European Road Safety Observatory

Road safety thematic report

Speeding

European Commission

2020

This document is part of a series of 21 qualitative analyses on road safety topics. The purpose of these thematic reports is to give road safety practitioners an overview of the most important research questions and results on the topic in question. The level of detail is intermediate, keeping the total length under 10 pages (excluding references). More detailed overview papers or reports are suggested for further information. Each road safety thematic report has a 1-page summary.

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Contents

Summary

Speeding in road traffic

Driving at excessive or inappropriate speed is a major threat to safety on the road. It is estimated that 10 to 15% of all crashes and 30% of all fatal crashes are the direct result of speeding or inappropriate speed. The faster someone is driving, the higher the risk of a crash, but also the higher the severity of the crash and the probability that the crash is fatal. Another important factor influencing the crash risk are differences in vehicle speed. The less the speeds of vehicles differ from each other, the lower the risk of a crash.

The main factors affecting the impact of speed-related crashes are: the design of the road, the safety systems in vehicles, differences in mass between the colliding vehicles/ road users, and the vulnerability of the road users. The probability that a vulnerable road user (pedestrian, cyclist, motorcyclist) will die in a collision with a passenger car or truck is much higher than that for the occupants of a vehicle. This is one of the main arguments in favour of the introduction of low speed zones in densely populated areas.

Speed limits are frequently exceeded by many car drivers. 67% of Europeans admit to having speeded on rural roads over the previous 30 days. There are five main reasons why people drive too fast: (1) matching the speed of surrounding traffic; (2) being in a hurry; (3) enjoying driving fast; (4) out of boredom; and (5) being unaware of driving too fast. Speeding is socially more accepted than other traffic code violations such as drunk driving.

Countermeasures

Measures against (excessive) speed are possible and necessary in several areas:

- determination of appropriate speed limits
- adequate design of road infrastructure
- enforcement of speed limits
- education and awareness
- vehicle technology.

Structural improvement of speeding behaviour requires a combination of measures. Speed limits should be based on the principle of injury minimization. They will depend on the traffic situation, such as the interactions and possible conflicts between different road users, and on the design of the roads (e.g. curvature of the road, presence of a median barrier). Speed limits should be credible for drivers – not perceived as too low or too high – and infrastructural characteristics (e.g. curvature, width, presence of hard shoulder) should reinforce this credibility, otherwise speed limits will not be observed.

Enforcement of speed limits by speed detection systems has been shown to be effective in reducing crash and injury risks, in particular section control systems. Speeding can also be prevented by education of young people and by awareness campaigns, in particular when combined with other measures. Safety systems in cars (such as intelligent speed assistance systems) can prevent people from speeding or reduce the severity of a crash.

Highlights

- About 30% of road fatalities are caused by excessive or inappropriate speed.
- 67% of Europeans admit to having speeded on rural roads over the previous 30 days.
- A pedestrian who is hit by a car travelling at 65km/h is four times more likely to be killed compared with a car travelling at 50km/h.
- Cutting the average speed by 1 km/h on all roads across the EU would save more than 2000 lives per year.

1 What is the problem?

1.1 What is speeding ?

Traditionally, two types of speed are considered problematic for road safety:

- **Excessive** speed: driving at a speed higher than the maximum allowed;
- **Inappropriate** speed: driving at too high a speed given the traffic situation, infrastructure, weather conditions, and/or other special circumstances.

In contrast to excessive speed, inappropriate speed is to some extent subjective. Driving at excessive or inappropriate speed is called 'speeding'.

Internationally, the following indicators are often used in analysing traffic speed (Aigner Breuss, Braun, Eichhorn, & Kaiser, 2017): (1) speed limit; (2) average speed of the traffic; (3) speed below which 85% of the drivers drive ("V85"); and (4) speed dispersion (range).

The focus of this thematic report is on speeding by car and van drivers (other vehicles are discussed in other thematic reports of the European Road Safety Observatory).

1.2 What share of road crashes is attributable to speeding?

In general, expert literature agrees that an estimated 10 to 15% of all road crashes and 30% of fatal injury crashes are the direct result of excessive or inappropriate speed (Adminaité-Fodor & Jost, 2019; OECD/ECMT, 2006; Trotta, 2016). Often however, speed is not the main cause but a contributing or aggravating factor. There are no good estimates of the percentage of crashes where this is the case.

1.3 What is the effect of increased speed on road safety?

As a key risk factor in road traffic, driving speed is associated with the number of crashes as well as with the severity of crashes (IRTAD, 2018; SWOV, 2012) . There are several reasons why crash risks increase with speed:

- A driver driving at high speed has less time to react to an unexpected event than when driving at moderate speed. Although the reaction time remains the same, the distance covered before a driver reacts is greater at high speed.
- At higher speeds, the braking distance will increase because it is proportional to the square of the speed.

- When a vehicle approaches at higher speed, there is less time left for other road users to avoid a collision. At excessive speed, other road users often overestimate the time they have to react.
- The drivers' field of vision narrows as they drive faster. At 130 km/h, the driver has only an angle of about 30°, which means that drivers are able to estimate far fewer potential hazards (OECD/ECMT, 2006).

Figure 1 shows the relationship between speed change and change in crash risk for injury crashes and fatal crashes. This figure illustrates that a speed increase of 10 km/h leads to a fatal crash risk that is 220% of the original one, which means that the risk has more than doubled. The increase in risk is higher for fatal injuries (see also 1.5).

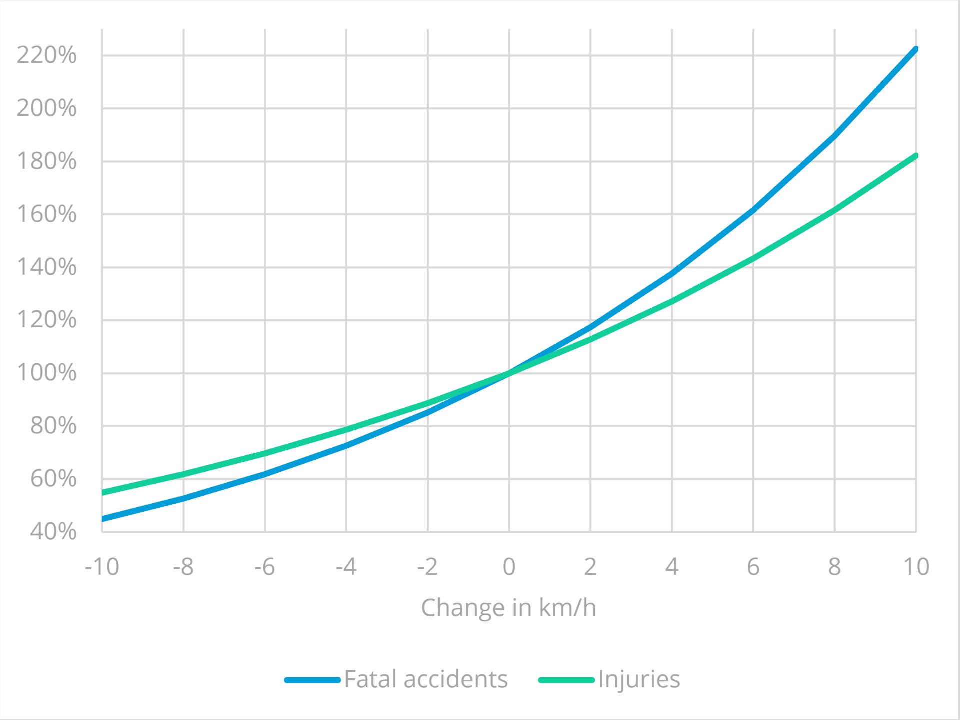

Figure 1. Relationship between speed change and crash rate
Source: Van den Berghe & Pelssers (2020) based on coefficients of exponential model in Elvik et al. (2019)

The European Transport Research Council (ETSC) estimates that reducing the average speed by 1 km/h on all roads across the EU would save over 2000 lives per year (Adminaité-Fodor & Jost, 2019). Another example comes from the World Health Organisation: a pedestrian who is hit by a car travelling at 65km/h is four times more likely to be killed compared with a car travelling at 50km/h (WHO, 2018).

1.4 What is the impact of speed differences in traffic on road safety?

In addition to speed in absolute terms, the difference in speed (or variation) also has an influence on the crash rate. Speed differences result in more encounters with other road users and also in more lane-changing and overtaking manoeuvres; this increases the risk of crashes (Aarts & Van Schagen, 2006; Elvik, Christensen, & Amundsen, 2004; Hauer, 1971).

Kloeden et al. (2002; 2001) found an increase in the crash rate among motorists driving faster than average, especially in an urban environment. Quddus (2013) even found that for highways in and around London the differences in vehicle speeds were strongly associated with the number of crashes. An increase of 1% in the speed distribution - at the same average speed - increased the number of crashes by 0.3%.

1.5 What is the impact of speed on crash severity?

Speed does not only have an impact on crash risk, but also on crash severity. For occupants of modern passenger cars (with crumple zone, airbags and seatbelts), the risk of being fatally injured is low below 50 km/h and very high from 100 km/h onwards (Elvik, 2009). In this context, 'speed' is defined as the vehicle's impact speed at the time of the collision, not the speed limit or the speed driven before the collision.

Most experts explain this phenomenon by referring to the absorption of the kinetic energy of the vehicle. However, Stipdonk (2019) has pointed out that the force on the body results from the 'amount of movement' of the body, which in turn is proportional to the square of its velocity. This explains that even if vehicles have a perfect crumple zone that absorbs virtually all kinetic energy, they still cannot prevent occupants from being killed when speeds are high. It is not the energy dissipation that poses the danger, but the deceleration, the thrust and the force on the body during the collision.

In a collision between a car and a vulnerable road user (VRU) - pedestrians, cyclists, and drivers of powered two-wheelers – the risk of serious injury to VRUs is much higher than for the car occupants. After all, the VRUs are not protected by a vehicle with crumple zones, airbags and seatbelts.

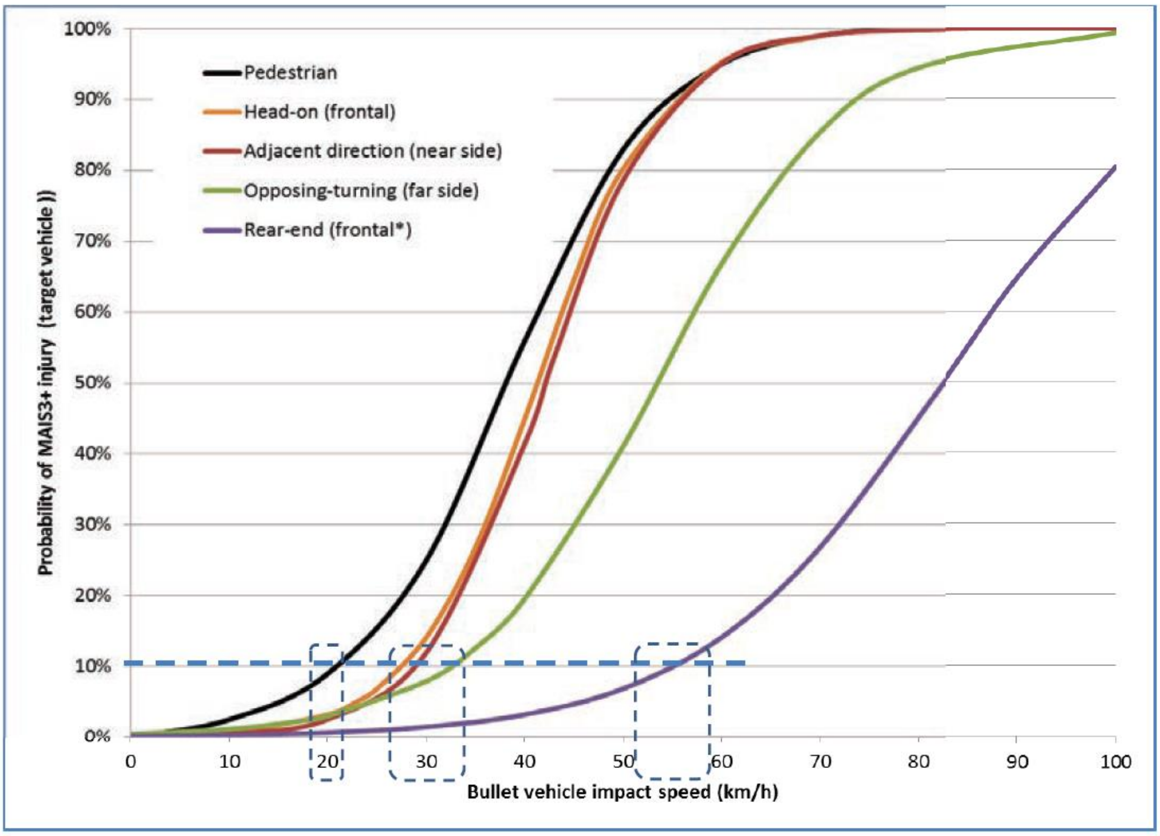

Figure 2. Relationship between the impact speed of a vehicle and the probability that the road crash is severe (MAIS3+) for different types of crashes. *Source: Jurewicz et al. (2016)*

At an impact speed of 70 km/h the risk of *fatal injury* is 16% for a car occupant, and twice as high (38%) for a pedestrian; at 80 km/h, this probability increases to 33% for car occupants and 61% for pedestrians (Elvik, 2009).

Jurewicz et al. (2016) mapped the probability of a *serious crash* (injury level MAIS3+) for five common collision types: car-pedestrian collisions, frontal collisions, lateral collisions (same direction of travel), collisions with oncoming traffic when turning off, and rear-end collisions. The results are shown in Figure 2. The authors concluded from this that the critical impact speed for serious injuries is 20 km/h for pedestrian collisions, 55 km/h for rear-end collisions and 30 km/h for most other types of passenger car collisions.

Based on in-depth research of crashes in France it was found that the mortality risk of pedestrians when hit by a car was low (about 1%) at an impact speed of 30 km/h, but increased by a factor of 2 at 40 km/h, a factor of 6 at 50 km/h, a factor of 18 at 60 km/h, and a factor of 59 at 70 km/h (Martin & Wu, 2018).

1.6 What factors influence the impact of speed on crashes?

Several factors influence the effects of speed and speeding on road safety:

- **Road design characteristics**. Speed is not equally dangerous everywhere. Driving 100 km/h on a motorway designed for high speeds is less risky than driving the same speed on a curvy rural road. But for any given location, the risk of road crashes and their severity increases if the average speed increases (and the other conditions are unchanged) (Aarts & Van Schagen, 2006).
- **Safety systems in vehicles**. Most cars are equipped with a range of safety systems (crumple zones, ABS (automatic braking system), ESC (electronic stability control), seatbelts, airbags) and increasingly also with intelligent safety systems such as EBS (electronic braking system) and ADAS systems (speed warning, ISA (intelligent speed assistance), ACC (adaptive cruise control) that can prevent cars crashing when driving at high speeds, or reduce the effects of crashes.
- **Differences in mass**. In the event of a collision between two vehicles, occupants of the lighter vehicle are significantly worse off than occupants of the heavier vehicle. Mass differences are obvious when we look at trucks and buses on the one hand and passenger cars on the other, but there are also large differences in mass within passenger cars: the mass of a large SUV can be three times higher as that of a small city car. The mass differences in a collision between a motor vehicle and an unprotected and therefore vulnerable cyclist or pedestrian are of an entirely different order. In such cases the masses differ from a factor of 10 (light cars) to almost 700 (for trucks of 50 tons). The survival chance of vulnerable road users drops dramatically with increasing differences in mass.
- **Vulnerability**. Older road users are physically more vulnerable than young road users. Their chance of surviving a crash as a pedestrian or cyclist at a similar impact speed is therefore considerably smaller than for younger people.

2 How many people speed and why?

2.1 What is the prevalence of speeding in traffic?

In 2014 ETSC published an overview of national studies on speeding in Europe (ETSC, 2014). It showed that approximately 30% of drivers exceed the speed limit on motorways, and that more than 70% drive too fast outside built-up areas and 80% inside built-up areas. In most countries, there is a trend for the average speed on motorways to decrease. This decrease is much smaller in urban areas. ETSC concluded in a recent survey study (Adminaité-Fodor & Jost, 2019) that in urban areas, 35% to 75% of Europeans do not observe the speed limit. This is also the case with between 9% and 63% of drivers outside built-up areas and between 23% and 59% of drivers on motorways.

ESRA survey results (Holocher & Holte, 2019; www.esranet.eu) showed that in 2018, 56% of European car drivers indicated that they had deliberately driven faster than the speed limit in built-up areas at least once in the previous month (67% on rural roads and 62% on motorways). The differences between countries are displayed in Figure 3.

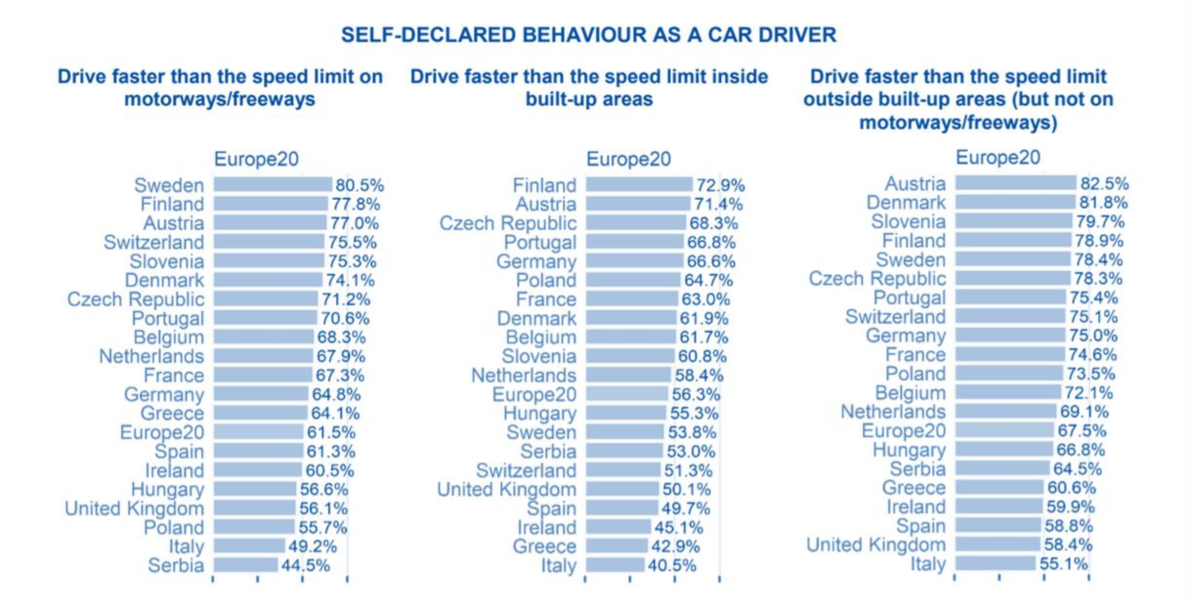

Figure 3. Self-declared speeding behaviour of car drivers (at least once over the previous 30 days)
Source: Holocher & Holte, 2019

2.2 Who is speeding most?

Although excess and inappropriate speed are widespread phenomena, there are differences between drivers. Young people generally drive faster than older drivers; men generally drive faster than women; drivers who travel for work generally drive faster than drivers who travel for other reasons (Holocher & Holte, 2019; Webster & Wells, 2000; Yannis, Laiou, Theofilatos, & Dragomanovits, 2016).

2.3 Why do people speed?

Most people do not speed all the time. The main reasons for observing speed limits are, according to a Dutch survey (Duijm, de Kraker, Schalkwijk, Boekwijt, & Zandvliet, 2012) concerns for road safety, the willingness to obey the law, and the risk of a fine.

However, many people speed occasionally and some are speeding very regularly. Various studies, e.g. Elvik et al. (2004) show that there are five main reasons why people drive too fast: (1) matching the speed of surrounding traffic; (2) being in a hurry; (3) enjoying driving fast; (4) out of boredom; and (5) being unaware that they are driving too fast.

Åberg, Larsen, Glad, & Bellinson (1997) pointed out that most drivers want to drive at the same speed as the other drivers on the road. They also noted that drivers often overestimate the speed of these other drivers. This may therefore partially explain the number of speeding violations. As with other traffic behaviours, the social norm (individual perception of how other people behave or think they should behave) is therefore very important in speeding offences. Speeding among young men is often associated with a general positive attitude towards taking risks and seeking sensation (Goldenbeld & van Schagen, 2007).

Not knowing to be speeding happens when drivers do not know how fast they are allowed to drive or how fast they are actually driving. According to Haglund & Åberg, (2000) many drivers prefer to rely on subjective assessment of their speed rather than looking at their speedometer and they often tend to underestimate their speed, in particular when driving for a long period of time (DaCoTA, 2012).

Surveys have shown that speeding is more socially accepted than other traffic violations (see for instance Meesmann et al., 2017). ESRA2 results show that 14% of European car drivers think it acceptable to drive faster than the speed limit on motorways, 11% to exceed the speed limit on rural roads and 5% in built-up areas (Holocher & Holte, 2019). It is interesting to note that these figures are much lower than the numbers who admit to speeding: so even when speeding is regarded as not acceptable, people nevertheless speed regularly.

The morphology of roads and vehicle characteristics also impact on the speeds driven. If the speed limit does not match the impression given by a certain road infrastructure, the speed limit will be considered as not credible and therefore not observed by some drivers. Also, drivers of powerful, comfortable, and higher vehicles tend to drive faster than drivers of other cars (DaCoTA, 2012).

3 Which measures help against speeding?

In the Stockholm Declaration on road safety (Ministerial Conference on Road Safety, 2020) paragraph 11 stresses the need for speed limits and law enforcement to prevent speeding. The declaration states: *"Focus on speed management, including the strengthening of law enforcement to prevent speeding and mandate a maximum road travel speed of 30 km/h in areas where vulnerable road users and vehicles mix in a frequent and planned manner, except where strong evidence exists that higher speeds are safe,* *noting that efforts to reduce speed in general will have a beneficial impact on air quality and climate change as well as being vital to reduce road traffic deaths and injuries;"*

Measures against (excessive) speed are possible and necessary in several areas: determination of appropriate speed limits; adequate design of road infrastructure; enforcement of speed limits; education and awareness; and vehicle technology. Structural improvement of speeding behaviour requires a combination of measures.

3.1 Speed limits

Setting speed limits on roads is a crucial step within a speed policy. The limit must be a balancing act between considerations of safety, mobility, impact on the environment, and the quality of life of local residents (OECD/ECMT, 2006). Historically, it was customary to set a speed limit by measuring an 85th percentile of the speed on a road (or V85, the speed not exceeded by 85% of the drivers) and to consider this as a good indication of a speed limit to be imposed (OECD/ECMT, 2006). However, many behavioural observations, attention measurements, and the high number of traffic crashes caused by excessive speed have shown that one cannot always rely on the judgement of drivers to set a suitable speed limit.

This is why other approaches have emerged for determining the correct speed limit in order to minimise injuries. One of those approaches is "Sustainable Safety". This is a concept that originated in the Netherlands. Table 1 shows the maximum speeds that are included in the original Sustainable Safety concept. These limits were determined on the basis of analyses of the seriousness of accidents, collision investigations, and thinking developed in the Swedish Vision Zero road safety strategy (Tingvall & Haworth, 1999). A more detailed set of recommended speed limits can be found in Van Schagen & Aarts (2018).

Table 1. Maximum speed limit for different traffic situations

Road types in combination with permitted road users	Safe speed (km/h)
Roads with possible conflicts between cars and unprotected road users	30
Intersections with possible cross conflicts between cars	50
Roads with possible frontal conflicts between cars	70
Roads where frontal or lateral conflicts with other road users are impossible.	≥100

Source: Tingvall & Haworth, 1999; Wegman & Aarts, 2005.

Numerous studies have shown that when speed limits are decreased, the average speed also decreases which in turn leads to a reduction of the number of casualties (Elvik, 2019), (IRTAD, 2018). An example of a recent successful speed limit initiative at national level is the reduction of the speed limit from 90 km/h to 80 km/h on rural roads in France. An evaluation has shown that this measure has spared 349 lives during the first 20 months of the measure (CEREMA, 2020). An increasing number of cities in Europe have implemented a 30km/h zone in the city centre (including Munich, Helsinki, Bilbao, Brussels, Madrid and Grenoble). In Toronto (Canada), a 67 percent reduction in pedestrian fatalities was observed on streets where the speed limit was reduced from 40 to 30 km/h. (Fridman et al., 2020)

3.2 Design of road infrastructure

Ideally, road infrastructure should ensure that roads are 'readable', so that road users understand how fast they are supposed to drive. Much of this has to do with road categorization. Each road category should be recognisable by means of particular infrastructural features, so that drivers know which type of road they are on and, hence, what speed is suitable/allowed. Within the Sustainable Safety concept, three types of roads are distinguished (Van Schagen & Aarts, 2018):

- **Through roads**: roads intended for handling high capacity traffic at high speed (100-130 km/h). Slow traffic is not allowed on these roads. The carriageways are also physically separated from each other.
- **Distributor roads**: roads connecting the 'through roads" and the 'access roads'. The speed is set at 80 km/h outside built-up areas and 70 or 50 km/h inside built-up areas. Slow and fast traffic must be separated from each other.
- **Access roads**: this type of road is considered the lowest category within Sustainable Safety. These roads should provide access to residential areas, business parks, etc. The speed is set at 30 km/h inside built-up areas and 60 km/h outside built-up areas. Since the residential function is paramount on these roads, additional speed reduction measures are often in place on these types of roads.

Road authorities can set local restrictions on speed that take account of the configuration of the roads and/or dangerous traffic situations. Dynamic speed limits (which take into account real-time traffic conditions, the weather, or pollution) can also strengthen the credibility of speed limits. It is also important to inform drivers regularly about the speed limits, by road signs and by real-time messaging on the road or in vehicles.

Speed limits must be credible to drivers. In the Netherlands, SWOV has developed the 'credible speed limits' concept (Aarts, Van Nes, Wegman, Van Schagen, & Louwerse, 2009). The idea is that the speed limit set on a certain road section should not be perceived as being too high or too low. The credibility of low speed limits can be increased by infrastructural measures such as road narrowing, axis offsets, green-wave traffic light control, roundabouts, and speed bumps.

3.3 Enforcement of speed limits

Carrying out checks on compliance with speed regulations deters at different levels. On the one hand, a fine will discourage drivers from committing the same offence again. On the other hand, drivers who have not yet been fined will also tend to slow down when they feel the chance of being caught is high. The subjective chance of being caught depends not only on the actual number of checks, but also and especially on drivers' perception of the presence of checks.

Furthermore, the way speed enforcement is carried out appears to have an impact on its acceptability. For example, experts (Delaney, Ward, Cameron, & Williams, 2005; OECD/ECMT, 2006; SafetyNet, 2009) recommend that checks are carried out on roads where, and at times when speed has an important negative impact on road safety. Ideally, speed enforcement should be based on a thorough analysis of traffic crashes and the role of speed. However, the OECD also stresses that other avenues should not be overlooked (OECD/ECMT, 2006). If speed checks are carried out at certain points only, the expectation of being caught may be reduced. Drivers should be made aware that speed limits must be observed at all times and everywhere and not only in dangerous places where more crashes occur.

Most studies confirm that radar controls have a positive influence on the speed being driven and on crash incidence. Estimated reductions of crashes range between 5% and 69% (Pilkington & Kinra, 2005). The preventive effects are generally greater for more serious crashes. Even greater effects result from the application of section control, in which the average speed over a road segment is measured (De Ceunynck, 2017; Pilkington & Kinra, 2005). A meta-analysis (Høye, 2014) shows that fixed speed cameras reduce the number of crashes on road sections on average by about 20%, while the average effect for section controls is 30%.

The effectiveness of checks also depends on the follow-up to the infringement. It is important that each recorded violation is followed by a fine (Goldenbeld, Jayet, Fuller, & Mäkinen, 1999). Otherwise, the effectiveness and credibility of the controls will be reduced. The detection equipment is often set in such a way that there is a margin of tolerance with regard to the speed limit. The use of such margins of tolerance serves to filter out minor, accidental violations and to deal with the possible unreliability of the equipment. A disadvantage of this approach is, however, that it strengthens drivers' opinion that a minor offence is not so serious.

Figure 4 displays the number of yearly speeding tickets from 20 different countries. By far the most speeding tickets per thousand inhabitants were issued in Austria (592) and the Netherlands (457), followed by Belgium (299) and France (259).

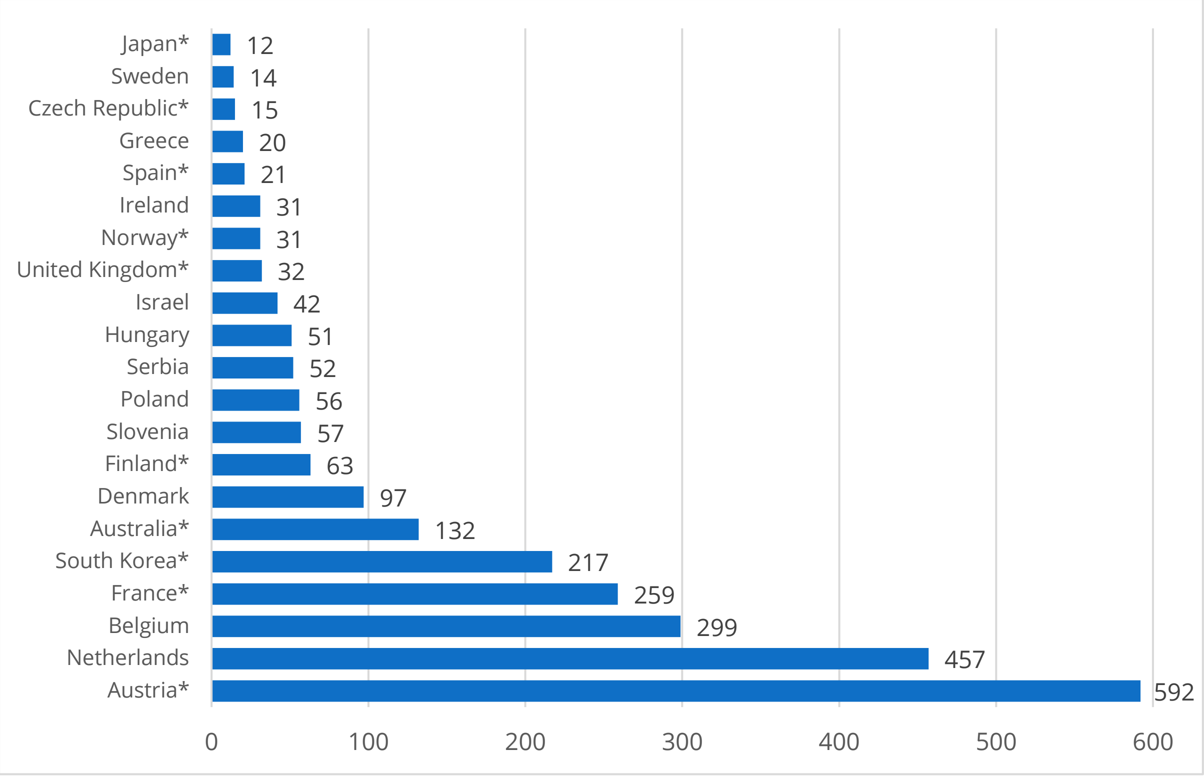

Figure 4. Number of speeding tickets per 1000 inhabitants in 2017 (Holocher & Holte, 2019) – Data based on ETSC (2019) and on an experts survey by ESRA (marked with *)

3.4 Education and communication

Young people exhibit the strongest tendency for risky behaviour and are the most important target group for awareness-raising about the effects of speed. While this could begin as early as secondary school, it should certainly be addressed during driver education. Additional courses could be added, e.g. in the context of continued driver training. Training should focus on recognising dangerous situations, ways to avoid them, and driver limitations (OECD/ECMT, 2006). Another important target group for educational measures are people who have committed serious speed offences. Training courses can be proposed or imposed by the courts as an alternative or additional penalty.

Awareness-raising campaigns are organised in almost all countries to alert road users to the dangers in traffic and to encourage them not to behave in a risky way. Recent synthesis studies indicate that campaigns aimed at reducing speed can have the desired effects (Philips, Ulleberg, & Vaa, 2009; Pilgerstorfer & Eichhorn, 2017). However, various studies indicate that awareness campaigns work much better (or even only) in combination with additional measures such as enforcement, rewards, legislation, or education (Delhomme, De Dobbeleer, Forward, & Simoes, 2009).

Companies can also raise awareness about speed. Employees who make trips for work sometimes appear to be more inclined to drive faster than when they are driving for other reasons. In some cases, those responsible within companies themselves also need to be made aware so as not to impose undue time pressure on their employees which may force them to drive too fast.

3.5 Safety technology

There are several technological tools that can help drivers not to exceed the speed limit. First of all, drivers can access information about the current speed limit via devices in their vehicle (such as a GPS or smartphone). However, such systems do not always take into account dynamic speed limits or temporary arrangements, and therefore carry the risk that they may overstate the speed limit in some places. There is also a risk that the speed limits in these systems are no longer up to date.

There are various technical possibilities that can help drivers comply with the legal limits. The speed limiter and the Cruise Control which most new cars are equipped with can ensure that drivers do not drive unconsciously faster than the permitted speed limit. However, such systems can also be used to set a maximum speed above the maximum permitted speed. While there are currently no regulations regarding speed limiters in cars, there are for trucks and buses. The speed of trucks (>3.5 tonnes) and buses is limited to 90 km/h. For recent coaches this limit is 100 km/h.

Distance and time headways between vehicles are important factors for both total traffic flow and safety on certain road segments. Short headway distances and small time differences between vehicles in front of them affect safety performance, as there may not be enough time to stop or avoid another vehicle in case of an emergency. Adaptive Cruise Control (ACC) systems (Reed, 2017) can help prevent short tracking distances by monitoring and maintaining a safe tracking distance to a vehicle ahead by automatically adjusting the vehicle speed. This is especially useful in stable driving conditions, such as on highways and other high-speed roads where a vehicle can sometimes follow another vehicle for a longer period of time.

ISA (Intelligent Speed Assistance) is a system that determines the position of a vehicle and compares its speed with the local speed limit. This comparison is based on a road map containing the speed limits or by means of traffic sign recognition. The ISA system then provides feedback to the driver about the speed limit or limits speed. Table 2 gives an overview of the ISA variants.

Observation studies and field experiments have shown that ISA leads to a reduction in driving speed, an improvement in safety performance indicators, and a reduction in the number of fatal crashes (Theofilatos & Macaluso, 2017).

Despite some technical obstacles - in particular the difficulty of knowing the correct speed limits in all circumstances on all roads, especially if they deviate from the normal situation - the European Union has decided (European Regulation no. 661/2009) that from 2022 new cars will be equipped with an ISA system that continuously indicates the maximum speed that applies to the road segment where the vehicle is located, and can be set so that the speed of the vehicle does not exceed the speed limit. From 2024 onwards, all traded cars must be fitted with such a system.

Table 2. Variants of ISA systems. *Source: SWOV (2015)*

Assistance level	Type of feedback	Feedback
Information	Mainly visual	The speed limit and changes to the speed limit are displayed
Warning (Open)	Visual/auditive	The system alerts the driver if he exceeds the local speed limit. The driver decides what to do with this information and whether to adjust his speed.
Intervention (Half-open)	Haptic pedal (medium/light feedback)	The driver feels resistance in the accelerator pedal when trying to exceed the speed limit. If sufficient force is applied, it is possible to drive faster than the limit.
Automatic control with speed limiter (Closed)	Haptic pedal (powerful feedback) and off pedal	The maximum speed of the vehicle shall be automatically limited to the local speed limit. Attempts by the driver to drive faster are simply ignored.

4 More information

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