

(A. Villaveces

SPEED AND ROAD CRASHES

Whether driving above the speed limit or inappropriately fast for conditions (although within the established limits), speeding is almost universally recognized as the greatest risk factor for road crashes. This is why speed control policies and programs play a key role in efforts to improve road safety indicators.

Among all risk factors related to road crashes, speeding is almost universally recognized as the most significant.

» Speed, a critical risk factor

Speed is a key risk factor in road crashes, increasing both the likelihood of a crash and the severity of resulting injuries. Speed can be deceiving since many circumstances affect how it is perceived as a risk factor, including the type of vehicle, time of day, weather conditions, and the design and state of the road.

Speeding increases the likelihood that a driver will lose control of the vehicle, since there is less time to anticipate oncoming hazards. It also causes others using the road to misjudge the intentions of the speeding driver.

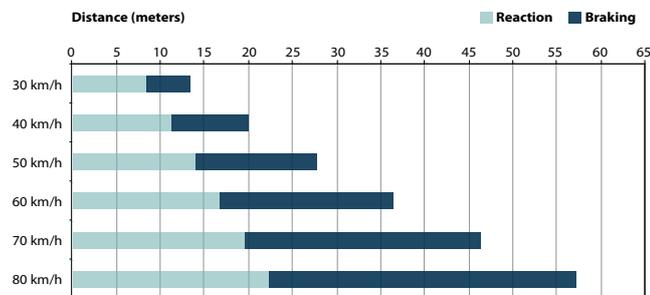
» How does speed affect crashes?

Several aspects should be considered in the relationship between speed and road crashes. One of the most important is that as speed increases, so does the distance travelled during the driver's reaction time and the distance needed to avoid an obstacle or stop; in this regard, the likelihood that the driver will be able to regain control of the vehicle also decreases, since there is less time to react. Furthermore, higher speeds increase instability and risk when approaching a curve. At an intersection, higher speed decreases the likelihood

that the driver will be able to take evasive action in an emergency situation when another vehicle is in the way. In addition, the severity and consequences of a crash increase with speed, since higher energy levels are involved.

Although several studies have shown that a driver can react in as little as 1 second, most response times are between 1.5 and 4 seconds. The implications of relying on these response times can be seen in Figure 1, which illustrates the distance travelled during the driver's reaction time and the distance needed to stop, depending on the speed.

Figure 1: Stopping distance for emergency braking



Source: Speed management: a road safety manual for decision-makers and practitioners (GRSF, 2008)

For example, if a child crosses the road 13 m in front of a car travelling at 30 km/h, it can stop just before hitting the child. However, if the car's speed is 50 km/h or more, the child will be hit by the car and there will be little chance of survival.

» Disproportionate force

In a traffic collision, human tissue is subjected to a force of impact that is the product of mass and velocity. The kinetic energy absorbed equals one half of mass multiplied by the square of velocity, illustrating how the effects of velocity greatly increase with higher speed. Bodily harm also depends on the shape and rigidity of the colliding object or surface, but velocity usually plays the most critical role.

In a crash, it is physically impossible for any vehicle occupant to securely hold an unrestrained person or object, let alone a child who is not wearing a

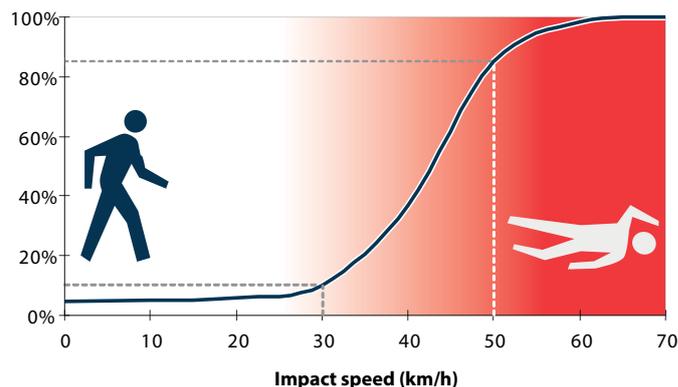
seatbelt. In a collision of just 50 km/h, the child's weight will effectively increase by 20 times, which means that a 5 kg baby will weigh 100 kg within a split second.

The probability that a pedestrian will be killed if hit by a motor vehicle increases dramatically with speed.

Furthermore, the most vulnerable road users—pedestrians, cyclists, and motorcyclists—have a high risk of severe or fatal injury when motor vehicles collide with them. The probability that a pedestrian will be killed if hit by a motor vehicle increases dramatically with speed.

Figure 2 illustrates the probability of fatal injury for a pedestrian hit by a vehicle. The research indicates that while most pedestrians survive if hit by a car travelling 30 km/h, the majority are killed if hit by a car travelling at 50 km/h or more.

Figure 2: Probability of fatal injury for a pedestrian hit by a vehicle



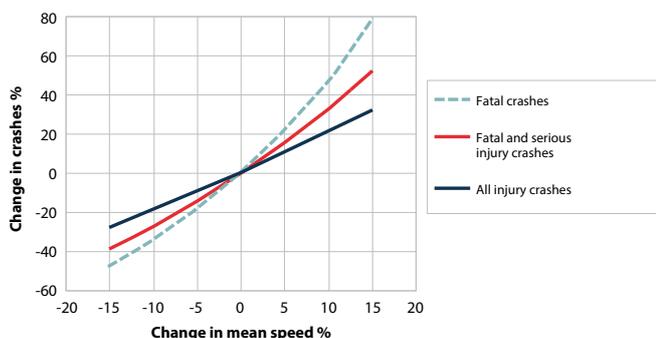
Source: Speed management: a road safety manual for decision-makers and practitioners (GRSF, 2008)

» The importance of speed management, even for “moderate” speeding

Persuading drivers to drive within permitted speed limits is not always easy, but it is a challenge that must be tackled. This is especially important because it has been proven that greater speed increases crash, injury, and fatality rates, while decreasing speed reduces these rates.

Studies indicate that no less than one third of fatal crashes are linked to excessive speed. Speed is an aggravating factor in all cases, and it should be noted that even small increases in speed result in large increases in crash risk.

Figure 3: Illustration of the Power model and the relationship between percentage change in speed and the percentage change in crashes

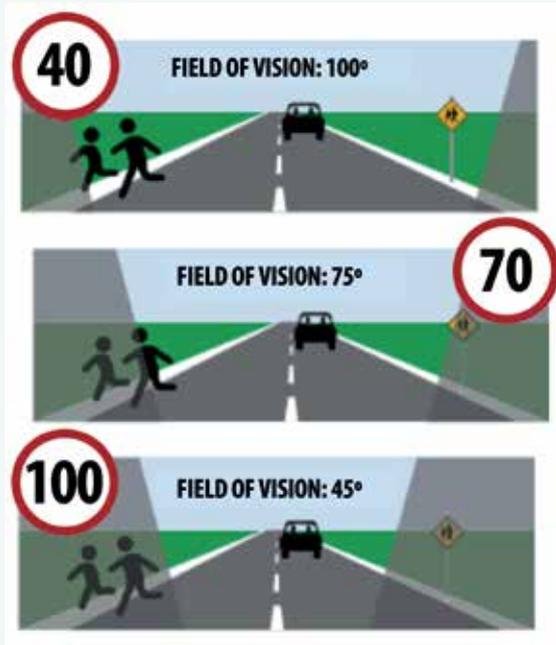


Source: Speed management: a road safety manual for decision-makers and practitioners (GRSF, 2008)

A 5% increase in average speed leads to approximately a 20% increase in fatal crashes.

As shown in Figure 3, a 5% increase in average speed leads to approximately a 10% increase in injury accidents, and a 20% increase in fatal crashes. In other words, “moderate” speeding (within 10 or 15 km/h of the posted limit) contributes to a large extent to serious road crashes, with results that as a whole are comparable to the results of cases of more extreme speeds, because they are much more common.

Figure 4: Driver's field of vision at different speeds



The previously established relationship between speed and risk results both from the laws of physics and the driver's cognitive ability to deal with unexpected circumstances. As shown in Figure 4, the driver's field of vision decreases as speed increases. High speeds also mean that road users have a lesser opportunity to take preventive actions.

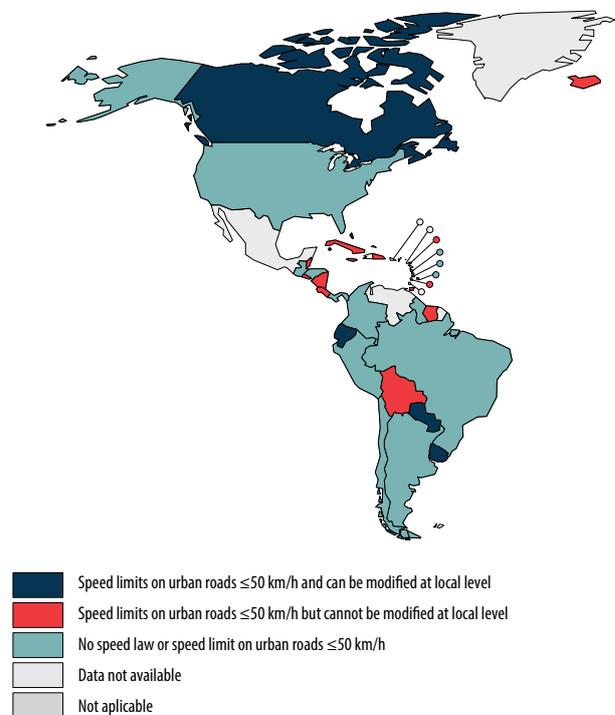


» Speed limits in urban areas

In urban areas, the most vulnerable road users share space with powerful and heavy vehicles. This means that speed limits should not exceed 50 km/h, in line with the international consensus of best practices. In the Americas, there are already 17 countries that have set a maximum limit of 50 km/h in urban areas. Speed laws should be paired with strong enforcement in order to make them effective and save lives. Unfortunately, according to the PAHO report on Road Safety in the Americas, only one of these countries rates its enforcement of speed laws as "good" (8 or above on a scale of 0 to 10).

The recommended second best practice for dealing with speed involves the engagement of local authorities to reduce national speed limits and manage speed at the local level in urban areas. At present, 13 countries of the Americas allow local authorities to reduce national speed limits, but only five countries meet both legislative criteria for best practice on urban speed management: a national urban speed limit of 50 km/h, and local authorities empowered to reduce this limit (see Figure 5).

Figura 5: Urban speed laws, by country/area (2013)



Source: Road safety in the Americas (PAHO, 2016)

» A “Safe System” for speed management

Easy, quick, and low-cost travel is important for work and other daily activities in our societies, as well as a key aspect for economic growth. Nevertheless, ease of mobility should not be at the expense of safety.

Ease of mobility should not be at the expense of safety.

Speed management encompasses a variety of measures designed to strike a balance between safety and efficient travel in road networks. The Safe System approach to road safety (Figure 6) ensures that impact energy in a crash remains below the threshold likely to result in death or serious injury. It goes beyond establishing speed limits to managing interactions between the environment, infrastructure, and physical vulnerability.

Within this approach, speed limits are a complementary intervention to creating safer roads, roadsides, and vehicles that together work to accommodate driver error. All parts of the system need to be strengthened so that if one part of the system fails, other parts will still protect the people involved.

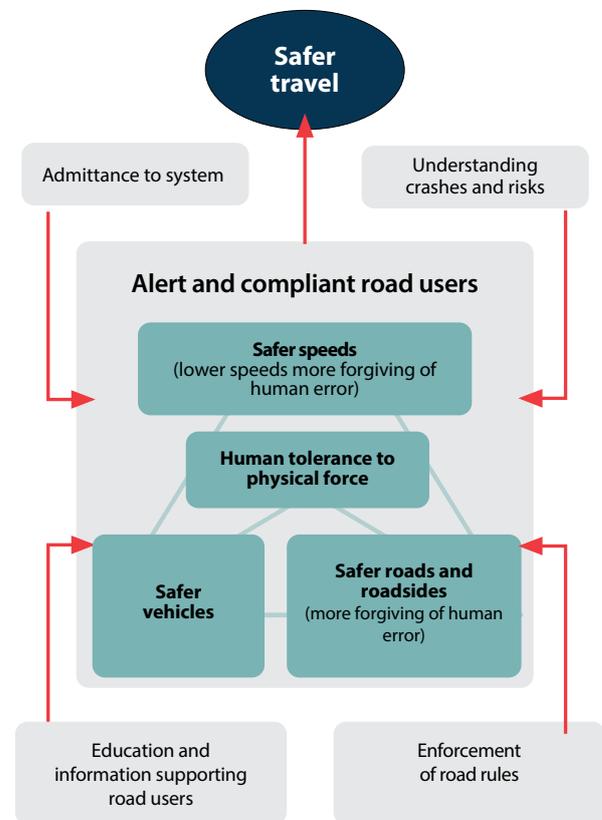
Without a strong, sustained public commitment to robust enforcement of speeds on the network by government, speed management programs are unlikely to be effective.

An appropriate speed, in the context of the Safe System, is a speed level that considers traffic safety as the main goal, in the context of mobility and prevailing conditions such as roadside development, the mix of users along the road, the frequency of access to the road (including intersections), the volume and mix of traffic, environmental concerns, and the quality of life for residents living along the road.

Speed management is a central part of a Safe System that, in addition to setting and enforcing appropriate speed limits, also aims to convince drivers to choose appropriate speeds in the prevailing circumstances through education and publicity. It also advocates the selective use of engineering treatments.

In any case, without a strong, sustained public commitment to robust enforcement of speeds on the network by government, speed management programs are unlikely to be effective.

Figure 6: The Safe System model

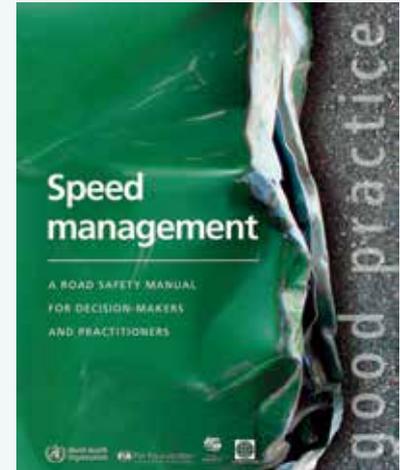


Source: Speed management: a road safety manual for decision-makers and practitioners (GRSP, 2008).

» Elements that could be included in a speed management program

The following table details a number of effective interventions for speed management that could be included in a speed management program, organized by priority for planning and implementation. The table also includes information on the effectiveness of each proposal and the difficulties and costs to undertake and implement them.

More information on the actions outlined below can be found in the *Speed management* manual.



» Possible program elements, by priority, for countries implementing a speed management program

	Element	Description	Effectiveness	Difficulty to undertake	Cost to implement
High Priority	Road safety/crash data assessment	Conduct a situation analysis to define the problem, set a baseline for evaluation and determine best targeting of resources and interventions.	High	Low	Low
	Define road hierarchies (rural and urban)	Review functions and features of the road, road environment and activities. Classify and zone the roads accordingly.	High	Medium	Low
	Speed limit setting	Establish maximum permissible travel speeds for motorized vehicles, a fundamental tool of speed management.	High	Medium	Low
	Speed limit signage and informing the public	Advise motorists of legal speed limits through signs, markings or other methods to give effect to speed limits. If this is not done effectively, compliance will be low.	High	Low	Medium
	Enforcement of speed limits	Enforcing speed limits is the most effective way to encourage motorists to travel at safer speeds.	High	Low	Medium
	Penalties, including fines and license loss	Setting penalties high enough to deter all motorists from exceeding legal speed limits will give effect to speed limit compliance.	High	Low	Low
	Public education with enforcement messages	Conducting publicity campaigns to advise motorists that there will be strong levels of enforcement will assist in persuading them that if they exceed speed limits they are likely to be caught. Enforcement is needed to make this element effective.	High (if linked to enforcement)	Low	Medium
	Engineering treatments to slow traffic	Installing sound, physical treatments to the road to compel motorists to drive their vehicles more slowly is effective.	High	Medium	Medium to High

	Element	Description	Effectiveness	Difficulty to undertake	Cost to implement
	Engineering treatments to separate vulnerable road users	Install physical barriers to prevent pedestrians and cyclists being exposed to moving motor vehicles – an effective way to prevent serious injury crashes.	High to medium	Low	Medium to High
	Medical trauma response systems	Ensure that emergency and medical response services are in place to reduce the long-term injury impact of serious crashes involving speed.	High	Medium	High
	Prepare an action plan for speed management	Plan and document interventions, expected benefits, resources needed, responsible implementing agencies and performance measurement process.	High to medium	Medium	Low
	Monitoring and evaluation	Track and assess the success of interventions to ensure that the resources for speed management are put to good use.	High	Medium to Low	Low
Moderate Priority	Speed camera enforcement	Using speed cameras to detect offenders is an effective means of speed enforcement.	High	Medium	Medium
	Graduated licensing speed restrictions	Restricting the speed that new drivers or riders can travel will reduce the likelihood and severity of crashes as a result of inexperience.	Medium	Medium (can be enforcement difficulties)	Low
	Social marketing and public education	Appealing to the public to support government speed management actions will help to secure political will to do what is necessary. Needs to be combined with enforcement to make a difference.	Medium	Medium	Medium
	Legislating for employer responsibility	Encouraging employers to manage or influence employee driving practices can result in fewer speed-related crashes.	Medium	Low	Low
	Speed advisory signage	Install signs to advise motorists of recommended (lower) speeds for road and traffic conditions. This can be helpful, but usually drivers and riders will make their own judgment about speed selection unless they are required to do otherwise.	Low	Low	Medium
	Set up a reference group for consultations	Identify stakeholder groups with a particular interest in speed management (but not responsible for outcomes) and set up a forum to gain their inputs to the program.	Medium	Medium	Low
	Promote new vehicle speed control technologies	Advise organizations with large vehicle fleets to use such technologies as speed limiters, electronic data monitors and intelligent speed adaptation devices.	Medium	Medium	Low (to promote) High (to implement)
Low Priority	Community programs	People in local communities taking actions to promote safe travel speeds can be a useful complement to government actions.	Low	Low	Low
	School education	Educating young children about speed risk in appropriate ways can be helpful to creating a speed-risk conscious generation.	Low	Low	Low
	Incentives	Offering incentives to encourage compliance with speed limits is rarely done by governments, but sometimes employers and insurers can do this effectively.	Low	Low	Low

Source: Adapted from *Speed management: a road safety manual for decision-makers and practitioners* (GRSP, 2008)

» Related documents

- [Speed management: a road safety manual for decision-makers and practitioners](#) (GRSF, 2008).
- [Report on Road Safety in the Americas](#) (PAHO, 2016).
- [Global status report on road safety 2015](#) (WHO, 2015).

Speed and road crashes.

PAHO/NMH/18-007

© Pan American Health Organization 2018

All rights reserved. Publications of the Pan American Health Organization are available on the PAHO website (www.paho.org). Requests for permission to reproduce or translate PAHO Publications should be addressed to the Communications Department through the PAHO website (www.paho.org/permissions).

All reasonable precautions have been taken by the Pan American Health Organization to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the Pan American Health Organization be liable for damages arising from its use.



SPEED AND ROAD CRASHES



Pan American
Health
Organization



World Health
Organization
REGIONAL OFFICE FOR THE
Americas