



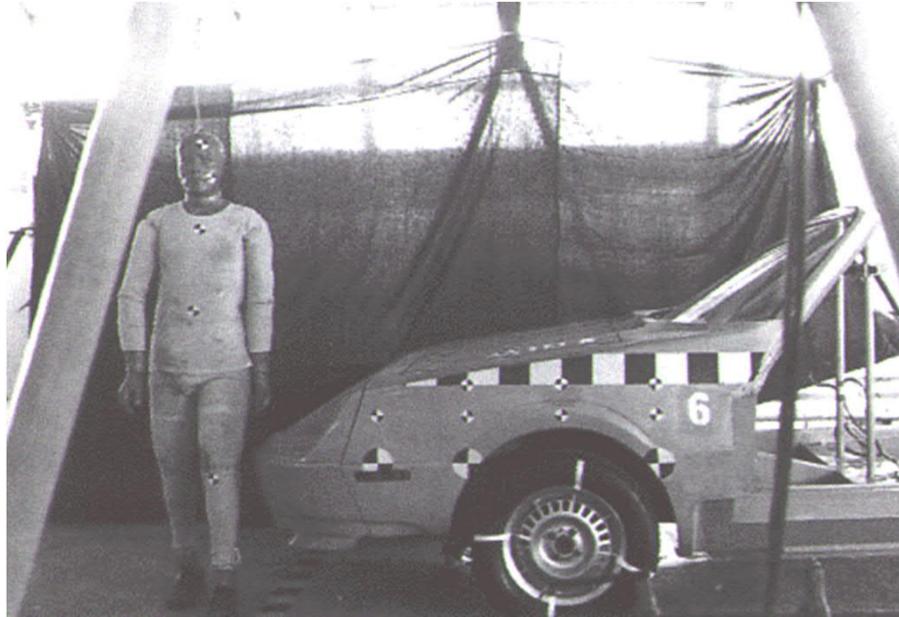
The changing face of vehicle safety and pedestrian protection measures

Streets Safe for Walking –  
November 2018

Overview of vehicle safety design and standards,  
some history and,  
the importance of the current GSR/PSR changes



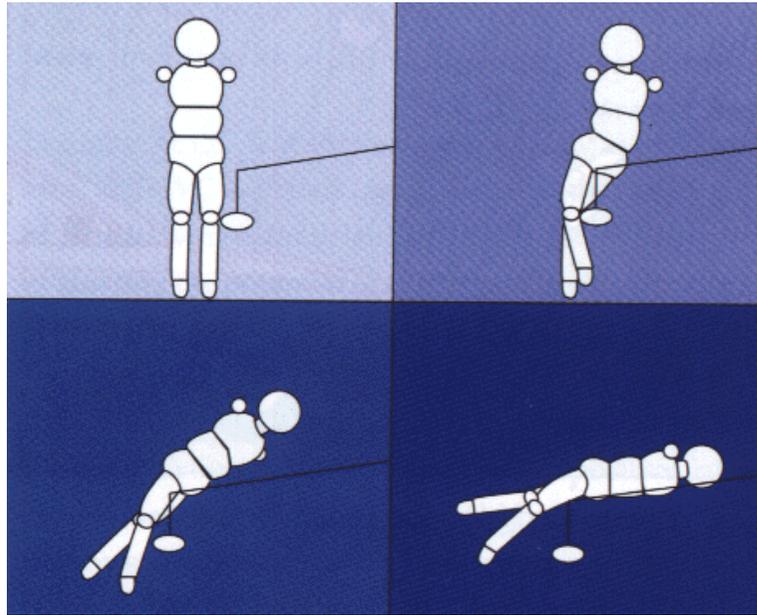
1982



EEVC (European Enhanced Vehicle-safety Committee) WG7 reported at the 9<sup>th</sup> ESV Conference

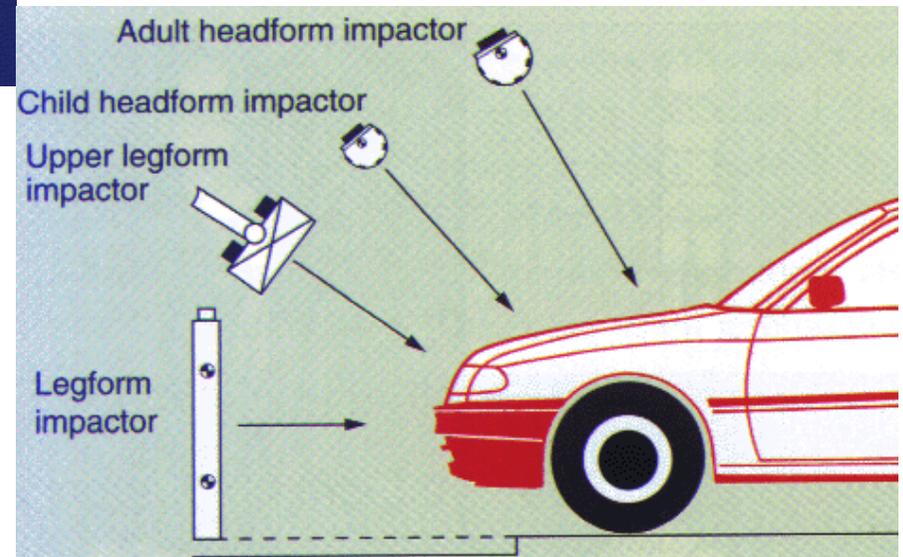
This Working Group analysed the available collision data to identify the most productive approaches to reducing the toll of pedestrian injuries in Europe

1989



EEVC WG10 reported at the 12<sup>th</sup> ESV Conference

Rationale to break pedestrian collision into subsystem (component) test requirements



1996

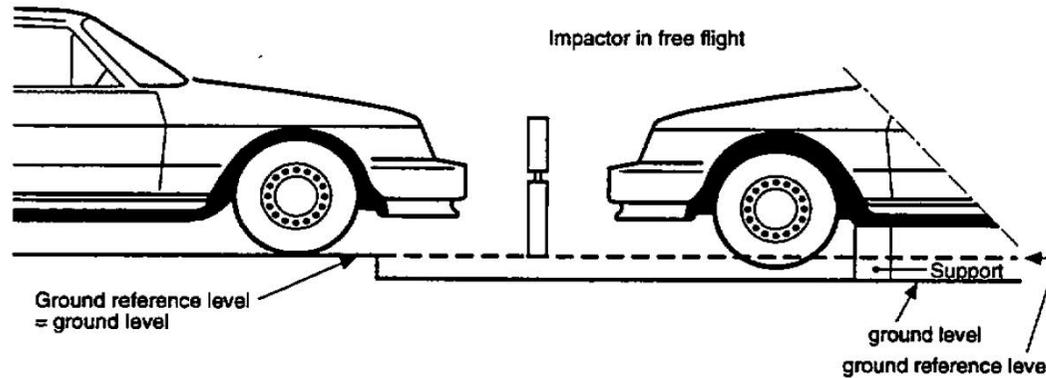


Figure 2. Legform to bumper test for complete vehicle in normal ride attitude (left) and for complete vehicle or subsystem mounted on supports (right).

EEVC WG10 published pedestrian impact test procedures at the 15<sup>th</sup> ESV Conference

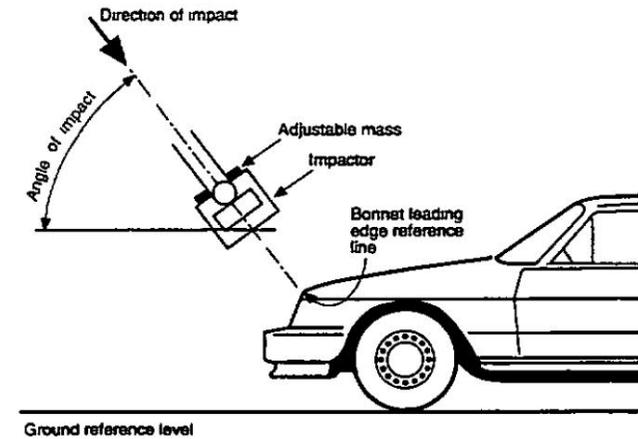


Figure 8. Upper legform to bonnet leading edge test.

1997

Euro NCAP launched with pedestrian protection results

VW Polo

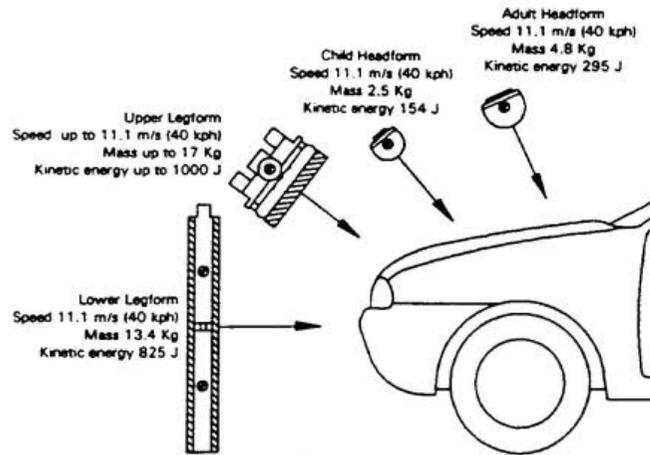
RATING

ADULT OCCUPANT  
★★★★☆

PEDESTRIAN  
☆☆☆☆



2003



TIRL



EUROPEAN ENHANCED VEHICLE-SAFETY COMMITTEE

EEVC WG17 publishes...

**EEVC Working Group 17 Report  
IMPROVED TEST METHODS TO EVALUATE  
PEDESTRIAN PROTECTION AFFORDED BY  
PASSENGER CARS** (December 1998 *with September  
2002 updates*).

2003

A diagram consisting of three horizontal bars. The top bar is dark grey and spans from the left edge to the right edge. Below it, there are two shorter bars: a dark grey one on the left and an orange one on the right, both positioned towards the right side of the page.

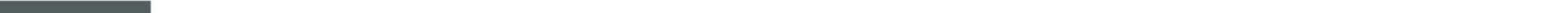
DIRECTIVE 2003/102/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL  
(17 November 2003)

relating to the protection of pedestrians and other vulnerable road users before  
and in the event of a collision with a motor vehicle

With effect from 1 October 2005,... Phase I limits

A single vertical dark grey bar located in the bottom right corner of the page.

2009

A series of horizontal bars in dark grey and orange, positioned above and below the text, serving as a decorative border.

REGULATION (EC) No 78/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL  
(14 January 2009)

on the type-approval of motor vehicles with regard to the protection of  
pedestrians and other vulnerable road users

2009

UN Global Technical Regulation No. 9 - PEDESTRIAN SAFETY

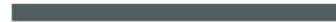
2009



Euro NCAP launched new rating system to reward the overall safety of a vehicle



The new overall rating reflects the protection offered to adult and child occupants as well as pedestrians



2013

A series of horizontal bars of varying lengths and colors. From left to right: a short dark grey bar, a medium-length dark grey bar, a long dark grey bar, and a short orange bar.

REGULATION (EC) No 78/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL  
(14 January 2009)

on the type-approval of motor vehicles with regard to the protection of  
pedestrians and other vulnerable road users

With effect from 24 February 2013,... Phase II limits for new types of car  $\leq 2,500$  kg

A short, thick, dark grey vertical bar.

2013



UN Regulation No. 127

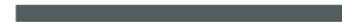
Entry into force: 17 November 2012

Uniform provisions concerning the approval of motor vehicles with regard to their pedestrian safety performance

Aligned with:

UN Global technical regulation No. 9

Does it work?

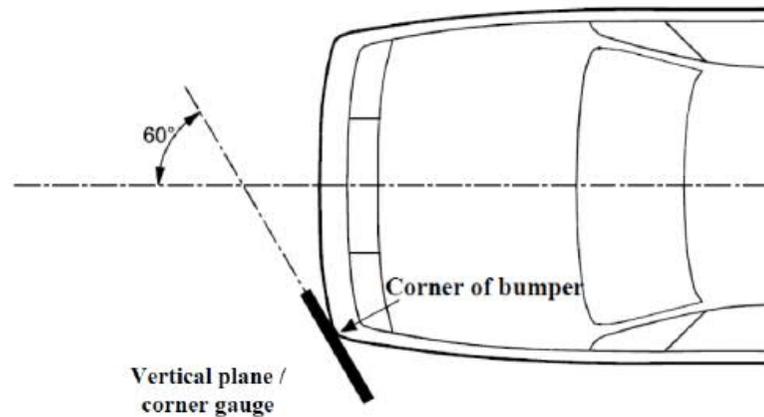


Predicted benefits:

TRL study (Hardy et al., 2006) estimated 16% of pedestrian fatalities and 26% of serious injuries would be prevented

It is estimated that GTR No. 9 will prevent between 1 and 5 percent of all pedestrian fatalities

## Does it work?



### Some limitations:

- Effective within some physical constraints – energy-absorbing capacity
- Tested regions
  - Small proportion of vehicle front
- Unable to prevent injuries from secondary sources



Does it work?

# Number of killed pedestrians compared with the distance walked, Great Britain (2007-2017)

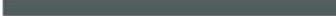


Reprinted from 'Reported road casualties in Great Britain: 2017 annual report' (DfT, 2018)

2018



Pedestrian Safety Regulation review  
Head protection



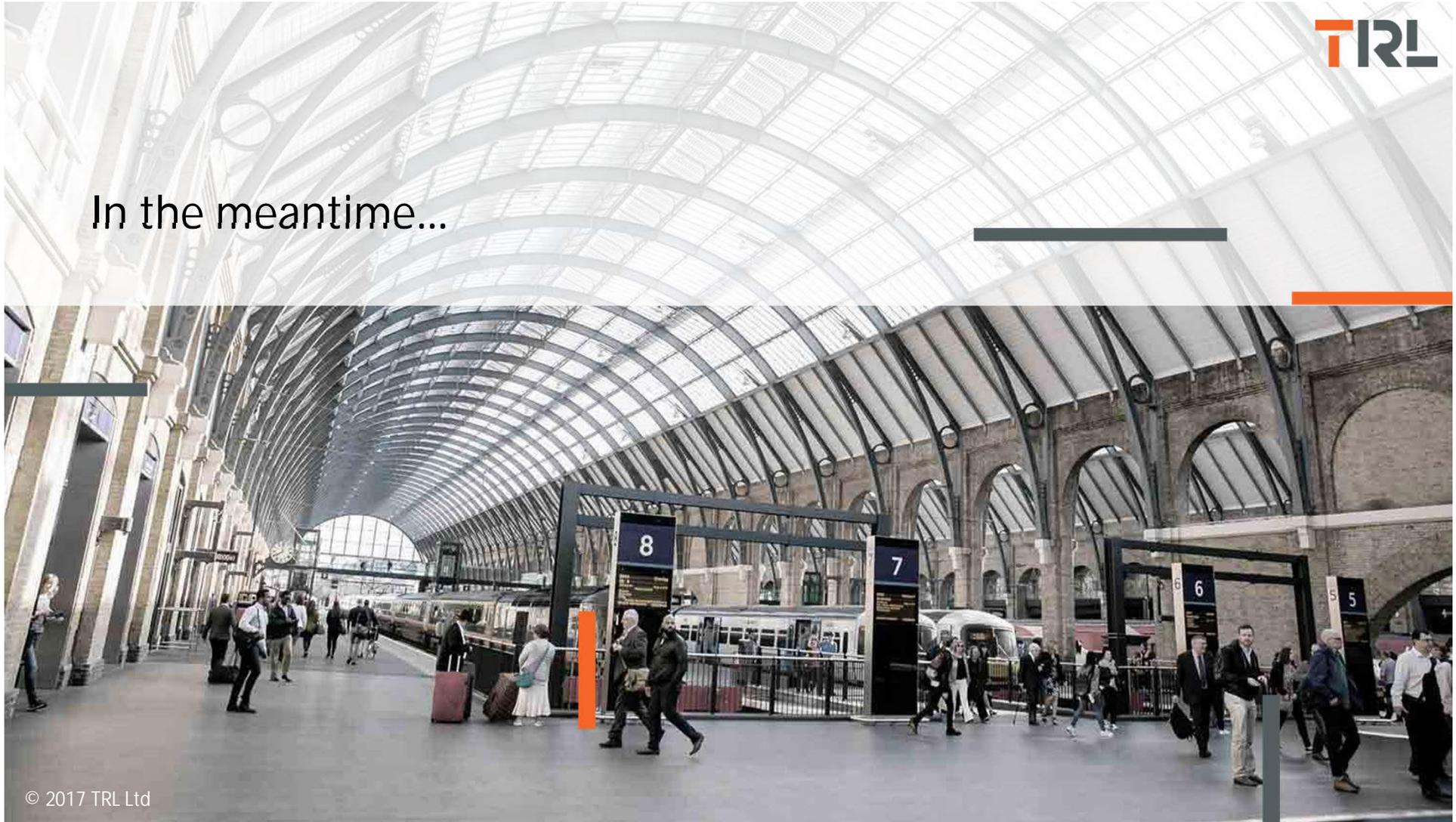
Action being considered:  
Revise legislation to enlarge the current head impact zone so that the risk of severe head injuries of pedestrians and cyclists is reduced



... by means of improved energy absorbing measures integrated in a bigger overall head contact zone, notably including the front windscreen area between the A-pillars



In the meantime...



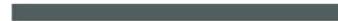
2014



Euro NCAP added crash avoidance systems to the overall star rating:

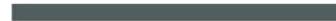
Autonomous Emergency Braking

Lane Keep Assist/Lane Departure Warning



2016

  
Euro NCAP Safety Rating including  
AEB Pedestrian Systems



2016



Pedestrian Protection		32.5 Pts
	Head Impact	22.2 Pts
	Pelvis Impact	0.1 Pts
	Leg Impact	6 Pts

AEB Pedestrian		4.2 Pts
System Name	Active Brake Assist	
Type	Auto-Brake with Forward Collision Warning	
Operational From	7 Km/h	
Additional Information	Defaults on for every journey; operates in low ambient light	
<b>PERFORMANCE  </b>		
	Autobrake Function	
	Avoidance	Mitigation
Running Adult crossing from Farside	Collision avoided up to 20 km/h	Impact mitigated up to 45 km/h
Walking Adult crossing from Nearside -25%	Collision avoided up to 40 km/h	Impact mitigated up to 45 km/h
Walking Adult crossing from Nearside -75%	Collision avoided up to 40 km/h	Impact mitigated up to 60 km/h
Running Child from behind parked vehicles	Collision avoided up to 30 km/h	Impact mitigated up to 55 km/h

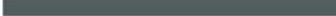
<https://www.euroncap.com/en>

Mercedes-Benz E-Class (W213)

2018



General Safety Regulation review  
AEB  
ISA



Autonomous emergency braking,  
action to be considered:



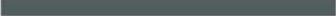
Mandatory application of autonomous  
emergency braking for pedestrians and  
cyclists



2018



General Safety Regulation review  
AEB  
ISA



### Intelligent speed assistance

This measure is expected to reduce the risk of collision occurrence, but also the resulting impact speed in those collisions that will not be prevented.



2018

UN AEBS Informal Working Group

Starting with regulation for car target AEB  
Then moving to pedestrian target (~2021)



<https://www.euroncap.com/en>

2018

 VULNERABLE ROAD USERS

Total 44.2 Pts / 92%

 GOOD  ADEQUATE  MARGINAL  WEAK  POOR

Pedestrian Impact Protection

32.4 / 36 Pts



Head Impact	20.4 Pts
Pelvis Impact	6 Pts
Leg Impact	6 Pts

Vulnerable Road Users

11.8 / 12 Pts

System Name	Active Brake Assist
Type	Auto-Brake with Forward Collision Warning
Operational From	7 km/h

<https://www.euroncap.com/en>

Mercedes-Benz A-Class (W177)

2018



AEB Pedestrian

Day time

Adult crossing the road



Child running from behind parked vehicles



Adult along the roadside



Pedestrian Impact Protection 24.7 / 36 Pts



Head Impact	12.7 Pts
Pelvis Impact	6 Pts
Leg Impact	6 Pts

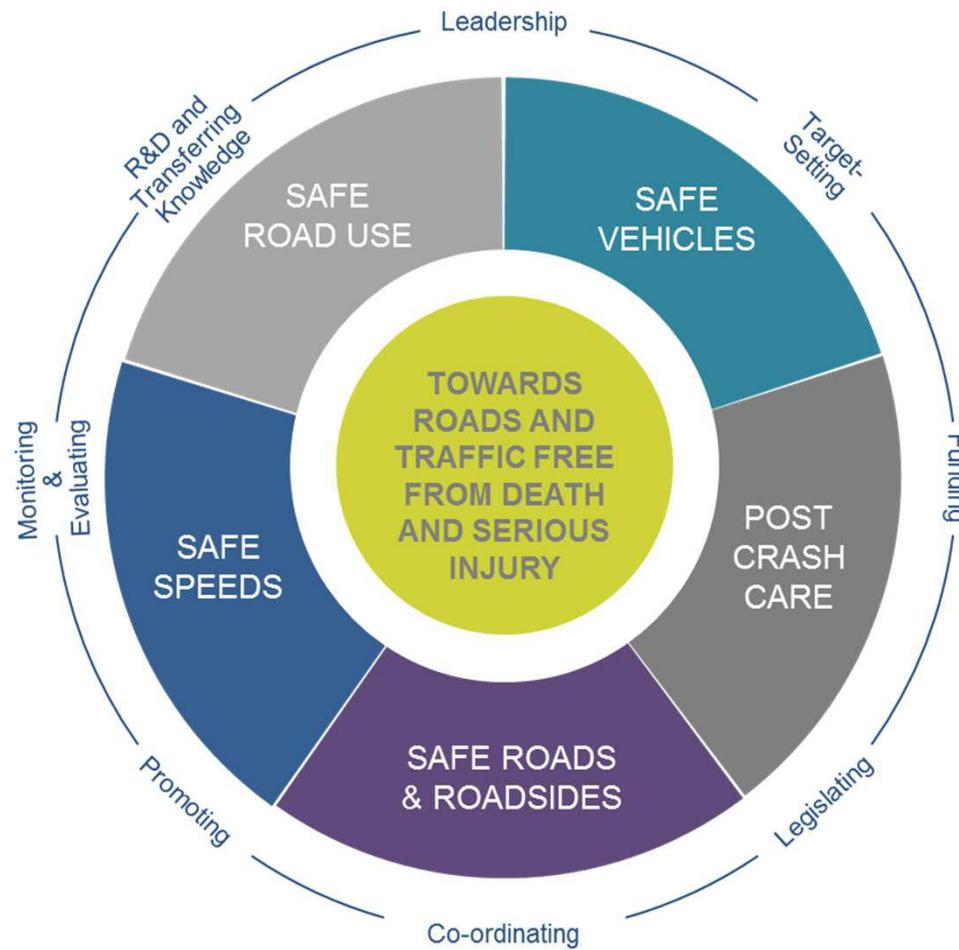
<https://www.euroncap.com/en>

Citroën Berlingo

## Summary

- Vehicle design has influenced frontal profiles of cars
- Pedestrian safety legislation (and consumer information) has had some controlling influence on shape and stiffness
- Extent of these measures is only 'keeping pace' with exposure
- Primary (pre-crash) and secondary (post-crash) interventions can be employed
  - Overlapping effect – but neither is totally effective

# Summary



## Conclusions

- No single vehicle intervention will address the casualty population in entirety
  - Automated braking represents a positive step
- Reducing collision speed will change the interaction between pedestrians and vehicles
  - Ultimately beneficial
- Successes in vehicle shape and stiffness developments are not the final step
  - More should be done



Questions?

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