



Insurance Institute for Highway Safety
Highway Loss Data Institute

Vehicle Design for Pedestrian Protection

NTSB Pedestrian Safety Forum

May 10, 2015
Washington, DC

David S. Zuby

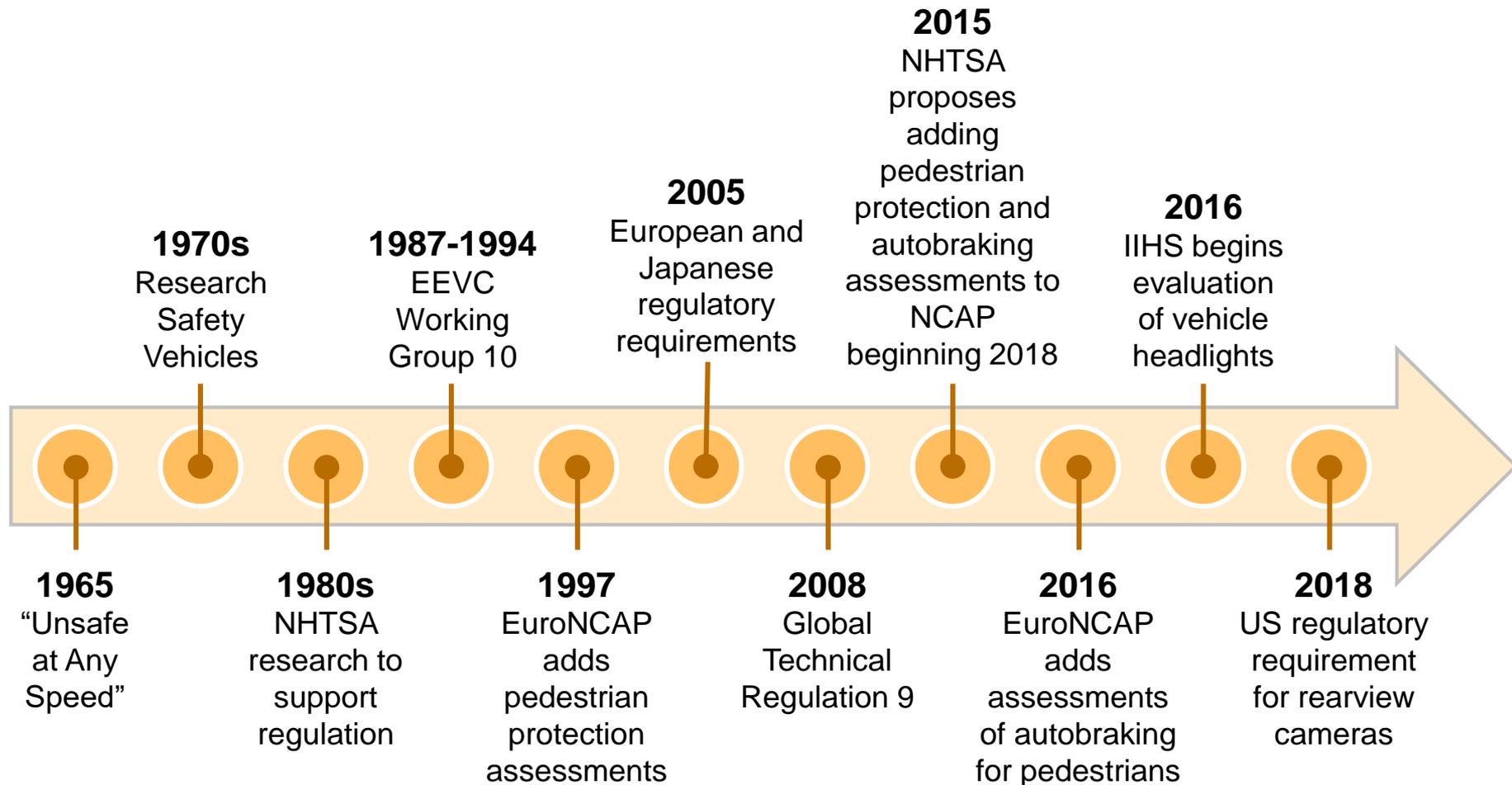
iihs.org

Vehicle design for pedestrian protection

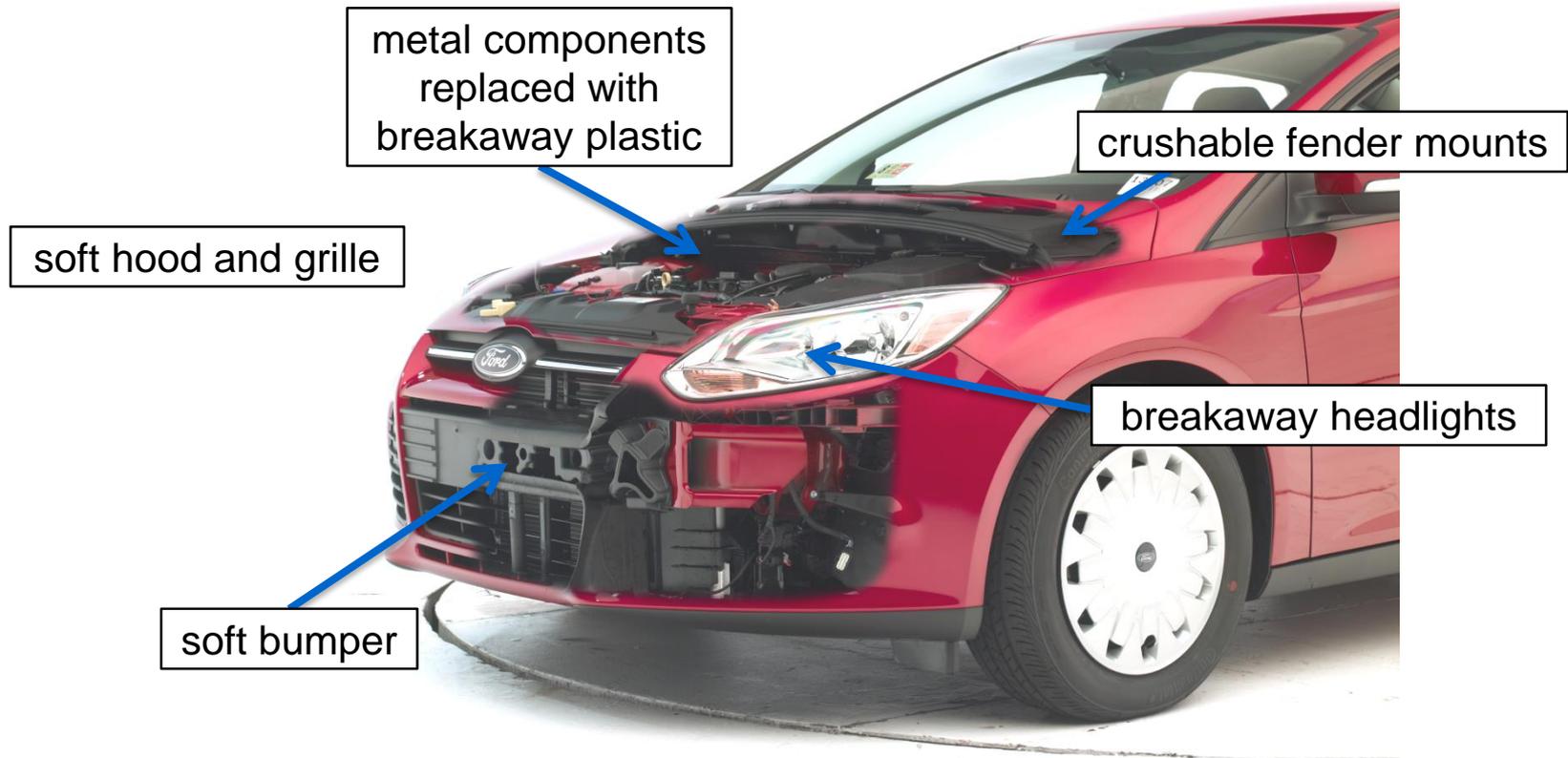
Principles

- ▶ Enhance driver's ability to see pedestrians
 - Headlights
 - Rearview cameras
- ▶ Assist driver with braking
 - Simple and dynamic brake assist
 - Automated braking with pedestrian detection
- ▶ Distribute the force of impact
 - No sharp edges, corners or protrusions
- ▶ Extend the time to bring the pedestrian up to vehicle speed
 - Surfaces that crush under the force of impact with pedestrian

Vehicle design for pedestrian protection

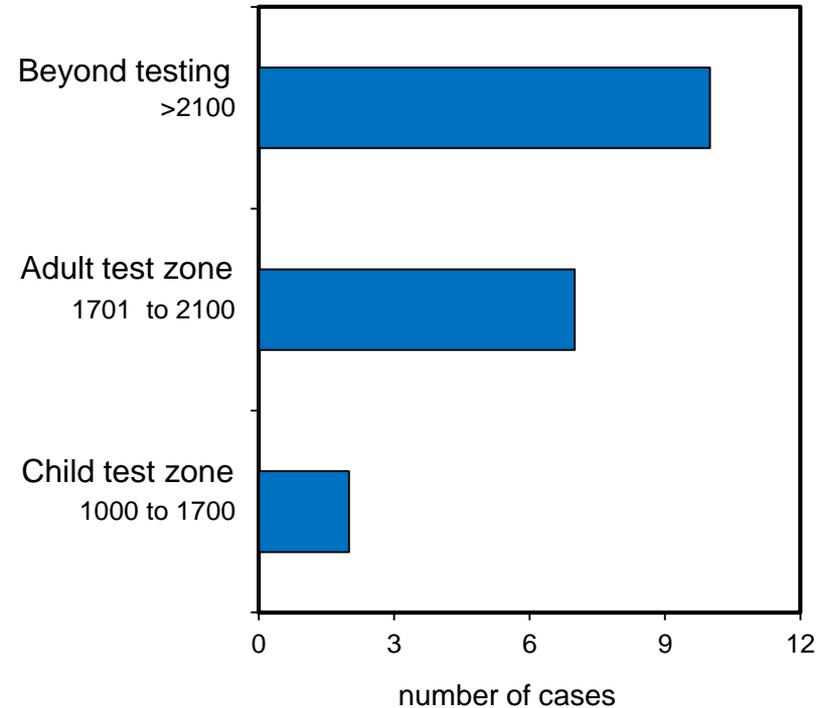
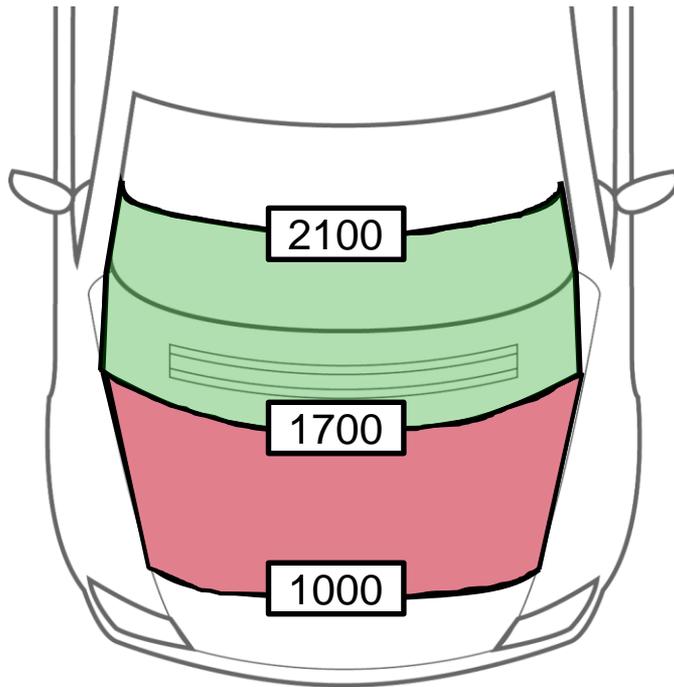


Countermeasures for pedestrian tests



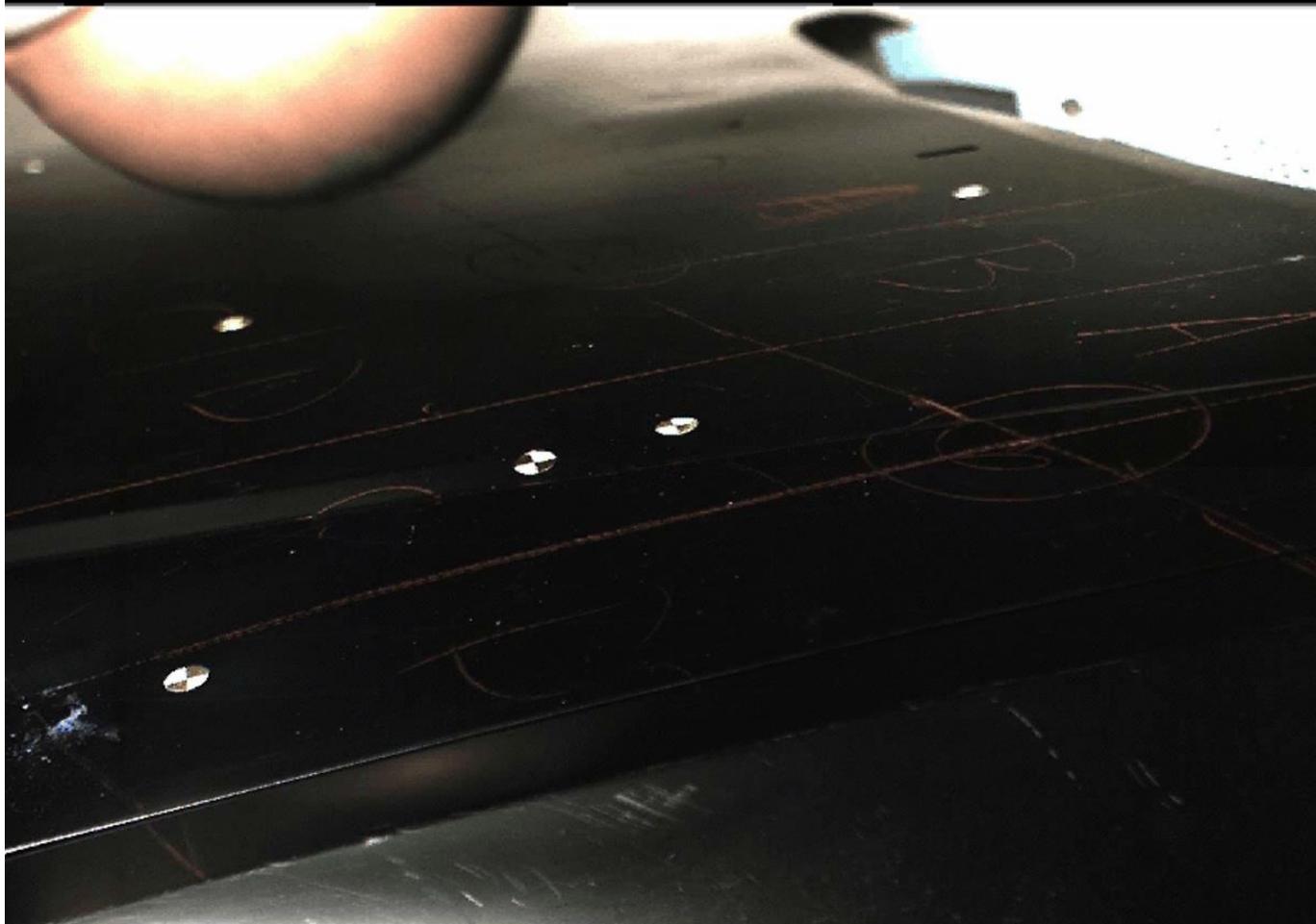
Head contact locations relative to GTR zone

Wrap distances (mm)



MGA Research

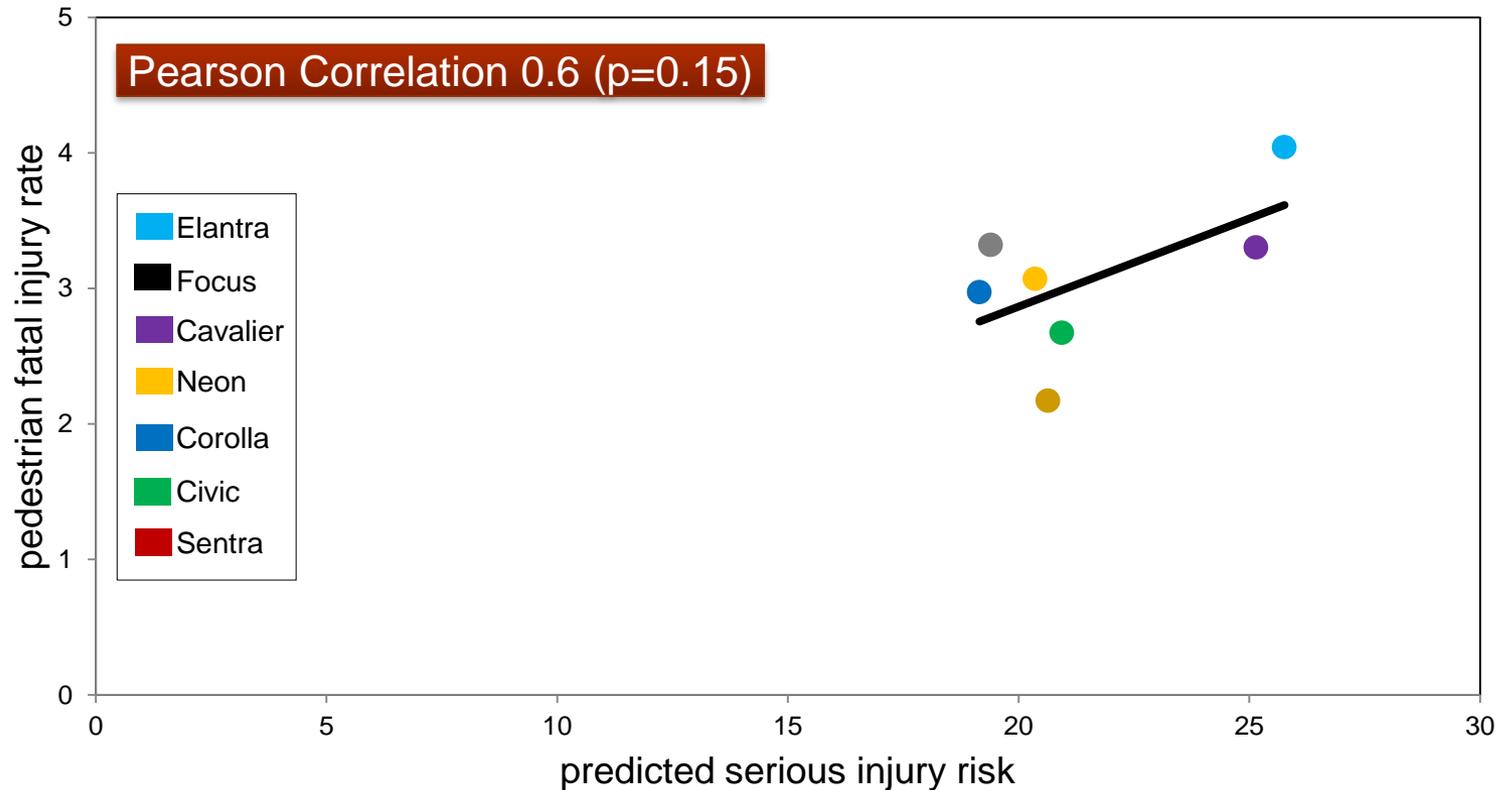
10+: +80.000 ms
Rate: 1000
Exp: 400 μ s



HC2340 - 6-C Child

MGA Research

Relationship between test performance and fatality rate



Correlations of real-world pedestrian injury rates to risk of severe head injury

pedestrian injury rate	correlation	p-value
fatal	0.60	0.1521
incapacitating	0.76	0.0462
combined	0.74	0.0549

You are here: [Auto News](#) > Volvo's Pedestrian Airbags May Already Be On

REPORT

Volvo's pedestrian airbags may already be on their way out



By [Jeffrey N. Ross](#)
 Posted Dec 1st 2013 10:01AM

98

58

10

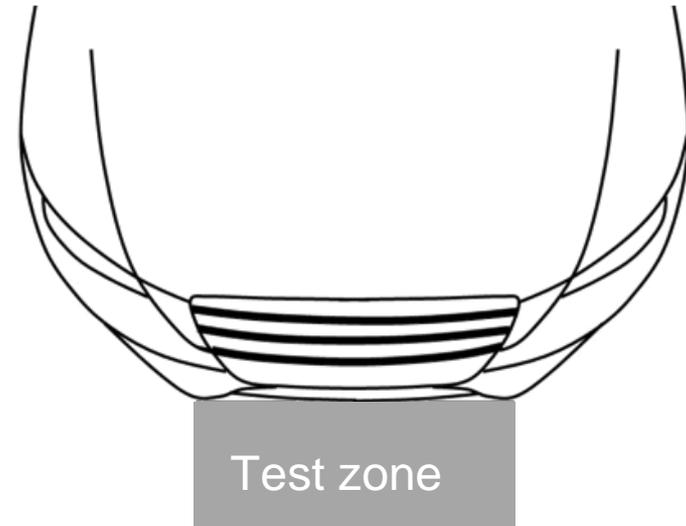
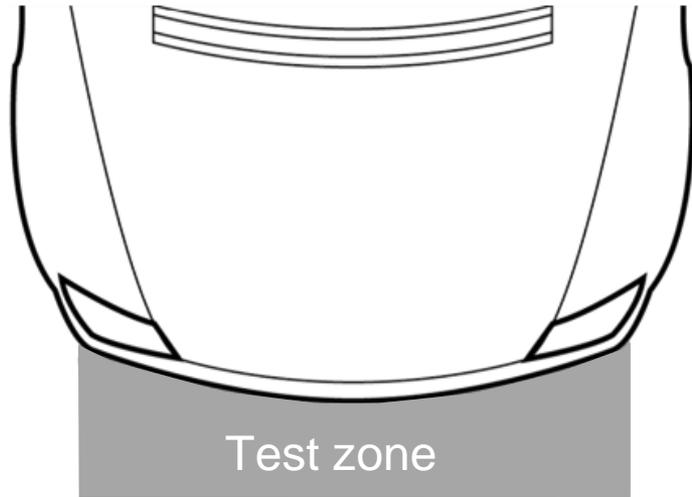
Comments 14

As proof of just how quickly automotive technology can advance, just check out the [Volvo V40](#). Developed with an [external airbag](#) aimed at better protecting pedestrians in the event of a collision, this innovative safety device could be phased out soon in place of more advanced active safety technologies like pedestrian detection and auto braking.



Leg impact test zone definition (GTR 9)

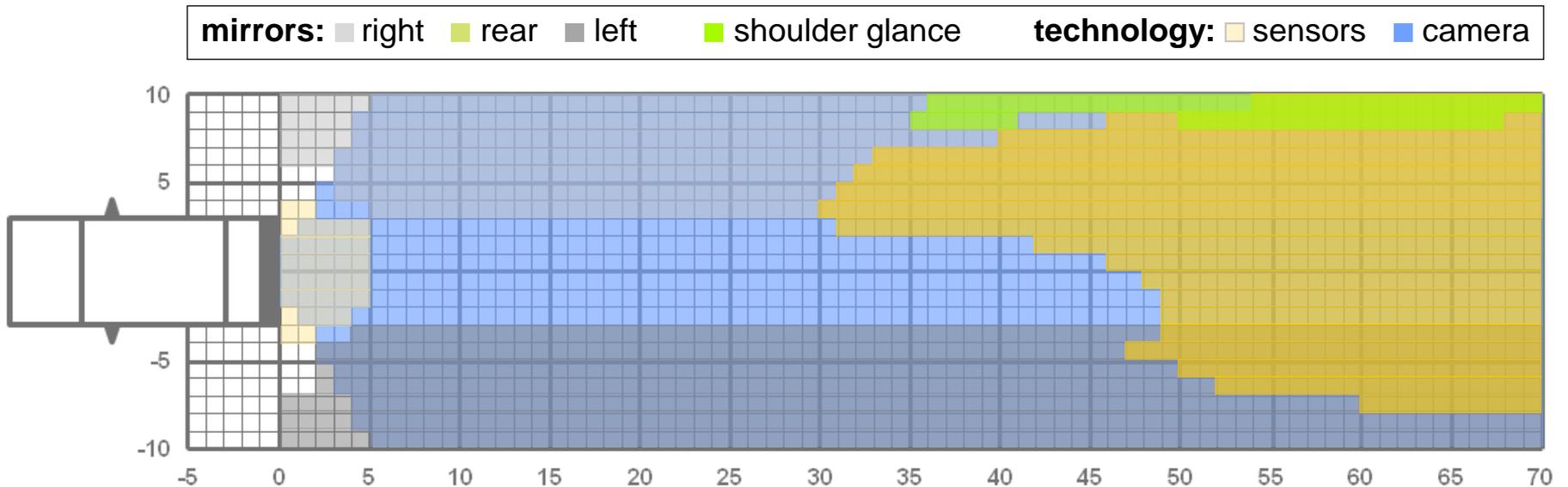
May not result in countermeasures across the full width





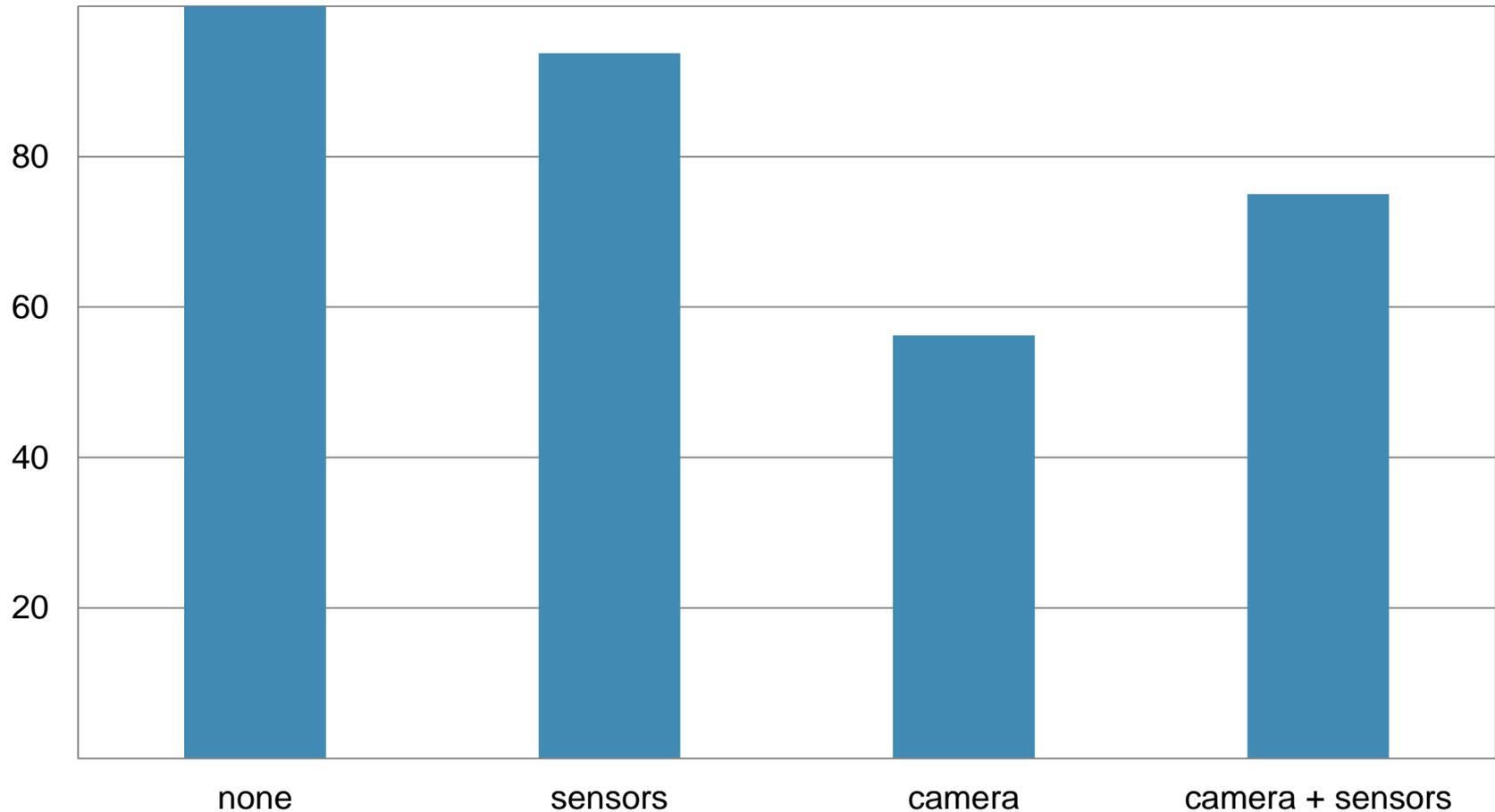
Visibility advantage provided by technology

Rear visibility in typical SUV: 2013 Chevrolet Equinox LTZ



Rearview cameras prevented collisions

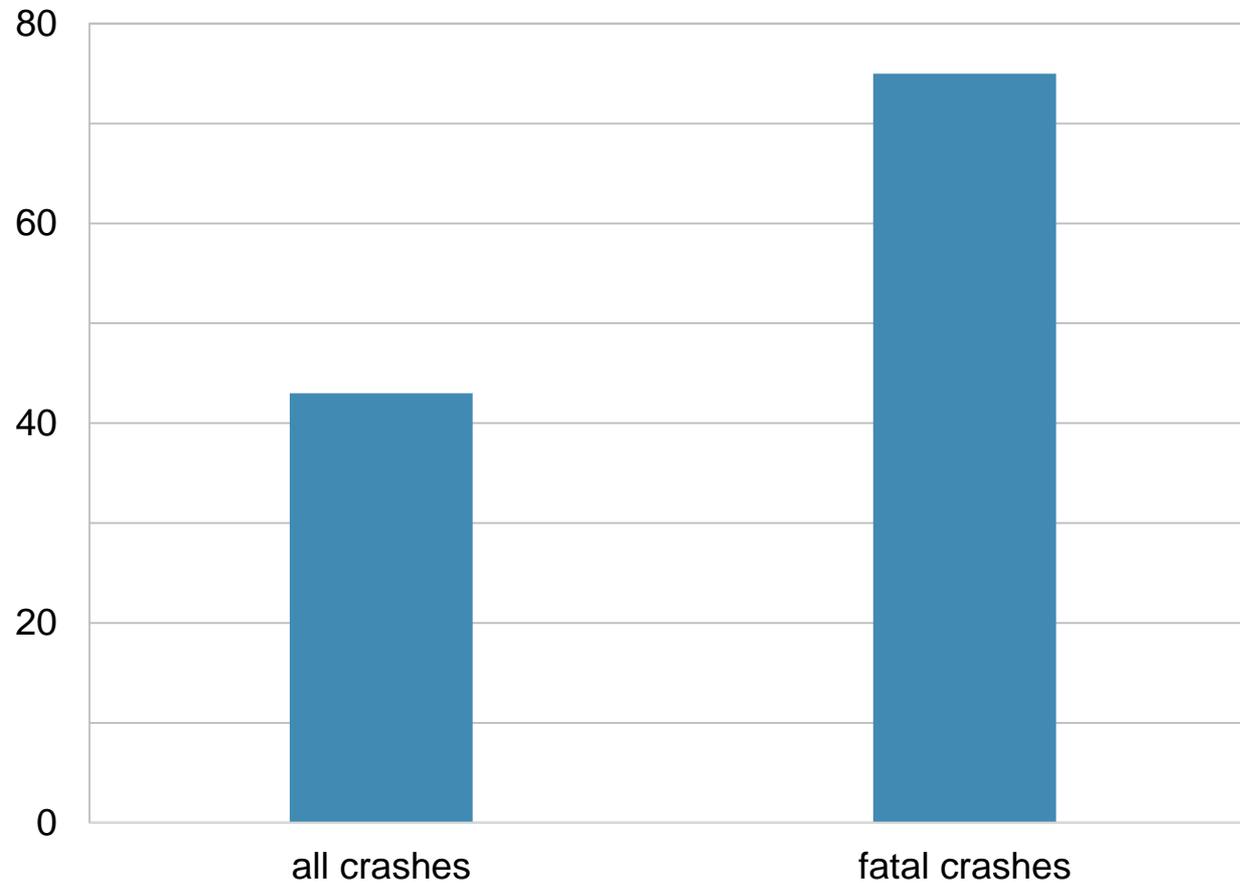
Percent of participants who hit stationary object, by technology condition





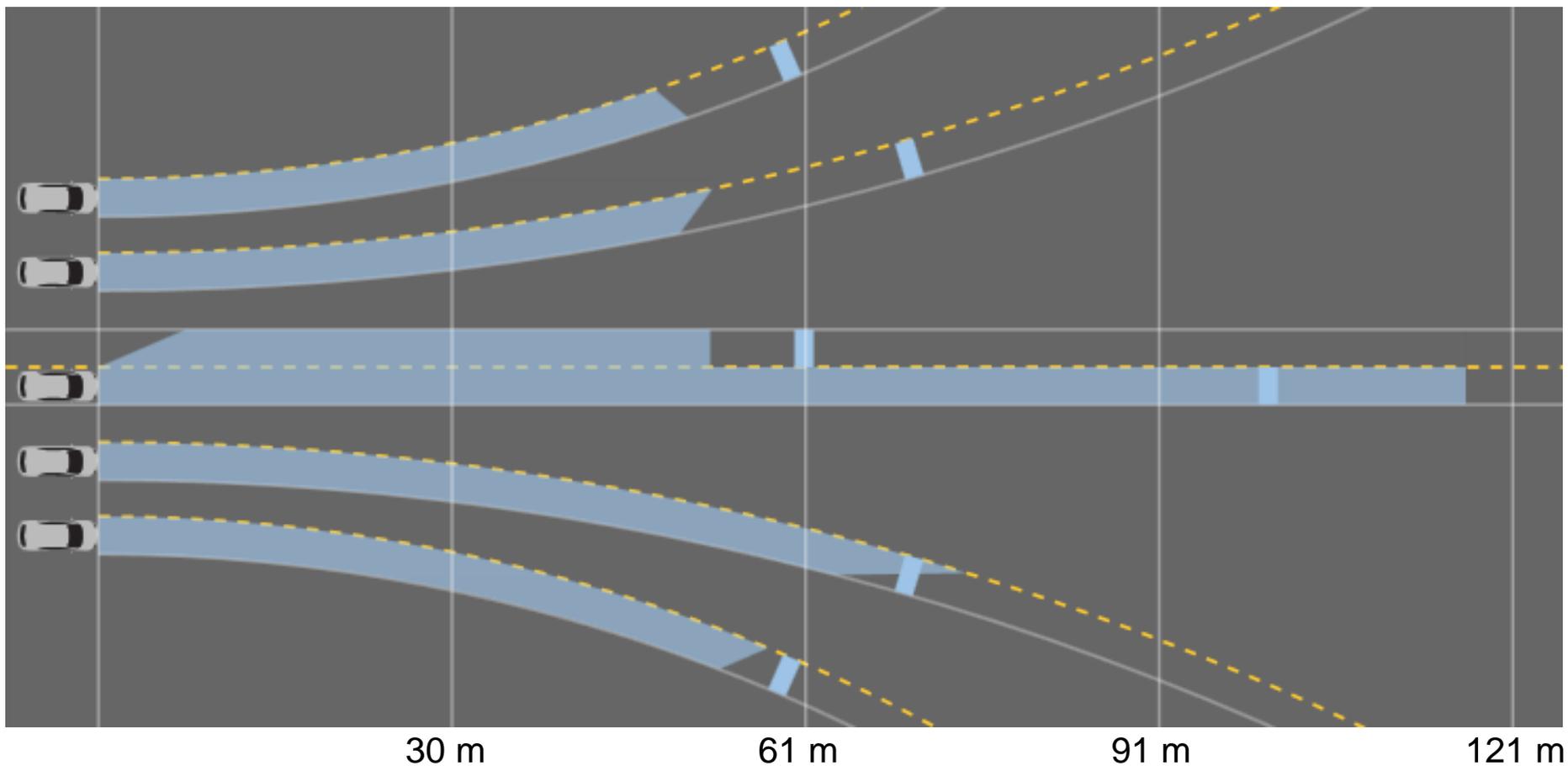
Role of darkness in pedestrian crashes

Percent of pedestrian crashes occurring in non-daylight conditions



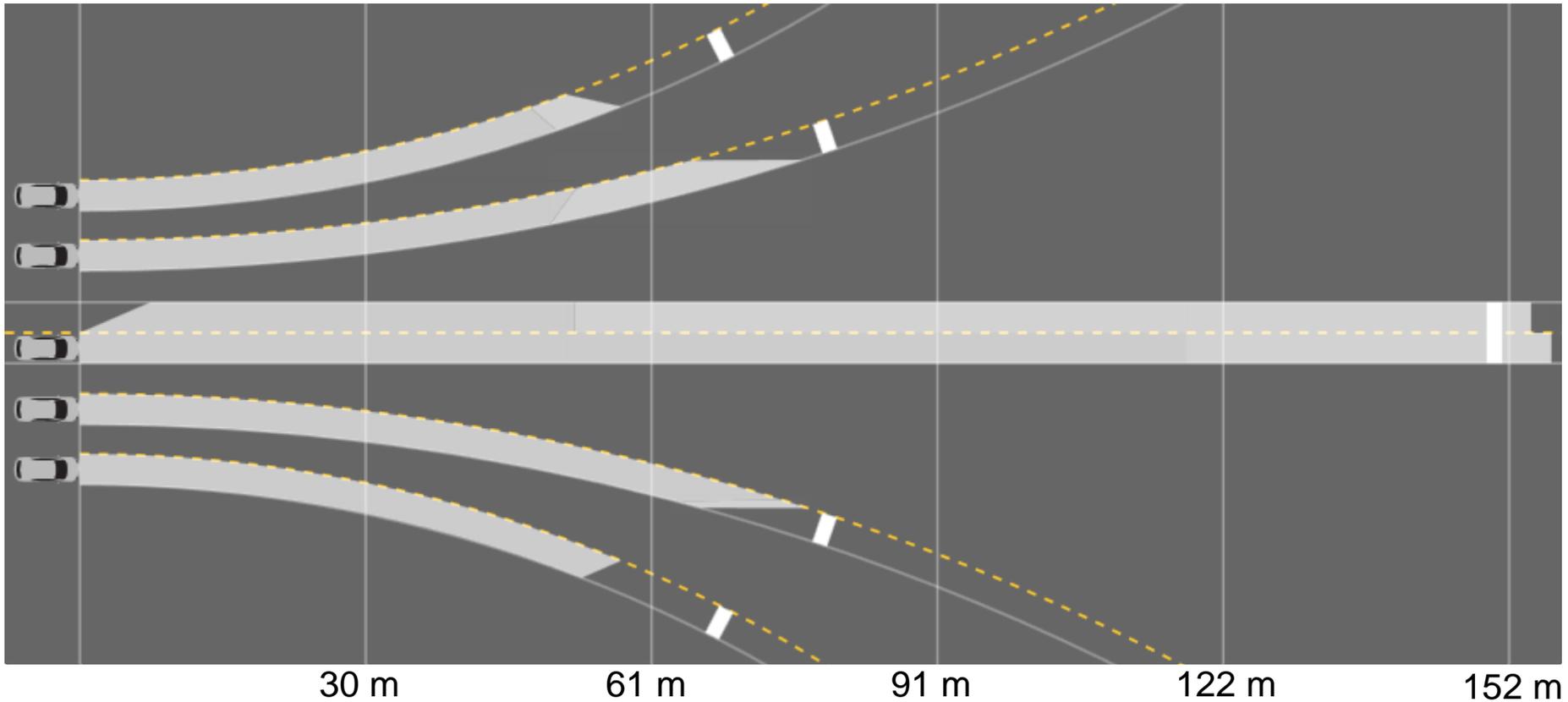
BMW 3 series halogen and Toyota Prius v LED

Low beams



BMW 3 series halogen and Toyota Prius v LED

High beams



Differences in low-beam headlight illumination



First headlight release

March 30

- ▶ Midsize moderately priced and luxury/near-luxury cars
- ▶ 31 vehicle models
- ▶ 82 headlight combinations
 - 1 good
 - 17 acceptable
 - 20 marginal
 - 44 poor



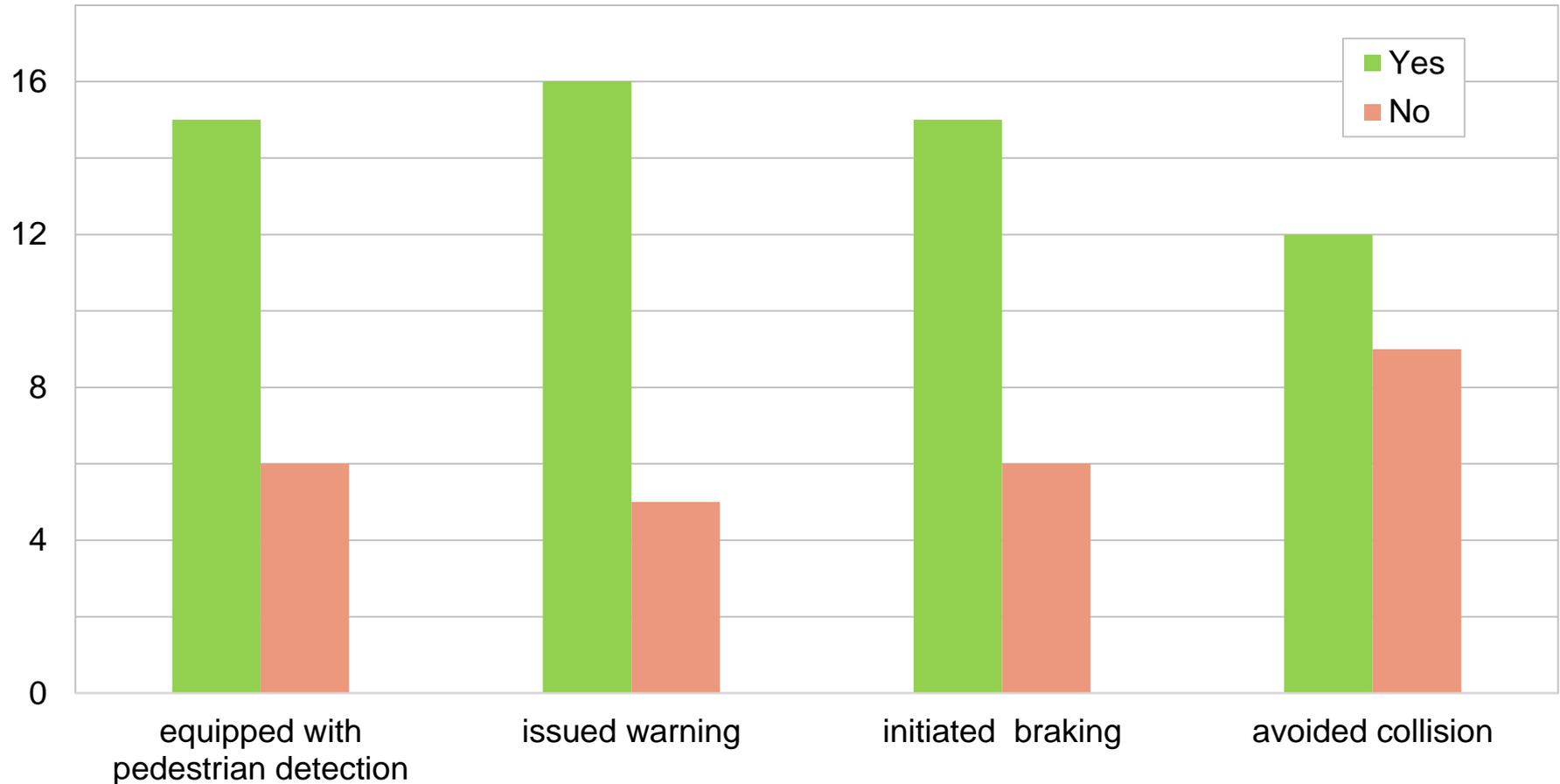
Estimated annual target population for forward collision warning/mitigation systems

Status Report May 20, 2010

	all	injury	fatal
without pedestrian identification	1,165,000	66,000	879
additional with pedestrian identification	39,000	22,000	2,932

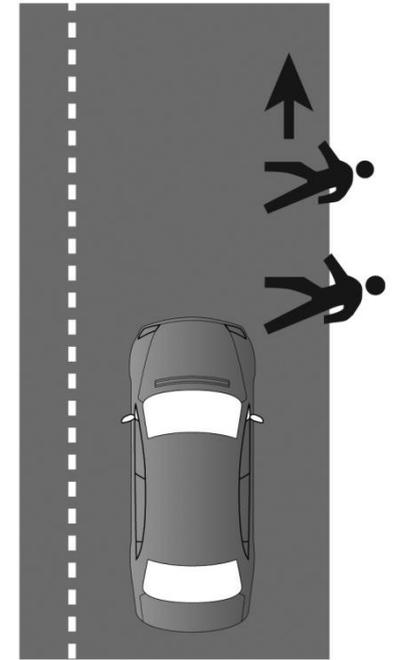
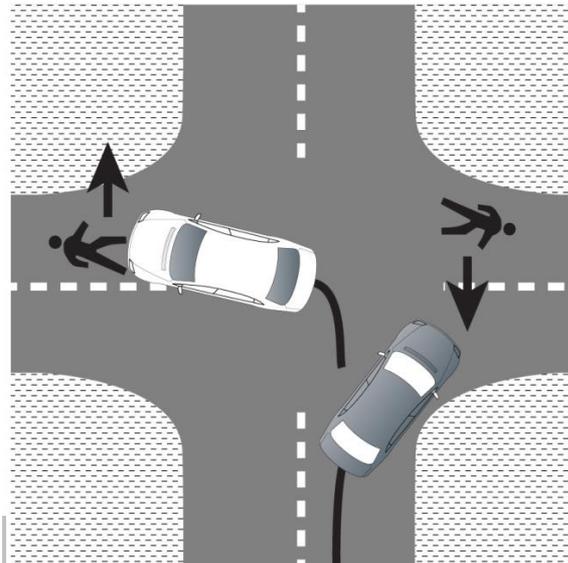
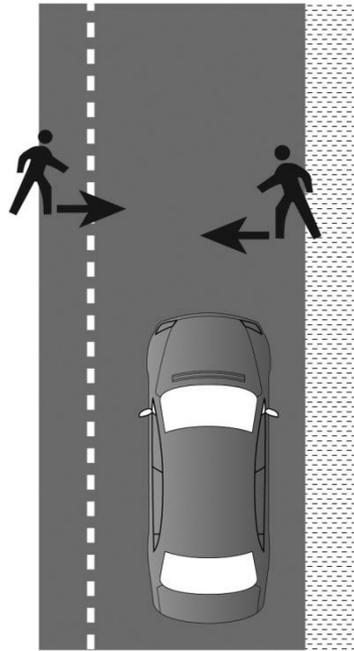
Preliminary results of IIHS pedestrian AEB tests

20 km/h toward stationary pedestrian



Vehicle and pedestrian movement

Single-vehicle pedestrian crashes, front of passenger vehicle



crashes

63%

29%

4%

deaths

72%

4%

16%

EuroNCAP test scenarios

Automatic emergency braking with pedestrian detection

- ▶ Adult crossing from near passenger-side of the road
- ▶ Child running from between parked cars on passenger-side of the road
- ▶ Adult running from driver-side of the road





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