Analysis of Road Safety Trends 2014

Management by objectives for road safety work towards the 2020 interim targets

TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

Towards Zero Together

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Foreword

This report is the seventh of our annual follow-ups of the progress towards the 2020 road safety objectives. It describes and analyses road safety trends in 2014. As in previous years, results are analysed in terms of the number of fatalities and injured as well as of a series of designated indicators. The report will provide the basis for the 2015 results conference in Stockholm, on 21 April.

The report was produced by a group of analysts from the Swedish Transport Agency, the Swedish National Road and Transport Research Institute (VTI) and the Swedish Transport Administration. The following analysts contributed to the report: Khabat Amin, Hans-Yngve Berg, Karin Bengtsson and Peter Larsson (the Swedish Transport Agency), Åsa Forsman and Anna Vadeby (VTI), and Magnus Lindholm, Simon Sternlund and Johan Strandroth (the Swedish Transport Administration).

Summary

Swedish road safety work is based on Vision Zero and the designated interim targets. The current interim target for road safety is to halve the number of fatalities between 2007 and 2020. That translates into a maximum of 220 road deaths in 2020. The number of seriously injured on the roads is to be reduced by a quarter. In addition to the current national target, there is an interim target at the EU level, for halving the number of road deaths between 2010 and 2020. This corresponds to a more stringent interim target of a maximum of 133 road deaths in 2020. No decision has yet been made to adjust the Swedish target to this level, and so the interim target of no more than 220 road deaths remains.

This report describes and analyses road safety trends in terms of the number of fatalities and injured, as well as of the ten indicators below. The report constitutes a basis for the efforts that will lead to achieving the targets by 2020, and will be presented at the 2015 results conference. The table below shows the present level of the various indicators and an assessment of whether their rates of change are sufficient for achieving the target by 2020.

Indicator	Starting point	2014	Target for 2020	Trend
Number of road traffic fatalities	440	270	220	In line with the required trend
Number of seriously injured	5 400	4 900	4 000	Not in line with the required trend
Share of traffic volume within speed limits, national road network	43 %	46 %	80 %	Not in line with the required trend
Share of traffic volume within speed limits, municipal road network	64 %	63 %	80 %	Not in line with the required trend
Share of traffic volume with sober drivers	99,71 %	99,78 %	99,90 %	Not in line with the required trend
Share of front seat passenger car occupants wearing a seat belt	96 %	97 %	99 %	In line with the required trend
Share of cyclists wearing a helmet	27 %	37 %	70 %	Not in line with the required trend
Share of moped riders using a helmet correctly	96 %	96 %	99 %	Not in line with the required trend
Share of new passenger cars with the highest Euro NCAP score	20 %	57 %	80 %	In line with the required trend
Share of safe motorcycles (ABS)	9 %	39 %	70 %	In line with the required trend
Share of traffic volume on roads with speed limit above 80 km/h and median barriers	50 %	73 %	75 %	In line with the required trend
Share of safe pedestrian, cycle and moped crossings on main municipal road networks	19 %	25 %	Not defined	Cannot be assessed
Share of municipalities with good-quality maintenance of pedestrian and cycle paths	15 %	No measurement in 2014	70 %	Starting year for the measurement in 2013, no measurement in 2014 – cannot be assessed

In 2014 there were 270 deaths from road traffic accidents. This is a 4% increase on 2013 in the number of fatalities. In order to achieve the target of no more than 220 fatalities by 2020, an annual reduction of at least 5% is required. Between 2007 (mean value 2006-2008) and 2014, the annual reduction was 7% on average, which means that we are in line with the required trend. This reduction mainly relates to car drivers, and to some extent motorcyclists, while the number of fatalities among other unprotected road users has been at a constant level. The number of suicides represents approximately 10% of the number of road deaths, which means that the problem of suicides has to be dealt with in road safety work even if suicides are excluded from official statistics.

The number of seriously injured has increased between 2013 and 2014, from 4 800 to 4 900, which is an increase of just under 2%. Since both the 2013 and the 2014 figures for seriously injured are above the level of the required trend, the analysis group assesses these not to be in line with the required trend for achieving the 2020 target. A prerequisite for achieving the target is an improvement in cycling safety, especially if

bicycle traffic volumes continue to rise. The increase in the total number of seriously injured over the last two years is primarily due to the increase in the number of seriously injured cyclists, from approximately 1 800 to approximately 2 200. One reason for this might be that cycling has increased in Sweden. However, the increase in the number of seriously injured between 2013 and 2014 is general and cannot be attributed to any particular road user category.

Increased bicycle traffic has been society's stated ambition for several years. Bicycle traffic is expected to grow, not least with respect to faster electric bicycles, whose use contributes to greater risks of injury. In light of this increase and the assessment that more cyclists will be seriously injured, the analysis group would like to emphasise particularly that safety must be a prerequisite when promoting increased bicycle traffic. Road safety work for unprotected road users must therefore be intensified and focus on seriously injured cyclists. In order to reduce these injuries, municipalities and the Swedish Transport Administration must primarily provide infrastructure and maintenance that takes the needs of unprotected road users into account. The use of helmets by cyclists must also increase (this is increasing at present, though not at a sufficient rate) as must the use of other protective equipment. The two indicators safe PCM crossings (pedestrian, cycle and moped) and maintenance of PCM paths in urban areas have been followed since 2013. The share of safe PCM crossings has been measured as being 25% in 2014. This is a higher level than in 2013 (19%), but the measurements are not fully comparable since the 2014 measurement covers considerably more municipalities. Maintenance was not measured in 2014, but it is assessed that both these indicators must undergo considerable improvement by 2020 in order to reduce the number of seriously injured at the required pace.

The reduction in the number of fatalities since 2007 is mainly explained by ongoing improvements to the vehicle fleet and infrastructure, and not least by reduced speeds. Both the safe national roads and safe vehicles indicators are improving at a sufficient rate. Speed as an isolated factor has a decisive influence on the number of road deaths and injuries, but speed also interacts strongly with other indicators. Road design and vehicle fleet safety gains are optimised when combined with the right speed. Average speeds on the national road network are estimated to have increased somewhat from 2013 to 2014 and are now back at the 2012 level of 78.2 km/h (target: 77 km/h). However, the result is still below the required trend. Despite average speeds being in line with the required trend, compliance with speed limits remains at an unacceptably low level. In 2014, the share of traffic volume within speed limits was estimated at 47% (target: 80%) on national roads and 63% (target: 80%) on municipal roads.

The share of sober drivers is largely unchanged between 2013 and 2014. Since measurements of sober drivers began in 2007, the share of 99.71% has increased to 99.78% in 2014. However, the increase has not been large enough, so the result for 2014 is under the curve for the required trend.

Seat belt use in the front seat has stagnated in recent years, but it is still at such a high level as to be considered in line with the required trend.

The overall assessment of the analysis group is that the existing 2020 target for road deaths looks likely to be achieved. However, some caution is necessary due to random annual variations. The number of seriously injured has increased over the last two years and is no longer in line with the required trend. A prerequisite for achieving the target by 2020 is an improvement in cycling safety, especially if bicycle traffic volumes continue to rise.

Another overall conclusion is that road safety trends in recent years have more or less stagnated for unprotected road users, while there is still a positive trend for those travelling in cars. This is true both for the number of fatalities and for the number of seriously injured. In order to achieve the 2020 interim target, it is necessary to develop and introduce further measures for unprotected road users on a wide front and at a fast pace. This is also necessary if Sweden is to continue to see positive road safety trends in the long term.

If one looks at the trend for fatalities in relation to the target at the EU level (which corresponds to a maximum of 133 road deaths in Sweden in 2020), then the number of fatalities at present is much higher than the required trend. The analysis group's assessment is that extraordinary measures are necessary in order to achieve the EU target of no more than 133 road deaths by 2020.

Content

1 Introduction

Swedish road safety work is based on Vision Zero and designated interim targets. The current interim target was adopted by the Swedish Parliament in 2009 and specifies that the number of road deaths should be halved between 2007 and 2020 (Govt. bill 2008/09:93 Objectives for future travel and transports). This means that the number of road deaths in 2020 should not exceed 220. The bill also specifies that the number of seriously injured on the roads is to be reduced by a quarter during the same period. The bill further specifies that the targets are to be reviewed in 2012 and 2016. This is a way of ensuring that road safety work always has the most relevant and motivating targets possible. Following the 2012 review, there are proposals to adjust the target to be in line with the interim target for road safety adopted within the EU. This would mean a target of no more than 133 roads deaths by 2020. This target has not yet been expressly adopted by the Government.

In order to achieve the road safety targets, road safety work is managed by objectives. This means that there are targets to follow up for a number of indicators and that road safety trends and target fulfilment are explicitly evaluated at annual results conferences. The aim of this working method is to apply a long-term, systematic approach to road safety work. The method is continuously being developed and improved through cooperation between a number of organisations: The National Police Board, NTF (Nationalföreningen för Trafiksäkerhetens Främjande, the National society for the Promotion of Road Safety), Toyota Sweden AB, Folksam, the Swedish Work Environment Authority, the Swedish Association of Local Authorities and Regions, the Swedish Taxi Association, the Swedish Bus and Coach Federation, the Swedish Association of Road Transport Companies and the former Swedish Road Administration.

The follow-up of indicators is a key part of management by objectives. Each of these has a target value to be achieved by 2020. Together, these targets make up the consolidated target for road safety trends. The following indicators are currently being followed up (precise target levels and descriptions are presented in section 4):

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

1.1 Purpose

The aim is to describe and analyse road safety trends in 2014. We present and analyse the current situation in terms of the number of fatalities and seriously injured, as well as the trends for each of the ten indicators.
Taken together, this means that the analysis report points out which of the indicators are the most important ones to influence in order to increase road safety and, by extension, to achieve the interim target by 2020. The report will form the basis for the 2015 results conference as well as for continued road safety planning in Sweden.

1.2 Basic assumptions

The analysis is based on the targets and indicators that underlie the interim targets. These were formulated by the former Swedish Road Administration in collaboration with a number of national organisations – see the report entitled Målstyrning av trafiksäkerhetsarbetet ("Management by objectives of Road Safety Work", Swedish Road Administration, publication 2008:31).

In 2012 a review of targets and indicators was carried out to ensure that the follow-up methods were always as relevant and up to date as possible. The review set out from the new interim target at the EU level of halving the total number of road deaths between 2010 and 2020.

In Sweden's case this corresponds to a target of no more than 133 road deaths in 2020. The analysis showed that a more stringent interim target, in line with the EU target, would be challenging but not unachievable. This conclusion owes a great deal to the forecast that developments in terms of vehicle safety characteristics will be very favourable in the remaining years until 2020. The review produced a proposal for a more stringent interim target, in line with the EU target, along with updated indicators with some changes to target levels (Swedish Transport Administration, 2012:124).

At present, no new target level has been adopted and therefore results are analysed in terms of the current target of no more than 220 road deaths by 2020. The EU target is nonetheless shown in the summary diagram. With respect to indicators, the analysis applies the proposed set of indicators from the 2012 review.

2 Number of fatalities and seriously injured

In May 2009, the Swedish Parliament adopted an interim target for road safety trends which specified that the number of fatalities should be halved to a maximum of 220 and the number of seriously injured be reduced by a quarter between 2007 and 2020, from 5 400 to 4 000. It also stated that measures aimed at improving road safety for children should be given special priority.

The number of fatalities and injured on the roads is due to a series of factors such as road safety measures, traffic volume and many other external factors. There is also a random annual variation in the number of fatalities and injured. This variation is not particularly significant for injury figures, but for fatality figures the relative margin of error can be as large as 10%.

If a person dies within 30 days of a road traffic accident, as a result of that accident, this is counted as a fatality. A road traffic accident is “an accident that occurs in traffic on a road which is generally used for traffic with motor vehicles, in which at least one moving vehicle is involved, and which causes personal injury”. Pedestrians killed as a result of falls in road traffic[1] are therefore not included in the statistics for traffic accidents with personal injuries.

Suicides were previously included by definition in Sweden’s official road death statistics. Since 2010, however, suicide figures are reported separately by Transport Analysis[2]. Thus suicides have been excluded from official statistics on fatalities in road traffic accidents since 2010. This means that since 2010, statistics are not fully comparable with those for the years up to 2010. Between 2010 and 2012, there was also a change in the way suicide is determined, which was a factor contributing to a rise in the number of assessed suicides during that period. Since 2012, however, the method has been established (Swedish Transport Administration 2014), and suicides represent approximately 8% of the number of road deaths. In 2014, there were 25 fatalities as a result of suicide.

The definition of a seriously injured person is of someone who has suffered at least 1% medical impairment as a result of a road traffic accident. “Medical impairment” is a term used by insurers to assess degrees of functional disability regardless of the cause. However, a problem of using medical impairment in assessments is that a long period of time often elapses between injury and confirmed impairment. For this reason another method (Swedish Transport Agency, 2009) is used, which involves forecasting the number of persons with medical impairments on the basis of the injuries reported by hospitals to STRADA, and using a risk matrix developed by Folksam, an insurer.

[1] Sometimes called “pedestrian single”

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

2.1 Fatalities

	2006–2008	2014	Target for 2020	Assessed trend towards meeting target
Number of fatalities	440	270	220	In line with the required trend

In 2014, there were 270 road deaths, of which 191 were men and 79 women. This breaks the positive trend between 2011 and 2013. Compared to the mean value for 2006-2008, the number of fatalities has decreased by 38%, which represents an average annual decrease of approximately 7%. In order to achieve the target of no more than 220 deaths in 2020, the number of fatalities needs to decrease on average by 5% every year until then. The trend for the number of fatalities is thus in line with the required trend (Figure 1).

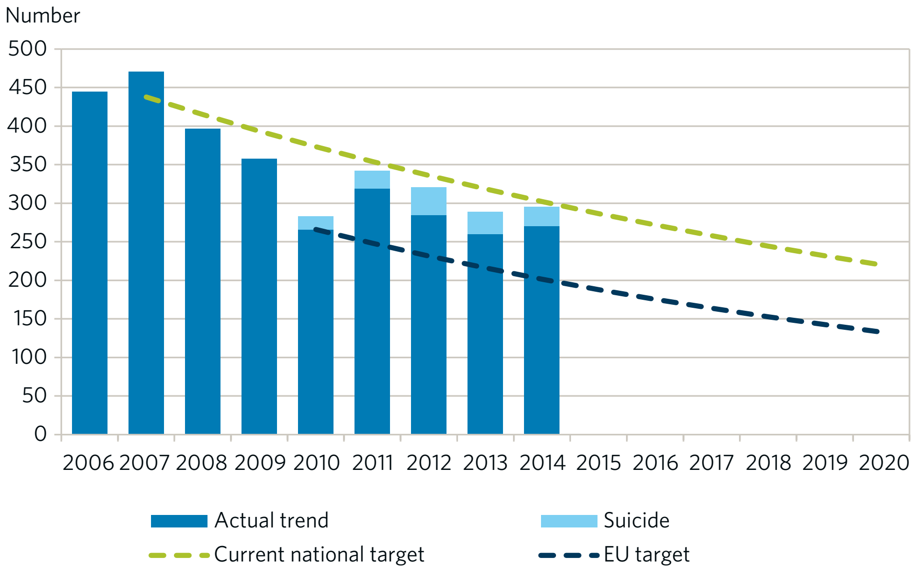


Figure 1. Number of fatalities in road traffic accidents 2006-2014, and the required trend until 2020. Suicide has been excluded since 2010. Source: STRADA.

Figure 1 also shows the required trend for meeting the EU target of halving the number of road deaths between 2010 and 2020, to a maximum of 133 deaths in 2020[3] . This indicates that the number of deaths is much higher than the required trend for meeting the EU target.

The increase in the number of deaths may be attributed primarily to pedestrians, cyclists and, to some extent, moped riders (see Figure 2). The number of fatalities decreased for other categories of road users. The number of cyclists killed in 2014 was 33, which was an increase of 19 from 2013. However, the number of cyclist fatalities was unusually low in 2013. The most common fatal accident for cyclists is a collision with a motor vehicle. In 2014, just over half the cyclist fatalities were due to being hit by a passenger car or a lorry. Single bicycle accidents are the next most common type of accident among fatal accidents for cyclists

[3]The Swedish Transport Administration, publication 2012:124

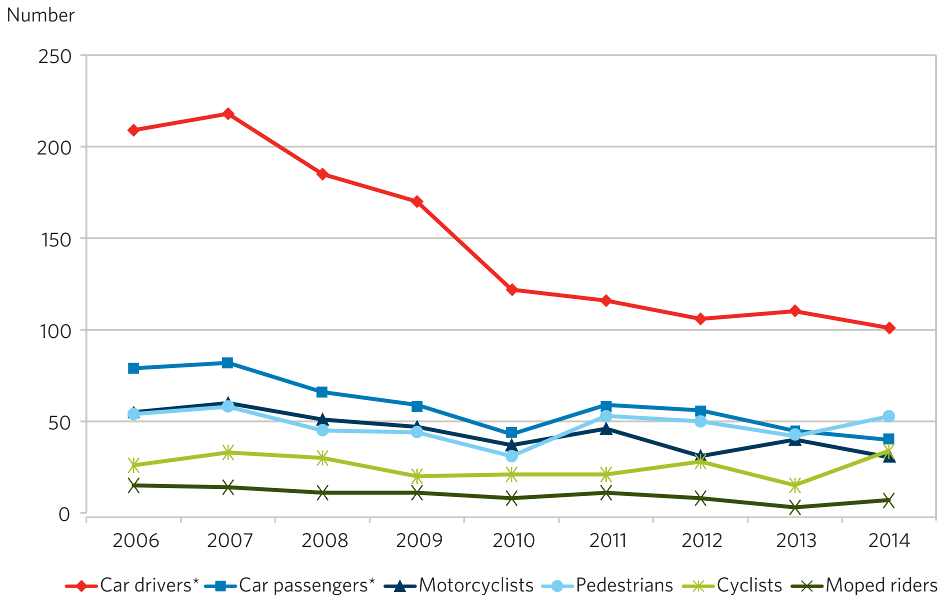


Figure 2. Number of fatalities by road user category. 2006-2014.
**Car drivers include drivers of passenger cars, lorries and buses. Source: STRADA.*

For moped riders and pedestrians, the number of fatalities increased, respectively, from 3 to 8 and 42 to 52. Just over half the pedestrians had been hit on the street or in a junction on the municipal road network. The remaining fatalities were on the national road network. Some persons had been hit having exited their vehicle and others by a reversing car or by their own car that had started to roll.

The number of child fatalities has stabilised at a low level (Figure 3). In 2013, the number of child (0–17 years old) fatalities was 14, which is an increase of three persons compared with 2013, but still a lower level than in 2012. Three of these child fatalities were aged 0–6, of which two due to being run over by a reversing vehicle and one as a car passenger. Of the older child fatalities, three were in moped accidents, one as the rider in a motorcycle accident, two in bicycle accidents, two as pedestrians, two as passengers in a passenger car and one as the driver of an all-terrain vehicle. The gender distribution was 11 male and 3 female. Of the child fatalities, 7 were aged 0-14 and 7 were aged 15-17.

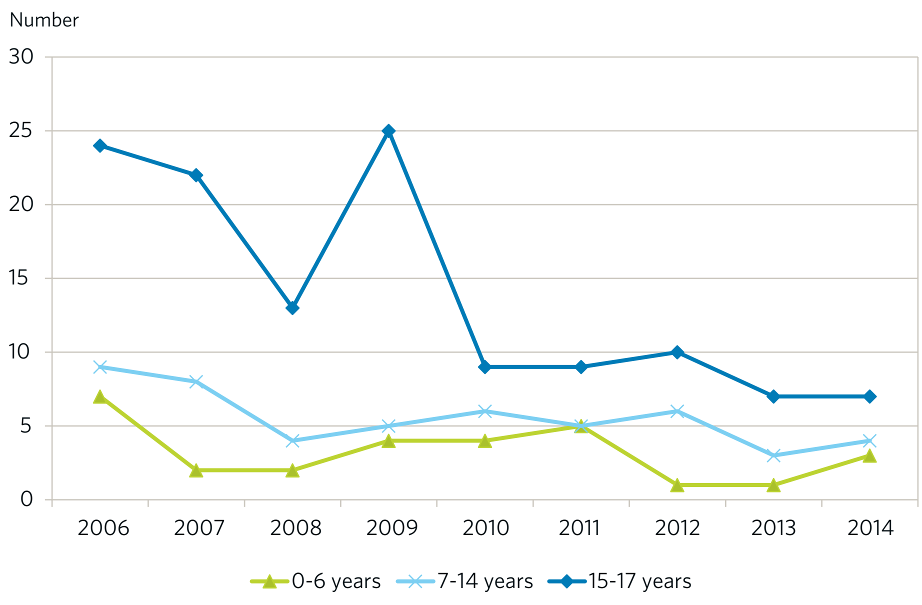


Figure 3. Number of child fatalities (0-17 years) by age. 2006:-2014. Source: STRADA.

2.2 Seriously injured

	2007	2014	Target for 2020	Assessed trend towards meeting target
Forecast number of seriously injured	5 400	4 900	4 000	Not in line with the required trend

The number of seriously injured was estimated at approximately 5 400 for 2007 and approximately 4 900 for 2014. The interim target sets the maximum number of seriously injured at 4 000 for 2020, which corresponds to an annual rate of reduction of just over 2%. The number of seriously injured has declined by about 10% since 2007, which is an annual reduction of 1.4%. The trend is thus no longer sufficient in terms of the required annual reduction.

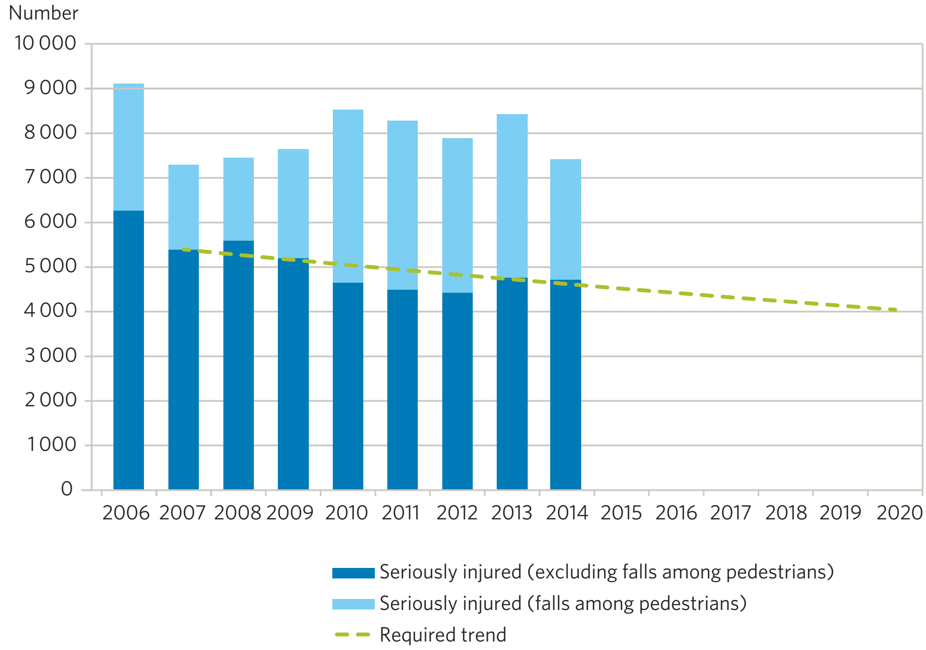


Figure 4. Forecast number of seriously injured 2006-2014, and the required trend until 2020. Source: STRADA.

Figure 5 shows the trend in the number of seriously injured distributed by road user category. It is clear that the increase over the last two years is due to an increase in the number of seriously injured cyclists. The number of seriously injured in passenger cars has levelled off at approximately 1 600. As regards the other road user categories, their reduction has stabilised at the level of 300–400.

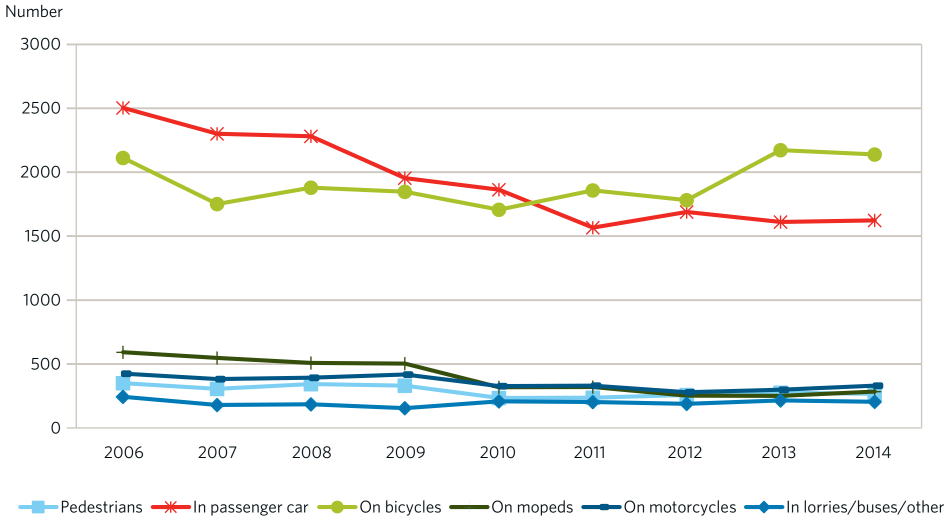


Figure 5. Forecast number of seriously injured by road user category 2006-2014. Source: STRADA.

Many of those seriously injured were pedestrians who had fallen (Figure 4). If this type of accident had been included in the formal definition of road traffic accident, the number of seriously injured would be just over 7 500. Figure 6 shows the number of falls per month in 2014. Most falls occurred in January and in December. It is therefore important to keep this road user category in mind even though it is not included in the official statistics.

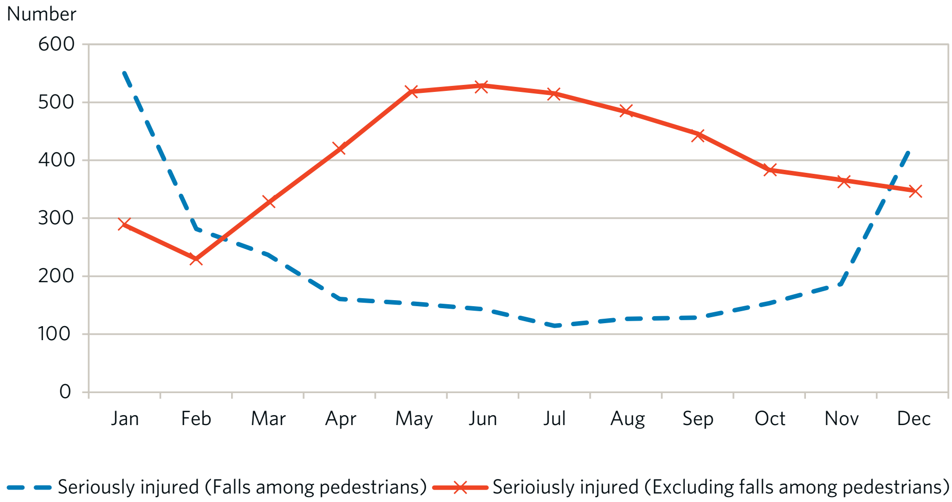


Figure 6. Forecast number of seriously injured, including/excluding pedestrian single, by month 2014. Source: STRADA.

Many people with a low degree of medical impairment do not regard themselves as seriously injured. For this reason, the term very seriously injured is also used. This refers to a person who has sustained a medical impairment of at least 10%. The estimate for 2014 is that about 700 individuals were very seriously injured. Of these, 40% were women and 60% men. The greatest difference between seriously and very seriously injured persons is that the very seriously injured have more often sustained head injuries.

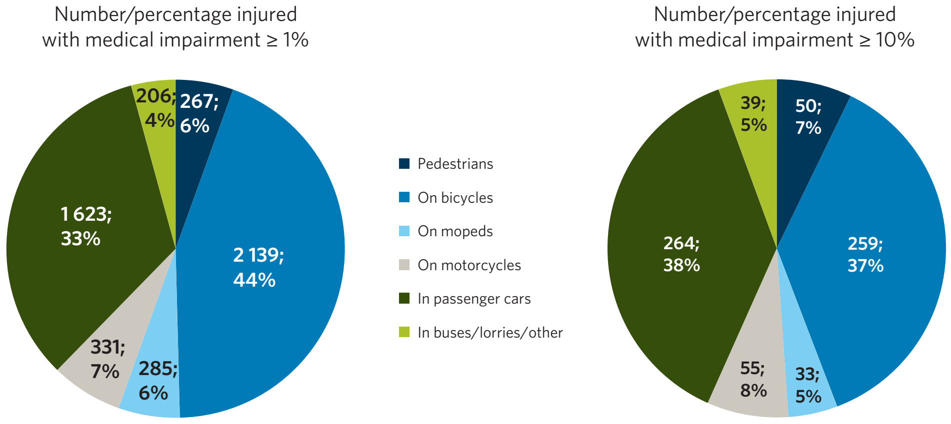


Figure 7. Forecast number/share of seriously injured and very seriously injured (excluding falls among pedestrians) by mode of transport, 2014. Source: STRADA.

Figure 7 shows the distribution between different road user categories by degree of seriousness. Cyclists and persons travelling in passenger cars are the road user categories that represent the greatest share of both seriously injured and very seriously injured. Together, these two categories represent about 75% of all injured. The types of injury for these two road user categories are completely different. The most common cyclist injuries are those to the arms, shoulders and legs. The greatest difference between seriously and very seriously injured cyclists is that four in ten very seriously injured cyclists have sustained injuries to the head. This is only one in ten for seriously injured cyclists. For car occupants, neck injuries are the most common injury; just over 60% have been affected by neck injuries, regardless of their degree.

More motorcyclists have been seriously injured or very seriously injured than moped riders. The most common injuries in both categories are those to the arms, shoulders and legs. The share of pedestrians who are seriously or very seriously injured after being hit by a vehicle is much larger than their share of the total passenger traffic volume. In this category as well, leg or arm injuries are what most often lead to permanent disabilities of at least 1%.

2.3 International comparison

Sweden, the United Kingdom, Denmark and the Netherlands have the lowest number of fatalities per capita in the EU. Even though Sweden's proportion has increased from 2.7 to 2.8 between 2013 and 2014, Sweden is still well placed in comparison with the 2013 value for the other countries.

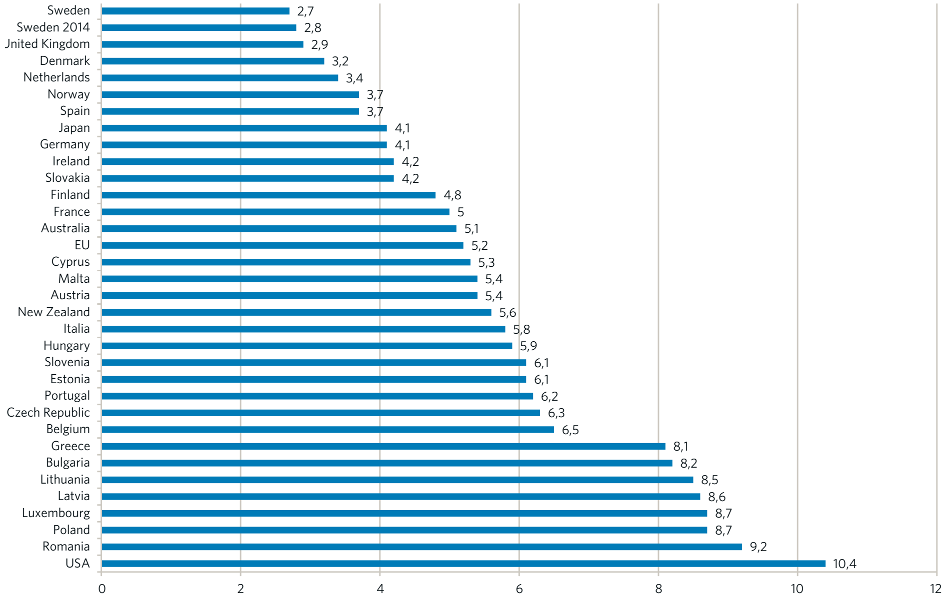


Figure 8. Number of road deaths per 100 000 inhabitants. Sweden (2013 and 2014) compared with other countries (2013). Source: IRTAD and CARE.

If Sweden's road death trend between 2006 and 2014 is compared with those of Norway, Finland and Denmark, there is variation in the number of fatalities, but the trends are positive in all these countries. There is a steady decrease in the number of fatalities over time, but with a certain annual variation (Figure 9).

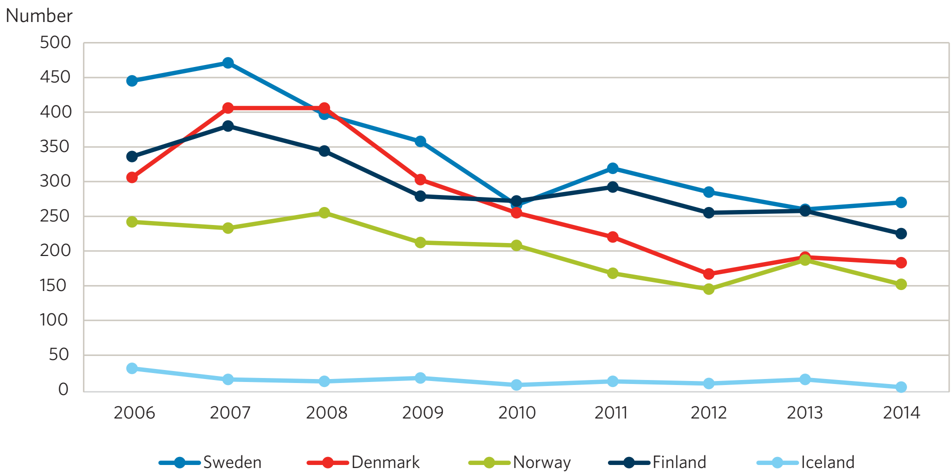


Figure 9. Number of fatalities in road traffic accidents in Sweden, Denmark, Norway and Finland, 2006-2014. Source: Nordic Road Association.

Comparing the countries' trends, it can be seen that Sweden has had a mean annual decrease of about 24 fatalities compared with the mean value for 2006-2008. This corresponds to an average annual decrease of 7%. The corresponding decrease in Norway and Finland has been 7% and 6%, respectively, while Denmark has had an annual decrease of 10% compared with the mean value for 2006-2008.

2.4 Analysis and discussion

Sweden's average annual decrease in the number of fatalities since 2007 is 7%, which is still in line with the required trend for achieving the target by 2020. However, the number of fatalities has risen by 10 between 2013 and 2014. This increase may be attributed primarily to pedestrians, cyclists and, to some extent, moped riders, whereas the other road user categories are decreasing. Whether this increase in killed unprotected road users constitutes a trend is still too early to determine, but it will need to be monitored closely. It is also cause for concern that the number of seriously injured is no longer sufficient in terms of the required annual reduction. Here too, it is clear that the rise is due to an increase in the number of seriously injured cyclists and that the decrease in the number of seriously injured in passenger cars has levelled off. If we look at the number of seriously injured, and include pedestrians who have fallen, it is seen that they are a large category that needs to be taken into account.

Swedish road safety is still among the best in the world. The fatalities trend across all Nordic countries is a decreasing one, even though Sweden saw a rise between 2013 and 2014 in contrast to the other Nordic countries.

The influence of random variation has been calculated in order to assess the probability of Sweden achieving the target of no more than 220 road deaths by 2020. Calculations show that if the expected number of fatalities in 2020 is 197[4] on the basis of road safety and external factors, then there is a 95% probability of Sweden achieving an actual outcome of no more than 220. Continued measures for achieving the target of no more than 220 road deaths should therefore be designed on the basis of 197 fatalities. This should be taken into account in the forthcoming interim target review to begin in 2015.

[4] The number of fatalities is assumed to follow a Poisson distribution, and the target value has been calculated by selecting 220 fatalities as the upper confidence limit in a 95% one-sided confidence interval.

3 External factors

There are a number of factors affecting road safety which lie beyond the reach of actual road safety work. Weather is an example of such an external factor that can have a direct impact on road safety. Other factors, e.g. the age structure of the population, affect the composition of different modes of transport which in turn affects the development of the number of fatalities and injured in road traffic. This chapter will present some external factors and how they developed in 2014.

An important external factor is the size and composition of traffic volume. Preliminary figures for 2014 show that total traffic volume increased by approximately 2.3% on 2013. Traffic volumes for passenger cars and heavy vehicles have increased to roughly the same extent, 2.3% and 2.1% respectively. As the average annual increase in traffic volume since 1996 is 0.9%, 2.3% is a relatively large increase. Figure 10 shows how traffic volumes for different types of vehicles have evolved between 1996 and 2014. The dominant vehicle type is passenger cars, which represents just over 80% of the total traffic volume on Swedish roads. Over the entire period, all vehicle types except buses increased until 2008, after which traffic volumes of passenger cars, heavy lorries and motorcycles levelled off or even declined slightly, while the volume of light lorries continued to grow. The volume of bus traffic has remained at just under 1 000 million vehicle kilometres annually throughout the period.

The number of motorcycles on the road increased slightly between 2013 and 2014, from just under 310 000 to just under 312 000[5] . The number of motorcycles increased sharply in the early 2000s until around 2007–2008. The rate of increase then slowed, but the number of vehicles has continued to grow every year. This has coincided with a decrease in traffic volume (see Figure 10), which points to a decrease in the distance driven per motorcycle. The number of Class I[6] mopeds on the roads has declined from just over 105 000 in 2013 to just over 104 000 in 2014. This class of moped has declined in number every year since 2009, when there were just over 135 000 registered mopeds on the road. Vehicle register data also shows that, since 2012, temporarily deregistered mopeds outnumber mopeds on the road, per 30 June. In 2014 there were approximately 145 000 temporarily de-registered mopeds. Estimates of moped traffic volumes[7] indicate the total distance driven by mopeds was approximately 190 million kilometres in 2014, and that this figure declined by about 1% between 2013 and 2014.

Bicycle traffic volumes are important to monitor since a large share of injured road users are cyclists. However, total bicycle traffic volume, and annual changes to it, is difficult to estimate as no national measurements are made, but municipal measurements from Stockholm, Gothenburg and Malmö all indicate an upward trend in recent years. Stockholm measures its bicycle traffic volume in May and June each year and reports 5-year averages. These show an increase every year through the 2000s[8] in both the inner city cordon and the Saltsjö-Mälaren cordon. The only exception was the most recent 5-year average (2010–2014) showing a decrease in the inner city cordon. Gothenburg's calculations point to an increase of approximately 29% between 2011 and 2014, on a full-year basis. Between 2013 and 2014, cycling increased by 4% and between 2012 and 2013 by 22%[9]. Malmö reports combined figures for bicycle and moped traffic (though bicycle traffic accounts for about

[5] Refers to the number of registered motorcycles on the road as of 30 June each year, according to the vehicle register. Source: Transport Analysis/Statistics Sweden.

[6] Refers to the number of registered motorcycles on the road as of 30 June each year, according to the vehicle register. Source: Transport Analysis/Statistics Sweden.

[7] Data from Insurance Sweden, processed by VTI. Refers to both Class I and Class II.

[8] Data obtained from Johan Bergkwist of the Stockholm Traffic and Public Transport Authority.

[9] Results obtained from Jenny Larsson of the Gothenburg Traffic and Public Transport Authority.

98%), and these show that traffic has increased by 48% between 2003 and 2013 (Streets and Parks Department, 2014). All three sections measured have shown an increase in bicycle traffic. What these cities have in common is that they measure the number of bicycles passing certain selected points which are the same from year to year. The methods can otherwise differ in some respects, such as the way in which cyclists are counted and what data is reported (e.g. every day or only weekdays).

Bicycle sales have grown in recent years. During the 2013/2014 season[10], approximately 584 000 bicycles were sold, which is a 5% increase on the 2012/2013 season when 555 000 bicycles were sold (Svensk Cykling, 2014). Since the 2010/2011 season, the number of bicycles sold has increased by 16.5%.

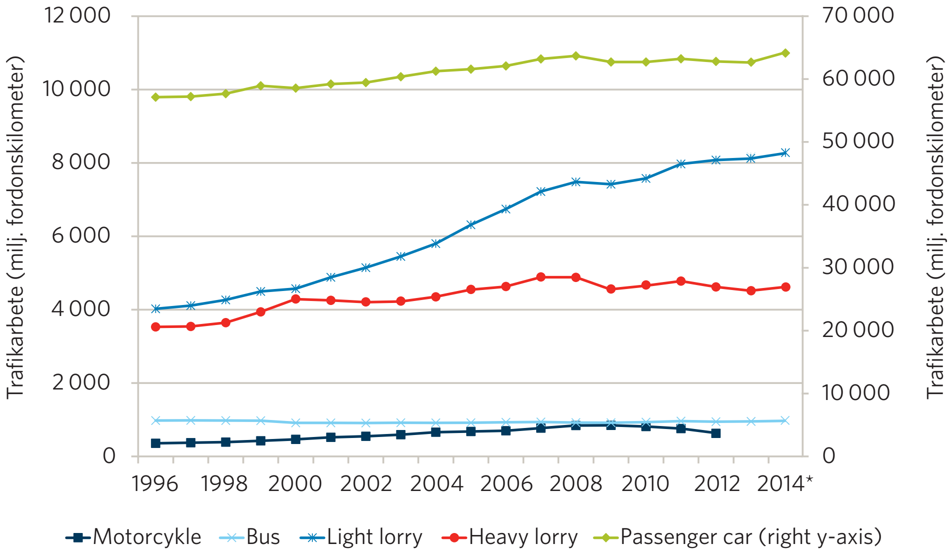


Figure 10. Traffic volumes by vehicle type, 1996-2014 (million vehicle kilometres). Note that the traffic volume for passenger cars is shown along the right-hand y-axis. Source: Transport Analysis and VTI.

**Data for 2014 is preliminary and has been adjusted upwards using change factors, as defined by the Swedish Transport Administration, for passenger cars (cars + light lorries) and heavy vehicles (heavy lorries and buses), respectively. For motorcycles, the latest definitive data is from 2012.*

The age structure of the population also affects road safety since people of different ages choose different modes of transport and present different behaviours (how great risks they take on the road). A person's physical ability to cope with being hit by a vehicle, for example, also varies with age. Figure 11 shows changes to the age structure of the population between 1996 and 2014. The changes between different age groups of course occur very gradually, but it is possible to discern, e.g. that the 65–74 age group has grown somewhat and the 18–24 group declined somewhat between 2013 and 2014.

The age group with the highest risk of being killed in traffic is the 75+ group, which is partly because people over 75 are more fragile if an accident occurs and because they are frequently unprotected road users (Transport Analysis 2011). The second highest risk group is the 18–24 one, and here it is primarily men who represent the high risk. The share of the population that is over 75 years old has remained stable at between 8% and 9% since 1996, but population forecasts by Statistics Sweden indicate that the 75+ group will grow between now and 2020. In other words, the group with the highest fatality risk is set to grow over the next few years, which may lead to increased road deaths. However, the 18–24 group, which also represents a relatively high risk, is set to decline and may thus compensate somewhat for a possibly increased incidence of road deaths among the elderly. The group with the lowest risk of being killed in traffic is the 7–14 age group, followed by the 45–64 and 25–44 groups.

[10] A season is counted from 1 September to 30 August.

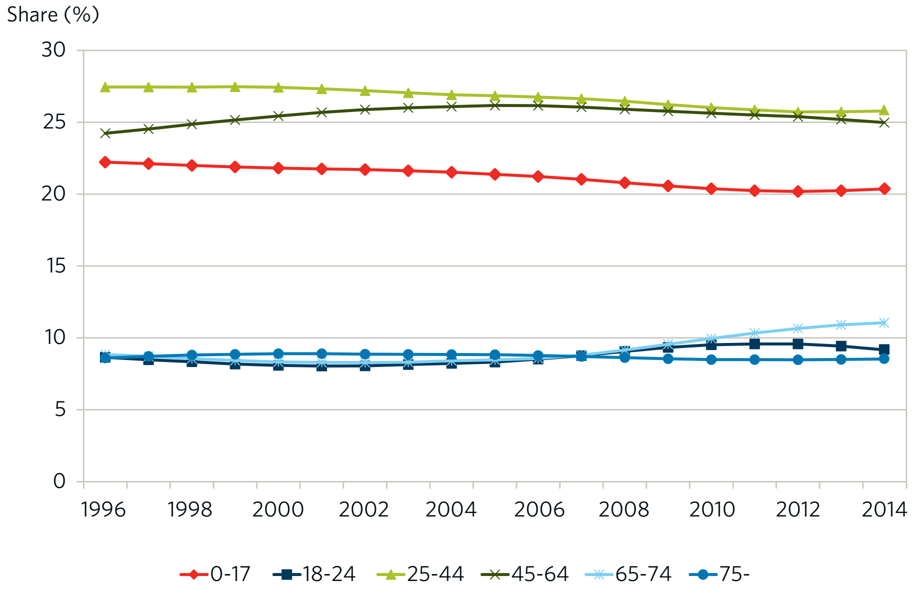


Figure 11. Age distribution of the population, 1996-2014. Source: Statistics Sweden.

Experiences from several countries indicate that there is a link between the number of road deaths and economic development, where a slowdown of the economy is often followed by a reduction in the number of road deaths (Wiklund et al 2011, Ch. 2). To some extent this may be due to the decline in travelling associated with a recession, but that is not the whole story. There are a number of hypotheses about the link between state of the economy and road safety, most of which have to do with patterns of travel. There are probably several different effects that influence road safety in different ways, so it is difficult to present any clear causation.

Unemployment figures are often used in this context as a measure of economic development. Figure 12 shows statistics from the Swedish Public Employment Service on the share of the population who are openly unemployed or participating in a programme with activity support. Unemployment has gone down by 0.4 percentage points between 2013 and 2014. However, unemployment rates have varied quite a lot during the entire period of 1996-2014. Its lowest level was in 2007 and 2008, after which it rose fairly sharply until 2009. Since then the unemployment rate has remained quite high. This may have contributed to the relatively low number of road deaths in recent years. It should be remembered, however, that the unemployment rate is only one of many factors affecting road death figures, and that there is also a sizeable random variation from year to year which affects the actual outcome.

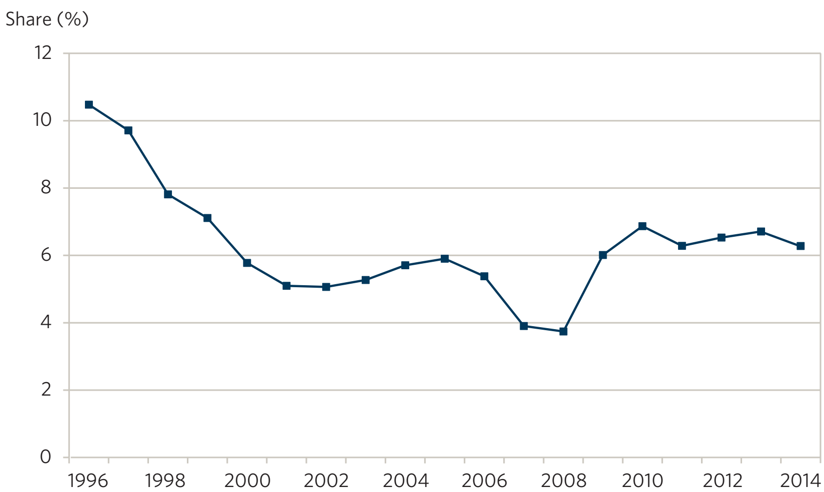


Figure 12. Total unemployment (open unemployment plus participants in programmes, share of the population), 1996-2014. Source: Swedish Public Employment Service.

The weather can have a considerable effect on traffic during limited periods of time and in specific geographical locations, e.g. during temporary downpours or slippery road conditions. It is very difficult to determine the extent of the effect that such temporary and local weather conditions have on road safety, and how much this impacts national statistics. With respect to the winter season, however, it has been observed that wintry road conditions and low temperatures lead to reduced traffic and lower speeds. During winters with heavy snowfall large amounts of snow accumulate along the roadside, which leads to fewer serious single-vehicle accidents. These effects were observable during the winters of 2010 and 2011, both of which had heavy snowfall. Snow depth charts compiled by the Swedish Meteorological and Hydrological Institute (SMHI) show that 2014 had relatively little snowfall. This may have contributed to poorer road safety conditions for car traffic as compared with 2010 and 2011. By contrast, the extent of the difference between 2013 and 2014 should not have had any impact.

4 Follow-up of road safety performance indicators

4.1 Compliance with speed limits – national road network

	2004	2014	Target for 2020	Assessed trend towards meeting target
Share of traffic volume within speed limits, national road network	43 %	46 %	80 %	Not in line with the required trend
Average journey speed (km/h)	82	78	77	In line with the required trend

The target is for at least 80% of the traffic volume to be within legal speed limits by 2020. The target for average speed corresponds to a reduction by 5 km/h. Lowered speeds are deemed to be among the indicators that have the greatest potential for reducing road deaths.

Carrying out nationwide measurements of speed levels is resource intensive. In 2012, the Swedish Transport Administration conducted one of three measurements (2012, 2016 and 2020) planned until 2020. The last measurement prior to that was conducted in 2004. For 2013–2014, an estimate has been made on the basis of the 2012 measurement and the Swedish Transport Administration's simpler measurements (the Speed Index), which only show relative changes to speeds.

Trend and projection towards the 2020 target

Figure 13 presents the observed share of the traffic volume travelling within speed limits on national roads. The share of traffic volume within speed limits on national roads is estimated to be 46.2% in 2014. The corresponding result from 2013 measurements was 46.6%. The outcome is 20 percentage points below the required trend for achieving the target by 2020.

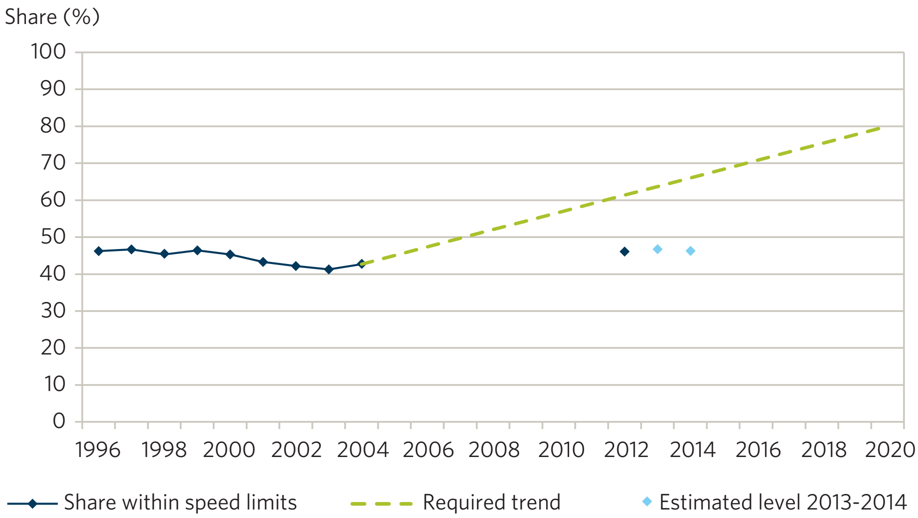


Figure 13. Share of traffic volume within speed limits on national roads, 1996–2004 and 2012–2014, and the required trend until 2020. Source: The Swedish Transport Administration.

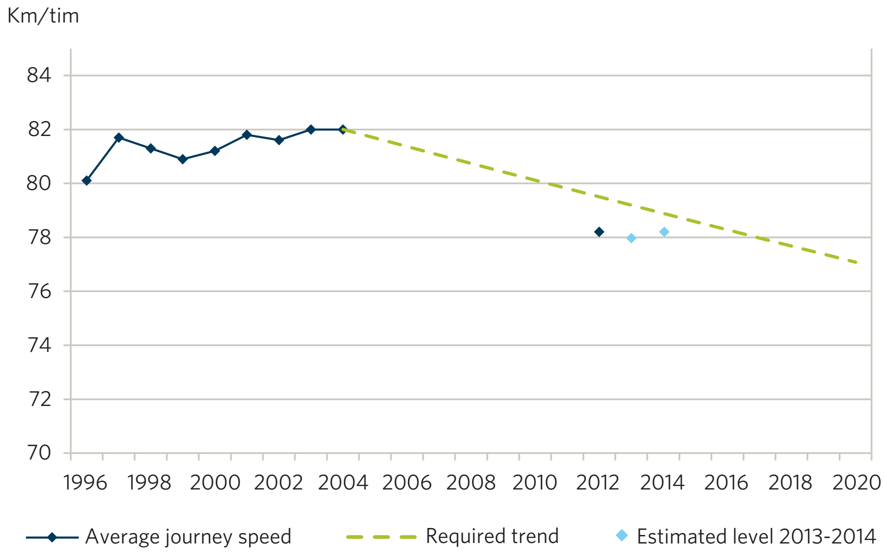


Figure 14. Average journey speeds on national roads, 1996–2004 and 2012–2014, and the required trend until 2020. Source: The Swedish Transport Administration.

Analysis and discussion

Results from the simpler index measurements carried out each year show more clearly that the trend of decreasing speed levels has not continued in 2014 (see Figure 15).

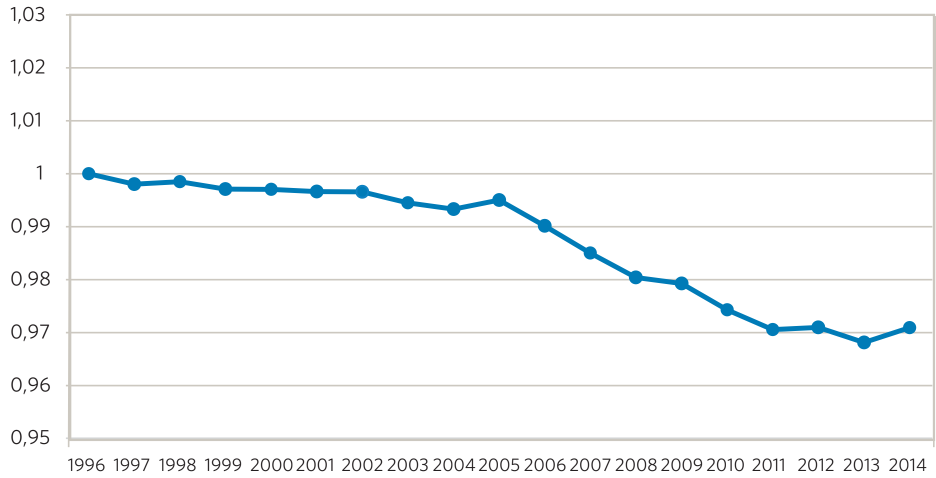


Figure 15. Average speed index for the summer period (April-September), national roads 1996-2014 (Index 1996=1). Source: The Swedish Transport Administration.

Even if the tracking of travel speeds points towards lowered speeds which are still in line with the required trend, we still have a long way to go in order to achieve the target of 80% compliance in 2020. Since compliance is more or less unchanged, the gap to the required trend grows bigger and bigger.

Automatic speed surveillance (ATK) is the single most important tool for increasing compliance. Expanded use of ATK is particularly important on 80 km/h stretches of roads, primarily because these roads do not have median barriers and because compliance is generally low. For the period from 2014 until 2020, the Swedish Transport Administration and the police are planning a yearly addition of 200 stations. However, this investment to double the number of ATK stations by 2020 from today's 1 100 is not deemed sufficient to achieve 80% compliance.

It is also important to continue supporting correct behaviour among drivers by encouraging the introduction of Intelligent Speed Adaptation (ISA) in vehicles, e.g. through financial incentives. The introduction of ISA into Euro NCAP safety classifications is an important milestone in this regard.

Since 2012, there have been annual speed surveys in order to measure various speed parameters for motorcycles. However, the scope of these measurements is considerably less than that of the nationwide speed surveys carried out in 2012 and planned for 2016. The measuring period is from May to September with speeds being measured at around 270 locations. The share of motorcycles within speed limits is estimated to have increased from 39.1% in 2013 to 41.5% in 2014 (see Figure 16). Compliance by passenger car drivers has not improved. Motorcycles travelling at more than 5 km/h above the speed limit also show a clear reduction.

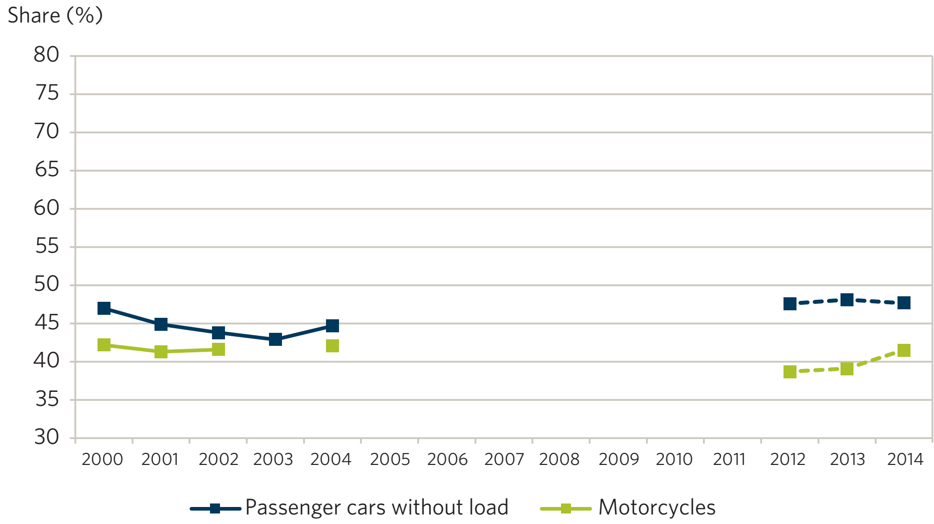


Figure 16. Share of the traffic volume within speed limits, 2000-2004 and 2012. The estimate for 2013-2014 is for heavily used motorcycle road networks and the entire national road network for passenger cars without load, May to September 2014.

Compliance with speed limits has been indicated as a priority area for achieving safe motorcycle traffic in the strategy for increased safety for motorcycle and moped riders (Swedish Transport Administration, 2012). A questionnaire carried out by SMC and VTI during 2013 shows that lowered speeds are not regarded as an important safety factor by motorcyclists themselves. For this reason, the results from the 2014 measurements may viewed as very positive.

4.2 Compliance with speed limits – municipal road network

	2012	2014	Target for 2020	Assessed trend towards meeting target
Share of traffic volume within speed limits, municipal road network	64* %	63 %	80 %	Not in line with the required trend
Average travel speed (km/h)	49	49	To be set in 2016	

*First year of measurements. The measurements are not nationally representative, but are considered good enough as a basis for tracking changes over time.

The target is for at least 80% of the traffic volume to be within applicable speed limits by 2020. Starting in 2012, average speeds have also been monitored. At present there is no target for average speeds, but one will be set in 2016 during the interim target review. Increased compliance with speed limits and lowered speeds are regarded as areas with a considerable potential for reducing the number of road deaths. As has been stated above regarding the national road network, speed is often a prerequisite for achieving the full effect of other measures. Adapting one's speed to speed limits which have been set in consideration of both the safety standard of the road and vehicle safety systems produces overlapping system gains.

A new series of measurements began on the municipal road network in 2012. This series is based on measurements in 23 different localities, with measurements being carried out at three different sites in each locality, see Vadeby and Anund (2014, 2015). The idea is to measure the speed at the same points and during the same period, and 2014 is thus the second year that gives an indication of the change. The measurements do not aim to estimate the share of traffic volume within speed limits in Sweden in a representative manner, but they are nonetheless considered good enough to serve as a basis for tracking changes over time and provide the approximate share.

Trend and projection towards the 2020 target

Figure 17 presents the observed share of the traffic volume travelling within speed limits on municipal roads in 2014. Results show that 63% of the traffic volume is within applicable speed limits. This represents no significant change on 2013. The outcome is 4 percentage points below the required trend for achieving the target by 2020. For this reason, the assessment of the analysis group is that this is not in line with the required trend.

The average travel speed is the same as in 2013, at 49.3 km/h. Although no target has been set for this measurement, we note that no improvement has occurred from 2013 to 2014 in terms of the average speed on municipal roads in urban areas.

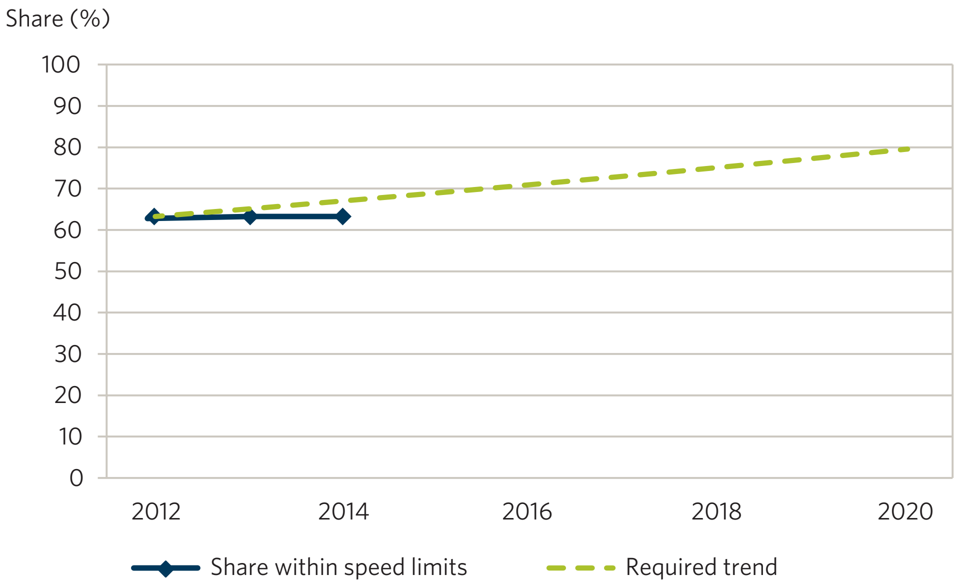


Figure 17. *Share of traffic volume within speed limits on the municipal road network 2012–2014, and the required trend until 2020. Source: Vadeby and Anund (2015).*

Analysis and discussion

The results of the measurements in 2012, 2013 and 2014, grouped by speed limits, are shown in Figure 18. In 2014, 54% of the traffic on roads with a 40 km/h speed limit drove within applicable speed limits. On 50 km/h roads, 61% comply with the speed limit, on 60 km/h roads 68% and on 70 km/h roads 77%. Compliance with speed limits is thus highest on roads with a 70 km/h speed limit, and lowest on roads with a 40 km/h speed limit. For roads with a 70 km/h limit we are close to the target level of 80%. In principle, there are no changes compared with the 2013 measurements.

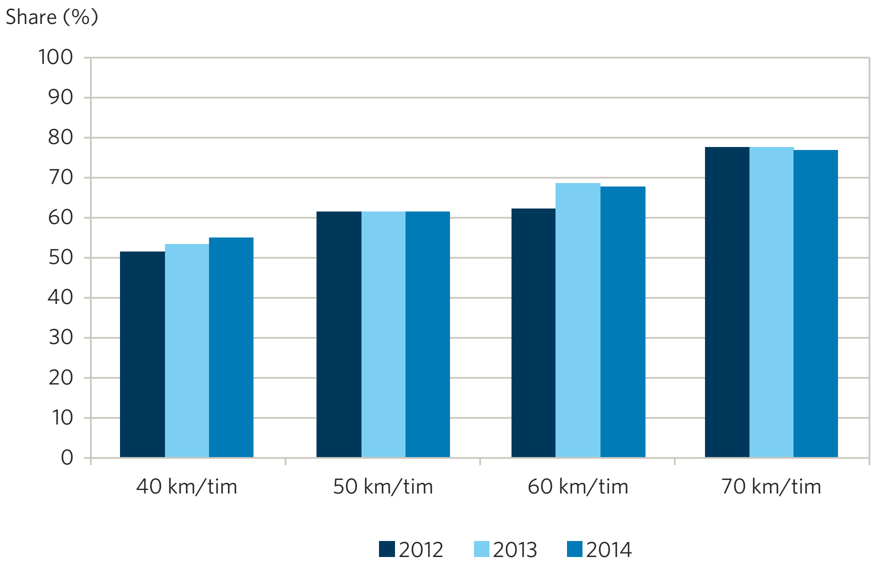


Figure 18. *Share of traffic volume within speed limits on the municipal road network 2012–2014, divided by speed limit. Source: Vadeby and Anund (2015).*

Compliance is somewhat higher during the daytime, when 64% of the traffic volume travels within speed limits, while only 59% of it does so at night. Dividing the data by type of vehicle we find that 62% of passenger cars comply with speed limits, 72% of lorries and buses, and 84% of lorries with loads. The share of violations by motorcycles/mopeds is not reported separately, since the measuring equipment cannot differentiate between motorcycles and mopeds.

A national speed limit review has been in progress since 2008, and according to the national evaluation (Swedish Transport Administration, 2012), 26% of Sweden's municipalities had commenced introduction of new speed limits by the end of 2011. Between 2013 and 2014, the total extent of roads with a 40 km/h speed limit increased by approximately 170 km on the main road network in urban areas. This represents an increase of 23%. Correspondingly, the extent of roads with a 50 km/h speed limit decreased by just over 230 km (7%). In the Swedish Transport Administration's 2013 road safety survey, 62% of respondents find it generally reasonable to lower speed limits in order to increase road safety. In particular, 70% find it reasonable to lower speed limits to 30 km/h in areas with a lot of pedestrians and cyclists.

In order to achieve the target that 80% compliance with speed limits in 2020, improvements to compliance are needed particularly on roads and streets with lower speed limits. In 2014, 72 persons were killed on the municipal road network and 2 160 were seriously injured. About 42% of those killed were pedestrians or cyclists in collisions with motor vehicles on roads with a speed limit of 50 km/h or lower. Kröyer et al (2014) shows that the risk of a pedestrian being killed if hit by a vehicle is about five times greater at 50 km/h than at 30 km/h. Reducing speeds and increasing compliance thus have considerable potential for reducing the number of road deaths.

In contrast to national roads, municipal roads cannot rely on ATK to increase compliance since these roads only have a few cameras, and there are no current plans for more. On the other hand, technical equipment to help drivers to comply with speed limits (ISA) and financial incentives (Stigson et al, 2012) can have a positive impact. There is strong support for technical systems of this kind; the Swedish Transport Administration's road safety survey shows that 57% agree that all cars should be equipped with technology to aid drivers to comply with speed limits more easily. Furthermore, compliance can be increased by making more streets in urban areas more "self-explanatory", thereby making it natural for road users to comply with the indicated speed limit. A good level of compliance at low speed limits is also essential for achieving the full effect of autonomous emergency braking (low-speed AEB), see Rizzi et al (2014).

4.3 Sober traffic

	2007	2014	Target for 2020	Assessed trend towards meeting target
Share of traffic volume with sober drivers	99,71 %	99,78 %	99,90 %	Not in line with the required trend

The target for sobriety on the roads is for at least 99.9% of the traffic volume to have sober drivers by 2020. A sober driver is defined as a driver with a blood alcohol concentration of less than 0.2mg/ml.

A measurement series derived from police surveillance data is used as a basis for monitoring trends (Forsman, 2011). The measurement series shows drink driving trends, not the actual levels. The series has been produced to be as independent as possible from police working methods, but a certain degree of influence cannot be excluded.

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

Trend and projection towards the 2020 target

Results from the measurement series based on police checks indicate that there has been no change in the share of sober drivers in traffic between 2013 and 2014. The share for 2014 is 99.78%, which can be compared with 99.77% in both 2012 and 2013 (Figure 19). There has been an overall increase since the measurement series began in 2007, when the share of sober drivers was 99.71%. That increase has not been large enough, however, and the results for 2014 are below the required trend. The assessment of the analysis group is therefore that the rate of improvement is insufficient for achieving the 2020 target.

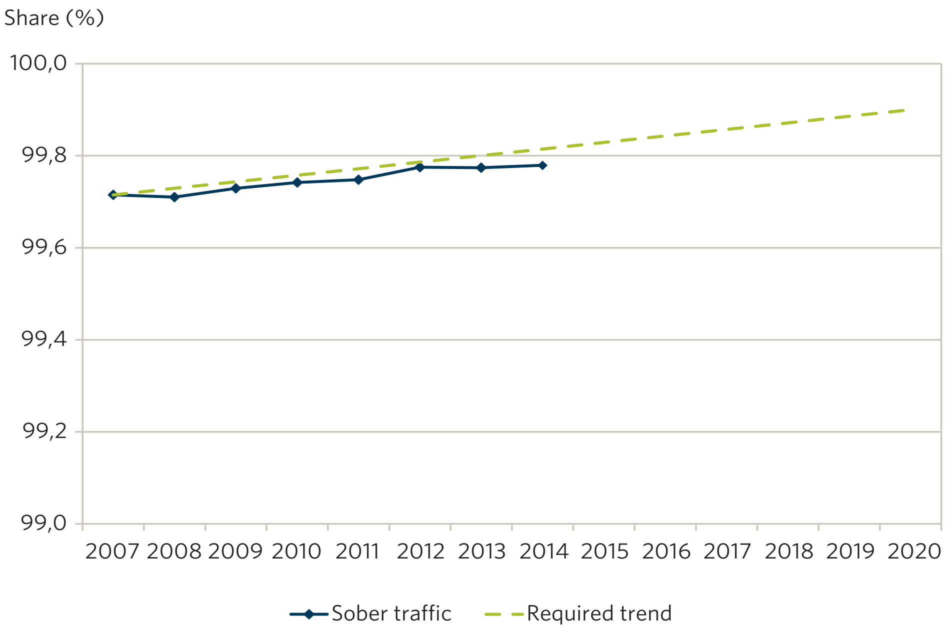


Figure 19. Share of sober traffic 2007-2014. Measurement series based on data from police checkpoints. Source: The police, VTI.

Analysis and discussion

The Swedish Transport Administration's in-depth studies of fatal accidents show that the number of passenger car drivers killed while under the influence of alcohol (blood alcohol concentration ≥ 0.2‰) was lower in 2014 than in 2013 (Figure 20). The share is, however, the same for these two years, which is due to the reduction in the total number of passenger car drivers killed. Looking at the entire period, we can see that the share of drunk drivers, with the exception of 2012, has been relatively low since 2010. This means that when the total number of drivers killed has declined, the share of drunk drivers killed has also declined.

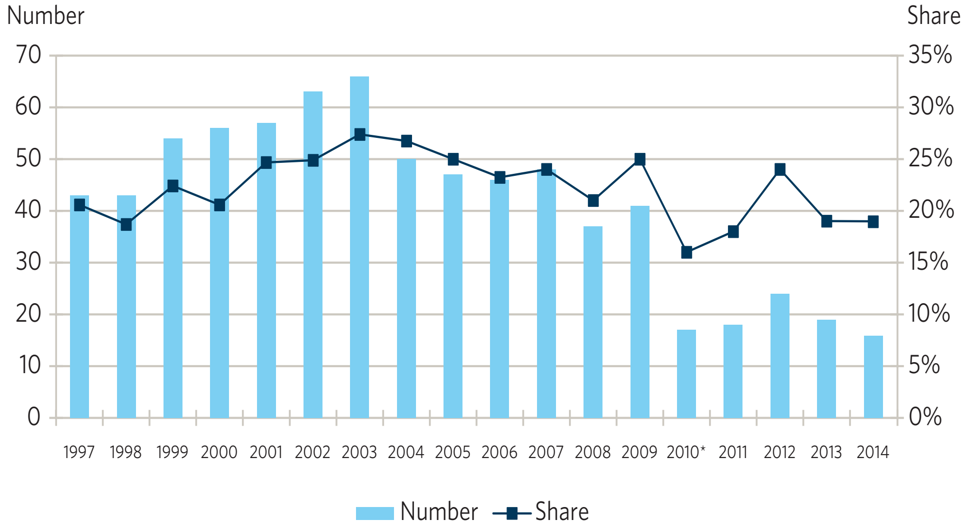


Figure 20. Share of drunk driver (alcohol > 0.2 mg/ml) fatalities among all fatalities and number of drunk driver fatalities, 1997–2014. Source: The Swedish Transport Administration's in-depth studies.
**From 2010 excluding suicide.*

The review of the in-depth studies also shows that alcohol was found in 2 of 8 (29%) moped riders killed and 2 of 28 (7%) riders of two-wheeled motorcycles killed in 2014. Among riders of four-wheeled motorcycles killed, 5 of 6 (83%) were under the influence of alcohol. It is previously known that many four-wheeled motorcycle accidents are alcohol-related. The joint strategy for safer four-wheelers (Swedish Transport Administration, 2013) states that more than 6 of 10 drivers in fatal accidents had been under the influence of alcohol.

Figure 21 shows the number of individuals killed in alcohol-related accidents, divided by mode of transport. A fatal accident is defined as alcohol-related if alcohol (≥ 0.2‰) is found in a motor vehicle driver and/or a pedestrian and/or cyclist. Between 2013 and 2014, there has been a minor increase in the number of fatalities from 49 to 54 persons. It is especially the category of bicycles and mopeds that shows an increase in the number of fatalities in an alcohol-related accident. There were 9 such fatalities in 2014. Of these 9 persons, 7 were cyclists. As regards cyclists and pedestrians killed in alcohol-related accidents, it is usually the cyclists and pedestrians themselves who are under the influence of alcohol. In 2014, this was true of all cyclists and a majority of pedestrians.

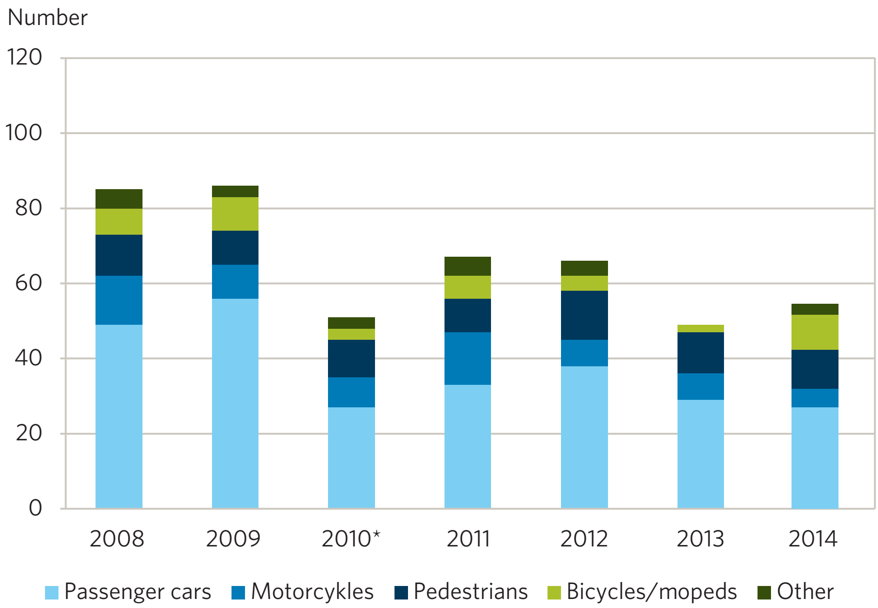


Figure 21. Number of individuals killed in alcohol-related accidents, divided by mode of transport, 2008-2014. Source: The Swedish Transport Administration's in-depth studies.
**From 2010 excluding suicide.*

In the Swedish Transport Administration's 2014 road safety survey, 5.0% of respondents answered yes to the question: "Have you at any time over the past 12 months driven a car after drinking alcohol other than low-alcohol beer?" That is essentially the same level as in 2013 (4.9%), and is one of the lowest levels since measurements began in 1981 (Swedish Transport Administration, 2014). In summary, the share of sober traffic continues to be high in Sweden – but it has stagnated, and measures need to be increased in order to achieve the 2020 target.

An important role in future efforts to prevent drunk driving will be played by devices that quickly and reliably identify alcohol in exhaled breath. Devices of this kind can be used either in vehicle-integrated systems or in vehicle-independent automatic sobriety controls (also known as alcogates). The purpose of automatic sobriety controls is to allow for extensive drunk driving checks in locations with large numbers of cars, and field trials have been conducted with promising results at the Germany terminal in port of Gothenburg and at the Port of Stockholm. The field trial was initiated by MHF (Motorförarnas Helnykterhetsförbund, the Swedish association of teetotal drivers), which now proposes a successive introduction of the system at Sweden's ports. As regards vehicle-integrated systems, the technology of passive alcohol sensors is relatively well developed, and the next step will be to test and demonstrate these systems on a larger scale. But even if the technology is promising, it will be a number of years before it can be implemented to any greater extent.

Parallel to alcohol detection systems, there is the development of more general systems to monitor driver behaviour and take appropriate action. These systems can also be significant with respect to drivers under the influence of alcohol and even drugs.

Police surveillance will continue to play an important role. Even if technology might eventually reduce the role of the police, it will take a long time before this exists to any great extent and it also primarily relates to cars. The decrease in the number of breath tests carried out in recent years is therefore cause for concern. Approximately 1.9 million breath tests were carried out in 2014, which is a 15% decrease from 2009, when 2.2 million tests were carried out. The number of tests has decreased in all but two counties. Since 2009, the number of tests has decreased by almost one third (31%).

The number of reported drunk driving offences has also declined in recent years, which may be due to a combination of decreased surveillance and more sober traffic. The decrease between 2013 and 2014 is not very great, 13 999 to 13 735 (preliminary figures from the Swedish National Council for Crime Prevention). However, in 2009, when the number of breath tests was greatest, 17 847 offences were reported.

The definition of sober traffic also includes drivers being free of drugs other than alcohol. None of the indicators monitors this, but Figure 22 shows a time series for the number of persons killed in drug-related accidents. These are defined in a manner corresponding to alcohol-related accidents. Only illegal drugs are in view here. However, it should be noted that knowledge of possible drug influence in surviving road users is relatively rare, for which reason there is some uncertainty in the results. In total, 21 persons were identified as having been killed in a drug-related accident in 2014, which corresponds to approximately 8% of all fatalities. Figure 22 shows that these fatalities were distributed according to the modes of transport of passenger car, motorcycle and pedestrian.

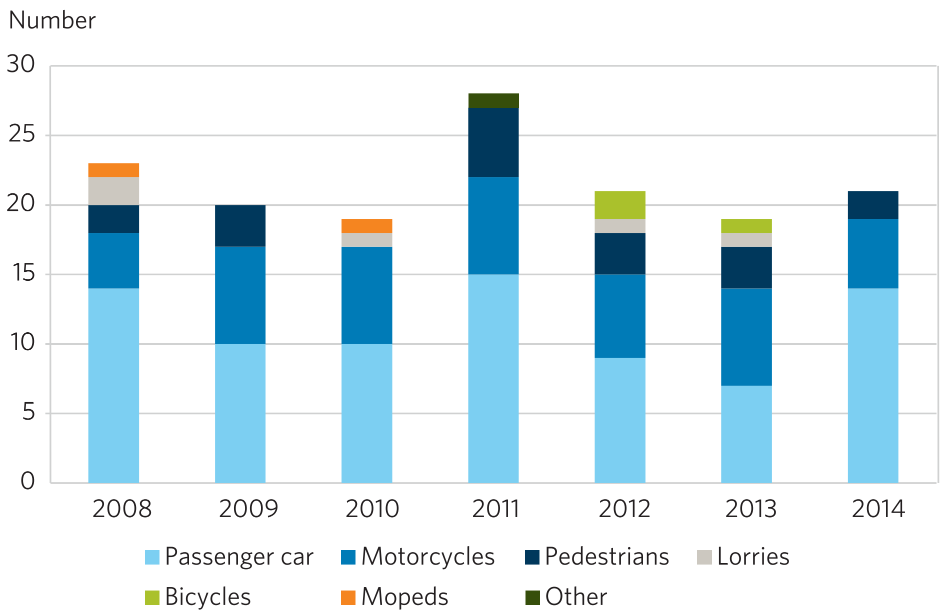


Figure 22. Number of individuals killed in drug-related accidents, divided by mode of transport. Source: The Swedish Transport Administration's in-depth studies..
**From 2010 excluding suicide.*

A review of all passenger car drivers killed in the years 2005–2013 shows that amphetamine was the most common illegal drug, occurring in 4.3% of drivers (Forsman, 2015). The next most common was THC (cannabis), occurring in 2.4%. Previous studies (e.g. Elvik, 2013) have shown that amphetamine is the drug generating the greatest increased risk of being killed or seriously injured on the road.

4.4 Use of seat belts

	2007	2014	Target for 2020	Assessed trend towards meeting target
Share of front seat passenger car occupants wearing a seat belt	96 %	97 %	99 %	In line with the required trend

The target for seat belt use is that at least 99% of all drivers and front seat passengers in passenger cars use a seat belt by 2020. Results of the observational measurements by the Swedish National Road and Transport Research Institute (VTI) are used as a basis for monitoring trends. The indicator is defined as the share of the observed drivers and front seat passengers wearing a seat belt (for a description of the measurements, see Larsson et al. 2014). The measurements are based on observations of 58 000 passenger cars at major roundabouts in six urban areas in central Sweden. The measurements are intended to monitor trends over time, and the extent of belt use reported should not be regarded as representative of drivers and passengers in Sweden in general.

Trend and projection towards the 2020 target

The use of seat belts in the front seats of passenger cars was 97% in 2014, which is no change on 2013. The assessment of the analysis group is that this is in line with the required trend.

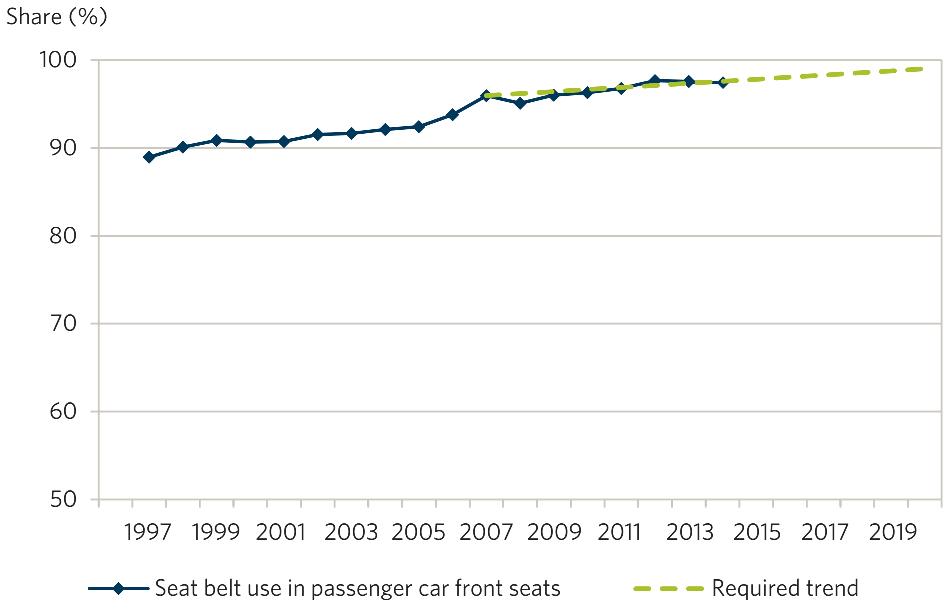


Figure 23. Share of individuals in passenger car front seats who were wearing a seat belt when observed, 1997-2014, and the required trend until 2020. Source: VTI's observational measurements.

Analysis and discussion

The share of individuals using a seat belt in the front seat is high, but has stagnated over the last three years. Of the drivers, 98% use a seat belt, while 97% of front seat passengers use a belt. Figure 24 shows that seat belt use has increased in all professional groups, and seat belt use by taxi drivers is now as high as for other drivers of passenger cars. Even though the extent of seat belt use is far too low among drivers of heavy lorries, a continued rise is discernible. Belt use among adults in the back seat has decreased over the last two years.

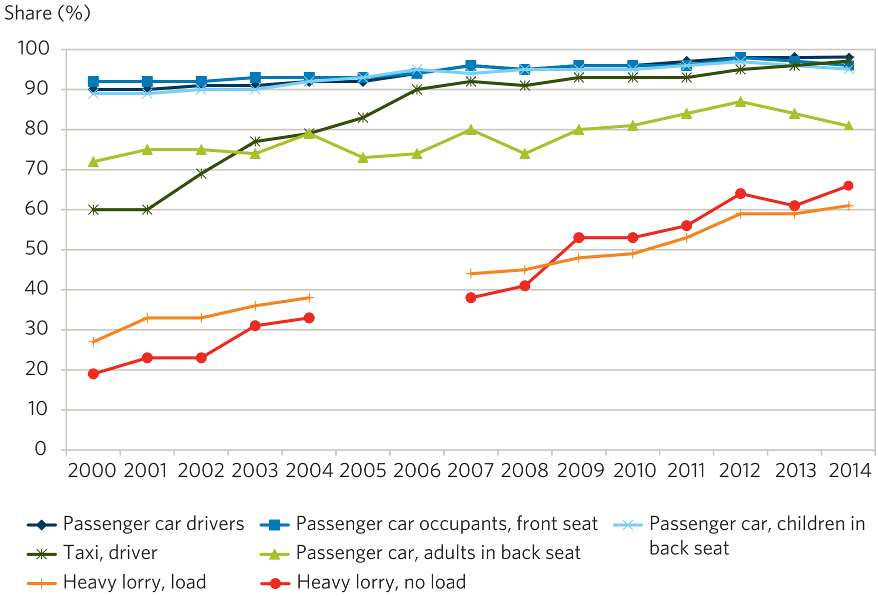


Figure 24. Seat belt use in passenger cars and heavy lorries, 2000-2014. Source: VTI's observational measurements.
**Observations of heavy lorries from 2007 on are not fully comparable with earlier observations.*

The seat belt use of women is of the order 5-10 percentage points higher than that of men. Belt use is particularly low among younger men. Belt use in the group of men aged 18-25 is estimated to be around 10 percentage points below other age groups.

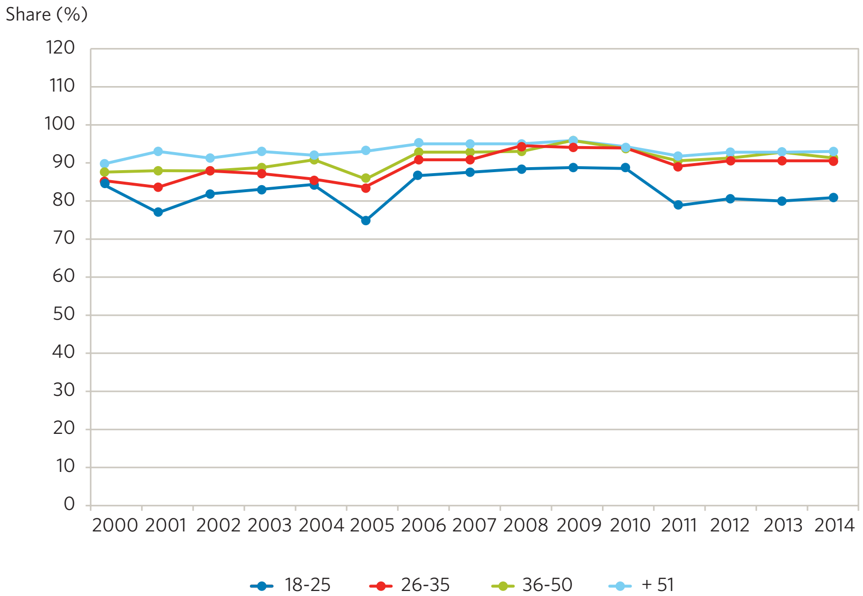


Figure 25. Seat belt use of male passenger car drivers by age group, 2000-2014.

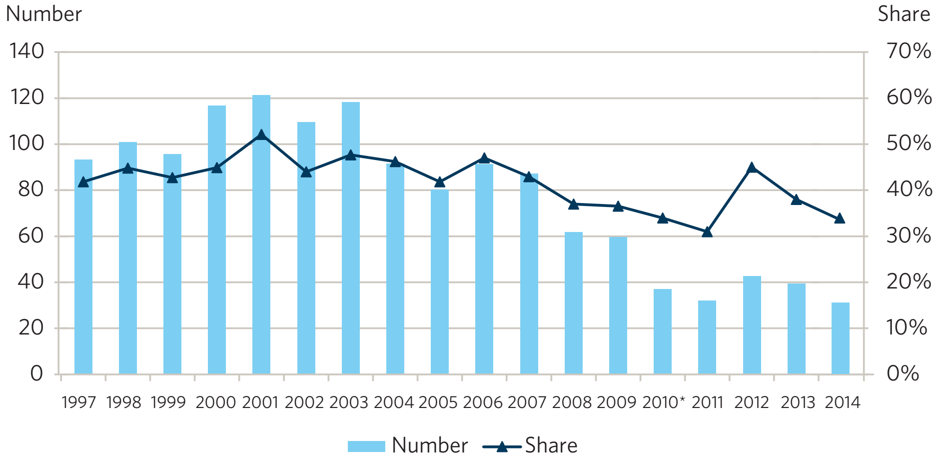


*Figure 26. Share of passenger car driver fatalities who were not wearing a belt at the time of the accident, and the number of passenger car driver fatalities who were not wearing a belt at the time of the accident, 1997-2014. Source: The Swedish Transport Administration's in-depth studies. *Data for 2010 was collected in a different manner than previously, and results are therefore not fully comparable with earlier values. However, the difference is judged to be small. Figures exclude suicide since 2010.*

Results of the Swedish Transport Administration's in-depth studies show a positive trend, with a reduced share of passenger car driver fatalities who were not wearing a belt at the time of the accident. During the past three years, however, the share has been slightly above the positive trend curve which has applied since 2002. In 2014, the share not wearing a belt was 34% (Figure 26).

The share of new cars with seat belt reminders continues to increase. The share of the car traffic volume with seat belt reminders was 73% in 2014 and 67% in 2013. As recently as 2005, the share was just under 10%. A forecast indicates that the share of the traffic volume with seat belt reminders will increase from about 70% currently to about 95% in 2020 (see the section on safe passenger cars). Even if the vehicle fleet does not become 100% equipped with seat belt reminders, it remains likely that seat belt use will increase from the current 98% to the target of 99% use by 2020. Figure 25 above makes it clear that there is considerable potential for increased seat belt use in passenger cars among younger, male drivers aged 18–25. It is also this group of passenger car drivers that uses the oldest cars, which do not have seat belt reminders. In view of the fact that seat belt use among car fatalities is only 60–70%, many lives could be saved if there were to be a further increase to the already high use of seat belts in general. As has been mentioned earlier, there is also some uncertainty as to how well the measurements reflect the true level of seat belt use across the entire Swedish road network. According to NTF's measurements of seat belt use in all of Sweden's municipalities, seat belt use in 2014 was only 93% within urban areas.

4.5 Use of helmets

	2007	2014	Target for 2020	Assessed trend towards meeting target
Share of observed cyclists wearing a helmet	26,7 %	37,0 %	70 %	Not in line with the required trend
Share of observed mopedists wearing a helmet	95,7 %	96,3 %	99 %	Not in line with the required trend

The target for cycle helmet use is that at least 70% of cyclists use a helmet by 2020. The figure used to gauge cycle helmet use is the share of cyclists observed using a helmet in VTI's annual measurements (Larsson 2015). The measurements are not intended to estimate overall helmet use in Sweden in a representative way, but are good enough to give a picture of changes over time and of the approximate level of use.

Helmet use among moped riders is studied alongside cyclists' use of helmets. As of 2012, observations of moped riders' use of helmets are conducted in connection with VTI's measurements of cycle helmet use. These observations are carried out at the same locations and times as the cycle helmet observations, but at marginally fewer sites in each location (Larsson 2015). Only those riders who are seen to have their helmets properly fastened are counted as helmet users. The target for helmet use among moped riders is that 99% use helmets by 2020. For motorcyclists, the potential for saving lives lies mainly in other measures than increased helmet use. Therefore this report will not further analyse helmet use among motorcyclists.

Cycle helmets

Trend and projection towards the 2020 target

Figure 27 presents the trend for observed cycle helmet use between 1996 and 2014. In 2014, observed cycle helmet use was 37.0%, which is the highest level since measurements began in 1988. It is an increase by just under one percentage point from the 2013 level of 36.2%, and the change is statistically significant. The figure also shows how cycle helmet use needs to change between 2007 and 2020 in order for the target level of 70% to be achieved. This implies an annual increase of 7.6%. On average, cycle helmet use has had that rate of increase between 2010 and 2013, but 2014 shows only a minor increase. In addition, as the actual level of cycle helmet use is 8 percentage points below the required trend, the assessment is that cycle helmet use has not increased sufficiently since 2007 to reach the target level by 2020.

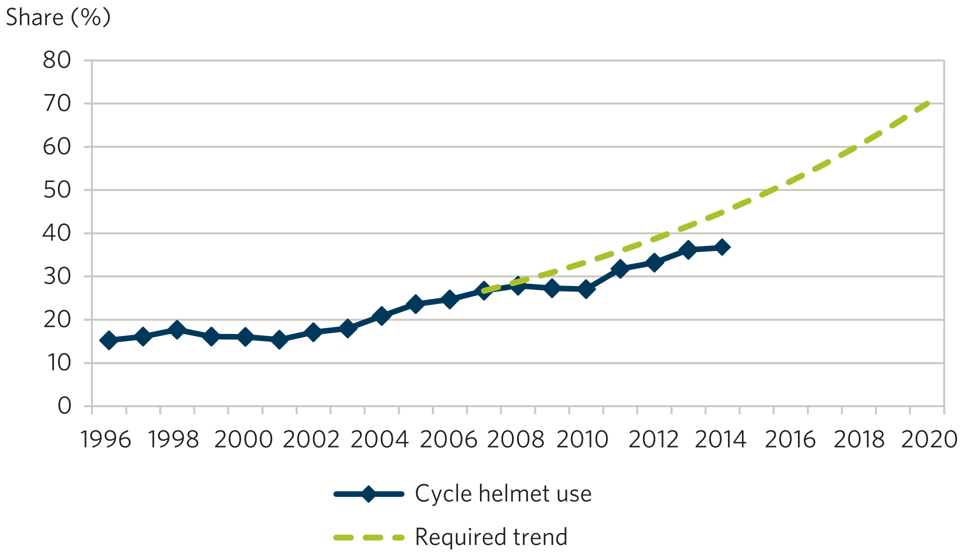


Figure 27. Share of observed cyclists using a helmet 1996-2014, and the required trend until 2020. Source: VTI's observational measurements 2014.

Analysis and discussion

Despite a positive trend for cycle helmet use in Sweden over the past few years, helmet use remains at a fairly modest level, particularly among adults. There is thus considerable potential for increasing the share of cycle helmet users. Figure 27 shows that observed cycle helmet use in 2014 was 81% among children up to 10 years of age in residential areas and 66% among children aged 6-15 who cycle to and from school. Cycle helmet use among adults is a lot lower: in 2014 it was 29% on journeys to and from work, and 31% on public cycle paths. Between 2013 and 2014, helmet use has increased particularly among children at schools, but also for children up to 10 years of age in residential areas. Helmet use among adults is in principle unchanged compared with 2013. Among older secondary school pupils helmet use has increased from 34% in 2013 to 38% in 2014 (not significant), while among primary school and younger secondary school pupils helmet use has increased from 85% to 90% (significant).

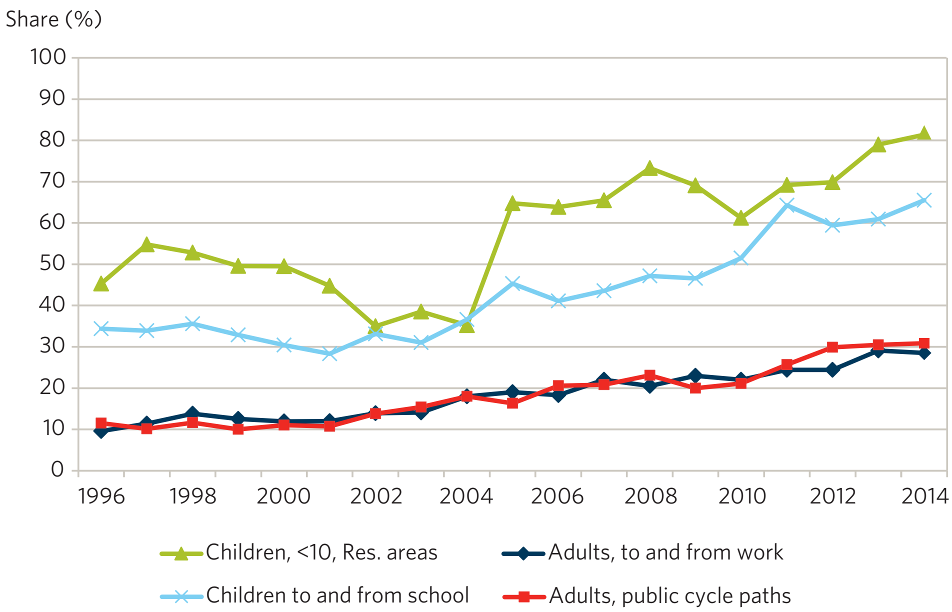


Figure 28. Cycle helmet use among different groups ,1996-2014. Source: VTI's observational measurements 2014.

IA new strategy for safer cycling was presented at the beginning of 2014 (Swedish Transport Administration 2014), as well as a report on cyclists' accident situation. The aim was to identify measures for reducing the number of injured cyclists (Niska and Eriksson 2014). Increased helmet use is one of the most important measures and a priority area of action in order to reduce the numbers of cyclists killed and seriously injured. Andersson and Vedung (2014) study cyclists' motivation and central government instruments for increasing cycle helmet use. They draw the following conclusions:

- It is advantageous to combine different policy instruments, such as helmet legislation, information/education and helmet subsidies (financial policy instrument).
- The greatest opportunities for success lie in increasing the use of helmets voluntarily in the following target groups: commuter cyclists, parents, the elderly, children and those who cycle in their work.
- Achieving the 2020 target without legislation will require those designing systems to work more actively than at present on financial policy instruments and information initiatives.

In 2014, there were 33 road deaths among cyclists, and approximately 2 140 cyclists were seriously injured, suffering at least 1% medical impairment – of which approximately 260 with more than 10% medical impairment. The distribution of injuries in different parts of the body shows that just under half of the very seriously injured cyclists sustained a head injury, while the corresponding share for the seriously injured cyclists is only about 10%. A measure such as a cycle helmet is thus effective primarily in preventing the more serious injuries. The strategy for safer cycling notes that if all cyclists used helmets, the total number of seriously injured could be reduced by 10% and the number of killed cyclists by 25%. According to a study by Rizzi at al (2013), the use of cycle helmets could reduce the number of serious head injuries by 58% and the number of very serious head injuries by 64%.

The level of cycle helmet use is approaching the level of voluntary seat belt use before campaigning began for a legal requirement, and is the highest observed level since measurements began in 1988. Experiences from Sweden as well as other countries suggest that a rapid increase in the use of protective equipment generally requires new legislation. One example of this is the demand for compulsory seat belt use in Sweden in 1975, when seat belt use increased from 50% to 85%. Similar experiences exist for cycle helmet use in e.g. Australia and New Zealand (O'Hare 2002).

The strategy "Safer cycling" highlights increased helmet use as a priority area of action, but since a new helmet law for everyone is not regarded as imminent, new methods for increasing voluntary helmet use are advocated. However, it is not specified what these new methods would involve. Andersson and Vedung (2014) highlight that those designing systems will need to work more actively on financial policy instruments and information initiatives in order to achieve the 2020 target without legislation. The analysis group's assessment is that the target of 70% helmet use will be very hard to achieve, and we would emphasise that concrete measures are needed to increase cycle helmet use further. In the 2014 road safety survey, 60% of respondents agree that it should be compulsory for everyone to use a helmet when cycling, which indicates that there is relatively strong support for increased helmet use.

Moped helmets

Trend and projection towards the 2020 target

Figure 29 presents the observed use of helmets by moped riders in 2014. It shows that observed moped helmet use was 96.3% in 2014, compared with 96.1% in 2013. Measurements began in 2012, and there has been no significant change to moped helmet use between 2013 and 2014. The analysis group's assessment is that the rate of change is not sufficient for reaching the target level by 2020.

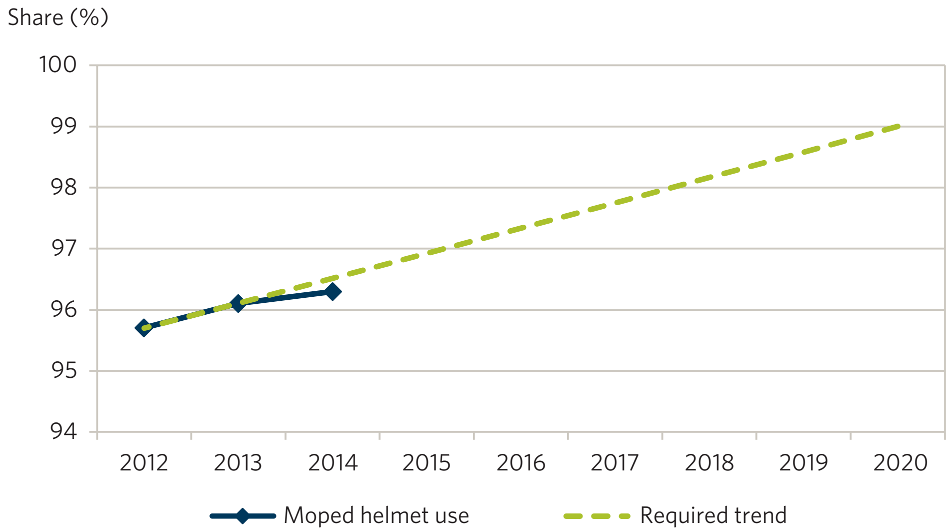


Figure 29. Share of observed moped riders using a helmet 2012-2014, and the required trend until 2020. Source: VTI's observational measurements 2014.

Analysis and discussion

In 2014, eight moped riders were killed on the road, and it is estimated that about 290 were seriously injured and just over 30 very seriously injured. Studying the distribution of the moped riders' injuries by the degree of medical impairment and part of the body, we can see that, just as for cyclists, head injuries represent a considerably larger share of those very seriously injured than of those seriously injured; just under 40% of all moped riders with very serious injuries have sustained a head injury, while the corresponding share of those seriously injured is only just under 10%. Increased helmet use by moped riders therefore has the potential above all to reduce the number of very seriously injured. Calculations indicate that helmet use reduced the risk of a serious injury by 17%, and the risk of a very serious injury by 47%.

Studying moped rider fatalities, we can see that 115 moped riders were killed in the years 2004–2014, and 53% of these were not using a helmet or had dropped it at the time of the accident. The strategy for motorcycles and mopeds (Swedish Transport Administration, 2012) highlights increased and correct helmet use as a priority area of action. It reports that most of those who had dropped their helmet at the time of the accident were under 18 years of age and that increased correct helmet use could save three lives per year. In October 2009, a compulsory moped driving licence was introduced for EU mopeds.

Hopefully training for the licence will lead to an increased awareness of the importance of using the helmet correctly, and that this use will increase.

The Swedish Transport Administration's in-depth studies show that shortcomings in helmet use are also a major problem in connection with fatal accidents on four-wheelers. There are several types of four-wheelers including four-wheeler motorcycles (quadricycles) for which using a helmet is a legal requirement, and all-terrain vehicles (ATVs) which do not require the driver to wear a helmet. Between 2010 and 2014, a total of 24 individuals were killed on four-wheelers. Seven of these were killed on quadricycles and one on a moped, of which five were not wearing a helmet. It was judged that four of these five would have survived had they been using helmets (uncertain in one of the cases). A further fourteen individuals were killed on ATVs (helmet not a legal requirement), and two on four-wheelers of unknown vehicle class. It has been assessed that four of these could have survived (uncertain in two of the cases) if they had been using helmets. The strategy for four-wheelers (Swedish Transport Administration 2013) assesses that a helmet requirement for ATVs has the potential of reducing road deaths by 28%. The Swedish Transport Administration has presented a proposal to the Government that a helmet requirement should apply for all those travelling on an ATV. Following referral, the proposal is with the Ministry. New registrations of four-wheelers increased sharply between 2005 and 2012, but decreased between 2012 and 2014. In spite of this, however, more four-wheelers than two-wheeled motorcycles were sold in 2014, and it will be important to monitor this area in the continuing target follow-up.

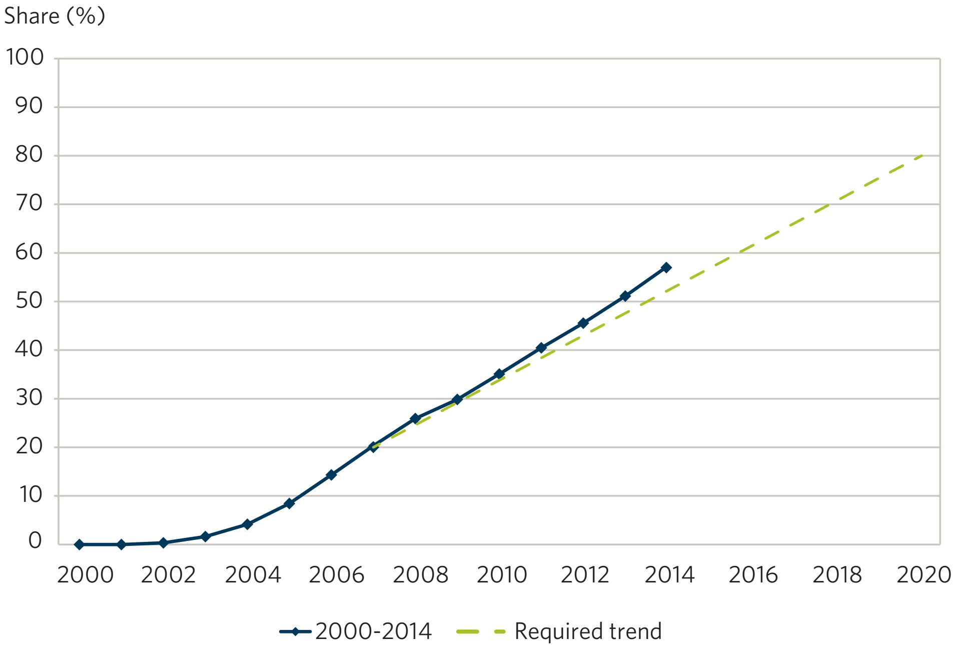
4.6 Safe passenger cars

	2007	2014	Target for 2020	Assessed trend towards meeting target
Share of traffic volume with the highest Euro NCAP score	20 %	57 %	80 %	In line with the required trend

The 2020 target for safe passenger cars is that at least 80% of the traffic volume, i.e. the number of driven kilometres on Swedish roads, will consist of passenger cars with the highest safety score according to Euro NCAP[11] (2007). This means five stars[12] under the Euro NCAP assessment system of 2007, and implies the same level of crashworthiness for car occupants as five stars under the current assessment system.

Trend and projection towards the 2020 target

Euro NCAP has tested and set scores for crash protection since 1997. This scoring includes seat belt reminders (since 2003) and electronic stability control (since 2009). The first cars with the highest score of five stars were tested and released on the market in 2001. Towards the end of 2007, 66% of all new cars sold in Sweden had the highest Euro NCAP score, and in 2014 that share was 89%. These developments among new cars has led to an increase in safe car traffic volumes by approximately 5 percentage points per year. Between 2013 and 2014, this traffic volume increased by six percentage points, from 51% to 57% (Figure 30). The rate of improvement is thus in line with the required trend for achieving 80% by 2020.



Figur e30. Share of the traffic volume with the highest Euro NCAP score 2000-2014, and the required trend until 2020. Source: Bil Sweden, Statistics Sweden, Swedish Transport Administration.

[11]Euro NCAP is an organisation that evaluates the safety level of new cars. The score of 1-5 stars covers Adult Occupant Protection, Child Occupant Protection, Pedestrian Protection and Safety Assist. More information is available on www.euroncap.com.
[12]Five stars is the highest score in Euro NCAP.

Analysis and discussion

As old cars are scrapped and replaced by new, safer cars, the traffic volume on Swedish roads consists increasingly of cars with five star ratings from Euro NCAP. This trend is further accelerated by the fact that newer cars are used more, on average, than older cars. It may be generally assumed that it takes 15-20 years from the introduction of a new safety system for the vast majority of the cars in the Swedish vehicle fleet to be equipped with it, provided the rate of introduction in new vehicles is high (see example in Figure 31). For example, the share of new cars equipped with electronic stability control (ESC) has essentially been 100% since 2009, and the share of the traffic volume with ESC is therefore assumed in the interim target review to approach 100% around 2020. The trend in 2014 continues to be in line with these assumptions.

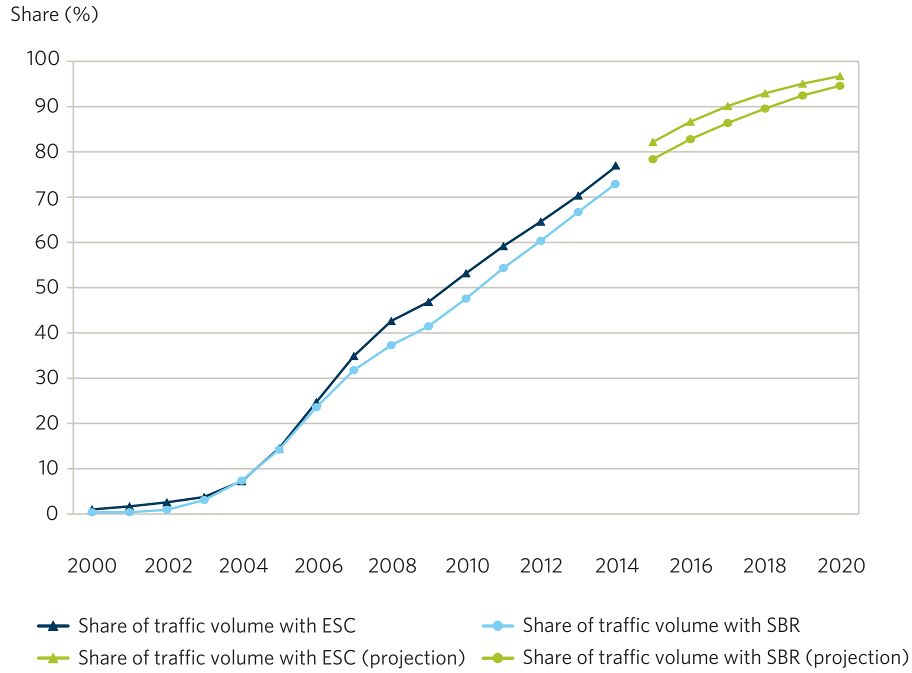


Figure 31. Share of the traffic volume consisting of cars with electronic stability control (ESC) and seat belt reminders (SBR), 2000-2014. Source: Statistics Sweden, the Swedish Transport Administration.

The safety of the Swedish vehicle fleet is thus not determined only by what new cars are added to it, but also by the rate at which old cars are removed from it – and which cars these are. This is of considerable importance as serious personal injuries occur more frequently in accidents involving older cars. In general, when a group of cars has been driven for 80% of their total traffic volume, they have only been involved in 50% of the total number of serious accidents (Strandroth, 2012) they are expected to be involved in during their working life. This points to the importance of guaranteeing that these safety systems continue to function throughout the car's lifetime. This is a challenge, as many of these systems are not compulsory and thus not subject to verification at annual vehicle inspections. Another important conclusion that can be drawn from this fact is that it may be necessary either to transfer traffic volumes from older to newer cars, or to scrap older cars that lack essential safety equipment such as ESC or seat belt reminders (SBR), in order to accelerate the trend towards a greater share of safe vehicles on the road.

As regards new cars, the Euro NCAP testing programme develops over time, and comprises more essential safety systems than in previous years. As of 2012, for example, higher scores are required in pedestrian tests for a five-star rating in comparison with 2007, even if the adult protection requirements in collision tests are largely the same. These developments will continue, and can provide valuable additions to vehicle safety, e.g. in the form of intelligent speed adaptation (ISA), lane keeping assistance and autonomous emergency braking. In 2013, the first cars were tested under Euro NCAP's new protocol for ISA, which led to a larger share of speed alert systems among the tested cars in 2013 and 2014. However, this share was small because the highest Euro NCAP score does not yet require points for speed alert systems. These requirements will be gradually raised, however, which means that more cars are expected to be equipped with some form of ISA in the future.

The 2012 interim target review expected cars with lane keeping assistance systems to account for a considerably greater share of new sales at present than is the case in reality. The share varies between 0% and 40% depending on the model of car, but is expected to rise in the coming years, particularly in connection with the development of more autonomous vehicles. There were corresponding expectations regarding the introduction of systems for autonomous emergency braking in rear-end collisions and in conflicts with unprotected road users. These systems will also be incorporated in the Euro NCAP testing programme in the coming years and are therefore expected to be standard in an increasing share of new cars from 2016 on. Since the indicator is based on the assessment system of 2007, it will not be affected by a development of the Euro NCAP testing programme in these respects, but will naturally entail a positive influence on vehicle safety. In summary, the analysis group notes that the indicator for safe passenger cars is developing in a desirable direction.

However, measures to increase the scrapping of old cars could accelerate developments to a relatively great extent. Measures to increase the introduction of systems for lane keeping assistance and autonomous emergency braking are also important, even if their benefits are expected to emerge late in the period and above all after 2020.

4.7 Safe motorcycles (ABS)

	2007	2014	Target for 2020	Assessed trend towards meeting target
Share of traffic volume made up of motorcycles fitted with anti-lock braking systems (ABS)	9 %	39 %	70 %	In line with required trend

The target for safe motorcycles is that at least 70% of the motorcycle traffic volume by 2020 be made up of motorcycles fitted with anti-lock braking systems (ABS).

Trend and projection towards the 2020 target

The share of new motorcycles with ABS is estimated at 85% in 2014, compared with about 30% in 2009 and 78% in 2013. This resulted in a 39% share of the traffic volume in 2014. Even if the current level is slightly below the required trend, the annual rate of increase is judged sufficient for achieving the required level by 2020 (Figure 32).

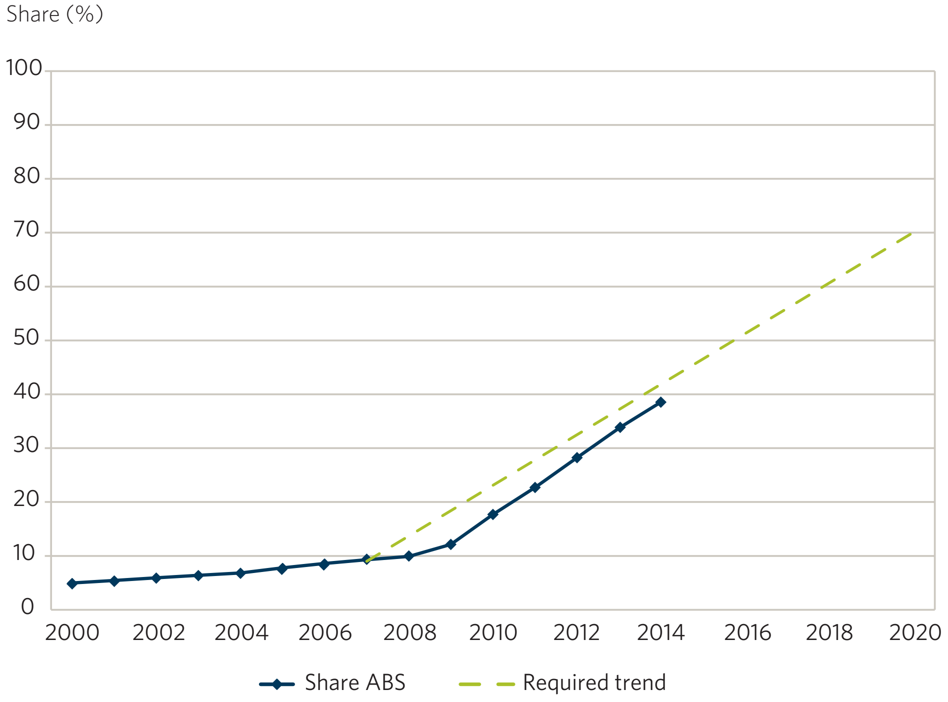


Figure 32. Share of the traffic volume made up of motorcycles fitted with anti-lock braking systems (ABS) 2000–2014, and the required trend until 2020. Source: Statistics Sweden, the Swedish Transport Administration.

Analysis and discussion

There is very little scrapping of older motorcycles as owners most often keep them as a leisure interest and for recreational riding. This means that possibilities for increasing the share of traffic volume with ABS lie mainly in the addition of new motorcycles with ABS. The share of newly sold motorcycles with ABS has increased sharply in recent years. In the early and middle 2000s, the share was 10-15%, but then it rose to 30% in 2009, and has then continued to rise to 85% during 2014.

From having been standard equipment on only a few models and an expensive option on others, ABS has now become standard equipment on most models from most manufacturers.

ABS is currently available as standard or optional equipment on just about all types of motorcycles except small off-road models. This was not the case just a few years ago. The share of ABS-fitted motorcycles in new sales will continue to increase over the coming years, as the EU is introducing a legal requirement for ABS on all new motorcycles with an engine displacement above 125 cc as of 2016. The rapid rate of increase of ABS-fitted motorcycles in new sales will also lead to increasing their share of the traffic volume. This share is expected to increase by approximately 5 percentage points per year, and thus the rate of increase is in line with the required trend for achieving the target of 70% by 2020.

4.8 Safe national roads

	2007	2014	Target for 2020	Assessed trend towards meeting target
Share of traffic volume on roads with speed limit > 80 km/h with median barriers	50 %	73 %	75 %	In line with required trend

The target for 2020 is that at least 75% of the traffic volume on roads with speed limits above 80 km/h be on roads with median barriers. This target can mainly be achieved either by lowering speed limits or by installing median barriers to roads. Other measures on the national road network include primarily side barriers, centre line rumble strips, intersection measures and measures for safer cycling.

Trend and projection towards the 2020 target

The share of the traffic volume on roads with speed limits above 80 km/h with median barriers was 73% at the end of 2014. This is far better than the required trend towards the target of 75% (Figure 33). The very extensive changes to speed limits that took place in 2009 are the main reason for this result.

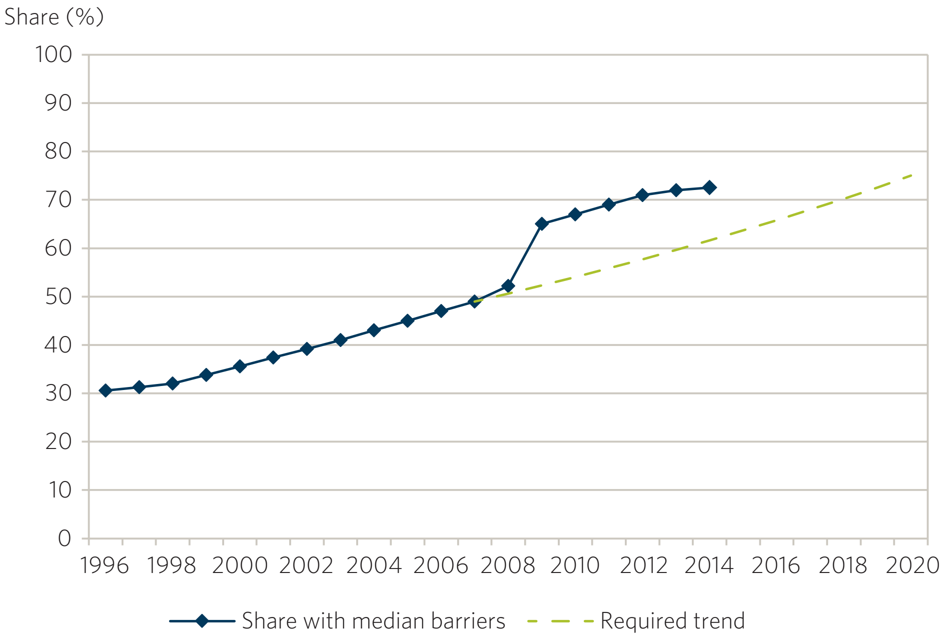


Figure 33. Share of traffic volume on roads with speed limits above 80 km/h with median barriers 1996–2014, and the required trend until 2020. Source: The Swedish Transport Administration.

Analysis and discussion

A total of 110 km of 2+1 roads with median barriers were added in 2014 and 50 km of motorway opened. No extensive change to speed limits was carried out. This meant that the outcome for the indicator increased by one percentage point to 73% in 2014. At the end of 2014 there was a total of 5 000 km of roads with median barriers, corresponding to 5% of the national road network. The share of the traffic volume on roads with median barriers was 47% in 2014. Some smaller measures were also applied to intersections and roadside areas, and 180 km of road provided with centre line rumble strips in 2014.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
2+1 road	68	95	113	130	151	177	195	212	233	250	262	268	279
Motorway	153	158	160	170	174	181	186	188	194	196	196	200	205
Other w. median barrier	22	22	23	24	24	25	20	20	20	22	19	17	17
W. median barrier, total	**243**	**275**	**296**	**324**	**349**	**383**	**401**	**420**	**447**	**468**	**478**	**485**	**500**
Central line rumble strips	0	0	0	25	124	250	334	425	493	493	499	510	528

Roads with median barriers and centre line rumble strips, 2002–2014 (in tens of km at year's end). Source: The Swedish Transport Administration.

RThe Government adopted the national plan in April 2014. This decision means that the systematic adaptation of speed limits to the standard of roads will continue. This means that all national roads with a traffic flow of more than 2 000 vehicles/24 h will either have median barriers or have a maximum speed limit of 80 km/h by the end of the planning period in 2025. National roads with a traffic flow of less than 2 000 vehicles/24 h will not be subject to any systematic speed limit reductions – an exception applying to approximately 7 700 of 90km/h and 100 km/h roads with opposing traffic, primarily in inner Norrland.

A project is in progress to implement the decision: Regional speed analysis. The aim of the project is for the Swedish Transport Administration to propose adjusted speed limits in dialogue with all county planners. The Swedish Transport Administration's ambition is to be able to commence more systematic speed reductions in autumn 2016 from 90 to 80 km/h on national roads which have a traffic flow of more than 2 000 vehicles/24 h and which are not planned to be converted into 2+1 roads. The scope of these reductions is not known at present.

The analysis group assesses that this decision, together with the ambitions to establish ATK on more 80 km/h stretches of roads, can contribute considerably to achieving the more stringent EU target of no more than 133 roads deaths by 2020. However, in view of this higher level of ambition, it is cause for concern that the new addition of 2+1 roads since 2011 has been at a considerably lower level than previously, while there have also been no more extensive reductions from 90 to 80 km/h. For this reason, if it is to be possible to achieve the EU target of halving the number of road deaths by 2020, the analysis group wishes to underline the importance of securing a high level of ambition both for conversion to 2+1 roads and for reductions from 90 to 80 km/h.

4.9 Safe pedestrian, cycle and moped crossings in urban areas

	2013	2014	Target for 2020	Assessed trend towards meeting target
Share of safe PCM crossings on main municipal road networks for cars	19 %	25 %	Not definied	Cannot be assessed

A pedestrian, cycle and moped crossing (a PCM crossing) is defined as safe if it is grade separated or if 85% of motorists drive through it at a maximum of 30 km/h. The latter is most effectively achieved by means of a physical speed control hump in direct proximity to the crossing. For more exact definitions of safe, moderately safe and unsafe PCM crossings, see the memorandum "Kriterier för säkra GCM-passager" ["Criteria for safe PCM crossings"] (Swedish Transport Administration 2013).

Trend and projection towards the 2020 target

At the end of 2013, the share of safe crossings was 19%, according to information from just over 40 municipalities. At the end of 2014, this share had reached 25%, now based on information from 104 municipalities. No target level has been defined for this indicator at the present time. Looking at what is required to contribute to the 2020 targets, the analysis group has assessed that a target level of around 35% seems reasonable. That would correspond to an almost 20% reduction in the number of seriously injured cyclists. It would also represent a considerable reduction in the annual number of those seriously injured and killed.

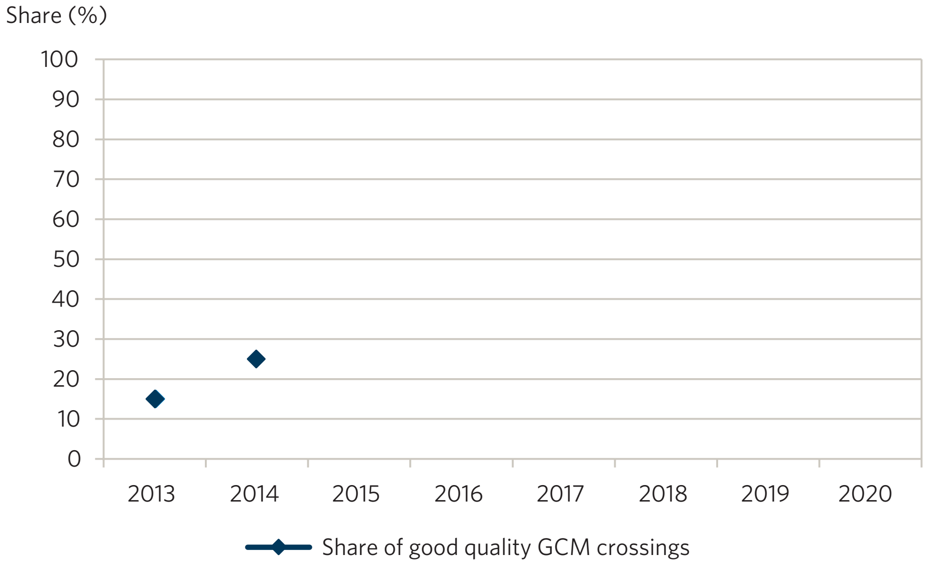


Figure 34. Share of good-quality PCM crossings, 2013-2014. Source: The Swedish Transport Administration

In order for the indicator to be monitored, municipalities must have reported data on PCM crossings and speed control humps to the national roads database NVDB, otherwise the indicator cannot be calculated. At the end of 2014, the number of municipalities that had reported this data had grown to 104 and the share of safe crossings to 25%. The share of crossings of less good quality was 21%, and the remaining 54% were of low quality (Figure 35).

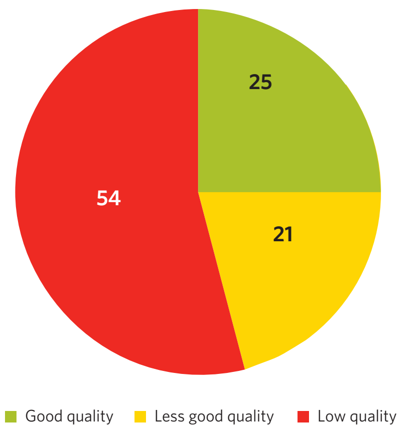


Figure 35. Share of PCM crossings of good, less good and low quality, reported 2014/2015 Source: The Swedish Transport Administration

Analysis and discussion

According to the Swedish Transport Administration's in-depth studies of fatalities, between 10 and 20 individuals are killed each year at PCM crossings in urban areas. Most of these individuals are killed at crossings which are not protected by some form of speed reduction device such as a speed bump .

The indicator for safe PCM crossings is also important for reducing the number of seriously injured. By changing a PCM crossing from not being speed protected to being speed protected, the number of seriously injured is reduced by 50% for cyclists and pedestrians, and the number of very seriously injured (with a degree of medical impairment of 10% or more) is reduced by 80%.

Although no exact target level has been defined for the indicator, it may be noted already at this point that a target level of around 35% would amount to a considerable challenge as there are not many years left until the target year and changes to the physical design of the road environment are necessary to move a crossing from red or yellow to green quality. Achieving a target level of 35% would require an average of 2-3 crossings in the main network for car traffic to be fitted with speed control humps every year in the 104 municipalities that have currently reported their status to NVDB. These measures will not only affect road safety in urban areas, they will also lead to reduced emissions and noise, increase the competitiveness of bicycles and public transport as well as create a more attractive urban environment.

The increase in the share of PCM crossings between 2013 and 2014 is welcome news, but the increase itself should be interpreted with caution since the number of municipalities reporting full data to NVDB has risen sharply thanks to extensive data collection under the auspices of NTF, from just over 40 municipalities at the end of 2013 to 104 municipalities at the end of 2014. This means that the indicator's outcomes for these two years are not fully comparable.

In order to improve this indicator, and thereby road safety in urban areas, municipalities must take up the challenge of speed protecting more crossings of the car network in urban areas. This can be done by building a grade separated crossing or introducing speed reducing measures near crossings, such as humps, raised crossings or narrowed roadways. These and other measures are described in SALAR's Catalogue of measures for safe traffic in urban areas (Swedish Association of Local Authorities and Regions, third edition, 2009). Another possibility is to promote better speed adaptation and lower speeds in the urban area, primarily through local speed supervision. According to the most recent data available (from the beginning of 2012), just over 25% of municipalities have carried out a speed limits review. The analysis group considers it very important that work on speed limit reviews and speed adjustments continue in Sweden's municipalities. A procedure for this is described in SALAR's manual, Right speed in the city (2008).

A prerequisite for continuing to monitor this indicator, and thereby making municipalities' part in road safety work towards the 2020 interim targets visible, is that more municipalities make inventories of their crossings and report them to NVDB. This should be done as described in "Handledning för inventering av GCM-passager och korsningar i tätorter" ["Guidelines for inventories of PCM crossings and intersections in urban areas"] (Swedish Transport Administration 2010). Furthermore, those municipalities that have already reported to NVDB should ensure that data in NVDB is kept updated, so that changes to the road environment can be monitored.

4.10 Maintenance of pedestrian and cycle paths in urban areas

	2013	2014	Target for 2020	Assessed trend towards meeting target
Share of municipalities with good-quality maintenance of pedestrian and cycle paths	15 %	No measure-ment in 2014	70 %	Starting year for the measurement in 2013, no measurement in 2014 – cannot be assessed

This indicator is new since the indicators were reviewed in 2012. The reason it is now included among the national indicators is that the results of the 2012 review showed that management by objectives had not focused enough on following up indicators that reduce the number of seriously injured. Approximately 80% of the cyclists seriously injured on the roads are injured in single bicycle accidents, and the indicator is intended to capture a large part of these cases.

The definition of the indicator is the share of municipalities (with populations exceeding 40 000) that carry out good-quality operation and maintenance of cycle paths, with the highest priority reserved for the central/main town in the municipality. Good quality means quality in terms of standard requirements for winter and summer maintenance of cycle paths, as well as good quality assurance of the standard requirements made.

In order to measure the indicator, the Swedish Transport Administration had a survey carried out of how well Sweden's municipalities organise and carry out operation and maintenance of cycle paths in their charge. The assessment is made in the form of points awarded for the responses which – with present knowledge – can be viewed as positively affecting the safety level for cyclists. The survey was carried out in January 2014 in consultation with the Swedish Association of Local Authorities and Regions (SALAR). The intention was to carry out annual data collections like this, but in consultation with SALAR, this level of ambition has been lowered to every other year. The next measurement will be made in January 2016.

Trend and projection towards the 2020 target

It is very difficult to assess what is a reasonable target level for this indicator, as there is very little knowledge about cause-effect relationships between PCM path maintenance and fewer serious injuries. However, the analysis group's very rough estimate is that the target level for the indicator could be 70% for 2020. This target level is based on the unverified assumption that effective maintenance of PCM paths can reduce the share of seriously injured cyclists there by 30%. A target level of 70% would thus correspond to an annual reduction in the number of seriously injured cyclists of almost one hundred. This in turn corresponds to just over half of the reduction in the number of seriously injured cyclists that has to occur by 2020.

Results of the 2013 measurement and assessment of the indicator show that 15% (9) of the municipalities with more than 40 000 inhabitants carry out good-quality operation and maintenance of cycle paths with the highest priority reserved for the central/main town in the municipality. Another 36% (21 municipalities) are judged to provide less good quality operation and maintenance of their highest priority cycle paths.

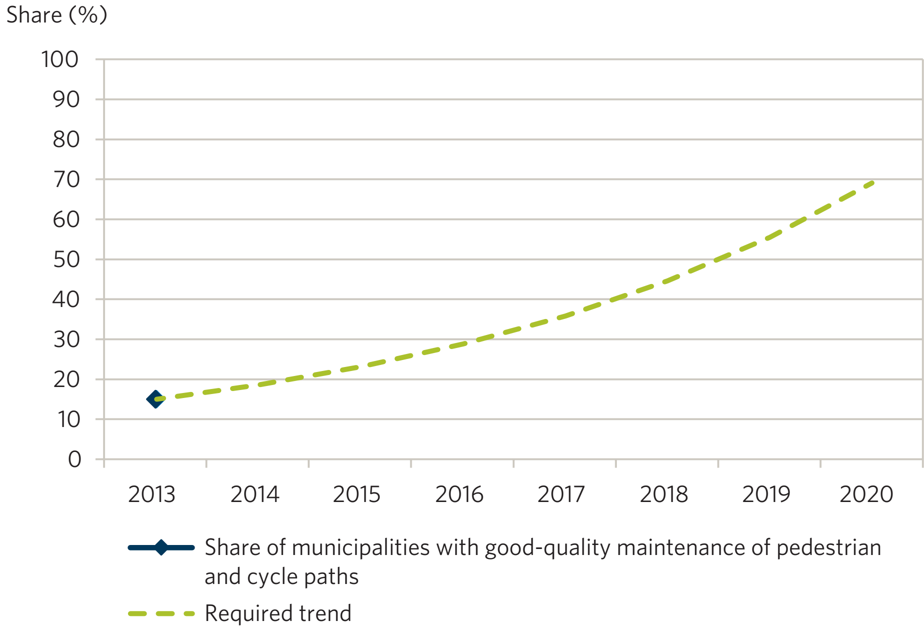


Figure 36. Share of municipalities with good-quality maintenance of pedestrian and cycle paths in 2013, and the required trend until 2020.

Since the indicator has so far only been measured for 2013, in January 2014, the rate of the trend cannot be assessed. There is no doubt, however, that the target level of 70% will require measures to be applied quickly.

Analysis and discussion

Since no new measurement has been carried out for 2014, we present the results of the 2013 measurement. The text below is identical to that in the 2013 report.

A measurement method was developed for this indicator in 2013 – a telephone interview survey. Responses to the survey give a certain number of points. The distribution of points means that a maximum of 64 points can be awarded to a municipality for operation and maintenance of cycle paths. The maximum number of points for each response varies between 1 and 4 points per response depending on how important it is considered for cyclists' safety.

Of the maximum 64 points that can be awarded to a municipality, a maximum of 20 points (31%) are awarded for responses that have to do with quality assurance (internal control, training, choice of methods), and a maximum of 44 points (69%) for the standard requirements that the municipality presents for winter maintenance, gravel sweeping and summer maintenance.

The 44 points which can be awarded for standard requirements are distributed as follows: 20 points (45%) for winter, 12 points (27%) for gravel/leaves and 12 points (27%) for summer. This distribution closely matches the potential that operation and maintenance have for reducing the number of seriously injured cyclists, and which is presented in the joint strategy "Safer cycling": 43-44% for winter, 29-33% for gravel and 22-29% for summer.

The highest total number of points awarded to any of the interviewed municipalities in this survey was 33 points, which is 52% of the possible maximum. The lowest total number of points awarded was 9. The median number of total points was 19.

In order to assess the quality of municipalities' operation and maintenance on the basis of the results described above, a weighting must be done of the areas studied. The table below shows the quality requirements which were applied to the material:

Quality	Basic requirement	Additional requirement
Good (green)	Level 1 for the total number of points	All four component areas are at level 1 or 2
Less good (yellow)	Level 1 or level 2 for the total number of points	One component area is at level 1 or all four component areas are at level 1 or 2
Low (red)	Level 1 or level 2 for the total number of points	One or more component areas are at level 3 and none at level 1
Low (red)	Level 3 for the total number of points	-

Points requirements for different quality levels for operation and maintenance of cycle paths. Level 1 means good quality, level 2 less good quality and level 3 low quality. The exact specifications of levels 1, 2 and 3 are found in Table 1-5 in PM Mätning och bedömning av indikator 10 [Memorandum re Measurement and assessment of indicator 10].

The outcome of the requirements described in Table 6 are as follows regarding the quality of operation and maintenance of priority cycle paths (Figure 37).

- 9 municipalities (15%) have good quality.
- 21 municipalities (36%) have less good quality.
- 30 municipalities (50%) have low quality.

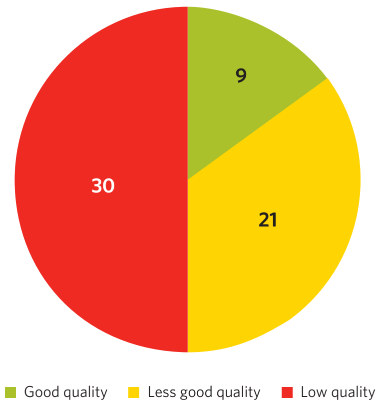


Figure 37. *Number of municipalities distributed by quality levels for operation and maintenance of cycle paths, 2014. Source: The Swedish Transport Administration.*

There are certain regional differences, and it turns out that between 44% and 64% of municipalities with at least 40 000 inhabitants in the Swedish Transport Administration's East, Stockholm, West and South regions are judged to provide good or less good quality of operation and maintenance of priority cycle paths. In the North and Central regions the corresponding share is only 25-33%.

The municipalities in the survey that are judged to provide good-quality maintenance are: Falun, Gothenburg, Linköping, Lund, Malmö, Nacka, Norrköping, Uppsala and Varberg.

The municipalities in the survey that are judged to provide less good quality maintenance are: Borlänge, Falkenberg, Halmstad, Helsingborg, Huddinge, Hässleholm, Jönköping, Karlskrona, Kristianstad, Lidingö, Luleå, Mölndal, Norrtälje, Skövde, Sollentuna, Stockholm, Trelleborg, Täby, Västerås, Växjö and Österåker.

The 21 municipalities judged to provide less good quality of operation and maintenance of cycle paths should have ample opportunities to raise the quality of their work to the level required for good quality by 2020. A rough estimate is that at least a further 15 municipalities that are deemed in this survey to provide low quality of operation and maintenance of cycle paths have the opportunity, using reasonable but focused measures, to raise their quality to the level for good quality by 2020. It is also reasonable to assume that most of the municipalities providing low quality have the opportunity to raise their level to less good or good quality by 2020.

In order for it to be possible for municipalities providing low or less good quality to raise their level to good quality, municipalities must review both their working methods and their standard requirements. Most municipalities have both strong and weak points, but just about all municipalities have component areas where they could improve. Improved quality assurance and more stringent standard requirements need not imply increased costs across the board. But if they want to achieve clear improvements, it is likely that certain municipalities will have to try allocating more funds to cycle paths, particularly priority cycle paths.

Overall, the improvement potential is greatest for gravel/leaf sweeping. Very few municipalities score well in this area. For a higher score, it is also important to make requirements for starting criteria and duration of measures more stringent, both for winter and summer maintenance.

5 Conclusions and discussion

In 2014 there were 270 killed in road traffic in Sweden. This is a 4% increase on 2013 in the number of fatalities. The increase in 2014 may be attributed primarily to an increase in fatalities among pedestrians, cyclists and moped riders.

In relation to the 2020 target, the outcome for fatalities is below the required trend, that is a reduction of 5% per year from 2007. This reduction is mainly found among car drivers, but also to some extent among motorcyclists, while the number of fatalities among other unprotected road users has been at a constant level. The overall assessment of the analysis group is that the existing 2020 target for road deaths looks likely to be achieved. However, some caution is necessary since the target value for the maximum number of fatalities must be around 200 in order to be sufficiently certain of achieving the target of no more than 220. To achieve the target with this level of certainty, the annual reduction from 2007 needs to be 6% instead of 5%. Between 2007 (mean value 2006-2008) and 2014, the annual reduction was 7%.

The number of seriously injured has increased between 2013 and 2014, from 4 800 to 4 900, which is an increase of just under 2%. Since both the 2013 and the 2014 figures for seriously injured are above the level of the required trend, the analysis group assesses these not to be in line with the required trend for achieving the 2020 target. A prerequisite for achieving the target is an improvement in cycling safety, especially if bicycle traffic volumes continue to rise. The increase in the total number of seriously injured over the last two years is primarily due to the increase in the number of seriously injured cyclists between 2012 and 2013, from approximately 1 800 to approximately 2 200. One reason for this increase might be that cycling has increased in Sweden. As cyclists are often injured in single bicycle accidents, there is reason to assume that variations in cyclist injury figures coincide to some extent with cyclists' exposure. However, the increase in the number of seriously injured in 2013 and 2014 is general and cannot be attributed to any particular road user category.

Increased bicycle traffic has been society's stated ambition for several years. Bicycle traffic is expected to grow, not least with respect to electric bicycles, whose use contributes to greater risks of injury due to the ability to cycle at higher speeds. However, a higher level of safety for cyclists must be a prerequisite; bicycle traffic may not increase at the expense of cyclist safety. Municipal road safety work must therefore be intensified and focus on seriously injured cyclists. In order to reduce these injuries, the municipalities must primarily provide infrastructure and maintenance that takes the needs of unprotected road users into account. The use of helmets by cyclists must also increase (this is increasing at present, though not at a sufficient rate) as must the use of other protective equipment. With respect to infrastructure and maintenance, it should not be forgotten that an important part of the responsibility also falls on the national road operator. The two indicators safe PCM crossings (pedestrian, cycle and moped) and maintenance of PC paths in urban areas have been followed since 2013. The share of safe PCM crossings has been measured as being 25% in 2014. This is a higher level than in 2013 (19%), but the measurements are not fully comparable since the 2014 measurement covers considerably more municipalities. Although maintenance was not measured in 2014, it is assessed that both these indicators must undergo considerable improvement by 2020 in order to reduce the number of seriously injured at the required pace. Guidance for the work to reduce the number of seriously injured is available in the "Safer cycling" strategy as well as the handbook "Trafiksäkra staden" ["Road safety in the city"], which were published in 2013 and early 2014. Helmet use is an important measure for preventing serious, and above all very serious, head injuries among cyclists and moped riders. Cycle helmet use has increased since 2007, mainly among children, but is still below the required trend.

As regards car traffic, preliminary figures show that the total traffic volume in 2014 increased by approximately 2.3% on 2013. The traffic volume of passenger cars has increased a little more (2.3%) than that of heavy vehicles (2.1%). The 2014 increase in traffic volume is somewhat greater than the average value since 1996 (0.9%).

This positive development in the number of car fatalities is mainly explained by ongoing improvements to the vehicle fleet and infrastructure, and not least by reduced speeds. Both the Safe national roads and Safe vehicles indicators are improving at a sufficient rate. It is positive in itself that each of these areas is improving, and when they are combined they can reinforce each other. Road safety work will not achieve optimal effects if the indicators for management by objectives are addressed in isolation from each other. The cumulative effect of the indicators' target fulfilment is not necessarily the same thing as the sum of the potential of all the indicators. This is because some indicators relate to the same set of problems, which can lead to the number of saved lives being counted twice and thus an overrating of the indicators' road safety effects. Conversely, "system effects" mean that certain road safety measures are a prerequisite for the functioning of others, and sometimes also for reinforcing their effects.

Average travel speed as an isolated factor has a decisive influence on the number of road deaths and injuries, but speed also interacts strongly with other indicators. Road design and vehicle fleet safety gains are optimised when combined with the right speed. In the current set of indicators it is precisely the indicator for speed limit compliance that has the greatest effect on other indicators. The fact that this indicator is not in line with the required trend in 2014 thus also affects the benefit of the indicators for safe passenger cars, safe motorcycles, seat belt use and safe national roads.

The share of sober traffic is high in Sweden, but the indicator is still not in line with the required trend. In 2014, 54 road users were killed in alcohol-related traffic accidents. The police's sobriety controls, which have decreased in number in recent years, represent an important measure for improving this indicator.

The number of fatalities in relation to the target at the EU level (which corresponds to a maximum of 133 road deaths in Sweden in 2020), is at present considerably higher than the required trend. The analysis group's assessment is that extraordinary measures are necessary in order to achieve the EU target of no more than 133 road deaths by 2020.

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