



TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

Analysis of Road Safety Trends 2018

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

Swedish Transport Administration
Postal address: Rödavägen 1, 781 89 Borlänge
Email: trafikverket@trafikverket.se
Telephone: 0771-921 921

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Foreword

This report is the tenth annual follow-up of the progress towards the Swedish 2020 road safety objectives. It describes and analyses road safety trends in Sweden 2018. As in previous years, results are analysed in terms of the number of fatalities and injured as well as a series of road safety performance indicators.

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, Karin Bengtsson, Hans-Yngve Berg, Marie Skyving and Ryo Yamazaki (Swedish Transport Agency), Åsa Forsman and Anna Vadeby (VTI), and Rikard Fredriksson, Peter Larsson, Magnus Lindholm, Simon Sternlund and Matteo Rizzi (Swedish Transport Administration).

The report will provide the basis for the 2019 results conference to be held in Stockholm on 24 April.



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Summary

Swedish road safety work is based on Vision Zero and designated interim targets to track progress towards its achievement. 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 interim target also specifies that the number of severely injured on the roads is to be reduced by a quarter.

This report describes and analyses current road safety trends in terms of road safety performance indicators and the numbers of fatalities and injured. The table below shows the present situation and an assessment of whether the trends for the various indicators are improving at rates sufficient for achieving the targets by 2020.

Indicator	Starting point	2018	2020 target	Trend
Share of traffic volume* within speed limits, national road network	43 %	45 %	80 %	Not in line with the required trend
Share of traffic volume within speed limits, municipal road network (starting year 2012)	64 %	66 %	80 %	Not in line with the required trend
Share of traffic volume with sober drivers	99,71 %	99,73 %	99,90 %	Not in line with the required trend
Seat belt wearers in the front seat of passenger cars, share of total	96 %	99 %	99 %	In line with the required trend
Share of cyclists wearing a helmet	27 %	42 %	70 %	Not in line with the required trend
Share of moped riders using a helmet correctly	96 %	93 %	99 %	Not in line with the required trend
Share of traffic volume with the highest Euro NCAP score	20 %	76 %	80 %	In line with the required trend
Correct use of motorcycles	-	-	-	Not measured yet, no target set
Share of traffic volume with median barriers on national roads with speed limits above 80 km/h	50 %	76 %	90 %	Not in line with the required trend
Share of safe pedestrian, cycle and moped passages	19 %	27 %	35 %	Not in line with the required trend
Share of municipalities with good quality operation and maintenance of pedestrian and cycle paths	18 %	36 %	70 %	Measured every two years – can therefore not be assessed
Systematic road safety work in line with ISO 39001	-	-	-	Not measured yet, no target set
Number of fatalities in road traffic	440	324	220	Not in line with the required trend
Number of severely injured in road traffic	5 400	4200	4 100	In line with the required trend

* Traffic volume is in this report defined as the number of driven kilometres on Swedish roads

Road safety in 2018:

An elevated number of fatalities and a continuing negative trend for indicators

In 2018 there were 324 deaths from road traffic accidents. That is an increase of 29 per cent on 2017, when there were 253 fatalities. The 2018 figure is 35 per cent above the level required in order to be in line with the required trend (no more than 240 fatalities in 2018) necessary for achieving the 2020 interim target. The number of severely injured is estimated at 4,200, which is line with the required trend. In 2017 the number of severely injured was estimated at 4,400.

The analysis group notes that the trend for most of the road safety performance indicators has not improved at the rate required in order to achieve the interim target of no more than 240 fatalities in 2020. On the contrary, the trend for these indicators has more or less stagnated in the last few years, and the gap between actual outcomes and the required trend has grown. Our assessment is that this stagnating road safety trend is likely to be one explanation for why the reduction in numbers of fatalities levelled off between 2013 and 2017. However, the stagnation does not explain why the number of fatalities increased so sharply from 2017 to 2018.

On the basis of the current trend in terms of fatalities and of other indicators, the analysis group's assessment is that the 2020 interim target for the number of fatalities will most likely not be attained. However, attaining the target for the number of severely injured is still possible.

More measures are required to increase road safety

The fact that the road safety performance indicators have not improved suggests that measures undertaken have been insufficient. As part of its remit to manage overall collaboration in road safety work, the Swedish Transport Administration has drawn up an action plan for safe road traffic for the 2019–2022 period together with the affected government agencies and stakeholders. This plan comprises 111 measures intended to lead to increased road safety, of which a number in the priority action areas right speed, sober drivers and safe cycling. If the measures described in the action plan are fully implemented, they are estimated to contribute to a reduction in fatalities of about 40–50 per year after 2022.

Police surveillance is very significant for the trends in some of the most essential indicators: speed, sobriety and seat belt use. The Police, however, have had their resources for manual traffic surveillance reduced. Considering that the risk of discovery, which is essential for rule compliance, is thus reduced, this is likely to be a contributing factor to the absence of improvements in the speed and sober drivers indicators. And while seat belt use has seen an improvement, there are still many fatalities in which the seat belt was not used.

Speed limit compliance too low

Improved speed limit compliance, leading to lower speeds, is the area that is estimated to have the greatest potential for reducing the number of fatalities. But speed levels on national roads have remained largely unchanged since 2012, and did not improve much during 2018. The share of traffic complying with speed limits was only 45 per cent in 2018, which is more or less on the same level as when measurements began in 1996. The gap between reality and the required trend is therefore growing, which

is why the target of 80 per cent compliance by 2020 is not expected to be reached.

In order to be able to improve speed limit compliance, various forms of surveillance will be important in the short term. There are currently about 1,800 road safety cameras installed, but the goal is for about 2,300 by 2020. Speed cameras have a positive effect on speed limit compliance, but the road sections with cameras still represent too small a proportion of the total traffic volume (i.e. the number of driven kilometres on Swedish roads). For that reason it will also be important to increase police presence and the associated media coverage. The number of speeding fines issued as a result of manual surveillance fell sharply between 2011 and 2016, and then levelled off. This is a very worrying trend. In the longer term it will also be important to ensure that infrastructure design matches the highest permitted speeds.

National roads have speed limits that are too high in relation to the road standard

The indicator “Share of traffic volume on roads equipped with median barriers and speed limits above 80 km/h” improved in line with the required trend for virtually the entire period from 2007 to 2015. In recent years, however, this trend has stagnated. In 2018 almost a quarter of the traffic volume on roads with a speed limit of 90 km/h or higher was still on roads without median barriers.

In 2016/2017 the Swedish Transport Administration began a major speed review to adapt speed limits on national roads to the roads’ safety standards. For the period until 2020, this will mean that around 2,200 km of 90 km/h roads have their speed limit lowered to 80 km/h, while around 400 km of 90 km/h roads will have median barriers installed and their speed limits increased to 100 km/h. So far about 450 of the 2,200 km have had their speed limit lowered, 200 km have had median barriers installed. It is important that efforts to adapt speed limits continue as planned, and that the adaptations can be justified, but efforts should preferably be intensified as well.

Share of drunk drivers continuing its negative trend

The share of sober drivers in Sweden is high by international standards, but many of the country’s road traffic fatalities are of individuals who have been involved in alcohol or drug-related accidents. The indicator for sober drivers has continued to decline and is not in line with the required trend. A total of 75 individuals died in such accidents in 2018, compared with 81 individuals in 2017.



The number of breath tests declined sharply after 2011, and then levelled off during 2016. In 2018 the number was on the same level as in 2016 and 2017. The reduction in the number of breath tests seen in recent years thus seems to have been halted. In 2018 the Police Authority and the Swedish Transport Administration jointly requested that the government amend legislation in order to allow for the introduction of a new profession: road safety controllers. The intention is for such controllers to be authorised to carry out drink driving checks, thus relieving pressure on the police and other surveillance authorities. The government has not yet responded to the request.

Seat belt reminders and modern cars important

The use of seat belts in the front seat of passenger cars was 98.7 per cent in 2018, which is an increase on 2017, when it was 97.6 per cent. Seat belt use is in line with the required trend. Despite the high proportion of seat belt users, about a third of those killed in passenger cars were not wearing a seat belt. It is particularly worrying that 30 per cent of all passenger car drivers and passengers killed in 2018 were travelling in cars from 2000 or earlier. This was despite the fact that these older cars only represent about 1 per cent of total traffic volume.

Such older cars lack seat belt reminders and electronic stability control systems, which are standard equipment in newer cars. The scrapping of older cars and the increased implementation of new, relevant safety systems as standard equipment are thus increasingly important factors.

Cyclists and motorists suffer the majority of road traffic injuries

Cyclists and motorists still represent about 80 per cent of all those severely injured in road traffic accidents. The number of severely injured motorists continues to decline, and there is reason to believe that this trend will continue in the longer term, in great part thanks to safer cars and improved infrastructure. The number of injured cyclists, by contrast, has not declined to any significant extent and continues to be around 2,000 per year.

In order to reduce the occurrence of these injuries, road operators must ensure in the short term that pedestrian and cycle paths are properly maintained. In the most recent survey, from 2017/2018, 36 per cent of pedestrian and cycle paths were being properly maintained. The 2020 target is for this share to be 70 per cent, which means that much work remains to be done. Speed regulated PCM (Pedestrian, Cycle and Moped) passages is another area requiring attention. The share of such passages with a good safety standard did not improve in 2018. Cyclists' helmet use is another area that needs considerable improvement, and at a much faster rate than is currently the case. The gap to reaching the 2020 target of 70 per cent helmet use looms ever larger.



1 Introduction

The current interim target for Swedish road safety work was adopted by the Swedish parliament in 2009. The target is to halve the number of fatalities in road traffic between 2007 and 2020 (Govt. Bill 2008/09:93 Objectives for future travel and transports). This means that the number of road fatalities in 2020 must not exceed 220. The bill also specifies that the number of severely injured on the roads is to be reduced by a quarter over the same period.

The parliament's decision also included a specification that the targets were to be reviewed in 2012 and 2016. The purpose of the reviews is to ensure that road safety work always has the most relevant and motivating targets possible.

In simplified terms, the trend for the number of fatalities and severely injured in road traffic can be said to depend on three factors:

1. Systematic road safety work in the form of safer roads, safer vehicles, regulations and legislation, improved training of road users, expanded surveillance etc.
2. External factors that are not affected by systematic road safety work but which affect the road transport system, including changes in the economic outlook, traffic increases, demographic changes and weather variations. These factors are described in general terms in Chapter 3.
3. Random variation that depends on the size of the group in question. Random variation is less significant for the number of injured since this group is relatively large, but for the number of fatalities it may be as high as 10 per cent.

Road safety work in Sweden is carried out in a systematic way using a management by objectives model. This model involves measuring and following up a series of current situations in the road traffic system which have a verified connection with the trend for the numbers of fatalities and severely injured on the roads. These situations are measured using what are known as road safety performance indicators. Interim targets are then set for the numbers of fatalities and severely injured, as well as for the indicators. The actual numbers of fatalities and severely injured, and the indicators, are followed up and analysed every year. The analysis is then presented at annual results conferences attended by various stakeholders. The purpose of the management by objectives model is to apply a long term, systematic approach to road safety work.

The method of applying a management by objectives model was developed by Gruppen för Nationell Samverkan – väg (the Group for National Collaboration – roads). Stakeholders currently in the group include the Swedish Work Environment Authority, Folksam, the City of Gothenburg, the Ministry of Infrastructure, NTF (Nationalföreningen för Trafiksäkerhetens Främjande, the National society for the Promotion of Road Safety), the Swedish Police Authority, SAFER, the Swedish Association of Local Authorities and Regions, the City of Stockholm, the Swedish National Association of Driver Trainers, the Swedish Association for Road Transport Companies, the Swedish Transport Agency, the Swedish Transport Administration, and Veoneer.

Follow-up of indicators is central to management by objectives. Each of the indicators has a target value to attain by 2020. Together, these target values are taken to correspond to the overall goal for road safety development.

The fundamental idea is for the 2020 goal to be achieved as a result of systematic road safety work – regardless of the effect of external factors (such as traffic increases) and any random variation on the outcome.

The following indicators are currently being followed up (precise target levels and descriptions are presented in Chapter 2):

- 1) Compliance with speed limits, national road network
- 2) Compliance with speed limits, municipal road network
- 3) Sober drivers
- 4) Use of seat belts
- 5) Use of helmets
 - cycle helmets
 - moped helmets
- 6) Safe passenger cars
- 7) Increased rule compliance among motorcyclists
- 8) Safe national roads
- 9) Safe pedestrian, cycle and moped passages in urban areas
- 10) Maintenance of pedestrian, cycle and moped paths
- 11) Systematic road safety work (ISO 39001)

In addition to the national interim target there is an interim target at the EU level, for halving the number of fatalities in road traffic between 2010 and 2020. For Sweden this target corresponds to a maximum of 133 fatalities in 2020.

1.1 Aim

The aim of this report is to describe and analyse road safety trends in 2018. We present and analyse the current situation in terms of the trend for each of the indicators, the number of fatalities and severely injured, as well as external factors.

The report thus highlights which indicators it is most important to improve in order to increase road safety and, by extension, to achieve the interim target by 2020. The report will form the basis for the 2019 results conference as well as for continued road safety planning in Sweden.

1.2 Basic assumptions

The targets and indicators that underlie the interim targets are the basic assumptions for the analysis. The interim targets were defined by what was then the Swedish Road Administration (Vägverket) 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 an initial review of targets and indicators was carried out to ensure that the follow-up methods were relevant and up to date. A second review was carried out in 2016. The aim of these reviews has been to examine whether planned road safety measures appear to be leading to the attainment of the 2020 target, or if they need to be revised.

The analysis carried out in 2016 (the Swedish Transport Administration and the Swedish Transport Agency, publication 2016:109) indicated that the 2020 interim target for the number of fatalities may be possible to achieve, provided that further measures – in addition to those already planned – are applied promptly. The review noted that the fact that a series of indicators had not been in line with the required trend, which makes attaining the current interim targets more difficult. In order for the target for the number of severely injured to be attainable, further measures are needed in addition to those identified in the review. Two indicators were added in 2016: Correct use of motorcycles and Systematic road safety work in line with ISO 39001.

2 Follow-up of status targets – indicators

This section presents the outcome and target fulfilment for all the indicators.

2.1 Compliance with speed limits – national road network

	2004	2018	2020 target	Assessed progress towards target
Share of traffic volume within speed limits, national road network	43 %	45 %	80 %	Not in line with the required trend
Average travel speed (km/h)	82 km/h	78,3 km/h	77 km/h	Not in line with the required trend
Share of traffic volume within speed limits on 70-90 km/h roads without median barriers, national road network	47 %	48%	80 %	Not in line with the required trend

The target is for at least 80 per cent of the total traffic volume to be travelling within existing speed limits by 2020. In addition to compliance, the average travel speed is also tracked, where the target is a reduction by 5 km/h. Lowered speeds are deemed to be among the indicators that have the greatest potential for reducing road deaths. Since 2016 the indicator has also specified the share of the traffic volume within speed limits on 70-90 km/h roads without median barriers. The aim of this is to increase the focus on those roads where speed is most critical.

Carrying out nationwide measurements of speed levels is resource intensive. In 2016 the Swedish Transport Administration conducted the second of three measurements (2012, 2016 and 2020) planned until 2020. The last measurement before the 2012 one was done in 2004. For 2017-2018 estimates were made instead, based on the 2012 and 2016 measurements and the Swedish Transport Administration's simpler measurement (the Speed Index), which only shows the relative change in speeds.

Progress and projection towards the 2020 target

Figure 1 shows the share of the traffic volume travelling within speed limits on national roads. This share is estimated to be 45 per cent in 2018, which means that the level remains unchanged. The result in 2018 is thus 30 percentage points below the required trend, which in turn means that the target will not be reached by 2020. On 70-90 km/h roads without median barriers, and speed is therefore more critical, compliance has improved somewhat – from 47.3 per cent in 2017 to 48.1 per cent in 2018.

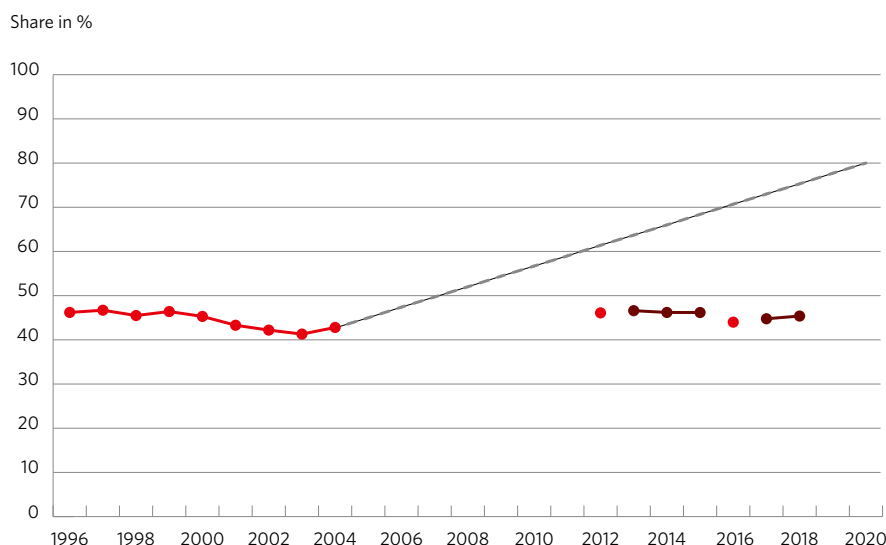


Figure 1
Share of traffic volume within speed limits on national roads 1996-2004, 2012 and 2016. Estimated levels for 2013-2015, 2017-2018, and the required trend until 2020.

Source: Swedish Transport Administration

The average travel speed in 2018 is estimated to have improved slightly compared with 2017 – from 78.5 km/h to 78.3 km/h. Still, this value is not in line with the required trend.

On roads with 70 to 90 km/h speed limits and without median barriers, where speed is a more critical factor, the average speed is estimated to have dropped 0.4 percentage points compared with 2017.

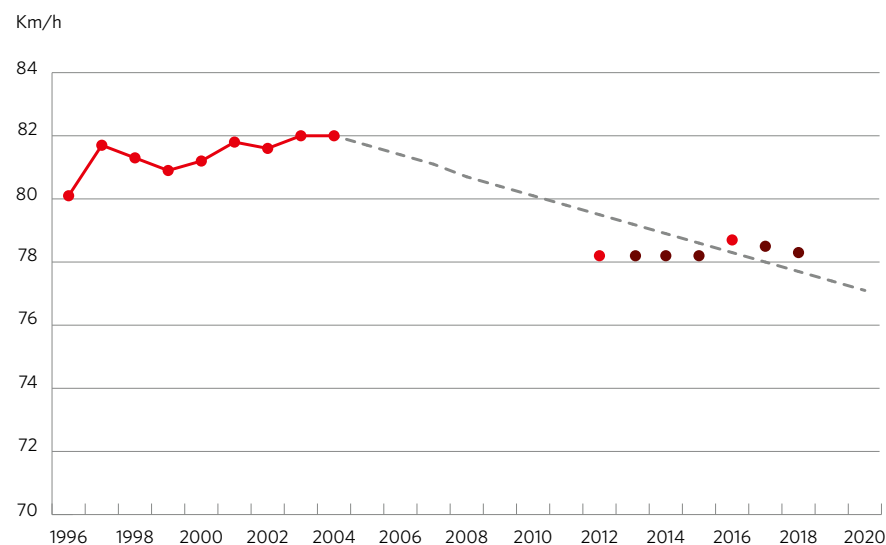


Figure 2
Average travel speed on national roads 1996-2004, 2012 and 2016. Estimated levels for 2013-2015, 2017-2018, and the required trend until 2020.

Source: Swedish Transport Administration

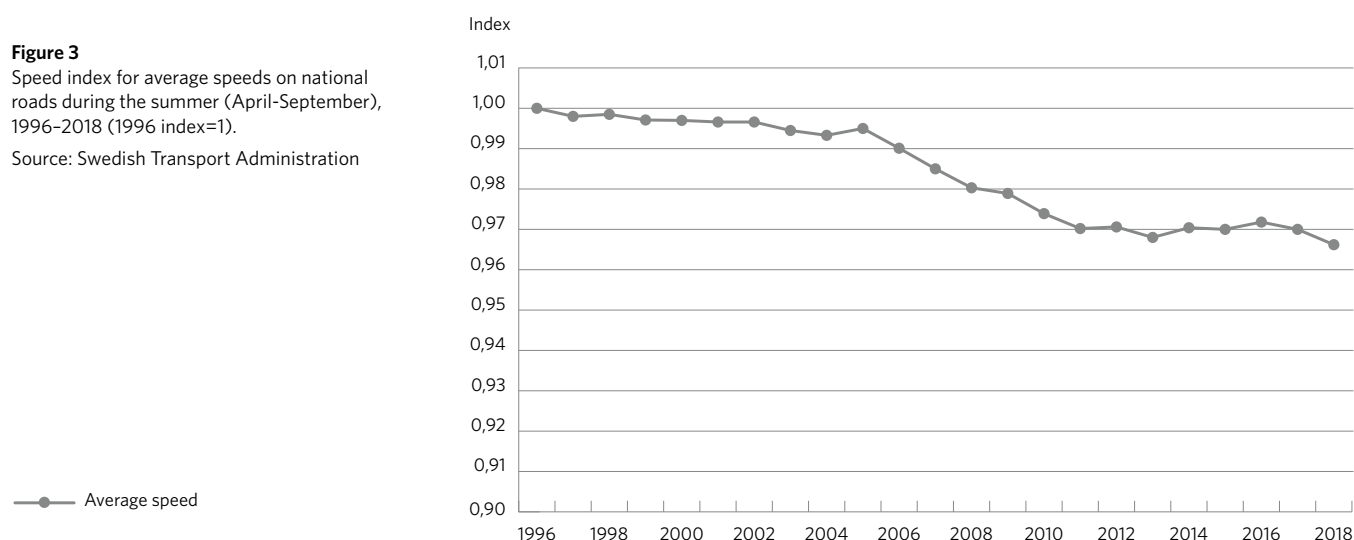
Analysis and discussion

If we use the results of the simpler index measurements carried out annually, it becomes clear that the trend for lower speeds levelled off after 2011. In 2018 we see an improvement on 2017 of 0.4 percentage points, see Figure 3. Speeds have dropped in all speed limit categories except the 100 km/h category, where speeds have remained unchanged.

Figure 3

Speed index for average speeds on national roads during the summer (April-September), 1996–2018 (1996 index=1).

Source: Swedish Transport Administration



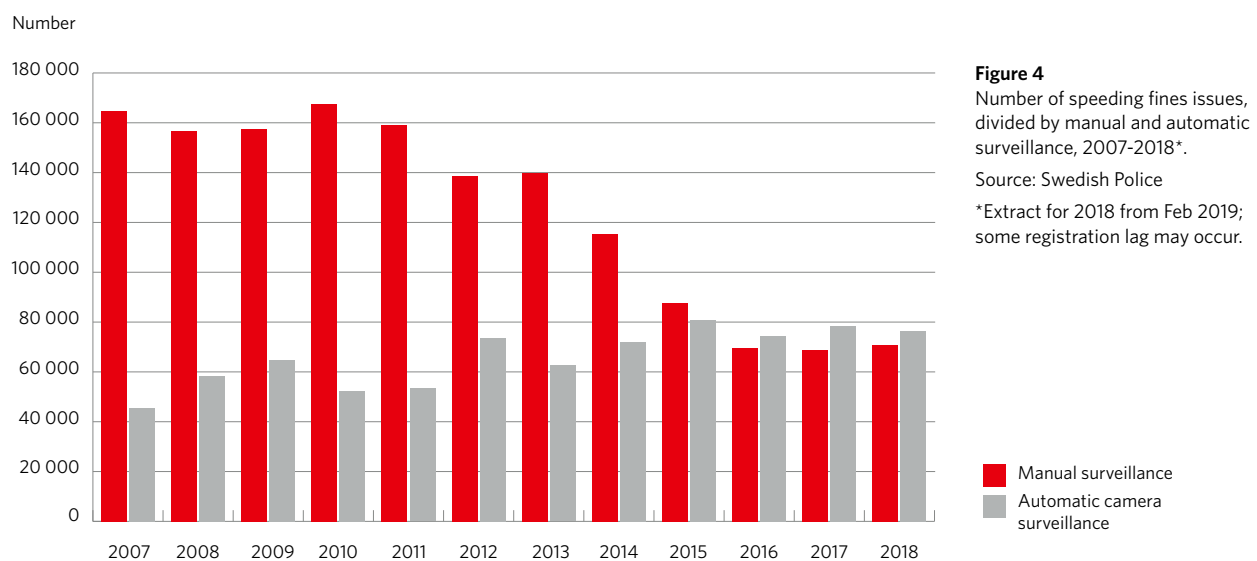
Speed levels and compliance with applicable speed limits have not improved since 2012, see Figures 1 and 2. Reaching the target levels in the short period of time remaining until 2020 must therefore be regarded as an essentially impossible task, despite the fact that around 200 cameras for automatic speed surveillance are installed every year. On the sections of road where they are installed, these cameras have a positive effect, but this nevertheless represents too small a share of the total traffic volume to affect the outcome for the indicator to any greater degree. There are currently around 1,800 road safety cameras installed, and the 2020 target is around 2,300.

In 2016/2017 the Swedish Transport Administration began a major speed review to adapt speed limits on national roads to the roads' safety standards. Above all, this involves lowering speed limits from 90 to 80 km/h. For the period until 2020, this will mean that around 2,200 km of 90 km/h roads have their speed limit lowered to 80 km/h, while around 400 km of 90 km/h roads will have median barriers installed and their speed limits increased to 100 km/h. In 2018 only 60 km of roads were lowered to 80 km/h, compared with 170 km in 2017. So far about 450 of the 2,200 km have had their speed limit lowered. Some sections of road with lowered speed limits became the subject of appeals at the government level. As these appeals were granted, the Swedish Transport Administration chose to postpone the lowering of speed limits on the remaining roads where the measure was planned in 2018. The plan to continue adapting speed limits is still in place, however, with expanded measures in 2019. In total there are currently 11,000 km of roads with a 90 km/h speed limit, of which 5,300 km are roads with a low traffic flow (an average annual daily traffic of less than 2,000 vehicles).

The cumulative effect of 400 planned road safety cameras and lowered speed limits from 90 to 80 km/h between 2019 and 2020 is estimated to be a total speed reduction on the national road network of 0.3 km/h. Even if this means that the targets are not reached, it will have considerable effects on those

parts of the road network where speed is most critical. The average travel speed on the entire 90 km/h network is estimated to be lowered by about 1.5 km/h. These estimates are based on assumptions that travel speeds will drop by just over 3 km/h on those sections of road where the speed limit is lowered from 90 to 80 km/h, and by just under 4 km/h on those roads where road safety cameras are installed.

The target for lowering the average travel speed will not be achievable only by means of the planned speed-reducing measures, however. It will therefore be important also to increase police presence and the associated media coverage. The number of fines issued for speeding (as a result of manual surveillance) dropped sharply between 2011 and 2016, after which it levelled off, see Figure 4. The number of fines issued as a result of automatic surveillance has not declined, however – instead it has remained largely constant, with a small increase.



Under the Road Signs Ordinance, road signs and other fixtures, together with road and street design and the surrounding environment, must give the road user guidance for safe traffic, i.e. contribute to a high level of rule compliance in traffic. Additionally, the Road Safety Act, which applies for parts of the national road network, states that road operators must systematically and regularly undertake such measures as are needed to prevent severe personal injury as a result of road use. This includes taking rule compliance into account in design.

One problem is that large parts of the road traffic system have for a long time had speed limits that are too high in relation to the safety standard of the road in question. Where this is the case, the risk of fatalities or severe injuries is very high in the event of a collision – even if road users are complying with the speed limit. Furthermore, road design often does not help road users in maintaining speed limits, as the link between the speed limit and road design is often perceived as less than evident. In urban areas it may be easier to understand lower speed limits, since unprotected road users are also present there.

The ongoing adjustment of current 90 km/h roads involves either converting them into 2+1 roads with a 100 km/h speed limit or lowering the speed limit to 80 km/h if this can be justified with reference to safety, environment and

accessibility. As this adjustment progresses it will become clearer to road users that national roads without a median barrier normally have a speed limit of 80 km/h, regardless of the width of the road and its surroundings, while roads equipped with median barriers have a speed limit of at least 100 km/h. Information to road users needs to improve considerably in this context, so that it becomes clear why a given road has a given speed limit. The Swedish Transport Administration has now been tasked with implementing information and knowledge improving measures for citizens and road users in order to increase road safety. These measures will include communicating speed limit compliance and why speed limits need to be adapted to the safety standard of the road.

However, at the present time it is not possible to achieve a high level of speed limit compliance only by redesigning streets and roads. It will be important, therefore, to continue investing in speed cameras and other innovative solutions such as vehicle technology and pay-as-you-speed insurance systems. These solutions will have a big role to play in the future, but current implementation of such systems is limited. Police presence is therefore of the utmost importance if we are going to reduce speed levels throughout the road traffic system.

2.2 Compliance with speed limits – municipal road network

	2012*	2018	2020 target	Assessed progress towards target
Share of traffic volume within speed limits, municipal road network	64 %	66 %	80 %	Not in line with the required trend
Average travel speed	49 km/h	47 km/h	46 km/h	In line with the required trend

*Year in which measurements began. Measurements are not nationally representative, but are deemed accurate enough for tracking change over time.

The target for the share of the traffic volume travelling within speed limits in the municipal road network is that it will be at least 80 per cent by 2020. For travel speed, the 2020 target is for the average travel speed to be 46 km/h. Measurements began in 2012, and are repeated annually in the municipal road network. The intention is not to estimate the share of traffic volume within speed limits in Sweden in a representative way, but the measurements are deemed accurate enough for tracking change over time and indicating the approximate level.

Progress and projection towards the 2020 target

Figure 5 shows the observed level of traffic volume travelling within speed limits on municipal roads in 2018. The result shows that 66 per cent of the traffic volume was within applicable speed limits, which is essentially the same level as in 2017. This is around 10 percentage points below the required trend for achieving the 2020 target. Progress is thus not in line with the required trend.

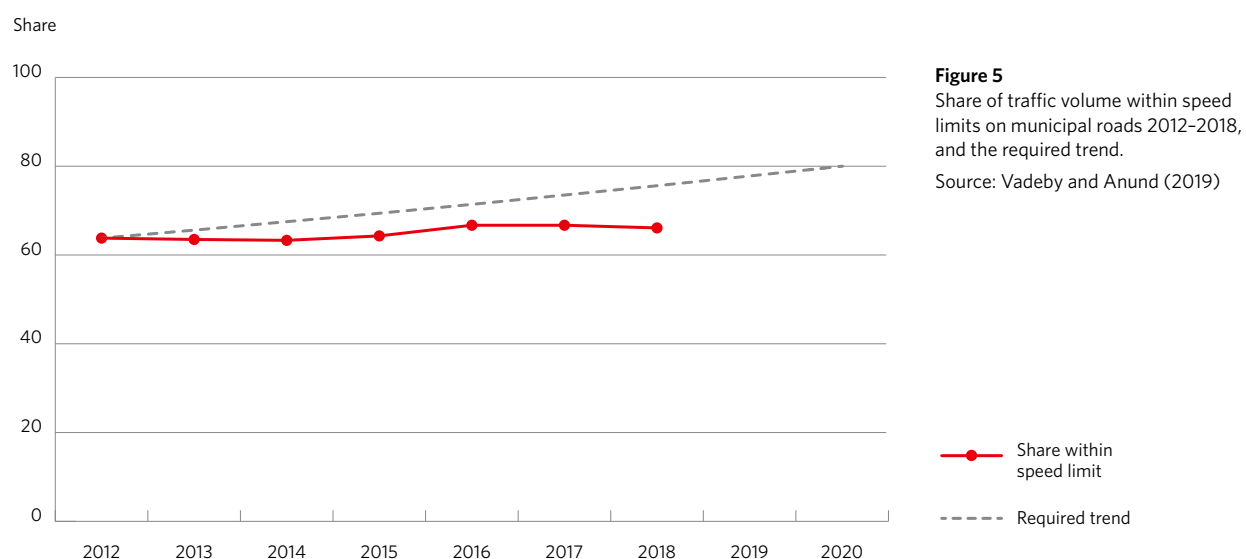


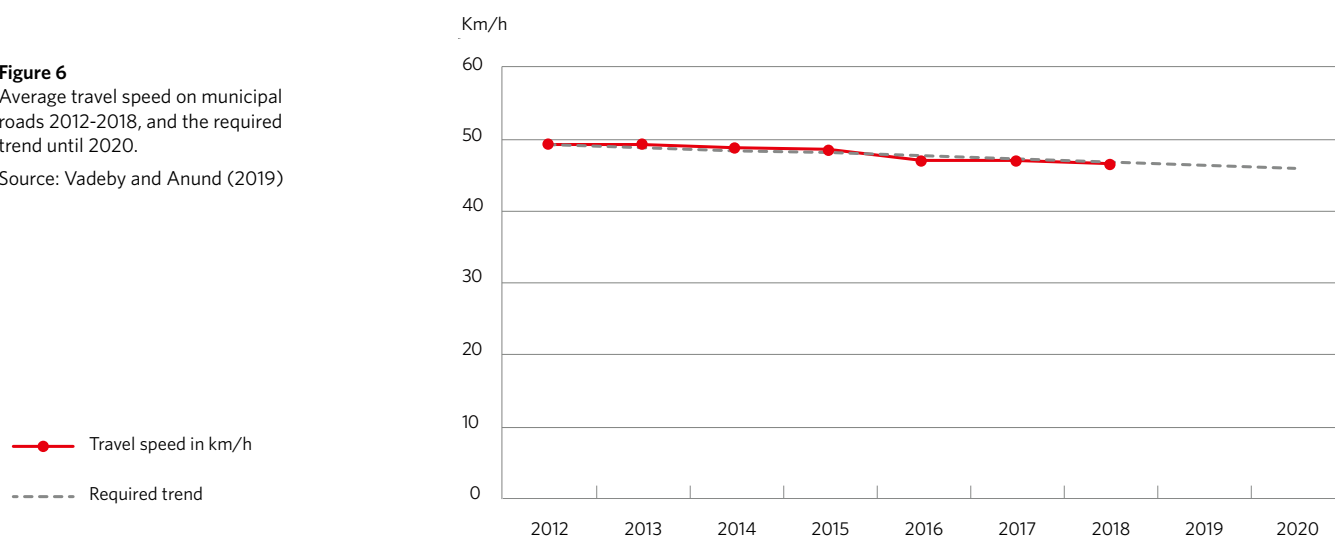
Figure 5
Share of traffic volume within speed limits on municipal roads 2012–2018, and the required trend.
Source: Vadeby and Anund (2019)

Figure 6 shows average travel speeds in 2012-2018. The average travel speed in 2018 was 46.5 km/h, which is essentially the same level as in 2017. The analysis group's assessment is that this is in line with the required trend.

Figure 6

Average travel speed on municipal roads 2012-2018, and the required trend until 2020.

Source: Vadeby and Anund (2019)



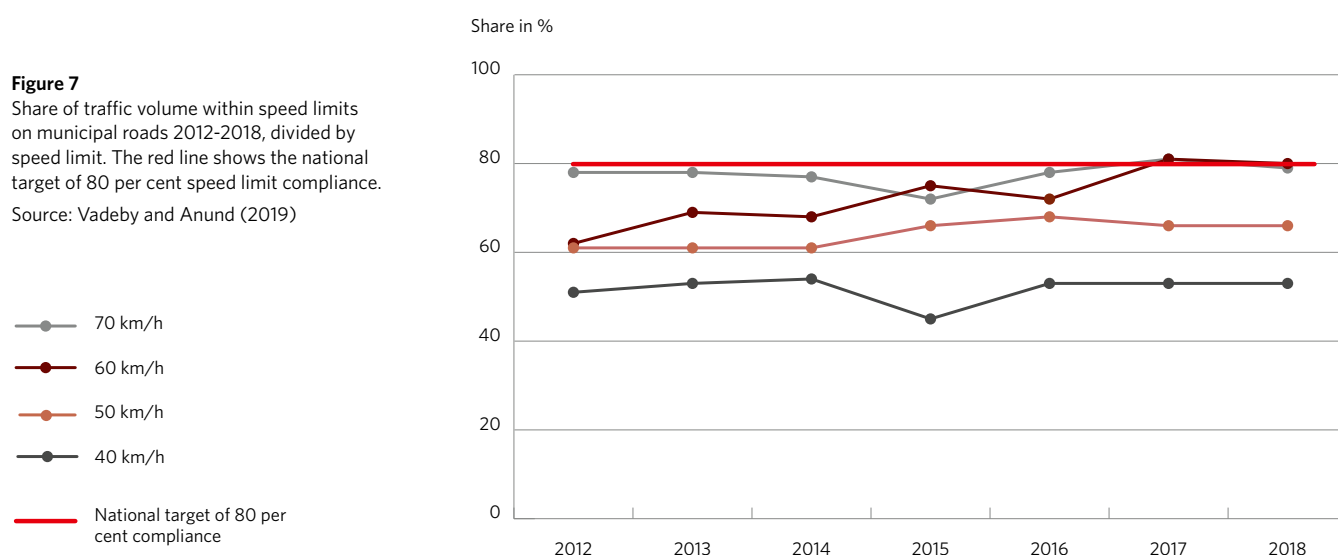
Analysis and discussion

Figure 7 shows the results of speed limit compliance measurements from 2012 to 2018, divided by speed limit. On streets with a 40 km/h speed limit, 53 per cent of the traffic was within that limit in 2018. On streets with a 50 km/h speed limit, compliance was 66 per cent, while it was 80 per cent on streets with a 60 km/h speed limit and 79 per cent on streets with a 70 km/h speed limit. Thus compliance with speed limits is highest on streets with 60 and 70 km/h speed limits, and in this year's measurements results for these speed limits are essentially at the 2020 target level for speed limit compliance, 80 km/h.

Figure 7

Share of traffic volume within speed limits on municipal roads 2012-2018, divided by speed limit. The red line shows the national target of 80 per cent speed limit compliance.

Source: Vadeby and Anund (2019)



Divided by vehicle type, 65 per cent of passenger cars comply with speed limits. Among lorries and buses compliance is 74 per cent, and among lorries with trailers 87 per cent. The number of speed limit infringements by motorcycles and mopeds is not reported separately, as the measuring equipment is unable to distinguish motorcycles and mopeds from each other.

If we consider the reporting threshold applied by the police, a total of 84 per cent of traffic travels within 5 km/h above the speed limit. Compliance is clearly lowest on sections with a 40 km/h speed limit here as well, with 77 per cent of traffic travelling within 5 km/h above the speed limit. The corresponding figure for sections with speed limits of 60 or 70 km/h is just over 90 per cent. Overall, compliance levels differ greatly between monitoring points. This is natural in urban areas, where there are many factors besides the speed limit that influence road users' choice of speed, including the frequency of junctions, road width, and the occurrence of roadside parking and pavements.

There were 52 deaths among unprotected road users in the municipal road network in 2018, of which 41 on streets with a speed limit of 50 km/h or less. Research has shown that a pedestrian hit by a vehicle at 50 km/h is 2-3 times more likely to be killed than if the vehicle was travelling at 40 km/h (Kröyer et al, 2014). Many municipalities are currently working to change the speed limits. Figure 8 shows the distribution of speed limits in the municipal road network in tens of kilometres of road length. Roads with a speed limit of 50 km/h remain the dominant type, but between 2012 and 2018 the total length of 50 km/h roads was reduced from 25,500 kilometres to 15,000 kilometres. Over the same period the total length of roads with a 40 km/h speed limit increased from 2,200 kilometres to 10,500 kilometres.

Tens of kilometres

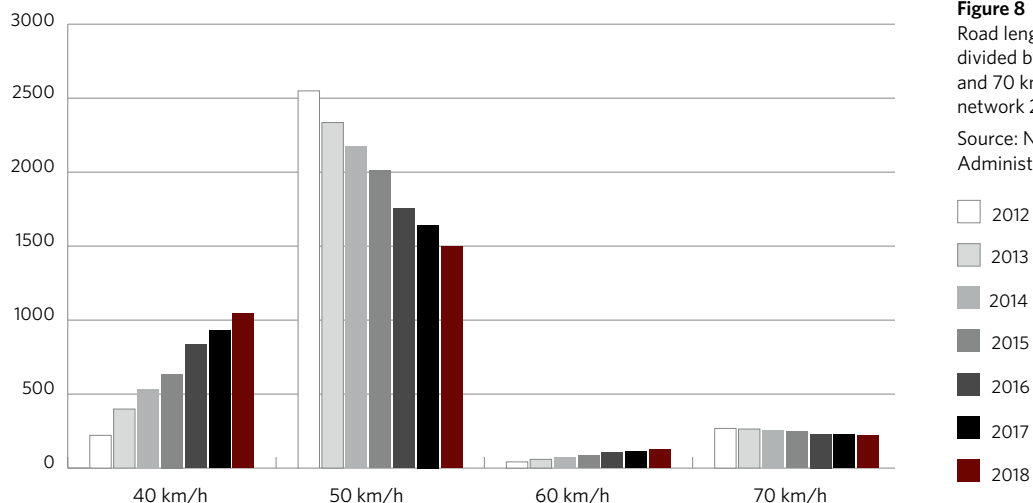


Figure 8
Road length in tens of kilometres, divided by speed limits of 40, 50, 60 and 70 km/h in the municipal road network 2012-2018.
Source: NVBD, Swedish Transport Administration (2018)

In November 2017, Traffic Analysis presented the results of a government commission examining the conditions for and consequences of lowering the base speed limit in urban areas from 50 km/h, the current level, to 40 km/h, see Traffic Analysis (2017). Traffic Analysis advocates the introduction of a 40 km/h base speed limit in urban areas. They point out that an advantage of a new base speed limit is that it can be quickly introduced across the country, which may contribute to a more equal application of speed limits than is currently the case. Vadeby, Forsman and Ekström (2017) studied the road safety effects of lowering the base speed limit from 50 to 40 km/h. Their results showed that if the reduction in the average speed were to be the same as previous evaluations have shown, i.e. around 2 km/h, about 5 lives could be saved every year. If the average speed were lowered by 5 or 10 km/h instead, the number of lives saved would be 10 and 17, respectively. As far as is known by the members of the analysis group, no decisions have been made on how to proceed with the matter of a 40 km/h base speed limit in urban areas.

The Swedish Transport Administration's road safety survey from 2018 (Berkow and Månsson, 2019) shows that 63 per cent of respondents find it generally reasonable to lower the speed limit in order to improve road safety. This is an increase on 2017, when the share of generally favourable respondents was 53 per cent. Women are more favourable to lowering the speed limit than men – 72 per cent compared with 54 per cent. Many respondents were particularly in favour of lowering the speed limit to 30 km/h in areas with a lot of pedestrians and cyclists – 76 per cent agreed with this.

In order to achieve the target of 80 per cent compliance with speed limits by 2020, improvements are needed particularly on streets with a 40 km/h speed limit. Compliance can be increased e.g. by means of increased surveillance and by adapting the infrastructure. By greater use of e.g. narrowing, speed humps and changes to road width when designing urban streets, they become more “self-explanatory”, making it more natural for road users to stick to the signposted speed limit. Under the Road Traffic Ordinance (2007:90), the overall design of the road environment should be appropriate for the speed limit the road was planned for. To increase rule compliance following a lowering of the speed limit, both road design and surveillance need to be adapted.

In addition to manual police surveillance, road safety cameras have proven effective in increasing compliance. However, at present the municipal road network has only 12 such camera installations, and only a further four are planned (this can be compared to the 1,745 speed camera installations in the national road network in 2018), meaning that we cannot expect any major effects of speed cameras in the municipal network over the next few years. By contrast, technology that helps drivers stick to the speed limit (Intelligent Speed Assistance, ISA), and financial incentives (Stigson et al, 2012) can have a positive impact – including the introduction of what is known as pay-as-you-speed insurance (which was mentioned in the previous section on speed limit compliance in the national road network).

To increase speed limit compliance in commercial traffic, the focus needs to be on leadership and those structures within an organisation that contribute to positive road safety behaviour. A recent report indicates that companies with ISO 39001 certification have somewhat better speed limit compliance than non-certified companies (Engström 2018). Good speed limit compliance where speed limits are low is also very important in order to reap the full benefits of e.g. automatic emergency braking in urban areas, see Rizzi et al (2014).

2.3 Sober drivers

	2007	2018	2020 target	Assessed progress towards target
Share of traffic volume with sober drivers	99,71 %	99,73 %	99,90 %	Not in line with the required trend

The target for sobriety on the roads is for at least 99.9 per cent of the traffic volume to have sober drivers by 2020. Trends in this area are monitored by using data from police drink driving checkpoints (Forsman, 2011). The measurements should be seen as a way of tracking drink driving trends, and not as gauging the actual level. The measurement series is carried out so as to be as independent as possible of policing methods, but a certain influence cannot be ruled out. A sober driver is defined as one with a blood alcohol concentration of less than 0.02% . This indicator is thus based only on sobriety with respect to alcohol, and not to other drugs. Unfortunately there is currently no reliable basis for monitoring drug use trends in traffic.

Progress and projection towards the 2020 target

The results of the 2018 measurements show that the share of sober drivers decreased marginally between 2017 and 2018. The share for 2018 was 99.73 per cent, compared with 99.74 per cent in 2017, see Figure 9. During the first few years after measurements began in 2007 the share of sober drivers increased, but since then that trend has levelled off and begun to go in the other direction. The results for 2018 are below the curve for the required trend, and the analysis group's assessment is therefore that the 2020 target will not be achieved.

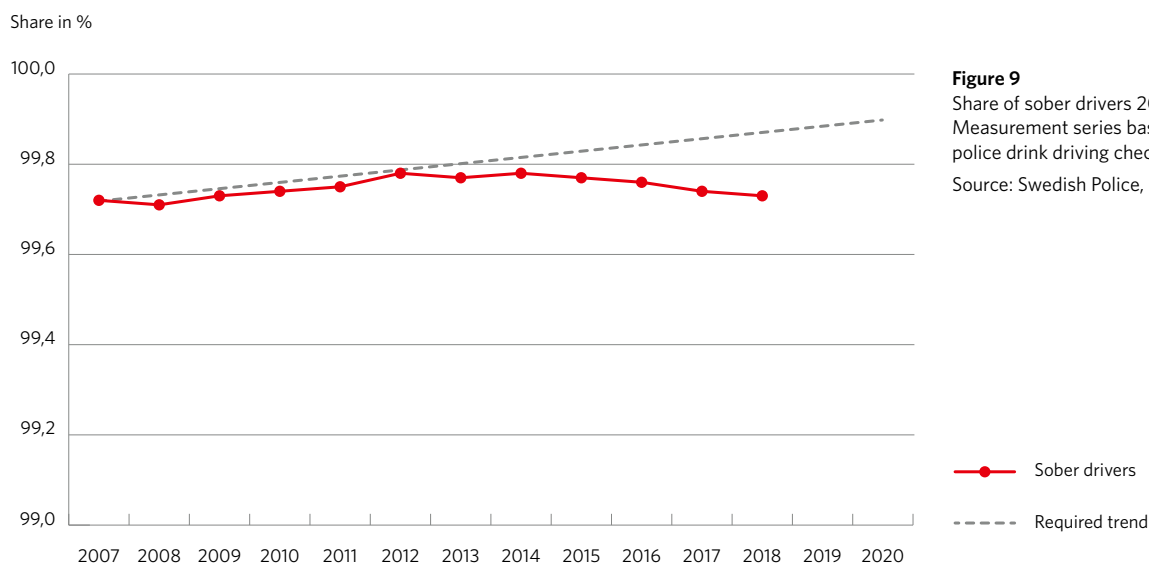
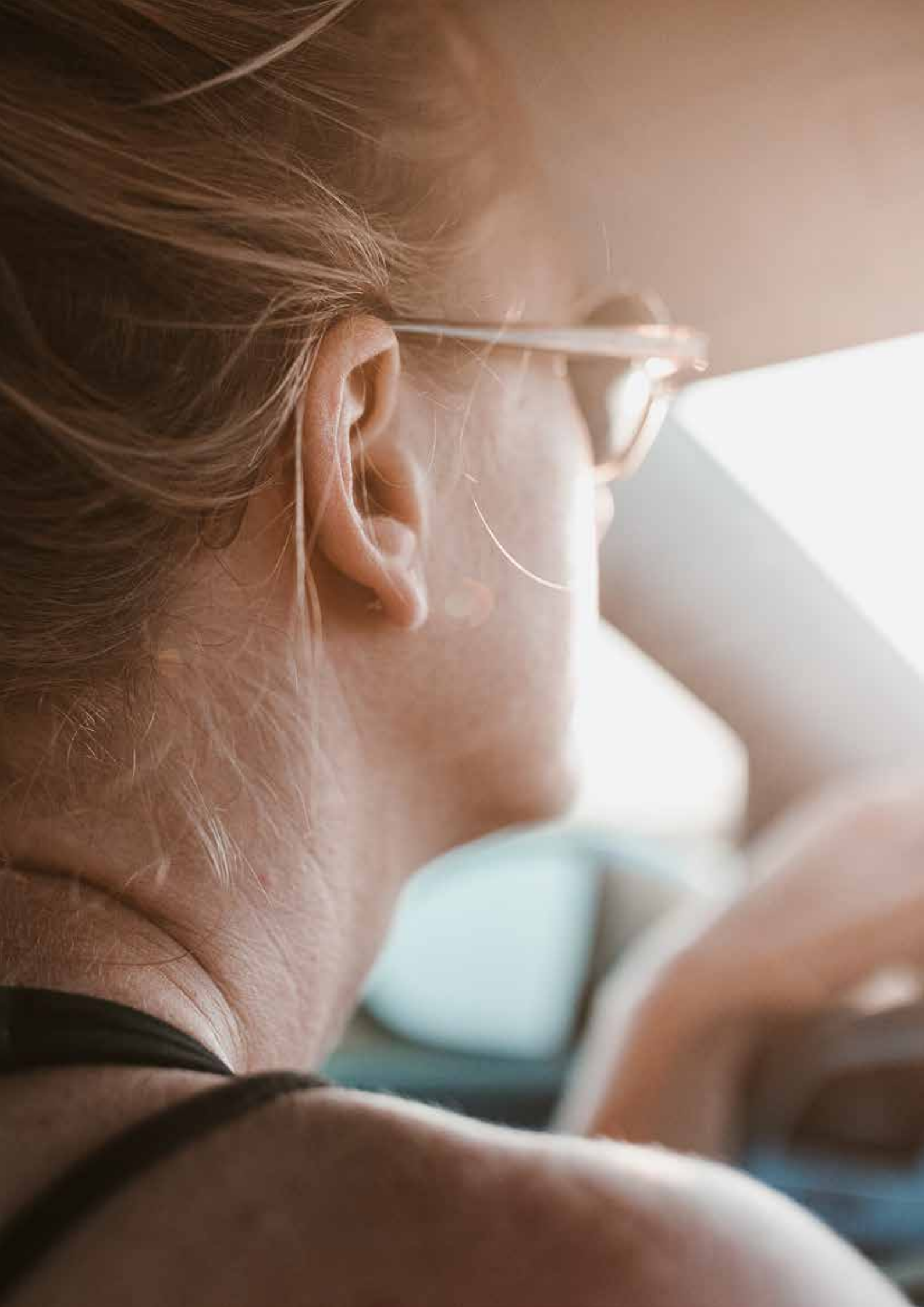


Figure 9
Share of sober drivers 2007-2018.
Measurement series based on data from
police drink driving checkpoints.
Source: Swedish Police, VTI



Analysis and discussion

The Swedish Transport Administration's in-depth studies of fatal accidents show that the number of passenger car drivers killed in 2018 who were under the influence of alcohol (blood alcohol concentration $\geq 0.02\%$) was at about the same level as in the previous three years, 2015-2017, see Figure 10. As a share of the total number of driver fatalities, this number has varied a fair amount during the same period, and between 2017 and 2018 the share decreased from 28 to 20 per cent as the total number of driver fatalities increased sharply. This means that the share has now returned to the same level as in 2013 and 2014. A large proportion of passenger car drivers killed under the influence of alcohol are victims of single-vehicle accidents.

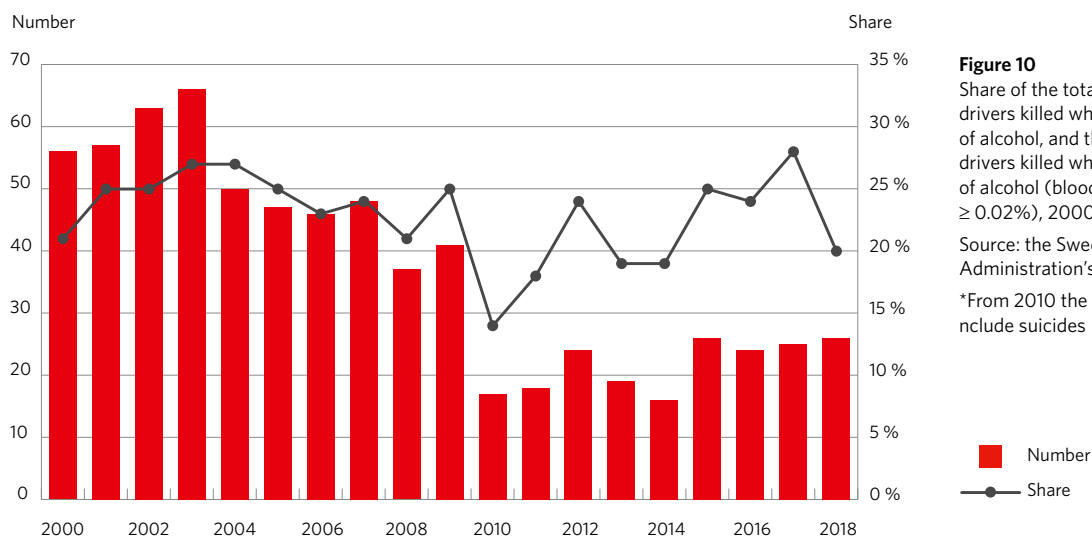


Figure 10

Share of the total number of passenger car drivers killed who were under the influence of alcohol, and the number of passenger car drivers killed who were under the influence of alcohol (blood alcohol concentration $\geq 0.02\%$), 2000-2018.

Source: the Swedish Transport Administration's in-depth studies

*From 2010 the number does not include suicides

The term “sober driver” also means that the driver is not under the influence of any other drugs besides alcohol. Figure 11 shows a time series of the number of individuals killed in alcohol or drug-related accidents. An accident is regarded as alcohol or drug-related if alcohol or drugs are present in any of the involved motor vehicle drivers, pedestrians or cyclists. Only illegal drugs are taken into consideration. It should be noted, however, that it is often not known if a road user who has survived a traffic accident was under the influence of drugs when it happened. This means that there is a degree of uncertainty in the results.

In total, 75 individuals were killed in alcohol or drug-related accidents in 2018, compared with 81 individuals in 2017. Of the 75 individuals killed in 2018, 44 were involved in accidents that were only alcohol-related, 22 in accidents that were only drug-related, and 9 in accidents that were both alcohol and drug-related. The number killed in alcohol-related accidents (including those that were also drug-related) was the same in 2017 and 2018 – 53 individuals. The number of individuals killed in drug-related accidents has decreased, from 40 in 2017 to 31 individuals in 2018. The increase in the number of killed in drug-related accidents that we saw in 2016 and 2017 has thus not continued, but the number in 2018 was still higher than it was prior to 2016.

The total number of road fatalities increased sharply from 2017 to 2018, which means that the share of fatalities in alcohol or drug-related accidents has decreased, from 32 per cent in 2017 to 23 per cent in 2018. That is the lowest share since 2010, when it was 22 per cent.

Figure 11

Number and share (of the total number of fatalities in Sweden, right Y axis) of individuals killed in alcohol and/or drug-related accidents, 2008-2018.

Source: the Swedish Transport Administration's in-depth studies

*From 2010 the number does not include suicides

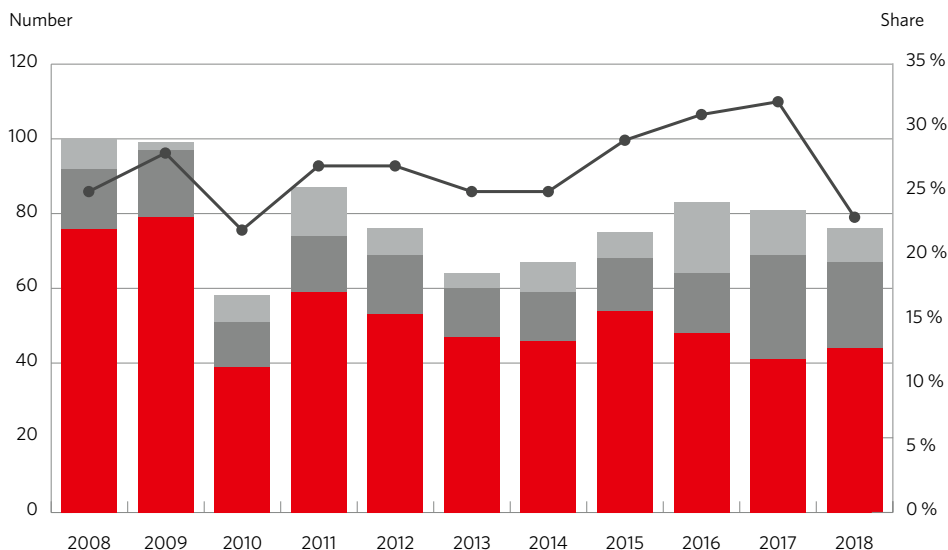
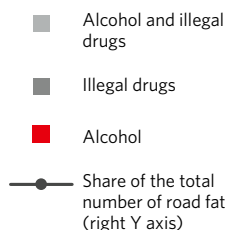
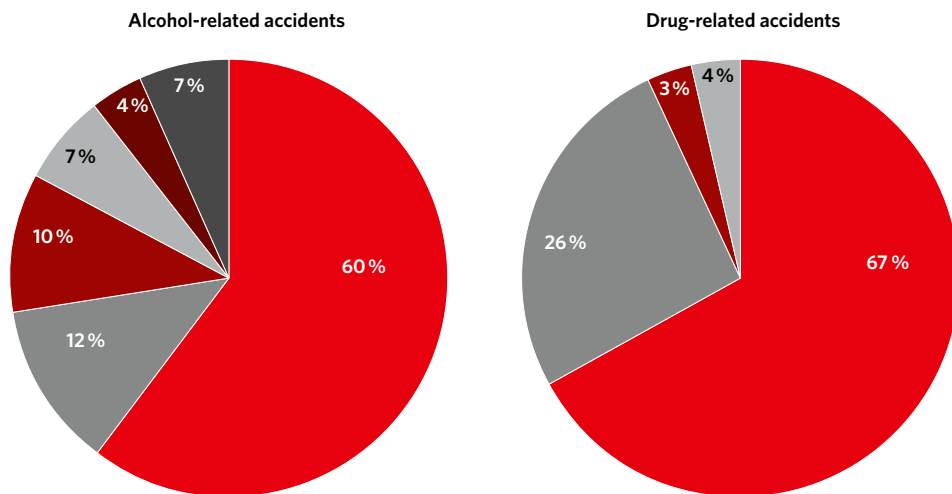
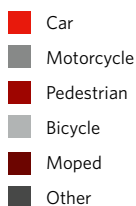


Figure 12 shows the distribution by transport mode of individuals killed over the past five years in alcohol and drug-related accidents, respectively. The biggest group in both alcohol and drug-related accidents is motorists. The second biggest group killed in alcohol-related accidents is pedestrians, followed by motorcyclists. In drug-related accidents motorcyclists are the second biggest group, while the number of pedestrians killed is relatively small. It may also be noted that no moped driver has been killed in a drug-related accident over the past five years. In the vast majority of cases it is the road user who was killed that was under the influence of alcohol or drugs; this also applies to pedestrians and cyclists.

Figure 12

Share of individuals killed in alcohol-related (left pie chart) and drug-related (right pie chart) accidents, by transport mode. Accidents that were both alcohol and drug-related are included in both pie charts. The distribution is based on all accidents during the 2014-2018 period.

Source: the Swedish Transport Administration's in-depth studies



In the Swedish Transport Administration's 2018 road safety survey, 5 per cent of respondents answered "yes" to the question "Over the past 12 months, have you at any time driven a car in connection with having drunk alcoholic beverages stronger than low-alcohol beer?" (Berkow and Månsson, 2019). That is a reduction by 2.5 percentage points on 2017, and at about the same level as in the years immediately prior to 2017. In a longer-term perspective, the 2018 result is fairly low; the share answering "yes" has been decreasing gradually since the end of the 1980s.

Figure 13 shows the number of breath tests carried out by the police in relation to the number of reported drink-driving offences during the 2001-2018 period. The number of breath tests increased sharply until 2007, after which it levelled off and then began to decline. The 2018 figure is an estimate of the final number of tests, and the result is more or less on the same level as in 2016 and 2017. The decline in the number of breath tests seen in recent years thus seems to have been halted.

The number of reported drink-driving offences follows roughly the same curve, albeit with smaller relative differences. The number of reported offences decreased marginally between 2017 and 2018, from about 11,800 to about 11,600. The number of reported drug-driving offences increased from about 13,800 in 2017 to about 14,300 in 2018 (the 2018 figure is preliminary). Since 2016 the number of reported drug-driving offences has been higher than the number of reported drink-driving offences. It is not known to what extent the increase in the number of reported drug-driving offences is due to policing methods, or to an actual increase in drug driving.

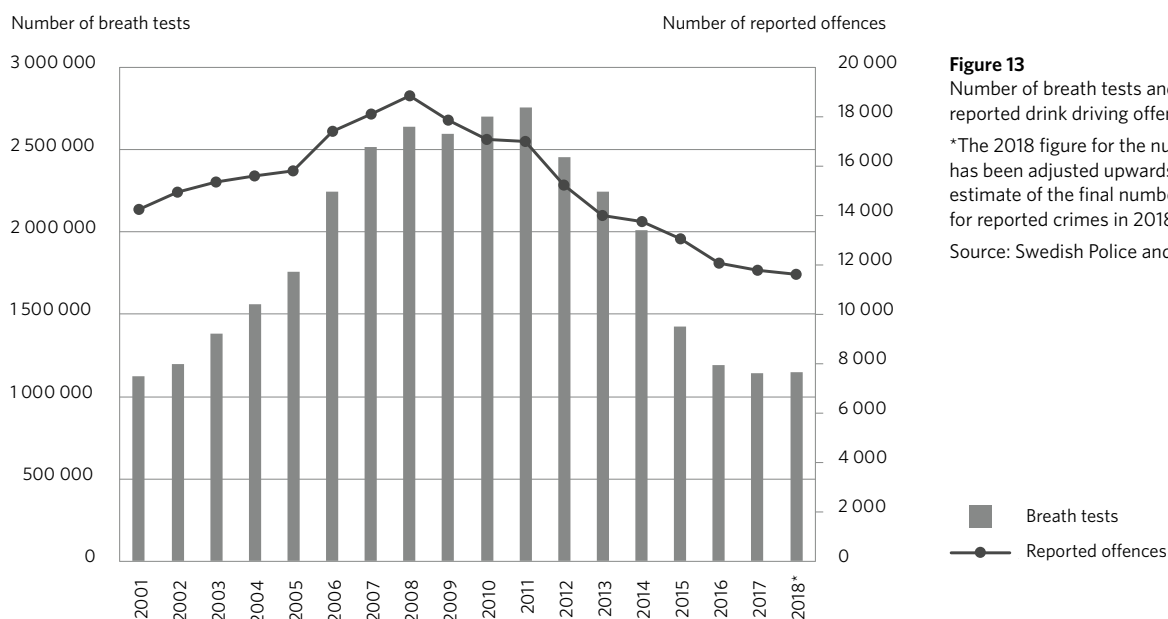


Figure 13
Number of breath tests and number of reported drink driving offences 2001-2018.
*The 2018 figure for the number of tests has been adjusted upwards and is an estimate of the final number. The figure for reported crimes in 2018 is preliminary.
Source: Swedish Police and BRÅ

In the long term there is considerable potential for technological solutions in reducing drink driving, and it is likely that on-board systems will be developed that can detect a driver's reduced driving ability (see also Chapter 2.6 Safe passenger cars). However, these advances will not have any impact to speak of over the next few years. Other initiatives are also underway to reduce drink driving, in parallel with technological developments.

In 2017 the Swedish Transport Administration presented the results of a government commission on preparing the introduction of facilities for drink driving checks in some ports (Swedish Transport Administration, 2017). The installation of one such facility began in 2018; it is expected to become operational during 2019, and a dialogue is in progress with several other ports. Also in 2018, the Police Authority and the Swedish Transport Administration jointly made a formal request¹ that the government amend legislation in order to allow for the introduction of a new profession: road safety controller. The intention is for such controllers to be authorised to carry out drink driving checks, thus relieving pressure on the police and other surveillance authorities. The government has not yet responded to the request.

The Police Authority is also working to find more effective ways of carrying out drink driving surveillance, in accordance with the traffic strategy adopted in 2016². A six-month pilot scheme was recently concluded in the Central Region (Region Mitt) which involved making 20 minute checks at predetermined locations, with the aim of distributing checks more widely across time and space, and of increasing their visibility. The pilot is being evaluated by VTI and a report will be completed during 2019.

SMADIT ("Samverkan mot alkohol och droger i trafiken", or Collaboration against alcohol and drugs in traffic) is a programme of measures in which individuals suspected of drink driving are offered help to deal with any abuse problems they may have, with the aim of reducing the recurrence of drink driving offences. It is a national programme, but is mostly carried out locally in a collaboration between the police, the municipality and other care providers. Since 2017 the programme's coordinating agency is the Public Health Agency of Sweden, which has also monitored in its Regional Report how many municipalities worked with SMADIT earlier. The report shows that the number has gradually declined from 157 municipalities in 2011 to 115 in 2017³. Initiatives may therefore be needed to encourage renewed involvement with SMADIT.

Footnote

¹ A formal request in this context is a request for a decision to be made regarding a specific measure, which in this case was sent to the Ministry of Justice as well as the Ministry of Enterprise and Innovation.

² <https://polisen.se/siteassets/dokument/strategier/polismyndighetens-strategi-for-trafik.pdf>

³ <http://www.andtuppfoljning.se/indikator/abbet/?SavedQueryId=8aedb2a8-d364-43da-a815-0c8b6628abf3>

2.4 Seat belt use

	2007	2018	2020 target	Assessed progress towards target
Share of front seat passenger car occupants wearing a seat belt	96 %	98,6 %	99 %	In line with the required trend

The target for seat belt use is that at least 99 per cent of all drivers and front seat passengers in passenger cars will be wearing a seat belt by 2020.

Results of the observational measurements by the Swedish Transport Administration (which used to be carried out by the Swedish National Road and Transport Research Institute, VTI) are used as a basis for monitoring progress. The indicator is defined as the share of the observed drivers and front-seat passengers wearing a seat belt. The measurements have been carried out under the auspices of the Swedish Transport Administration since 2016, and are based on observations of 37,000 passenger cars at major roundabouts in six Swedish urban areas of intermediate size.

The measurements are intended to monitor progress over time, and the extent of belt use reported should not be regarded as representative of drivers and passengers in Sweden in general. Measurements after 2016 have been carried out by a new contractor, using the same method as in previous years, which may have influenced the results.

Progress and projection towards the 2020 target

Seat belt use in passenger cars' front seats was 98.7 per cent in 2018, which is an improvement on 2017, when it was 97.6 per cent. Seat belt use is in line with the required trend.

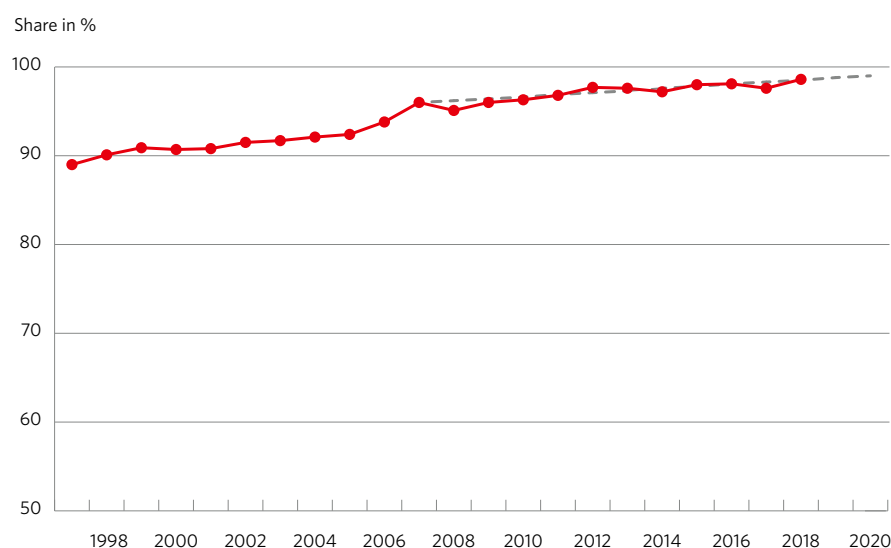


Figure 14

Share of individuals in passenger car front seats who were wearing a seat belt when observed, 1997-2018, and the required trend until 2020.

Source: VTI (1997-2015), Swedish Transport Administration (2016-2018)

Analysis and discussion

The share of people wearing seat belts in the front seat is high – 98.6 per cent. This is in line with the 2020 target level of 99 per cent seat belt use. Among drivers seat belt use is 98.7 per cent, and among front seat passengers it is 98.5 per cent, see Figure 15. Seat belt use among taxi drivers declined slightly in 2018 and is now at about the same level as in 2015. Seat belt use among drivers of heavy goods vehicles declined sharply in 2018.

The results of the measurements indicate a decline in seat belt use by adults in the back seat. Seat belt use in the back seat by children declined in 2016 and 2017, but increased in 2018 to the level it was before the decline.

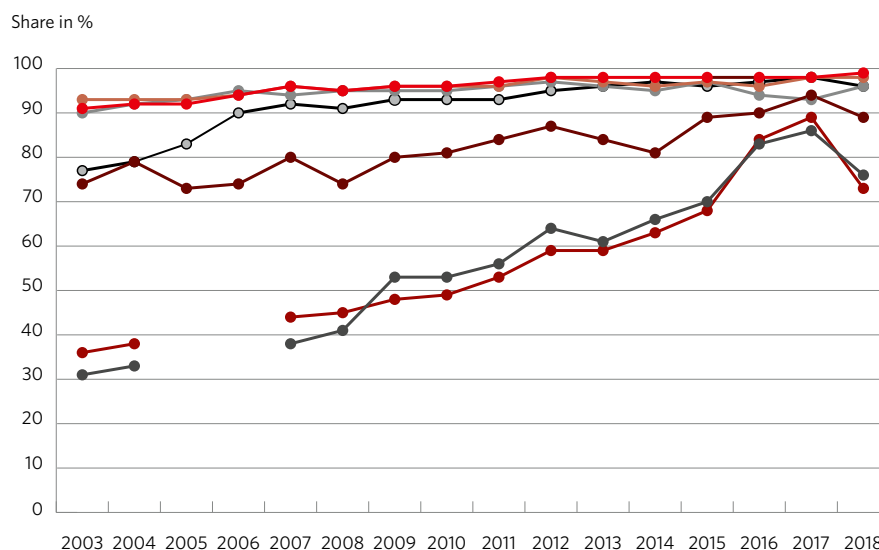
Figure 15

Seat belt use in passenger cars and heavy goods vehicles, 2003-2018.

Source: VTI (2002-2015), Swedish Transport Administration (2016-2018)

*Observations of heavy goods vehicles since 2007 are not fully comparable with earlier observations. Measurements after 2016 have been carried out by a new contractor, using the same method as in previous years, which may have influenced the results.

- Passenger car drivers
- Passenger car front seat passengers
- Passenger car back seat adult passengers
- Passenger car back seat child passengers
- Taxi drivers
- Heavy goods vehicle without trailer
- Heavy goods vehicle with trailer



Measurements carried out by NTF (Nationalföreningen för Trafiksäkerhetens Främjande, the National society for the Promotion of Road Safety) in urban areas in all of the country's municipalities (350,000 observations) point to a somewhat lower level of seat belt use than those shown in Figure 15, which are more indicative of through traffic. Seat belt use among passenger car drivers and passengers in urban areas was measured at 95 per cent in 2018, meaning that the situation is unchanged compared with 2017. Seat belt use was often lower on shorter journeys: among passenger car drivers it was 93 per cent in 2013.

Despite the relatively large share of drivers and passengers that wear seat belts, about a third of those killed in passenger cars were not wearing a seat belt. This corresponds to approximately 30 individuals per year. Results from the Swedish Transport Administration's in-depth studies show that the share of passenger car drivers killed who were not wearing a seat belt declined in comparison with 2017. In 2018 the share of drivers killed who were not wearing a seat belt was 26 per cent, see Figure 16. The number of those not wearing a seat belt is thus unchanged, while their share has declined as a result of the high total incidence of passenger car driver fatalities.

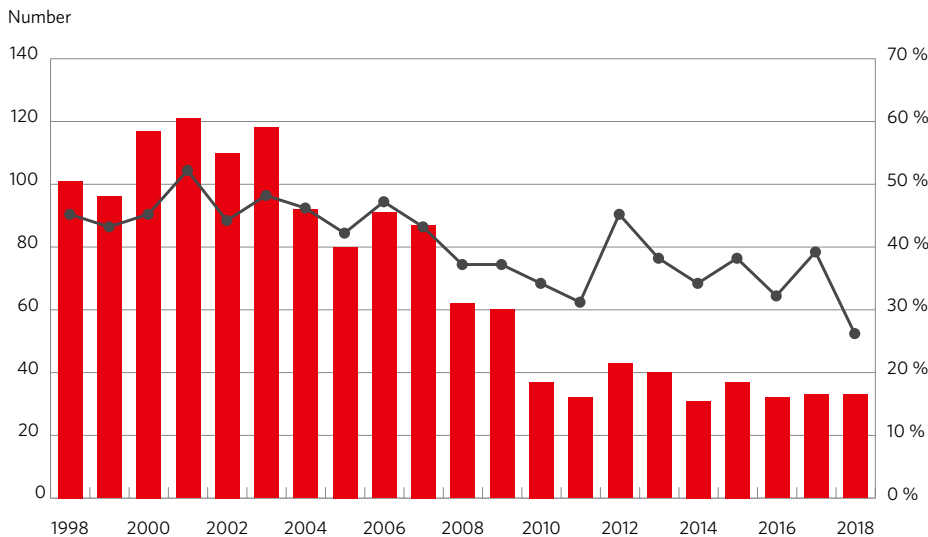


Figure 16

Number of passenger car drivers killed who were not wearing a seat belt at the time of the accident, and their share of drivers known to be seat belt users, 2000-2018.

Source: the Swedish Transport Administration's in-depth studies

*From 2010 the data has been collected in a different way than earlier, meaning that results are not entirely comparable with earlier values. The difference is judged to be small, however. Suicides have been excluded from the statistics since 2010.

■ Number
● Share

Of those killed who were not wearing a seat belt, nearly 80 per cent were in cars manufactured before 2003, which was the year that more modern seat belt reminders began to be introduced. Considering the fact that seat belt use among those killed in cars is only about 70 per cent, many lives could be saved if the already large proportion of overall seat belt use were to increase further.

The share of the traffic volume which occurs with passenger cars that have seat belt reminders continues to increase. It was just under 90 per cent in 2018, and 87 per cent in 2017. As recently as in 2005, this share was only just under 10 per cent. A forecast indicates that the share of traffic volume with seat belt reminders will increase to about 95 per cent in 2020. Even if the vehicle fleet does not become 100 per cent equipped with seat belt reminders, the increase in cars so equipped in traffic between 2015 and 2020 is estimated to lead to an increase in seat belt use of about 0.5 percentage points.

2.5 Helmet use

	2007	2018	2020 target	Assessed progress towards target
Share of observed cyclists wearing a helmet	27 %	42 %	70 %	Not in line with the required trend
Share of observed moped riders wearing a helmet	96 %	93 %	99 %	Not in line with the required trend

The target for bicycle helmet use is that at least 70 per cent of cyclists use a helmet by 2020. The figure used to gauge cycle helmet use is the share of cyclists observed wearing a helmet in the Swedish Transport Administration's annual measurements (Swedish Transport Administration 2019). 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. Since 2016 the measurements have been carried out by a new contractor, albeit with the same methods as earlier, which may have an influence on the results. This makes the change between 2015 and 2016 difficult to interpret. In 2018 the measurements are based on around 37,000 observations, which is about the same number as in 2017 and 2016, but considerably fewer than in 2015, when 65,600 cyclists were observed.

Helmet use among moped riders is also studied. Since 2012 moped riders' helmet use has been observed in conjunction with bicycle helmet observations. The study was carried out in the same places and at the same times as bicycle helmet observations, but at slightly fewer locations in each place (Swedish Transport Administration 2019). Only those riders who were perceived to be wearing a properly fastened helmet were counted as helmet users. The target for moped helmet use is for 99 per cent of moped riders to be using helmets by 2020. Regarding motorcyclists, our assessment is that the level of helmet use is very high and that the potential for saving lives lies in other measures.

Progress and projection towards the 2020 target – bicycle helmets

Figure 17 shows the trend for observed bicycle helmet use between 1996 and 2018. Observed bicycle helmet use was 42.4 per cent in 2018, which is a decline of almost two percentage points since 2017, when it was at 44.2 per cent. This is a significant change.

The figure also shows how bicycle helmet use needs to change between 2007 and 2020 in order for the target level of 70 per cent to be reached. This amounts to an annual increase of 7.6 per cent. While the share of cyclists wearing helmets maintained that rate of change, on average, between 2010 and 2013, the rate faltered in 2014. A decline was noted in 2016, while in 2017 observed use increased again, only to decline once more in 2018. As the actual level of bicycle helmet use is 18 percentage points below the curve for the required trend, bicycle helmet use is assessed not to have increased sufficiently since 2007 to reach the 2020 target level.

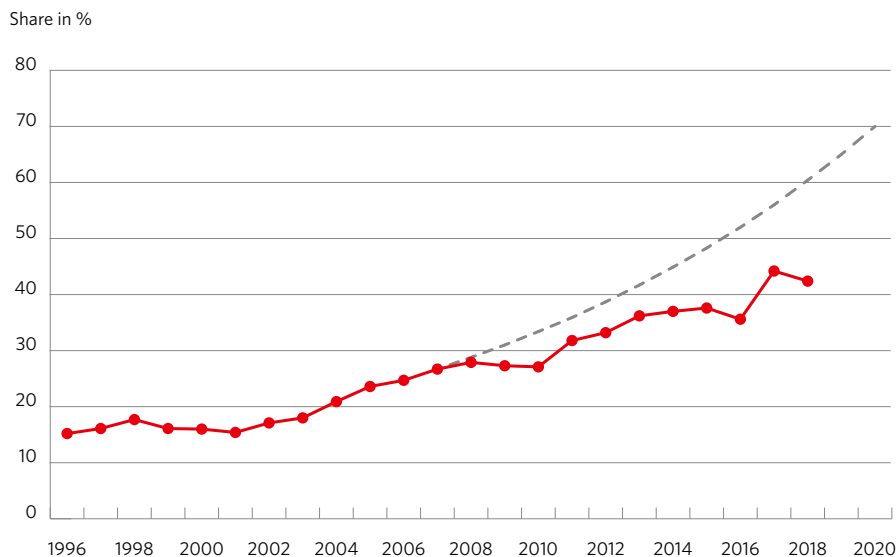


Figure 17

Share of observed cyclists wearing a helmet 1996-2019, and the required trend until 2020.

Source: VTI (until 2015) and Markör (from 2016)

*Uncertainties due to a change of contractor may have arisen in 2016.

—●— Bicycle helmet use
- - - Required trend

Analysis and discussion – bicycle helmets

Bicycle helmet use in Sweden is at a fairly modest level, particularly among adults, and there is considerable potential for increasing it. Figure 18 shows that observed bicycle helmet use in 2018 was 80 per cent for children up to the age of 10 in residential areas, and 61 per cent for children aged 6-15 who cycle to and from school. Helmet use is much lower for adults: in 2018 it was 36 per cent on journeys to and from work, and 39 per cent on public cycle paths. Helmet use declined for all groups in 2018, but the change is only significant for children, whose total helmet use declined by more than 5 percentage points. Between 2017 and 2018 helmet use declined above all for young people, according to the measurements. For older compulsory school pupils in the final three years, helmet use declined from 48 per cent in 2017 to 29 per cent in 2018, which is about the same level as in 2016, when 30 per cent wore a helmet. Helmet use for children in the first six years of compulsory school increased marginally between 2017 and 2018, from 80 to 82 per cent.

If we compare the indicator with NTF's bicycle helmet measurements (NTF, 2018), which are based on around 100,000 observations, NTF's result is slightly higher: 46 per cent. In contrast with the results for the indicator, this is an increase by two percentage points on 2017.

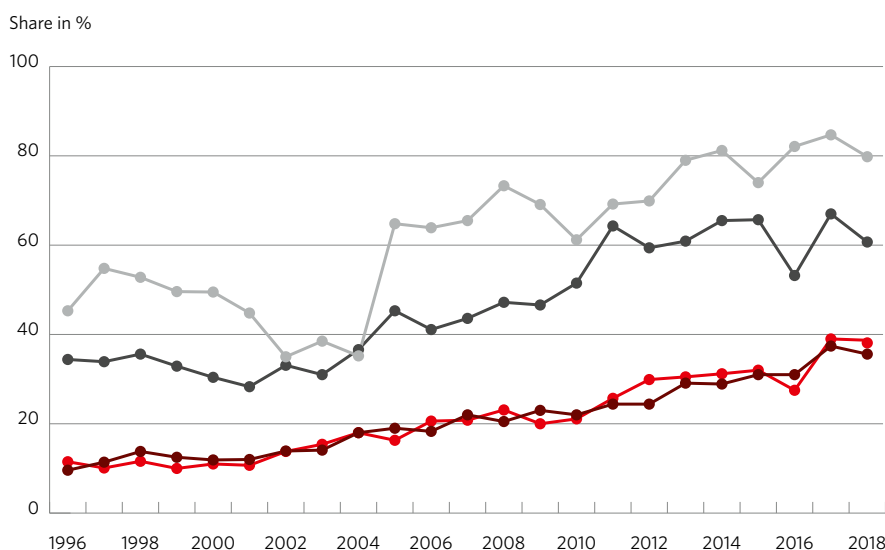


Figure 18

Bicycle helmet use in different groups, 1996-2018.

Source: VTI (until 2015) and Markör's observational measurements 2016, 2017 and 2018

*Uncertainties due to a change of contractor may have arisen in 2016.

—●— Children, journeys to/from compulsory school
—●— Children aged <10, residential areas
—●— Adults, cycle paths
—●— Adults, journeys to/from work

Å20 cyclists were killed on the roads in 2018. Around 2,000 were severely injured and 220 very severely injured. Previous years' studies also show that nearly half of those very severely injured sustain a head injury, while for those severely injured the figure is only about ten per cent. Wearing a bicycle helmet is thus effective above all in preventing the more severe injuries. The new strategy for safe bicycle and moped traffic (Swedish Transport Administration 2018) describes how one of the prerequisites of achieving a road transport system that is attractive and safe for cyclists is that cyclists wear helmets. The strategy describes increased helmet use a priority action area due to the injury-reducing effect: if everyone wore a bicycle helmet, the total number of severely injured could be reduced by about 5 per cent, and the number of fatalities by 25 per cent. To increase voluntary helmet use, the strategy primarily describes measures such as campaigns for wearing a bicycle helmet.

According to a study by Rizzi et al (2013), the use of bicycle helmets could reduce the number of severe head injuries by 58 per cent and the number of very severe head injuries by 64 per cent. A meta-analysis by Elvik (2013) based on 23 different studies showed that bicycle helmets reduce head injuries by 50 per cent. Olivier and Creighton (2017) describe effects of the same magnitude as in Elvik's study. Regarding bicycle accidents and quality of life, a study by Ohlin et al (2017a) showed that preventing severe head injuries, among other things, will improve health-related quality of life after an accident. Ohlin et al (2017b) have additionally shown that the combination of lower speed limits for motorists, bicycle helmets and less injury-inducing car front end designs could reduce disability-causing injuries that occur in collisions with passenger cars by 79 per cent.

There are currently fewer than 30 countries that have some form of bicycle helmet law. The argument is sometimes made that imposing bicycle helmet use by law might lead to fewer people choosing the bicycle as a means of transport. A literature study by Olivier et al (2018) looked at what effect a helmet use law has on cyclist numbers. The results do not support the argument that a bicycle helmet law would lead to fewer cyclists. 13 studies indicated no change to the number of cyclists or amount of cycling following the introduction of a law on compulsory helmet use, while 8 studies indicated a mixed outcome (both increased and reduced cycling) and 2 studies indicated reduced cycling.

The two studies indicating reduced cycling were from New Zealand and the US, but it should be noted that there are other studies from these two countries that do not consistently indicate a reduction in cycling in connection with the introduction of a law on compulsory helmet use. Several of the studies analysed children's cycling, and some of them noted a reduction in connection with a compulsory helmet use law being introduced. It turned out, however, that the observed reduction was due to other factors than the helmet use law. Data from western Australia indicate that the reduction was part of trend that had begun before the new legislation, and data from New South Wales indicated that the number of children being driven to school in cars had increased steadily since the 1970s. Other studies again, from Australia and Spain, did not indicate any notable reduction in cycling. In connection with the introduction of a compulsory helmet use law in New Zealand there were campaigns to discourage younger children from cycling to school.

Olivier et al (2018) also looked at whether bicycle helmet use leads to cyclists taking bigger risks on the road. They did not find that this was the case among those using a helmet. Of the 22 studies analysed, only two studies

from the United Kingdom indicated increased risk-taking, while 17 studies indicated no increase.

Sweden's law on compulsory helmet use for children under the age of 15 was introduced on 1 January 2005. Since 2000 the former Swedish Road Administration and the Swedish Transport Administration have carried out triennial surveys on how children get to school. These surveys show that a larger share of children aged 6-12 cycled to school in 2015 than in 2000. On this basis it cannot be shown in Sweden either that the share of children who cycle to school declined in connection with the introduction of the compulsory helmet use law.

The analysis group's assessment is that the target of 70 per cent bicycle helmet use will be very difficult to reach by 2020. To achieve a road transport system that is both attractive and safe for cyclists, bicycle helmet use needs to increase. The analysis group would emphasise that concrete measures have to be implemented promptly in order to achieve this. The results of the road safety survey indicate that acceptance of a general law on compulsory bicycle helmet use rose by 5 percentage points between 2017 and 2018; 72 per cent of respondents in 2018 were in favour of compulsory helmet use.

Progress and projection towards the 2020 target - moped helmets

Figure 19 presents observed moped helmet use in 2018. Only moped riders perceived to have their helmets properly fastened are counted as helmet users. The result shows that observed moped helmet use in 2018 was 93.2 per cent, compared with 97.8 per cent in 2017 – a reduction of just over four percentage points. The analysis group's assessment is that the trend is not keeping the right pace for achieving the 2020 target level.

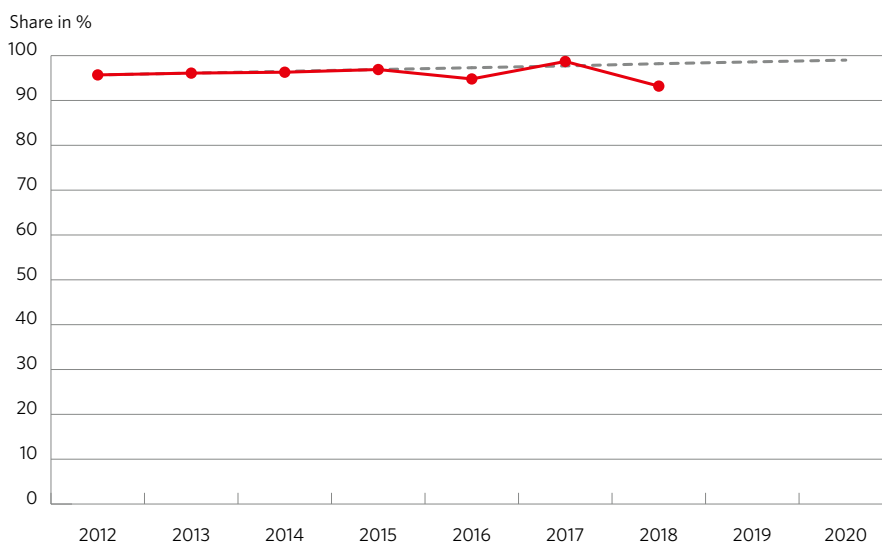


Figure 19

Share of observed moped riders wearing a moped helmet, 2012-2018, and the required trend until 2020. *Uncertainties may have arisen in 2016 due to a change of contractor for the observations.

Source: VTI (until 2015) and Markör (from 2016)

Analysis and discussion - moped helmets

Despite the fact that helmet use among moped riders is relatively high overall, helmet use among moped riders killed in accidents is only around 50 per cent. Between 2010 and 2018 there were 57 moped rider fatalities, and nearly 50 per cent of these were not wearing a helmet or lost their helmet when the accident occurred. The new policy document for safe bicycle and moped traffic (Swedish Transport Administration, 2018) highlights increased and correct

helmet use as a priority action area. It also notes that most riders who lost their helmets in a fatal accident were under 18, and the assessment is made that if all moped riders used their helmet correctly, two lives could be saved every year on average (compared with the baseline level in 2012-2014).

In 2018 there were 8 moped rider road fatalities, around 230 severely injured and just over 20 very severely injured. Previous statistics indicate that just under 40 per cent of all moped riders who sustain very severe injuries have a head injury, while the corresponding share among those severely injured is just under 10 per cent. Increased helmet use among moped riders thus has the potential, above all, of reducing the number of very severely injured riders. Estimates show that helmet use reduces the risk of severe injury by 17 per cent, and the risk of very severe injury by 47 per cent.



2.6 Safe passenger cars

	2007	2018	2020 target	Assessed progress towards target
Share of traffic volume with the highest Euro NCAP score	20 %	76 %	80 %	In line with the required trend

The target for safe passenger cars is for at least 80 per cent of the traffic volume, i.e. the number of driven kilometres on Swedish roads, to be made up of passenger cars with the highest safety rating for drivers and passengers, according to Euro NCAP⁴.

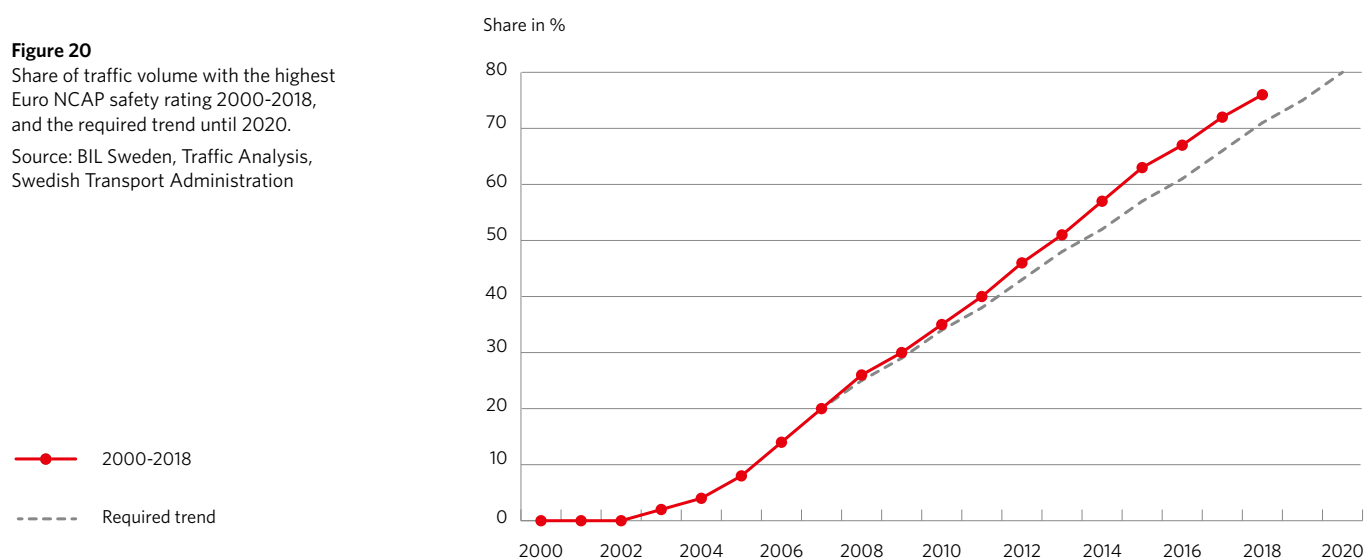
Progress and projection towards the 2020 target

In 2018 the share of new cars sold that had the highest safety rating was 90 per cent of total sales. This is a trend that has led to an increase in the traffic volume made up of safe cars. The annual increase is about 5 percentage points. The traffic volume increased by about 4 percentage points between 2017 and 2018, from 72 to 76 per cent, see Figure 20. Progress is thus in line with the required trend towards the 2020 target of 80 per cent.

Figure 20

Share of traffic volume with the highest Euro NCAP safety rating 2000-2018, and the required trend until 2020.

Source: BIL Sweden, Traffic Analysis, Swedish Transport Administration



Footnote

⁴ Euro NCAP is an organisation that evaluates the safety level of new cars. The 1-5 star rating includes crash protection of adults and children, pedestrian protection and driver assistance systems. More information is available on www.euroncap.com

Analysis and discussion

As older cars are scrapped and replaced by new and safer ones, the traffic volume on Swedish roads becomes increasingly made up of cars with five Euro NCAP stars. This trend is further accelerated by the fact that the annual mileage of cars is higher, on average, the newer they are. Overall it can be assumed that it will take 15-20 years to replace most of the Swedish vehicle fleet. That is then the time it will take from when new and safer cars begin to go on sale until the majority of cars on Swedish roads have this higher level of safety.

Since 2003 and 2009, respectively, driver assistance systems such as seat belt reminders and electronic stability control are also included in Euro NCAP scoring, and the share of new passenger cars equipped with electronic stability control and seat belt reminders for the front seats has been close to 100 per cent in Sweden since 2009. The share of the traffic volume made of passenger cars with these systems is estimated to reach approximately 95 per cent around 2020 (see Figure 22). Progress in 2018 continued to be in line with these assumptions. It is important to note, however, that we will benefit from these systems for a number of years after 2020, since the final percentage points of traffic volume that lack them may be expected to be heavily over-represented in fatal accidents (in the same way that drunk drivers account for a very small share of the traffic volume while accounting for a much bigger share of fatal accidents). The same applies to passenger cars with a low level of crash protection.

One example of the above relationship can be seen in passenger cars from before model year 2000, which generally have poor crash protection and lack electronic stability control and seat belt reminders. Even though these cars represent only about 1 per cent of the total traffic volume, almost 30 per cent of passenger car fatalities in 2018 occurred in such cars, see Figure 21. The average age of drivers killed in older cars does not differ markedly from the average age of drivers killed in newer cars. It is a known fact, however, that drivers of older cars more often commit offences. For example, the share of drivers under the influence of alcohol or drugs in fatal accidents involving passenger cars from before model year 2000 is twice as high as the share involving cars from 2013 or later. This is because a more recent car has better crash protection and uses various driver assistance systems to prevent or eliminate some of the offences more commonly committed in older cars (e.g. not wearing a seat belt).

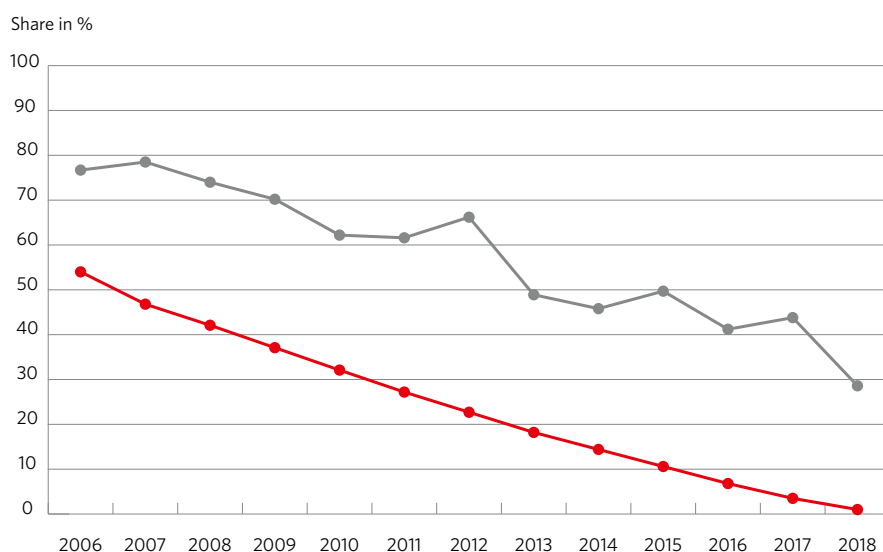


Figure 21
Share of traffic volume and share of killed motorists in passenger cars from model year 2000 or earlier.

Source: Traffic Analysis, Swedish Transport Administration

—●—
Share of traffic volume made up of cars from model year 2000 or earlier

—●—
Share of killed motorists in cars from model year 2000 or earlier

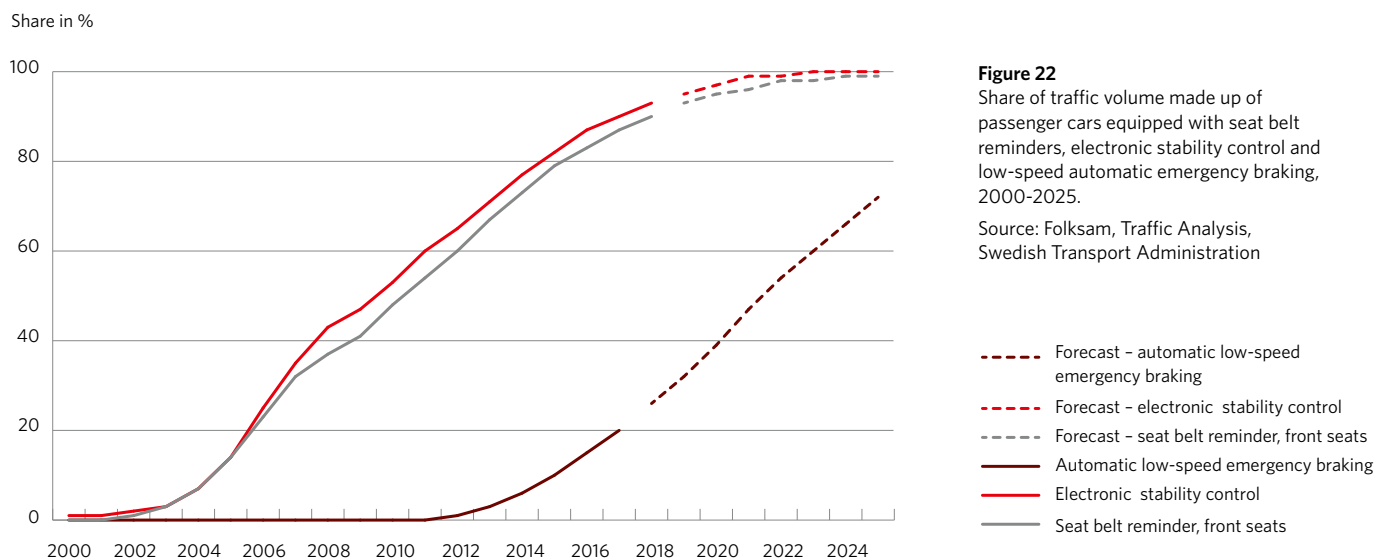
Seat belt reminders and electronic stability control are important assistance systems, but in order for vehicle safety levels to continue improving it is equally important that additional systems with documented road safety potential are introduced in short order. Examples of such systems include automatic emergency braking at low and high speeds, which reduces injuries in rear-end collisions by about 40 per cent (Rizzi et al, 2014 and Cicchino, 2017), and lane support systems, which have been shown to reduce head-on collisions and single-vehicle accidents causing personal injury by about 30 per cent (Sternlund et al, 2017). In recent years these systems, along with intelligent speed assistance (ISA) systems, have been included in Euro NCAP test protocols. Since 2016, automatic emergency braking as standard equipment is essential for a maximum score of five stars, and requirement levels were further raised on 2018 and 2019. In other words, Euro NCAP's testing protocols evolve over time, and requirements for the introduction of existing systems are expected to increase again after 2020. The testing programme is also expected to comprehend additional essential safety systems in future, e g systems that detect a driver's reduced driving ability due to distraction, drowsiness or possible alcohol or drug influence. The implementation of assistance systems such as ISA (Intelligent Speed Assist) and a standardised interface for installing alcohol interlock devices on new passenger cars will also be speeded up by a coming EU regulatory framework⁵.

At the end of 2017, automatic emergency low-speed braking systems were standard equipment in 61 per cent of all new cars sold in Sweden. A further 10 per cent had the system as an optional extra⁶. Even if figures for 2018 are not available yet, it is estimated that the share of total traffic volume made up of vehicles with this system as standard equipment was around 25 per cent, see Figure 22. No figures have yet been compiled for lane support systems, ISA and other types of emergency braking systems (e g for pedestrians and cyclists). It will nevertheless be important to continue monitoring the introduction of additional safety systems and what impact this has on the Swedish vehicle fleet and the total traffic volume. Euro NCAP's test protocols have been a decisive factor in bringing about accelerated implementation of relevant safety systems as standard equipment. When these systems are available only as optional extras, instruments such as financial incentives in the form of reduced insurance premiums can be a way of encouraging consumers to choose these extras. Since about 60 per cent of all passenger cars are bought by legal persons/entities, it is even more important to influence these purchases.

Footnote

⁵ See e g www.europarl.europa.eu/news/en/press-room/20190220IPR27656/safer-roads-more-life-saving-technology-to-be-mandatory-in-vehicles

⁶ Source: Folksam.



To sum up, it may be noted that the indicator for safe passenger cars is progressing at the required rate. It is important to undertake measures to increase the degree to which systems for lane support, automatic emergency braking and for detecting impaired driving ability are introduced, even if the benefits of these are only expected towards the end of the period, and primarily after 2020.

2.7 Increased rule compliance among motorcyclists

	2007	2018	2020 target	Assessed progress towards target
Correct use of motorcycles	-	-	-	No target set. Status not measured in traffic - only followed up in the fatalities outcomes

The aim of this indicator is not to focus on simple human error, but on serious and conscious offences. “Correct use” means that the motorcycle is used as follows:

- The rider is wearing a helmet
- The rider is sober (not under the influence of alcohol or illegal drugs)
- The rider has a valid motorcycle licence
- The rider is driving within the applicable speed limit
- The rider is not driving the motorcycle in an inappropriate manner, e.g. on only the rear wheel

Since 2016-2017 the EU has had a legal requirement for anti-lock brakes (ABS) on new motorcycles with an engine displacement of more than 125 cubic centimetres. For this reason, the indicator relating to safe motorcycles (ABS) has been replaced by an indicator relating to rule compliance among motorcyclists. This indicator is principally concerned with correct use, which is currently regarded as being more important for motorcyclists than for other categories of road user. The main reason for this is that motorcyclists are unprotected road users that travel at the same speeds as protected road users. This is best illustrated by what are known as risk curves, which show the connection between impact severity (e.g. impact speed) and the risk of a specific injury outcome, see Figure 23. A recent study (Ding et al, 2018) looked at the risk of severe and fatal injuries for motorcyclists wearing a helmet in different types of collisions. These risk curves show that even at such low speeds as 50 km/h, the risk of severe and fatal injury in the event of a collision is high, except when the collision is with some other object than the asphalt itself or a slope, in which case the risk is significantly lower.

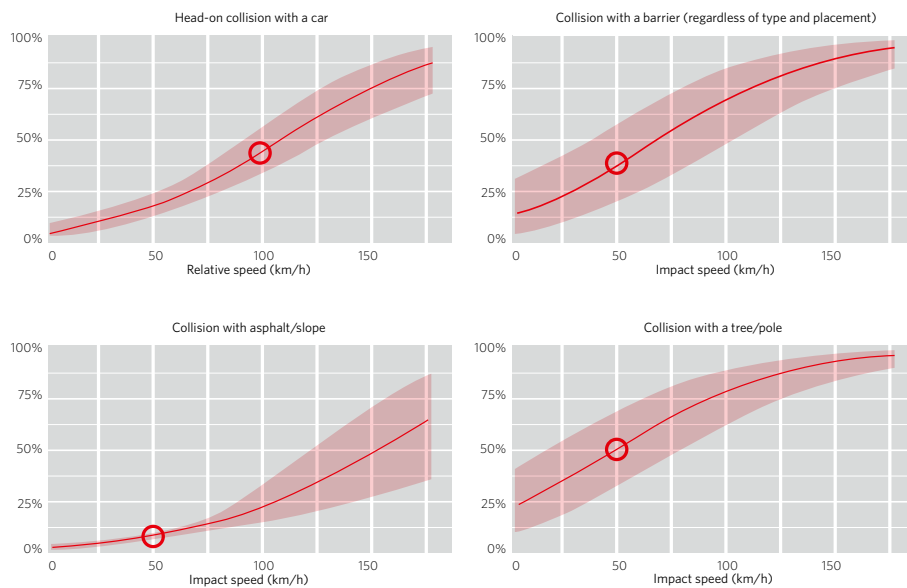


Figure 23
The risk of severe and fatal injury for motorcyclists wearing a helmet in different types of collisions at 50 km/h. The pink-shaded area shows the 95 per cent confidence interval.
Source: Ding et al (2018)

There are currently no ready strategies for adapting the road transport system to make it safe for motorcycles with respect to the risk of injury, and for that reason we are forced in the short term to make higher demands for correct use among motorcyclists themselves.

Development work on this indicator has shown that the practical difficulties of measuring its status on the road are too great. Instead we present data from the Swedish Transport Administration's in-depth studies of fatal accidents involving two-wheeled motorcycles. The Swedish Transport Administration's in-depth studies are currently the only source with sufficiently detailed information for assessing, to the extent that this is possible, correct use among motorcyclists. Given the complexity of the indicator, this approach will be the only reasonable option for following up progress, at least until 2020. It also means that it is not possible to set a target for this indicator.

The trend has been relatively stable over the past five years. In fatal accidents the driver was using the vehicle correctly in just over 25 per cent of cases, see Figure 24. However, there is also an element of unknown statistics for the same period, which varies between 0 and 8 per cent.

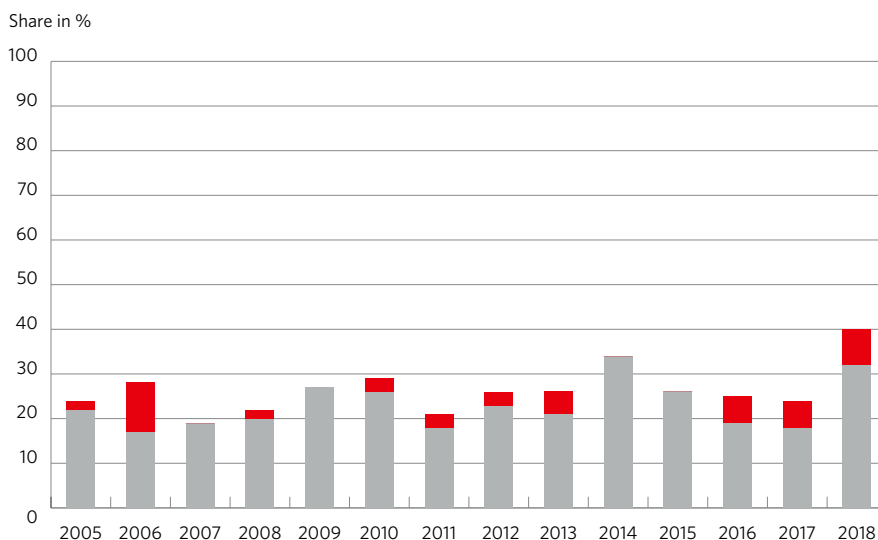


Figure 24
Share of correct use of motorcycles in fatal accidents involving two-wheeled motorcycles 2005-2018.

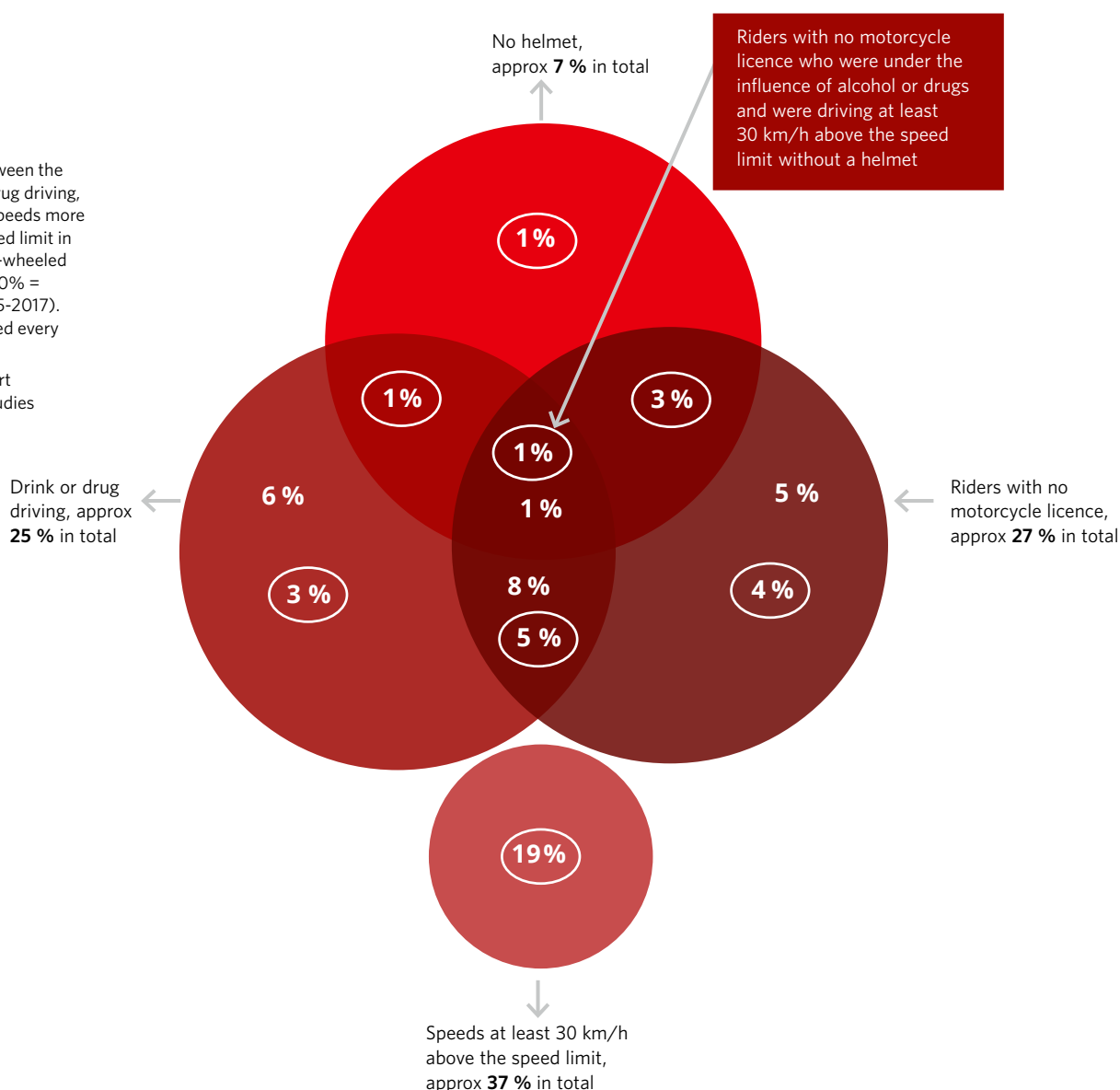
Overall we can say that just over half of fatal accidents involving motorcycles (57 per cent) are connected with at least one serious and conscious offence. To better understand the complexity of the problem, we can illustrate how the factors no helmet, drink or drug driving, no motorcycle licence, and speeds at least 30 km/h above the speed limit overlap in fatal motorcycle accidents. Figure 25 illustrates each serious and conscious offence with a circle (note that the figure is updated every two years). For example, the top circle illustrates all motorcyclists killed who were not wearing a helmet (in total 7 per cent between 2005 and 2017). When two or more circles overlap, this means that the offences they illustrate were both, or all, factors in the same accidents – see examples in Figure 25.

Between 2005 and 2017 about 38 per cent of fatal accidents involved a combination of two or more serious and conscious offences. But only in 1 per cent of the cases (which corresponds to one fatal accident every two years) did all these offences occur at the same time. Previous analyses show that among those killed who did not have a motorcycle licence and whose vehicle licence history was known, about 50 per cent had had their licence suspended (Swedish Transport Administration, 2016). In a further 19 per cent of the cases, the only conscious offence was driving at a speed at least 30 km/h above the applicable speed limit (the bottom circle). Two thirds of these accidents occurred with motorcycles of the supersport type.

Figure 25

Distribution and overlap between the factors no helmet, drink or drug driving, no motorcycle licence, and speeds more than 30 km/h above the speed limit in fatal accidents involving two-wheeled motorcycles, 2005-2017 (100% = 516 motorcyclists killed 2005-2017). Note that the figure is updated every two years.

Source: the Swedish Transport Administration's in-depth studies



Taken together, the information from the Swedish Transport Administration's in-depth studies suggest that this indicator is very complex. The reason for this is that other indicators are intended to measure fairly one-dimensional conditions in traffic (e.g. compliance with speed limits, use of bicycle helmets or seat belts etc), while the indicator for rule compliance among motorcyclists is intended to measure a number of factors which occur both separately and in combination with each other. As illustrated in Figure 25, there are many different combinations.

The single best parameter that could indicate rule compliance among motorcyclists on the roads is compliance with speed limits. The purpose of the indicator for increased rule compliance, however, is to address several of the conscious offences that so often feature in fatal accidents. Speed measurements in 2018 indicated that the share of motorcyclists who drive within the speed limit on national roads is around 44 per cent, and the corresponding share for cars was similar, or just over 46 per cent. About 7 per cent of the motorcycle traffic volume on national roads in 2018 was breaking the speed limit by more than 30 km/h. This is a reduction of around one percentage point compared with 2016, see Figure 26.

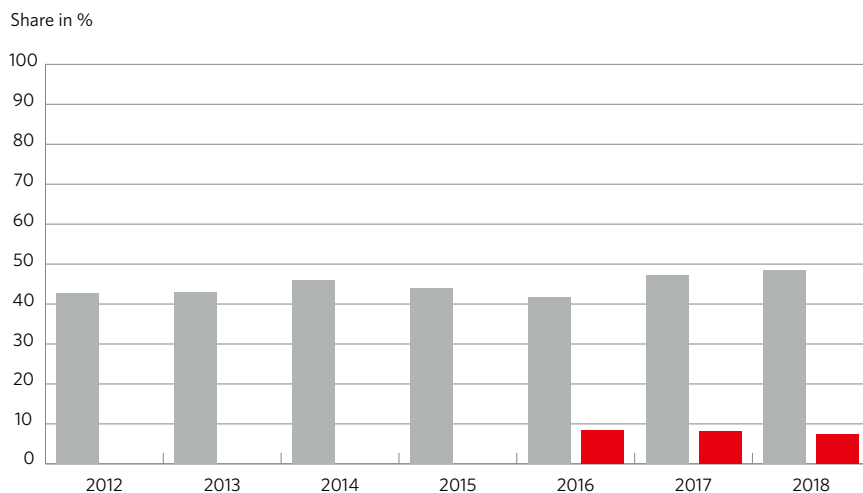


Figure 26

Share of motorcycle traffic volume within speed limit and share at least 30 km/h in excess of the speed limit on national roads, 2012-2018.

Source: Swedish Transport Administration

Currently the indicator for rule compliance is based on information from in-depth studies of fatal accidents, since there are no effective procedures for measuring the various factors on the road. Given the complexity of the indicator, this approach will remain the only reasonable option for following up progress, at least until 2020, even if that implies that no target can be set for the indicator.

2.8 Safe national roads

	2007	2018	2020 target	Bedömd utveckling mot mål
Share of traffic volume with median barriers on national roads with speed limits > 80 km/h	50 %	76 %	90 %	Not in line with the required trend

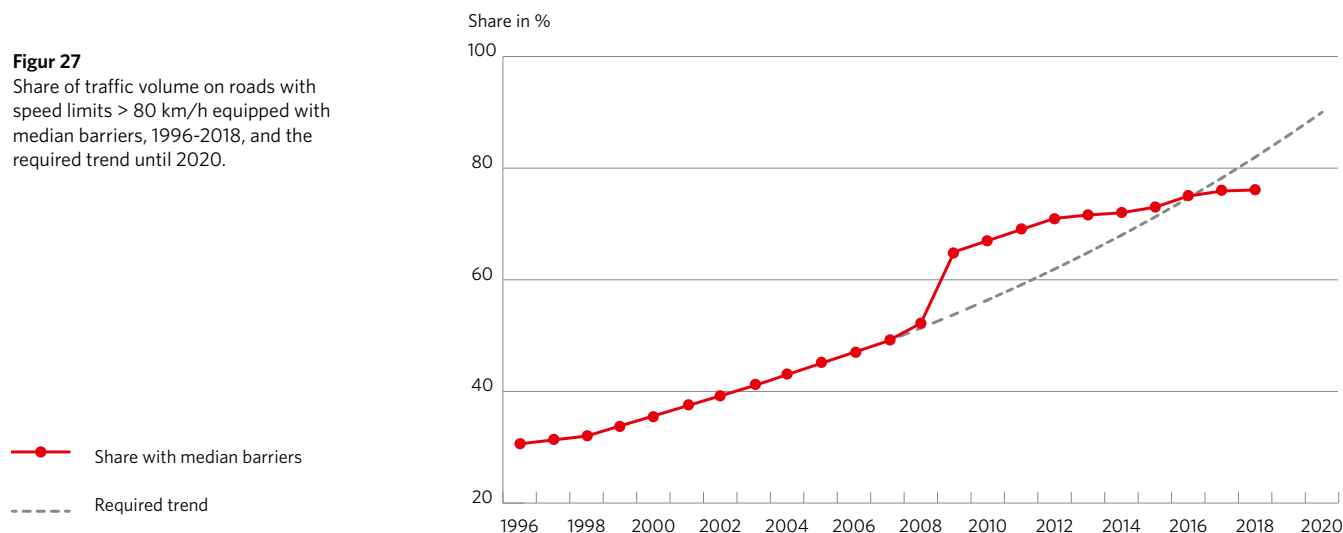
The 2020 target is for at least 90 per cent of the traffic volume on roads with a speed limit above 80 km/h to be on roads equipped with median barriers. This target can be achieved either by lowering speed limits or by adding median barriers to roads. Other measures in the national road network are primarily side barriers, centre line rumble strips, measures in intersections and measures for safer cycling.

Progress and projection towards the 2020 target

The share of the traffic volume on roads with speed limits above 80 km/h equipped with median barriers was 76.1 per cent at the end of 2018. Progress for this indicator is therefore not in line with the required trend.

Figur 27

Share of traffic volume on roads with speed limits > 80 km/h equipped with median barriers, 1996-2018, and the required trend until 2020.



Analysis and discussion

In 2018 median barriers were added to 120 kilometres of road, and 6 kilometres had the speed limit lowered from 90 to 80 km/h. This means that the outcome for the indicator increased by 0.2 percentage points, from 75.9 to 76.1 per cent, in 2018. Taking the last few years into account, median barriers need to be added or speed limits lowered at an increased rate if the target level is going to be attained.

At the end of 2018 there were 5,380 kilometres of national roads equipped with median barriers. That corresponds to only just over 5 per cent of the national road network, but represents 50 per cent of the total traffic volume. Of national roads with a speed limit above 80 km/h, a total of 4,750 kilometres had median barriers at the end of 2018, which corresponds to 30 per cent of the total distance of national roads with a speed limit above 80 km/h. This means that we currently have 11,000 kilometres of roads without median barriers and with a speed limit of 90 or 100 km/h. Some smaller strips installed. Table 1 shows the trend for the number of kilometres of road equipped with median barriers. The annual increase in kilometres of road with median barriers has declined from 200-250 kilometres previously to around 100 kilometres at present.



Table 1

Roads equipped with median barriers
2003-2018, in tens of kilometres
(at year's end).

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2+1 roads	95	113	130	151	177	195	212	233	250	262	268	279	287	294	300	312
Motorways	158	160	170	174	181	186	188	194	196	196	200	205	208	208	209	209
Other roads with median barriers	22	23	24	24	25	20	20	20	22	19	17	17	17	18	18	17
Roads with median barriers, total	275	296	324	349	383	401	420	447	468	478	485	500	512	520	527	538

When the National Plan for the Transport System 2014-2025 was adopted the government decided, among other things, that systematic adaptation of speed limits to the road standard would continue. The aim of the plan is that all national roads with an annual average daily traffic (AADT) of more than 2,000 vehicles will either have median barriers or have a speed limit not exceeding 80 km/h by the end of the planning period in 2025. National roads with an AADT of less than 2,000 will not be subject to any systematic speed limit reductions – an exception that affects around 7,500 kilometres of 90 and 100 km/h roads without median barriers in sparsely populated areas. It is important in this connection to point out, however, that while a lowering of the speed limit from 90 to 80 km/h on roads without median barriers reduces the risk of accidents as well as of injuries, it is not a sustainable solution in the longer term. This is very clear from accident statistics, where we see that around half of all head-on collisions with a fatal outcome happen on roads with 70 and 80 km/h speed limits. We furthermore see that the sharp increase in the number of fatalities from 2017 to 2018 is largely accounted for by head-on collisions on those types of roads.

In the spring of 2016 the Swedish Transport Administration circulated a proposal for adjusted speed limits for comment. The proposal involved raising the speed limits on around 1,200 kilometres of national roads and lowering speed limits on around 4,300 kilometres. This would lead to an estimated reduction in fatalities by 7 individuals per year as a result of changed speed limits on existing roads, and by 9 individuals per year as a result of planned investments until 2025.

Of the roads on which speed limits will be raised, about 1,000 kilometres will be raised from 90 to 100 km/h by being converted to roads with median barriers. The roads with lowered speed limits will be primarily 90 km/h roads lowered to 80 km/h. Systematic lowering of speed limits from 90 to 80 km/h under the proposal began in the autumn of 2016, and the Swedish Transport Administration intends to continue with these efforts over the next few years. Some of the Swedish Transport Administration's decisions on 80 km/h were appealed to the government, but no decision has yet been made regarding these cases. If the government reverses the Swedish Transport Administration's decision on 80 km/h, this is very likely to affect continued efforts in the systematic adaptation of speed limits to roads' safety standards.

Plans for the 2016-2020 period include adding median barriers to just over 400 kilometres of 90 km/h roads and raising their speed limit to 100 km/h, while lowering the speed limit on around 2,200 kilometres of 90 km/h roads to 80 km/h. If the measures planned until 2020 are carried out, it is estimated that about 85 per cent of the traffic volume on roads with speed limits above 80 km/h will be on roads equipped with median barriers by 2020. If the government reverses the decisions on 80 km/h in its review of the Swedish Transport Administration's decisions, the level of 85 per cent is unlikely to be achievable.

2.9 Safe pedestrian, cycle and moped (PCM) passages

	2013	2018	2020 target	Assessed progress towards target
Share of safe PCM passages in main road networks for cars	19 %	27 %	35 %	Not in line with the required trend

The target for the indicator for the share of safe PCM passages is that at least 35 per cent of all passages in main road networks will be safe by 2020.

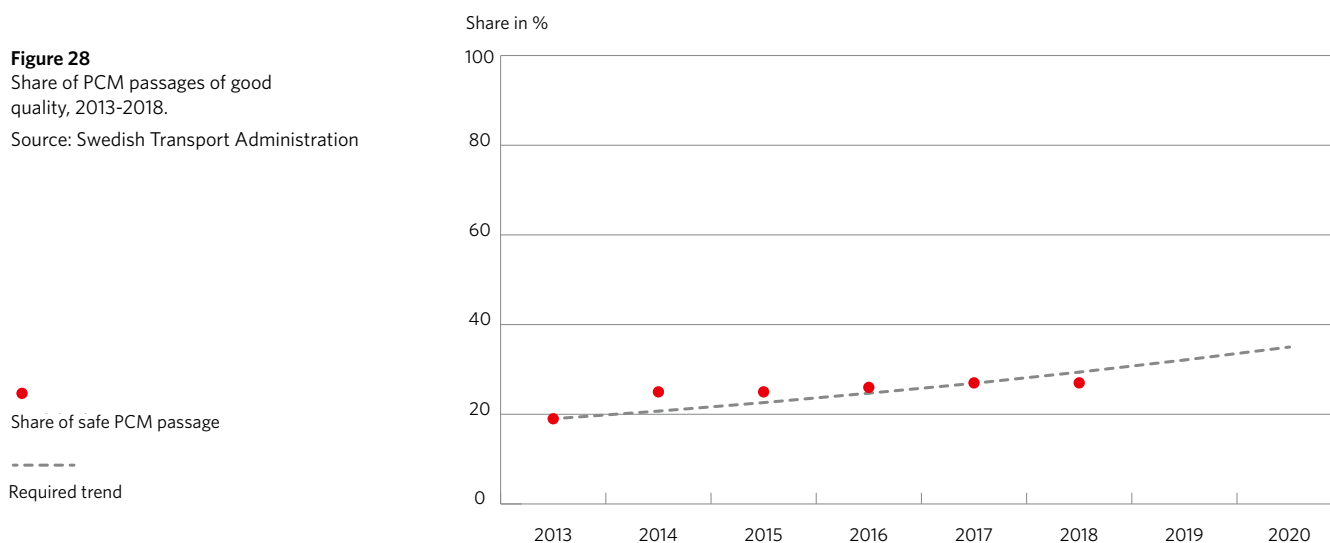
A PCM passage is defined as safe if it is grade separated or if 85 per cent of motorists pass it at no more than 30 km/h. The latter is achieved most effectively by means of a physical speed control hump in direct proximity to the passage. “Main road network” here refers to streets and roads in functional road class 0-5. For more exact definitions of safe, moderately safe and unsafe PCM passages, see the memorandum entitled “Kriterier för säkra GCM-passager” [“Criteria for safe PCM passages”] (Swedish Transport Administration, 2013).

Field inventories have been made by compiling data on what types of PCM passages and speed control humps exist, and where. The passages have then been classified using tools in the GIS map application, according to specified criteria. Data from around 150 municipalities have been registered. Some municipalities have also chosen to make inventories of passages on national roads in the local area. In 2016 and 2017 a more systematic inventory was made of the national road network: European roads, arterial roads and county roads (roads numbered up to 500).

Progress and projection towards the 2020 target

At the end of 2018 the share of PCM passages with a good safety standard was estimated to be 27 per cent, see Figure 28. Any comparison between the years should be regarded with considerable caution, as the number of municipalities making inventories of their passages has increased significantly. Furthermore, a large number of passages were added to national roads in 2016 and 2017. The share of PCM passages with a good safety standard in 2018 is at a level the analysis group assesses not to be in line with the required trend until 2020.

Figure 28
Share of PCM passages of good quality, 2013-2018.
Source: Swedish Transport Administration



The share of passages of moderately good quality was 23 per cent, while 50 per cent were of low quality in 2018, see Figure 29. In the municipal road network 21 per cent were of good quality, and the corresponding share for the national road network was 47 per cent.

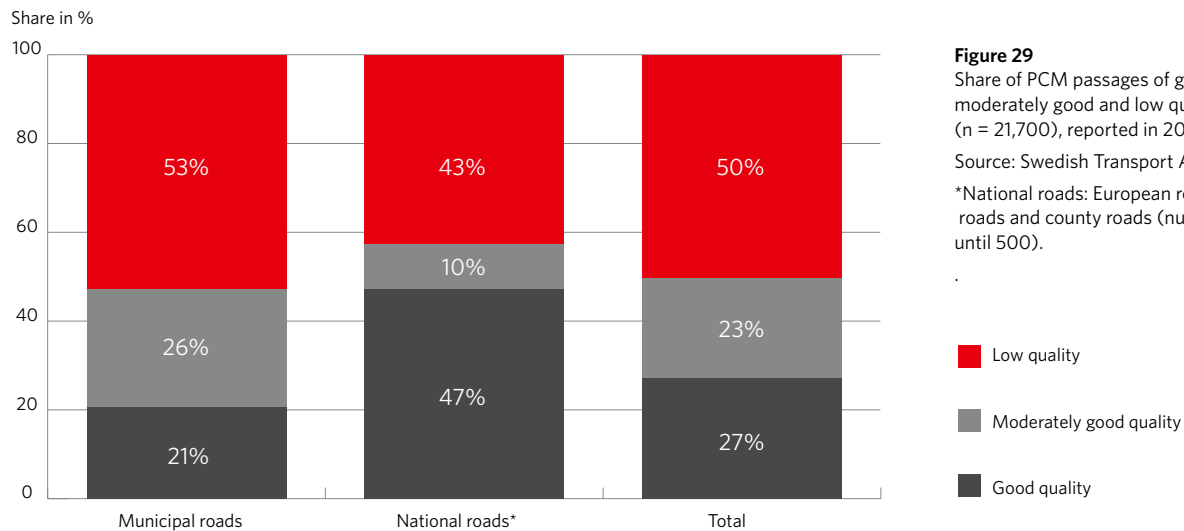


Figure 29
Share of PCM passages of good, moderately good and low quality (n = 21,700), reported in 2017/2018.
Source: Swedish Transport Administration
*National roads: European roads, arterial roads and county roads (numbered until 500).

Analysis and discussion

Any comparison between the years should be regarded with considerable caution, as the number of municipalities included has increased significantly between measurements – from just over 40 municipalities in 2013/2014 to just over 150 in 2018/2019. In 2016 and 2017 a more systematic inventory was made of the national road network – European roads, arterial roads and county roads (the inventory of county roads is not fully comprehensive). There are currently 21,700 passages classified as functional road class 0-5, of which 16,600 are municipal and 5,400 national (roads numbered until 500).

According to the Swedish Transport Administration's in-depth studies, between 10 and 20 individuals are killed every year in PCM passages in urban areas. The vast majority of accidents occur in the municipal road network, where passages are not speed adapted. A total of about 10 unprotected individuals are killed each year passage roads in the national road network. Of these, an average of 2 individuals are killed in some form of organised passage without speed adaptation. The remaining fatalities occur where there is no PCM passage at all, and about half of these in locations that are urban in character.

To improve the outcome for this indicator, and thus improve road safety primarily in urban areas, municipal and national road operators have to take on the challenge of speed regulating passages or building grade separated passages. Another possibility is to work towards better speed adaptation and lower speeds in urban areas. The GIS map application mentioned above provides good support for both municipal and national road operators in speed regulating more passages.

The target level of 35 per cent may seem low, but amounts to a significant challenge to achieve by 2020. Changes will be required to the design of the road environment itself, which means that plans have to be drawn up and funds allocated to improve the safety level of passages from red to amber or green quality.



2.10 Maintenance of pedestrian and cycle (PC) paths in urban areas

	2013/14	2017/18	2020 target	Assessed progress towards target
Share of municipalities with good-quality maintenance of PC paths	18 %	36 %	70 %	Measured every two years. Most recent measurement in 2017/2018. Progress thus cannot be assessed.

The target for this indicator is that 70 per cent of municipalities shall have good-quality maintenance of priority cycle paths by 2020. A more detailed definition of the indicator is as follows: the share of municipalities with at least 40,000 inhabitants that operate and maintain the most prioritised cycle paths in the municipality's main town to a good level of quality. Good quality here refers to meeting standard requirements for winter and summer maintenance, gravel and leaf sweeping, as well as quality assurance of the standard requirements applied.

The indicator is measured by means of a survey every two years. So far the survey has been distributed three times; in 2014 (season 2013/14), 2016 (season 2015/16) and 2018 (season 2017/18). The survey is carried out on behalf of the Swedish Transport Administration and in consultation with the Swedish Association of Local Authorities and Regions.

In 2014 there were 60 municipalities with at least 40,000 inhabitants, of which 59 responded to the survey. In 2016 there were 63 municipalities with at least 40,000 inhabitants, of which 54 responded. In 2018 there were 64 municipalities with at least 40,000 inhabitants, of which 55 responded. The survey used in 2016 and 2018 was a further development and simplification of the survey used in 2014.

Municipalities are awarded points based on their responses to the survey regarding standard requirements and quality assurance of the standard requirements applied. These points are then used as a basis for an overall assessment of the quality level in each municipality. Quality levels are not absolute levels, but should be seen as a relative scale for comparisons between municipalities with at least 40,000 inhabitants. However, requirements are high enough that those municipalities where quality is deemed good achieve a broad and high level on most requirements that are important for cyclists' safety.

A total of 50 municipalities responded to the survey in both 2014 and 2016, and 47 municipalities responded to the altered survey in 2016 as well as 2018. Assessed progress between 2013/14 and 2015/16 applies to the 50 municipalities that responded on those occasions, and assessed progress between 2015/16 and 2017/18 applies to the 47 municipalities that responded on those occasions.

The 2017 analysis report showed that the share of municipalities with good quality was 40 per cent in 2015/16. That figure included an error, however, and was also adjusted to apply to the 47 municipalities that responded to both surveys in 2015/16 and 2017/18. This meant that the figure for the 2015/16 season was adjusted

Progress and projection towards the 2020 target

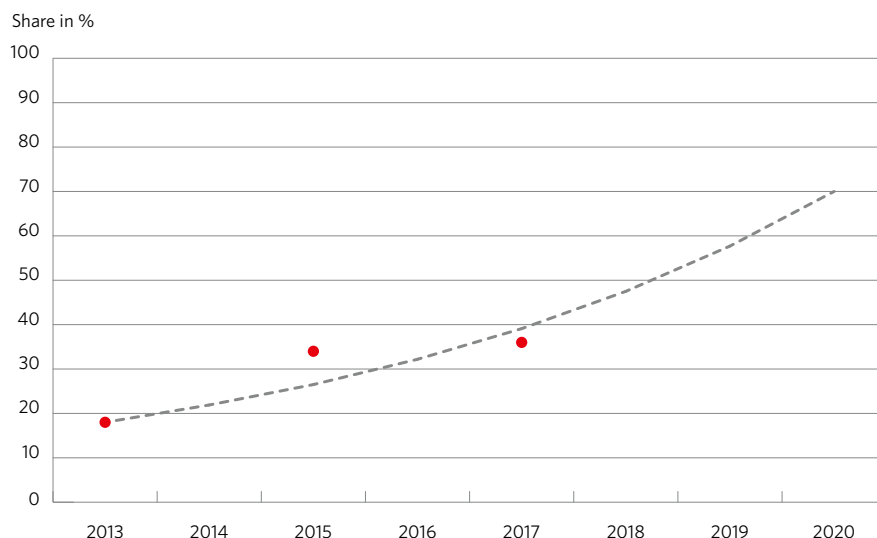
The share of municipalities with good-quality maintenance of priority cycle paths in 2017/18 is estimated at 36 per cent, see Figure 30.

Figure 30

Share of municipalities with good-quality operation and maintenance of priority cycle paths in 2013 (2013/14), 2015 (2015/16) and 2017 (2017/18), and the required trend until 2020.

Source: Swedish Transport Administration

● Share of municipalities with good-quality maintenance of PC paths
 - - - Required trend



The results indicate the following for the 47 municipalities that responded to both surveys in 2016 and 2018:

- 36 per cent (17 municipalities) of municipalities with 40,000 or more inhabitants apply requirements for operation and maintenance of priority cycle paths at a level assessed to correspond to good quality. That is an increase by 2 percentage points compared with the 2015/16 season.
- A further 40 per cent (19 municipalities) of municipalities with more than 40,000 inhabitants were assessed to have moderately good (amber) quality operation and maintenance of priority cycle paths. That is an increase by just over 12 percentage points compared with the 2015/16 season.
- A quarter, or just under 24 per cent (11 municipalities) of municipalities were assessed to be at the level of low (red) quality. That is 14 percentage points lower than in the 2015/16 season.

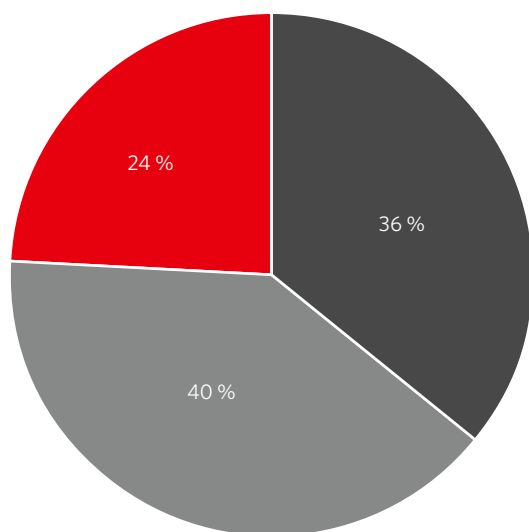
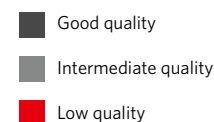


Figure 31

Percentage distribution of municipalities with good, moderately good and low quality operation and maintenance of priority cycle paths, 2017/2018.

Source: Swedish Transport Administration



Analysis and discussion

The result for the 2015/16 season was very positive compared with the result for the 2013/14 season. The survey showed that the standard of operation and maintenance of municipalities' highest-priority cycle paths fulfilled the requirements for good quality in just about twice as many municipalities in the 2015/16 season as in the 2013/14 season (20 compared to 9). Judging by the results of the latest survey, for the 2017/18 season, this increase looks set to continue even if the high rate of improvement appears to have declined.

The result indicates that several municipalities improved from low as well as moderately good quality to good quality between 2013 and 2015, while the quality improvement between 2015 and 2017 consisted primarily of several municipalities improving from low to moderately good quality.

A comparison between 2013 and 2015 shows that 19 of 50 municipalities (38 per cent) shifted from a lower to a higher quality level. The corresponding figure for the period from 2015 to 2017 is 14 of 47 municipalities (30 per cent). It may also be noted that 6 of 47 municipalities (13 per cent) lowered their quality by one level between 2015 and 2017.

The difference between the results for the different periods is probably due mainly to actual conditions having changed in terms of standard requirements and quality assurance of operation and maintenance of priority cycle paths. Some of the changes to the survey and the points system, as well as the circumstance that different individuals responded to the three surveys in some municipalities, may have influenced the results.

At an aggregated level, the results of the 2018 survey indicate that improvements among the 47 municipalities primarily relate to requirements that influence quality and summer maintenance, while the standard requirements that relate to winter maintenance and gravel removal do not appear to have improved to any appreciable extent.

Winter maintenance and gravel removal are the single most important areas with respect to cyclists' safety. The 2018 survey indicates that:

- 50 per cent of municipalities have a maximum of 3 cm as the trigger level for beginning snow clearance during ongoing snowfall
- 76 per cent of municipalities have a requirement that snow clearance must be completed by 07.00
- 24 municipalities (44 per cent) use sweep-salting as the method for snow clearance and anti-skid treatment on priority cycle paths.

Of the municipalities that do anti-skid treatment in the traditional manner, only 6 (19 per cent) carry out some form of gravel sweeping during the winter and spring, before the gravel is removed in the spring.

2.11 Systematic road safety work in line with ISO 39001

	-	2018	2020 target	Assessed progress towards target
Systematic road safety work in line with ISO 39001	-	-	-	Not yet being measured

The 2016 review of management by objectives proposed that systematic road safety work be carried out in accordance with the ISO 39001 standard. This is an international standard for road traffic safety management systems, adopted in 2012. The purpose of the standard is to give organisations the practical means to work systematically with road safety. The standard affects and is applicable on all organisations that want to improve road traffic safety, regardless of type and size and of the product or service they are providing.

Despite more than six years having passed since ISO 39001 was established, only a few stakeholders have undergone an accredited certification process. Knowledge of the standard remains low, despite the fact that companies certified according to ISO 39001 have in most cases already worked with other ISO standards. Stakeholders can also apply the standard and its system without becoming certified.

The standard specifies requirements for a road traffic safety management system that makes it possible for an organisation, interacting with the road transport system, to reduce the number of fatalities and severe personal injuries. The standards requirements include the development and introduction of an appropriate road safety policy, and the establishment of objectives and action plans for road safety, in consideration of statutory requirements and other requirements that the organisation is subject to. The impact of this management by objectives system on the individual stakeholder is determined to a great extent by how systematic the stakeholder's safety work is.

By being applied in the management of comprehensive collaboration with road traffic safety, ISO 39001 and its possibilities can become better known among purchasers as well as transport providers, which is seen as a way of giving it a more widespread impact.

With a gradual impact among both clients and providers, the development of measuring methods and a target level for ISO 39001 become increasingly important to follow up and communicate. The Swedish Transport Administration has now begun to study the possibilities of devising a way to measure the indicator. The ambition is to carry out an initial measurement for inclusion in the next analysis report.

3 External factors

This chapter describes some external factors which may be useful to consider before interpreting trends in the number of injured and killed solely as results of road safety work such as it has been conducted. In this context, an external factor is one that affects road safety but which lies beyond what can be influenced through actual road safety work. Some external factors, such as the weather, can have a direct impact on road safety. Other factors, including the age structure of the population and the economic outlook, affect the mix of different modes of transport which in turn affects the trend for the number of fatalities and injured in road traffic. Moreover, different external factors affect these trends over different lengths of time. The economic outlook and the age structure of the population are both factors that change relatively slowly and thus cause changes in the mix of transport modes over intermediate periods of time (5-10 years). The weather causes seasonal variations, but can also have an impact almost immediately (e.g. roads turning slippery in a cold snap) as well as in the longer term (e.g. climate change).

The weather, the age structure and the economic outlook all affect the size of the traffic volume (total distance driven in vehicle kilometres), which has historically had a clear correlation with the trend in the number of fatalities. According to preliminary data for 2018, there was no change in the total traffic volume of motor vehicles on national roads compared with 2017. Measurements indicate an increase of 0.4 per cent, but that is within the statistical margin of error. Heavy vehicle traffic volume did increase, however, by 2.6 per cent, while passenger vehicle traffic volume was virtually unchanged (+0.2 per cent). The increase in heavy vehicle traffic was biggest on European roads (5.0 per cent). The total increase for heavy vehicles (2.6 per cent is the preliminary figure) is relatively large. By way of comparison, the average annual increase in heavy vehicle traffic volume between 1996 and 2017 was only 1.0 per cent. Figure 32 shows the traffic volume trend for different vehicle categories between 1996 and 2018. The dominant group is passenger cars, which represents just over 80 per cent of the total traffic volume on Swedish roads.

Motorcycle traffic volume has remained at roughly the same level over recent years – around 700 million vehicle kilometres. However, the number of motorcycles on the road increases every year, and has done so for some time. From 2017 to 2018 the number of motorcycles on the road grew from approximately 320,000 to approximately 323,000⁷. The number of Class I mopeds⁸ on the roads increased from 108,000 in 2017 to just over 115,000 in 2018. The number of mopeds has continued to grow over the past three years, after an earlier fairly sharp decline, and is currently at the same level as in 2011. Data from the vehicle register also show that since 2012 there are more deregistered mopeds than mopeds on the road, as at 30 June. In 2018 there were approximately 173,000 deregistered mopeds.

Footnote

⁷ The number of registered motorcycles on the road on 30 June of both years, according to the vehicle register. Source: Traffic Analysis/Statistics Sweden.

⁸ Class II mopeds are not registered.

Traffic volume (in million vehicle kilometres)

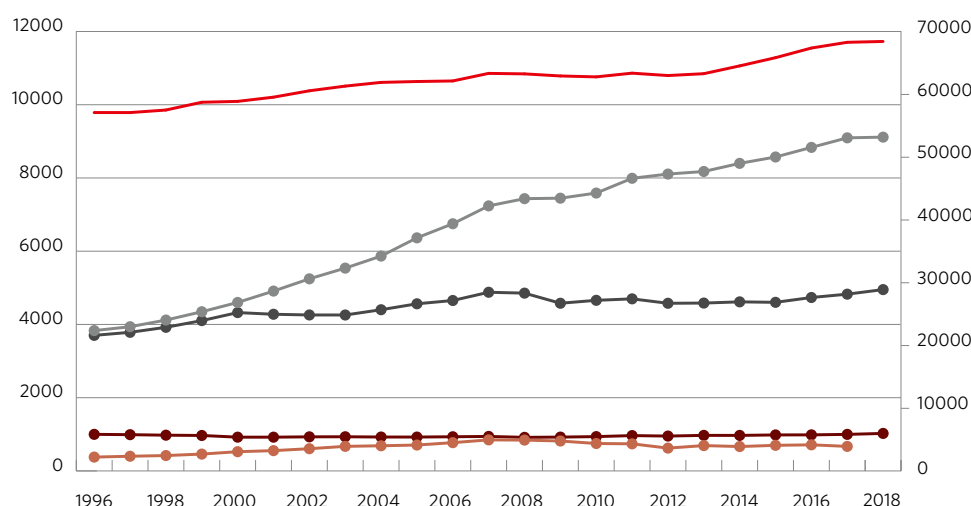


Figure 32

Traffic volume per vehicle type, 1996-2018* (in million vehicle kilometres). Note that passenger car traffic volume is shown on the right Y axis.

Source: Traffic Analysis

* Data for 2018 are preliminary and have been adjusted upwards using change factors, as defined by the Swedish Transport Administration, for passenger cars (passenger cars and light goods vehicles) and heavy vehicles (heavy goods vehicles and buses). No upward adjustment has been made for motorcycles as no relevant change factors have been defined.

- Passenger cars, right axis
- Light goods vehicles
- Heavy goods vehicles
- Buses
- Motorcycles

Total bicycle traffic volume and changes to it are difficult to estimate as no observational measurements are made nationally. Some local documentation is available, however. For example, the three biggest cities in Sweden carry out fairly comprehensive annual measurements. The trend between 2017 and 2018 was for increased cycling. Bicycle traffic in central parts of Malmö is estimated to have increased by about 6 per cent⁶. In Gothenburg bicycle traffic is estimated to have increased by about 12 per cent (City of Gothenburg, 2019), following several years of unchanged or decreased traffic. Stockholm computes 5-year averages, and these show an increase of almost 8 per cent between 2012-2016 and 2013-2017¹⁰ (this is estimated using the inner city average, but the Saltsjö-Mälar average produces a similar result).

Total bicycle sales declined by just over 3 per cent between the 2016/2017 and 2017/2018 seasons¹¹, from 551,000 to 533,000 bicycles. This means that sales have now declined for two consecutive years, following an earlier increase. However, sales of electric bicycles grew by just over 50 per cent, and made up 19 per cent of total bicycle sales.

The age structure of the population also affects road safety, as different age groups choose different transport modes and present different risk behaviours on the road. A person's physical ability to cope with being hit by a vehicle, for example, also varies with age. Figure 33 shows changes to the age structure of the population between 1996 and 2018. The changes between different age groups occur very gradually over time, but we can see that the 0-17, 25-44, and 75+ groups increased between 2017 and 2018, while all other groups declined. If we look at the number of individuals instead, we see an increase in all age groups except the 18-24 and 65-74 groups, where numbers declined slightly.

The age group with the highest risk of being killed on the road is the 75+ group. This is partly because people over 75 are more frail in the event of an accident and because they are frequently unprotected road users (Traffic Analysis, 2011). The second highest risk group is the 18-24s, and here it is primarily men who represent a high risk. The share of the population that is over 75 was between 8 and 9 per cent from 1996 until 2017. At the end of 2018 the share was just over 9 per cent. Both their share and their numbers have increased in recent years, and population forecasts by Statistics Sweden indicate that this group will make up about 9.6 per cent of the population in 2020. In other words, the group with the highest fatality risk is set to grow

Footnote

⁹ Personal communication with Biljana Eriksson, City of Malmö.

¹⁰ Data obtained from Per Karlsson at Stockholm's Traffic Administration Office.

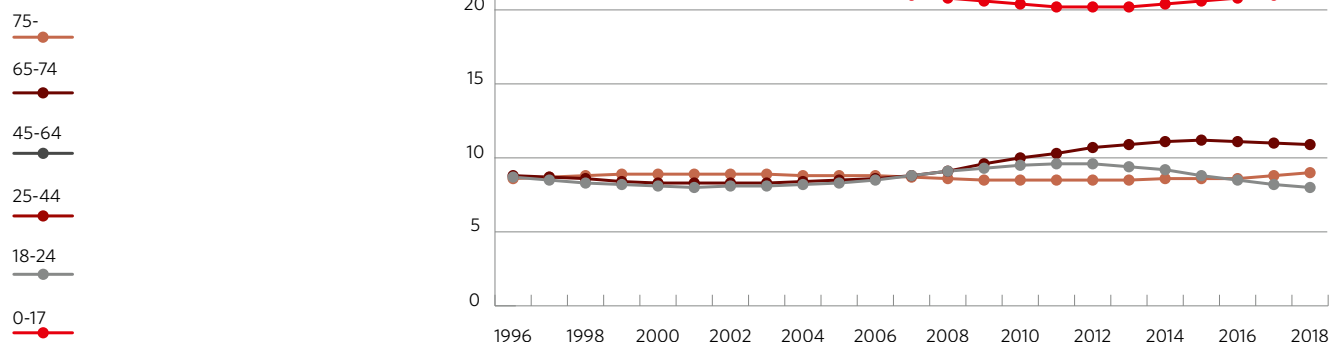
¹¹ The season runs from 1 Sep-30 Aug.
<http://svenskcykling.se/2018/10/02/ny-statistik-fran-cykelbranschen-over-100-000-elcyklar-salda-i-sverige/>

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 0-17 age group, followed by the 45-64 and 25-44 groups.

Figure 33

The age distribution of the population, 1996-2018.

Source: Statistics Sweden



Experiences from several countries indicate that there is a link between the number of road deaths and economic development. A slowdown of the economy is often followed by a reduction in the number of road deaths (Irtad, 2015). To some extent this may be due to the decline in travel associated with a recession, but that is not the whole story. There are a number of hypotheses about the connection between the state of the economy and road safety, most of which have to do with changes in patterns of travel. However, there are probably several different factors that can influence road safety in different ways, so it is very difficult to present any clear causation.

Unemployment figures are often used as a measure of economic development in this context. Figure 34 shows statistics from Arbetsförmedlingen (Sweden's public employment agency) on the share of the population who are unemployed or participating in a programme with activity support. Unemployment declined by 0.4 percentage points between 2017 and 2018. During the period as a whole, 1996-2018, unemployment has varied a fair amount. It was at its lowest level in 2007 and 2008, and then rose quite sharply until 2009. Since then it has remained at a relatively high level, but is gradually declining. The forecast issued by the Swedish National Institute of Economic Research makes the assessment that the expansion peaked during the first half of 2018 and that the economy is now heading towards a slowdown¹². Based on previous causal connections, that could be favourable for road safety.

Footnote

¹² <https://www.konj.se/publikationer/konjunkturlaget/konjunkturlaget/2018-12-19-hogkonjunkturen-mattas-av.html>

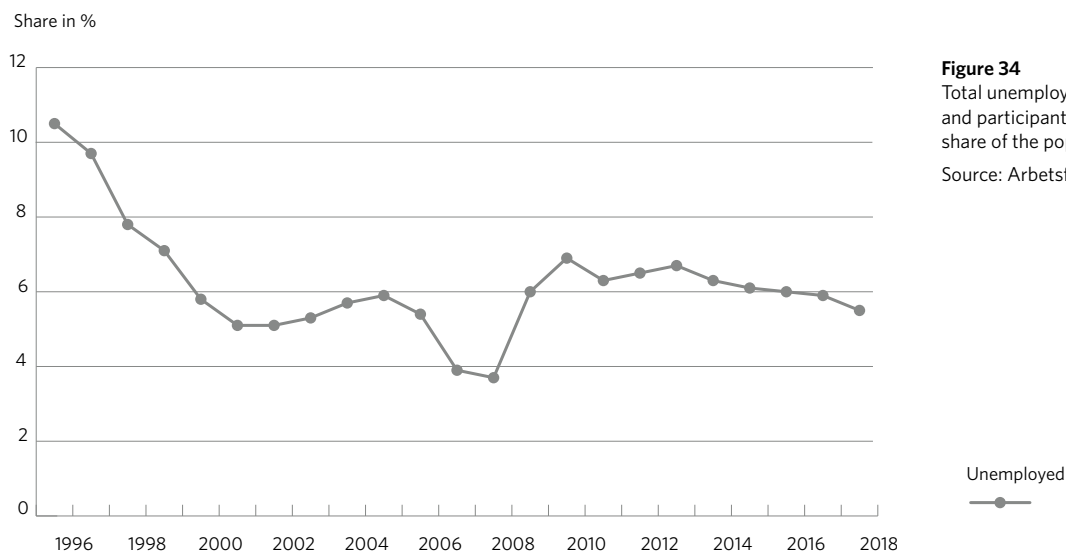


Figure 34
Total unemployment (unemployed and participants in programmes, share of the population), 1996-2018.
Source: Arbetsförmedlingen

The weather can have a considerable effect on traffic during limited periods of time and in quite specific geographical locations, e.g. during temporary downpours or slippery road conditions. However, 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. Winters with heavy snowfall mean that 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. The weather also affects how exposed some transport modes are, primarily in the case of cyclists and motorcyclists – e.g. that cycling declines when precipitation and cold increase. Northern Sweden had large amounts of snow in 2018 while the south, where most of the traffic volume is concentrated, had relatively little snow. This may have contributed to unfavourable conditions for road safety, with respect to car traffic, compared to years with plentiful snow. 2018 was further characterised by unusually warm and dry conditions in almost all of Sweden¹³. This may have led to increased bicycle and motorcycle traffic during the year.

The changes to various external factors that occurred between 2017 and 2018 were mostly unfavourable for road safety. However, these changes were not particularly large, so they will probably only have had a small impact on the outcome in terms of the number of fatalities and severely injured.

Footnote

¹³ <https://www.smhi.se/klimat/klimatet-da-och-nu/arets-vader>

4 Number of fatalities and severely injured

4.1 Fatalities

According to the definition used in official statistics, a road traffic accident is “an accident that occurs in traffic on a road generally used for motor vehicle traffic, in which at least one moving vehicle is involved and which causes personal injury”. Pedestrians who die as a result of falls in the road traffic environment are therefore not included in statistics for road accidents with personal injuries. A person who dies within 30 days of the road traffic accident in which they were injured is regarded as a road traffic fatality.

Suicides were previously included by definition in Sweden’s official road death statistics. Since 2010, however, Traffic Analysis has been instructed to report suicide figures separately. Suicides have therefore been excluded from official statistics on fatalities in road traffic accidents since that year. The upshot is that statistics since 2010 are not fully comparable with those from earlier years. Between 2010 and 2012 the method for classifying suicide was altered, which contributed to a rise in the number of assessed suicides during that period. An established method has been in use since 2012 (Swedish Transport Administration, 2014), and it shows that suicides represent approximately 10 per cent of road deaths. In 2018 there were 34 road deaths that were classified as suicide; 4 additional individuals were killed in these accidents.

The source for figures on road fatalities and injured is Strada (an information system about road traffic accidents that cause personal injury), whose data in turn is based on information from the Swedish Police and emergency hospitals.

Progress and projection towards the 2020 target

	Mean value 2006-2008	2018	2020 target	Assessed progress towards target
Number of fatalities	440	324	220	Not in line with the required trend

In May 2009 the Swedish parliament laid down an interim target for progress on road safety: a halving of the number of fatalities, to a maximum of 220, by 2020. The target level is based on the mean value for the number of fatalities in 2006-2008, which was 440. It follows from this that we make comparisons of the number of fatalities from the baseline value and looking ahead. In addition to the national target there is also an interim target at the EU level, for halving the number of road traffic fatalities between 2010 and 2020. That corresponds to a more rigorous interim target of no more than 133 fatalities.

There were 324 road traffic fatalities in 2018, see Figure 35. This is an increase of 72 deaths, or 29 per cent, on the previous year. The number of fatalities declined by half over a ten-year period, until 2013, but the decline levelled off between 2014 and 2017, and in 2018 the number of fatalities increased. The 2017 figure represented a reduction by 43 per cent on the baseline value of 440. Taking the increase that occurred in 2018 into account, that reduction amounts to only 26 per cent, and is the highest figure for fatalities since 2009.

The number of fatalities in 2018 should have been no more than 240 in order to have been in line with the required trend. Based on current progress and on other indicators, the analysis group's assessment is that it is looking very difficult to reach the 2020 target.

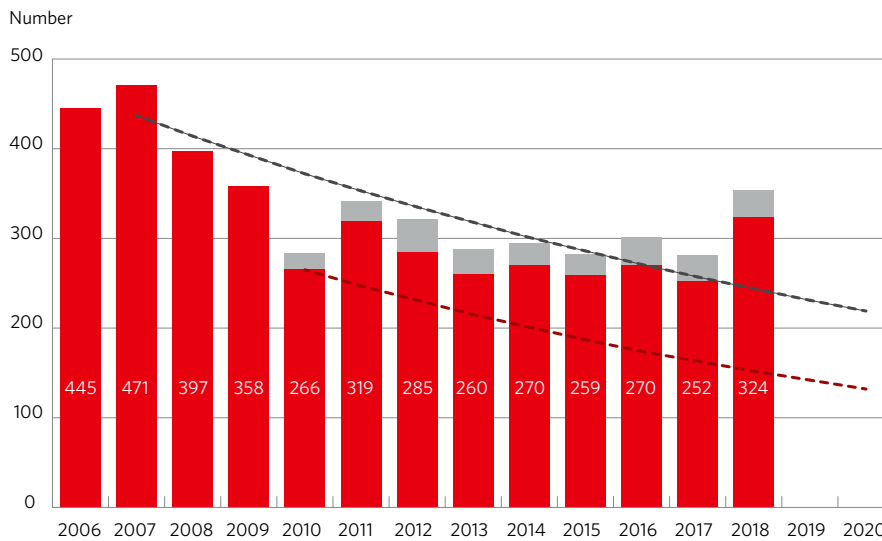


Figure 35
Number of fatalities in road traffic accidents 2006-2018, and the required trend until 2020.

Source: Swedish Transport Agency

Figure 35 also includes the required trend for reaching the EU target, showing that the number of fatalities far exceeds the required trend for achieving the target of no more than 133 deaths by 2020.

Road user category

In 2018 motorists and motorcyclists were the road user categories with the greatest increases in the number of road fatalities. “Motorists” is an umbrella term that covers individuals travelling in passenger cars, buses and goods vehicles. We can see that the increase among motorists is mostly due to a higher number of passenger car motorist fatalities, but also that there were more fatalities in light goods vehicles than in 2017.

The category with the highest number of fatalities has historically been passenger car motorists. A total of 181 passenger car motorists were killed in 2018, which is an increase by 51 individuals or 39 per cent compared with 2017, when the figure was 130. The number of passenger car motorist fatalities has declined since the 2006-2008 period, when an average of 280 individuals in this category were killed per year. However, since 2010 we have seen a stagnation in the number of fatalities in passenger cars.

There were 16 fatalities in goods vehicles in 2018, which is 8 more than in 2017 and about the same number killed in goods vehicles annually between 2006 and 2008. Of the 16 fatalities in 2018, 12 were travelling in light goods vehicles and 4 in heavy goods vehicles. The average annual number of fatalities in light goods vehicles was 7 during the 2013-2017 period; for heavy goods vehicles the average was 5.

Motorcycle fatalities increased by 8 individuals from 2017 to 2018, from 39 to 47. The number of motorcycle fatalities also stagnated during the 2010-2017 period, from previously having fallen since 2006. The number of pedestrians killed fell from 2017 to 2018, from 37 to 34, as did cyclist fatalities, from 26 to 33. In 2018 there were 7 moped rider fatalities, compared with only 1 fatality in 2017. There were no fatalities on buses in 2018, compared with 4 in 2017.

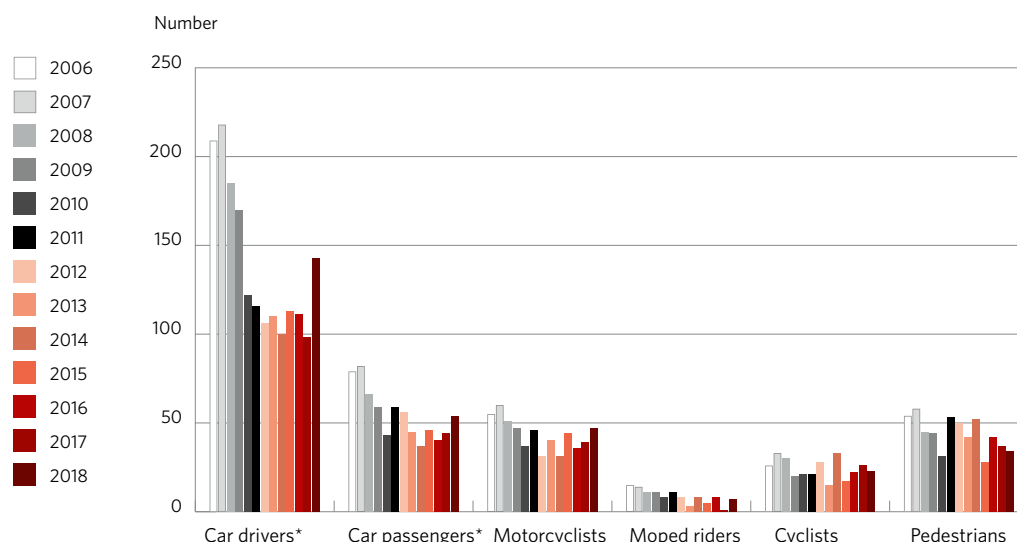
Figure 36

Number of fatalities by road user category, 2006-2018. Suicides have not been included in statistics for road accident fatalities since 2010.

* "Car" refers to passenger cars, goods vehicles and buses.

Source:

Swedish Transport Agency



Accident type

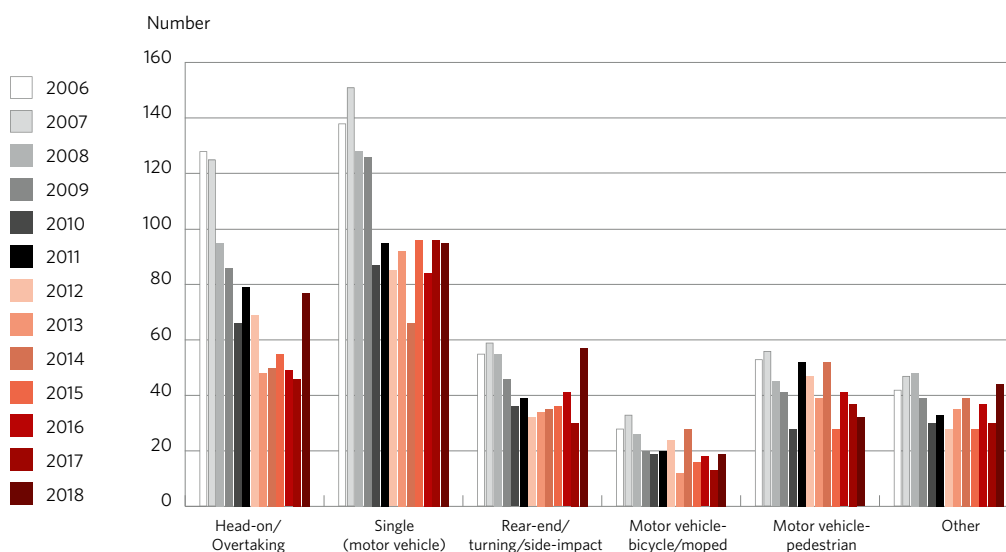
Single-vehicle accidents are the type of accident with the highest number of fatalities, historically as well as in 2018. A total of 95 individuals died in single motor vehicle accidents in 2018, which is 1 less than in 2017. The large increase in the number of fatalities in 2018 occurred among head-on, side-impact and rear-end accidents.

Figure 37

Number of fatalities by accident type, 2006-2018. Suicides have not been included in statistics for road accident fatalities since 2010.

Source:

Swedish Transport Agency



Head-on

A head-on accident is a collision between motor vehicles (excluding mopeds) travelling towards each other from opposite directions (but where passing was intended) and is the accident type that dominates in the head-on/overtaking category. 75 individuals were killed in head-on accidents in 2018. This is also the type of accident that saw the greatest increase in 2018: 32 more individuals than in 2017, or an increase of 74 per cent. If we compare this with the mean value for the 2013-2017 period, we see an increase of 27 fatalities in head-on accidents in 2018. A total of 68 passenger car motorists were killed in head-on accidents in 2018; this figure has been around 40 since 2013. The number of fatalities in head-on accidents involving heavy goods vehicles increased by 44 per cent in 2018 compared with the mean value for 2013-2017: 26 individuals were killed in such accidents in 2018.

Side-impact

A side-impact accident is a collision between motor vehicles on intersecting courses (mopeds are not included here). The number of fatalities in accidents of this type increased between 2017 and 2018, from 14 individuals to 26. From the beginning of the measuring period until 2017, an average of 19 individuals were killed annually in side-impact accidents. Of the 26 individuals killed in this type of accident in 2018, 20 were passenger car motorists and 6 were motorcyclists. Many of these accidents occur on roads with high speeds. Four of the side-impact accidents in 2018 occurred on roads with speed limits below 70 km/h, and seven on roads where the speed limit was 100 km/h.

Rear-end

A rear-end accident is a collision between motor vehicles travelling in the same direction, where one impacts the rear of the other (mopeds are not included here). In 2018 there were 18 fatalities in rear-end accidents, which is the highest number since 2006. By comparison, an average of 9 individuals have been killed annually in rear-end accidents since then. Of those killed in rear-end accidents in 2018, 11 were passenger car motorists and 6 were motorcyclists.

Road operators

The majority of fatalities occurred in the national road network: 254 individuals, or 78 per cent of all fatalities, see Figure 38. That is an increase by 81 individuals, or 47 per cent, compared with 2017. If we compare this to the 2013-2017 period, when there was an average of 188 fatalities in the national road network annually, we see a increase of 35 per cent.

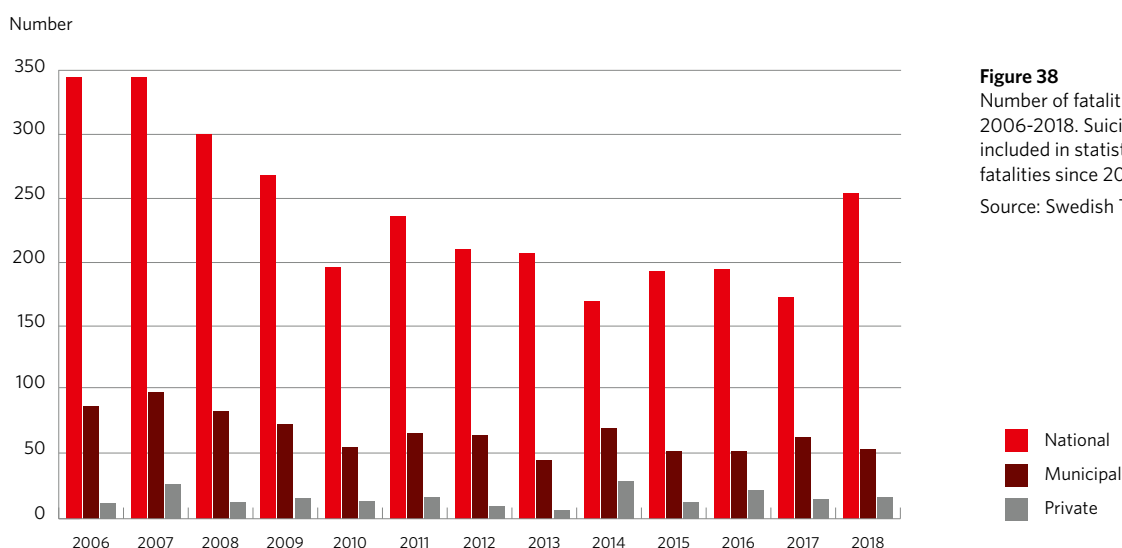


Figure 38
Number of fatalities by road operator, 2006-2018. Suicides have not been included in statistics for road accident fatalities since 2010.

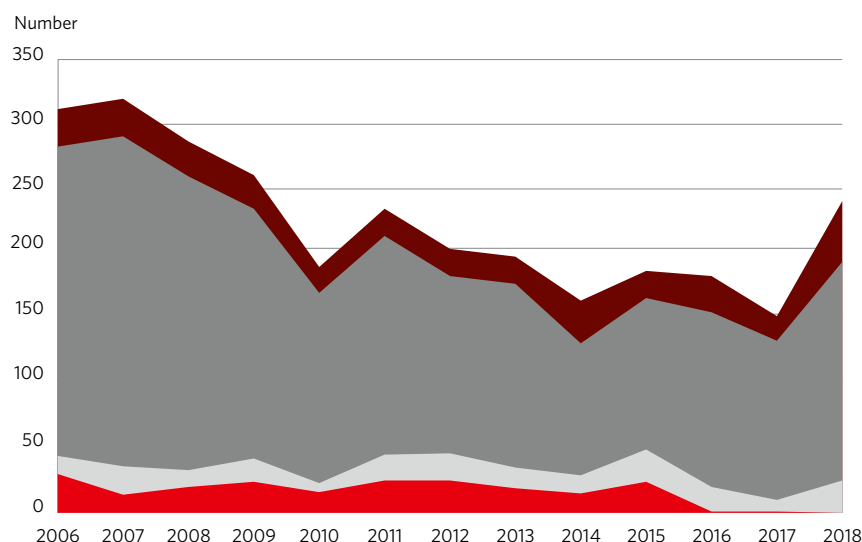
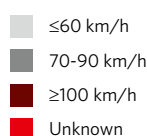
Source: Swedish Transport Agency

The most common accidents in the national road network were single-vehicle accidents, head-on and overtaking accidents, with the latter being the category that most increased on the previous year. Figure 39 shows the number of fatalities on national roads by speed limit. We can see that the biggest share, 169 deaths, occurred on roads with speed limits between 70 and 90 km/h, while 47 individuals were killed on roads with speed limits of 100 km/h or more. This means that the stagnation in the number of fatalities on roads with high speeds that we have seen in recent years has ended, with 2018 showing an increase.

Figure 39

Number of fatalities in the national road network 2006-2018 by road speed limits. Suicides have not been included in statistics for road accident fatalities since 2010.

Source: Swedish Transport Agency



In the municipal road network fatalities were most common on roads with a 50 km/h speed limit. The most common accident types were pedestrians being hit by motor vehicles and single motor-vehicle accidents.

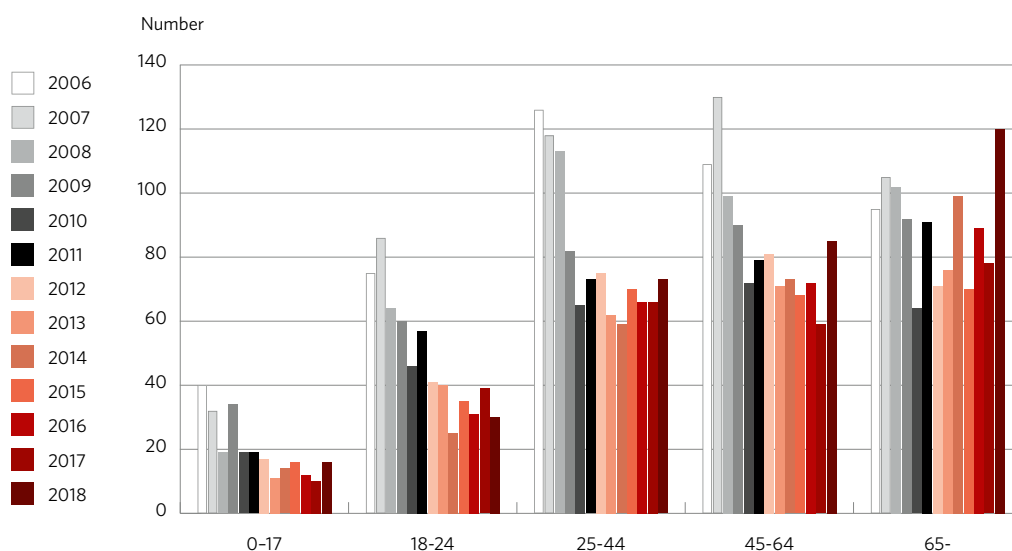
Trends by age group

In 2018 there was an increase in the number of fatalities in all age groups except the 18-24s. The biggest increase was among people over 65: from 78 fatalities in 2017 to 120 in 2018, an increase of 54 per cent. If we compare with the mean value for 2013-2017 the increase is by 38 fatalities, from 82, which is an increase of 46 per cent. There was also a relatively big increase in the 45-64 age group, from 59 deaths in 2017 to 85 in 2018. That corresponds to an increase of 44 per cent. The mean value for 2013-2017 was 69, which gives an increase of 16 individuals, or 23 per cent, in 2018.

Figure 40

Number of fatalities by age group 2006-2018. Suicides have not been included in statistics for road accident fatalities since 2010.

Source: Swedish Transport Agency



Trends by gender

The biggest increase in the number of fatalities is among women. In 2017 there were 56 women who were killed on the road, and in 2018 there were 75. That is an increase of 19 individuals, or 34 per cent. Historically, the share of women in road fatalities has been around 26 per cent, while for 2018 it was 23 per cent. There was also an increase among men, from 196 to 249 fatalities, which is a 27 per cent rise. In 2018 the share was somewhat lower.

Analysis of the fatality figures

The number of road traffic fatalities in 2018 increased by almost 30 per cent compared with 2017, which means that the decline from the baseline value for the interim target decreased from 43 per cent in 2017 to only 26 per cent in 2018. This marks a clear break in the stagnation we saw between 2013 and 2017. On this basis, the analysis group's assessment is that fatality figures are not in line with the required trend for reaching the interim target of no more than 220 deaths in 2020.

In terms of road user categories, the biggest increase in fatalities has been among passenger car motorists. This can be explained to some extent by the fact that the number of passenger car motorists killed in collisions with heavy goods vehicles increased sharply in 2018 compared with 2017 – from 18 to 45. This increase represents 38 per cent of the total increase in fatalities in the road transport system during 2018. A partial explanation for this is the increase in goods vehicle traffic volume. The accident types causing fatalities that increased most on the previous year were head-on and overtaking accidents and rear-end, turning and side-impact accidents. It is hard to find an explanation for why these types of accidents increased while there was no corresponding increase in single-vehicle accidents.

Almost the entire increase occurred in the national road network. Roads with higher speed limits, where fatality figures had been declining steadily since the beginning of the measuring period and then stagnated in recent years, increased as sites for fatal accidents in 2018. We can see that the number of fatalities grew significantly on 70-90 km/h roads as well as on 100-120 km/h roads. On 70-90 roads the increase was mainly in head-on and overtaking accidents and turning, side-impact and rear-end accidents. On 100-120 roads all types of accidents saw an increase.

Gender distribution of fatality figures did not change significantly in 2018, but the trends by age group show that individuals in the 45-64 age group and the 65+ age group had the biggest increases, by 44 and 54 per cent respectively. An increase of that magnitude cannot be explained by the increased share of older people in the population. Frailty in elderly people is a contributing factor for fatalities in the 65+ age group, but this does not explain the increase in the 45-64 age group, nor does it provide the whole picture for the elderly fatalities.



4.2 International comparison

Despite the increased number of fatalities in the country in 2018, Sweden's fatality figures remain relatively low when compared with other countries' figures. Figure 41 shows the number of road deaths per million inhabitants in European countries, based on data from the ETSC's safety report. Figures for the rest of Europe are the number of fatalities in 2017, while for Sweden both the 2017 and the 2018 figures are shown. The EU average in 2017 was 50 fatalities per million inhabitants, which may be compared with Sweden's figures: 32 fatalities per million inhabitants in 2018 and 25 fatalities per million inhabitants in 2017. Denmark, Switzerland, the United Kingdom and Norway had fewer fatalities per million inhabitants in 2017 than Sweden did in 2018.

The interim target at the EU level is for the number of fatalities to be halved between 2010 and 2020. Between 2010 and 2017, this number declined by only 20 per cent. There is considerable variation here between member states. Greece and Estonia have made good progress in the last few years, and are in line with the required trend, while the United Kingdom, Sweden and the Netherlands are among the countries with the slowest rate of improvement since 2010.

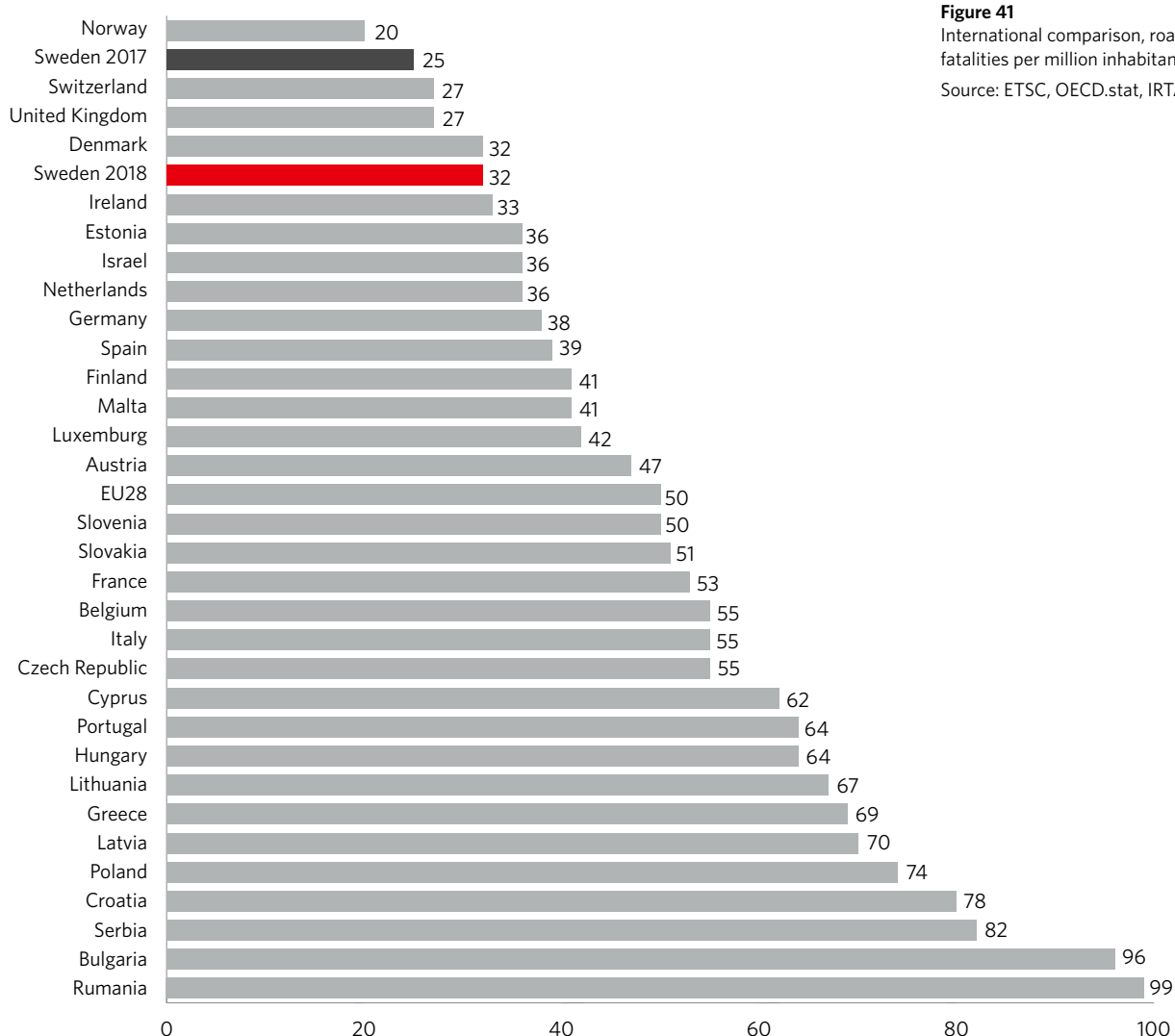


Figure 41
International comparison, road traffic fatalities per million inhabitants and year
Source: ETSC, OECD.stat, IRTAD (2017)

Only preliminary statistics are available for the number of fatalities in the Nordic countries in 2018. Figure 42 shows the number of fatalities per capita for the four Nordic countries from 1990 to 2018. We can see that Sweden sticks out in 2018, when no major increases occurred in Finland, Denmark or Norway. In Denmark there were 175 road fatalities compared to 183 in 2017. In Finland the number of fatalities increased from 212 to 223 between 2017 and 2018, and in Norway the number of fatalities was more or less unchanged, increasing from 107 and 109.

We can see a general decline in road traffic fatalities in all four countries since the starting year for the period. The country whose trend has been closest to Sweden's is Norway, although the number of fatalities per capita in 2017 and 2018 were significantly lower in Norway than in Sweden.

Figure 42

Number of road traffic fatalities per 100,000 inhabitants per year in the Nordic countries 2007-2018.

Source: SSB, Statistikcentralen, Vejdirektoratet and the Swedish Transport Agency

—●— Sweden
—●— Norway
—●— Finland
—●— Denmark

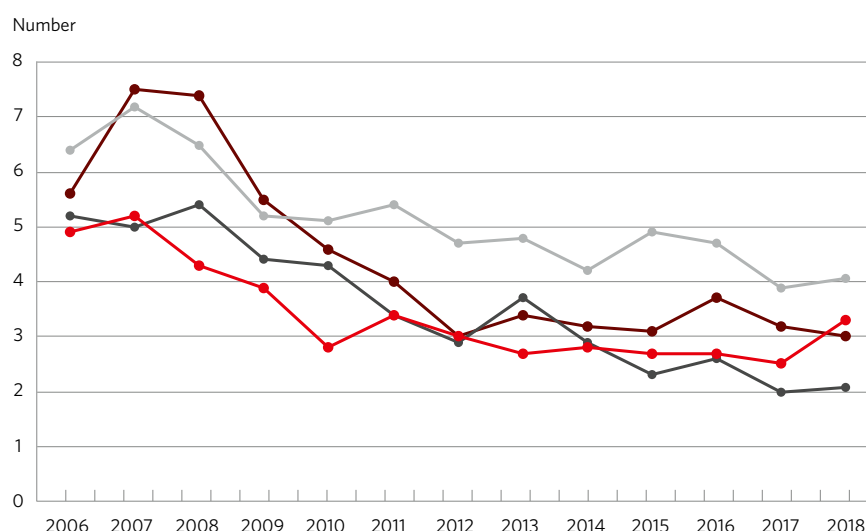


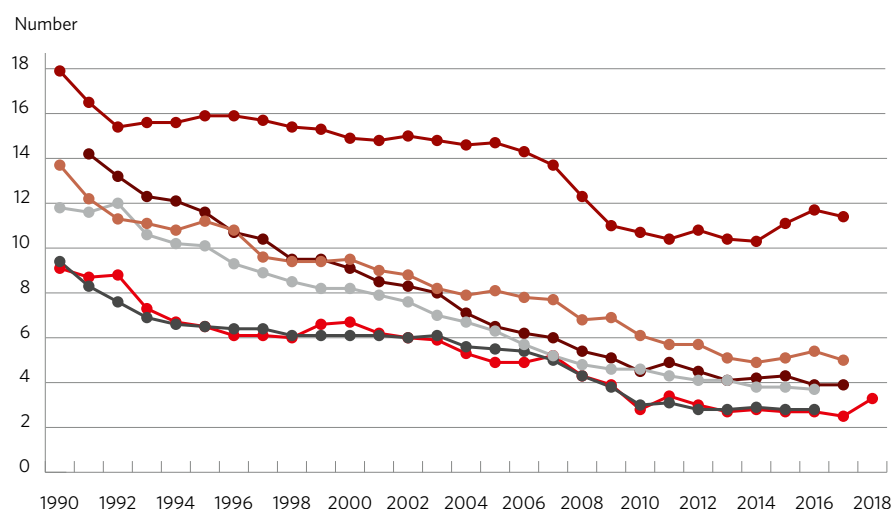
Figure 43 shows a more historic survey of the number of road traffic fatalities per capita in a selection of OECD countries. We can see that the safety trend in Sweden has been very similar to that in the United Kingdom. Similar declines can also be seen in Germany, Australia and Japan, albeit from a higher starting level. Among the countries in the comparison, the USA stands out in having the smallest decline over time.

Figure 43

Trend for the number of road traffic fatalities per 100,000 inhabitants per year in Sweden and major OECD countries.

Source: ETSC, IRTAD 1990-2018

—●— USA
—●— Germany
—●— Sweden
—●— United Kingdom
—●— Japan
—●— Australia



4.3 Severely injured

The definition of a severely injured person is of someone who has suffered at least 1 per cent 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. Another method has therefore been used since 2007 which makes it possible to forecast the number of people with medical impairment. This method is described in Berg et al (2016). An injury is considered very serious if it causes 10 per cent medical impairment or more.

The source used for data on severely injured road users is Strada (an information system about road traffic accidents that cause personal injury). Strada’s data is based on information from the Swedish Police and emergency hospitals. The number of severely injured is estimated on the basis of all injuries that are reported to medical care services and that have occurred in road traffic. This is because it is only possible to forecast the number of severely injured by means of medically assessed injury data. The medical care services are not obliged to report to Strada, and the frequency of reporting may be influenced by factors such as procedural changes, staff turnover, or workload issues. To enable regular follow-ups it may therefore sometimes be necessary to make adjustments in order to compensate for gaps in the data (Fredlund, 2016). Not all emergency hospitals were connected to Strada before 2015, so adjustments used to be made for those gaps as well.

Pedestrians who have fallen and injured themselves on the road are not included in the definition of a road traffic accident as no vehicle was involved. However, every year many pedestrians sustain severe injuries that way in the road transport system, and the number of severely injured in pedestrian falls is therefore included in this section.

The number of individuals injured in road traffic is influenced by a number of factors including road safety measures, traffic volume, and external factors. Random variation is less significant for the number of injured than it is for the number of fatalities.

Progress and projection towards the 2020 target

	2007	2018	2020 target	Assessed progress towards target
Forecast number of severely injured	5 400	4 200	4 100	In line with the required trend

The Swedish parliament's interim target for severely injured in road traffic is that the number of severely injured be reduced by at least a quarter between 2007 and 2020. In its 2016 infrastructure bill, "Infrastructure for the future", the government defined a target of no more than 4,100 severely injured by 2020, and this is therefore the starting point for analyses of severely injured road users in this report.

The number of severely injured in 2018 is estimated at just under 4,200, see Figure 44. This amounts to a reduction by 22 per cent from 2006-2008 until 2018.

The figure includes a 95 per cent confidence interval showing how big the uncertainty of the forecasts of the number of severely injured is for each year (Forsman et al, 2016). The confidence intervals are small, which shows that the method for estimating the number of severely injured is relatively reliable. However, the interval does not take data loss into account, which implies an uncertainty beyond that shown in the diagram, even if adjustments have been made for data loss from hospitals that did not previously report to the accident database.

The figure for severely injured road users is below the required trend, and has declined in the last few years, which leads the analysis group to make the assessment that it will be possible to reach the 2020 target.

Figure 44

Forecast number of severely injured 2006-2018, and the required trend until 2020. The error bars specify the uncertainty of the forecast number, but do not take data loss into account. 2015, 2016, 2017 and 2018 have been adjusted for internal data loss due to procedural changes.

Source: Swedish Transport Agency

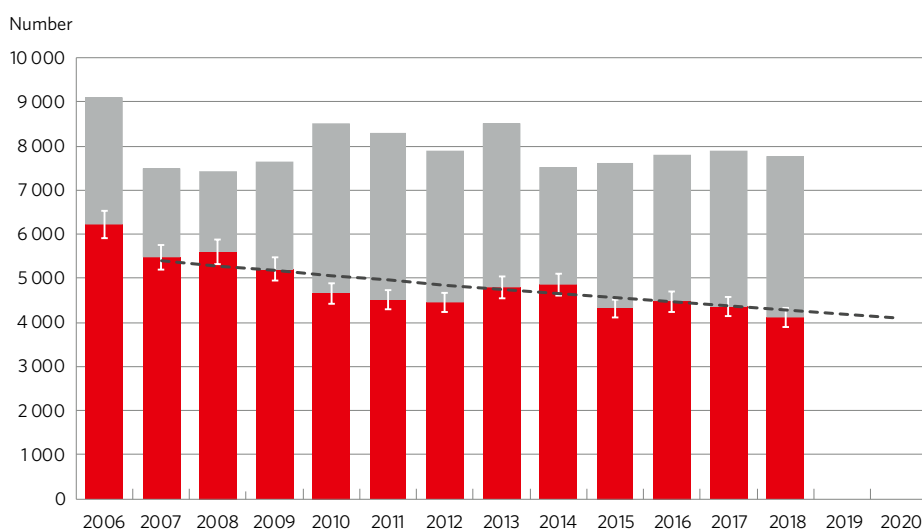
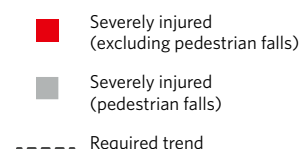
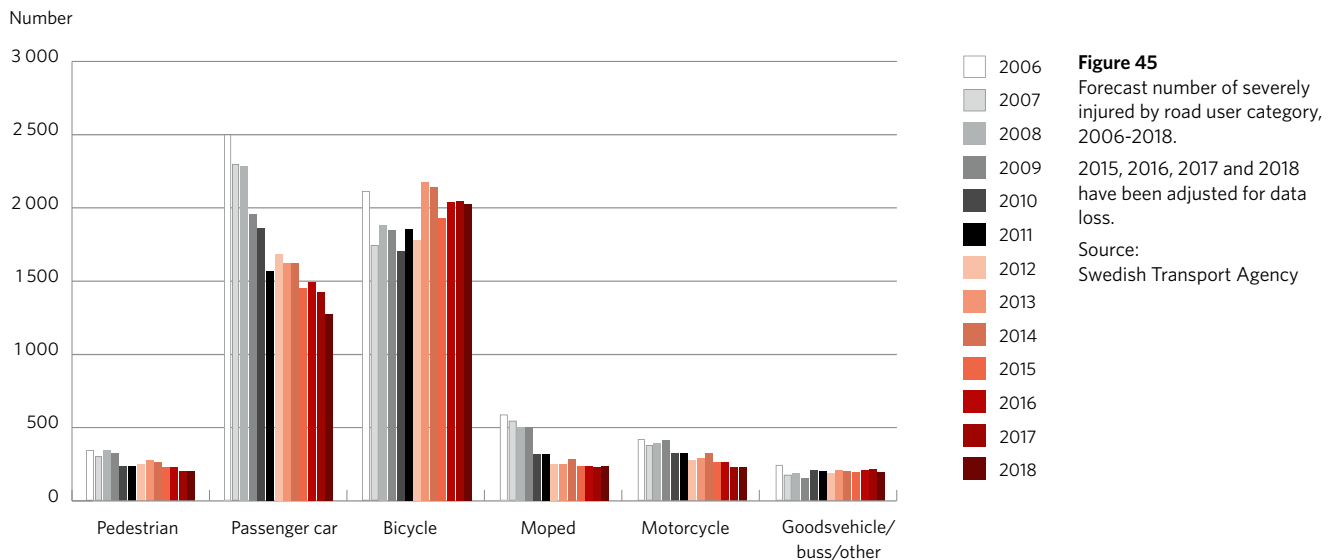


Figure 44 shows that the number of severely injured would be 7,900 if pedestrian falls were included as road traffic accidents. A considerable proportion of pedestrian falls occur during the winter period. During some of the winter months the number of pedestrians severely injured in falls can be more than twice as high as the number of individuals severely injured in road traffic accidents.

Road user category

Figure 45 shows the trend for the number of severely injured by road user category. It is clear that the reduction in the number of severely injured over the last few years is not consistent across road user categories. There was a change between 2010 and 2011, from the number of severely injured passenger car motorists being higher than the number of severely injured cyclists to the reverse. This situation has remained the same since then; in 2018 the number of severely injured cyclists was around 2,000, which is about the same number as in recent years. The number of individuals severely injured in passenger cars, however, appears to be continuing its decline. In 2018 the figure was 1,250, which is the lowest level at any time during the measuring period.

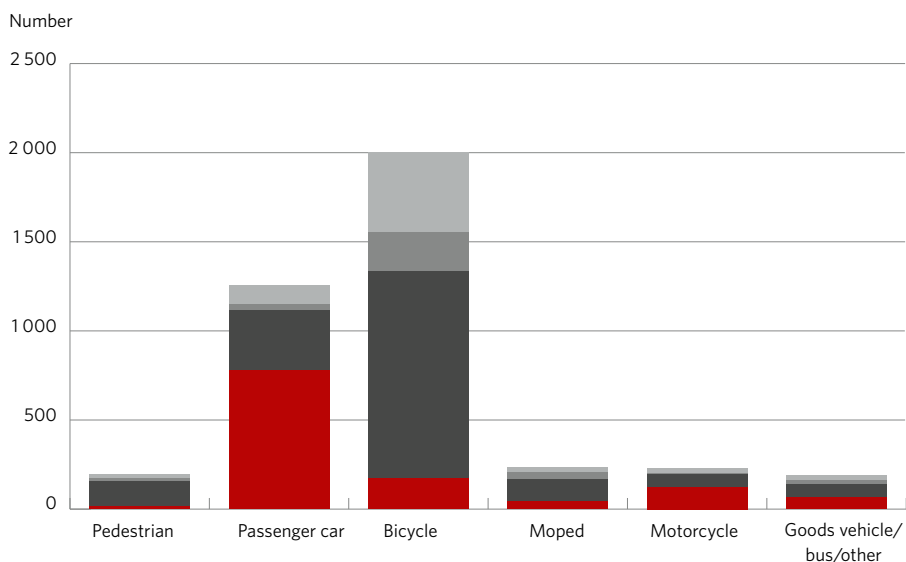
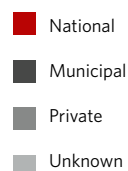


Just under half of severe injuries occur in the municipal road network, and about 30 per cent in the national road network, see Figure 46. There is quite a lot of variation between road user categories, however. If we look more closely at the biggest road user categories that sustain severe injuries, we can see that six in ten passenger car motorists were injured on national roads and just under three in ten on municipal roads. Among cyclists, by contrast, about six in ten are injured on municipal roads and just under one in ten on national roads. For a fairly large share of injured cyclists there is no information about the road operator responsible for the location where the injury occurred. In just over half of these cases the cyclist has been injured on a pedestrian and cycle path in an urban area, which suggests that they should be categorised under the municipal road network.

Figure 46

Forecast number of severely injured in 2018, by road user category and road operator.

Source: Swedish Transport Agency



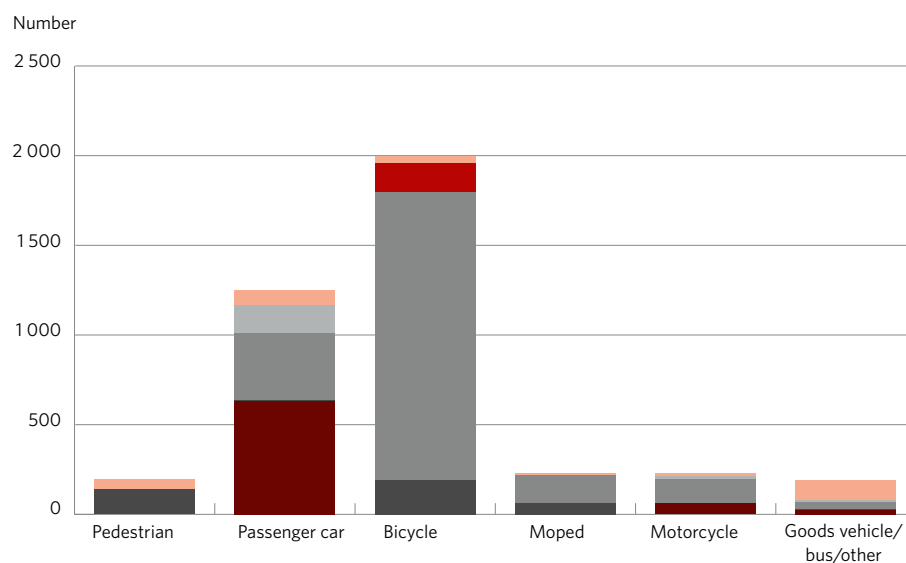
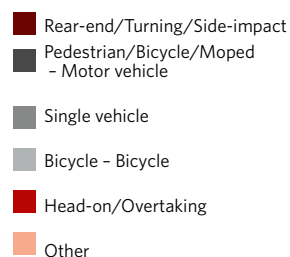
Accident type

Figure 47 shows in what types of accidents different categories of road user are injured. Those who are severely injured on bicycles, mopeds or motorcycles most often sustain their injuries in single-vehicle accidents, while the most common type of accident among passenger car motorists (half of all cases) is a rear-end or side-impact accident. Rear-end and side-impact accidents in which passenger car motorists are severely injured occur on both national and municipal roads, while single-vehicle accidents primarily occur on national roads.

Figure 47

Forecast number of severely injured in 2018, by road user category and accident type. Pedestrian falls are not included.

Source: Swedish Transport Agency



The decline in the number of severely injured in passenger cars can be seen most clearly in the continuous decline in those severely injured in single-vehicle accidents, but also in the decline in those injured in rear-end accidents between 2017 and 2018.

Injury type

The distribution of those severely injured between road user categories and degree of injury severity can be seen in Figure 48. Cyclists and passenger car occupants are the road user categories that make up the biggest share of both severely and very severely injured. These two categories together make up almost 80 per cent of all individuals among both the severely and the very severely injured.

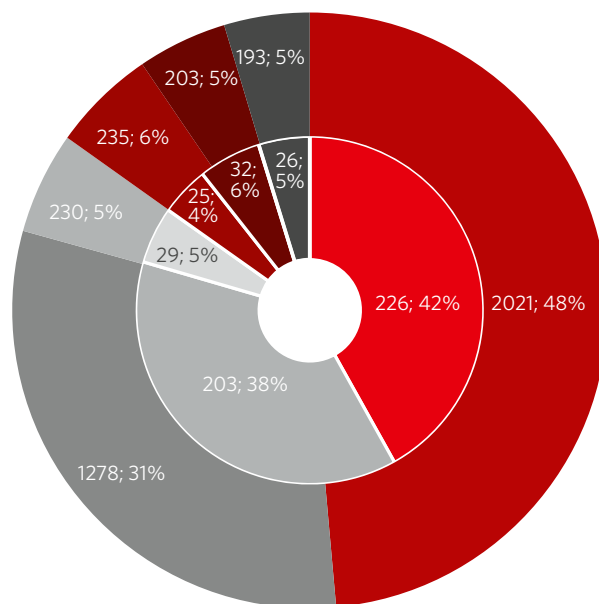
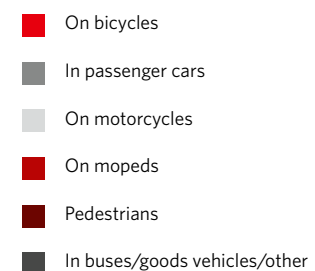


Figure 48

Forecast number of severely injured (outer circle) and very severely injured (inner circle) in 2018, by mode of transport. The figure does not show pedestrian falls.

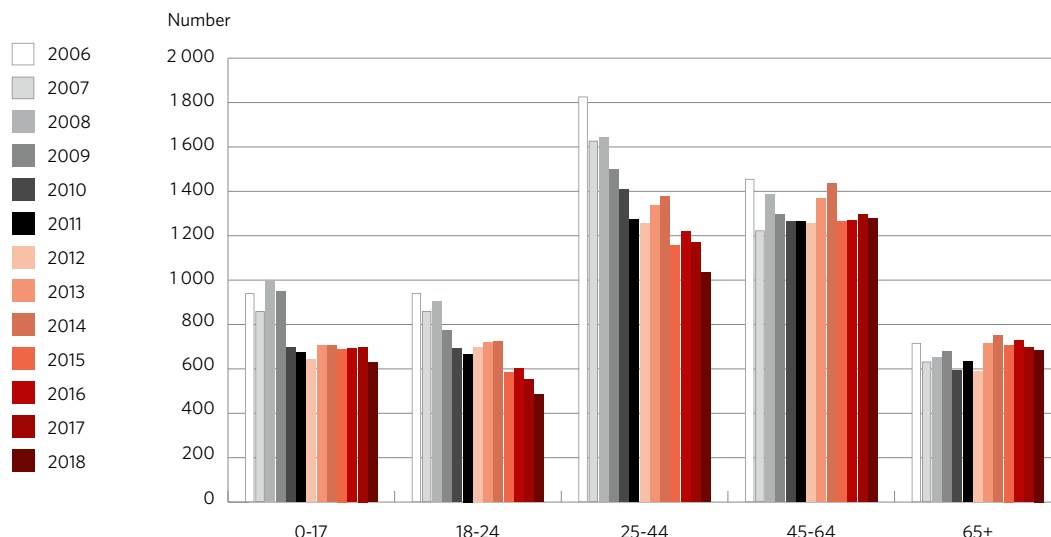
Source: Swedish Transport Agency



The most common injury among severely injured passenger car motorists is neck injury, regardless of injury severity. The injury picture among cyclists differs more between those severely and those very severely injured. For severely injured cyclists, arm, shoulder and leg injuries are the most common; these types of injuries are also common among those who are very severely injured, but they have a higher incidence of head and face injuries as well.

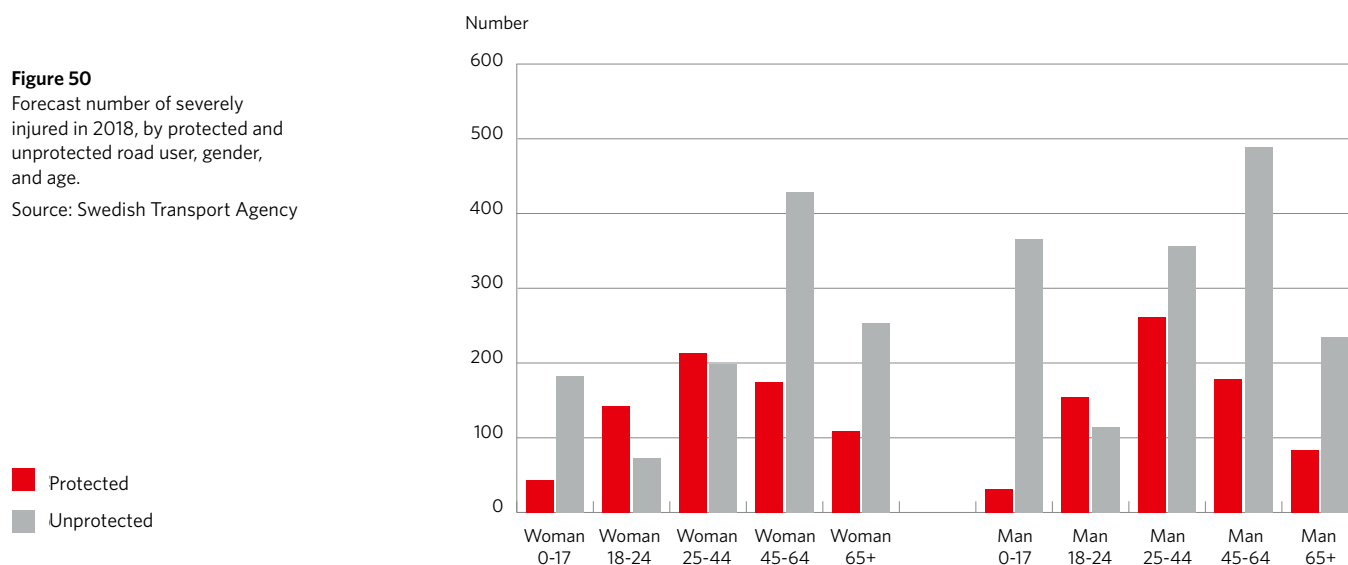
Figure 49 shows trends for the number of severely injured by age group. The reduction in the number of severely injured that has occurred during the period has been primarily in the 18-24 and 25-44 age groups. The number of severely injured children aged 0-17 declined at the beginning of the measuring period. This is connected in large part with the fact that the number of injured moped riders declined between 2009 and 2010 as a result of changed licence requirements. The number of severely injured children has been approximately 700 per year since 2010.

Figure 49
Forecast number of severely injured in 2018, by age group.
Source: Swedish Transport Agency



Unprotected road users sustain severe injuries to a greater extent in the youngest and the older age groups, see Figure 50. Unprotected road users include individuals riding bicycles, mopeds or motorcycles, or walking. We can see that in general the distribution of severely injured protected road users does not differ much between genders. However, men are over-represented among the unprotected road users.

Figure 50
Forecast number of severely injured in 2018, by protected and unprotected road user, gender, and age.
Source: Swedish Transport Agency



Studies have shown that a person's quality of life generally declines after a road traffic injury, and that this decline is due to several factors. Besides the type of injury, there are demographic, clinical, psychosocial and socioeconomic factors that also play a part. Some groups are more affected by a road traffic accident, including elderly people, women, groups with a lower socioeconomic status, and people diagnosed with post-traumatic stress disorder (Rissanen et al, 2017). Even less severe injuries bring an increased risk of not regaining one's previous quality of life, and thus not regaining full health. For this reason, continuous focus is needed on reducing the large number of less severe injuries and their consequences (Monarézz-Espino et al, 2018; Rissanen et al, 2017; Hasselberg et al, 2018).

If we look at the total number of injured individuals reported by the medical care services, i.e. the number that the projections of severely and very severely injured are based on, we can see in Figure 51 what the distribution is according to the Maximum Abbreviated Injury Scale (MAIS)¹⁴. A MAIS score is assigned by the medical care services and measures how life-threatening an injury is on a scale from 1 to 6. The figure makes it clear that the vast majority of injured individuals do not have life-threatening injuries. From a prevention perspective it is important to take this large group of individuals with less severe injuries into account, as there is a risk that they will not regain full health despite having less severe injuries.

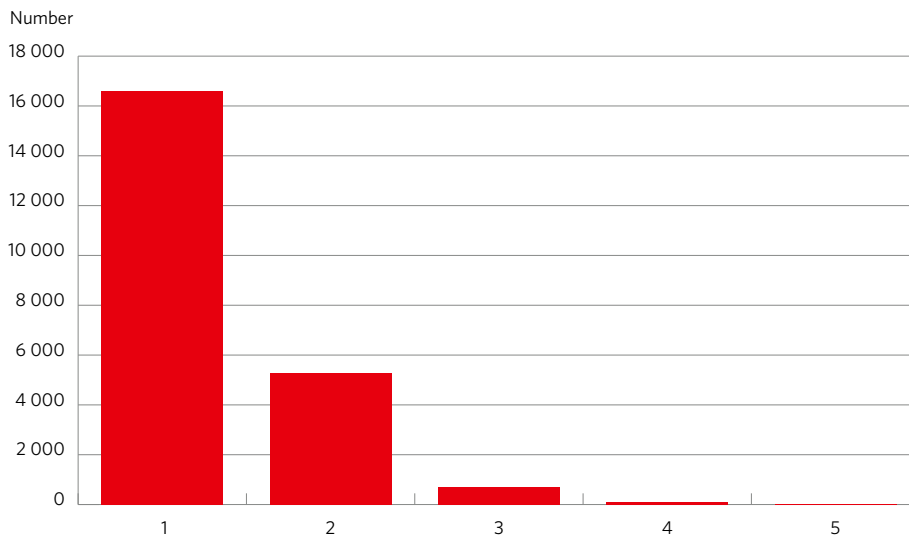


Figure 51
Number of injured in 2018 by degree of severity (MAIS) of individual injuries.
Source: Swedish Transport Agency

■ Number of injured by increasing level of severity according to MAIS (1 = Not life-threatening, ..., 6 = Not survivable)

Analysis and discussion

UIn 2018 just under 4,200 individuals were projected as severely injured and just over 500 as very severely injured. Additionally, about 3,600 individuals are estimated to have been injured in falls where no motor vehicle was involved – a type of accident that is not included in the official definition of a road traffic accident. Cyclists and passenger car motorists are the road user categories that make up the biggest share of the injured in road traffic accidents, irrespective of injury severity. Together, these two categories make up 80 per cent of all those injured.

Even if the target for the number of severely injured is within reach, it continues to be very important to increase the safety of unprotected road users and to improve it for occupants of passenger cars. During the target period the number of severely injured has decreased primarily in passenger cars. The number has not improved for cyclists. And while the number of severely injured in passenger cars has decreased over the last few years, this decrease has been mainly in single-vehicle accidents. The same positive trend does not apply for other accident types among passenger car motorists.

Pedestrians injured in falls are not counted as injured in road traffic accidents, but if we take their number together with the number of injured cyclists we get about 70 per cent of the total number of severely injured in the road traffic environment (47 per cent are pedestrian falls). Falls represent 95 per cent of severe injuries among pedestrians and are more common among women and the elderly. From a whole-journey perspective, pedestrians should be regarded as a transport mode in its own right, regardless of

Footnote

¹⁴ The Maximum Abbreviated Injury Scale involves assessing the most severe injury an individual sustains in a specific region of the body and assigning it a level of threat to the individual's life, where 1 represents "minor", 2 "moderate", 3 "serious", 4 "severe", 5 "critical" and 6 "maximum" threats to life.

whether a motor vehicle was involved in the accident. The argument for this is that the vast majority of people walk at some point during the day. For that reason pedestrians must be regarded as an important part of a sustainable transport system.

In order to be able to continue reducing the number of accidents and injuries among cyclists and pedestrians, municipalities must improve their maintenance of pedestrian and cycle paths (PC paths). Major investments are required if we are going to reach the target of 70 per cent of municipalities with good-quality PC paths by 2020. Speed regulated PCM (pedestrian, cycle and moped) passages are another area that it is important to focus on in order to reduce injuries among unprotected road users. Helmet use among cyclists also has to increase at a much higher rate than is currently the case.



5 Conclusions and discussion

In 2018 there were 324 deaths in road traffic accidents. That is an increase by 29 per cent on the previous year, and 35 per cent above the required trend (no more than 240 fatalities in 2018) towards reaching the 2020 interim target. The number of fatalities is also the highest since 2009, the year in which the Swedish parliament adopted the interim target for Vision Zero, and represents an end, in negative terms, to the stagnation in road safety progress that we saw between 2013 and 2017. It is too early to determine if the sharp increase is a break in the trend, in particular as the figure for 2017 was the lowest ever, 252 fatalities. What is clear, however, is that the increase between 2017 and 2018 is the biggest relative change between two consecutive years since 1970 – and that cannot be explained by random statistical variation.

The analysis group notes that most of the indicators do not show the required progress for reaching the 2020 interim target for fatalities. Progress for these indicators has more or less stagnated over a number of years, and the gap to the required trend has grown. Our assessment is that the stagnation of these indicators is the likely explanation for the levelling off in the number of fatalities between 2013 and 2017. It cannot, however, explain the big increase in the number of fatalities from 2017 to 2018.

On the basis of the current trend for the number of fatalities and for the other indicators, the analysis group's assessment is that the 2020 interim target for the number of fatalities will not, in all likelihood, be achieved. This notwithstanding, it remains crucial to keep working indefatigably to reduce the number of fatalities.

A more detailed analysis of the increase in fatalities between 2017 and 2018 shows that the increase occurred exclusively in the national road network. The increase was most marked for motorists in head-on and overtaking accidents, as well as in rear-end, turning, and side-impact accidents on roads with speed limit between 70 and 90 km/h. Heavy vehicles were often involved in these accidents. Under Vision Zero, speed limits are to be set such that the combined crash protection characteristics of the road and the passenger car prevent fatalities or severe injuries if an accident happens. However, an analysis of the Swedish Transport Administration's in-depth studies shows that in just over half of fatal accidents with passenger cars on these roads, the impact severity is too great for there to be any chance of surviving the accident. In these accidents, road users are judged to have done their best to comply with applicable rules. This suggests that even speed limits of 70 and 80 km/h are too high for many roads, in relation to the combined crash protection characteristics of the vehicle and the road. Further measures therefore need to be taken in the infrastructure-vehicle system to reduce the consequences of accidents as well as reduce the risk of accidents happening. Yet it also remains essential to increase speed limit compliance significantly, and this can be facilitated by technical assistance systems in the vehicles, for example.

Police surveillance has considerable significance for progress in some of the most important indicators, including speed, sobriety and seat belt use. We see no improvement for the speed and sober drivers indicators. Seat belt use does show some progress, but there are still far too many of those killed in older cars who were not wearing a seat belt. It is therefore likely

that reductions in police resources for manual traffic surveillance have contributed to this negative trend, bearing in mind that the risk of getting caught is essential for rule compliance.

The indicator for the share of the traffic volume on roads with speed limits above 80 km/h equipped with median barriers has shown progress in line with the required trend for just about the entire period from 2007 to 2015. However, this trend has stagnated in the last few years, and in 2018 almost a quarter of the total traffic volume was on roads with speed limits of 90 km/h or more and no median barriers. It is worth noting in this context that these roads currently have a total length of 11,000 km. The speed limit review initiated by the Swedish Transport Administration for the purpose of lowering speed limits in parts of the national road network from 90 to 80 km/h was interrupted in 2018. The reason was that some sections where the speed limit had been lowered became the subject of an appeal at the government level. The government granted the appeals, which led the Swedish Transport Administration to postpone speed limit reductions which had been planned for 2018 on other sections of road. Adaptation of speed limits is set to continue, however, with a major effort in 2019.

The indicator for the share of the traffic volume that featured passenger cars with the highest Euro NCAP safety rating for the car occupants has progressed steadily and is well in line with the required trend towards 2020. In 2018, 30 per cent of all passenger car occupant fatalities occurred in cars of model year 2000 or older. This was despite the fact that older cars represent only about 1 per cent of the total traffic volume. Estimates indicate that at least 30 lives could be saved every year if passenger cars older than model year 2000 were replaced by passenger cars of model year 2013 or younger.

Just over half of all motorcycle fatalities are connected with one or several serious, conscious offences. At the present time there are no ready strategies for adapting the road transport system to make it a safe system for motorcycles. Recent research indicates that even at such low speeds as 50 km/h, the risk of severe and fatal injuries is high for motorcyclists in the event of a collision. It is therefore even more important, in the short term, to increase rule compliance among motorcyclists than among other road user categories. The single parameter that could best indicate rule compliance among motorcyclists is compliance with speed limits. Speed measurements from 2018 showed that the share of motorcyclists driving within speed limits on national roads was around 44 per cent, and that the corresponding share for cars was similar, just over 46 per cent. Around 7 per cent of the motorcycle traffic volume on national roads in 2018 was more than 30 km/h above the speed limit, which is a reduction by about a percentage point compared with 2016.

The number of severely injured in 2018 is estimated at 4,200. This amounts to an average reduction of 22 per cent from the 2006-2008 period until 2018. Despite some tendency to stagnation over the last few years, the analysis group's assessment is that 2018 is in line with the required trend.

Cyclists and motorists still represent about 80 per cent of all severe road injuries. The number of severely injured motorists continues to decline, and there is reason to believe that this trend will continue, in great part due to safer cars. The number of injured cyclists, however, has not improved to any notable extent, and continues to be around 2,000.

In order to reduce these injuries, road operators have to provide good maintenance of pedestrian and cycle paths in the short term. The indicator is currently measured by means of a survey of major municipalities about what requirements apply, and with what quality assurance. The most recent measurement, in 2017/2018, indicated that 36 per cent were of good quality. The 2020 target is 70 per cent. There are no measurements at the national level that indicate how well maintenance is done in the field. In the longer term, increased attention will also have to be paid to the needs of unprotected road users in terms of infrastructure design. Helmet use among cyclists also needs to increase, as does the use of other protective gear. The national road operator also has an important responsibility for infrastructure and maintenance. Speed regulated pedestrian, cycle and moped passages are another area it is important to focus on.

In summary, the analysis group's assessment is that there are too many indicators which are not in line with the required trend. The gap between these and the required trend is growing, and considering the time left until 2020 it is therefore highly unlikely that the interim target for the number of fatalities will be reached. However, the outcome for the number of severely injured is in line with the required trend. The stagnation in the trends for the indicators suggests that the stakeholders involved in road safety work are not applying sufficient measures. As part of its remit to manage overall collaboration in road safety work, the Swedish Transport Administration has drawn up an action plan for safe road traffic for the 2019–2022 period, together with the affected government agencies and stakeholders. This plan comprises 111 measures intended to lead to increased road safety, of which a number in the priority action areas right speed, sober drivers and safe cycling. If the measures described in the action plan are fully implemented, they are estimated to contribute to a reduction in fatalities of about 40–50 per year after 2022.

Despite the fact that we have a good overall picture of the road safety problem, and knowledge of effective measures that can be applied, such measures are not being implemented to a sufficient extent. It will therefore be increasingly important to analyse and understand the motive forces behind stakeholders' inclination and possibilities for undertaking effective road safety measures. Currently, Swedish road safety work is based on management by objectives, where different stakeholders participate and contribute voluntarily. In 2019 the Swedish Transport Administration will be carrying out an evaluation of the management by objectives programme to learn what its effects are and how it can be improved.

In conclusion, the analysis group notes that large parts of the road traffic system are still not dimensioned and designed on the basis of the physical and mental abilities and shortcomings of people. Nor are the safety levels of vehicles or infrastructure able to protect people sufficiently at the speeds we allow in the road traffic system. We have to adapt speed levels to the existing safety level of the system, while at the same time increasing compliance with speed limits. There are two ways of achieving this. One is to invest in the safety level of the system (vehicles and infrastructure) in order to achieve the level of accessibility we wish to have. The other is to lower speed limits and ensure a high level of compliance with them.



References

- Berkow J, Månsson T. (2019) Trafiksäkerhet – Resultat från trafiksäkerhetsenkäten 2018. Trafikverket publikation 2018:244.
- Berg H-Y, Ifver J, Hasselberg M. (2016) Public health consequences of road traffic injuries – Estimation of seriously injured persons based on risk for permanent medical impairment. *Transportation Research Part F* 38, 1–6.
- Cicchino J. (2017) Effectiveness of Forward Collision Warning Systems with and without Autonomous Emergency Braking in reducing police-reported crash rates. *Accident Analysis and Prevention* 2017; 99:142-152
- Ding C, Rizzi M, Strandroth J, Sander U, Lubbe N. (2019) Motorcyclist injury risk as a function of real-life crash speed and other contributing factors. *Accident Analysis and Prevention* 2019 Feb;123:374-386
- Elvik R. (2013) Corrigendum to: "Publication bias and time-trend bias in meta-analysis of bicycle helmet efficacy: a re-analysis of Attewell, Glase and McFadden, 2001" [*Accident Analysis and Prevention* 43 (2011) 1245-1251]. *Accident Analysis and Prevention*, 60, 245-253.
- Engström E. (2018) Yrkestrafikens hastighetsefterlevnad 2018 och effekten av certifiering enligt Ledningssystemstandarden för vägtrafiksäkerhet ISO 39001. *Folksam* 2018.
- Forsman Å. (2011) Rattfylleriets utveckling – mätserie baserad på data från polisens övervakning. VTI. Dnr: 2010/0543-22
- Forsman Å, Eriksson O, Eriksson J. (2016) Prognosintervall för antal allvarligt skadade i vägtrafikolyckor. VTI notat 21-2016.
- Fredlund T. (2016) Minskad sjukvårdsregistrering i Strada år 2015. Transportstyrelsen, TSV 2016- 4905.
- Goteborgs Stad (2019) Trafik- och resandeutveckling 2018. Tillgänglig [2019-04-11]: http://forlivochrorelse.se/wp-content/uploads/2019/03/TRU_2018.pdf.
- Hasselberg M, Kirsebom M, Bäckström J, Berg H-Y, Rissanen R. (2018) I did NOT feel like this at all before the accident: do men and women report different health and life consequences of a road traffic injury? *Injury Prevention* 2018; 0:1-6.
- IRTAD (2015) Why Does Road Safety Improve When Economic Times Are Hard? IRTAD report.
- Kröyer H, Jonsson T, Varhelyi A. (2014) Relative fatality risk curve to describe the effect of change in the impact speed on fatality risk of pedestrians struck by a motor vehicle. *Accident Analysis and Prevention*, 62, 143-152.
- NTF (2019) Användning av cykel- och mopedhjälm 2018. NTF rapport 2018:7
- Ohlin M, Berg H-Y, Lie A, Algurén B. (2017a) Long-term problems influencing health-related quality of life after road traffic injury – differences between bicyclists and car occupants. *Journal of Transport & Health* 2017; 4:180-190
- Ohlin M, Strandroth J, Tingvall C. (2017b) The combined effect of vehicle frontal design, speed reduction, autonomous emergency braking and helmet use in reducing real life bicycle injuries. *Safety Science*, 92, 338-344.

- Olivier J, Creighton P. (2017) Bicycle injuries and helmet use: a systematic review and meta-analysis. *Int J Epidemiol*, 46(1), 278-292.
- Olivier J, Esmaeilikia M, Grzebieta R. (2018) Bicycle Helmets: Systematic Reviews on Legislation, Effects of Legislation on Cycling Exposure, and Risk Compensation. University of New South Wales, Sydney.
- Rissanen R, Berg H-Y, Hasselberg M. (2017) Quality of life following road traffic injury: a systematic literature review. *Accident Analysis and Prevention* 2017; 108:308-320
- Rizzi M, Stigson H, Krafft M. (2013) Cyclist Injuries Leading to Permanent Medical Impairment in Sweden and the Effect of Bicycle Helmets, IRCOBI Conference 2013.
- Rizzi M, Kullgren A, Tingvall C. (2014) Injury crash reduction of low speed Autonomous Emergency Braking (AEB) on passenger cars. IRCOBI Conference 2014.
- Sternlund S, Strandroth J, Rizzi M, Lie A, Tingvall C. (2017) The effectiveness of lane departure warning systems – a reduction in real-world passenger car injury crashes. *Traffic Injury Prevention* 2017, 18(2):225-229.
- Stigson H, Krafft M, Kullgren A, Rizzi M. (2012) Grönt ljus. Kan en säkrare trafik uppnås med hjälp av ISA (Intelligent stöd för anpassning av hastighet) kopplad till en bonusgrundad bilförsäkring? Folksam Forskning.
- Trafikanalys (2011) Vägtrafikskador 2010. Publikation 2011:15.
- Trafikanalys (2017) Sänkt bashastighet i tätort. Publikation 2017:16.
- Trafikverket (2012) Översyn av etappmål och indikatorer för säkerhet på väg mellan år 2010 och 2020. Publikation 2012:124.
- Trafikverket (2014) Vilka dödsfall i vägtrafiken är suicid? Metodbeskrivning samt analys av åren 2010-2013. Publikation 2014:113.
- Trafikverket (2016) Ökad säkerhet på motorcykel och moped. Gemensam strategi version 3.0 för åren 2016–2020. Publikation 2016:032.
- Trafikverket, Transportstyrelsen (2016) Ökad översyn av etappmål för säkerhet på väg. Publikation 2016:109.
- Trafikverket (2017) Förbereda för ett införande av anläggningar för nykterhetskontroller i vissa hamnar. Redovisning av ett regeringsuppdrag. Ärendenummer: TRV2016:38117.
- Trafikverket (2018) Gemensam inriktning för säker trafik med cykel och moped. Publikation 2018:159.
- Trafikverket (2018) Cykelhjälsanvändningen i Sverige 1988-2017. Publikation 2018:178.
- Vadeby A, Forsman Å, Ekström C. (2017) Trafiksäkerhetseffekter av sänkt bashastighet i tätort till 40 km/tim. VTI rapport 954.
- Vadeby, A. och Anund, A. (2019) Hastigheter på kommunala gator i tätort. Resultat från mätningar 2018. VTI rapport 1001.
- Vägverket (2008) Målstyrning av trafiksäkerhetsarbetet – Aktörssamverkan mot nya etappmål år 2020. Publikation 2008:31.

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Swedish Transport Administration,
781 89 Borlänge. Street address: Röda vägen 1.
Telephone: +46-771-921 921. Text telephone: +46-10-123 50 00.

www.trafikverket.se

