

# Behind the Scenes of Active Safety Technology Testing – and What's Coming Next

Minnesota TZD

3/30/2022

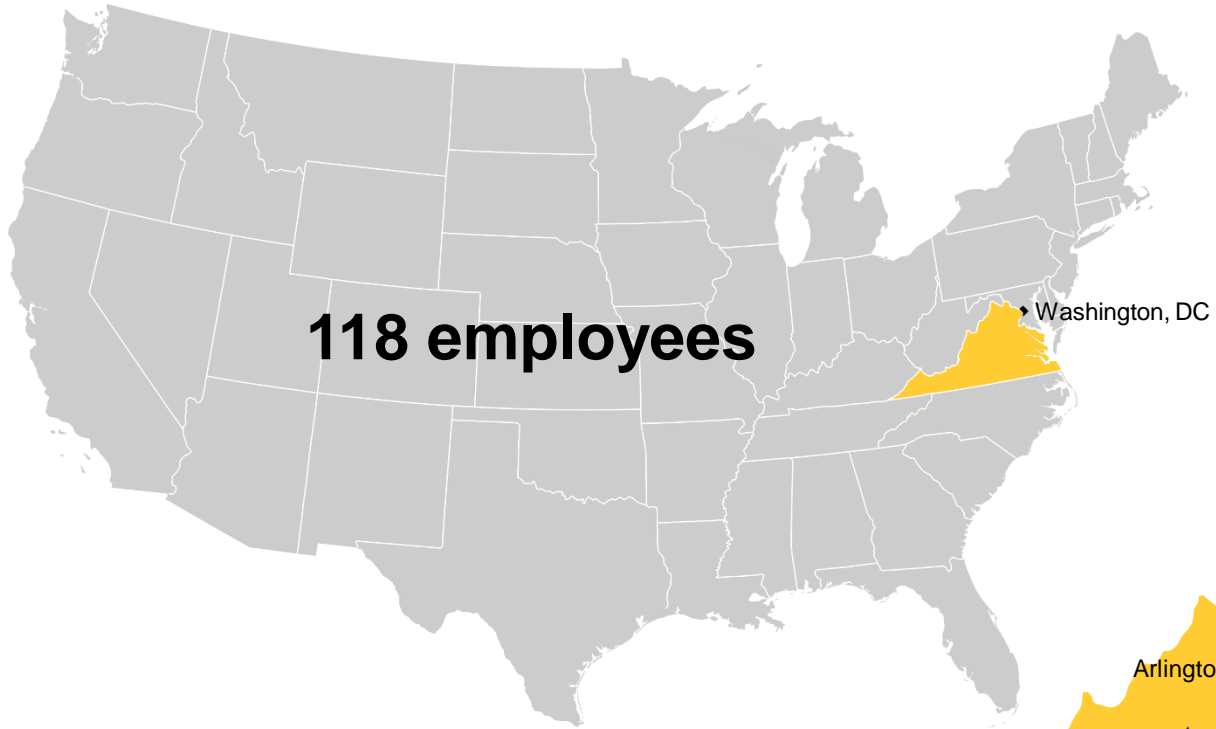
**David Aylor, IIHS**  
Manager of Active Safety Testing



**IIHS** is an independent, nonprofit scientific and educational organization dedicated to reducing deaths, injuries, and property damage from motor vehicle crashes through research and evaluation and through education of consumers, policymakers and safety professionals.

**HLDI** shares and supports this mission through scientific studies of insurance data representing the human and economic losses resulting from the ownership and operation of different types of vehicles and by publishing insurance loss results by vehicle make and model.

Both organizations are wholly supported by auto insurers.



**45 staff members**



# Crash avoidance features are preventing crashes

## Forward collision warning

- ↓ 27% Front-to-rear crashes
- ↓ 20% Front-to-rear crashes with injuries
- ↓ 9% Claim rates for damage to other vehicles
- ↓ 17% Claim rates for injuries to people in other vehicles
- ↓ 44% Large truck front-to-rear crashes

## Forward collision warning plus autobrake

- ↓ 50% Front-to-rear crashes
- ↓ 56% Front-to-rear crashes with injuries
- ↓ 14% Claim rates for damage to other vehicles
- ↓ 24% Claim rates for injuries to people in other vehicles
- ↓ 41% Large truck front-to-rear crashes

## Lane departure warning

- ↓ 11% Single-vehicle, sideswipe and head-on crashes
- ↓ 21% Injury crashes of the same types

## Blind spot detection

- ↓ 14% Lane-change crashes
- ↓ 23% Lane-change crashes with injuries
- ↓ 7% Claim rates for damage to other vehicles
- ↓ 9% Claim rates for injuries to people in other vehicles

## Rear automatic braking

- ↓ 78% Backing crashes (when combined with rearview camera and parking sensors)
- ↓ 10% Claim rates for damage to the insured vehicle
- ↓ 28% Claim rates for damage to other vehicles

## Rearview cameras

- ↓ 17% Backing crashes

## Rear cross-traffic alert

- ↓ 22% Backing crashes

# Front AEB testing



# Front crash prevention ratings

Tests conducted at 12 and 25 mph



**BASIC**

The vehicle has a forward collision warning system that meets National Highway Traffic Safety Administration performance criteria



**ADVANCED**

The vehicle has an autobrake system that avoids a crash or significantly reduces the speed in 1 of 2 tests



**SUPERIOR**

The vehicle has an autobrake system that avoids a crash or substantially reduces the speed in both tests

# Current front crash prevention testing

Speed reduction in 12 and 25 mph tests



Volvo S60



Dodge Durango

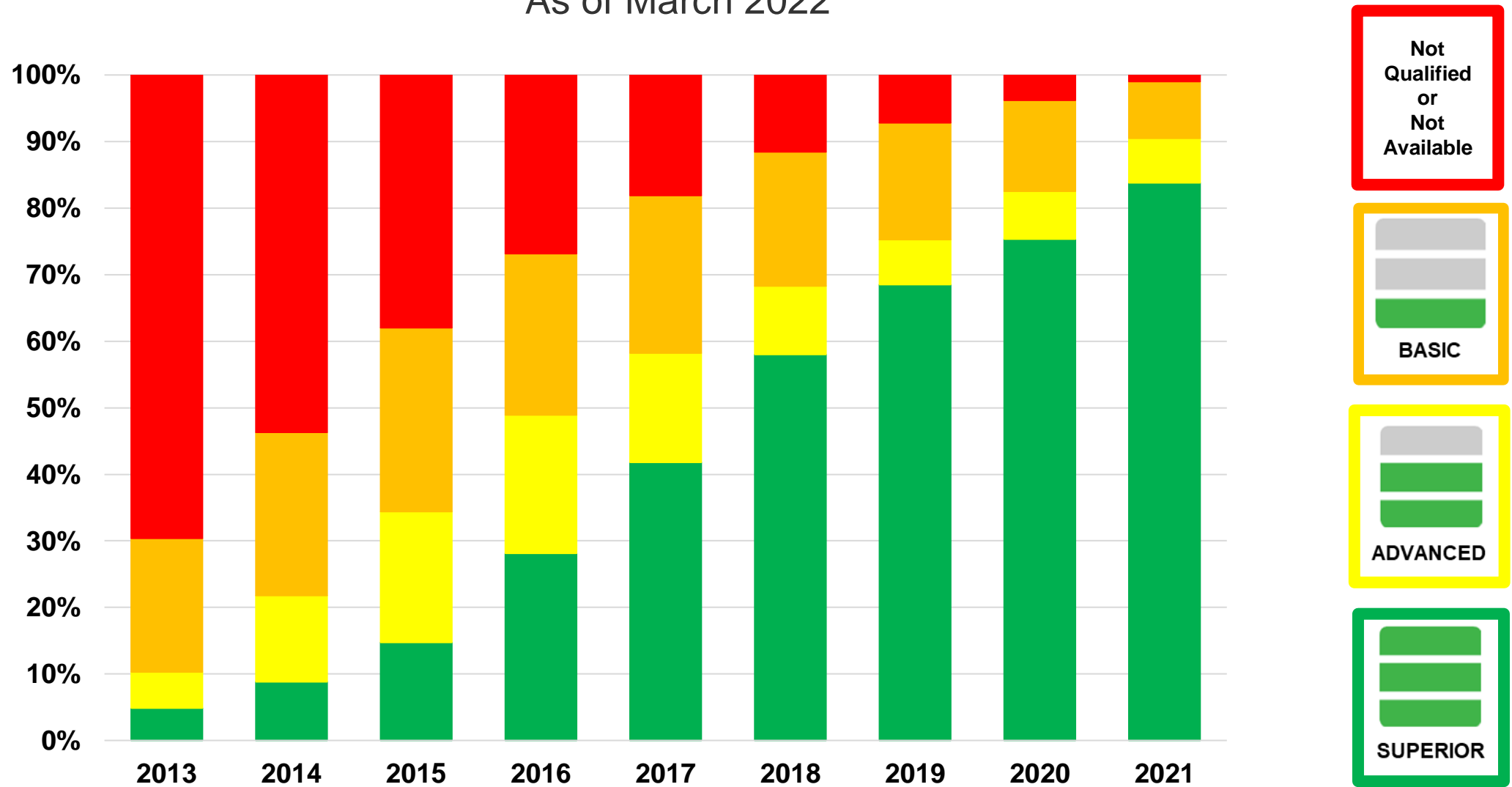


Subaru Outback



# Front crash prevention ratings for 2013-21 model years

As of March 2022







**20 automakers**  
(99+% of the U.S. market)  
have committed to making  
autobrake standard by September 2022



# *“10 automakers fulfill automatic emergency braking pledge ahead of schedule”*

–Consumer Reports / December 17, 2020

**0–49%**

5 manufacturers

**50–75%**

2 manufacturers

**90–94%**

3 manufacturers

**≥95%**

10 manufacturers

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Vehicles equipped with AEB as built for the U.S. market during the period Sep. 1, 2019 through Aug. 31, 2020



CASCADIA

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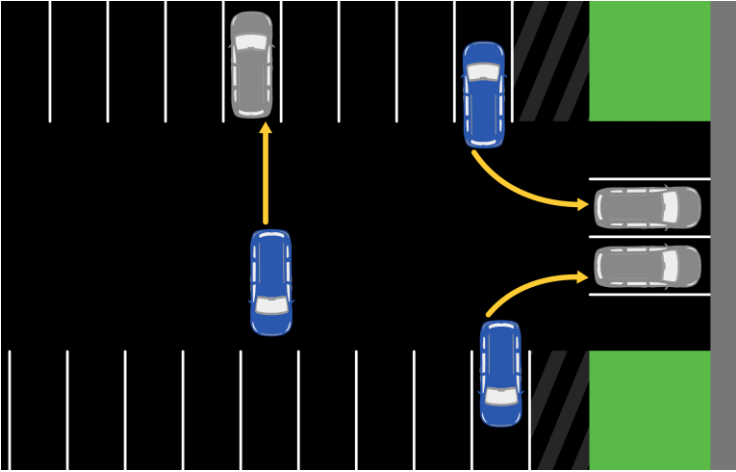
- ↓ 17% Backing crashes

## Rear cross-traffic alert

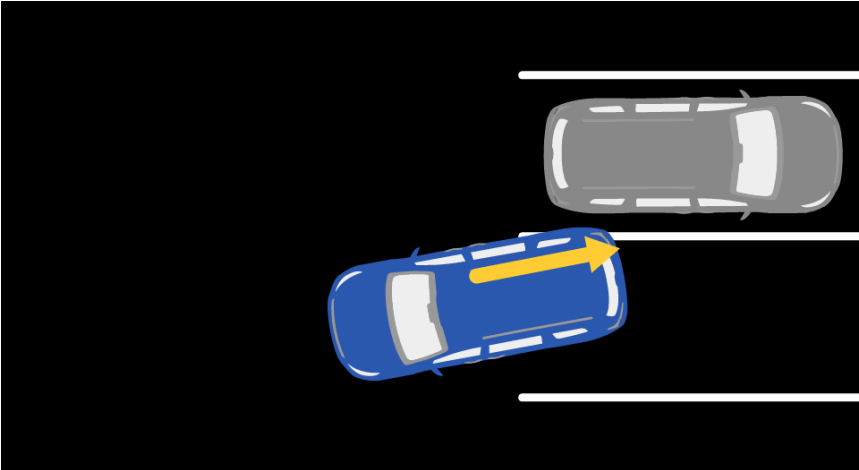
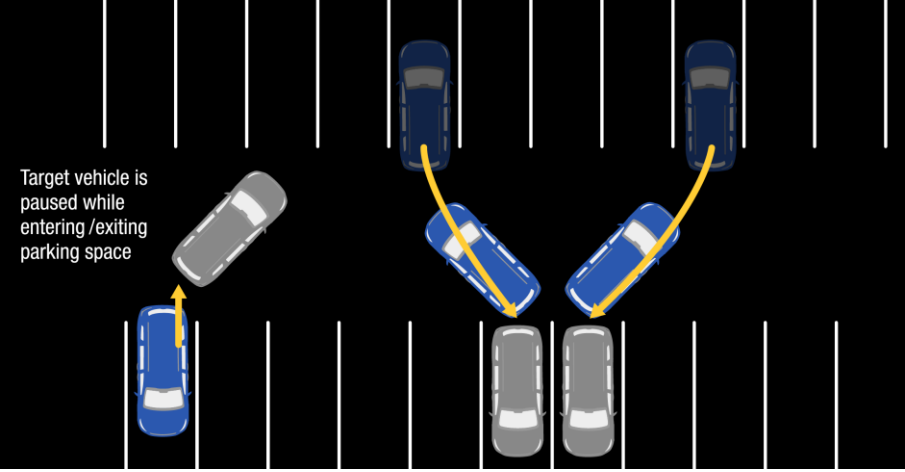
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# Rear crash prevention test scenarios

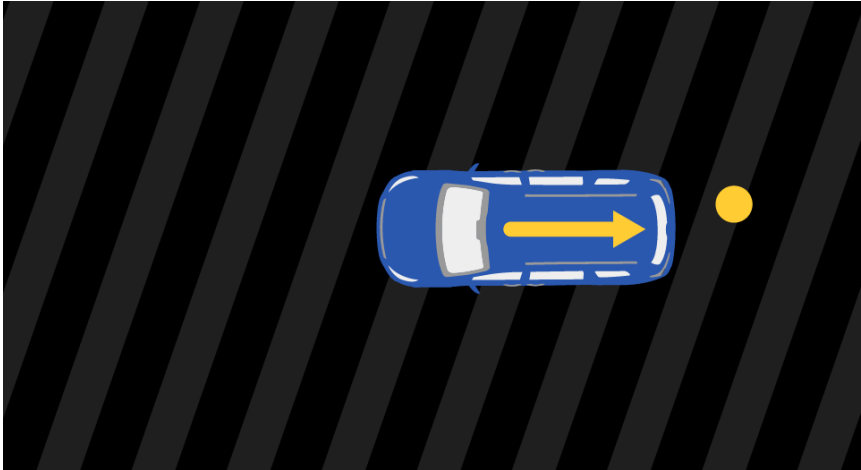
reversing car-to-car, 16" overlap



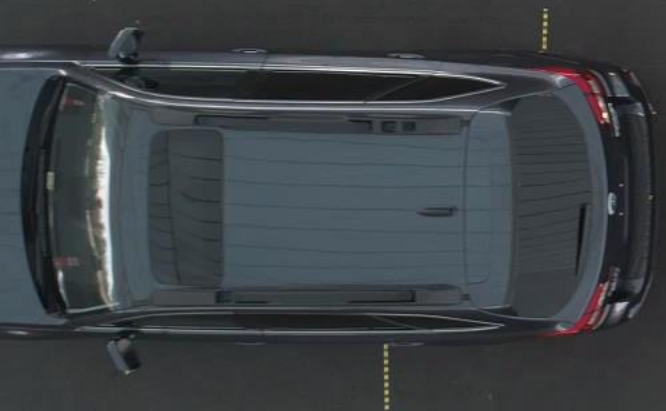
reversing car-to-car, 45° angle



reversing car-to-car, 10° angle



reversing toward fixed pole



# Rear crash prevention ratings



## **BASIC**

Vehicles with rear cross traffic alert only

Vehicles with parking sensors only

Vehicles with cross traffic alert and parking sensors

Vehicles with parking sensors and/or RCTA and minimal rear autobrake performance



## **ADVANCED**

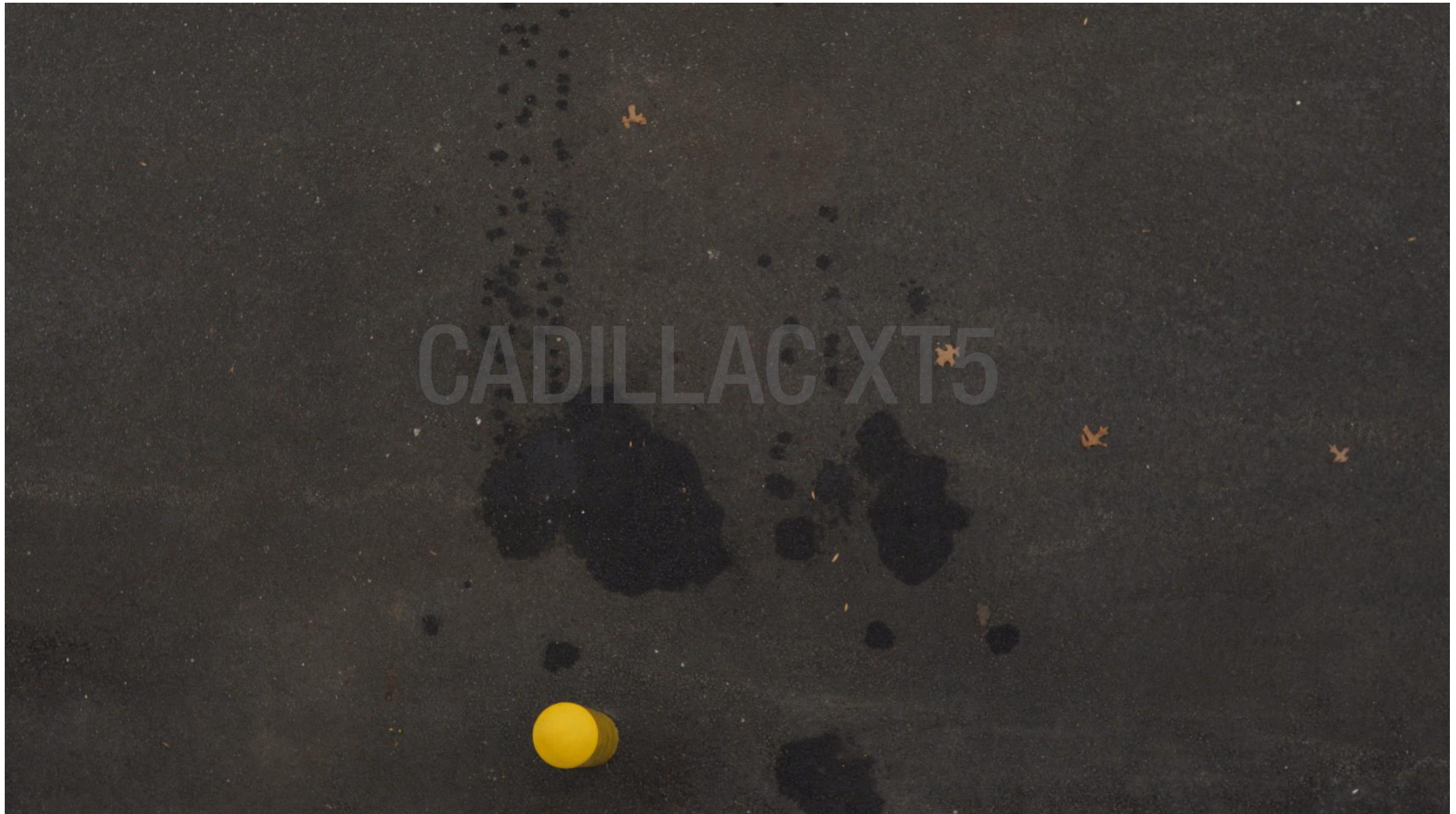
Vehicles with rear parking sensors, rear cross traffic alert, and more capable rear autobrake system



## **SUPERIOR**

Vehicles with rear parking sensors, rear cross traffic alert, and the best performing rear autobrake systems

# Benefit of rear autobrake





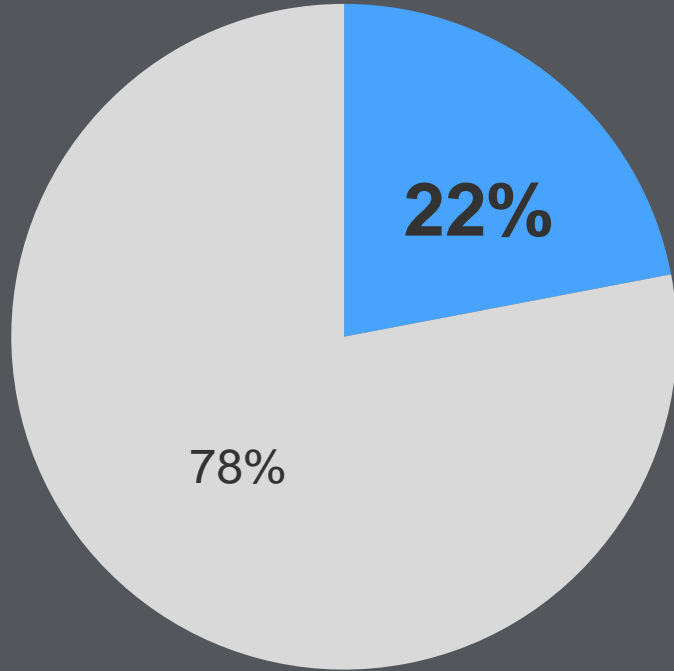
# IIHS headlight evaluations and industry progress



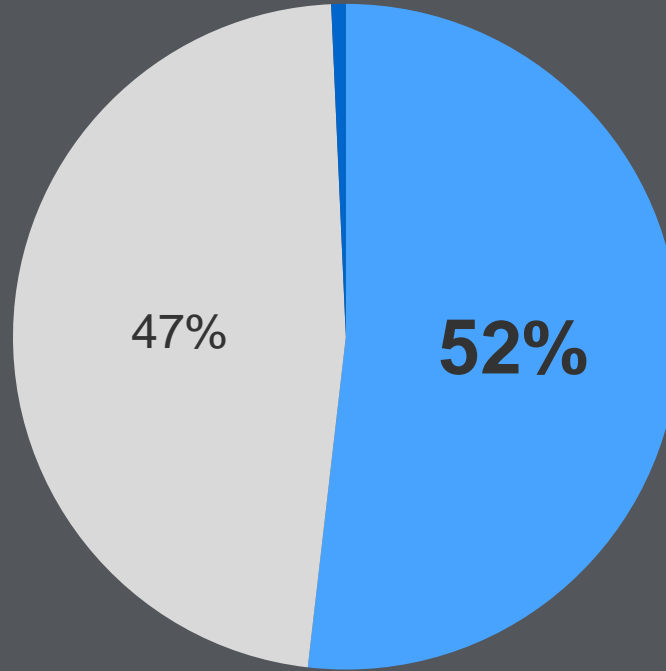
# Why are headlights important?

Driving at night is 3 times riskier than driving during the day

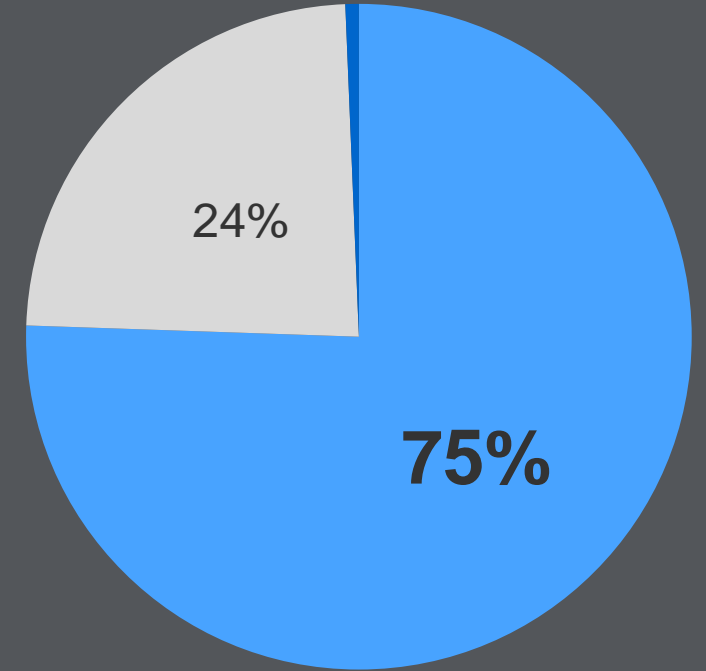
■ Daylight ■ Dark/low light ■ Other



Miles driven

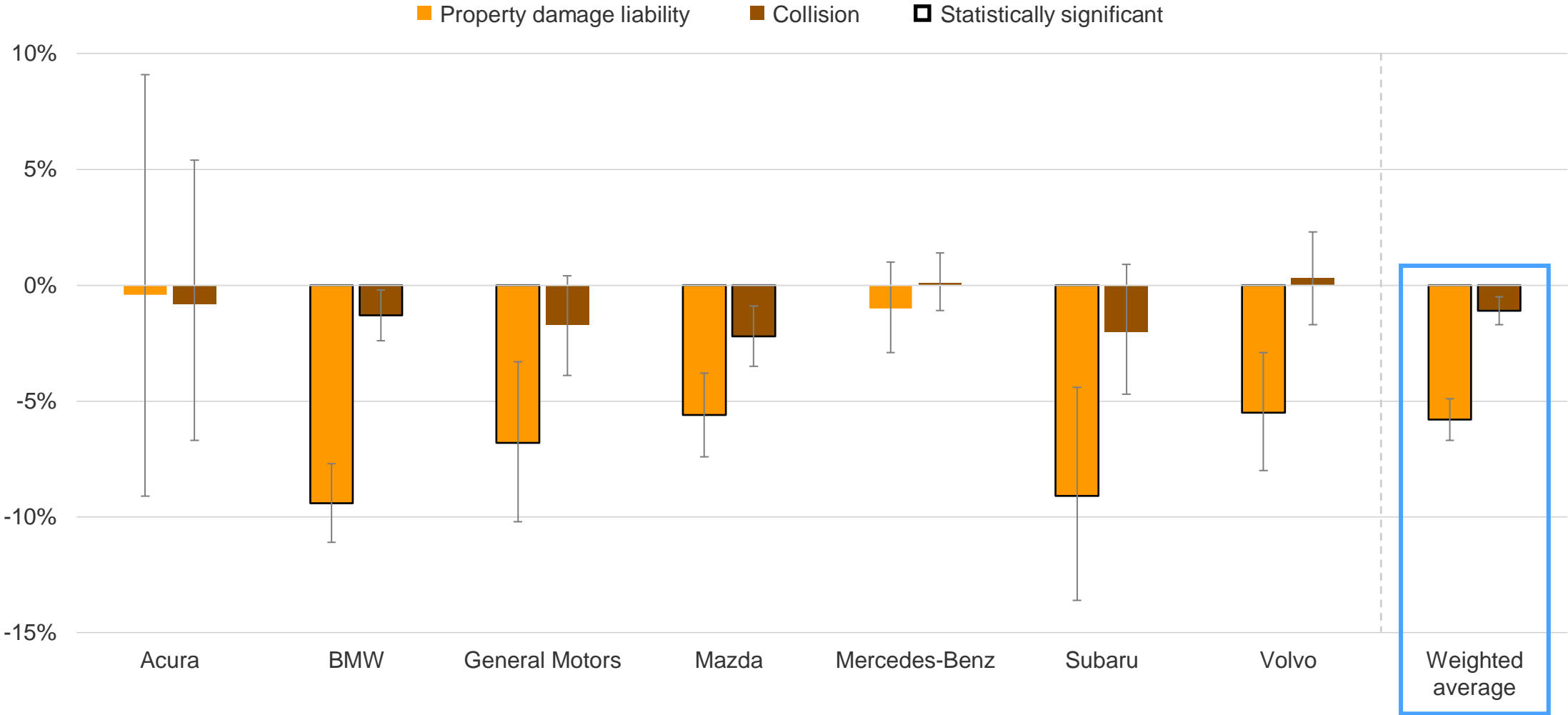


All fatalities

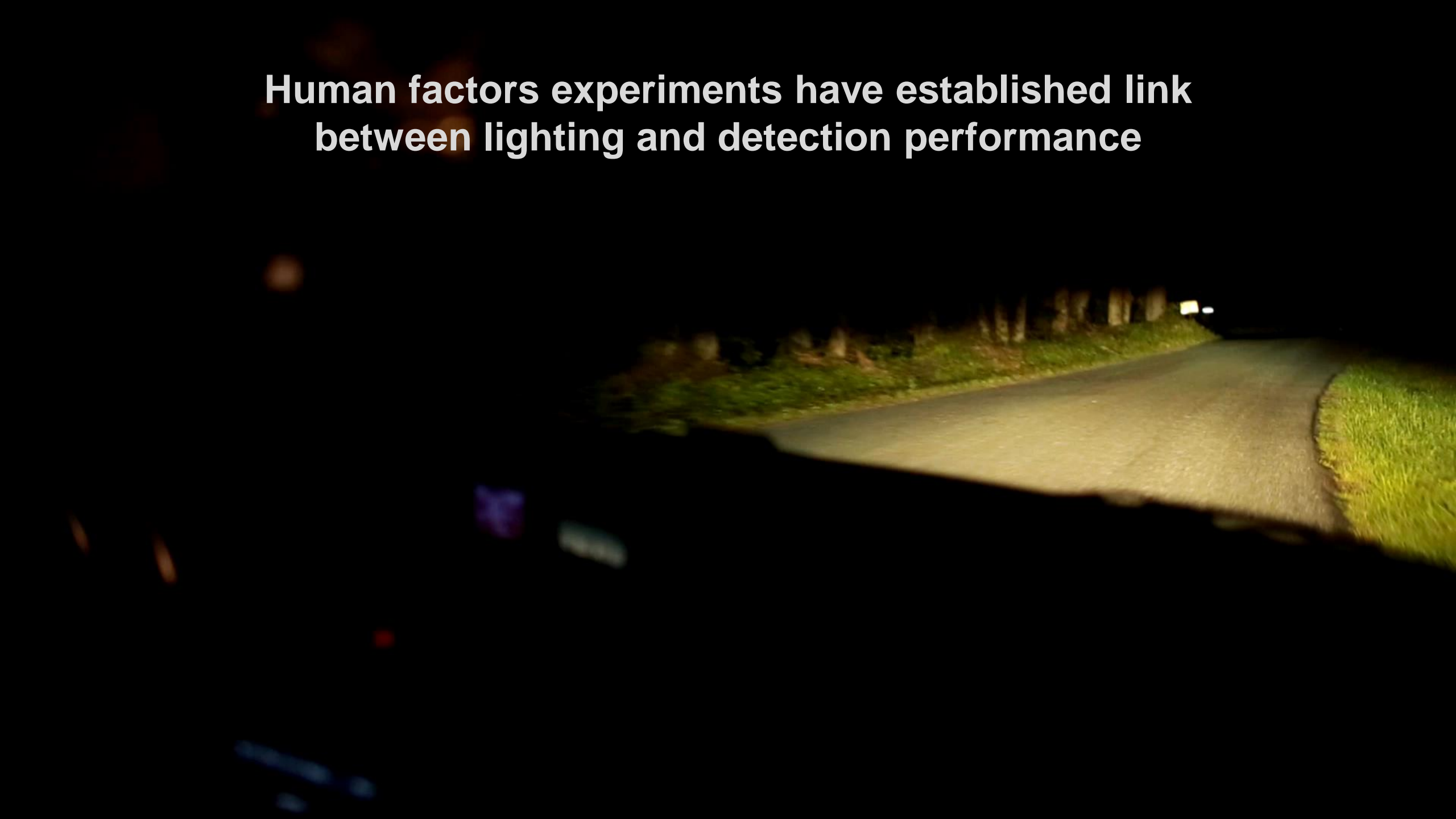


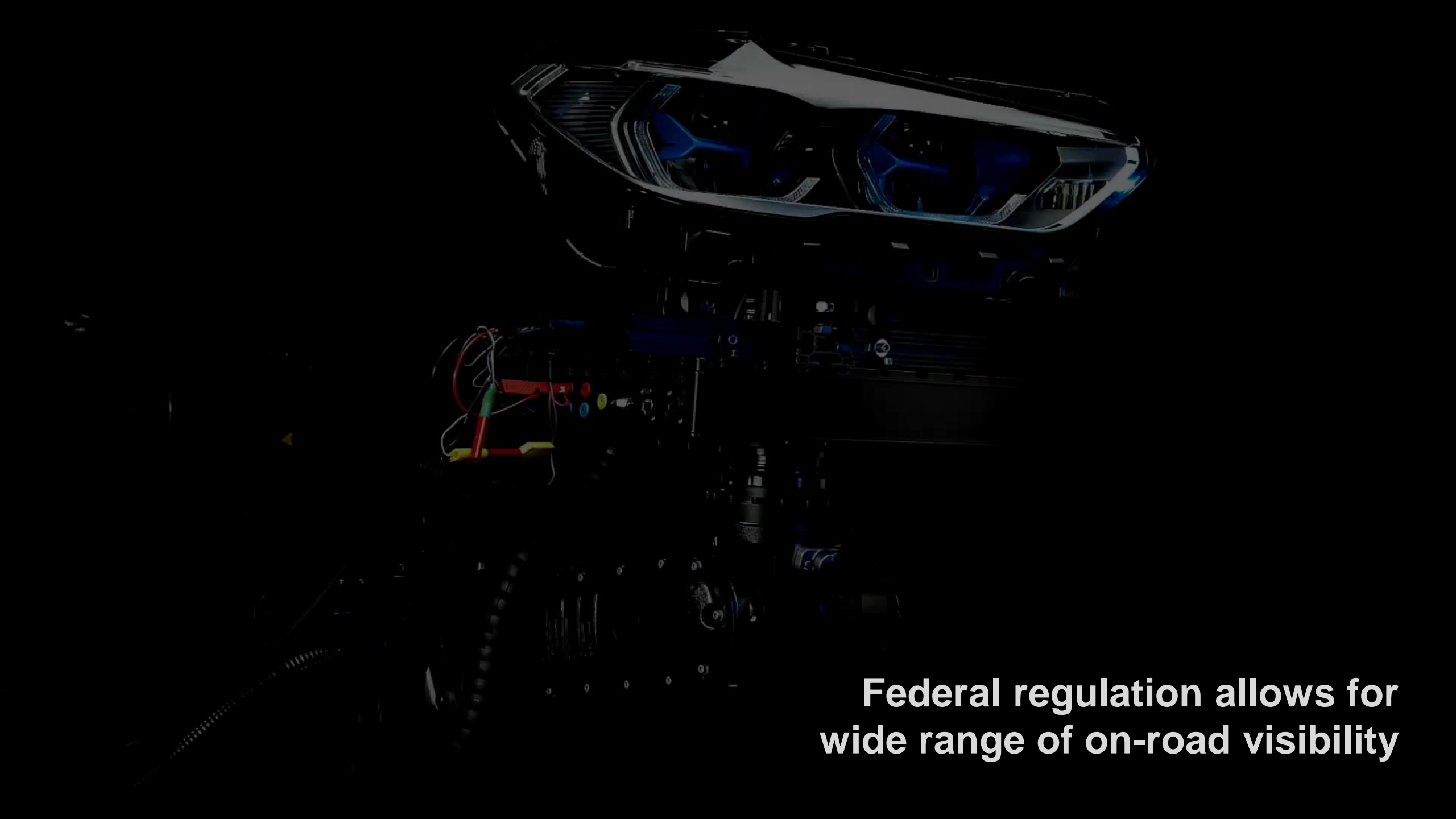
Pedestrian & bicyclist fatalities

# Change in claim frequency associated with the presence of curve-adaptive headlights



**Human factors experiments have established link  
between lighting and detection performance**

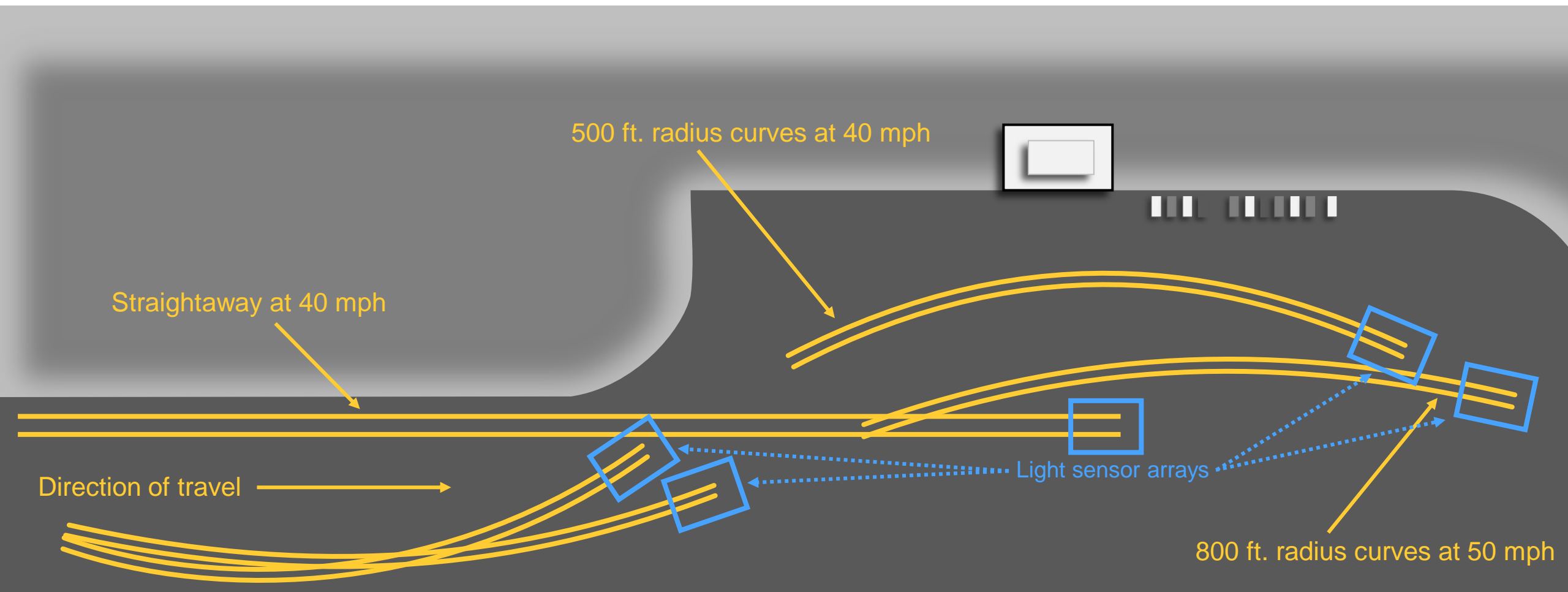




**Federal regulation allows for wide range of on-road visibility**

# IIHS dynamic headlight test

## Vehicle approaches



# IIHS dynamic headlight test

Illuminance readings

## Visibility

- ▶ Edges of the road
- ▶ 10 inches above ground

## Glare

- ▶ Center of oncoming lane
- ▶ 3 feet, 7 inches above ground





# IIHS headlight releases



## Midsized cars

March 2016

31 models  
82 headlights



## Small SUVs

July 2016

21 models  
47 headlights



## Pickup trucks

October 2016

11 models  
23 headlights



## Midsized SUVs

June 2017

37 models  
79 headlights

# HEADLIGHT WARNING

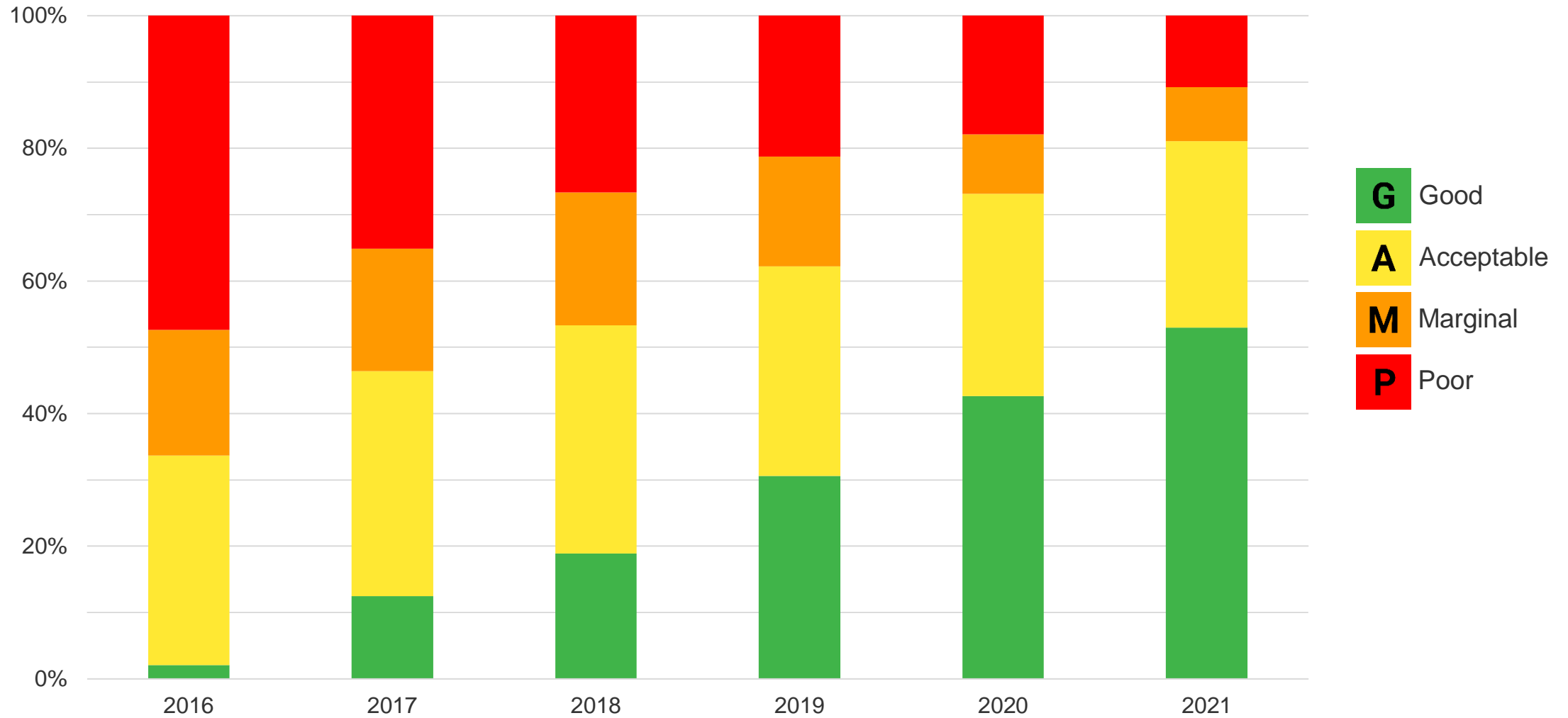
NIGHTLY  
NEWS

# Improvements



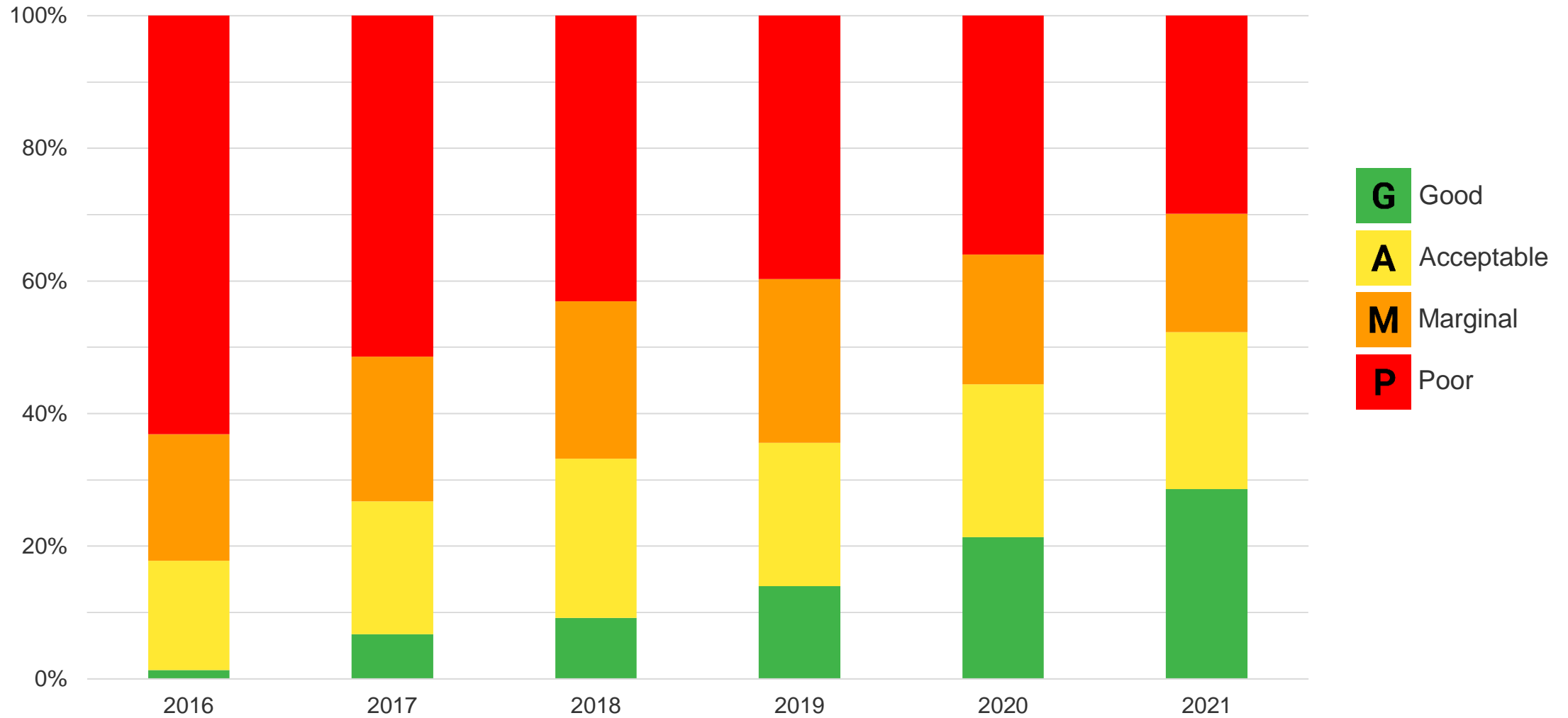
# Best-rated headlight for 2016-21 models

As of March 2022



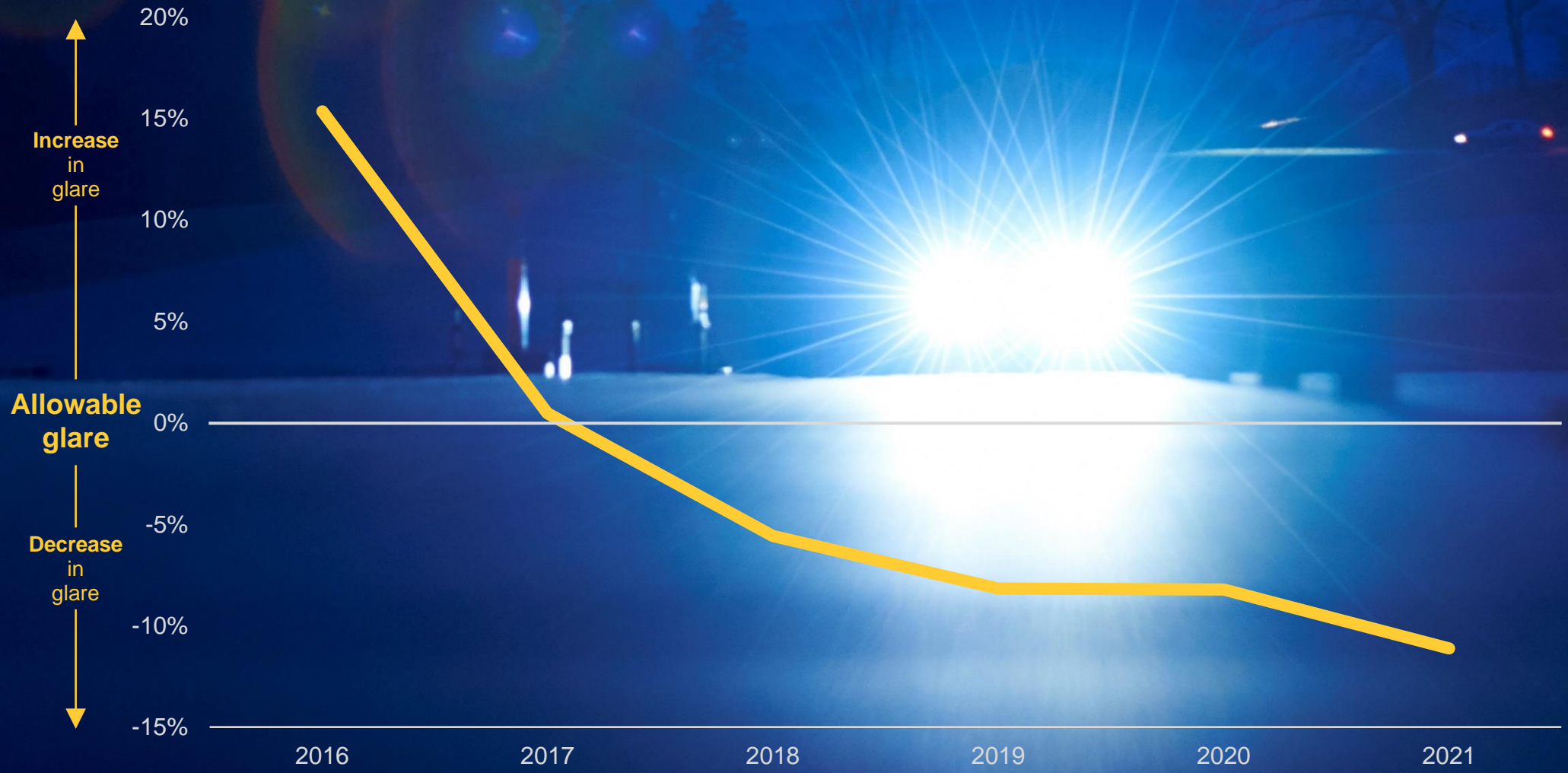
# All headlight ratings for 2016-21 models

As of March 2022



# Decreasing glare

Average low-beam glare by model year



**Ford Edge**

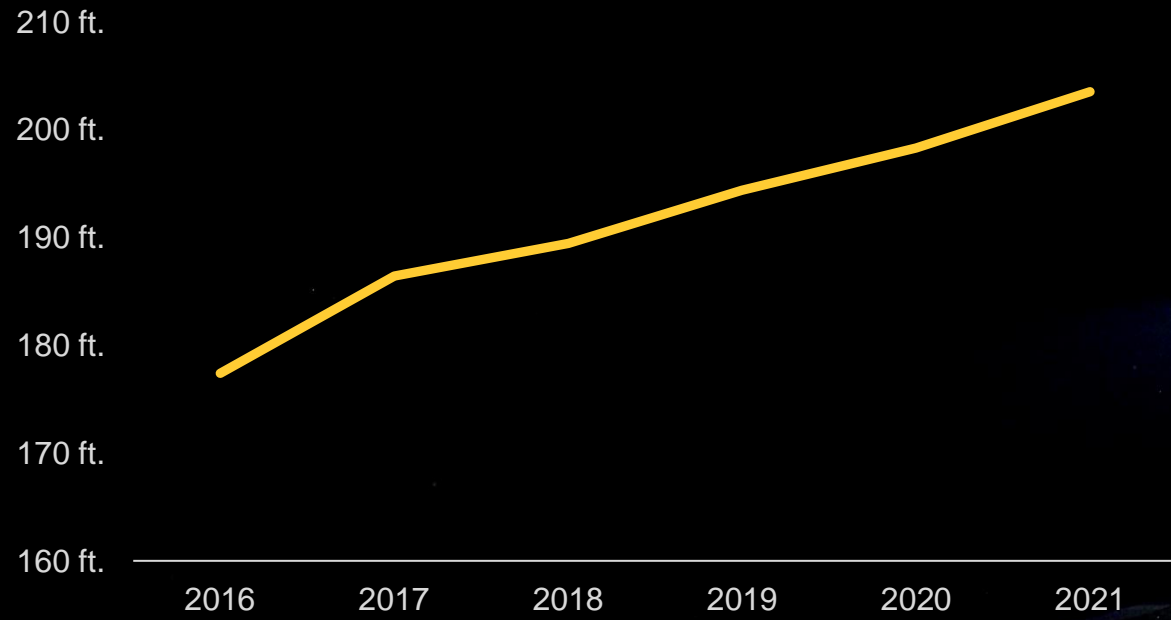


**Ford Bronco Sport**



# Increasing low-beam visibility

Average low-beam visibility distance by model year





2016  
Toyota Prius v

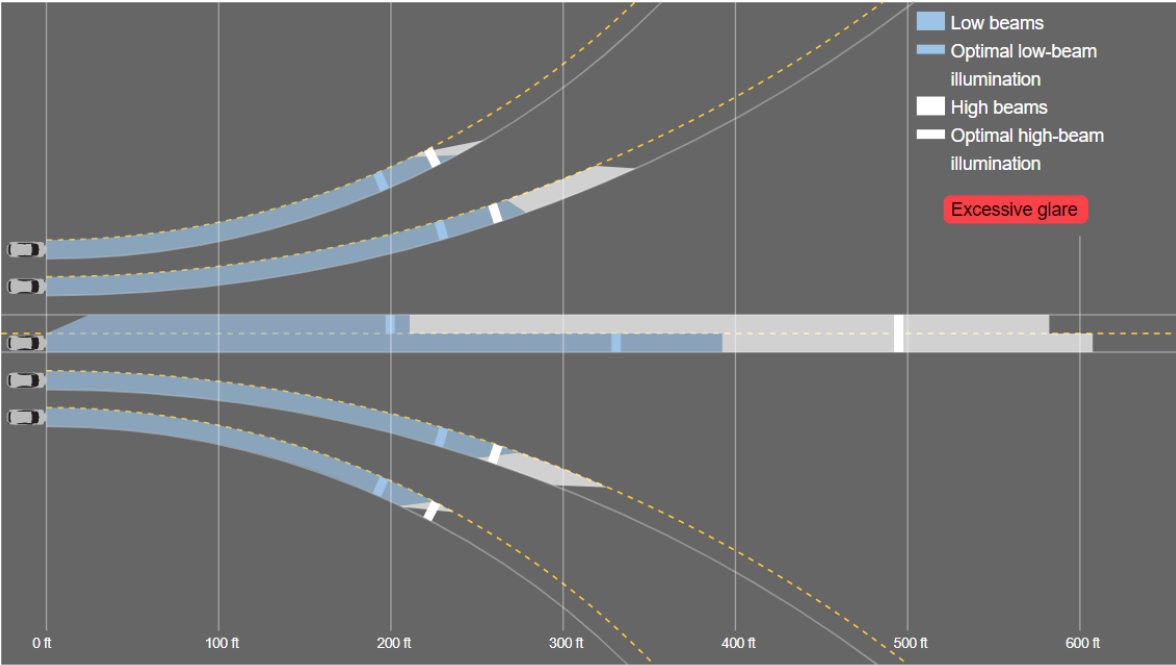


2016  
BMW 3 series



# Genesis service campaign

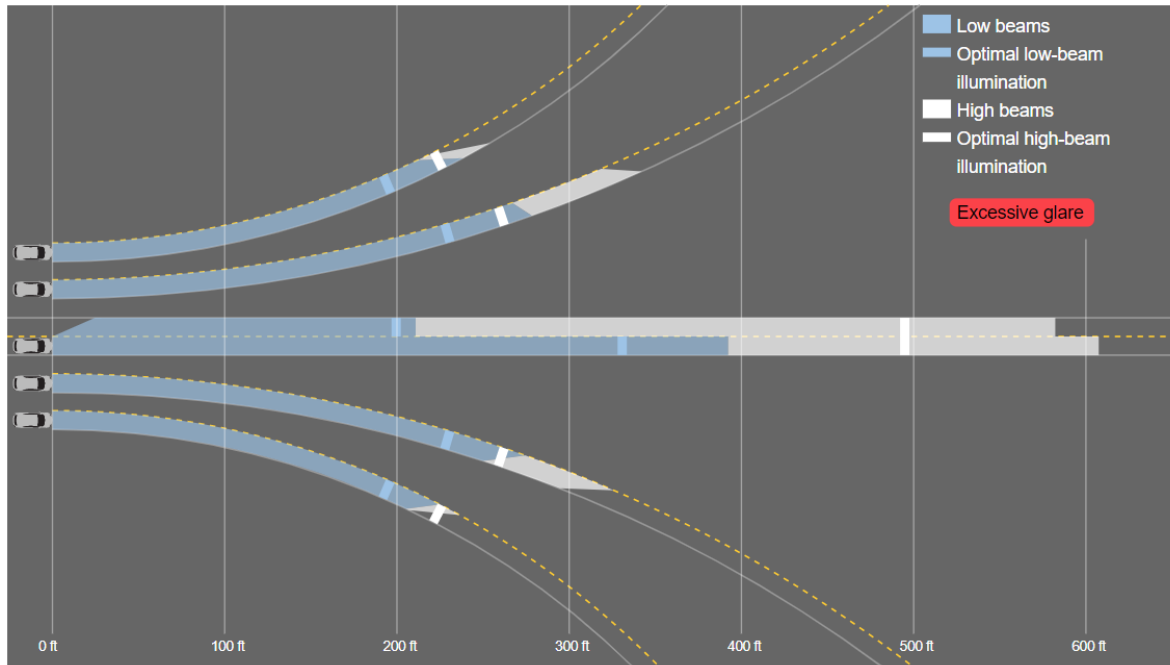
2021 Genesis G80



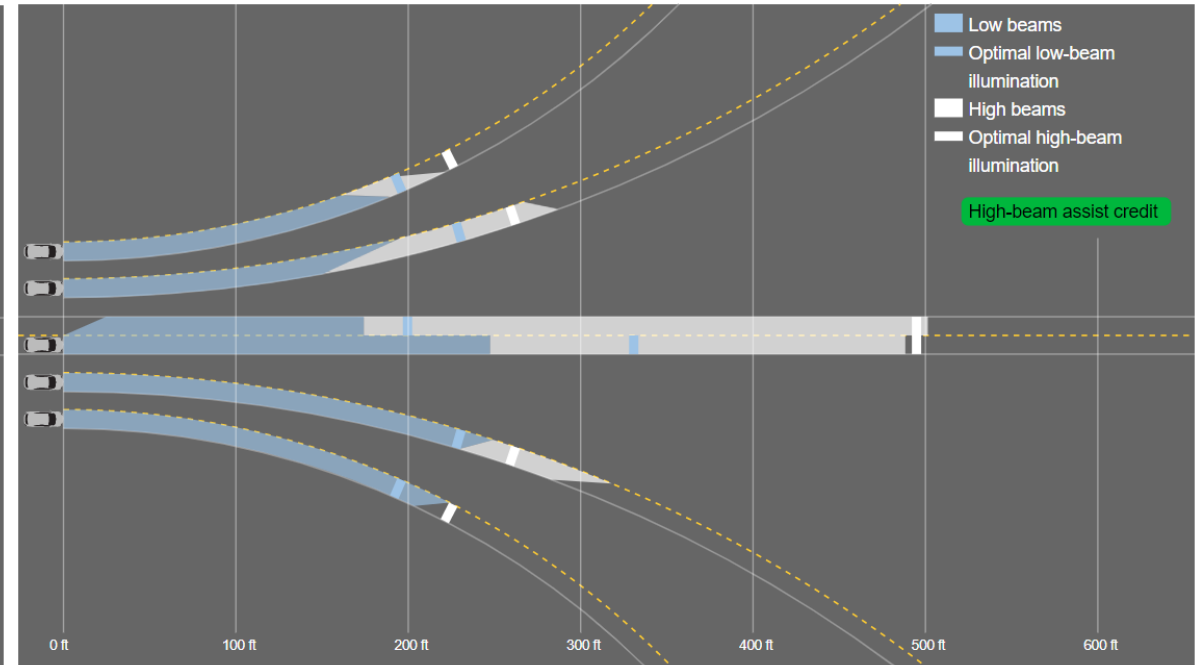
**M** Marginal

# Genesis service campaign

2021 Genesis G80



**M** Marginal



**A** Acceptable

# Genesis service campaign

## 2021 Genesis G80



GENESIS MOTOR AMERICA, LLC  
P.O. BOX 20850  
FOUNTAIN VALLEY, CA 92728

Service Campaign Number: 903G

### What is the purpose of the service campaign?

The Insurance Institute for Highway Safety (IIHS) is a well-known organization that conducts supplemental testing to evaluate certain aspects of the vehicle performance. As a result of such testing, Genesis and IIHS have determined that improvements could be made to adjust headlight aim, to improve the focus and reduce glare from the headlights to oncoming traffic.

➤ Genesis Customer Care can help with any questions or concerns:  
**844-340-9741** or [www.Genesis.com/US/CampaignHome](http://www.Genesis.com/US/CampaignHome)

This notice applies to your Genesis G80, VIN: XXXXXXXX XXXXXXXX

Dear <FirstName LastName,>

Genesis is conducting a service campaign to inspect, and if necessary adjust the headlight aim on certain 2021 model year Genesis G80 vehicles. You have received this notice because our records indicate that you are the current owner of the vehicle above.

#### What is the purpose of the service campaign?

The Insurance Institute for Highway Safety (IIHS) is a well-known organization that conducts supplemental testing to evaluate certain aspects of the vehicle performance. As a result of such testing, Genesis and IIHS have determined that improvements could be made to adjust headlight aim, to improve the focus and reduce glare from the headlights to oncoming traffic.

#### What will Genesis do?

Your Genesis retailer will inspect, and if necessary, adjust the headlight aim on the vehicle. This procedure will be performed at **NO CHARGE** to you.

#### What should you do?

**Please contact your nearest Genesis retailer to schedule the campaign service as soon as possible.**

The actual time required to perform the procedure is less than an hour, however your vehicle may be needed longer; therefore, we recommend scheduling a service appointment to minimize inconvenience. You may arrange in advance for a Service Rental vehicle using Service Valet should you require alternate transportation during the service period.

#### If you have other questions

If you have any questions or require further assistance, you may contact the Genesis Customer Care Center at 844-340-9741.

We thank you for your purchase of your Genesis and hope for your continued satisfaction as a Genesis owner.

Genesis Motor America, LLC



# Genesis service campaign

## 2021 Genesis G80

[MODELS](#)[MEMBERS](#)[GENESIS](#)[SUPPORT](#)

## 2021 IIHS TOP SAFETY PICK+

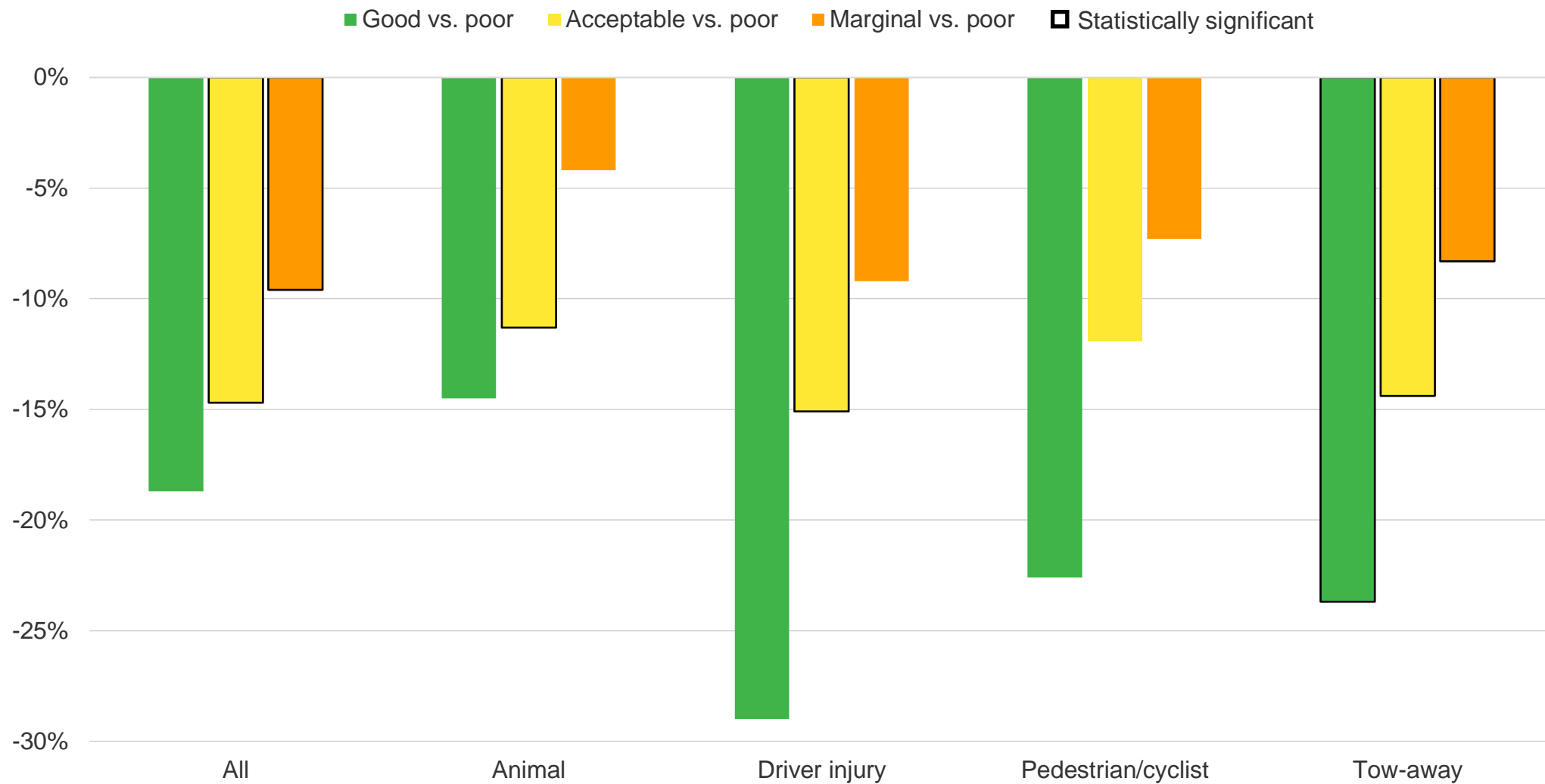
The Insurance Institute for Highway Safety (IIHS) announced that the all-new 2021 Genesis G80 executive sedan has been designated as TOP SAFETY PICK+ (TSP+) for 2021.

With this designation, G80 completes the 2021 Genesis lineup sweep of top honors, joining the GV80 SUV, G70 sport sedan, and G90 flagship sedan. This marks the third year in a row that G80 has earned top honors along with G70 and G90 all having received TOP SAFETY PICK+ designations in 2019, 2020, and 2021.



**2021** IIHS TOP SAFETY PICK+  
APPLIES TO US MODELS

# Nighttime crash risk relative to poor-rated headlights

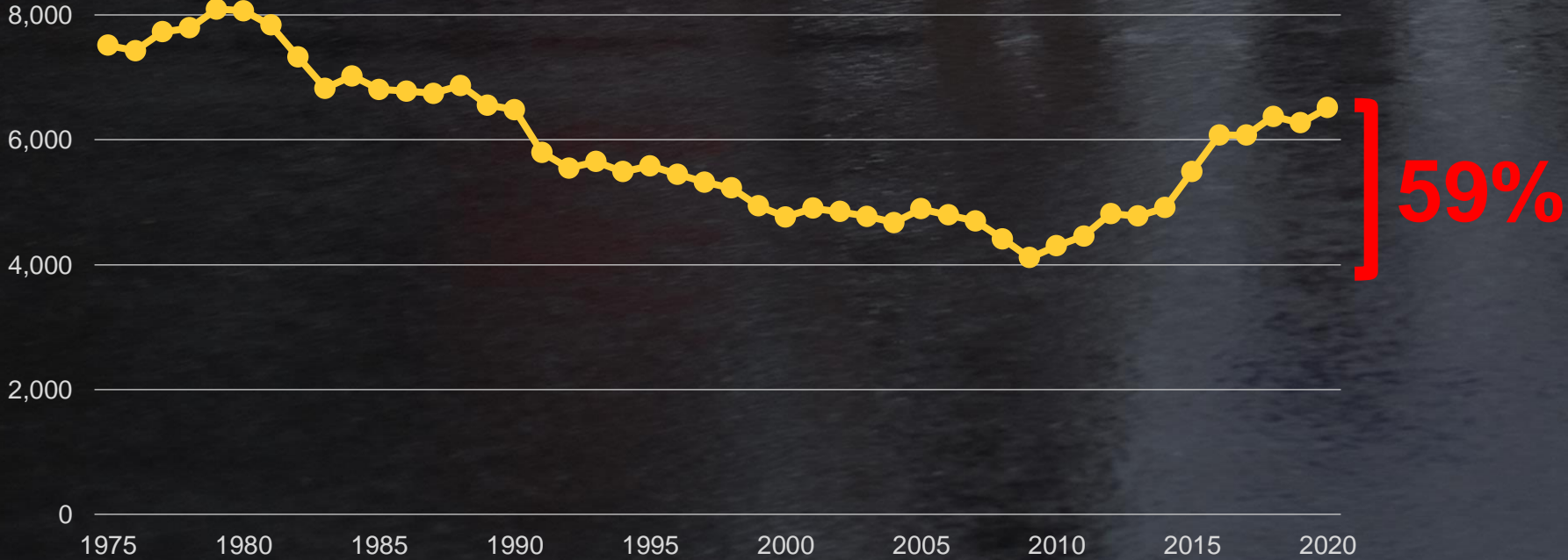


# IIHS Pedestrian Testing



# U.S. pedestrian fatalities

1975-2020





# Upward trend in pedestrian deaths



- ▶ Highest increases occurred in scenarios with most pedestrian deaths
  - Urban areas
  - Arterials
  - Nonintersections
  - Dark
- ▶ Higher increases among age group 20-69 and pedestrians not impaired by alcohol
- ▶ Increasing popularity of SUVs and vehicle power associated with increased risk of pedestrian deaths

# Pedestrian front crash prevention testing began in late 2018



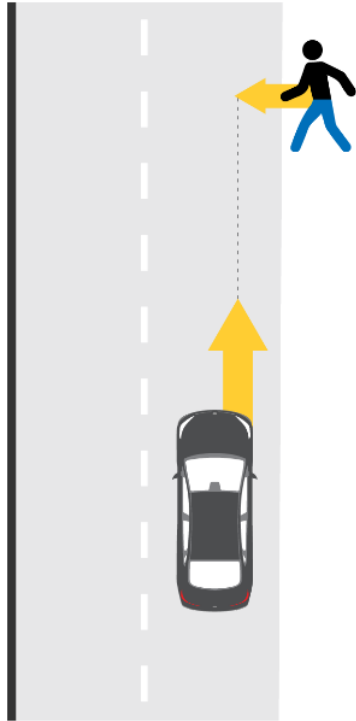
# Pedestrian Test Scenarios

## Adult walking from right side

Vehicle speed: 20 & 40 km/h

Pedestrian Speed: 5 km/h

Impact location: 25%

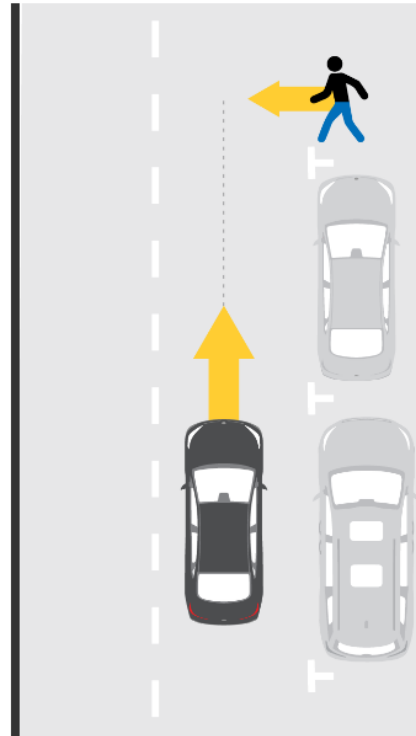


## Child running from right side

Vehicle Speed: 20 & 40 km/h

Pedestrian Speed: 5 km/h

Impact location: 50%

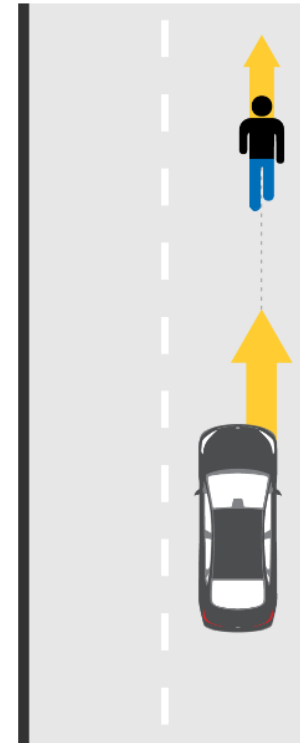


## Stationary adult in traffic lane

Vehicle speed: 40 & 60 km/h

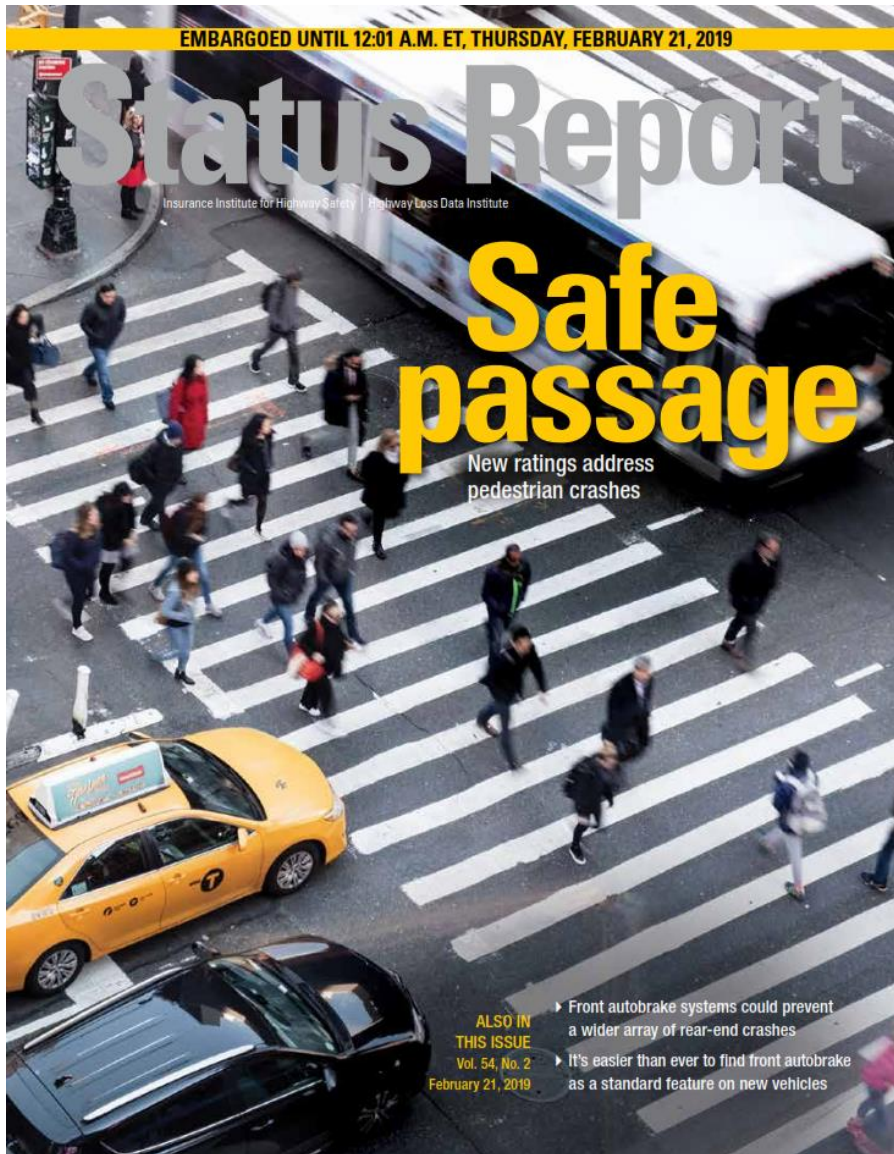
Pedestrian Speed: 0 km/h

Impact location: 25%



# Pedestrian Rating

Small SUV release – February 21, 2019



## SUPERIOR



2018-19 Honda CR-V

2019 Subaru Forester

2019 Toyota RAV4

2019 Volvo XC40

## ADVANCED



2019 Chevrolet Equinox

2018-19 Hyundai Kona

2019 Kia Sportage

2018-19 Mazda CX-5

2019 Nissan Rogue

## BASIC



2019 Mitsubishi Outlander

## NO CREDIT

2018-19 BMW X1

# Pedestrian Rating

Midsized car release – October 29, 2019



## SUPERIOR



2019 Audi A4 standard

2019-20 BMW 3 series standard

2020 Subaru Outback standard

2019-20 Mercedes-Benz  
C-Class optional

2019-20 Nissan Maxima  
optional for 2019/standard for 2020

2019-20 Volvo S60 standard

## BASIC



2019-20 Chevrolet Malibu  
optional camera only

2019-20 Chevrolet Malibu  
optional camera + radar

2019-20 Mercedes-Benz  
C-Class standard

## ADVANCED



2019-20 BMW 3 series optional

2019-20 Honda Accord standard

2019-20 Lexus ES 350 standard

2019 Mazda 6 standard

2019-20 Nissan Altima optional

2019-20 Tesla Model 3 standard

2019-20 Toyota Camry standard

## NO CREDIT

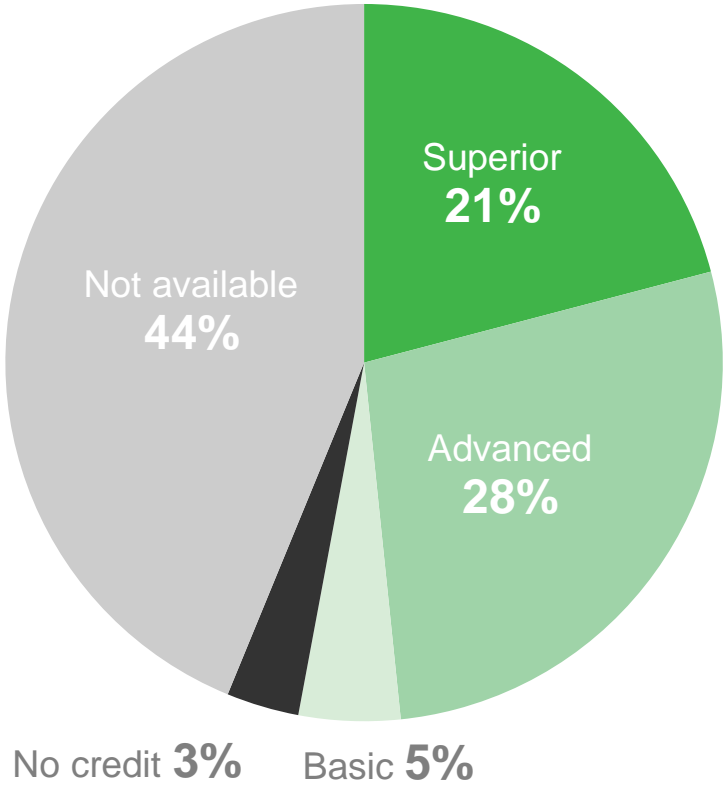
2019-20 Ford Fusion standard

2019 Hyundai Sonata optional

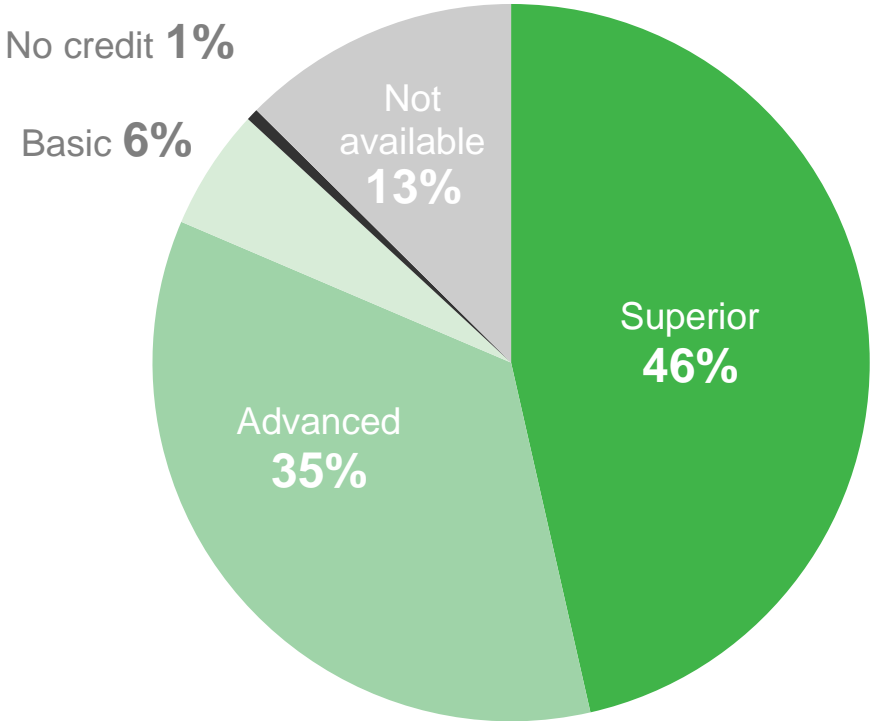
2019-20 Kia Optima optional

# Pedestrian front crash prevention ratings

2019



2021

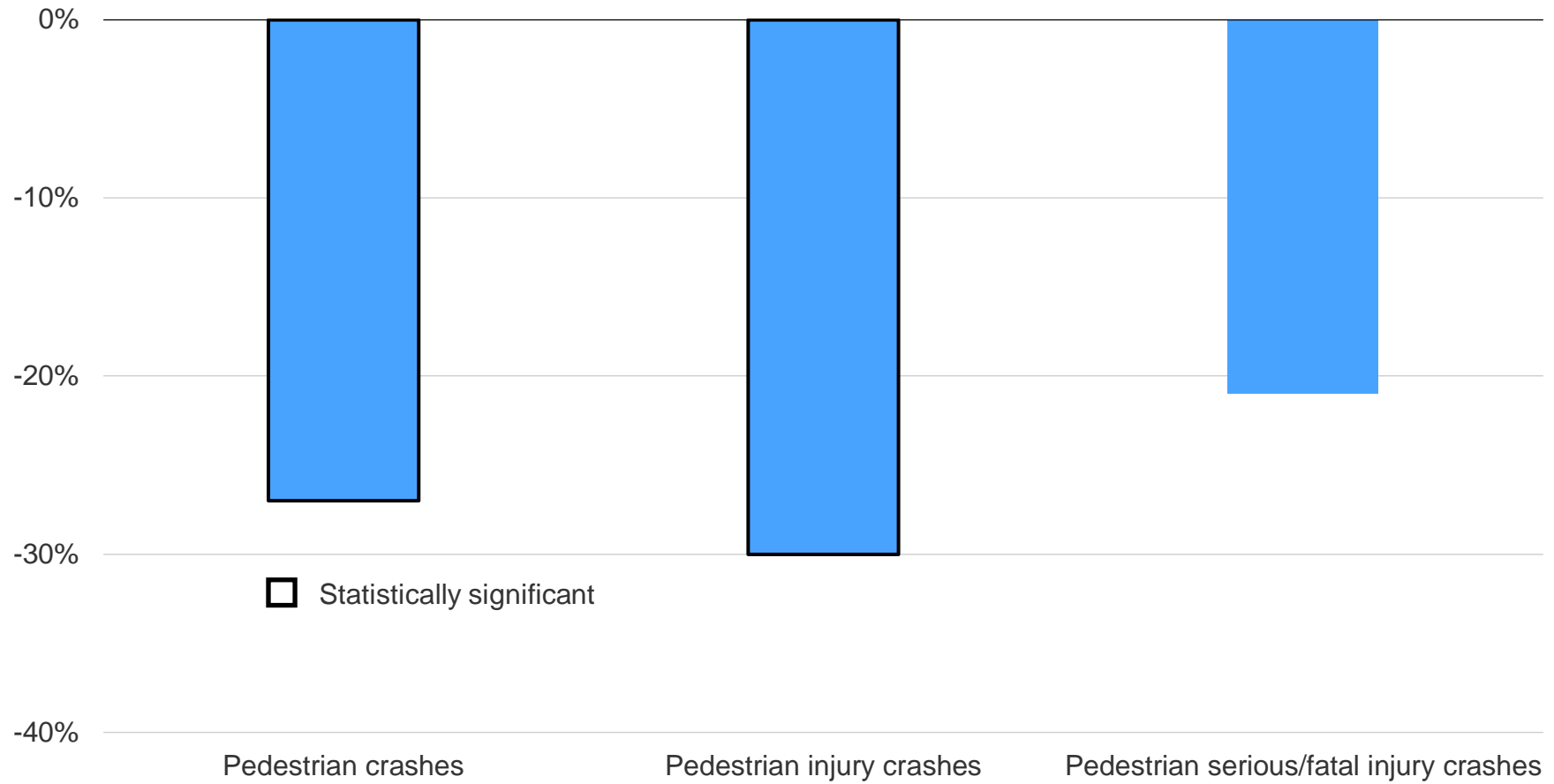




*HLDI analysis:*  
**Subaru EyeSight  
and pedestrians**

Pedestrian-related  
insurance claims  
reduced by  
**35%**

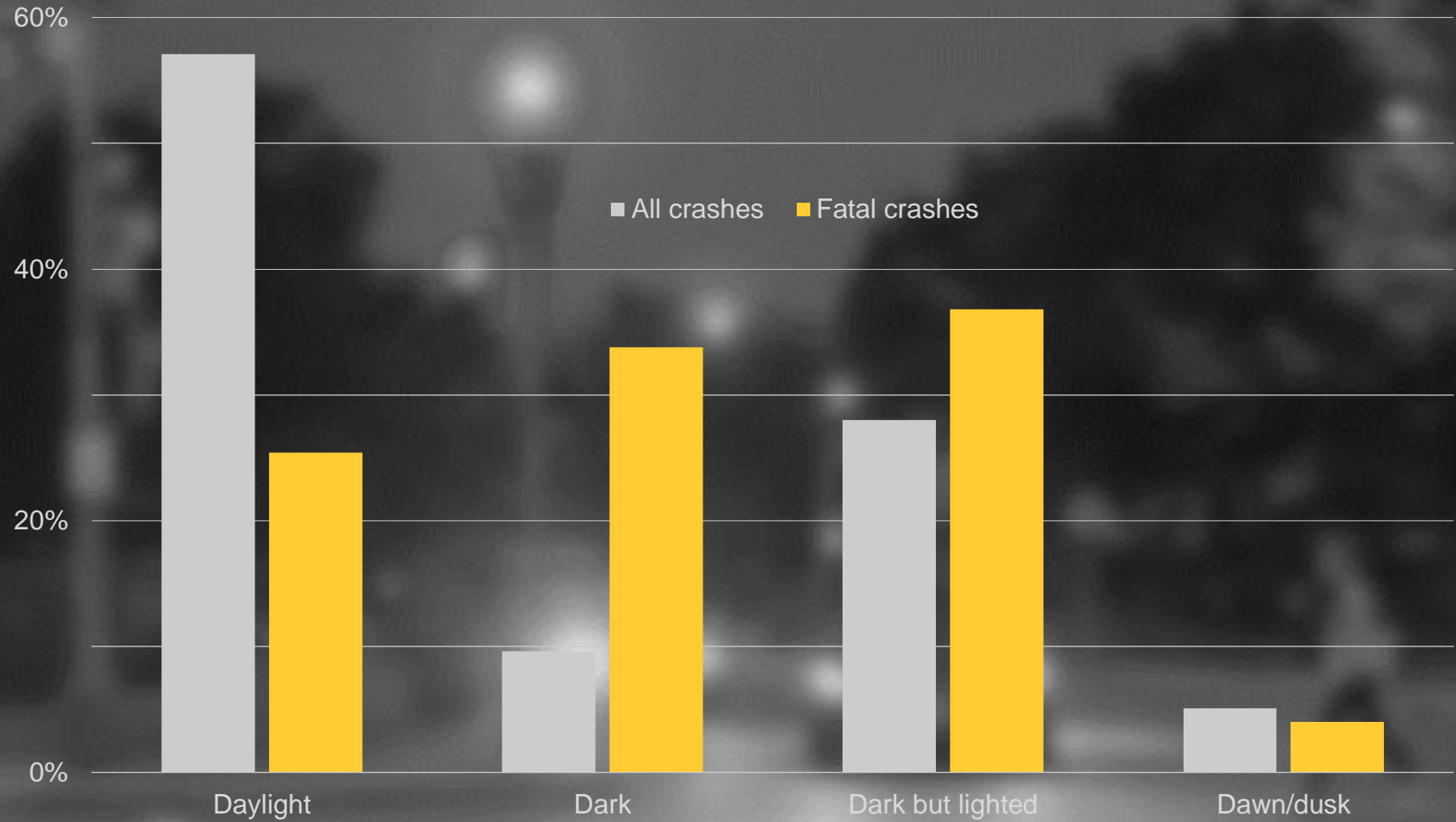
# Effects of pedestrian automatic emergency braking (AEB) on police-reported pedestrian crashes





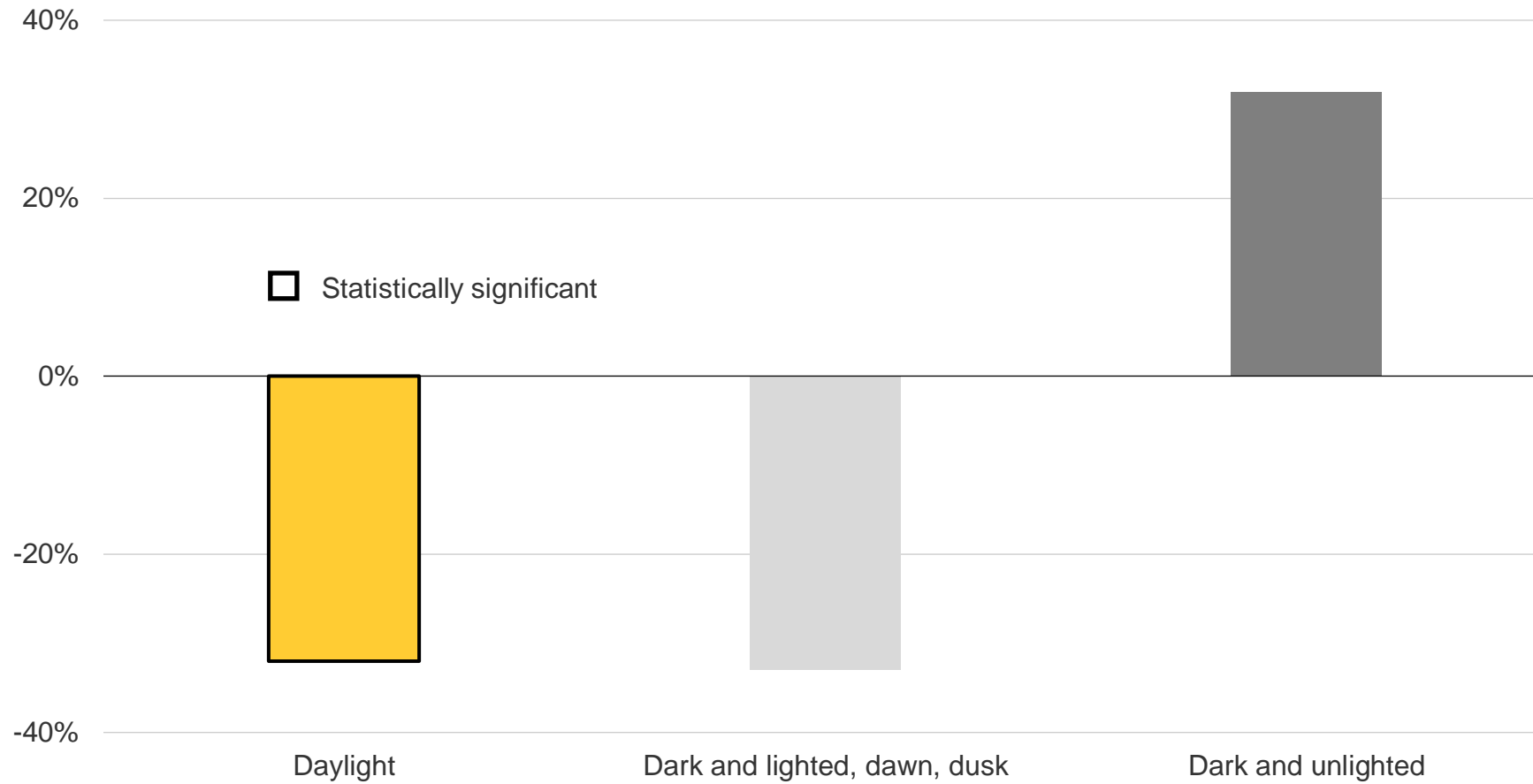
# Pedestrian crashes and fatalities

By light condition



# Effect of pedestrian AEB on the odds of a pedestrian crash

## By light condition



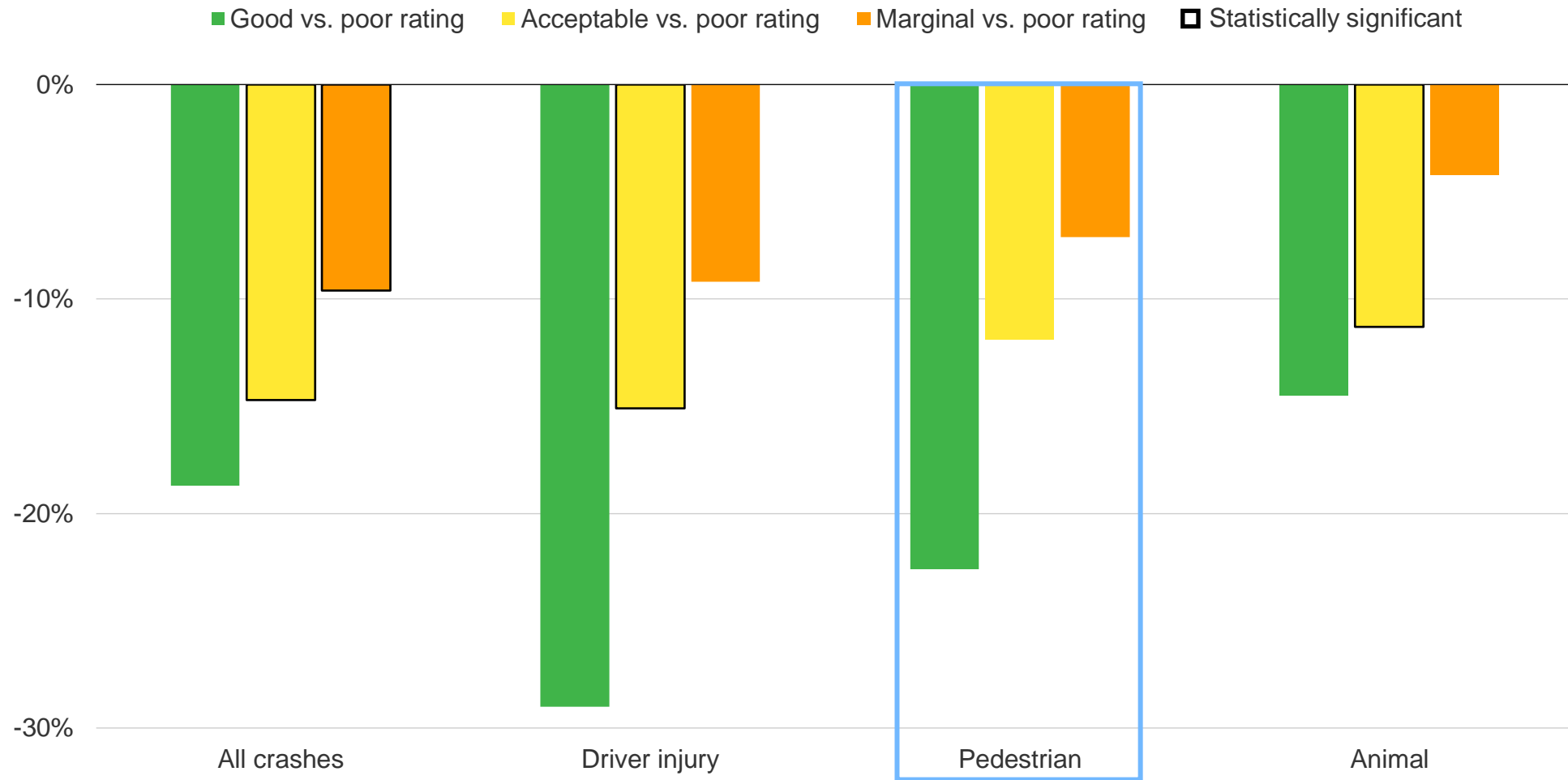
2016  
Toyota Prius v

2016  
BMW 3 series

Pedestrian target  
at 50 feet

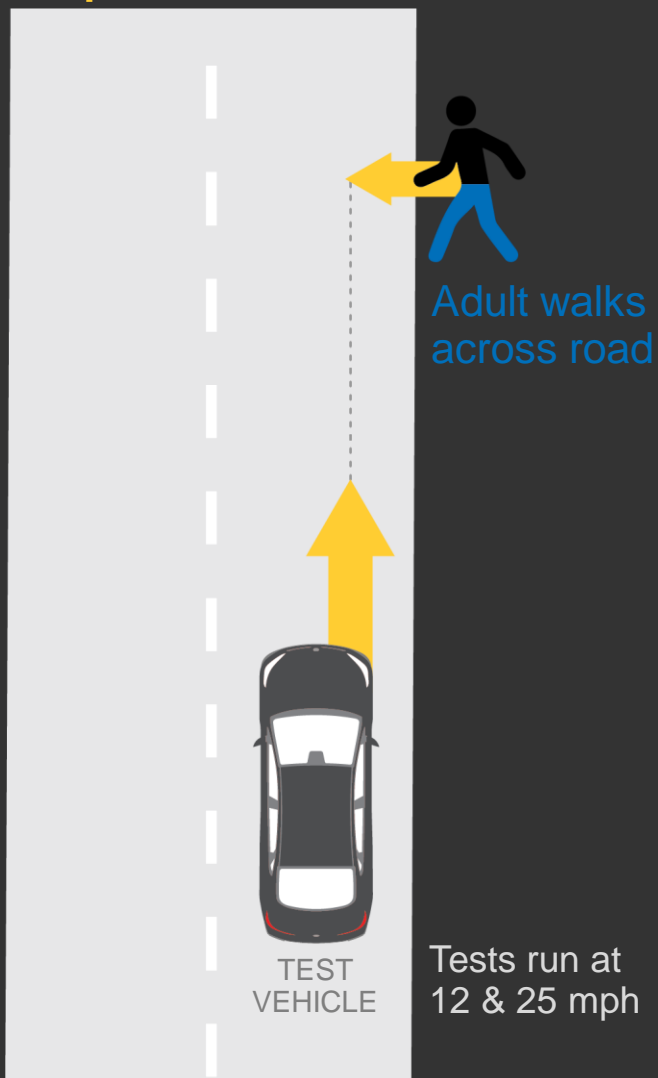


# Nighttime crash risk relative to poor-rated headlights

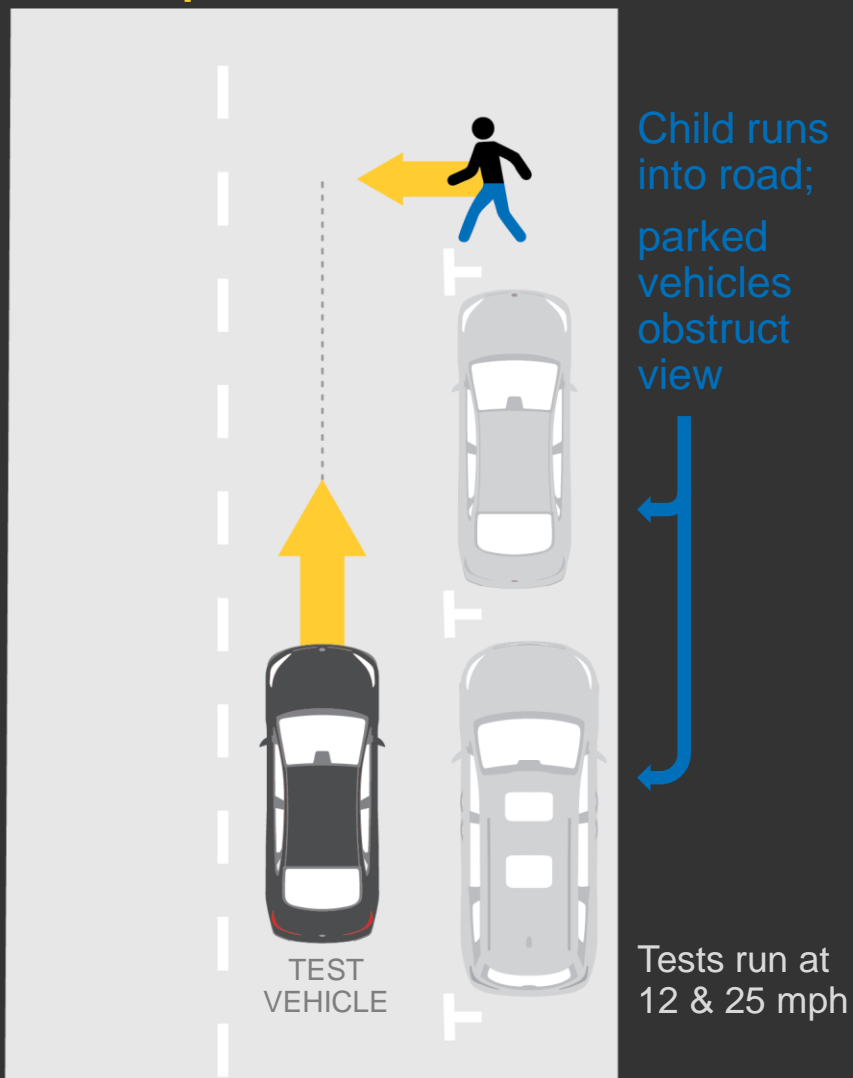


# Night pedestrian front crash prevention test scenarios

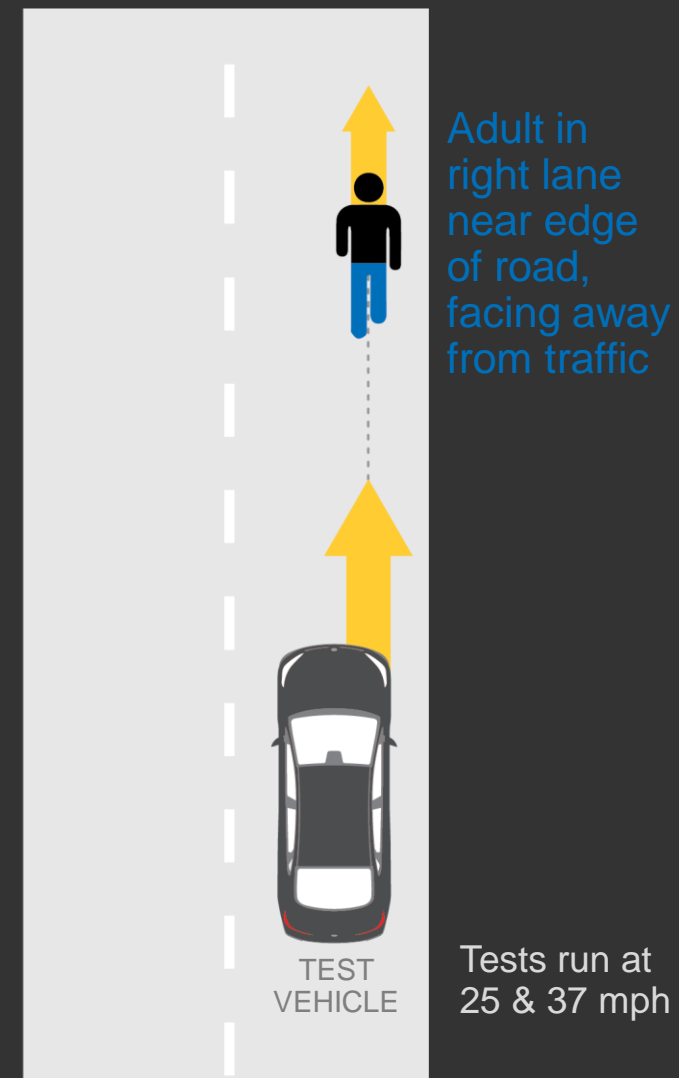
## Perpendicular adult



## Perpendicular child



## Parallel adult







**High beam 25 mph**

**Low beam 25 mph**



# Night pedestrian front crash prevention test vehicles

By headlight rating



2021 Ford Bronco Sport



2020 Honda CR-V



2021 Toyota CH-R



2022 Volkswagen Taos



2019 Volvo XC40



2021 Chevrolet Trailblazer



2020 Hyundai Venue



2019 Subaru Forester



2021 Toyota CH-R

# Night pedestrian front crash prevention test vehicles

By AEB technology



2021 Ford Bronco Sport



2020 Honda CR-V



2021 Toyota CH-R



2022 Volkswagen Taos



2019 Volvo XC40



2021 Chevrolet Trailblazer



2020 Hyundai Venue



2019 Subaru Forester



2021 Toyota CH-R

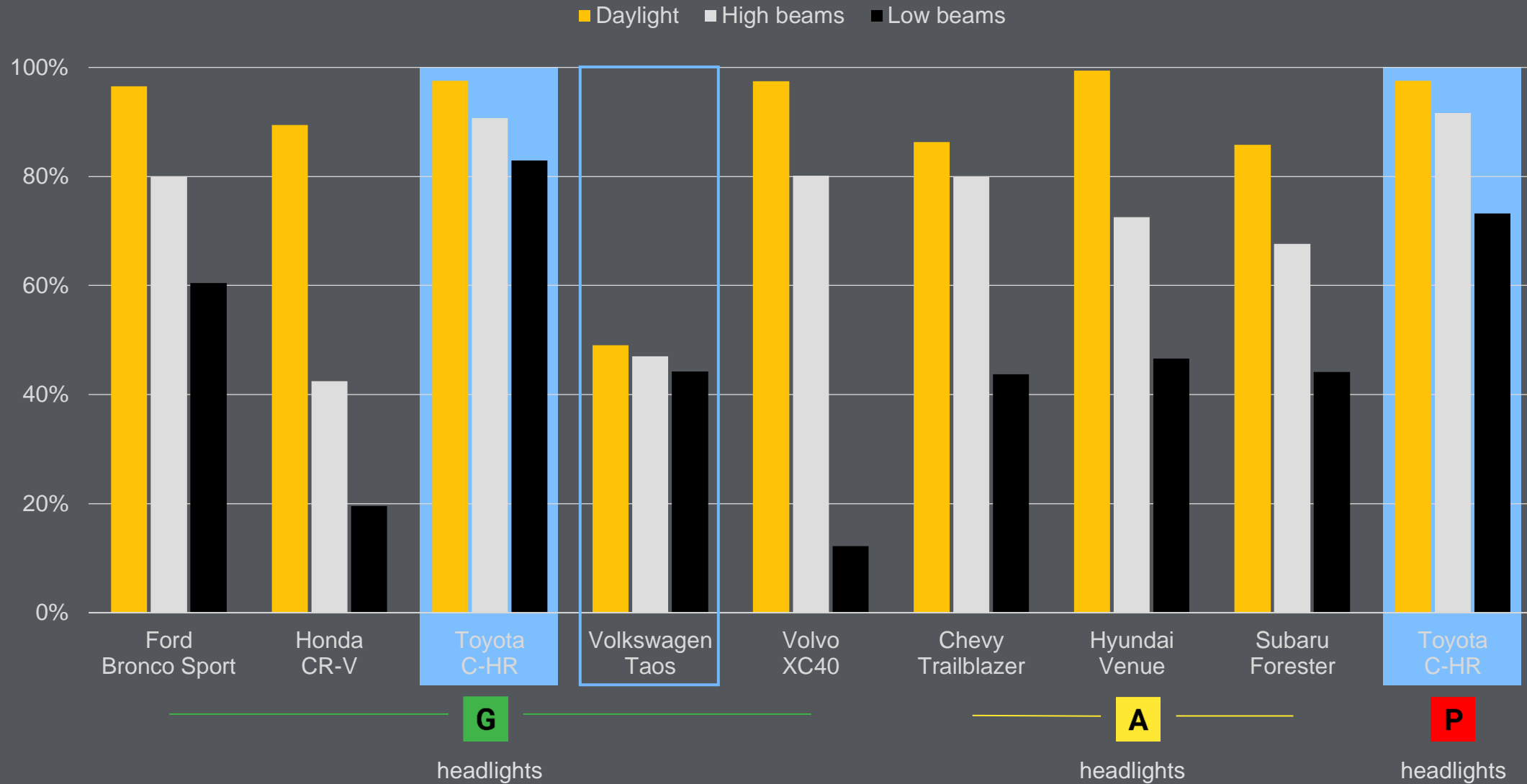


Camera



Radar

# Average speed reductions in pedestrian tests





## Takeaways

- ▶ Most pedestrian AEB systems perform well in our current test
- ▶ Pedestrian AEB is preventing crashes
- ▶ Fatal pedestrian crashes occur more often in the dark
- ▶ Better rated headlights help drivers see pedestrians and prevent crashes at night
- ▶ IIHS plans to launch night pedestrian front crash prevention later this year

# IIHS safeguards ratings for partial driving automation



## Some drivers misuse partially automated systems



# IIHS issued recommendations for keeping drivers engaged

March 2020

## IIHS recommends new safeguards for partially automated driving systems

IIHS has issued a set of research-based safety recommendations on the design of partially automated driving systems. The guidelines emphasize how to keep drivers focused on the road even as the vehicle does more of the work.

Today's partially automated systems still need the driver to be involved at all times. That means they need robust methods of monitoring driver engagement and more effective ways of regaining the driver's attention when it wanders. Designs should also be based on a principle of shared control, and they should have built-in limits that prevent them from being used on roads and under conditions where it isn't safe to do so, IIHS researchers say.

As part of that philosophy of shared control, partially automated systems shouldn't change lanes or overtake other vehicles without driver input. They should also be responsive to driver steering input even when automatic lane centering is engaged.

"Unfortunately, the more sophisticated and reliable automation becomes, the more difficult it is for drivers to stay focused on what the vehicle is doing," says IIHS President David Harkey. "That's why systems should be designed to keep drivers actively engaged."

Under the classification system developed by SAE International, there are five levels of automation, ranging from 0 (no automation) to 5 (fully self-driving). The highest level available in production



vehicles today is Level 2. These systems continuously control acceleration, braking and steering to keep the vehicle traveling at a set speed in the center of its lane while maintaining a selected following distance from the vehicle ahead. They require the human driver to remain vigilant and ready to intervene in the event that the system encounters a situation it cannot handle.

Despite these limitations, some designs make it too easy for the driver to rely heavily on the system and lack safeguards to make sure he or she remains actively engaged in the driving.

The IIHS researchers reviewed dozens of academic studies to develop a series of recommendations for how manufacturers can

### IIHS RESEARCH

"Addressing driver disengagement and system misuse: human factors recommendations for Level 2 driving automation design" by A.S. Mueller, I.J. Reagan and J.B. Cicchino

To request this paper, email [researchpapers@iihs.org](mailto:researchpapers@iihs.org).

better ensure that users remain focused on what's happening on the road.

One key recommendation is for a specific series of attention reminders to bring the driver's focus back to the road as outlined in the graphic below. ■

Full story at [go.iihs.org/automation-safeguards](http://go.iihs.org/automation-safeguards)

What behaviors should be monitored?

How should the system respond if the driver is not paying attention?

Should the system have extra capabilities?

# IHS safeguards for partial driving automation ratings program

Sets minimum expectations for automakers to design systems that deter misuse through:

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Attention reminders



Driver monitoring



Emergency escalation



Responsible application of automated functionality



Cooperation between driver and automation



Safety feature use



- ▶ Program does not endorse partial driving automation
- ▶ It is technology neutral to encourage innovative solutions
- ▶ Safeguard categories are data-driven and will continue to evolve



# IIHS safeguards for partial driving automation ratings program



Safeguards will be rated good, acceptable, marginal or poor

Currently working on an official protocol

Expect to issue the first set of ratings later this year

# Questions?

Insurance Institute for Highway Safety  
Highway Loss Data Institute

[iihs.org](https://www.iihs.org)



[/iihs.org](https://www.facebook.com/iihs.org)



[@IIHS\\_autosafety](https://twitter.com/IIHS_autosafety)



[@iihs\\_autosafety](https://www.instagram.com/iihs_autosafety)



[IIHS](https://www.youtube.com/IIHS)

**THANK YOU**



**David Aylor**  
Manager of Active Safety Testing  
[daylor@iihs.org](mailto:daylor@iihs.org)

