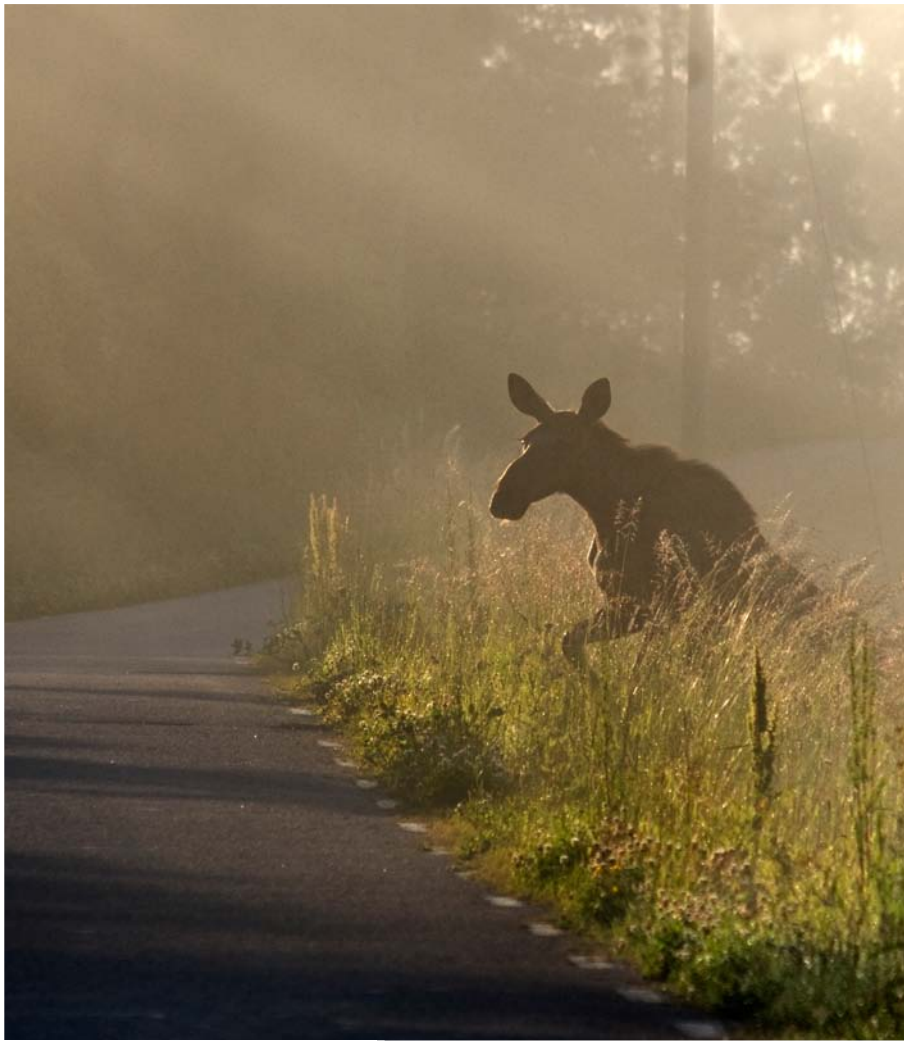
Analysis of Road Safety Trends 2011

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

TRAFIKVERKET



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Foreword

This report is the fourth annual follow-up of progress towards the road safety objectives for road traffic in 2020. The report describes and analyses road safety trends in 2011. As in previous years, the results are analysed on the basis of the number of fatalities and casualties and a number of designated indicators. The report will form the basis for the 2012 results conference in Stockholm on 23 April.

Conditions for making the interim targets more stringent by 2020 have been analysed in parallel with the production of the report. A number of conclusions from that analysis will influence results reporting in the future. Among other things, we propose a new set of indicators to be followed up as of the end of 2012. The present report, however, deals with the road safety results in 2011 and the analysis is based on the current interim target of no more than 220 fatalities in 2020.

The report was produced by an analysis group consisting of analysts from the Swedish Transport Agency, Transport Analysis, VTI (the Swedish National Road and Transport Research Institute), and the Swedish Transport Administration. The following analysts have participated: Jan Ifver and Peter Larsson (the Swedish Transport Agency), Anna Vadeby and Åsa Forsman (VTI), Maria Melkersson (Transport Analysis) and Johan Strandroth, Ylva Berg and Magnus Lindholm (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. This report describes and analyses road safety trends on the basis of the number of fatalities and casualties and on 13 indicators. It will form a basis for the work which will lead to meeting the objectives by 2020, and will be presented at the 2012 results conference.

The table shows the present (2011) position for the various indicators as well as an assessment of whether their rate of change since 2007 is sufficient for reaching the objective by 2020.

Indicator	Starting point	2011	Target year 2020	Trend
Number of fatalities on the roads	440	314	220	In line with the required trend
Number of seriously injured on the roads	5 500	4500	4 125	In line with the required trend
Percentage of traffic volume within speed limits, national road network	43 %	-	80 %	Not in line with the required trend
Percentage of traffic volume within speed limits, municipal road network	52 %	-	80 %	Not measured
Percentage of traffic volume with sober drivers	99,71 %	99,75 %	99,90 %	Not in line with the required trend
Percentage of those wearing a seat belt in the front seat of passenger cars	96 %	97 %	99 %	In line with the required trend
Percentage of cyclists wearing a helmet	27 %	32 %	70 %	Not in line with the required trend
Number of new passenger cars with the highest Euro NCAP score.	66 %	78 %	100 %	In line with the required trend
Percentage of new heavy vehicles with automatic emergency braking system	0 %	0 %	100 %	Not in line with the required trend
Percentage of traffic volume on roads with speed limits of more than 80 km/h and median barrier	50 %	69 %	75 %	In line with the required trend
Percentage of safe pedestrian, cycle and moped passages in the municipal road network	Approx 25 %	-	Not defined	Not measured, no target
Percentage of safe junctions in the main municipal road network for cars	Approx 50 %	-	Not defined	Not measured, no target
Average time from alarm to satisfactory rescue and care	-	-	Not defined	No target
Percentage of drivers stating they have fallen asleep or almost fallen asleep while driving	11,9 %	15,6 %	6 %	Not in line with the required trend
Valuation of road safety, index	67	67	80	Not in line with the required trend

It is estimated that 314 persons died in road traffic accidents in 2011. Despite the fact that this is an increase on 2010 (266 fatalities), the result is well below the level required in order to meet the objective by 2020. To achieve the objective of no more than 220 fatalities in 2020, an annual decrease of 5 percent is required. Between 2008 and 2011 the average annual decrease was 7 percent. The number of seriously injured decreased between 2010 and 2011, from 4700 to 4500. These results are in line with the required rate of change.

It is the analysis group's assessment that the 2011 results are part of a trend in which fatality figures decrease at a higher rate than earlier. The fact that the 2011 fatality figure was an increase on the previous year's figure does not represent a break in this trend. Instead the fatality figure for 2010 can be regarded as lower than expected in view if the risk level at the time. The low result for 2010 can also be explained by the unusually severe winter, which lowered road speeds more than normally, and by a delayed recession effect.

The positive trend can partly be explained by gradual improvements in infrastructure and vehicle population. Both the Safe national roads and Safe vehicles indicators are improving at a sufficient rate, and road design in the municipal road network as well has long been developing towards greater safety. Developments in these areas are a good thing in themselves, but when they are combined they can optimise each other. A given level of safety in the vehicle may only have its full effect when it is combined with the right type of road design.

Road design and safety gains in the vehicle population are optimised principally when they are combined with the right vehicle speed, which is crucial to achieving the target. The assessment is that average speeds have dropped incrementally since 2006, but there is some uncertainty here as no nationwide measurements of average speeds and compliance have been made. Despite many indications that average speeds have dropped, the assessment is still that compliance with speed limits remains at an unacceptably low level. The likely cause is that speed limits have been drastically lowered, making the target for increased compliance harder to achieve.

Even if trends are positive in many areas, many challenges remain:

Drink driving figures moved in the right direction between 2010 and 2011. This positive trend can also be seen in fatal accidents. In spite of this, the assessment based on police data is that the rate of change towards the 2020 target for the indicator is no longer sufficient. It is therefore imperative that measures are found for further reducing the number of drivers under the influence. This indicator plays a key role in the work until 2020, as drink driving coincides with other road traffic offences. For example, for about half of all fatalities in which the person was not wearing a seat belt, he or she was also under the influence of alcohol.

The use of seat belts is still low in fatal accidents, which shows that there is great potential in a continued increase in the use of seat belts. The

long-term positive trend in seat belt use will probably continue, thanks to the increase in the number of cars with seat belt reminders. It is not, however, likely that the goal will be achieved on this basis alone since the car population will not, at its present rate of turnover, have been replaced to the degree required for all cars to have seat belt reminders by 2020. This is a problem that applies in other areas too. The positive effects of new technologies will not be fully felt before 2020 if the car population is not replaced at a high enough rate or if technologies that prevent excessive speeds or alcohol are not implemented. There should, therefore, be a strategy for how to proceed until anticipated technologies are introduced and gain market acceptance.

As the installation of median barriers continues, the number of serious head-on collisions will probably decrease. However, this safety improvement will stagnate once the remaining roads with high traffic flows but no median barriers have had such barriers installed. This leaves the serious accidents in the smaller-road network, on roads with a lot of heavy vehicles and where median barriers will not be installed in the foreseeable future. On these roads it will be necessary for both driver behaviour and the vehicle itself to compensate for the elevated risk. From a collision perspective, this will make speed reduction in heavy vehicles particularly important for achieving the 2020 target. The same applies to motorcycle traffic, which will likely become more prominent in accident statistics if other traffic becomes increasingly safer. It will then become extra important to apply measures related to the indicators that have a clear impact on the number of motorcycle fatalities. Currently, this applies above all to speed limit compliance and ABS brakes.

In last year's analysis report, the analysis group noted that trends for the indicators should proceed in step with each other in order to achieve the maximum traffic safety effect. This reasoning has been the basis for a review of the interim targets in early 2012. In the review, effects of the indicators have been analysed from a system perspective, and the conclusions will benefit next year's analysis report. It is hoped that there will then be a more established connection between what happens with the indicators and what happens with fatality and casualty figures, which of course is fundamental for the successful management by objectives of Swedish road safety work.

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. This means that the number of fatalities in 2020 must not exceed 220. The Riksdag has also decided that the number of serious casualties in road traffic is to be reduced by a quarter. This decision further specifies that the targets be reviewed in 2012 and 2016, in order to ensure that road safety work 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 which are closely linked to measures, and that road safety trends and target fulfilment are evaluated at annual results conferences (the Swedish Road Administration, publication 2008:31). The aim of this working method is to bring a long-term and systematic approach to road safety work. The method has been developed in cooperation between a number of organisations including the National Police Board, the Swedish Association of Local Authorities and Regions, the Swedish Transport Agency and the Swedish Transport Administration.

Management by objectives, then, is based on measuring and following up results for different indicators, and thus assessing progress towards the targets set. Together, these targets make up an overall target for road safety trends. The targets for individual indicators are intended to make follow-ups more activity-based. 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
- Safe vehicles
- Safe national roads
- Safe municipal streets
  - Safe pedestrian, cycle and moped passages in urban areas
  - Safe crossings in urban areas
- Quick and qualitative rescue
- Rested drivers
- High valuation of road safety

1.1 Aim

The aim of the analysis report is to describe and analyse road traffic safety trends in 2011. 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 2012 results conference and for continued planning of road safety work in Sweden.

1.2 Basic assumptions

The analysis sets out from the indicators and the links between them in terms of effects that in turn underlie 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 analysis is based on data primarily from measurements by the Swedish Transport Administration and the Swedish Transport Agency.

The interim target for fewer fatalities and serious casualties by 2020, as well as the indicators, will be reviewed during 2012. The aim of the review is to guarantee that road safety work is always governed by the most relevant and updated target levels possible. The review consists mainly of basic documentation with an analysis of the conditions for making the interim targets more stringent by 2020, since the EU targets between 2010 and 2020 are currently more stringent than the Swedish road safety targets for road traffic. The analysis (presenteras i rapporten Översyn av etappmål och indikatorer för trafiksäkerhet på väg 2020 som publiceras under 2012) arrives at a number of conclusions which are likely to affect target levels and follow-ups of indicators in the future.

However, this does not directly affect the follow-up of road safety results in 2011. This report analyses road safety trends in 2011 based on existing conditions, using the existing set of indicators and target levels in accordance with the Riksdag decision of 2009. Where they regard it as appropriate, however, the analysis group will refer to the review analysis.

2 Numbers of fatalities and seriously injured

The figures for fatalities and casualties in road traffic depend on a series of different factors, including traffic volumes, external factors and road safety measures. There is also a random variation from year to year in the outcome for fatalities and casualties. This variation is not so significant for casualty figures, but for fatality figures it may be as much as ± 10 percent.

2.1 Fatalities

At the time of writing (March 2012) there was no official data on the number of fatalities in 2010. The figure has therefore been estimated in order to be comparable with previous years. Official statistics do not include accidents in which pedestrians have died from injuries sustained through falls in the road environment or after having been hit by a tram. Such accidents are therefore not included in the analysis.

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 2011 it is estimated that approximately 20 fatalities occurred through suicide – all pedestrians or drivers of passenger cars. For 2010, 17 fatalities were excluded from the statistics for this reason.

	2006–2008	2011	Target year 2020	Estimated trend towards target
Number of fatalities	440	314*	220	In line with required trend

**2011 estimated, excluding suicides*

For 2011 the number of fatalities is estimated at 314 persons, which is 48 more than in 2010. Compared with the mean value[2] for 2006–2008, the number of fatalities has dropped by 29 percent. In order to achieve the target of no more than 220 fatalities in 2020, an annual reduction of 5 percent is required. Between 2008 and 2011 the annual reduction in the number of fatalities averaged 7 percent. This means that the number of fatalities for the period from 2008 to 2011 is still well below the curve for achieving the target by 2020.

[1] Transport Analysis (previously SIKA) is responsible for official statistics in the area of communication.

[2] 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.

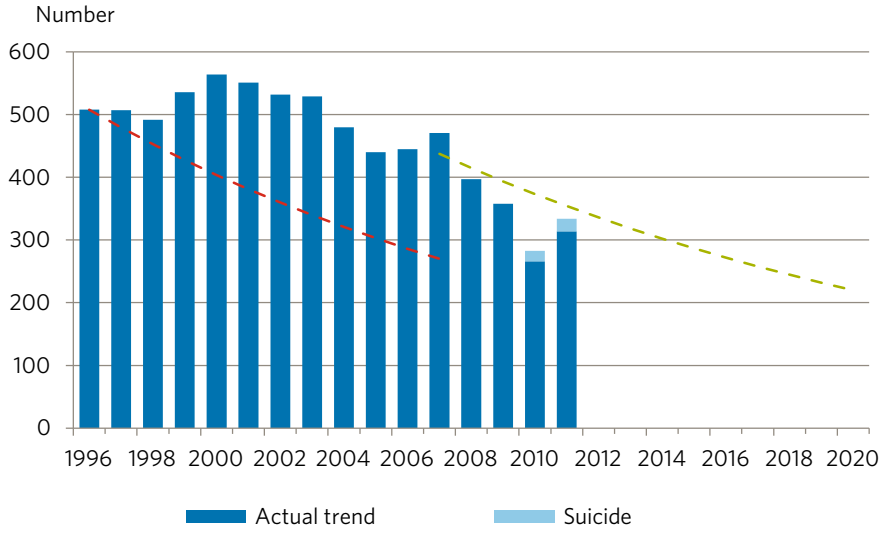


Figure 1. Number of fatalities in road traffic accidents1996–2011 (2011 estimated and 2010–2011 excl./incl. suicides) and the required trend up to 2020. Source: STRADA

The number of fatalities in 2011 increased for all categories of road user except drivers of passenger cars and cyclists, where the number decreased slightly. The relative increase was greatest for pedestrian fatalities, which grew by 65 percent compared to 2010.

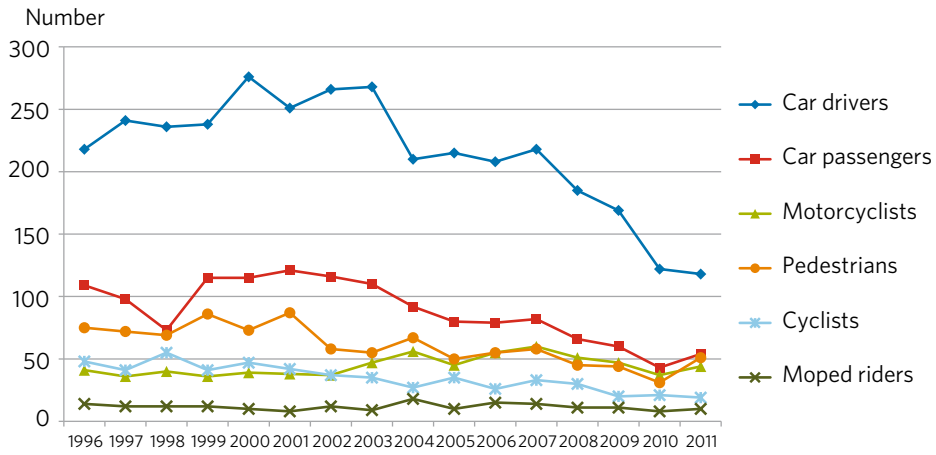


Figure 2. The number of fatalities divided into road-user categories. 1996–2011 (2011 estimated and 2010–2011 excl./incl. suicides). Source: STRADA

During the period from 1996 to 2011 the total number of fatalities decreased by 38 percent. However, the number of motorcyclist fatalities increased by 7 percent in the same period. One reason why the number of motorcyclist fatalities did not decrease to same degree as other road-user categories may be that the volume of motorcycle traffic more than doubled during this period.

About 15 children aged between 0 and 17 were killed in 2011, which translates to a reduction of 70 percent compared with 1996.

2.2 Seriously injured

The definition of a seriously injured person is of someone who has suffered an injury leading to at least 1 percent medical impairment . “Medical impairment” is a term used by insurers to assess degrees of disability regardless of the cause. However, the method for estimating the number of seriously injured has not yet been fully developed, meaning that the figures for seriously injured may come to be adjusted.

	2007	2011	Target year 2020	Estimated trend towards target
Number of people seriously injured	5 500	4 500	4 100	In line with required trend

For 2007 the number of seriously injured in 2007 was estimated at approximately 5,500 persons and for 2011 at approximately 4,500.

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 more than 8,400 in 2011. As almost one in every two persons seriously injured in the road transport system in 2011 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, which must be put down to the snowy winters of 2009/2010 and 2010/2011.

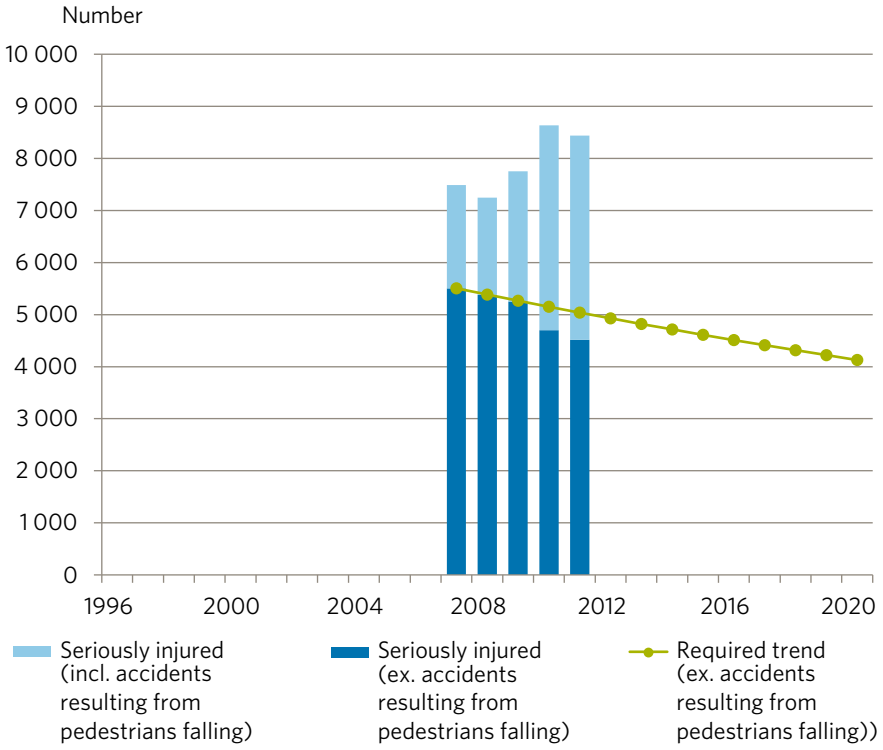


Figure 3. Number of people seriously injured 2007–2011 and the required trend up to 2020 (incl./excl. pedestrians falling in the road traffic environment). Source: STRADA

The interim target means that the number of seriously injured may not exceed 4,100 in 2020, which corresponds to an annual rate of decrease of almost 3 percent. From 2007 the number of seriously injured has dropped 18 percent, which is well below the required trend. Approximately 700 children aged 0–17 were seriously injured in 2011, which is 36 percent fewer than in 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 percent. In 2011 approximately 650 people were so seriously injured that they sustained a medical impairment of 10 percent or more.

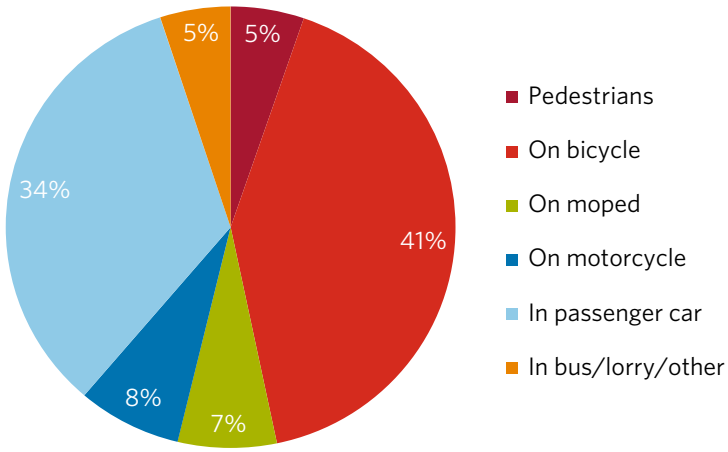


Figure 4. Percentages of seriously injured (≥1%) divided by mode of transport, 2011. Source: STRADA

The biggest difference between the different degrees of medical impairment is that the higher degree more often involves brain injuries. Of all injuries leading to a medical impairment of at least 1 percent in drivers of passenger cars, brain injuries accounted for 5 percent, while brain injuries accounted for 21 percent of injuries leading to a 10 percent or higher medical impairment in drivers of passenger cars. The corresponding figures for injured cyclists were 7 and 33 percent respectively.

Drivers of passenger cars are the group of road users that make up the biggest share of the very seriously injured, 43 percent. By far the most common type of injury leading to a medical impairment of 10 percent or more in drivers of passenger cars was whiplash. The second most common type were brain injuries, which 22 percent suffered. Cyclists also made up a significant share of the very seriously injured. More than one in three of those seriously injured in 2011 were cyclists. Cyclists often suffer injuries to the head. Other common injuries that lead to permanent disabilities are wrist and collar bone fractures.

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 traffic. In both groups it was brain injuries that most often led to permanent disabilities. The share of pedestrians who were very seriously injured after being hit by vehicles is much greater than their share of traffic volumes. In this group too it was brain injuries that most often led to permanent disabilities.

2.2.1 Seriously injured according to PAR[3]

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 includes information about the number of road users who have been injured so seriously that they have been hospitalised for more than 24 hours (Transport Analysis, 2010). The most recent statistics available are for the period up to and including 2010.

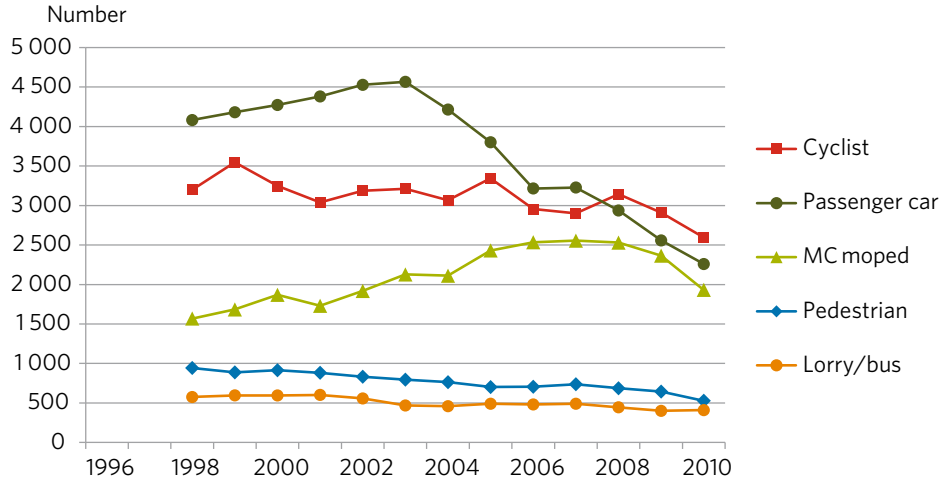


Figure 5. The number of people seriously injured (hospitalised for at least 24 hours) divided by mode of transport, 1998–2010. Source: PAR

Up to 2007, more of those seriously injured had been travelling in a passenger car than by any other means of transport. The number of seriously injured motorists in passenger cars even increased in 2003. Since then the number has shown a striking decrease. Between 1998 and 2010, the number of seriously injured motorists in passenger cars dropped by 45 percent. This means that cyclists are now the road-user group that accounts for the biggest number of seriously injured. A third of road users admitted to hospital in 2010 were cyclists.

The number of moped riders and motorcyclists injured so seriously that they were admitted to hospital for at least 24 hours increased by 61 percent from 1998 to 2008. This is the only category of road user that has demonstrated a negative trend during the period. In 2009, however, the number decreased by 7 percent, and during 2010 it dropped a further 18 percent. Half the decrease occurred in the 15–17 age group. The number of pedestrians seriously injured after being hit by a vehicle decreased by 44 percent from 1998 to 2010. The number of road users injured on other means of transport (bus, lorry or other) has remained low throughout the period and even decreased somewhat, from a total of 575 to 400.

[3] The National Board of Health and Welfare's Patient Register.

2.3 International comparison

In 2010, a total of 30,700 people were killed in road traffic in the 27 countries that make up the EU. This information is based on data from the EU's database for road traffic accidents (CARE). In 2001, the European Commission decreed that the number of fatalities in road traffic in the EU should be reduced by half by 2010. This would mean a decrease from 54,000 to 27,000. According to preliminary figures, the actual decrease was 44 percent. Sweden, however, was deemed to have achieved the target, reducing its fatalities by 50 percent from 531 to 266[4], In July 2010, the European Commission decided that the number of fatalities should be halved again between 2010 and 2020. This means that the number of fatalities should decrease to a maximum of 15,350 by 2020.

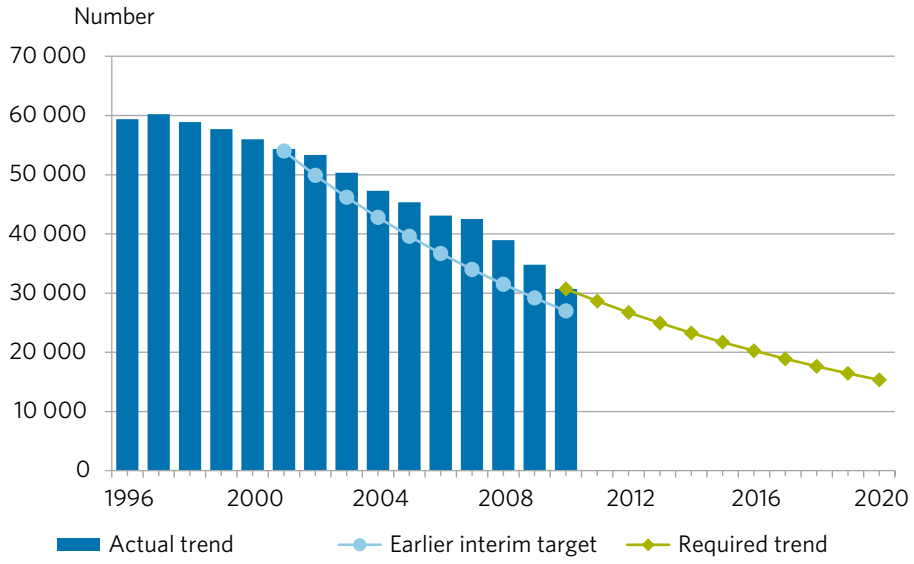


Figure 6. The number of fatalities in the EU, 1996–2010 and required trend up to 2020. Source: CARE

Sweden, the UK and the Netherlands have the lowest number of fatalities per capita within the EU. Between 2001 and 2009 the number of fatalities per capita decreased by 35 percent in these countries. In the Union as a whole, the number of fatalities per capita decreased by 44 percent. In 2010 Sweden had the lowest number of fatalities per capita, with 2.8 fatalities per 100,000 inhabitants. For 2011, however, this quotient has increased to 3.3.

[4] For 2001 and 2010 respectively, 20 suicides (estimated level) have been deducted. Causes of death other than collisions have been excluded in official statistics since 2003 and, for this reason, illness has also been excluded for 2001.

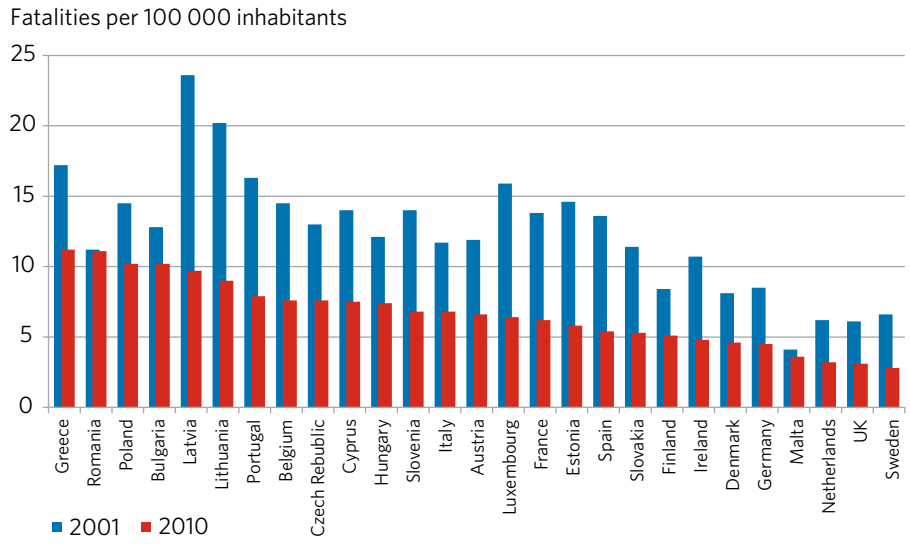


Figure 7. Number of fatalities per 100,000 inhabitants for the 27 countries within the EU, 2001 and 2010. Source: CARE

In Sweden, Denmark, Norway and Finland, the number of fatalities has decreased by 50, 41, 24 and 38 percent respectively during the period from 2001 to 2010. In Sweden, however, the number of fatalities increased by 18 percent between 2010 and 2011. In Denmark, Norway and Finland, according to preliminary information, the number of fatalities has decreased by 25, 19 and 5 percent respectively between 2010 and 2011.

3 External factors

There are many external factors that affect the size and makeup of traffic volumes and thereby the road safety situation. In the short term, weather has a considerable impact on road safety, while economics and demography are significant in the longer term. All these factors influence who drives what vehicles as well as when, where and how much they are driven. The makeup of traffic volumes, in turn, is significant for variations and tendencies in the number of fatalities and casualties in road traffic.

Figure 8 shows how traffic volumes have evolved since 1960, up to and including 2011. Today, passenger cars account for about 81 percent of traffic volumes (vehicle kilometres) on Swedish roads. Buses and motorcycles account for just over 1 percent each, light lorries for 10 percent and heavy lorries for 6 percent. Light lorries are the type of vehicle with the most rapid increase, both in terms of numbers of vehicles and traffic volume. In 2011 the total traffic volume increased by 1.8 percent. For passenger cars the change was + 1.5 percent, for light lorries + 4.5 percent and for heavy lorries + 2.3 percent.

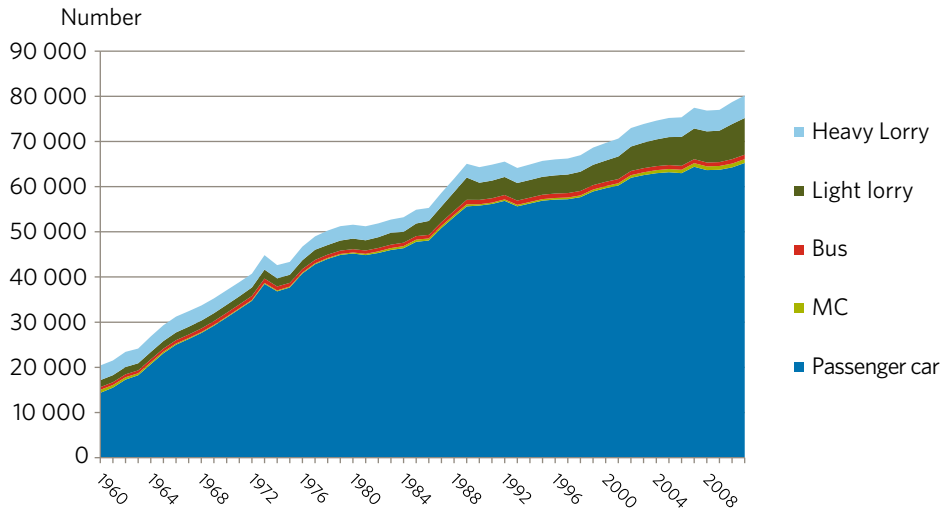


Figure 8: Traffic volumes by vehicle type, 1960–2011. Millions of vehicle kilometers. Source: Transport Analysis, except for 2010 and 2011, where upward adjustment figures have been taken from VTI's traffic volume model.[5]

Weather and climate

The seasons and the weather naturally have a considerable significance for road safety from a short-term perspective. However, despite the generally worse state of the roads during the winter half of the year, risks are actually lower than in the summer. Over the past 20 years, on average 45 percent of road traffic fatalities have occurred during the winter half of the year (October–March). It follows that the remaining 55 percent were killed during the summer half of the year (April–September). In certain recent years, the share of those killed in the winter has been 40 percent or lower. The median value for the past five years is 41 percent. According to the national travel survey from 2005–2006, about 45 percent of Swedes' road

5 Transport Analysis conducts a survey of how traffic volumes (and transport volumes) is calculated for all vehicle types. New times series for traffic volumes will be published during the autumn of 2012.

travel[6], measured in kilometers, takes place during the winter half of the year, and consequently about 55 percent during the summer half of the year. These proportions have remained constant over a long sequence of years.[7] This means that today a smaller proportion of fatalities occur due to winter traffic volumes than summer traffic volumes. Figure 9 shows the share of fatalities during the winter and summer halves of the year, respectively, since 1960.

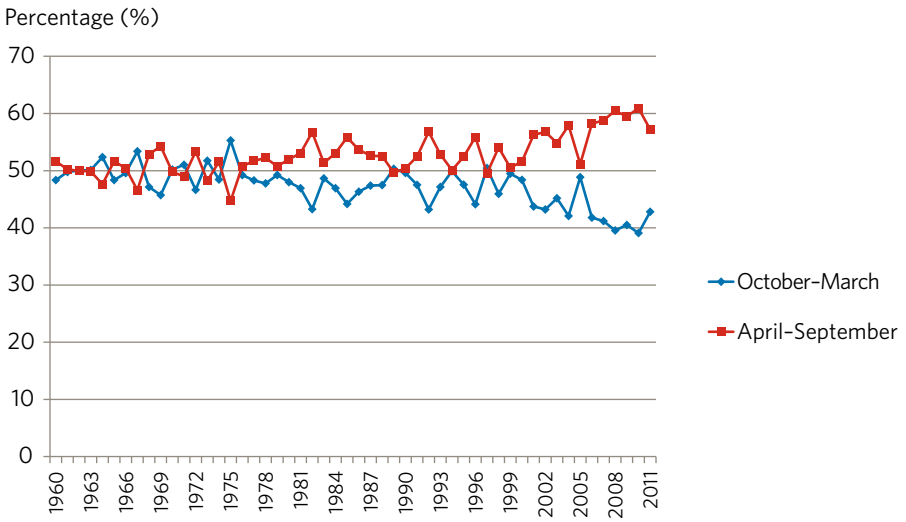


Figure 9. Percentages of fatalities occurring during the winter (October–March) and summer (April–September), respectively. 1960–2011. Source: The number of killed according to official statistics from Transport Analysis. Figures for 2011 are preliminary.

Winter road conditions and temperatures well below zero mean reduced traffic and lower speeds. Winters with heavy snowfall mean larger amounts of snow along the roadside, which leads to fewer serious single-vehicle accidents. Furthermore, the effects of median barriers and ABS brakes in cars is greatest under such conditions. Besides the fact that there is more traffic on the roads during the summer half of the year, this traffic also travels at higher average speeds, and motorcycles and mopeds are added to the mix. The winter of 2010–2011 was cold, with a lot of snow in all parts of the country, while low temperatures and great snow depths were more unevenly distributed in the winter of 2011–2012. If we compare the figures for 2011 (preliminary figures, the Swedish Transport Administration's website, 19 March) with the average for the previous decade (2001–2010), the share of fatalities that occurred in November was considerably smaller in 2011, and the share that occurred in June considerably greater. However, it remains unclear if the weather had any significance in this connection.

Economics

The number of fatalities on the roads decreased dramatically in 2009 (-10 percent) and 2010 (-21 percent[8]). GDP at fixed prices grew by 6.1 percent in 2009 and 3.9 percent in 2011[9]. 2011 was thus a year with high growth and a large increase in the number of traffic fatalities. Experiences from several countries indicate that there is

6 I.e. the number of travelled kilometres by passenger car, lorry, bus, motorcycle, moped, bicycle or as pedestrian.

7 We have looked at traffic volume proportions in the annual RVU (travel habits study) from 1995 to 2001 and the national travel survey 2005–2006. SIKA/Transport Analysis carried out these studies.

8 In order to calculate the percentage change 2009–2010, the fact that suicides are excluded from official statistics as of 2010 must be considered. If suicides are included, the number of fatalities between 2009 and 2010 decreased from 358 to 283, a reduction of 21 percent. We know that in 2010 there were 17 suicides and other premeditated acts among the fatalities. On the same basis as for the year before, the number of traffic fatalities excluding suicides decreased from 358 to 266, a reduction of 24 percent.

9 According to the National Accounts, Statistics Sweden (www.scb.se).

a link between the number of traffic fatalities and economic development, where an economic slowdown is often followed by a reduction in traffic fatalities. It has not been possible, however, to establish exactly what constitutes this link. Neither is it possible to quantify the effect of different factors that influence road safety in individual years. This is partly because many factors (measurable and not measurable) coincide, and partly because there is considerable random variation from year to year in the outcome for the number of fatalities.

The diagram in figure 9 shows growth in GDP at fixed prices and the annual change in the number of road deaths since 1960. The correlation between the series is 0.36 (0.50 if 2009 and 2010 are excluded). The series thus have a positive correlation: put simply, strong growth is bad for road safety and a recession is good. We can see that, during the deep recession at the beginning of the 1990s, the number of fatalities decreased quickly. But even over the past decade, with mostly strong growth, the total number of fatalities has decreased substantially, albeit with increases in certain single years. In 2010 the number of road fatalities decreased more than in any year since 1960, while at the same time growth was at its strongest for the same period. In 2011 the number of fatalities increased again, and economic growth was fairly strong. 2010 appears to be a deviating year with low fatalities in a trend of decreasing numbers of traffic fatalities.

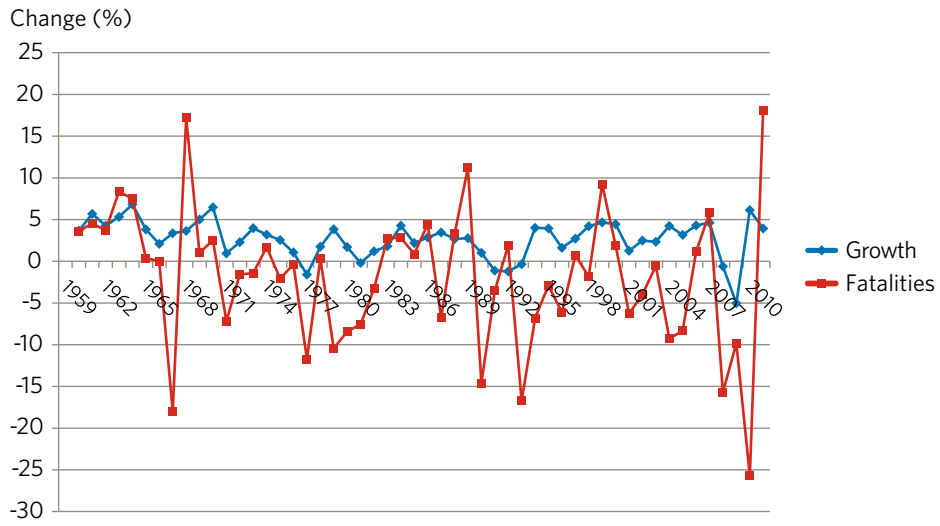


Figure 10: The number of fatalities and growth in GDP in fixed prices, annual change expressed as a percentage. The years 1960–2011. Source: The number of fatalities, official statistics from Transport Analysis, GDP in fixed prices from SCB, the National Accounts.

Another variable that is an indicator of economic activity is unemployment. The level of unemployment is directly related to the distribution of income and work travel, and thereby to the makeup of traffic volumes. Figure 11 shows the annual change in total unemployment (open unemployment plus participants in programmes as a percentage of the population) and the annual change in the number of fatalities in road traffic. The correlation between the series is negative: -0.47. This means that when unemployment rises, traffic fatalities fall. In this respect, then, a negative labour market situation is positive from a road safety perspective.

There is a Swedish study that shows, at an individual level, that people involved in road traffic accidents have a poorer connection to the labour market than those who are not. In a weaker employment situation, people with a weak connection are at greater risk of exclusion from the regular labour market. People without a job move around less in road traffic than those with a job. If those outside the regular labour market are more subject to risk than others, this makes unemployment appear favourable for road safety.[10] In 2011, total unemployment fell from 6.9 to 6.3 percent of the population, while at the same time the number of traffic fatalities grew by just under 20 percent. The relatively high rate of unemployment may have been a factor that mitigated the effect of the strong growth, which is usually detrimental to road safety.

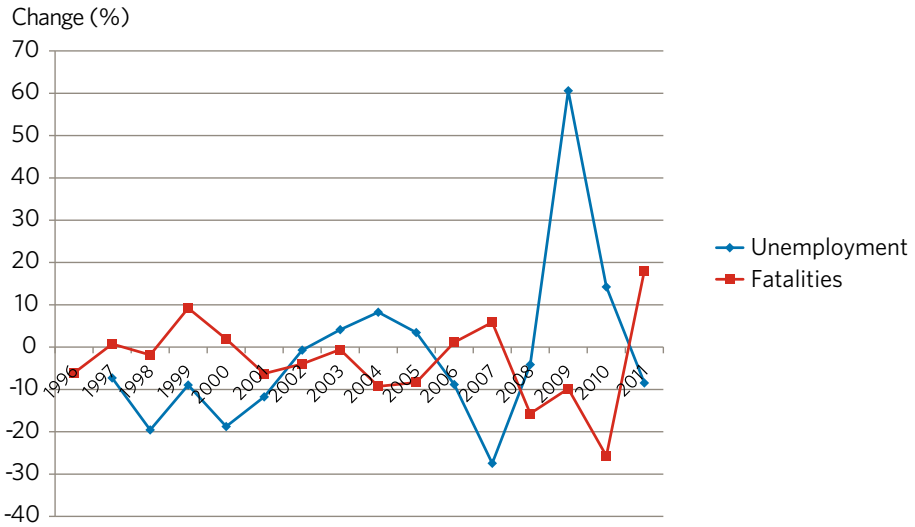


Figure 11. Changes in the number of fatalities and total unemployment (open and in programmes, percentage of the population), annual changes expressed as a percentage. The years 1997–2011. Source: The number of fatalities official statistics from Transport Analysis, unemployment from www.arbetsformedlingen.se

Demography

The composition of the population in terms of gender, age, education and other characteristics largely determines the populational makeup of traffic volumes. The number of fatalities in relation to the distance travelled on roads, here termed the risk, is greatest for the 75+ age group, followed by "young drivers" aged 18–24.[11] Naturally, the size and share of different age groups change very slowly over time. In 2010 and 2011 the share of fatalities aged 75+ was the same, 8.5 percent, while the share aged 18–24 increased from 9.5 to 9.6 percent (+12,000 people). The 15–17 age group, which has a medium risk of being killed in traffic, decreased from 3.8 to 3.5 percent of the population, a reduction of 19,000 people.

The share of the population that has a driving licence has grown over time, from 52 percent in 1980 to 66 percent in 2011. The share of licence holders in different age groups has also changed over time, but these are also naturally slow processes. Figure 12 shows the share of different age groups with some kind of driving licence. Today the 45–64 age group is the one with the highest share of licence holders, while the share of licence holders has dropped in the 20–24 and 25–44 age groups. The share with a driving licence in the 65+ age group has increased considerably in 30 years, from just over 30 percent to more than 80 percent. The 65+ age group is

[10] See the report "How Much Does a Road Traffic Accident cost?" (SIKA Report 2008:8).

[11] See risks for different age groups in Road Traffic Injuries 2009 (Transport Analysis Statistics 2010:17).

also a group that will grow in size and as a share of the population over the next few decades (according to Statistics Sweden's population forecast). Over the slightly longer term, then, we will have an aging population in which an increasing proportion of the oldest people have driving licences.

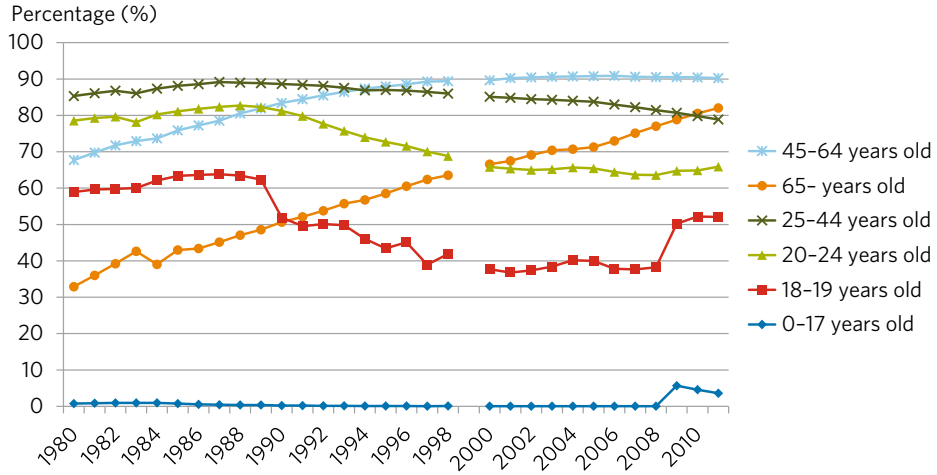


Figure 12: Percentages of different age groups that have driving licences, 1980–2011. Source: Number of licence holders per age group from the Swedish Transport Agency (www.transportstyrelsen.se) and population per age group from Statistics Sweden (www.scb.se).

Note: The Swedish Transport Agency has no figures for licence holders in 1999.

Of the traffic fatalities in the 15–17 age group (a medium risk group), about 25 percent travel by moped, either as driver or passenger. In other age groups, about 2 percent of fatalities are on mopeds. Driving what is known as an EU moped (Class 1 moped, designed to be driven at a maximum speed of 45 km/h) requires a driving licence as of 1 October 2009, while previously a driver's certificate was enough. The number of EU mopeds has grown very quickly. As recently as ten years ago there were only a few thousand on the roads. In June 2011 there were 117,000 EU mopeds on the roads, a reduction from 127,000 in June 2010 (-8 percent). The number of newly registered EU mopeds was roughly the same in 2010 as in 2011, just under 15,000. In 2009–2010 the 15–17 age group shrank by 5 percent (or 19,000 individuals).[12]

Passenger cars make up the dominant share of the total number of vehicles. On 31 December 2011 there were 4.4 million passenger cars on the roads, an increase by 1.5 percent on the previous year. In 2011 about 327,000 passenger cars were registered for the first time, as compared to 309,000 in 2010.

[12] For Class II mopeds (designed to be driven at a maximum speed of 25 or 30 km/hour) a driver's certificate is required as of October 2009. Class II mopeds do not need to be registered in the Road Traffic Register, so we do not know how many
there are.

4 Follow-up of road safety performance indicators

4.1 Compliance with speed limits – national road network

	2004	2011	Target year 2020	Estimated trend towards target
Percentage of traffic volume within speed limits, national road network	43 %	-	80 %	Not in line with required trend
Average journey speed (km/h)	82 km/h	-	77 km/h	In line with required trend

The target is for 80 percent of traffic volume to take place within the legal speed limits by 2020. Assuming that average speeds decrease by 5 km/h, it is estimated that the annual effect by 2020 will be about 90 fewer fatalities.

Performing nationwide measurements of speeds levels is very resource intensive. The latest measurement was carried out in 2004. The Swedish Transport Administration plans to carry out a new measurement in 2012.

In order to be able to monitor speed trends on the national road network year by year, a speed index has been devised which only measures speed changes at a number of measurement points (Vectura: Speed index). The index has been designed to reflect the general speed trend and not changes connected with modifications to the road environment, e.g. changes to the legal speed limit or automatic speed monitoring.

Trends and projections towards the 2020 target
The latest nationwide measurement of vehicle speeds, carried out in 2004, showed that the percentage of the traffic volume travelling within the speed limits was 43 percent on the national road network. Such low acceptance of speed limits is unique in comparison with other European countries (TØI 230/2007).

The Swedish Transport Administration has carried out measurements in order to follow up effects of the major changes to speed limits that were implemented in 2008 and 2009. Taking these results into account, an estimate has been made which indicates that the total share of traffic that complies with speed limits is about the same as it was in the most recent vehicle speeds study, in 2004. However, there are many indications that the average speed has decreased. This is a reasonable consequence of the major changes to speed limits, and results from the speed index, which measures more general changes, show a clear reduction of the average speed.

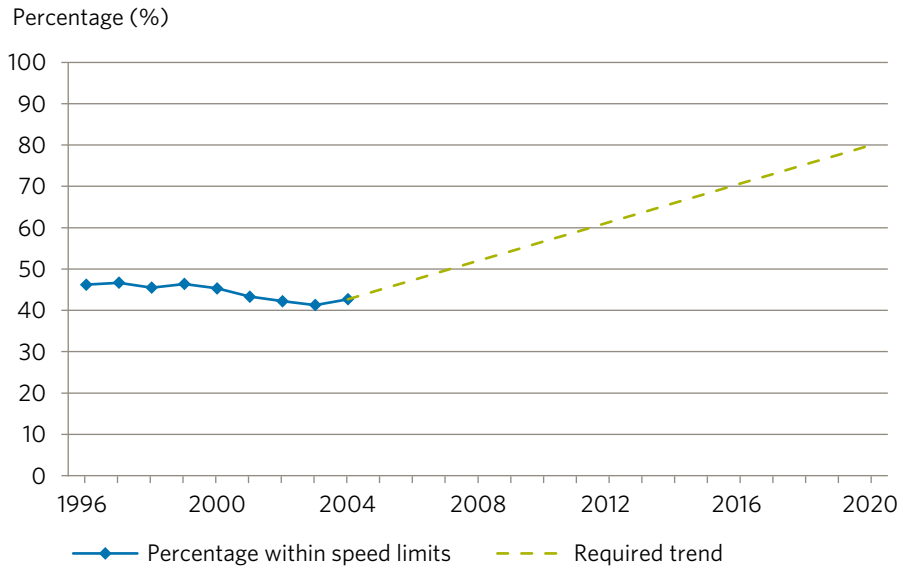


Figure 13. The percentage of the traffic volume travelling within the speed limit on national network, 1996–2004, and required trend to 2020. Source: The Swedish Road Administration

Speed levels will be measured on only three occasions between now and 2020. For this reason, a projection of the necessary trend as regards the speed index has been used, in keeping with the target of a 5 km/h, or 6 percent, decrease by 2020. The aim is to obtain an indication of whether speed levels are decreasing at a sufficient rate.

During 2011 the average speed increased by 0.9 percent. During the snow-free period, when speeds are not affected by winter road conditions, the average speed dropped by 0.4 percent. Despite the fact that speeds overall rose somewhat in 2011, the trend is in line with the rate required in order to achieve the target by 2020.

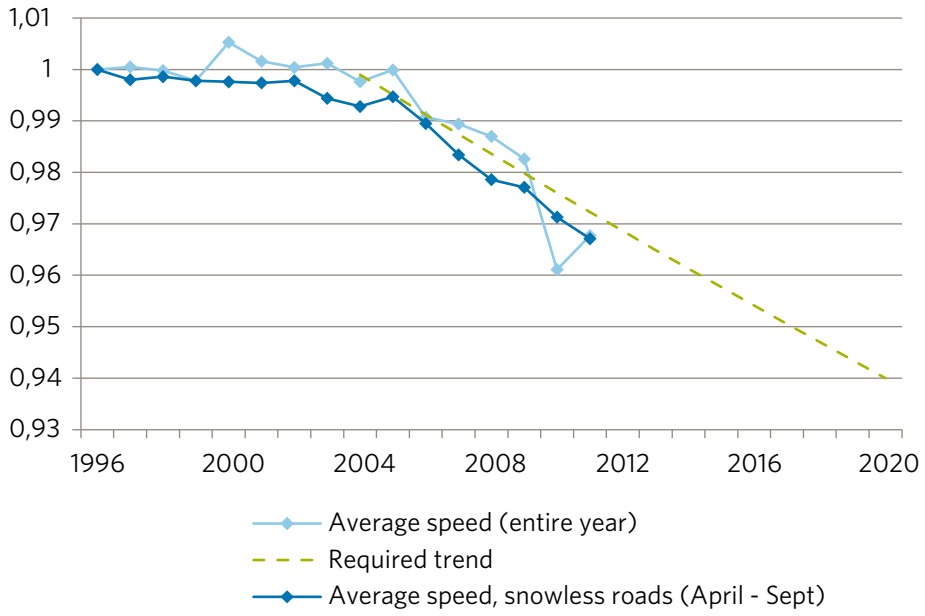


Figure 14. Relative average speed trends and required trend by 2020, national road network, 1996–2011 (Index 1996=1) Source: The Swedish Transport Administration

The joint assessment of the analysis group is that the share of motorists driving in excess of speed limits is not in line with the necessary trend in order to achieve the target, while the average speed for total traffic tends to be more in line with the necessary trend.

Analysis and discussion

The speed index points to an increase in speeds during 2011, primarily as a consequence of less severe winter conditions than in 2010. Measurements that are not affected by winter road conditions indicate a continued reduction, however.

According to the speed index, the share of passenger cars that drive faster than the legal speed limit is estimated to have increased by 4.2 percentage points compared with the extreme year of 2010, but the share is still 1.2 percentage points lower than in 2009. On snow-free roads, the share driving in excess of speed limits dropped by 1.5 percentage points. The average speed for passenger cars increased by 0.8 percentage points and decreased by 0.6 percentage points on snow-free roads. The average speed for other traffic (80 percent lorries) increased by 0.7 percentage points compared with 2010. Overall, heavy traffic has not reduced its speeds to the same extent as passenger cars; instead the outcome for 2011 is on the same level as when the series of measurements began in 1997. The Swedish Traffic Administration's targeted measurements of hauliers indicate that only 40 percent of lorries with trailers comply with the legal lorry limit of 80 km/h on roads with a 90 km/h speed limit. However, those hauliers that collaborate with the Swedish Transport Administration in order to improve road safety tend to stick to a somewhat lower speed than others.

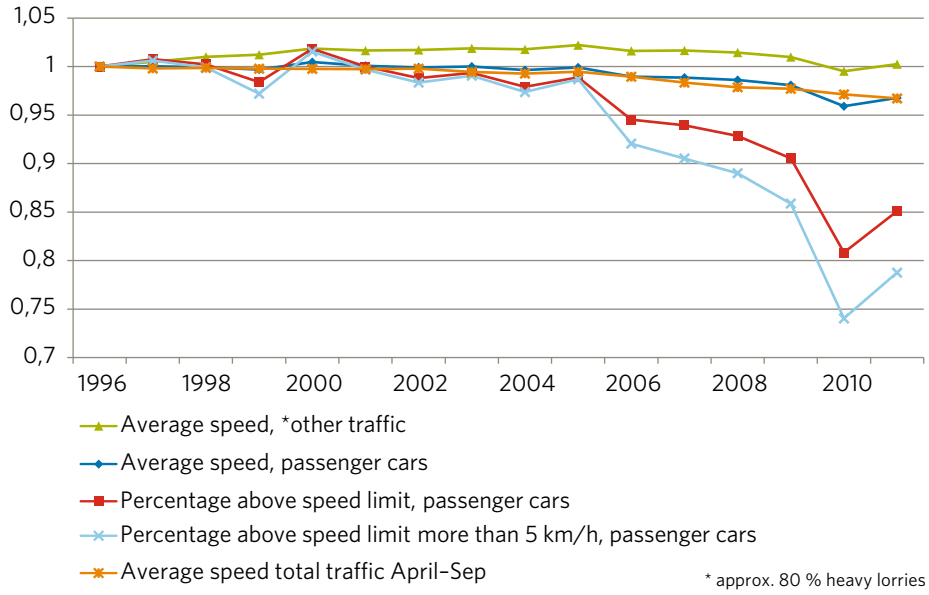


Figure 15. Relative trend in percentage of the traffic volume exceeding speed limits and also average speeds, national road network, 1996–2011 (Index 1996=1) Source: The Swedish Transport Administration

Motorcycle speeds are not measured in the current speed index. Since 2007, Vectura has carried out random measurements and compared speed levels between motorcycles and passenger cars on 50 and 70 km/h roads. The 2010 measurements show that the average speed of motorcycles is between 3 and 4 km/h higher than for passenger cars and that 35 percent drive within the legal speed limits. 40 percent of motorists drove within the speed limits. This is roughly the same ratio between cars and motorcycles as in the previous measurement in 2008. The Swedish Transport Administration plans to initiate a new series of measurements with the aim of monitoring motorcycle speed trends on an annual basis.

As shown in the figure below, police speed control operations have increased considerably, particularly through the introduction of speed cameras. The percentage of offences reported has increased from 138,000 in 2001 to just over 400,000 (in part only recorded on camera) in 2011, i.e. almost trebled. The number of infringements reported by means of speed cameras has peaked at 225,000, probably as a consequence of the fact that deployment of speed cameras has not increased since 2009. The number of infringements reported through manual surveillance is more or less unchanged since 2004.

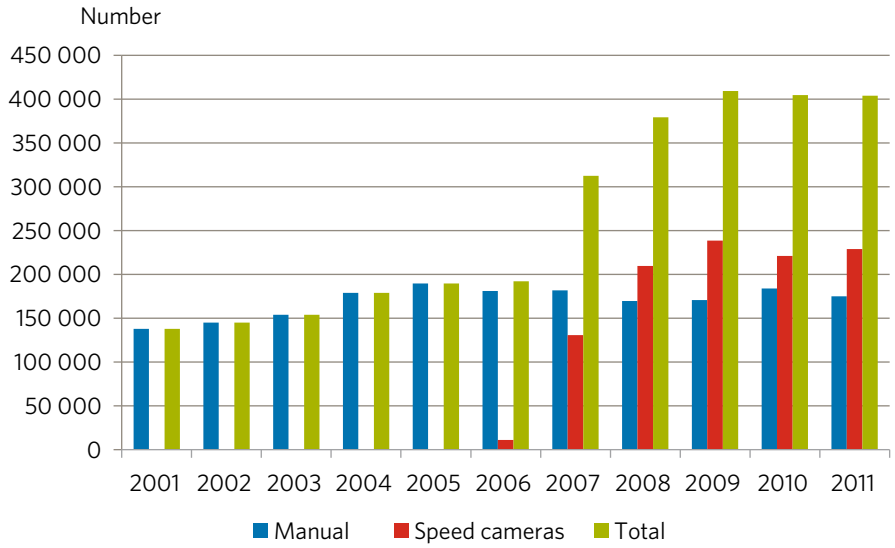


Figure 16. The number of speeding offences, 2001–2011. Source: RPS

Although no new speed cameras have been added since 2010, continued deployment is planned. During 2012 approximately another 50 camera boxes will become operational.

4.2 Compliance with speed limits – municipal road network

	2003	2011	Target year 2020	Estimated trend towards target
Percentage of traffic volume within speed limits, municipal road network	52 %	-	80 %	Not measured

The target is for 80 percent of the traffic volume to be driving within the legal speed limits by 2020. The traffic safety potential has been estimated at 30 fewer fatalities.

Previous measurements on the municipal road network have been very resource intensive, as they have been on the national road network. New, simpler measuring methods need to be developed.

Trends and projections towards the 2020 target

The latest nationwide measurement of vehicle speeds on non-national roads (major roads) in urban areas was carried out in 2003. It showed that 52 percent of the traffic volume was driving within the speed limits. Since then no speed measurements have been carried out on the municipal network, and therefore an assessment of whether the trend is progressing at the right pace cannot be made.

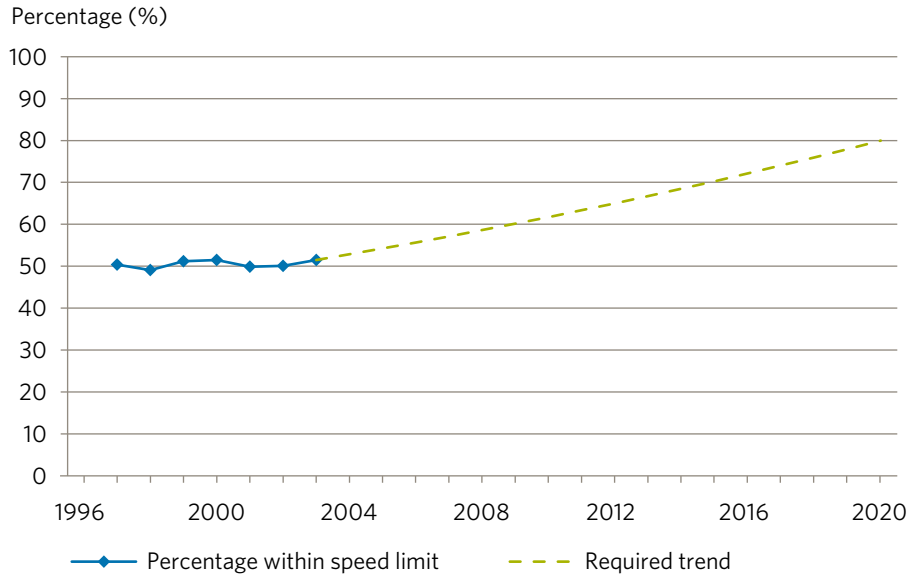


Figure 17. The percentage of the traffic volume driving within the speed limit on the municipal road network,1996–2003, and required trend to 2020. Source: The Swedish Road Administration

Analysis and discussion

According to the measurements carried out up to and including 2003, there are considerable differences in compliance between different speed limits. On roads with a 70 km/h limit compliance is almost twice as high as the average. Compliance is lowest on roads with a speed limit of 30 km/h.

Approximately 60 percent of those killed in the municipal road network are cyclists or pedestrians who are hit by or collide with motor vehicles. About 15 percent are moped or motorcycle riders.

The introduction of new speed limits in the country's municipalities has continued during 2011. Up to and including 2011, 25 percent of municipalities are estimated to have implemented or begun speed reviews. This is not in line with the Swedish Transport Administration's goal, which was 60 percent.

The municipalities must also rise to the challenge of managing speeds at those points in their road environment where unprotected road users are exposed to risk, and at crossings where they encounter motor vehicles. This is described in section 4.9 Safe Municipal Streets – pedestrian, cycle and moped passages in urban areas.

In an earlier assessment the analysis group concluded that this indicator would have to be excluded in the 2012 review of indicators if targets are not set for it and follow-ups carried out in a satisfactory manner in the near future. In the course of the review possibilities have emerged for finding alternatives for the previous resource intensive measurements, but with a lower level of ambition. The current assessment is therefore that it will be possible to follow up the indicator's progress towards the 2020 target.

[14] Gång-/, cykel- och mopedpassager

4.3 Sober traffic

	2007	2011	Target year 2020	Estimated trend towards target
Percentage of traffic volume with sober drivers	99,71 %	99,75 %	99,90 %	Not in line with required trend

The target for sobriety on the roads is for 99.9 percent 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 series should be seen as a measurement of 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 police check drivers who pass a certain location, and the 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. In interpreting the results, therefore, any bigger changes to police strategy on drink driving controls should also be considered.

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 underlies the measurement series there is no information on the occurrence of drugs; it refers only to sobriety with regard to alcohol.

Trends and projections towards the 2020 target

Results from the measurement series based on police controls show that there has been a positive trend since 2007. The percentage of sober drivers has increased during the period from 99.71 percent in 2007 to 99.75 percent in 2011. During this period there were no major changes in the police surveillance strategy at the national level, so the results should reflect the actual situation. Despite the positive trend, the rate of progress is not high enough for the target to be achieved, see figure 18.

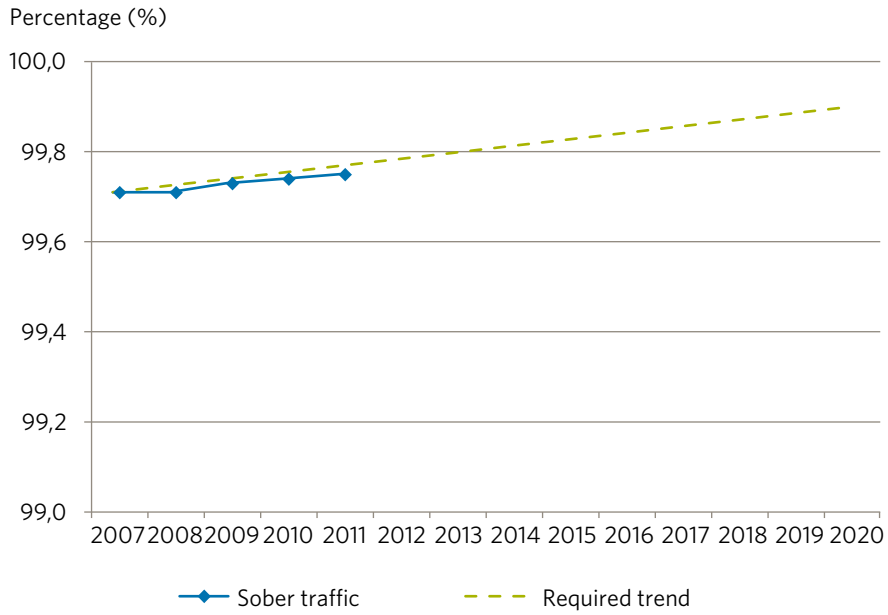


Figure 18. Percentage of sober traffic. Measurement series based on data from the police's checks 2007–2011, and required trend to 2020. Source: RPS, VTI.

Analysis and discussion

The positive trend for the indicator in recent years is supported by results from the Swedish Transport Administration's in-depth studies of fatal accidents. Figure 19 shows the percentage and number of passenger car drivers under the influence of alcohol killed during the period from 1997 to 2011 (BAC level ≥ 0.2 ‰). Since 2003 the overall trend has been a reduction in the share and number of drivers under the influence of alcohol. The two most recent years were particularly encouraging: in 2010 the share of drivers under the influence was 16 percent and in 2011 it was 18 percent.

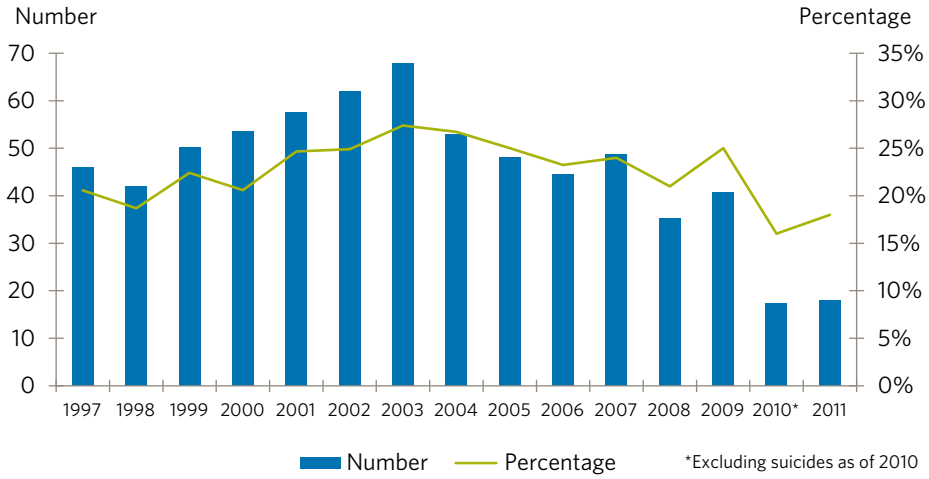


Figure 19. The percentage of passenger car drivers under the influence of alcohol killed among all fatalities and the percentage of passenger car drivers under the influence of alcohol killed (alcohol > 0.2 per thousand), 1997–2011. Source: The Swedish Transport Administration's in-depth studies

Results from the Swedish Transport Administration's road safety poll also point to a positive trend over the past few years. In the 2011 poll 3.8 percent of respondents 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?". That is a reduction of 1.9 percentage points on 2010, when the share of affirmative answers was 5.7 percent, and a reduction of 5.2 percentage points since 1997.

There thus appears to be a positive trend towards increasing traffic sobriety, which would mean the concerted measures against drink driving have had an effect. Police surveillance forms and important part of those measures. Over the past few years the police have maintained a level of roughly 2.5 million breath tests per year, which is a considerable improvement on earlier. In 2001, for example, only about 1.1 million tests were administered. A report by Svensson (2005), which looks at surveillance in Sweden, notes that it is probably difficult to reach the remaining group of violators through further increases in surveillance. Such a measure therefore has limited potential. A high level of surveillance should be maintained, however, in order to ensure social control.

In addition to police surveillance, the following national programmes can be mentioned: Don't Drink and Drive (DDD), Partnership against alcohol and drugs on the roads (Samverkan mot alkohol och droger i trafiken, SMADIT), and alcolocks for drink driving. DDD is a series of preventive activities aimed at young people aged between 15 and 24. SMADIT is a programme intended to reduce the recurrence of drink driving by offering anyone suspected of drink driving prompt contact with the social services or addiction treatment. 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 a device that prevents the car from starting if alcohol is found in the air exhaled by the driver. Alcolocks for drink driving was

previously a trial programme, but as of 1 January 2012 it is permanent. The transition has involved certain changes which are described in greater detail below.

Even if we are seeing a positive trend for sobriety on the roads, the rate of progress is not sufficient for achieving the 2020 target. Further measures are therefore needed. A significant increase in the use of alcolocks would appear to be the most important such measure.

One way to stimulate an increased use of alcolocks is by means of the changes introduced to the alcolocks for drink driving programme. The trial programme showed positive effects for those that took part in it, but participation was relatively limited (Bjerre, 2005). Only about 11 percent of those convicted of drink driving chose to participate. In the permanent programme, therefore, an attempt has been made to stimulate increased participation by extending the suspension period for those who don't choose alcolocks. The costs of participating in the programme are also going to be reduced by removing the application and participation fees and requiring fewer medical examinations.

As of 1 July 2011, alcolocks in company cars are tax exempt, which means that alcolocks are not counted as extra equipment that raises the benefit value of the car. So far, however, no effects of this legislation have been presented.

The extent of driving under the influence of other drugs than alcohol has not been followed up. It can be noted, however, that drugs-related driving offences made up about 43 percent of all reported substance-related driving offences in 2011 (preliminary figures from BRÅ, the Swedish National Council for Crime Prevention).

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 comparisons between roadside checks and studies of injured and killed drivers. Seriously injured drivers from six European countries have been included in the study, and four countries (Sweden among them) have contributed information on killed drivers. 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 concentration of alcohol. This indicates that cannabis is comparable to 0.1–1.5 ‰ alcohol, cocaine to 0.5–0.8‰ alcohol and amphetamine to 0.8–1.2 ‰ alcohol. It is only when drugs are combined with alcohol that levels comparable to more than 1.2 ‰ alcohol are obtained.

In the roadside study carried out in Sweden, 0.4 percent 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 percent), so the results are uncertain. In an earlier study of fatalities by Jones et al. (2009) it was found that 7.2 percent of drivers killed between 2003 and 2007 had some type of illegal drug in their body (in some of them there was also alcohol present).

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. Both DDD and SMADIT deal with driving under the influence of drugs as well as alcohol, but otherwise there are no more extensive programmes that include driving under the influence of drugs.

4.4 Use of seat belts

	2007	2011	Target year 2020	Estimated trend towards target
Percentage of those wearing a seat belt in the front seat of passenger cars	96 %	97 %	99 %	Not in line with required trend

The target for the use of seat belts is that 99 percent of all drivers and front-seat passengers in passenger cars use a seat belt by 2020. The results from VTI's (the Swedish National Road and Transport Research Institute's) observational measurements 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 NTF (Sweden's National Society for Road Safety). Of NTF's measurement sites (municipalities), 58 were deemed suitable for inclusion in the measurement series (Henriksson, 2010). In total, observations from 61 municipalities are included in the combined value for adults in the front seat. A combined value for children has not been possible since NTF's and VTI's measurements are of different categories of children.

Trends and projections towards the 2020 target

The results of VTI's measurements show that use of the seat belt in the front seats of passenger cars has increased from 96 percent in 2010 to 97 percent in 2011. The analysis group's assessment is that the trend for this indicator is satisfactory.

VTI's and NTF's combined observations also indicate that the share of people who use seat belts in the front seats grew quite sharply in the 2011 observations. The increase is of 1.5 percentage points compared to 2010, from 94 to 95.5 percent. The lower share of belt users in NTF's observations is at least partly due to the fact that they measure in a fairly large number of small urban areas, where belt use has been shown to be low (Henriksson, 2010).

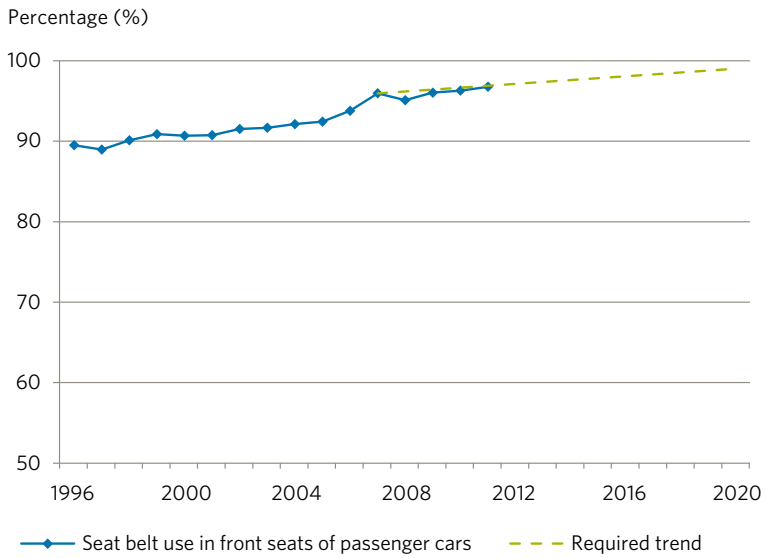
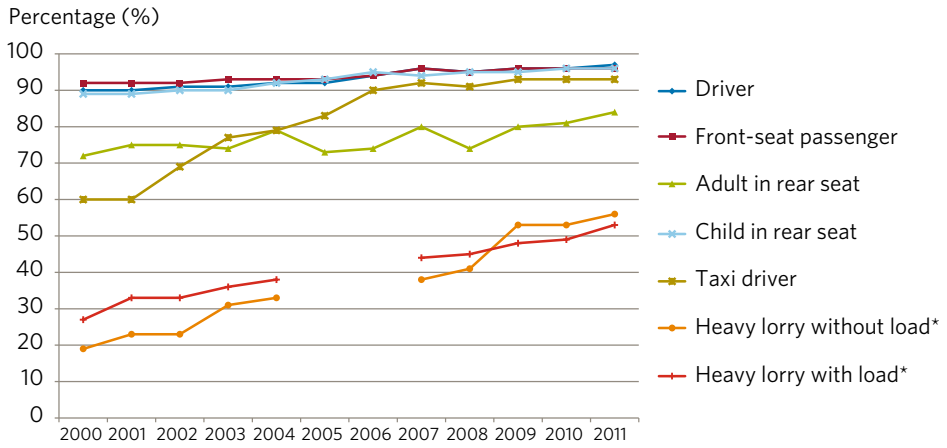


Figure 20. The percentage of persons wearing a seat belt in the front seat of passenger cars at the time of observation 1996–2011, and required trend to 2020. Source: VTI's observation measurements.

Analysis and discussion

The percentage of seat belt wearers in the front seat is high. The long-term upward trend has peaked in the last four years, but it appears now as if a larger proportion of drivers are wearing a seat belt. Figure 21 also shows that seat belt use has increased for several groups between 2010 and 2011. Seat belt use by adults in the back seat was measured at over 80 percent last year, for the first time, and during 2011 belt use in the back seat increased further. For children in the back seat the level is now as high as it is for front seat passengers.

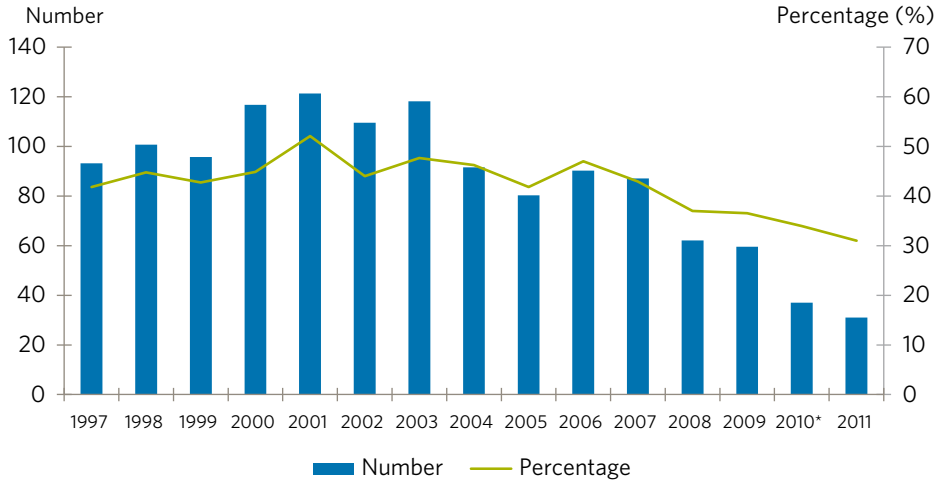


**Observations of heavy lorries from 2007 onward are not fully comparable with earlier observations.*

Figure 21. The wearing of seat belts in passenger cars and heavy lorries, 2000–2011.
Source: VTI's observation measurements.

The share of new cars with seat belt reminders continues to grow. Cars with seat belt reminders made up 54 percent of the traffic volume in 2011 and 48 percent in 2010. As recently as 2005, the share was barely 10 percent. One reason why set belt use in the front seat has not increased appreciably in recent years, despite the sharp increase in the share of cars with seat belt reminders, could be that those who are less inclined to use seat belts tend to drive older cars, in which the share with seat belt reminders is still low.

The results of the Swedish Transport Administration's in-depth studies show a positive trend. The percentage of killed drivers of passenger cars who were not wearing a seat belt at the time of the accident has continued to drop: in 2011 the share was 31 percent, compared with 34 percent in 2010 (figure 22). As with the measurements of the share of sober drivers, the data has been obtained in a different way since 2010. A backward comparison over time shows, however, that the difference in results between the two collection methods is relatively small and does not affect the interpretation of the diagram. Another contributing factor to the relatively sharp decrease in 2010 and 2011 is that suicides have been excluded.



**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. For 2010, the number of fatalities is preliminary.*

Figure 22. The percentage of passenger car drivers not wearing seat belts at the time of the accident as a percentage of all fatalities 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. Source: The Swedish Transport Administration's in-depth studies.

An earlier report describes the use of seat belts in fatal accidents during the period from 1 January 2005 to 30 June 2009 (Svensson, 2010). In this report, drivers and passengers in passenger cars, buses and lorries have been studied. Among other things the report shows that, in male fatalities on the roads, 48 percent were not wearing a seat belt, while the corresponding percentage for women was 24. When it comes to age, the percentage of fatalities not wearing a seat belt was highest in the 30–39 age group, followed by the 40–49 age group (just over 50 percent in both these groups). Of the fatalities in the 18–24 age group, about 48 percent were not wearing a seat belt. 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 percent) than those who were sober (31 percent).

One prognosis suggests that the share of vehicles in the total traffic volume with seat belt reminders will grow from 54 percent today to about 95 percent in 2020 (see the section on safe passenger cars). It is uncertain, however, if the target of 99 percent will be achieved without further measures, despite the fact that seat belt reminders are a very effective measure (99 percent seat belt use according to Folksam, an insurer) and despite the large proportion of vehicles with seat belt reminders forecast for 2020. This is partly explained by the fact that the forecasts are of seat belt reminders for the driver's seat while the target is for all front seat passengers. It is also not certain that the results from the earlier studies will still apply when the road-user groups who currently drive older cars without seat belt reminders begin to drive cars equipped with them. For the goal to be achieved, moreover, seat belt use would have to be 99 percent for the remaining vehicles without seat belt reminders as well, which is unlikely.

Nor should we forget other groups, such as adults in the back seat and lorry drivers, who currently show relatively low seat belt use. There are seat belt reminders in the back seats of passenger cars and in new lorries, but to a much lesser extent than in the front seats of passenger cars. The share of new cars sold in 2011 with seat belt reminders for the back seat was 46 percent.

4.5 Use of helmets

	2007	2011	Target year 2020	Estimated trend towards target
Percentage of cyclists observed wearing a helmet	27 %	32 %	70 %	Not in line with required trend

The target for using cycle helmets is for 70 percent of cyclists to be using a helmet by 2020. According to the report Management by Objectives for Road Safety Work, it will be necessary to introduce mandatory legislation for all cyclists to wear a helmet in order for this target to be achieved. If no mandatory helmet legislation is introduced, the target is that 35 percent of cyclists will 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. 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.

Trends and projections towards the 2020 target

Figure 23 shows trends in the observed use of cycle helmets from 1996 to 2011. In 2011 the observed use of cycle helmets was 32 percent, which is the highest level since measurements began in 1988. It is an increase of 5 percentage points on the level in 2010 (27 percent). This means that the stagnation in the measurement series between 2008 and 2010 has been broken. The figure also shows how the use of cycle helmets needs to change between 2007 and 2020 in order for the target level of 70 percent (with new mandatory helmet legislation) or 35 percent (with the current helmet legislation only for children) to be achieved. This means an annual increase of 7.6 percent and 2.0 percent respectively. 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. However, it is the analysis group's view that the trend is sufficient for achieving the target that 35% of cyclists use a helmet by 2020.

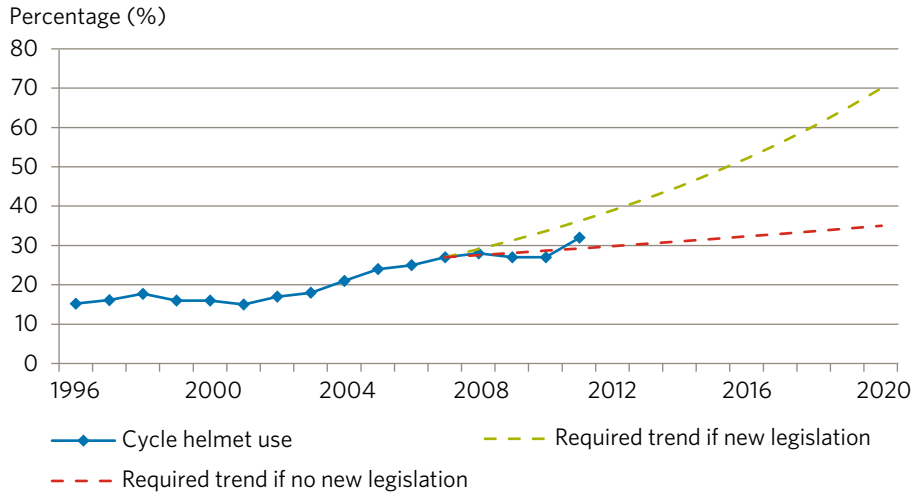


Figure 23. The percentage of cyclists observed wearing a cycle helmet 1996–2011, and required trend to 2020 with or without mandatory cycle helmet legislation being introduced.
Source: VTI's observation measurements 2011.

Analysis and discussion

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

Figure 24 shows that the observed use of cycle helmets in 2011 was 69 percent for children up to 10 years of age in residential areas and 64 percent for children aged 6 to 15 who cycle to and from school. For older comprehensive school pupils, the use of helmets is 46 percent and, for children at the primary and intermediate stages, 83 percent. For adults the use of cycle helmets is considerably lower: in 2011, it was 27 percent for journeys to and from work and 26 percent on public bicycle paths. In 2011 cycle helmet use increased for all categories – most for children in comprehensive school and children 10 years old or younger in residential areas. In comprehensive schools use among lower secondary level pupils showed the biggest increase, from 30 percent in 2010 to 45 percent in 2011. This is a trend from 2009 that is sustained. At all levels in comprehensive schools, helmet use was somewhat higher among girls than boys.

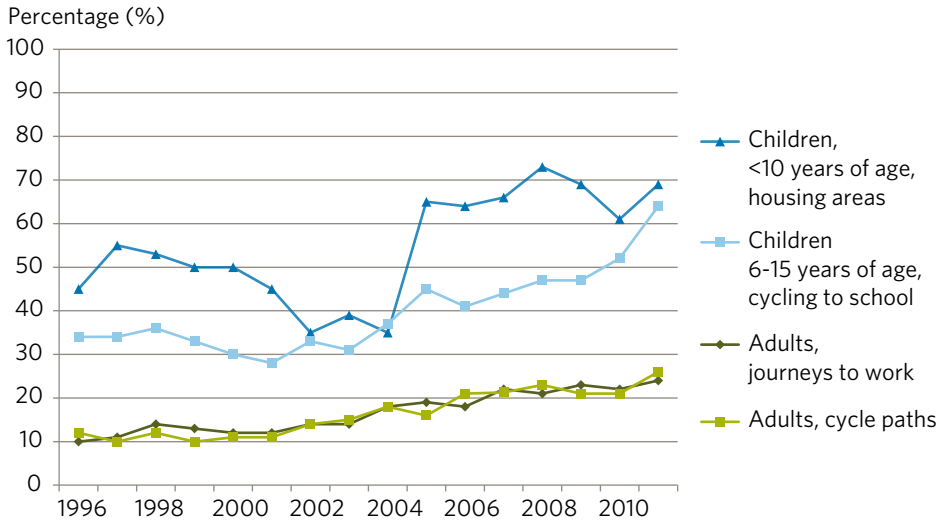


Figure 24.The use of cycle helmets for different groups. Source: VTI's observation measurements.

According to the Swedish Transport Administration's road safety poll for 2011, about 20 percent of cyclists (above 15 years of age) state that they nearly always or always use a cycle helmet when they cycle. That is the highest level since polls began, and an increase of 2 percentage points on 2010.

If we study accident trends and the outcome of accidents among cyclists, we can establish that 19 cyclists died on the roads in 2011 and about 1,870 were seriously injured with more than 1 percent medical impairment, of which just under 240 with more than 10 percent medical impairment. That is a 7 percent increase of those seriously injured compared with 2010. Those very seriously injured increased by about 4 percent in the same period. Every year about 3,000 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.

Figure 25 shows the distribution of cyclists' injuries by degree of disability. We can note that head injuries represent just over a third of all injuries in cyclists who are very seriously injured, but a much lower share (8 percent) of all seriously injured cyclists. A measure such as a cycle helmet will thus be effective primarily against the more serious injuries. Increased helmet use leads to a reduction in the risk of head injuries in a cycling accident. According to Nolén (1998), research shows that cycle helmet use can reduce the number of non-fatal head injuries by 50 percent.

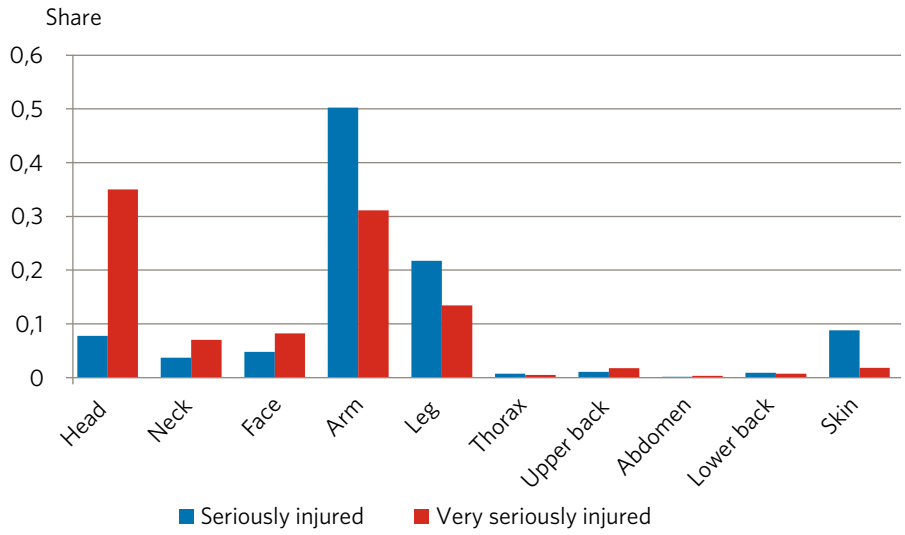


Figure 25. Distribution of cyclists' injuries by degree of disability, seriously injured (≥1%) and very seriously injured (≥10%) respectively. Source: The Swedish Transport Agency. Preliminary statistics for 2011 (retrieved 15 March 2011)

Helmet use among moped riders has not been studied in any current observational measurements. For the period from 1999 until 2003, however, helmet use among moped riders was estimated at just under 90 percent (Gustafsson, 2004). The Swedish Transport Administration plans to carry out observational measurements of helmet use among moped riders in 2012.

In 2011, 10 moped riders died on the roads, an increase on the 8 who died in 2010. Neither the number of seriously injured or very seriously injured moped riders has changed since 2010, but remains at about 320 and 45, respectively, for 2011. Figure 26 presents data on the use of helmets among moped riders killed in accidents (fatal accidents 2004–2011). 91 moped riders were killed in that period. More than 50 percent of these were not wearing a helmet or had lost their helmet during the accident. In the joint strategy for motorcycles and mopeds drawn up in 2010, it is

reported that most of those who had lost their helmet were under 18 years old (the Swedish Transport Administration 2010). There is thus great potential for increasing the percentage of riders using their helmet correctly. The Swedish Transport Administration's in-depth studies also show that shortcomings in helmet use are a major problem in connection with fatal accidents on four-wheelers. In 2011, 8 people died on four-wheelers. Of these 7 were not wearing a helmet. The vast majority of those who die on four-wheelers (75 percent in 2011) do so in single-vehicle accidents and under the influence of alcohol. In 2011 sales of four-wheelers exceeded motorcycle sales, which means that this is an area that urgently requires monitoring during the continued target follow-up.

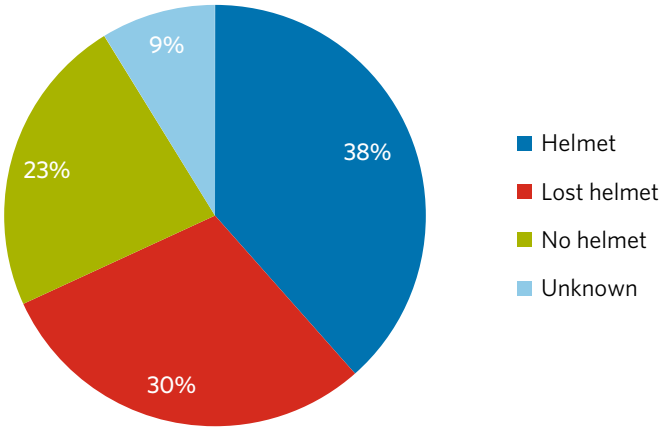


Figure 26. Helmet use among moped riders killed during the years 2004–2011.
Source: The Swedish Transport Administration's in-depth studies. Preliminary statistics for 2011.

Figure 27 shows the distribution of moped riders' injuries by degree of disability. Just as for cyclists, head injuries represent a considerably larger proportion of the injuries among those very seriously injured than among those seriously injured – over 45 percent compared with just under 10 percent. Increased helmet use among moped riders has the potential above all to reduce the number of very seriously injured moped riders (more than 10 percent disability).

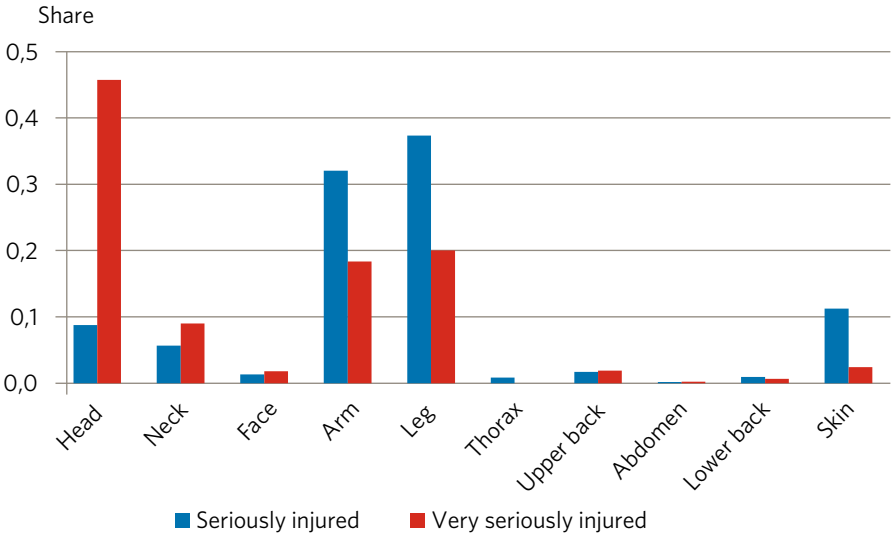


Figure 27. Distribution of moped riders' injuries by degree of disability, seriously injured (≥1%) and very seriously injured (≥10%) respectively. Source: The Swedish Transport Agency. Preliminary statistics for 2011 (retrieved 15 March 2011)

A priority area for action highlighted in the strategy for mopeds and motorcycles is increased and correct use of helmets among moped riders. 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 for improved surveillance by means of developing operational methods. In October 2009 a compulsory moped driving licence was introduced for EU mopeds. It is to be hoped that 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.

In the preparation of management by objectives, the assessment was made in respect of cycle helmet use that mandatory helmet legislation covering all cyclists would be the most effective measure for increasing helmet use to considerably higher levels than today's. However, the government has decided not to present such a proposal. The analysis group's assessment is that it will therefore not be possible to achieve the target for 70 percent helmet use. As part of the government commission "Increased and safe cycling", a final report was submitted to the Ministry of Enterprise, Energy and Communications in December 2010 (Gummessson et al. 2011). The report proposes trying a new approach to increasing helmet use, which involves cooperation between different stakeholders such as insurers, county councils and businesses. This cooperation has not yet begun, however. Another part of the proposal is to work out agreements with municipalities. Such agreements could include strategies for increased helmet use.

According to VTI's observational measurements, the use of cycle helmets varies greatly from location to location. In Stockholm, for example, just under 70 percent of cyclists wear a helmet, in Gothenburg just under 60 percent and in Malmö, Lund and Västerås only about 25 percent (Larsson, 2011). In 2011, however, there was a marked increase in cycle helmet use, particularly in Skåne. In all the Skåne locations included in the observational study, cycle helmet use has increased. In Malmö, for example, cycle helmet use grew from 22 percent in 2010 to 26 percent in 2011, and in Lund it went from 16 to 23 percent. A partial explanation could be that the authorities in Malmö, Lund and Helsingborg (the majority of the observations in Skåne are in these locations) have made efforts to increase cycle helmet use (a collaboration between municipalities and the Swedish Transport Administration).

Without mandatory cycle helmet legislation, the Swedish Transport Administration's target is for cycle helmet use to be at 35 percent in 2020. Results from the 2011 observational studies show that helmet use grew by about 5 percentage points, to 32 percent. That is the highest observed level since measurements began in 1988. This means that the stagnation between 2008 and 2010 has been broken. The analysis group's assessment is that the trend is sufficient for reaching the 35 percent target, but we would like to emphasise that concrete measures are required to further increase cycle helmet use. In the Swedish Transport Administration's road safety poll (2011), 54 percent agree that is should be compulsory for everyone to wear a helmet when cycling, which shows that there is relatively good support for increased helmet use. This level is the same as in the 2010 poll.

4.6 Safe vehicles

4.6.1 Safe passenger cars

	2007	2011	Target year 2020	Estimated trend towards target
Percentage of new passenger cars sold with the highest Euro NCAP score	66 %	78 %	100 %	In line with required trend

The target for safe vehicles has been set at 100 percent of new cars having the highest safety score according to Euro NCAP. The estimated potential at this level is around 90 fewer fatalities per year through an improvement in active and passive safety.

Trends and projections towards the 2020 target

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 percent of all new cars sold in Sweden had the highest Euro NCAP safety scores. The target level of 100 percent by 2020 means that an increase of just over 2.5 percentage units per year is required. This was achieved with a good margin in 2007–2008, when the level increased by 5 percentage points. The level stagnated in 2009 and 2010, but in 2011 it increased from 74 to 78 percent. The indicator is thereby on a level with what is required to achieve the target of 100 percent by 2020.

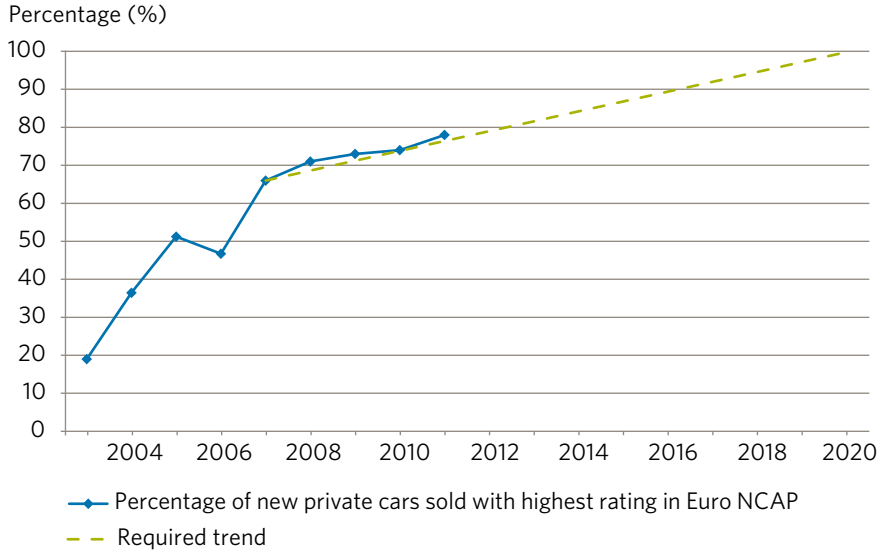


Figure 28. Percentage of new cars with the highest safety scores in Euro NCAP 2003–2011, and required trend to 2020. Source: Bil Sweden, The Swedish Transport Administration.

Analysis and discussion

The share of new passenger cars sold with the highest Euro NCAP safety scores previously grew at a rapid rate. It then levelled off until 2010, but grew by four percentage points in 2011. Still, reaching the target level of 100 percent by 2020 must be regarded as unrealistic. The reason is that Euro NCAP continuously raises the requirements for awarding five stars, as the safety level in new cars improves. A new indicator has therefore been suggested for the review of the interim target in 2012, with the aim of better relating to the safety level of the entire passenger car fleet. The proposed indicator would be the share of total traffic volume represented by cars with the highest Euro NCAP scores.

This way of measuring has already been used for a number of vehicle safety systems in previous analysis reports. A continuation of this measurement series is presented in figure 29. The diagram shows the trends in the volume of traffic in cars with electronic stability control (ESC), with seat belt reminders (SBR) for the driver's seat, and with the highest safety scores in Euro NCAP. In 2011, then, 40 percent of the total volume of traffic was in cars with the highest Euro NCAP safety scores, and 59 and 54 percent, respectively, in cars equipped with ESC and SBR.

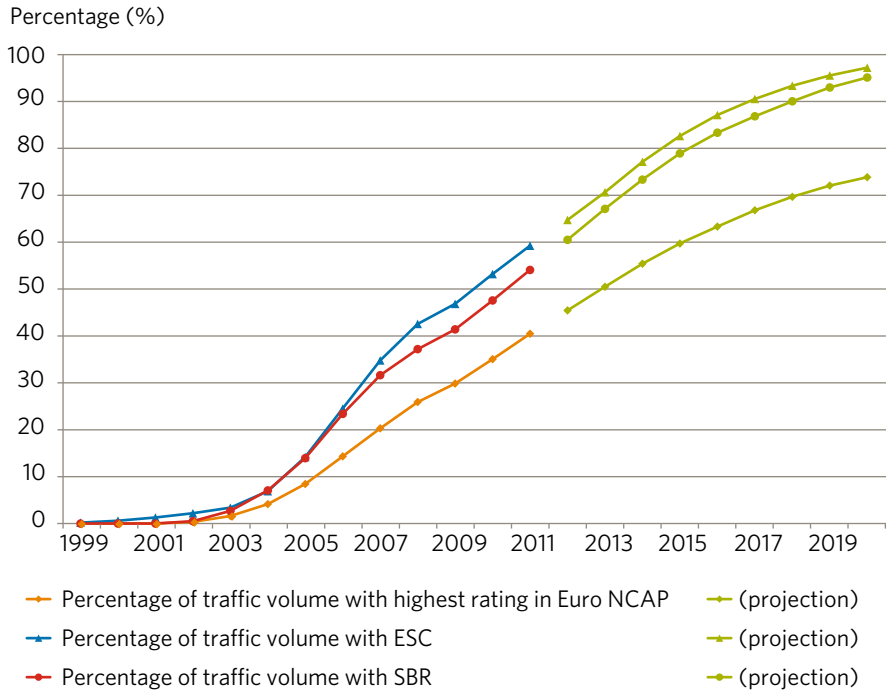


Figure 29. Percentage of traffic volume in cars with the highest safety score in Euro NCAP, electronic stability controls (ESC) and seat belt reminders (SBR). Source: Transport Analysis, the Swedish Transport Administration.

The share of the total volume of traffic in safe cars is growing at a high rate. This is due to the earlier rapid increase in passenger cars with the highest Euro NCAP scores, and to the fact that new passenger cars account for a greater share of the total volume of traffic. However, since future new requirements for top scores in Euro NCAP are an unknown, it is difficult to predict the continued rate of the trend.

Newer passenger cars account for the greatest share of the traffic volume. However, the overall safety of the Swedish car population is not only influenced by which cars are added to it, but also by the rate at which older cars disappear from it, and which cars disappear. Scrapping premiums and similar measures can have positive effects on vehicle safety, but should be linked to requirements regarding safety and environmental impact when buying new cars. Otherwise there is a risk that older, relatively safe cars are exchanged for new cars that may have a lower safety level.

It will also become important to monitor not just how quickly the number of cars with the highest safety level increases, but also what the highest Euro NCAP safety scores are based on. This should be taken into consideration when the interim target is reviewed in 2012.

4.6.2 Safe heavy vehicles

	2007	2011	Target year 2020	Estimated trend towards target
Percentage of new heavy vehicles with automatic emergency braking system[13]	0 %	0 %	100 %	Not in line with required trend

Trends and projections towards the 2020 target
There is currently no technology on the market with any great potential for preventing head-on collisions between heavy and light vehicles.

Analysis and discussion
As noted in earlier analyses, there is an ongoing rapid development of active safety systems for heavy vehicles as well. Future legislation about automatic braking systems to prevent rear-end collisions and about lane-keeping systems will likely have a positive effect on road safety, even if the potential remains unknown and is likely to vary between different systems.

[13] This system has not been defined, but the measurement aims to be a functional requirement where some form of solution to frontal collisions between heavy vehicles and other vehicles needs to be achieved.

4.6.3 Safe motorcycles and mopeds

In 2009, the measurement "percentage of new motorcycles sold that are fitted with antilock brakes" (ABS) was introduced. Studies of actual accidents have shown that ABS brakes on motorcycles have a great impact on reducing accidents[14]. For moped safety, lower speeds through reduced tuning has been highlighted as a priority area for increasing vehicle safety, although there are no explicit targets for 2020.

Trends and projections towards the 2020 target

It is estimated that the percentage of new motorcycles sold with antilock brakes in 2011 was 62 percent, compared with about 60 percent in 2010 and 30 percent in 2009.

Analysis and discussion

An estimate of the share of motorcycle traffic volume accounted for by motorcycles with antilock brakes provides a better picture of the impact of ABS in real traffic. In general, newer motorcycles are driven longer distances than older ones, which means that a large proportion of new motorcycles sold with ABS will have a large impact in terms of traffic volume as well. Figure 30 shows that about 23 percent of the motorcycle traffic volume in 2011 occurred with motorcycles equipped with ABS.

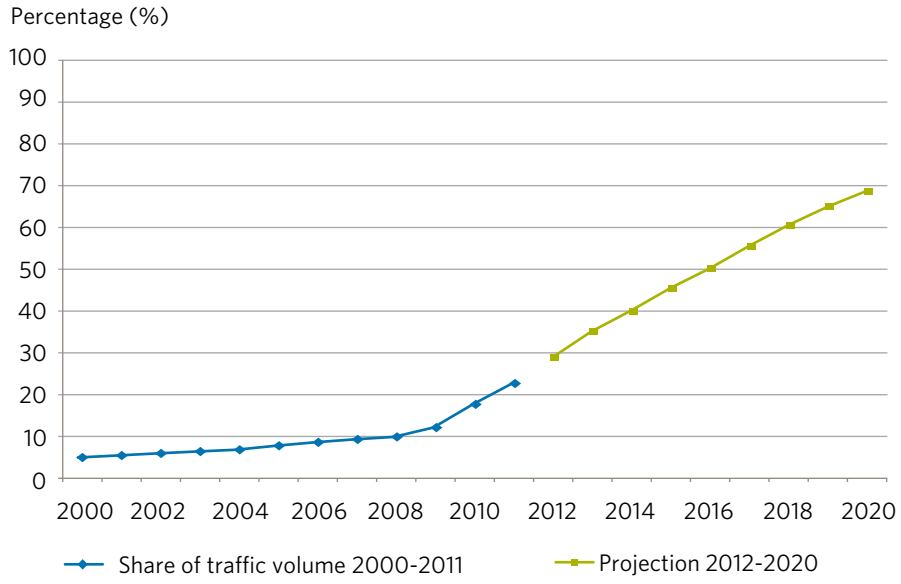


Figure 30. Share of mc traffic volume occurring with motorcycle equipped with ABS. Source: Transport Analysis, the Swedish Transport Administration.

The development of ABS brakes as standard equipment on motorcycles has moved quickly over the past few years. From being an expensive option on motorcycles from all but one manufacturer, ABS has become expected standard equipment on the majority of all larger motorcycle models. Many manufacturers also equip other types of motorcycles with ABS as standard, e.g. motorcycles in the super sport class.

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 share of traffic volume with ABS lie mainly in the addition of new motorcycles with ABS.

[14] Rizzi, M., Strandroth, J., Tingvall, C. (2009) The effectiveness of Antilock Brake Systems on motorcycles in reducing real life crashes and injuries. Traffic Injury Prevention, Vol. 10, Issue 5. Pages 479–487.

In the period before 2005, the share of tuned-up mopeds in fatal accidents was about 70 percent for drivers in the 15–17 age group. In 2005–2008, the share was about 50 percent and in 2009–2010 it was down to about 30 percent. In 2011 only one moped rider (out of a total of eight) was killed on a moped that was verified as having been tuned. On the other hand, the share of mopeds involved in fatal accidents where the tuning status is unknown is 50 percent, which, together with the small numbers, makes this indicator very uncertain. Since it will be important to monitor this indicator in the future, we urge an improvement regarding the control of whether mopeds involved in fatal accidents were tuned or not.

4.7 Safe national roads

	2007	2011	Target year 2020	Estimated trend towards target
Percentage of traffic volume on roads with speed limit above 80 km/h with median barriers	50 %	69 %	75 %	I linje med nödvändig utveckling

The target is for 75 percent 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. The annual effect between 2007 and 2020 is estimated at 50 fewer fatalities. Other measures on the national network are primarily side barriers, central reservations with rumble strips, and less frequent opportunities for overtaking. This is expected to lead to a further decrease by 12 fatalities.

Trends and projections towards the 2020 target

The share of traffic volume on roads with a speed limit of more than 80 km/h with median barriers was 69 percent at the end of 2011. This is far above the desired trend towards the target of 75 percent (figure 21), and is mainly due to the very widespread changes to speed limits implemented in 2009.

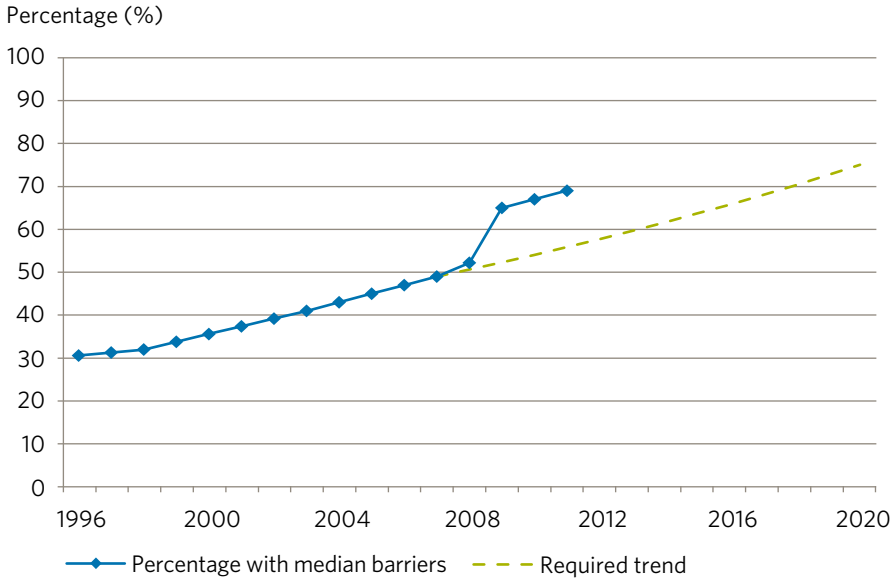


Figure 31. Percentage of traffic volume on roads with a speed limit of more than 80 km/h with median barriers 1996–2011, and required trend to 2020. Source: The Swedish Transport Administration

Analysis and discussion

Just over 200 km of roads with median barriers have been added in 2011, 24 km of which 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 69 percent, in 2011. In addition certain smaller measures have been implemented at crossings and side areas. No further roads have been converted to median barrier roads. At the end of 2011 there was a total of 4,700 km of roads with median barriers.

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

Roads with median barriers and central rumble strips 2002–2011, km x 10 (at year's end).

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). Converting these into roads with median barriers or lowering the speed limit to 80 km/h is an important measure. Road connections with a special function, such as important commuter roads, should have safe side areas and median barriers added, after which the speed limit can be raised to 100 km/h. On other roads the speed limit should be reduced to 80 km/h. The analyses initiated for the indicator review, which aims to raise the target level, are based on a scenario in which all 90 km/h roads have been converted by 2020. All 90 km/h roads with more traffic than 4,000 vehicles per average day are assumed to have median barriers, which comes to 2,000 km of roads. The investment costs are estimated at SEK 10 billion.

4.8 Safe municipal streets

The number of fatalities in the municipal street network have decreased just over 40 percent in the last decade, which is equivalent to the decrease the national road network. The decrease in the municipal road network can be explained primarily by the fact that many municipalities have been working systematically to create safer road designs in their urban areas. However, there is no overall picture of the measures that have been implemented.

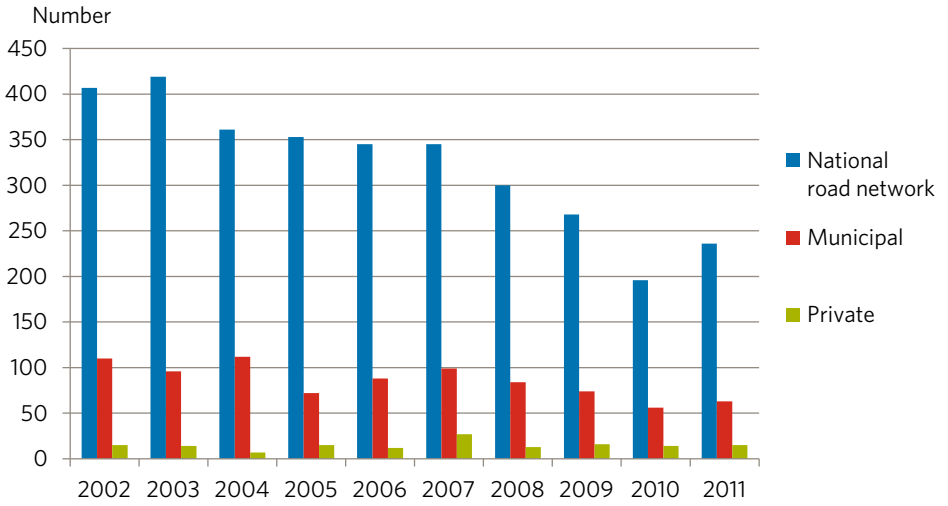


Figure 32. Fatalities in road traffic divided into body responsible for the upkeep of the road. Source: The Swedish Transport Administration.

4.8.1 Safe pedestrian, cycle and moped passages in urban areas

	2007	2011	Target year 2020	Estimated trend towards target
Percentage of safe PCM passages in the municipal road network	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 85th percentile of motorists drive at a maximum of 30 km/h.

Trends and projections towards the 2020 target

Only 6 municipalities fully report the percentage of safe PCM crossings in the national road database, NVDB. In these municipalities, 36.3 percent of crossings are safe. This data was added to NVDB at the end of 2010.

Analysis and discussion
According to the Swedish Transport Administration's in-depth studies of fatal accidents, just under 30 people are killed each year at PCM crossings in urban areas. Of these, most are killed at crossings which are not speed managed. It seems likely, therefore, that many of them would survive if the crossing were speed managed. Note, however, that the definition of a PCM crossing overlaps with that of a junction, since a junction often has one or more PCM crossings in its close proximity. This means that the potential for the number of saved lives at PCM crossings and junctions cannot be added together without compensating for considerable double counting effects.

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 municipal car road network has a documented accident-reducing effect. This can be done by building a grade separated crossing or implementing speed reduction measures before a PCM 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 percent of municipalities in 2011, which means that about 25 percent of them have done speed reviews so far.

A prerequisite for monitoring this indicator and thereby municipalities' contribution 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 crossings and junctions in urban areas" (the Swedish Transport Administration 2010). Currently this is not being done in a satisfactory way, which means that the trend for the indicator cannot be followed up. Moreover, there is no target level to match progress against. In the review of the interim targets at the beginning of 2012, we looked at the question of how the indicator "Safe PCM crossings in urban areas" should be followed up. Any changes to how the indicator is followed up will only have an effect in the follow-up of the 2012 results, i.e. in next year's results report.

4.8.2 Safe crossings in urban areas

	2007	2011	Target year 2020	Estimated trend towards target
Percentage of safe crossings in the municipal road network	Approx 50 %	-	Not defined	Not measured

A crossing is classified as safe if speed through it is physically managed by means of a roundabout or similar, or if the 85th percentile of motorists drive at a maximum of 50 km/h.

Trends and projections towards the 2020 target
It is not currently possible to determine the percentage of safe crossings.

Analysis and discussion
Just under 40 people are killed at junctions in urban areas every year. Of these, most are killed at junctions which cannot be classified as safe. Note that the definition of a junction overlaps with that of a PCM crossing, since a junction often has one or several PCM crossings in its close proximity. This means that the potential for the number of saved lives at junctions and PCM crossings cannot be added together without compensating for considerable double counting effects.

In order to improve the indicator, municipalities must rise to the challenge of managing junctions where motor vehicles meet. Speed managing junctions has a documented accident-reducing effect. This can be done, for example, by converting junctions into roundabouts. Other approaches include better speed adaption and lower speed levels in the urban area. One of the foremost tools for this is to carry out a speed review of the urban area in question. Such a review was carried out by 15 percent of municipalities in 2011, which means that about 25 percent of them have done speed reviews so far.

A prerequisite for monitoring this indicator and thereby municipalities' contribution to road safety work towards the 2020 interim targets is for municipalities to register their junctions in the national database, NVDB. This is not currently being done, which means that this indicator cannot be followed up in the way it should. Moreover, there is no target level to monitor progress against. In the review of the interim targets at the beginning of 2012, we looked at the question of how the indicator "Safe crossings in urban areas" should be followed up. Any changes to how the indicator is followed up will only have an effect in the follow-up of the 2012 results, i.e. in next year's results report.

4.9 Rested drivers

	2007	2011	Target year 2020	Estimated trend towards target
Percentage of drivers stating they have fallen asleep/almost fallen asleep while driving	11,9 %	15,6 %	6 %	Not in line with required trend

The target for the indicator "Rested drivers" is that the percentage of car drivers stating in the Swedish Transport Administration's road safety poll that they have "fallen asleep or almost fallen asleep at some time over the past 12 months" should be halved between the years 2007 to 2020. In order for this objective to be achieved, a reduction of about 6 percentage points, to 6 percent, is required by 2020.

There are a number of studies specifically focusing on driving in a drowsy state. In these, it is estimated that drowsiness among drivers has been a contributory factor in between 10 and 30 percent of all accidents (Horne and Reyner 1995a, Horne and Reyner 1995b, Maycock 1997, Radon et al. 1974, Radun and Summala 2004). That is about the same share as for accidents caused by drivers under the influence of alcohol. There is no reason to assume that conditions are any different in Sweden from how they are in other countries (Anund 2008, Anund & Patten 2010, Åkerstedt & Kecklund 2001). One difficulty, however, is how this should be measured. It is not possible to measure tiredness in drivers while driving, when an accident happens or after an accident has happened. Currently information provided by the drivers themselves in the Swedish Transport Administration's annual road safety poll is used. Even if there are a number of studies (e.g. Anund and Åkerstedt 2009) showing that drivers are able to report if they have felt drowsy, it is very doubtful if self-reporting in the road safety poll can be linked to the outcome in terms of fatalities on the road. In the review of indicators carried out early in 2012 we looked at the question of how the indicator "Rested drivers" should be followed up. Any changes to how the indicator is followed up will only have an effect in the follow-up of the 2012 results, i.e. in next year's results report.

Trends and projections towards the 2020 target

Figure 33 shows trends in self-reported drowsiness from the Swedish Transport Administration's road safety poll between 2006 and 2011. In 2007 just under 12 percent of polled car drivers responded that they had fallen asleep or almost fallen asleep while driving in the past 12 months. This share subsequently increased gradually until 2009 before decreasing in 2010 and then increasing again in 2011, to 15.6 percent. The figure also shows how the outcome for the indicator needs to change between 2007 and 2020 in order for the target level of 6 percent to be achieved. The 2011 result of 15.6 percent means that the trend for the indicator has not improved at a sufficient rate since 2007.

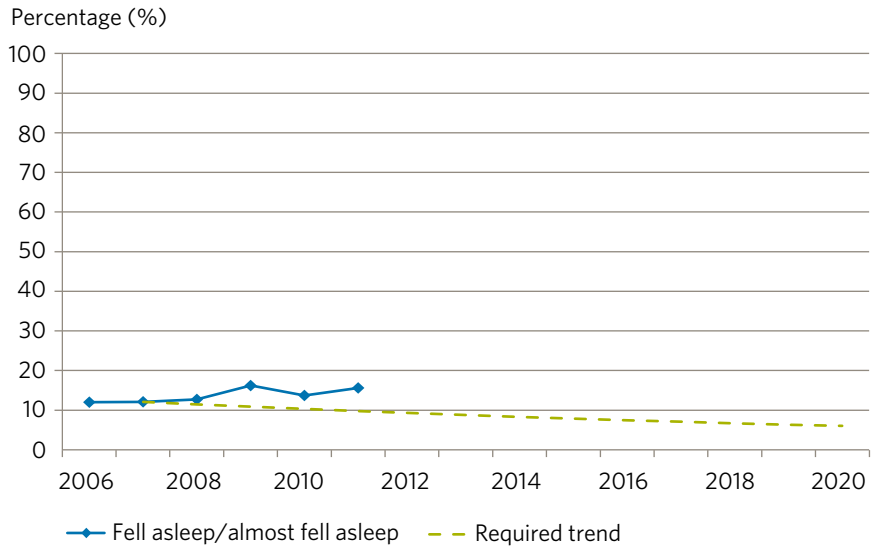


Figure 33. Percentage that state that they have fallen asleep or almost fallen asleep while driving a car in the past 12 months during the years 2006–2011 and the required trend to 2020.
Source: The Swedish Transport Administration's road safety survey

Analysis and discussion

The trend for the indicator "Rested drivers" has been heading in the wrong direction for several years. The drop between 2009 and 2010 was only temporary, and was followed by a rise of 1.9 percentage points – from 13.7 percent in 2010 to 15.6 percent in 2011.

National studies of tiredness-related accidents (Larsson and Anund 2002) show that such accidents take place at all hours of the day and every day of the year. The risk of a tiredness-related accident is greatest late at night (3 to 5 am) and most drivers have experience of driving when tired. The precise moment of falling asleep is also impossible to predict (Anunf et al. 2010). The risk groups identified are young drivers, professional drivers and shift workers (Anund et al. 2008, Lowden et al. 2009, Åkerstedt et al. 2005).

From a physiological point of view, there are major differences when it comes to age. Younger drivers need their sleep more and find it more difficult to "resist" when they feel drowsy. They also drive more at night than older drivers. The Swedish Transport Administration's 2010 road safety poll divides respondents stating that they have "fallen asleep or almost fallen asleep at some point in the past 12 months" by age group. There are major differences in the responses for different age groups: in the 20–24 age group, 22 percent say they have fallen asleep or almost fallen asleep, while only 8 percent in the 65–74 age group say the same thing (an increase by 2 percentage points since 2010).

In Sweden we use rumble strips cut into the roadway to alert drivers and thereby reduce the number of accidents caused by tiredness and inattentiveness. Results from other countries indicate that the number of accidents drops by 15 percent following the implementation of rumble strips in the middle of the road (Mahoney et al. 2003 and Persuad et al. 2005). In Finland trials are being done with rumble strips along the centre line on two-lane roads. The first report from these trials can be found in Rajamäki (2010), whose study presents a reduction of about 10 percent in collision accidents and drive-offs to the left leading to personal injury. In Sweden just under 5,000 km of roads had rumble strips cut into the middle of the roadway between 2005 and 2011. An accident analysis is in progress, and results point to slightly positive effects of centre line rumble strips, particularly on the type of road that most needs to improve – two-lane roads of less than 10 m total width (Carlsson et al. 2012). The effect is greatest for single vehicle accidents. If all types of accidents and all types of roads with centre line rumble strips are considered, effects are negligible or nonexistent measured by numbers of fatalities and serious injuries in relation to the traffic volume. It should be noted that none of the above results is significant, except the increase in the personal accident quotient for the total material. The evaluation will continue for accidents in 2010–2011, to obtain a more certain result.

The compulsory hazard lessons for the class B driving licence has been augmented since 1 April 2009 with a section about tiredness, alcohol and drugs. In the area of tiredness, the training aims to provide the prospective candidate with an understanding of and insight into how tiredness affects driving ability, what the consequences can be, as well as what increases the risks and how these can be avoided. The evaluation shows that the participants have become more aware of the effect tiredness has on driving, but they are not as aware of what is required to counteract this (Forward et al. 2010).

More and more manufacturers are fitting some of their car models with support systems to warn when a driver seems to be lacking attention. In the long term, this is expected to lead to drivers becoming more aware of the risks. At present there is no overall information about the extent to which these types of support system have been introduced in new cars. Nor are there any evaluations as yet based on outcomes of real accidents showing what effect these systems have on preventing and mitigating the consequences of accidents. Analyses of data from what are known as FOT studies are ongoing, but no results had been published at the time of writing.

It is not clear how the indicator “Rested drivers” can be linked to effects on the number of fatalities and casualties on the roads. It is unlikely that a measurable indicator will be found in the near future that shows changes to the number of killed or seriously injured people in accidents where drowsiness or sleep was a contributing factor. That doesn’t mean that drowsiness in drivers is an accident cause that can be disregarded. If 15.6 percent of drivers were very drowsy or actually fell asleep at the wheel at least once over the past 12 months, that constituted a serious risk of accidents, even if it isn’t possible to measure the exact outcome in terms of accidents. In the review of the interim targets carried out early in 2012 we looked at the question of how the indicator “Rested drivers” should be followed up. Any changes to how the indicator is followed up will only have an effect in the follow-up of the 2012 results, i.e. in next year’s results report.

4.10 Quick and qualitative rescue

	2009	2011	Target year 2020	Estimated trend towards target
Average time from alarm to adequate rescue and care	15,2 min	-	Not defined	No target

Two thirds of people dying as a result of road traffic accidents die at the scene of the accident and a third in hospital. A small number die while being transported in the ambulance. There is no doubt that the speed and quality of the rescue is of importance when it comes to how many people survive road traffic accidents. There is, however, a constant debate about how important the emergency response is in different circumstances. According to more recent studies, it is often decisive for the consequences of injuries sustained in an accident that the emergency response begins within 25–30 minutes (Sánches-Mangas, R. et al. 2010).

It is important to monitor the trends regarding the time between an accident and the arrival of an ambulance at the scene. Earlier data for this indicator came from SOS Alarm. It should be pointed out, however, that SOS Alarm only measure the time between receiving the alarm and the ambulance arriving at the scene, which does not take account of when the accident actually occurred.

Trends and assessment of continued development towards the 2020 target
At present there is no defined target from the time of a road traffic accident to an injured person receiving adequate emergency treatment. It is therefore not possible to describe the trend towards a desirable level. Based on the data analysed in 2009 and 2010, it is nonetheless clear that the average time from the emergency call until the ambulance arrives at the scene has increased somewhat. We have not yet had access to the relevant data for 2011. It is not possible, on the basis of this limited data, to determine whether this is a trend or whether it is simply a case of a certain variation in the outcomes from year to year.

Analysis and discussion
Data from SOS Alarm have previously shown that in 62.6 percent of all emergency responses the ambulance is at the scene of the accident within a quarter of an hour; if the emergency response time is extended to half an hour, the figure rises to a full 92.8 percent. To these times must be added the time that elapses between the accident and the emergency call being received by SOS Alarm, which can be assumed to vary considerably. The average time between a received emergency call and the ambulance arriving at the accident scene is about 15 minutes.

It has been discussed whether it would be possible in the future to use processed information from STRADA Medical care to estimate the full time between injury and arrival at emergency hospital. That would make it possible to relate emergency response times to the type an seriousness of the injury. However, this presupposes more in-depth knowledge about which types of diagnoses require the fastest emergency responses.

The fact that this indicator currently lacks a target and a suitable measure for monitoring the trend makes it questionable. In the review of the interim targets carried out early in 2012 we looked at the question of how the indicator “Quick and qualitative rescue” should be followed up. Any changes to how the indicator is followed up will only have an effect in the follow-up of the 2012 results, i.e. in next year’s results report.

4.11 High valuation of road safety

	2007	2011	Target year 2020	Estimated trend towards target
Value judgements of road safety, index	67	67	80	Not in line with required trend

There is a connection between the value judgements people make of road safety issues and the way they then behave on the roads (the Swedish Road Administration 2008). However, it can be difficult to get a picture of an individual's value judgement by asking a simple question. Instead we can make an index on the basis of a number of questions affecting different aspects of the concept of value judgements of road safety.

The index used here has been taken from the Swedish Transport Administration's road safety poll[15] (the Swedish Transport Administration 2010) In this, the public's attitudes and behaviour on the roads are monitored. Since 2000, the index includes seven questions that reflect attitudes to effective road safety measures.

1. It is reasonable to reduce the speed limit to 30 km/h on streets where there are many pedestrians and cyclists. (30 km/h at crossings)

2. All major roads should have median barriers installed to prevent head-on collisions. (Median barriers)

3. More crossings should be replaced by roundabouts. (Roundabouts)

4. All cars should be equipped with alcolocks where a breath sample is required every time the car is to be started. (Alcolocks in all cars)

5. All cars should have a technical support so that the driver can keep to the speed limits more easily. (ISA-system)

6. All cars should have a technical system that reminds drivers and passengers to put on their seat belts. (Seat belt reminder)

7. It should be compulsory for everyone to wear a helmet when cycling. (Cycle helmet legislation)

These measures have been added together in an index by weighting each measure's potential for reducing the number of fatalities on the roads. According to the international expert panel's report (Elvik et al. 2009) the potential for each measure, respectively, is: 30, 62, 30, 50, 150, 40 and 10 fewer fatalities.

[15] Through the Swedish Transport Administration's (previously the Swedish Road Administration's) road safety poll, we can see the public's attitudes to a number of road safety issues. The poll has been carried out annually since 1981 (though not in 2004) and is sent to about 10,000 randomly selected people.

Trends and projections towards the 2020 target

In 2011 the value of the index "Value judgements on road safety" increased by 2.7 units, from 64.6 to 67.3. In order to achieve the 2020 target, the index has to increase by an average of 1.4 units per year. The analysis group's assessment is that the attitude to technical aids that help the drive keep to speed limits, above all, needs to improve if we are going to achieve the target by 2020.

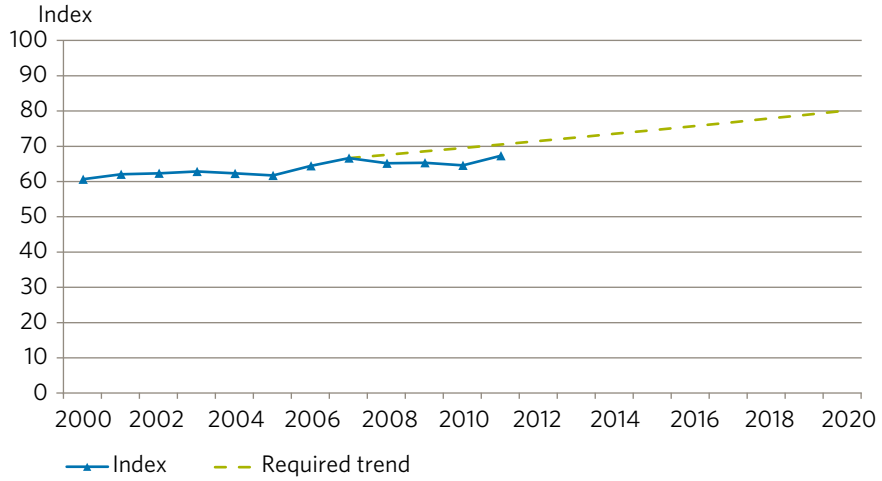


Figure 34. The public's value judgements of road safety issues, index based on the Swedish Transport Administration's road safety polls 2000–2011, and the required trend until 2020. Source: The Swedish Transport Administration

Analysis and discussion

The issues that affect the roads safety index most are those in question 5: "All cars should have a technical aid so that the driver can keep to the speed limits more easily" and question 2: "All major roads should have median barriers installed to prevent head-on collisions". Together they represent more than half of the index's weight. In 2011 the responses to all questions contributed to an increase in the index.

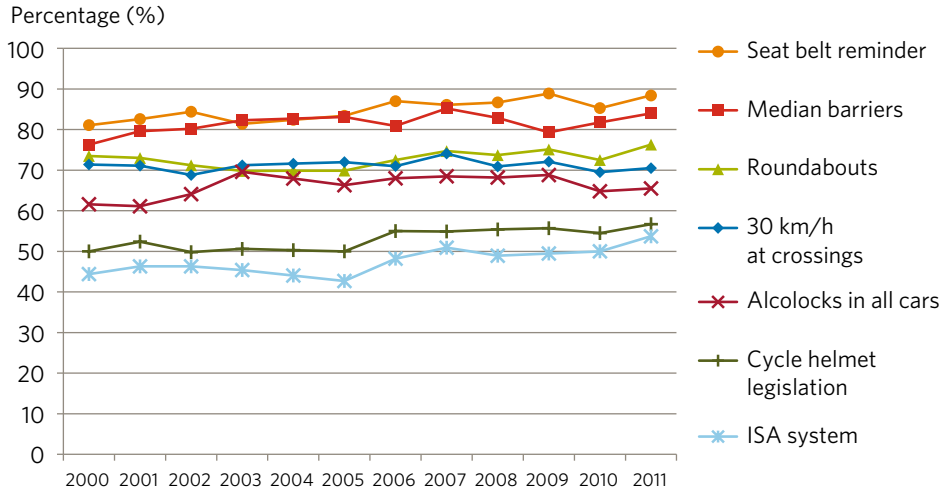


Figure 35. The percentage of respondents who agree with 7 of the questions in the Swedish Transport Administration's road safety poll, 2000–2011.
Source: The Swedish Transport Administration

In order to increase the index for value judgements of road safety, measures are required in the seven areas that it covers. Examples of measures include introducing more zones with speed limits of 30 km/h where there are unprotected road users, installing median barriers on more major roads and replacing more crossings with roundabouts. An important element when implementing such measures is information and training in order to explain the benefits and necessity of the measures. The coordinated effort regarding the use of seat belts and cycle helmets, sobriety and speed checks that the Swedish Transport Administration, the police and NTF carry out are examples of measures to improve the public's value judgements of road safety.

Improving the public's value judgements of road safety issues is important for the introduction and acceptance of new measures, and subsequently for compliance with them. An improved value judgement emerges after the introduction of measures (they eventually create a new norm) and after information and training – regardless of the order in which these are carried out.

5 Conclusions and discussion

In 2011 the number of fatalities increased compared with 2010, from 266 to 314. If we compare with only 2010, we naturally see an increase, but if we compare with the median value[16] for 2006–2008 the number of fatalities has decreased by 29 percent. In order to achieve the target of no more than 220 fatalities in 2020, an annual decrease of 5 percent is required. Between 2008 and 2011 the average annual decrease was 7 percent. This means that the number of fatalities for 2008–2011 is still well below the maximum curve for achieving the target by 2020.

Although the number of fatalities increased from 2010 to 2011, the number of seriously injured decreased in the same period, from 4,700 to 4,500. The outcome for 2011 is also a decrease compared to the starting point in 2007, when the number of seriously injured was estimated at 5,500. Here too the trend maintains a sufficient rate of reduction for it to be reasonable to expect that continued efforts will allow us to achieve the 2020 interim target.

5.1 Conclusions

The analysis group's assessment is that the 2011 outcome is part of a trend in which fatalities decrease at a faster rate than before. Despite the fact that fatalities increased in 2011 compared with 2010, then, we are not looking at a break in the trend. Instead, the outcome in 2010 can be regarded as lower than expected considering the perceived risk level at the time. The low outcome in 2010 can also be explained by the unusually severe winter, which lowered speeds more than normally, and by a delayed recession effect. The 2011 outcome in fatalities is – not counting 2010 – the lowest annual number of road traffic fatalities in modern history.

Since management by objectives began, it has been possible to track gradual improvements in infrastructure and vehicle population. Both the Safe national roads and Safe vehicles indicators are improving at a sufficient rate, and road design in the municipal road network as well has long been developing towards greater safety. Developments in these areas are a good thing in themselves, but when they are combined they can optimise each other. A given level of safety in the vehicle may only have its full effect when it is combined with the right type of road design.

Also, an extremely important parameter in this context is speed. By itself, speed plays a decisive role for the numbers of killed and injured on the roads, but it also interacts strongly with other indicators. Road design and safety gains in the vehicle population are only optimised when they are combined with the right speed. The assessment is that the average speed has dropped gradually since 2005, but there is some uncertainty here as nationwide measurements of average speed and compliance have not been made. Although the average speed has probably decreased, the assessment is that compliance with speed limits remains at an unacceptably low level. The likely cause is that speed limits have been drastically lowered, making the target for increased compliance harder to achieve.

[16] 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.

The trend for drink driving appears to have moved in the right direction from 2010 to 2011. This positive development can be seen in fatality figures as well. Since 2003 the general trend has been for the proportion and number of passenger car drivers under the influence of alcohol who are killed in road accidents to grow smaller. In spite of this, the assessment based on police data is that the rate of change towards the 2020 target for the indicator is no longer sufficient. It is therefore imperative that measures are found for further reducing the number of drivers under the influence. This indicator plays a key role in the work until 2020, as drink driving coincides with other road traffic offences. For example, for about half of all fatalities in which the person was not wearing a seat belt, he or she was also under the influence of alcohol.

The use of cycle helmets increased noticeably in 2011 compared with previous years, but the trend remains far from the level necessary in order to achieve the target of 70 percent use. A strategy for increasing safe cycling was developed in collaboration between a number of stakeholders in 2011. One of the most important factors highlighted in the strategy was infrastructure measures leading to a continuous safe network of bicycle paths in and near major urban areas. Since cycle helmet use has not increased to a sufficient degree, it is seen as important that new approaches are attempted, implying collaboration with insurers, county councils and businesses.

The indicators regarded as continuing to have the potential for saving most lives are *Compliance with speed limits*, *Safe national roads* and *Safe vehicles*. The Sober traffic indicator is also deemed to be particularly important, since drivers under the influence of alcohol who are killed in accidents were often also driving too fast and not wearing a seat belt. The trends for a few of the other indicators are also worth mentioning here:

Seat belt use remains low in fatal accidents, which shows that there is great potential in a continued increase in the use of seat belts, although seat belt use is high overall. The long-term positive trend in seat belt use will probably continue thanks to the increase in the number of cars with seat belt reminders. It is not likely, however, that the target will be achieved on this basis alone, since the current rate of turnover of the vehicle population will not replace all cars without seat belt reminders with ones that have seat belt reminders by 2020. This is a problem that applies in other areas too. The positive effects of new technologies will not be fully felt before 2020 if the car population is not replaced at a high enough rate or if technologies that prevent excessive speeds or alcohol are not implemented. There should, therefore, be a strategy for how to proceed until anticipated technologies are introduced and gain market acceptance.

As the installation of median barriers continues, the number of serious head-on collisions will probably decrease. However, this safety improvement will stagnate once the remaining roads with high traffic flows but no median barriers have had such barriers installed. This leaves the serious accidents in the smaller-road network, on roads with a lot of heavy vehicles and where median barriers will not be installed in the foreseeable future. On these roads it will be necessary for both driver behaviour and the vehicle itself to compensate for the elevated risk. From a collision perspective, this will make speed reduction in heavy vehicles particularly important for achieving the 2020 target. The same applies to motorcycle traffic, which will likely become more prominent in accident statistics if other traffic becomes increasingly safer. It will then become extra important to apply measures related to the indicators that have a clear impact on the number of motorcycle fatalities. Currently, this applies above all to speed limit compliance and ABS brakes.

5.2 Discussion

In last year's analysis report, the analysis group noted that trends for the indicators should proceed in step with each other in order to achieve the maximum traffic safety effect. The road safety effects of the indicators have to be analysed on the basis of their effects in a system. The positive effects on fatality and casualty figures of these system effects have likely been underestimated in the management by objectives so far.

This reasoning has been the basis for a review of the interim targets carried out in early 2012. In the review, effects of the indicators have been analysed from a system perspective, and the conclusions will benefit next year's analysis report. It is hoped that there will then be a more established connection between what happens with the indicators and what happens with fatality and casualty figures, which of course is fundamental for the successful management by objectives of Swedish road safety work.

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