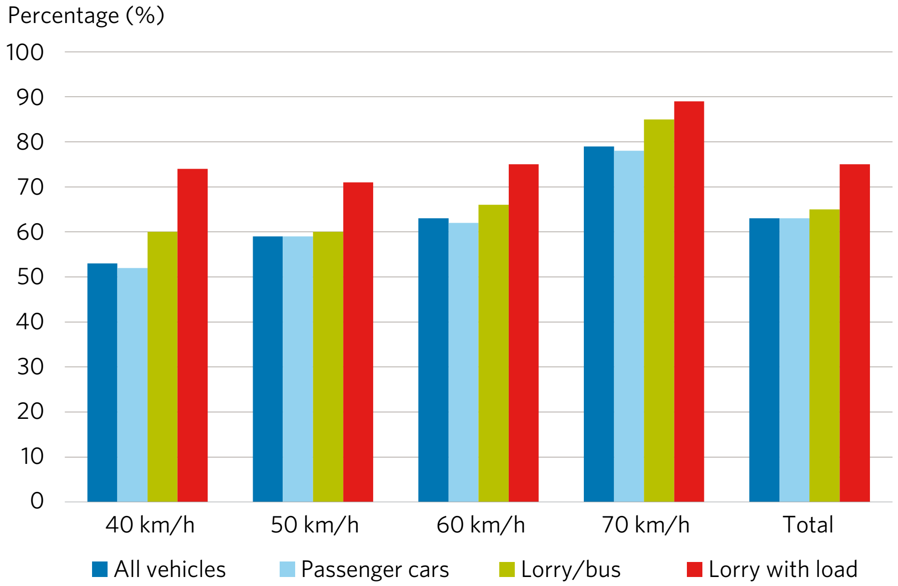


Figure 16. *The percentage of traffic volume within the speed limit on the municipal road network in 2012, divided by type of vehicle and speed limit. Source: NTF and VTI.*

The average speed on the studied road network is 49.8 km/h. On roads where the speed limit is 40 km/h the journey speed is 39.0 km/h, with speed limit 50 km/h it is 47.0 km/h, with speed limit 60 km/h it is 55.7 km/h and on roads with speed limit 70 km/h it is 61.0 km/h. You can say that there is a pretty large distribution between the speed levels for the different points. This is natural in urban areas, as there are many other factors than the speed limit which affect the road users' choice of speed, for example, the frequency of crossings, road width, presence of street parking and sidewalks.

During the previous national speed measurements on the municipal road network in 2003 (Andersson, 2004), 52% of the traffic volume was within the legal speed limit. The speed levels had the same size as the results from 2012, and the average journey speed on the municipal road network was barely 50 km/h. These studies were significantly more comprehensive than the measurements which started in 2012, and accordingly they are not directly comparable.

Since 2008 a national speed review has been ongoing and based on this new speed limits have been imposed in several urban areas. According to the national evaluation of the new speed limit system (the Swedish Transport Administration, 2012), 26% of the country's municipalities had started changing the signs at the turn of 2011/2012. In the evaluation, changes in the average speed on roads in urban areas which had lowered their speed limit from 50 km/h to 40 km/h were studied, as well as increased speed limit from 50 km/h to 60 km/h. The results showed that the average speed declined by roughly 2 km/h on roads where the speed limit was lowered from 50 km/h to 40 km/h, and after the reduction the average speed was approximately 38 km/h. On roads which got increased speed limit from 50 km/h to 60 km/h, the average speed increased by 1.5 km/h, and the average speed after the change was approximately 54 km/h. The evaluation report recommended that the new basic speed within urban areas should be 40 km/h and that all roads where the speed limits were not reviewed earlier should be reviewed in a major speed review within a five year period. In December 2012 the Directive for long-term infrastructure planning stated (the Ministry of Enterprise, Energy and Communications, 2012) that at present further long-term reforms of the speed limit system are not suitable, which is interpreted as that new basic speeds are not suitable.

The Swedish Transport Administration's road safety survey of 2012 shows that approximately 60% (and significantly more women than men) of the respondents generally think that it is reasonable to lower the speed limit for increasing road safety. At the same time, two of three men and more than one in every two women are of the opinion that it is more important to comply with the flow of the traffic than the speed limits. Almost 70% believe that it has become more difficult to keep track of which speed limit applies after more speed limits have been introduced.

In order to attain the target of 80% of road users complying with the legal speed limit on the municipal road network by 2020, it is primarily the compliance with speed limits on roads with lower speed limits which needs to be improved. Compliance with speed limits often deteriorates initially when new lower speed limits are introduced. More roads in urban areas need to be designed so that they become more "self-explanatory" so that it becomes natural for road users to comply with the displayed speed limit. Folksam (Stigson et al., 2012) has conducted a trial in which Intelligent Speed Adaptation (ISA) was combined with a financial incentive through the insurance premium. In that study almost half of the drivers thought that it is most difficult to stick to the speed on roads with speed limit 30 km/h or 40 km/h. The trial showed that those who were a part of the trial got better compliance with speed limits; speed violations more than halved in the test group compared to the control group. In order to support drivers to maintain the correct speed, Euro NCAP gives points for ISA in cars as of 2013 (Schram et al., 2013). Even new and extended use of speed cameras on the municipal road network can increase compliance with speed limits.

4.3 Sober traffic

	2007	2012	Target year 2020	Estimated trend towards target
Percentage of traffic volume with sober drivers	99,71%	99,77%	99,90%	In line with the required trend

The target for sobriety on the roads is for 99.9% of the traffic volume to have sober drivers by 2020. A sober driver is defined as a driver with a blood alcohol count of less than 0.2 per thousand.

As a basis for monitoring trends, a measurement series based on data from police control activities is used (Forsman, 2011). The measurement series shows drink driving trends, and not the actual level. The surveillance methods of the police influence how large a share of the breath tests are positive. For that reason, the measurement series is based on data from what are known as fixed checkpoints, where the measurement location has not been chosen because a large proportion of drink drivers are expected to pass there. Nonetheless, even with fixed checkpoints there are choices involved, both of the location and of which drivers are stopped, so a certain degree of influence cannot be excluded.

The report "Management by Objectives for Road Safety Work" (the Swedish Road Administration, 2008) states that the definition of a sober driver also includes being free of drugs other than alcohol. In the data that forms the basis of the measurement series there is no information on the occurrence of drugs; it refers only to sobriety with regard to alcohol.

4.3.1 Trends towards the 2020 target

Results from the measurement series based on police checks show that the percentage of sober traffic has increased by approximately 0.03% between 2011 and 2012. This means that the positive trend which has been ongoing since the start year for the measurement series in 2007 is continuing, see figure 17. The percentage of sober drivers has increased from 99.71% in 2007 to 99.77% in 2012. The positive trend between 2011 and 2012 largely depends on that the percentage of drink drivers in the checks of the police has declined in the three metropolitan counties, Stockholm County, Västra Götaland County and Skåne County. The results for 2012 are largely on the curve for the required trend and the analysis group therefore assesses that the trend is adequately fast for attaining the 2020 target.

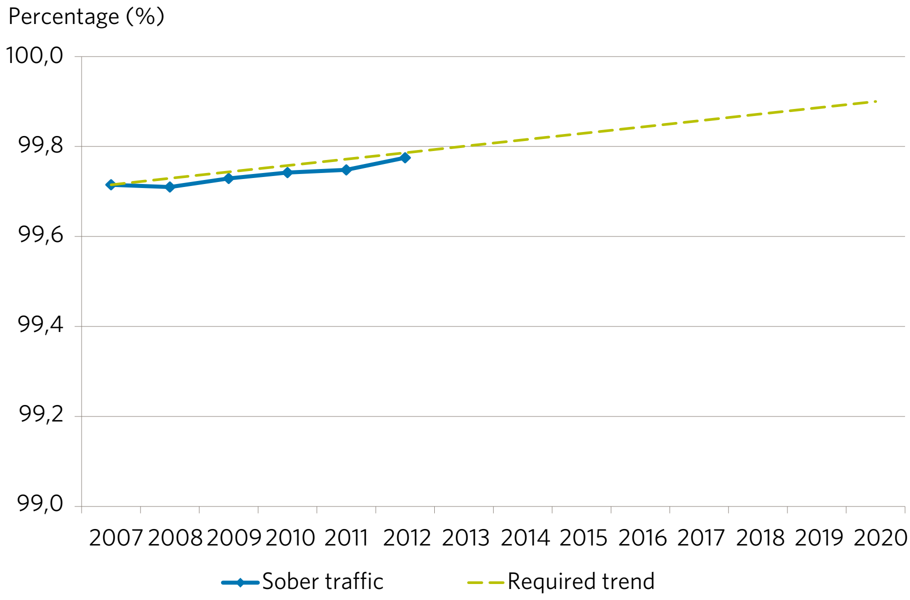
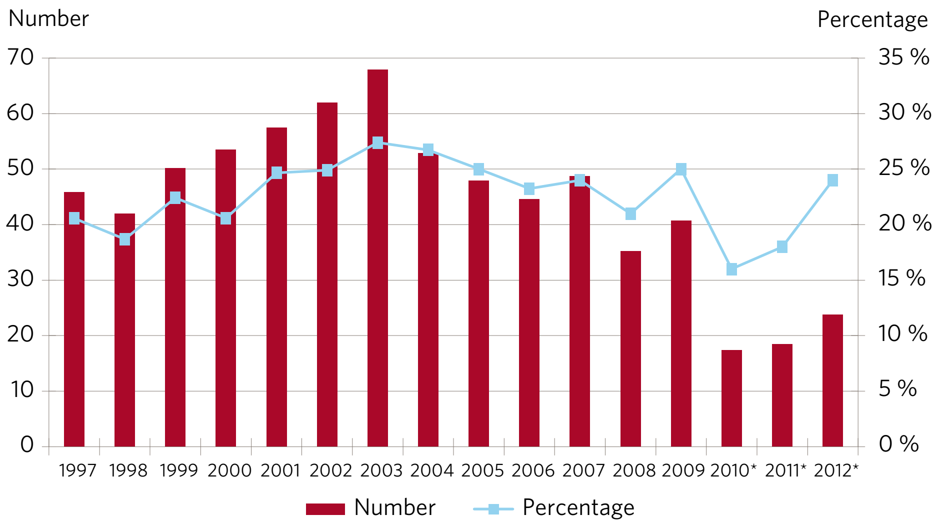


Figure 17. *Percentage of sober traffic and required trend to 2020. Measurement series based on data from the police's checks. Source: RPS, VTI.*

4.3.2 Analysis and discussion

The Swedish Transport Administration's in-depth studies of fatal accidents show that 24% of the passenger car drivers were under the influence of alcohol (blood alcohol count of more than 0.2 per thousand) in 2012. This is an increase from 2011, when the figure was 18%. There is however a large random variation from year to year in this data, and the change between 2011 and 2012 is not statistically significant. Therefore, it is important to continue monitoring the trend to see whether this is a break in the trend. Since 2007 the percentage has largely been between 20% and 25%. This means that when the number of fatalities in total has declined, the number of fatalities related to the influence of alcohol has also declined.



*excluding suicides as of 2010.

Figure 18. *The percentage of passenger car drivers under the influence of alcohol killed among all fatalities and the number of passenger car drivers under the influence of alcohol killed (alcohol > 0.2 per thousand), 1997–2012. Source: The Swedish Transport Administration's in-depth studies*

A summary of killed drivers during 2012 who were driving other motor vehicles than passenger cars shows that alcohol (blood alcohol content ≥ 0.2) was found in 6 of 32 (19%) killed motorcyclists and 2 of 8 (25%) killed moped riders and that none of the total 13 killed drivers of light or heavy lorries had alcohol in the body. Of all the fatalities between 2009-2011, at least 56 people on average were killed per year in alcohol-related accidents where at least one motor vehicle driver was under the influence of alcohol.

During 2012 in the Swedish Transport Administration's road safety survey 5% answered 'yes' to the question: "Have you at any time during the past 12 months driven a car after drinking other alcohol than low-alcohol beer?". This is an increase of 1.2% from 2011 when the percentage was very low. However, the result of 2012 is the second lowest since the measurements started in 1981.

Even if the indicator develops satisfactorily it is important to continue the work against drink driving in order to attain the 2020 target.

Police surveillance forms an important part of the fundamental work against drink driving. Since 2010 the number of tests has decreased; 2.6 million tests were done in 2010 compared to 2.4 million in 2011 and 2.3 million in 2012 (RPS, 2011 and 2012). A relatively large number of tests are still done from a historic perspective, but it is important to monitor the trend in the future. Even the number of reported drink driving offences has declined over recent years. Between 2011 and 2012 the reduction was quite large, approximately 10%[10].

There are currently two programs which aim to prevent recurrence of drink driving: Partnership against alcohol and drugs on the roads (Samverkan mot alkohol och droger i trafiken, SMADIT), and alcolocks for drink driving. SMADIT is based on offering everyone suspected of drink driving prompt contact with the social services or addiction treatment for help with any alcohol or drug problems. Alcolocks for drink driving allow people who would otherwise have their driving licence suspended due to a drink driving offence to keep it on condition that they install an alcolock. These programmes are parallel, but coordination between them would allow a better impact. According to conclusions by Willis et al., (2009) there are results to indicate that alcolock programmes combined with treatment result in a lower risk of recurrence.

In terms of alcolocks, a system which avoids using the mouthpiece is being developed. Instead sensors are integrated in the vehicle and alcohol in the exhalation air is detected through targeted exhalation or possibly completely passively. The new technology also has the potential to become significantly more user-friendly than the current technology, as the need for service will reduce considerably and the heating duration will also reduce. In the long-term the new system can facilitate technology which promotes sobriety having a wider impact on our vehicles. However, it will not be possible to implement this to a large extent by 2020.

The extent of driving under the influence of other drugs than alcohol has not been followed up over time. Data from 2005–2010 reveals that approximately 7% of the killed motor vehicle drivers had illegal drugs in the body (the Swedish Transport Administration, 2012).

[10] Data from the website of the Swedish National Council for Crime Prevention (Brå), www.bra.se. Preliminary figures for 2012. http://www.bra.se/

The EU's DRUID project has estimated the risks of driving with different types of drugs in the body (Hels et al., 2011). These estimates are based on studies of injured (MAIS 2+) and killed drivers being compared to roadside checks. Although data has been collected in several countries, the results show considerable uncertainty regarding the risk in connection with individual drugs. The authors have nevertheless made an overall assessment in which the risk of driving under the influence of a certain drug is compared with the risk of driving under the influence of a certain blood alcohol content. The risk of the different drugs refers to an average risk of the actual concentrations present among the drivers in the studies. The results indicate that cannabis is comparable to 0.1–1.5 per mille alcohol, cocaine to 0.5–0.8 per mille alcohol and amphetamine to 0.8–1.2 per mille alcohol. It is only when drugs are combined with alcohol that levels comparable to more than 1.2 per mille alcohol are obtained.

In the roadside study carried out in Sweden, 0.4% of the investigated drivers were found to have used illegal drugs (Forsman et al., 2011). However, there was a high incidence of non-response in the study (38%), so the results are uncertain.

These results suggest that drugs on the road are not as big a road safety problem as alcohol, but that it is a relatively big problem all the same. This should be borne in mind when discussing measures. As an example you can take the alcolock programme, where the rules are such that you are excluded from the programme if drugs are found in the tests which are conducted during the course of the programme. This is unfortunate, as alcohol combined with drugs is very risky from a road safety perspective. Even though these people cannot participate in the alcolock programme, it is important to capture them in some way.

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4.4 Use of seat belts

	2007	2012	Target year 2020	Estimated trend towards target
Percentage of those wearing a seat belt in the front seat of passenger cars	96%	98%	99%	In line with the required trend

The target for the use of seat belts is that 99% of all drivers and front-seat passengers in passenger cars use a seat belt by 2020. The results from the observational measurements of the Swedish National Road and Transport Research Institute (VTI) will be used as a basis for monitoring trends. The indicator is defined as the percentage wearing a seat belt out of the drivers and front-seat passengers observed (for a description of the measurements, see Larsson et al. 2011). The measurements are based on observations made at major roundabouts in six urban areas in central Sweden. The measurements are intended to monitor trends over time, and the level of use of seat belts reported should not be regarded as representative of drivers and passengers in Sweden in general.

In order to increase the spread of measurement sites we have also been monitoring, since 2009, a value in which VTI's measurements have been combined with measurements carried out by Sweden's National Society for Road Safety (NTF). Of NTF's measurement sites (municipalities), 58 were deemed suitable for inclusion in the measurement series (Henriksson, 2010).

4.4.1 Trends towards the 2020 target

The results of VTI's measurements show that use of the seat belts in the front seats of passenger cars has increased from 97% in 2011 to 98% in 2012.
This is slightly above the line for the required trend.

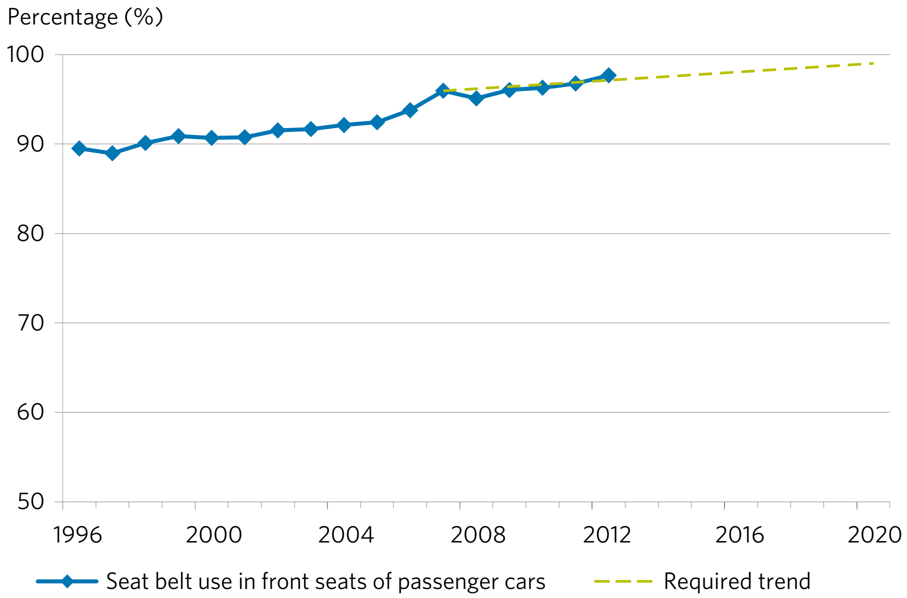
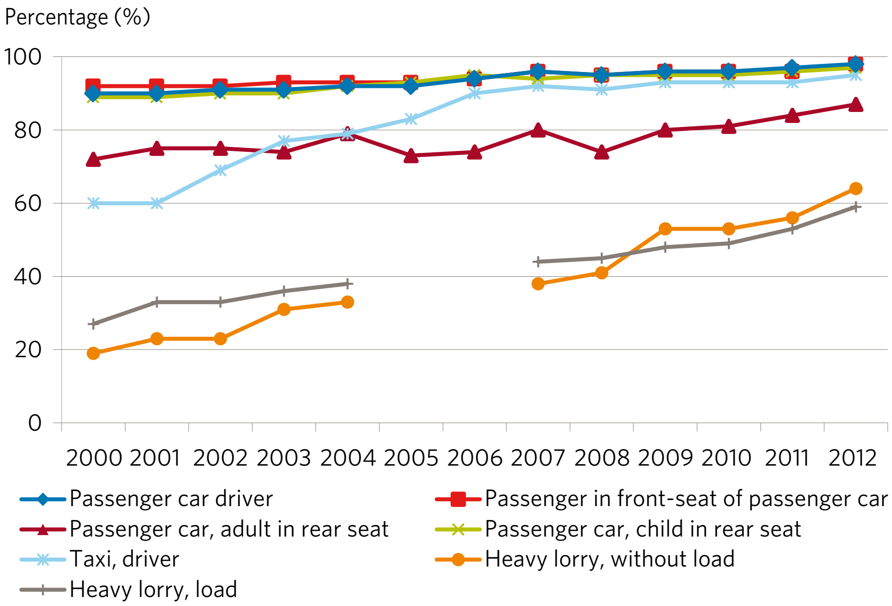


Figure 19. *The percentage of persons wearing a seat belt in the front seat of passenger cars at the time of observation 1996–2012, and required trend to 2020. Source: VTI's observation measurements.*

4.4.2 Analysis and discussion

The percentage of seat belt wearers in the front seat is high. Following a stagnation of the long-term upward trend between 2007 and 2010, the use of seat belts has increased both among drivers and passengers. Figure 20 shows that seat belt use has increased for all groups between 2011 and 2012.

Seat belt use by adults in the back seat and drivers of heavy lorries shows a strong rise over the last two years.

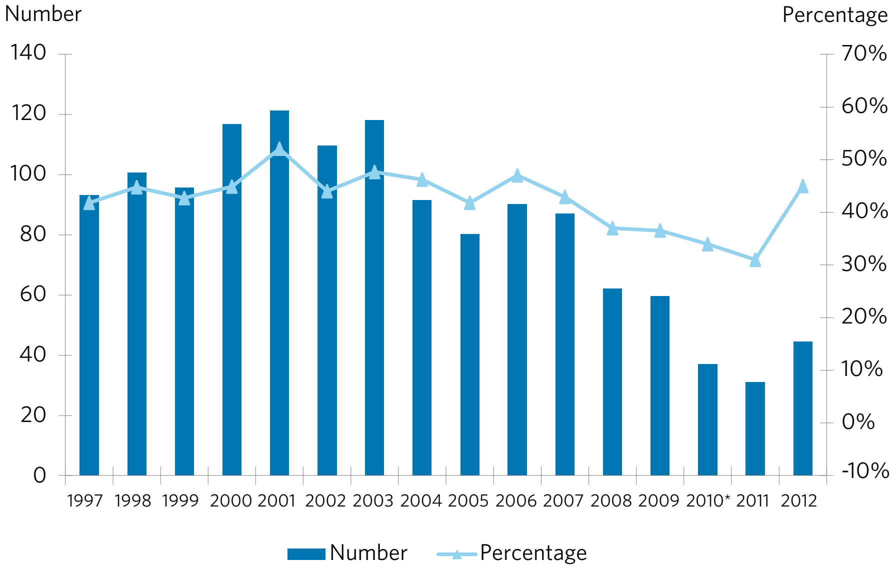


*Observationer av tunga lastbilar från 2007 och framåt är inte helt jämförbara med tidigare observationer.

Figure 20. *The use of seat belts in passenger cars and heavy lorries, 2000–2012. Source: VTI's observation measurements.*

The share of new cars with seat belt reminders continues to grow. Cars with seat belt reminders made up 60% of the traffic volume in 2012 compared to 54% in 2011. As recently as 2005, the share was barely 10%. Seat belt reminders are assessed as being a strong contributory reason for seat belt use in the front seat increasing from approximately 90% to the current 98%. An increasing number of car models also have reminders in the backseat, which can be an explanation for a clear rise in use of seat belts. Lorries are replaced relatively quickly, which indicates quicker conversion to a high percentage with seat belt reminders. Among taxis, practically 100% of the cars have reminders. The use of seat belts is ever increasing among drivers, but is still not at the approximate 100% level you would expect.

The results of the Swedish Transport Administration's in-depth studies of fatalities show a trend with a lower percentage of killed drivers of passenger cars who were not wearing a seat belt at the time of the accident However in 2012 the percentage of killed drivers who were not wearing a seat belt at the time of the accident increased strongly. In 2012 the figure was 45% and in 2011 it was 31% (see figure 21). The higher result among fatalities in 2012 is deemed to be temporary, by the observed use of seat belts indicating an ever increasing use of seat belts and by an ever increasing percentage of road users driving vehicles with seat belt reminders. As the percentage of cars with reminders increases, where measurements indicate 99% use, it is becoming increasingly important to monitor the percentage of fatalities with reminders. Until now there have been a few per year. By excluding suicide as of 2010, the percentage of those without a seat belt will be slightly lower. However, the higher number of suicides in 2012 compared to 2011 has not considerably affected the results for the percentage of those without a seat belt.



* Data for 2010 has been collected in a different fashion to previously and so the results are not fully comparable with previous values. The difference is, however, felt to be only a small one. As of 2010 suicide has been excluded.

Figure 21: The percentage of fatalities among passenger car drivers not wearing seat belts at the time of the accident of drivers known to be wearing a seat belt and the number of fatalities among passenger car drivers who were not wearing a seat belt at the time of the accident, 1997–2012. Source: The Swedish Transport Administration's in-depth studies

Not wearing a seat belt is mainly a problem exhibited by men. Previous studies show that in male fatalities on the roads, 48% were not wearing a seat belt, while the corresponding percentage for women was 24% (Svensson, 2010). When it comes to age, the percentage of fatalities not wearing a seat belt was highest in the 18–24 age group, followed by the 30–50 age group. It can also be noted that there was a considerably higher percentage of fatalities who were not wearing a seat belt among drivers and passengers under the influence (69%) than those who were sober (31%).

Forecasts suggest that the percentage of traffic volume with seat belt reminders will grow from 60% today to about 95% in 2020 (see the section on safe passenger cars). Even though 100% of the vehicle fleet will not consist of cars with seat belt reminders, it is likely that the total use of seat belts will increase from the current 98% to the 99% target of 2020. However, it is important to bear in mind that there is a very high potential among the remaining 1–2% who do not use a seat belt, which becomes clear as the use of seat belts among fatalities is only 60–70%.

Even though there has been a strong improvement among adults in the back seat and lorry drivers, the use of seat belts is relatively low. It is important to remember this as the target only covers the front seat. Analyses show that to a large extent the use of seat belts and alcohol overlap; many of those who did not use a belt in a fatal accident were also intoxicated. Therefore, measures for greater sober traffic can affect the use of seat belts in a very positive direction.

As mentioned earlier, there is also uncertainty in terms of how well the measurements reflect the true level of seat belt use throughout the Swedish road network. According to the combined observations of VTI and NTF, approximately 95% use a seat belt in the front seat of the car. That the percentage of those wearing a seat belt is lower in NTF's measurements depends partially on that you measure in many relatively small urban areas, where the use of seat belts has been shown to be low (Henriksson, 2010).

4.5 Use of helmets

	2007	2012	Target year 2020	Estimated trend towards target
Percentage of cyclists observed wearing a helmet	27%	33%	70%	Not in line with required trend
Percentage of moped riders observed wearing a helmet		96*%	99%	Starting year for the measurement – the trend cannot be assessed

*2012 is the starting year of the measurements.

The target for using cycle helmets is for 70% of cyclists to be using a helmet by 2020. The measurement used to gauge cycle helmet use is the percentage of cyclists observed wearing a cycle helmet in VTI's annual measurements (Larsson, 2011). The measurements do not intend to estimate total cycle helmet use in Sweden in a representative manner, but are good enough to provide a picture of changes over time and of the approximate level.

As well as the use of cycle helmets, the use of helmets among moped riders is also studied. In connection with VTI's measurements on use of cycle helmets in 2012, a pilot study was also conducted to estimate the use of moped helmets. It was conducted at the same locations and times as the cycle helmet observations, but at slightly fewer places in each location. The use of helmets was studied for approximately 1,100 moped riders in total (Larsson, 2012). Only those who were perceived as having the helmet properly fastened were included as helmet users. The target is for 99% of moped riders to be using a helmet by 2020. For motorcyclists, the main potential for saving lives lies in measures other than increasing the use of helmets. For this reason, this report will not analyse the use of helmets among motorcyclists further.

4.5.1 Trends towards the 2020 target

Figure 22 shows trends in the observed use of cycle helmets between 1996–2012. In 2013 the observed use of cycle helmets was 33%, which is the highest level since measurements began in 1988. This is an increase of 1% compared to 2011. In order to attain the target level of 70% by 2020, an annual increase in cycle helmet use by 7.6% is required. The figure shows the change and the required trend between 2007 and 2020. The assessment is that cycle helmet use has not increased sufficiently over the last few years for it to reach the target level of 70% use by 2020.

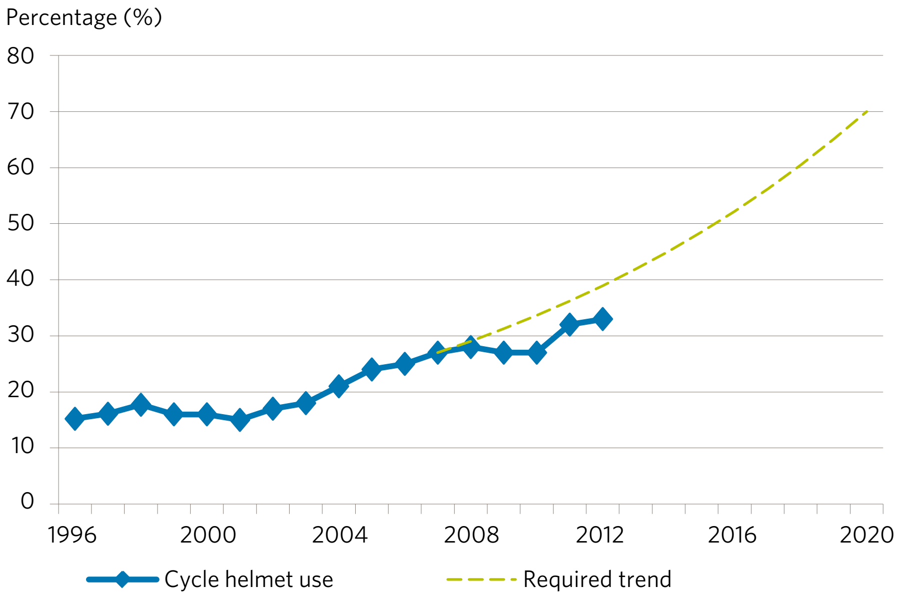


Figure 22. *The percentage of cyclists observed wearing a cycle helmet, and required trend to 2020. Source: VTI's observation measurements, 2012.*

According to observations, the use of moped helmets was 96% in 2012. Figure 23 presents the observed use of moped helmets and how the use of moped helmets needs to change between 2012 and 2020 to attain the target level of 99%. As 2012 is the starting year for the measurements, there is no basis to assess whether the trend is moving at the right pace.

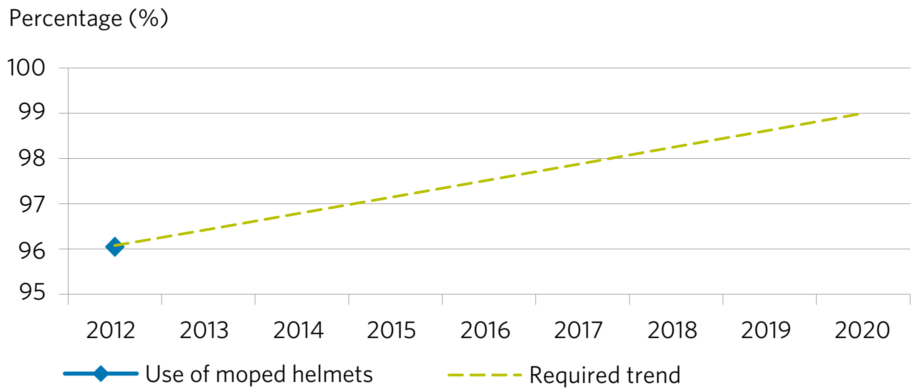


Figure 23. *The percentage of moped riders observed wearing a moped helmet, and required trend to 2020.Source: VTI's observation measurements, 2012.*

4.5.2 Analysis and discussion

Despite a positive trend for cycle helmet use in Sweden over the previous years, the level of use is rather modest, particularly among adults. There is thus considerable potential for increasing the share of cycle helmet users.

The use of cycle helmets in 2012 was 70% for children up to 10 years of age in residential areas and 59% for children aged 6–15 who cycle to and from school (see figure 24). For comprehensive school pupils at senior level, the use of helmets is 34% and, for children at the junior and intermediate stages it is 85%. For adults the use of cycle helmets is considerably lower: in 2012, it was 24% for journeys to and from work and 30% on public bicycle paths. Between 2011 and 2012 the use of cycle helmets has increased for adults on bicycle paths and for children aged 10 or below in residential areas. The use of helmets has declined at comprehensive schools. There it is the use among senior level pupils which accounts for the decline, from 45% in 2011 to 34% in 2012. The use continues to be high at the junior and intermediate stages and is 85%. At all levels in comprehensive schools, helmet use was somewhat higher among girls than boys.

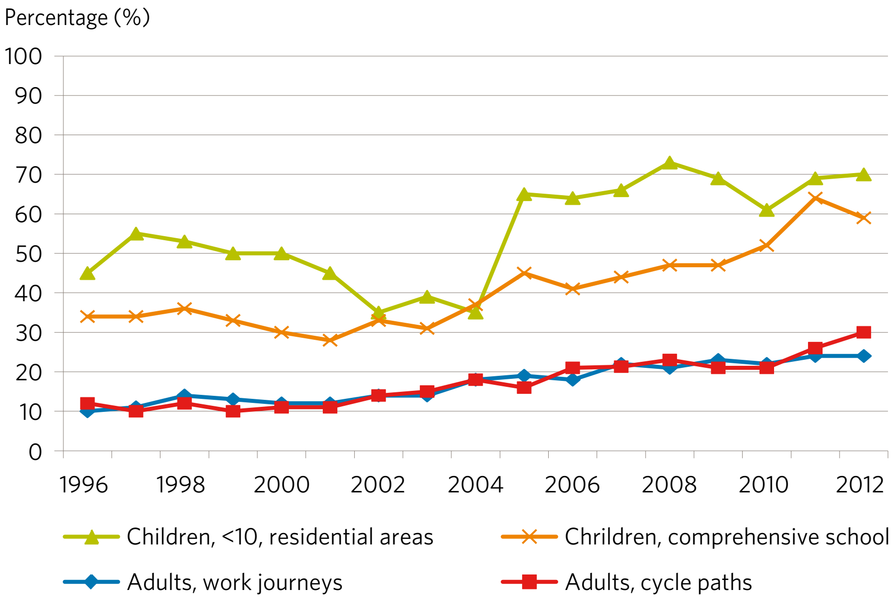


Figure 24. *The use of cycle helmets for different groups. Source: VTI's observation measurements, 2012.*

According to the Swedish Transport Administration's road safety survey for 2012, about 19% of cyclists (above 15 years of age) state that they nearly always or always use a cycle helmet when they cycle. This is a small decrease of 1% since 2011, which was the highest level since the measurements began.

Figures for 2012 show that 27 cyclists died on the roads and about 1,780 were seriously injured with more than 1% medical impairment, of which approximately 210 with more than 10% medical impairment. That is roughly a 4% decrease of those seriously injured and approximately 9% for those very seriously injured compared with 2011. Every year more than 2,500 cyclists are so seriously injured that they are hospitalised for at least 24 hours. Cyclists are the road-user category with the highest number of injured who are hospitalised for at least 24 hours.Increased cycle helmet use would, above all, contribute to a reduction in the number of injured cyclists.

Accident and injury data from single-vehicle accidents of cyclists has been studied in a new report by VTI (Niska et al., 2013). The focus was on fatalities and seriously injured (ISS 9+)[11], and data from the in-depth studies of the Swedish Transport Administration and STRADA medical care for 2007–2011 has been used. Results show that 8 of 10 cyclists who seek emergency treatment are injured in a single-vehicle accident. Of the seriously injured (ISS 9+), 7 of 10 are injured in a single-vehicle accident, and 2 of 10 killed cyclists have died in a single-vehicle accident. According to material of the in-depth study, 23 cyclists died in a single-vehicle accident during the studied five year period and of these 15 died of head injuries. According to the Swedish Transport Administration's assessment, 10 of these would have survived if the person had used a helmet. The study also shows that information on the use of helmets is missing in 20% of the cases in STRADA medical care. If you assume that the use of helmets was the same in these cases as for the rest, 80% of the cyclists who suffered at least one serious head injury had not used a cycle helmet.

Figure 25 shows the distribution of cyclists' injuries which result in medical impairment of 1% and 10% (note that one cyclist may have more than one injury). Head injuries account for approximately 40% of all injuries among cyclists who are injured very seriously, but for a clearly smaller percentage (9%) of the injuries among those with 1% medical impairment. A measure such as a cycle helmet will thus be most effective against the more serious injuries. Increased helmet use leads to a reduction in the risk of head injuries in a cycling accident. According to estimates, the use of a cycle helmet reduces the risk of a serious injury by 1% and the risk of a very serious injury by 17%. A new study reveals that using a cycle helmet can reduce the number of serious head injuries by 58% and the number of very serious head injuries by 64% (Rizzi et al., 2013).

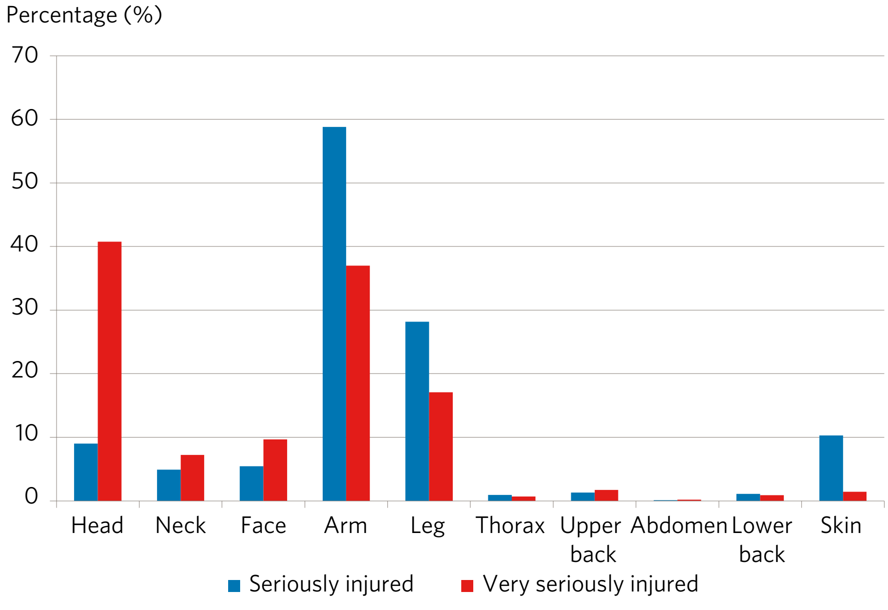


Figure 25. *Distribution of cyclists' injuries (a cyclist may have multiple injuries) by degree of disability, seriously injured (≥1%) and very seriously injured (≥10%) respectively. Source: The Swedish Transport Agency. Preliminary statistics for 2012 (retrieved on 15 March 2013).*

[11] ISS stands for "Injury Severity Score" and the value provides the probability of survival for patients with multiple injuries. ISS 9+ is classified as a seriously injured person.

In 2012, 8 moped riders died on the roads, a decrease on the 11 moped riders who died in 2011.Approximately 250 moped riders were seriously injured and roughly 30 moped riders were very seriously injured. This is a decrease from 2011 by roughly 20% for the seriously injured and by approximately 35% for the very seriously injured moped riders, which to a large extent can be explained by lower use of mopeds. Figure 26 shows the use of helmets by moped riders who were killed in accidents between 2004–2012. In that period approximately 100 moped riders were killed . More than 50% of these were not wearing a helmet or had lost their helmet during the accident. In the new joint strategy for motorcycles and mopeds drawn up in 2012, it is reported that most of those who had lost their helmet were under 18 years old (the Swedish Transport Administration 2012). If more moped riders had used a helmet or used their helmet correctly, there would have been 3 less fatalities on average per year. There is thus great potential for increasing the percentage of moped riders using their helmet correctly.

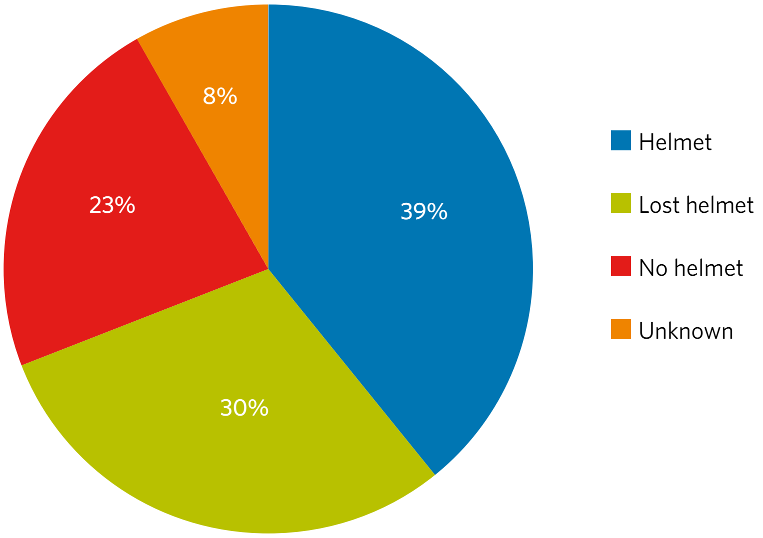


Figure 26. *Helmet use among moped riders killed during the years 2004–2012. Source: The Swedish Transport Administration's in-depth studies Preliminary statistics for 2012.*

Just as for cyclists, head injuries represent a considerably larger proportion of the injuries among those very seriously injured than among those seriously injured, approximately 30% compared to approximately 5% (note that a moped rider may have multiple injuries). Figure 27 shows the distribution of injuries and degree of medical impairment. Increased helmet use among moped riders has the potential above all to reduce the number of very seriously injured moped riders (more than 10% impairment). According to estimates, the use of a helmet reduces the risk of a serious injury by 17% and the risk of a very serious injury by 47%.

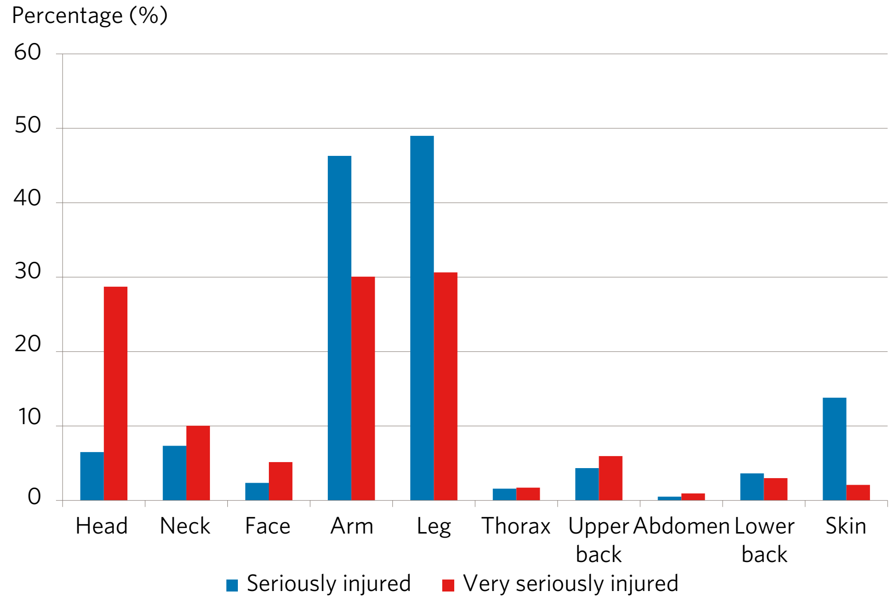


Figure 27. *Distribution of moped riders' injuries (a moped rider may have multiple injuries) by degree of disability, seriously injured (≥1%) and very seriously injured (≥10%) respectively. Source:The Swedish Transport Agency.Preliminary statistics for 2012 (retrieved on 15 March 2013).*

A priority area for action highlighted in the new strategy for mopeds and motorcycles for 2012 is increased and correct use of helmets among moped riders.The risk of a very serious injury is 67% lower for those who used a helmet compared to those who did not use a helmet.Proposed measures include traditional campaigns to influence public opinion, in which parents, schools, health care staff, the police and others can work together to increase helmet use among moped riders.A further proposal is that work approaches and methods for surveillance develop in such a manner that compliance is expected to increase.The Swedish Transport Agency will investigate the possibility of recalling driving licences and driver's certificates following a breach of the helmet provisions.In October 2009 a compulsory moped driving licence was introduced for EU mopeds.Hopefully the training for the licence will lead to increased awareness of the importance of using the helmet in the right way, and that this in turn will lead more moped riders to use their helmet correctly.

The Swedish Transport Administration's in-depth studies show that shortcomings in helmet use are a major problem in connection with fatal accidents on four-wheelers.There are several types of four-wheelers including four-wheeler motorcycles (quadracycles) for which using a helmet is a legal requirement, and all-terrain vehicles (ATVs) for which it is not necessary to wear a helmet.In addition to these types, there are also four-wheeler mopeds and unregistered 'play vehicles.' As four-wheelers are increasingly sold, the number of fatalities has started to reach the same level as for moped riders. In 2012 and 2011, 6 and 9 people respectively died on four-wheelers. In the accidents which were analysed based on in-depth study data (2010 – 2012), four people were killed on a four-wheeler motorcycle and one on a four-wheeler moped.Three of them were not wearing a helmet and all of them would have survived if they were wearing a helmet. In addition, nine people died on all-terrain vehicles which do not have a legal requirement of wearing a helmet, and two on four-wheelers where the vehicle class is unknown.It is assessed that three of them would have survived (of which one perhaps) if they were wearing a helmet. The number of newly registered four-wheeler motorcycles has increased strongly over recent years, from approximately 6,400 in 2005 to approximately 11,000 in 2012. All in all this consequently means that there are more four-wheelers than two-wheeler motorcycles and that this is an area which is important to monitor in the continued future target follow-up.

In collaboration with other actors, the Swedish Transport Administration started work during the autumn of 2012 on a strategy for safer cycling, in the same spirit as the strategy for mopeds and motorcycles. The strategy entails systematic work on the entire problem of cycle accidents, where the use of helmets is included as an important part.

The target is for the use of cycle helmets to be at 70% by 2020. The measurement results from the 2012 observational studies show that helmet use grew by about 1% to reach 33%. That is the highest observed level since measurements began in 1988. It was earlier assessed that mandatory cycle helmet legislation is required for everyone in order to attain the target of 70% helmet use. However, the Government has decided not to promote any such proposal. The analysis group's assessment is that then the target of 70% helmet use will be very difficult to attain and would like to emphasise that concrete measures are required to further increase the use of cycle helmets. In the Swedish Transport Administration's road safety survey (2012), 57% agree that it should be compulsory for everyone to use a helmet when cycling, which shows that there is relatively good support for greater use of helmets. This is the highest level observed so far, and an increase of 2% since 2011.

4.6 Safe passenger cars

	2007	2012	Target year 2020	Estimated trend towards target
Percentage of traffic volume with the highest Euro NCAP score (2007)	20%	46%	80%	In line with the desired trend

The target for safe passenger cars is for 80% of traffic volume, i.e. the number of driven kilometres on Swedish roads, to be conducted with passenger cars having the highest safety score according to Euro NCAP (2007). This means five stars in accordance with Euro NCAP's assessment system of 2007, but it entails the same level of collision safety as five stars in the current assessment system.

4.6.1 Trends towards the 2020 target

Since 1997 Euro NCAP has tested and graded the collision safety of cars. Since 2003 seat belt reminders are also included in the grading, as well as electronic stability control (ESC) since 2009. The first cars to achieve the highest safety scores, five stars in Euro NCAP, were tested and came onto the market in 2001. By the end of 2007, 66% of all new cars sold in Sweden had the highest Euro NCAP safety scores and in 2012 the percentage was 88%. This trend among new cars results in an increase in traffic volume with safe cars by approximately 5% per year. The trend is thereby moving in line with the required trend to achieve the target of 80% by 2020.

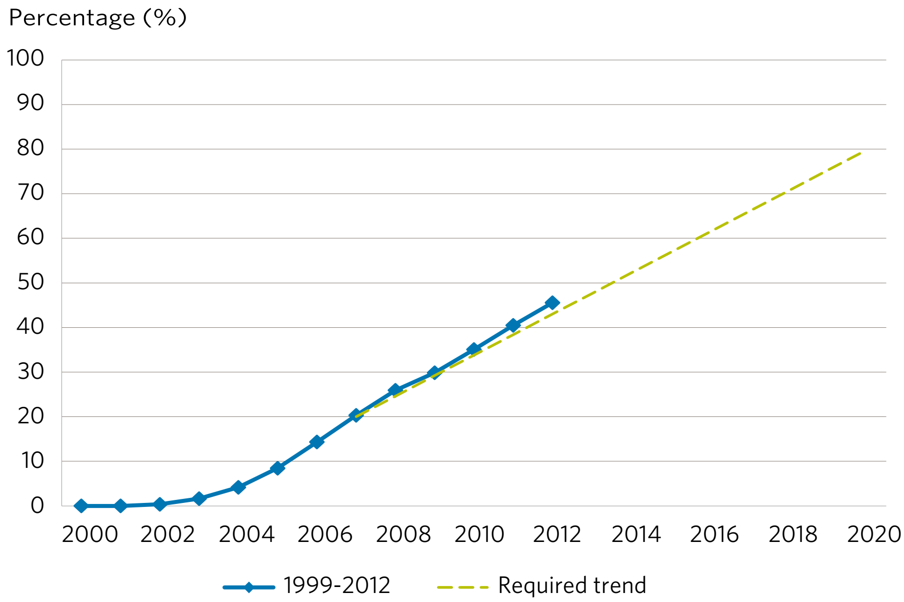


Figure 28. *Percentage of traffic volume with the highest safety scores in Euro NCAP, and required trend to 2020. Source: Bil Sweden, SCB, the Swedish Transport Administration.*

4.6.2 Analysis and discussion

As old cars are scrapped and replaced by new safer cars, the traffic volume on the Swedish roads increasingly comprises of five star cars. This trend is also accelerated by cars on average being driven more kilometres the newer they are.In general you can assume that it takes 15–20 years from a new safety system being introduced until the vast majority of cars in the Swedish vehicle population are equipped with it, provided a high introduction rate in new vehicles (see example in diagram 29). At a certain time the percentage of traffic volume tends to approach the percentage of new sales, but it can never be higher.

For example, the percentage of new cars equipped with electronic stability control was closest to 100% since 2009, and the percentage of traffic volume with electronic stability control is therefore predicted to approach 100% around 2020. However the percentage will not be exactly 100% for a long time as old cars will remain on the roads for a long time in the future. The same applies for the target of 80% of traffic volume with five star cars by 2020.If the percentage of five star cars in new sale continues to be roughly 80% or lower, the percentage of traffic volume with five star cars will asymptotically move towards 80%, thus not really get there by 2020. Euro NCAP's sample programme develops over time and covers more essential safety systems in 2012 than previous years. For example, in 2012 higher points in the pedestrian test are required compared to 2007 in order to attain five stars, even though the requirements in the collision tests for adult protection are largely the same. The trend continues and can provide valuable additions for vehicle safety, for example, systems for maintaining the course and autonomous emergency braking. It is important to monitor this trend in order to evaluate the benefit of these systems by 2020, but the benefit is expected to emerge late during the period and primarily after 2020.

However, the safety of the Swedish car fleet is not determined only by which new cars are added, but also the rate at which old cars disappear and which cars disappear. If it is difficult to increase the rate of introduction of new safe cars, it will be important to either shift existing traffic volume from old to newer cars, or scrap old cars which lack essential safety equipment such as electronic stability control or seat belt reminders, if the 2020 target is to be attained. This may be particularly important as serious accidents with passenger cars are more common among old cars (Strandroth, 2012). Consequently, despite the fact that a predominant majority of the car fleet is safe, there is a small proportion of old vehicles which account for a large proportion of the involvement in serious accidents.

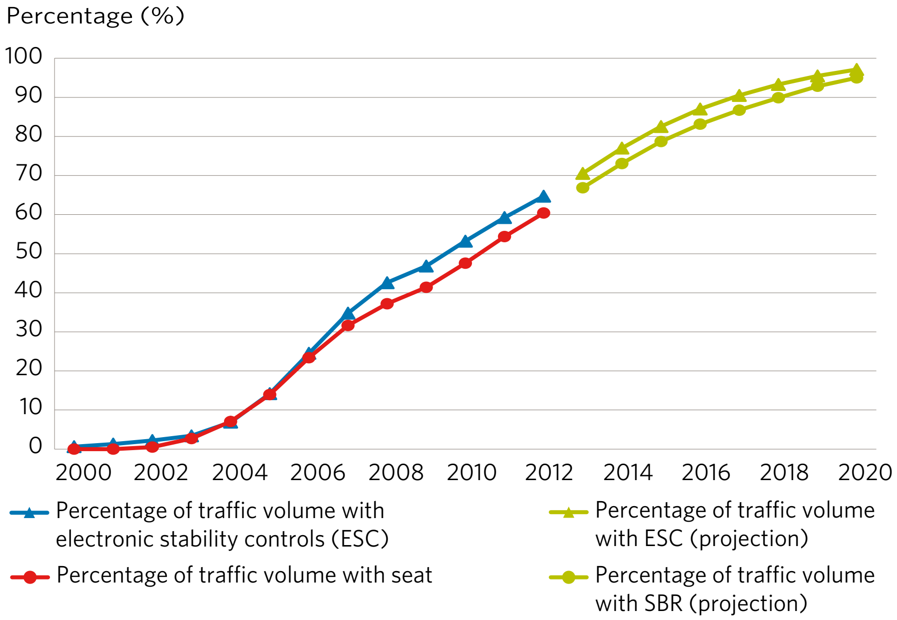


Figure 29. *Percentage of traffic volume of cars with ESC and SBR, as well as the forecast trend until 2020.Source:SCB, the Swedish Transport Administration*

4.7 Safe motorcycles (ABS)

	2007	2012	Target year 2020	Estimated trend towards target
Percentage of traffic volume of motorcycles fitted with antilock brakes (ABS)	9%	28%	70%	In line with the desired trend

The target of safe motorcycles is for 70% of traffic volume of motorcycles in 2020 to comprise of motorcycles fitted with antilock brakes (ABS).

4.7.1 Trends towards the 2020 target

According to preliminary data, the percentage of sold motorcycles with ABS in 2012 amounted to 73%, compared to approximately 30% in 2009 and approximately 60% in 2010. This resulted in a percentage of the traffic volume at 28% for 2012. Even though the current level is slightly below the required trend, the annual increase is adequate to attain the required level by 2020.

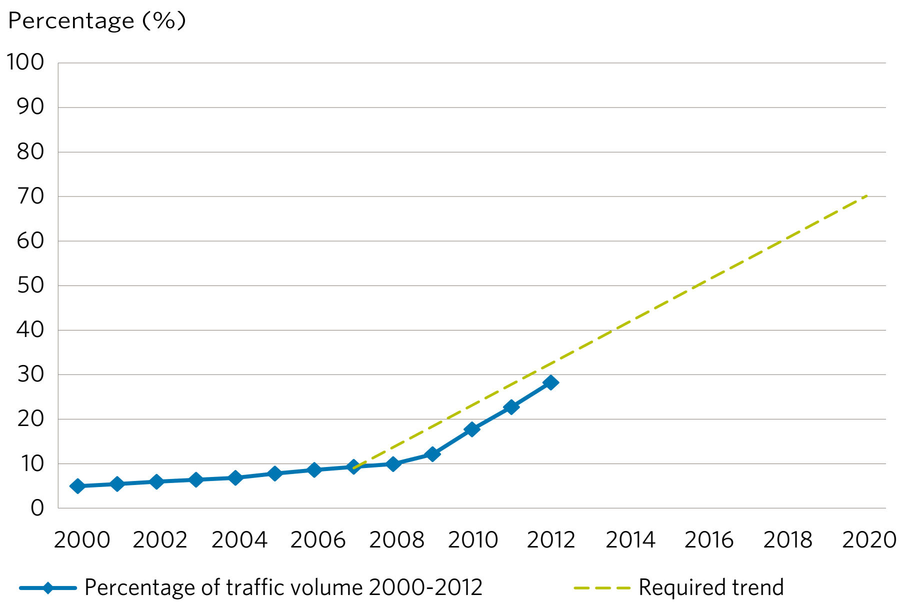


Figure 30. *Percentage of motorcycle traffic volume occurring with motorcycle equipped with ABS and required trend to 2020.Source:SCB, the Swedish Transport Administration.*

4.7.2 Analysis and discussion

There is very little scrapping of old motorcycles as their owners often keep them as a leisure interest and for pleasure trips. This means that the opportunities for increasing the percentage of traffic volume with ABS lie mainly in the addition of new motorcycles with ABS. The percentage of newly sold motorcycles with ABS has increased strongly over recent years. During the start and middle of 2000s, the percentage was 10-15%, but later increased to 30% in 2009 and then further to reach approximately 70% in 2012. From being standard on only a few models and an expensive option on others, ABS has now become standard equipment on the majority of models for most manufacturers. Now ABS is also available as standard or an option on largely all types of motorcycles, except for small off-road motorcycles, which was not the case only a few years ago. The increased proportion in new sales will probably continue over the coming years as the EU is introducing legal requirements for ABS on all new motorcycles above 125 cc as of 2016.

The fast increase in motorcycles fitted with ABS in new sales also results in a growing proportion of traffic volume with ABS. The percentage is expected to increase by approximately 5% per year, and the increase is thereby in line with the required trend for attaining the target of 70% by 2020.

4.8 Safe national roads

	2007	2012	Target year 2020	Estimated trend towards target
Percentage of traffic volume on roads with speed limit above 80 km/h with median barriers	50%	71%	75%	In line with the desired trend

The target is for at least 75% of the traffic volume on roads with speed limits above 80 km/h to be on roads with median barriers by 2020. This target can be achieved either by reducing speed limits or by adding median barriers to roads. Other measures on the national road network are primarily side barriers and central reservations with rumble strips with less frequent opportunities for overtaking.

4.8.1 Trends towards the 2020 target

The percentage of traffic volume on roads with a speed limit of more than 80 km/h with median barriers was 71% at the end of 2012. This is far above the desired trend towards the target of 75% by 2020 and is mainly due to the very widespread changes to speed limits implemented in 2009.

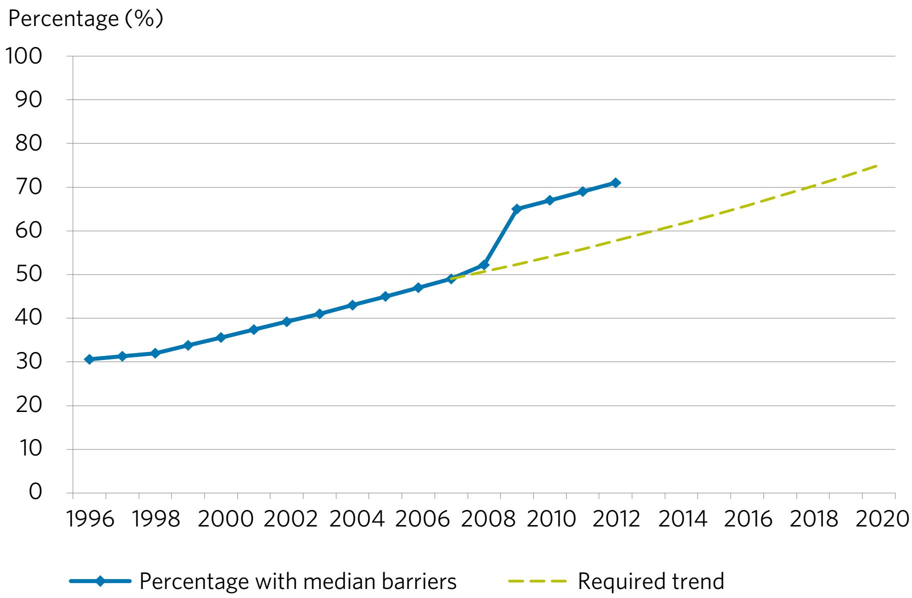


Figure 31. *Percentage of traffic volume on roads with a speed limit of more than 80 km/h with median barriers 1996–2012, and required trend to 2020. Source:The Swedish Transport Administration*

4.8.2 Analysis and discussion

Approximately 160 km of roads with median barriers have been added in 2012, of which 70 km is motorway. No widespread reduction in speed limits has been implemented. This means that the outcome for the indicator increased by two percentage points, to 71% percent, in 2012. In addition certain smaller measures have been implemented at crossings and side areas. In 2012, central rumble strips have been added to 60 km of road. At the end of 2012 there was a total of 4,840 km of roads with median barriers.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2+1 road*	68	95	113	130	151	177	195	212	233	250	259
Motorway	153	158	160	170	174	181	186	188	194	196	203
Other median-barrier	22	22	23	24	24	25	20	20	20	22	22
Median barrier, total	243	275	296	324	349	383	401	420	447	468	484
Central rumble strip	0	0	0	25	124	250	334	425	493	493	499

* 2+1 road is a specific category of three-lane road, consisting of two lanes in one direction and one lane in the other, alternating every few kilometres, and separated usually with a steel cable barrier

Roads with median barriers and central rumble strips 2002–2012, km x 10 (at year's end).

The existing target level for this indicator will most probably be attained by 2020. This is very positive and the trend of this indicator so far is also reflected in the overall statistics of the number of fatalities. Another strong reason for working on creating safe infrastructure is enabling and optimising the safety trend on the vehicle side. Many vehicle systems – both passive and active – are dependent on infrastructure maintaining a certain quality for the system to have full impact.

During the review of interim targets which was conducted in 2012 it was assessed that an increase of the indicator's target level is a prerequisite for being able to halve the number of fatalities. At the start of 2013, there are over 10,000 km of 90 km/h roads without median barriers. As many people are killed on these roads as on the 40,000 km of roads with a 70 km/h speed limit (paved roads). Consequently it is important to continue converting the existing 90 km/h roads with median barriers (and thereby increase the speed limit to 100 km/h) or lower the speed limit to 80 km/h. At the start of 2013 there were approximately 2,000 km of 90 km/h roads without median barriers and with average traffic per day of 4,000 or more.

According to the report "En konsekvensbeskrivning av åtgärder som bör övervägas för att nå reviderade etappmål" ("An impact statement of measures which should be considered for attaining the revised interim targets," the Swedish Transport Administration 2012), half of the 90 km/h roads with more than 4,000 vehicles/day (approximately 1,000 km) need to be converted to include median barriers by 2020. The report also states that the 90 km/h roads which are not a part of the conversion plans of 2025 need to be reduced to 80 km/h. The analysis group assesses that such a direction is necessary for the Swedish road safety work to be in line with the aims of the new EU target.

4.9 Safe pedestrian, cycle and moped passages in urban areas

	2007	2012	Target year 2020	Estimated trend towards target
Percentage of safe pedestrian, cycle and moped passages in urban	Approx. 25%	–	Not defined	Not measured

A pedestrian, cycle or moped (PCM) passage is classified as safe if it is grade separated or if the 85% of motorists drive at a maximum of 30 km/h across the passage. The latter is accomplished most effectively by having some form of physical speed breaker next to the crossing.

4.9.1 Trends towards the 2020 target

Only 6 municipalities report the entire data on this area in the national road database, NVDB, which is a prerequisite for the percentage of safe PCM passages to be calculated. In these municipalities, roughly 40% of passages are safe. This data was added to NVDB at the end of 2010 and in principle has not been updated since then. In 2013 work has been ongoing to establish the measurement from a much larger number of municipalities, but there is currently not more data than that presented above.

4.9.2 Analysis and discussion

The number of fatalities on the municipal road network has declined by approximately 40% over the past decade, which is the same magnitude as the reduction on the national road network. However, if you only consider the fatalities of pedestrians, cyclists and moped riders the trend is not the same, see figure 32. It is not possible to see any reduction in the number of fatalities in this group on the municipal road network, and over the last three years there have been significantly more fatalities of pedestrians, cyclists and moped riders on the municipal road network, compared to the national. This illustrates that the road safety work targeted towards unprotected road users should be intensified, especially on the municipal road network.

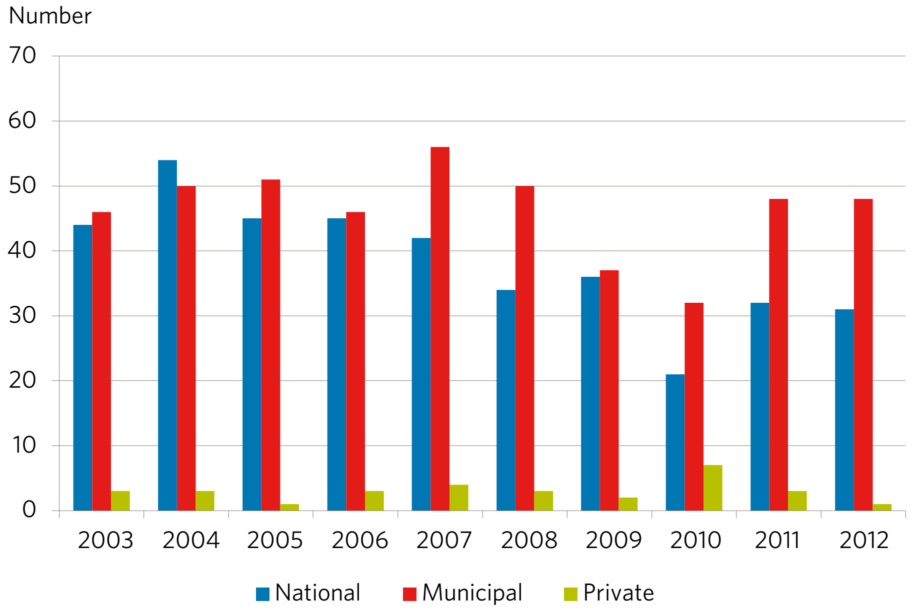


Figure 32. *Fatalities of unprotected road users (pedestrians, cyclists and moped riders) divided by maintainers of roads work, 2003–2012.Source: The Swedish Transport Administration*

According to the Swedish Transport Administration's in-depth studies of fatal accidents, just under 30 people are killed each year at PCM passages in urban areas.Of these, most are killed at crossings which are not speed managed through some form of speed limitation structure, for example, a speed breaker. It seems likely, therefore, that many of them would survive if the crossing were speed managed.However the potential of working with this indicator does not only involve reducing the number of fatalities, but also the number of seriously injured.In the review of road safety targets in 2012 (the Swedish Transport Administration, 2012), it was estimated that by moving from a PCM passage which is not speed managed to a PCM passage which is speed managed, the number of very seriously injured will reduce by 80% for cyclists and pedestrians.

In order to improve this indicator and thereby road safety in urban areas, municipalities must rise to the challenge of making safe those points in the road environment where unprotected road users are exposed to risk. Managing speeds at crossings in the car road network in urban areas has a documented accident-reducing effect (Transportekonomiskt institut, 2004). This can be done by building a grade separated crossing or implementing speed reduction measures, for example, a speed breaker next to the crossing. Other approaches include better speed adaption and lower speed levels in urban areas, principally by means of a speed review of the urban area in question. Such a review was carried out by 15% of municipalities in 2011, which means that about 25% of them have done speed reviews so far and started changing the signs at the turn of 2011/2012 (the Swedish Transport Administration, 2012).

A prerequisite for monitoring this indicator and clarifying municipalities' commitments to road safety work towards the 2020 interim targets is for municipalities to make an inventory of their crossings and report to NVDB. This should be done in accordance with "Guidance for inventories of PCM passages and speed breakers" (the Swedish Transport Administration, 2010). Currently reporting is far from satisfactory. In 2013 there have been efforts to get more municipalities to start working systematically with monitoring of this indicator, and thereby also ensure that national monitoring is more complete.

4.10 Maintenance of pedestrian and cycle paths

	2012	2012	Target year 2020	Estimated trend towards target
Percentage of municipalities with a good quality of maintenance of pedestrian and cycle paths	–	–	Not defined	Not measured

4.10.1 Trends towards the 2020 target

The definition of the indicator and measurement method are being developed, and neither target nor measurement levels have been prepared.

4.10.2 Analysis and discussion

This indicator is new following the review of the set of indicators in 2012. The reason for it now being included in the national set of indicators is that the review of 2012 showed that the management by objectives so far has not focused sufficiently on monitoring indicators which can generate fewer seriously injured. This new indicator intends to capture a large part of the many cyclists who are seriously injured in single-vehicle accidents. The potential of this indicator is that 25 accidents which result in very seriously injured (medical impairment of 10% or more) can probably be avoided if the pedestrian and cycle paths are completely free of loose gravel, holes, bumps and slippery surfaces (the Swedish Transport Administration, 2012).

A study by VTI in 2013 also illustrates that single-vehicle accidents constitute a large problem when it comes to the safety of cyclists. Of all cyclists who annually seek emergency treatment (approximately 6,500), 80% were injured in a single-vehicle accident, and of those seriously injured (approximately 400), 70% were injured in a single-vehicle accident. Of seriously injured cyclists in single-vehicle accidents, 27% can be related to operation and maintenance (primarily slippery ice and loose gravel), 20% to road design, 27% to the cyclist's interaction with the cycle (primarily getting on and off), 15% to the cyclist's behaviour and condition and 11% to the interplay with other road users. Approximately 70% of the accidents take place on the municipal road network (Niska et al., 2013).

An impact assessment between specific measures within this area and how many accidents and injuries take place is currently missing. Slipperiness or bumps at a certain location do not necessarily mean that the maintenance measures were poor.

There is currently neither any measurement method which has fully been developed for this indicator. Development work is underway in 2013 which will probably result in the indicator being monitored through an annual questionnaire survey. The decisive factor for a municipality's work being assessed as having a good quality when it comes to the maintenance of pedestrian and cycle paths is having systematic work – work which includes monitoring of the operations and which aims to prevent slipperiness and sudden obstacles on pedestrian and cycle paths.

5 Conclusions and discussion

It is estimated that 286 persons died in road traffic accidents in 2012. This is a 10% decline in the number of fatalities compared to 2011. The number of seriously injured also decreased between 2011 and 2012, from 4,500 to 4,400. Thus the results of both fatalities and seriously injured are well in line with the required trend for attaining the 2020 target.

5.1 Conclusions

Certain external factors are deemed to affect the results for 2012. Preliminary figures show that the total traffic volume in 2012 has declined by approximately 0.6% compared to 2011. The dominating group is passenger cars, which now account for about 82% of the total traffic volume on Swedish roads. The traffic volume of passenger cars increased until 2008 and has since levelled out and even declined slightly. This may be a contributory factor for the favourable trend of fatalities over recent years. In addition, the improved method for identifying suicides in road traffic has resulted in allowing the exclusion of more fatalities from the statistics on road traffic accidents, from 23 cases in 2011 to 36 verified suicides in 2012.

However, the reduced traffic and increased number of suicides in statistics does not change the analysis group's overall assessment that it appears to be possible to attain the 2020 targets. The positive trend towards the 2020 targets can primarily be explained by gradual improvements in vehicle population, infrastructure and not least lower speed levels. Both the Safe national roads and Safe vehicles indicators are improving at a sufficient rate. Developments in these areas are a good thing in themselves, but when they are combined they can strengthen each other. Speed per se plays a decisive role in the number of fatalities and injured on the road, but also interplays strongly with other indicators. The road design and car fleet's safety benefits are only optimised when they are combined with the right speed. Speed measurements on the national road network from 2012 show that the average speed declined significantly between 2004 and 2012. Despite a decline in average speeds, compliance with speed limits remains at an unacceptably low level. Even the indicators sobriety and use of seat belts, which are important for the safety trend, are assessed as moving at an adequate pace towards the targets.

However if you compare the trend so far with the targets which apply at the EU level – equivalent to a maximum of 133 fatalities in Sweden in 2020 – the number of fatalities is significantly higher than necessary. The curve for required trend for attaining the target indicates maximum 230 fatalities in 2012, compared to the outcome of 286 fatalities. Despite the very positive trend with declining average speeds, compliance of speed limits is one of the most important challenges we envisage in the future. Not even 50% of the traffic on the national road network complies with the speed limits, and the situation is even worse for heavy vehicles. For the tougher EU target, which would correspond to a maximum of 133 fatalities in 2020, good compliance of speed limits will be even more decisive – particularly as the new speed limits are set for attaining an optimal system effect of safer roads and vehicles. The analysis group also sees a risk in that the speed review which so far managed to reconcile requirements of accessibility and safety in a good manner is not continuing at the same pace as earlier.

Safe cycling has been identified as the most important area for attaining the target of seriously injured in 2020. This will become particularly important, as a strategy for greater cycling has been implemented. Municipalities need to initiate a systematic method of working, with a focus on the seriously injured. This involves focused work on getting cyclists to start wearing a helmet, but also providing infrastructure which takes into account the needs of unprotected road users. In this context national maintainers of roads work also have an important responsibility which should not be forgotten. Greater focus on injuries which result in medical impairment will allow identification of the large group of cyclists injured in single-vehicle accidents.This work starts in systematic work, based on the two common indicators safe pedestrian, cycle and moped passages and maintenance of pedestrian and cycle paths in urban areas.

5.2 Discussion

Road traffic can be seen as a complex socio-technical system where people cooperate with each other and with different forms of technology in a social and often organisational context. The system is also governed by a set of rules and regulations in many cases. Research has shown that in such a system, safety cannot be optimised by optimising the performance of the involved parts individually (for example, the human being, vehicle and road environment), as the cooperation of parts in many cases is strong but at the same time complex and difficult to predict.

This means that in the management by objectives of road safety work it is not possible to optimise effects by working with road safety indicators isolated from each other. The total effect of target fulfilment of indicators is not necessarily the same as the total of all indicators' potentials individually. This is because certain indicators relate to the same problems, which may result in double calculation of saved lives and thereby an overestimation of the road safety effects of indicators. In addition, system effects entail that certain road safety measures are a prerequisite for other measures to function, and sometimes even strengthen their effect. This can result in an underestimation of the number of saved lives if the effects are only added. Therefore, it is necessary to analyse road safety effects of the indicators based on a system perspective.

This system perspective was the basis of the review and development of new indicators and target levels in 2012. After the forecast for road safety trends up until 2020 was conducted, an analysis was performed of the gap which remained between the forecast's outcome in 2020 and the new intended halving target from 2010 to 2020. In order to assess which target levels were required for each indicator in order to attain the halving target, a number of scenarios were created with an increase in the levels of some indicators which were deemed to be able to bridge the gap between the forecast and halving target. The scenarios also took into account double counting and system effects as each potentially saved life could only be saved once.

Therefore, attaining the targets necessitates that all indicators attain their respective target level. If an indicator individually does not follow the desired trend, it can have consequences for other indicators as well. From a system perspective, the indicator which does not reach its target level can be the prerequisite for another measure or indicator functioning as intended.

In the current set of indicators "Percentage of traffic volume within speed limits" is the indicator which undoubtedly has the largest impact on other indicators. That this indicator is not in line with the required trend of 2012 also affects the benefit of indicators for safe passenger cars, safe motorcycles, use of seat belts and safe national roads. That the use of helmets among cyclists is not in line with the required trend is naturally important for the serious injuries it targets, but less important for the target fulfilment of other indicators. However it is difficult to exactly assess how much compliance with speed limits affects other indicators. Therefore, more knowledge of this area is required in order to derive maximum benefit of the road safety initiatives.

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