

The Road to Automation from an Insurance Perspective

2021 Casualty Actuarial Society Annual Meeting

November 10, 2021



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CBS Evening News

**55 MPH
MAXIMUM**



Saving lives. Preventing harm.

IIHS-HLDI mission:

To reduce deaths, injuries and property damage from motor vehicle crashes through **research and evaluation** and through **education** of consumers, policymakers and safety professionals.

Member groups

IIHS and HLDI are wholly supported by these auto insurers and insurance associations

Acceptance Insurance
Acuity Insurance
Allstate Insurance Group
AmericanAg
American Family Insurance
American National
Amica Mutual Insurance Company
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Auto Club Group
Auto-Owners Insurance
Celina Insurance Group
CHUBB
The Cincinnati Insurance Companies
Colorado Farm Bureau Insurance Company
Commonwealth Casualty Company
Concord Group Insurance
CONNECT, powered by American Family Insurance
Cooperators Financial Services Limited
COUNTRY Financial
CSAA Insurance Group
CSE Insurance Group
Desjardins Insurance
Donegal Insurance Group

DTRIC Insurance
ECM Insurance Group
Elephant Insurance Company
EMC Insurance Group
Encova Insurance
Erie Insurance Group
Farm Bureau Financial Services
Farm Bureau Insurance Company of Michigan
Farm Bureau Insurance of Tennessee
Farm Bureau Mutual Insurance Company of Idaho
Farmers Insurance Group
Farmers Mutual of Nebraska
Florida Farm Bureau Insurance Companies
Frankenmuth Insurance
Gainsco Insurance
GEICO Corporation
The General Insurance
Georgia Farm Bureau Mutual Insurance Company
Goodville Mutual Casualty Company
Grange Insurance
Grinnell Mutual
Hallmark Financial Services, Inc.
The Hanover Insurance Group

The Hartford
Haulers Insurance Company, Inc.
Horace Mann Insurance Companies
Indiana Farm Bureau Insurance
Indiana Farmers Insurance
Just Auto Insurance
Kemper Corporation
Kentucky Farm Bureau Mutual Insurance Companies
Liberty Mutual Insurance
Louisiana Farm Bureau Insurance Company
Main Street America Insurance
MAPFRE Insurance Group
Mercury Insurance Group
Metromile
Mississippi Farm Bureau Casualty Insurance Company
MMG Insurance
Munich Reinsurance America, Inc.
Mutual Benefit Group®
Mutual of Enumclaw Insurance Company
National General Insurance
Nationwide
NJM Insurance Group
Nodak Insurance Company

The Norfolk & Dedham Group®
North Carolina Farm Bureau Mutual Insurance Company
North Star Mutual Insurance Company
Northern Neck Insurance Company
NYCM Insurance
Ohio Mutual Insurance Group
Oregon Mutual Insurance Company
PEMCO Mutual Insurance Company
Plymouth Rock Assurance
Progressive Insurance
PURE Insurance
Qualitas Insurance Company
Redpoint County Mutual Insurance Company
The Responsive Auto Insurance Company
Rider Insurance
Rockingham Insurance
Root Insurance Co
RSA Canada
Safe Auto Insurance Company
Safeco Insurance®
Samsung Fire & Marine Insurance Company
Say Insurance
SECURA Insurance

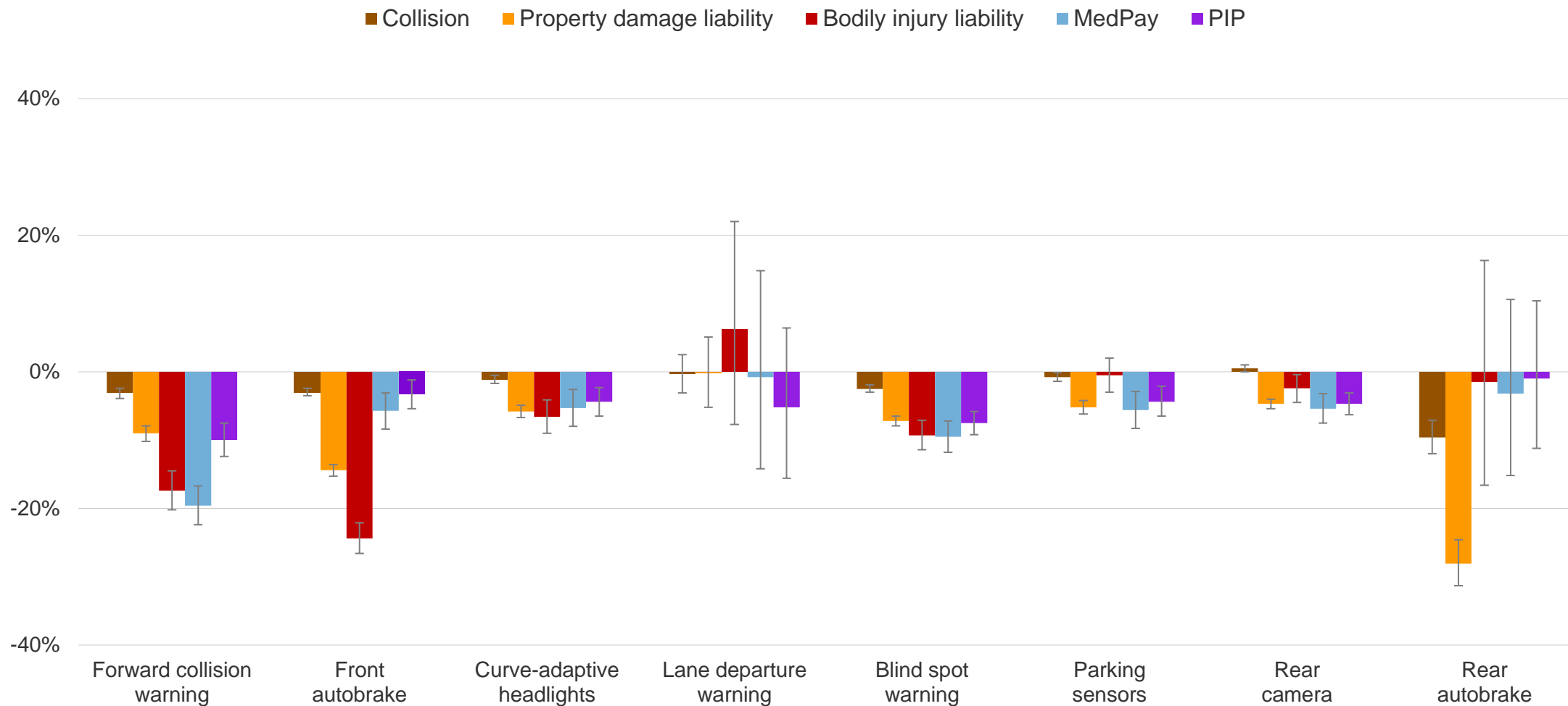
Selective Insurance
Sentry Insurance
Shelter Insurance®
Sompo International
South Carolina Farm Bureau Mutual Insurance Company®
Southern Farm Bureau Casualty Insurance Company
State Auto Insurance Companies
State Farm Insurance Companies
Stillwater Insurance Group
Swiss Reinsurance Company Ltd
Texas Farm Bureau Insurance
The Travelers Companies, Inc.
USAA
Virginia Farm Bureau Mutual Insurance
West Bend Mutual Insurance Company
Westfield

Funding associations

American Property Casualty Insurance Association
National Association of Mutual Insurance Companies

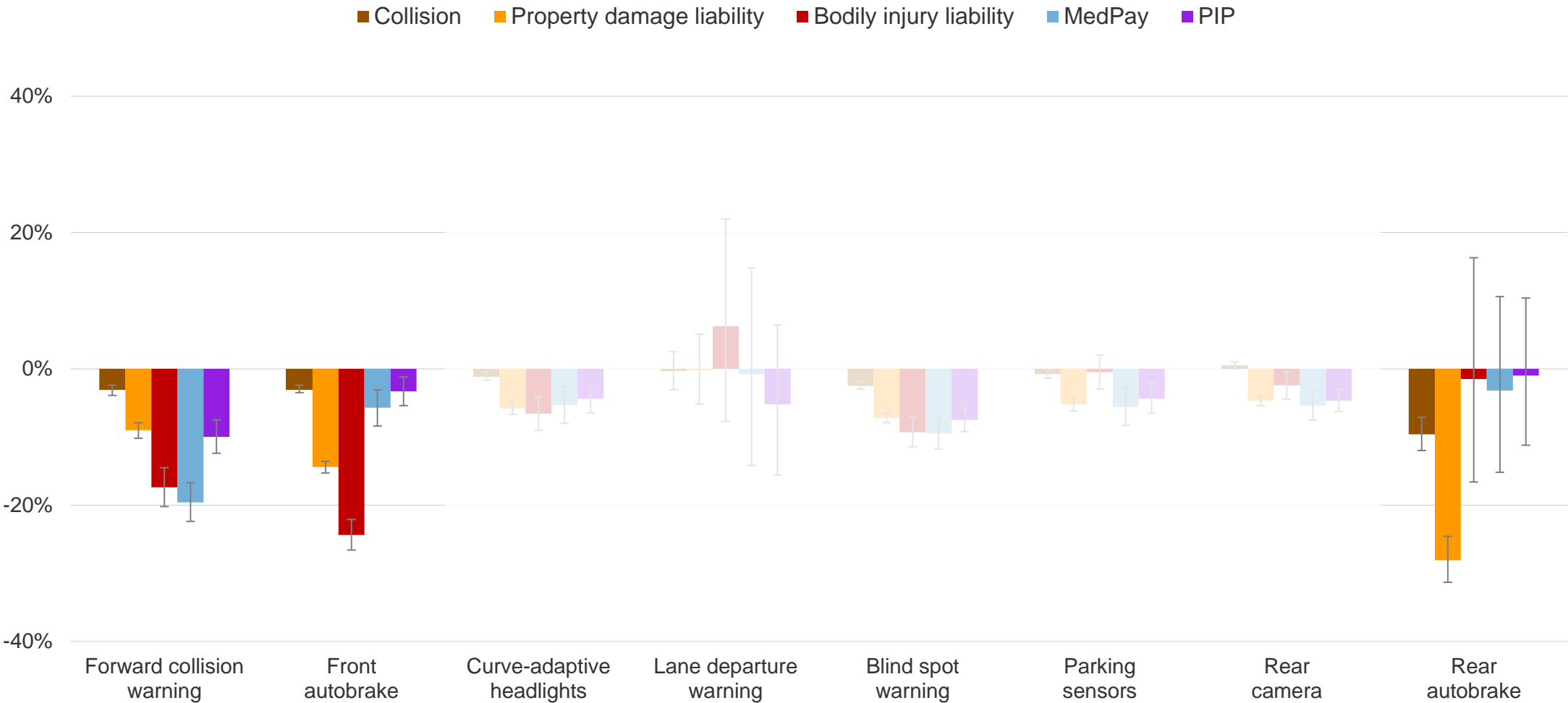
Summary of technology effects on insurance claim frequency

Results pooled across automakers



Summary of technology effects on insurance claim frequency

Results pooled across automakers



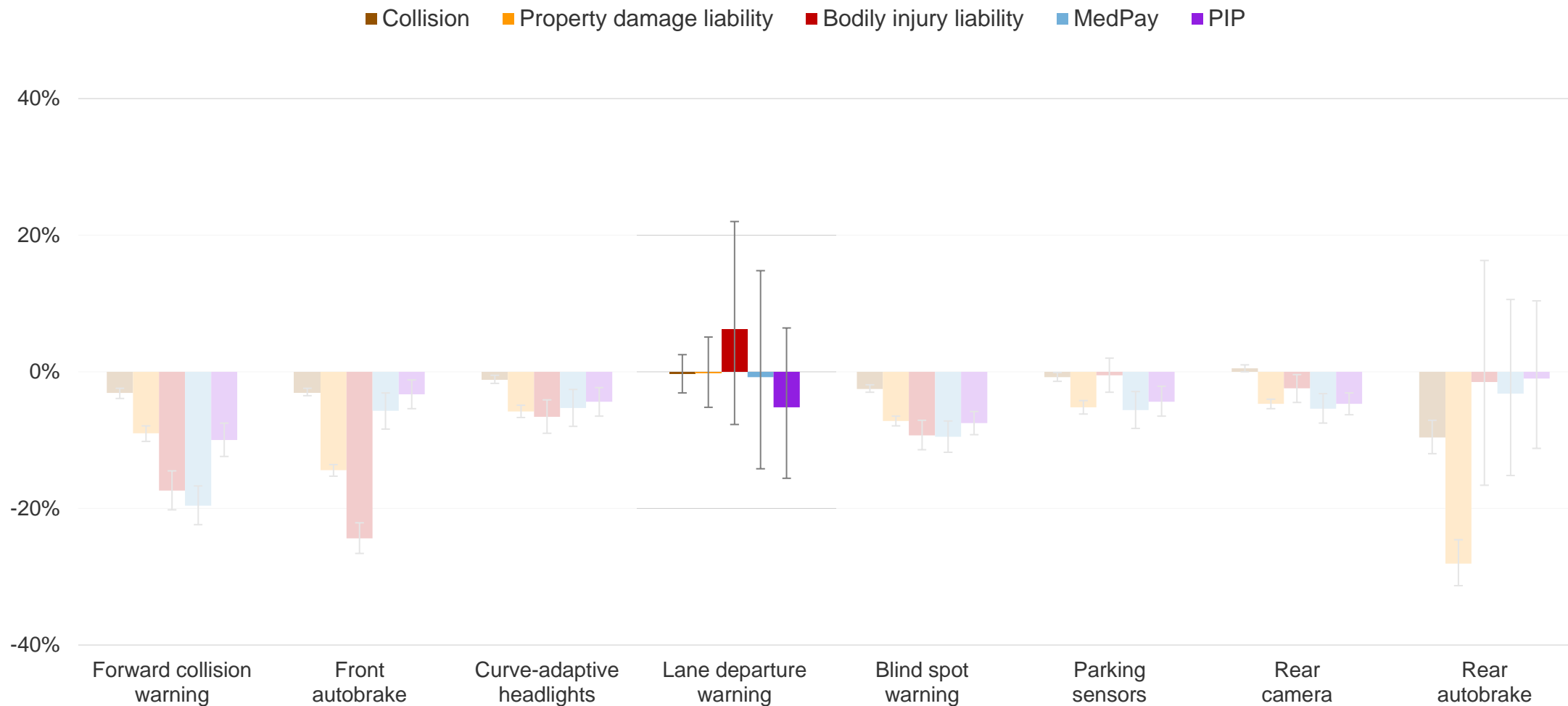
Summary of technology effects on insurance claim frequency

Results pooled across automakers



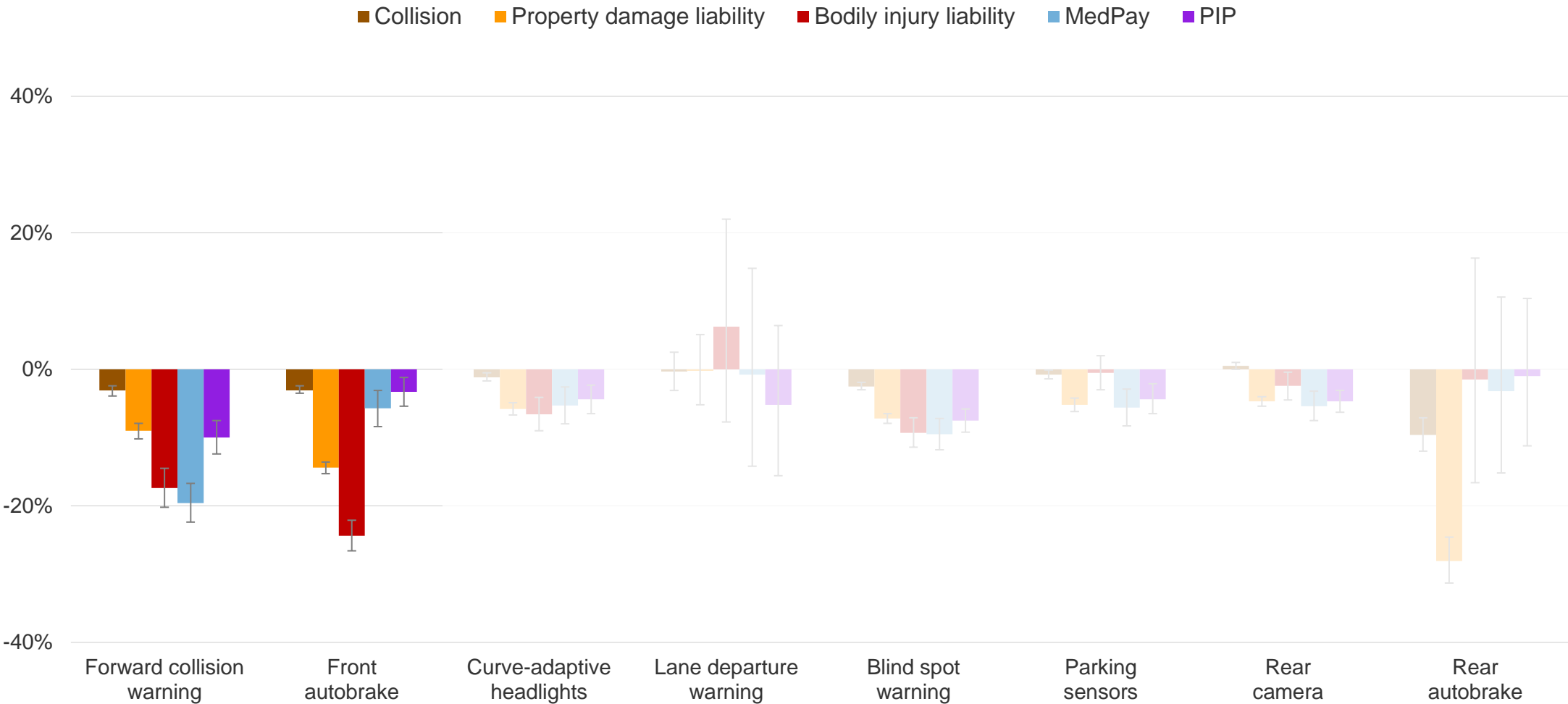
Summary of technology effects on insurance claim frequency

Results pooled across automakers



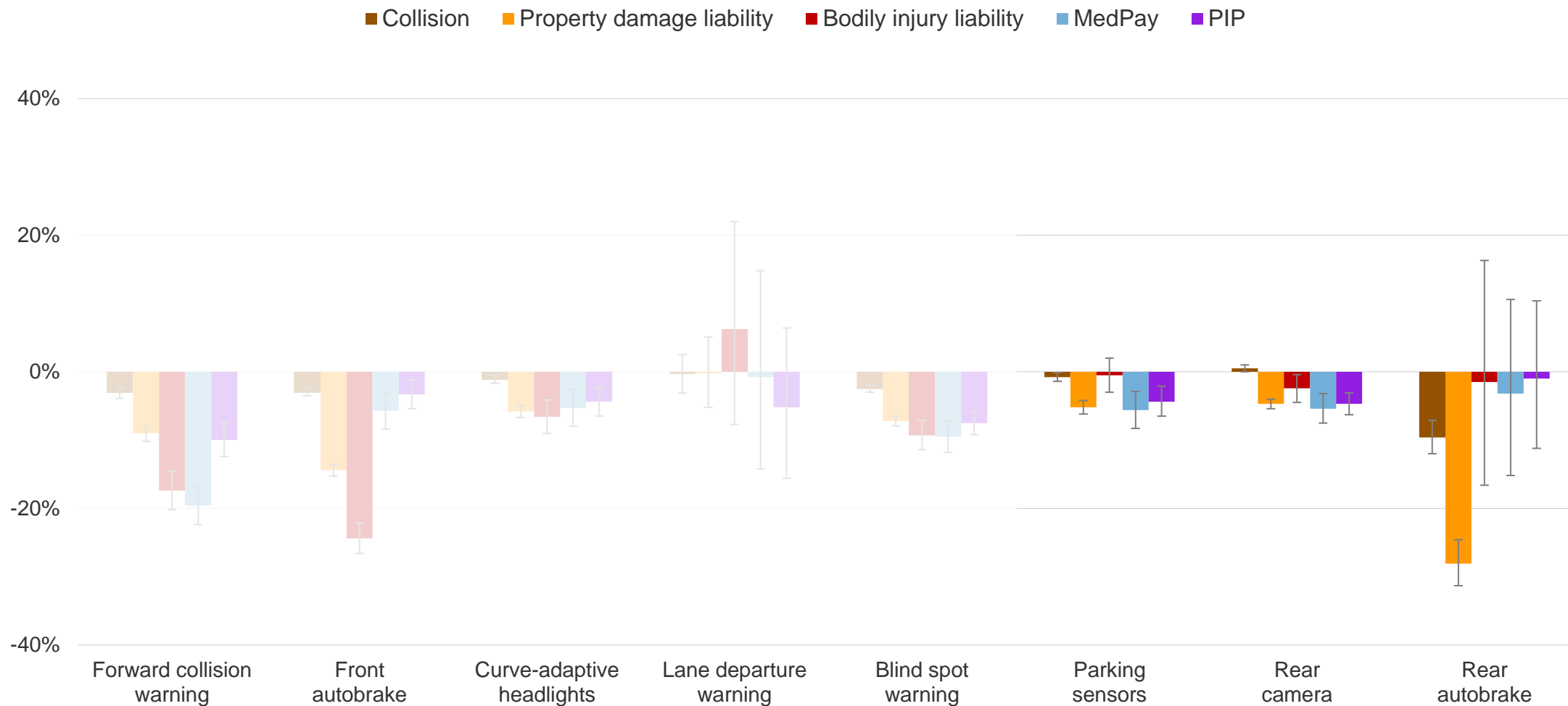
Summary of technology effects on insurance claim frequency

Results pooled across automakers



Summary of technology effects on insurance claim frequency

Results pooled across automakers



Speed reduction in 12 and 24 mph tests

Volvo S60
2 point advanced



Dodge Durango
3 point advanced

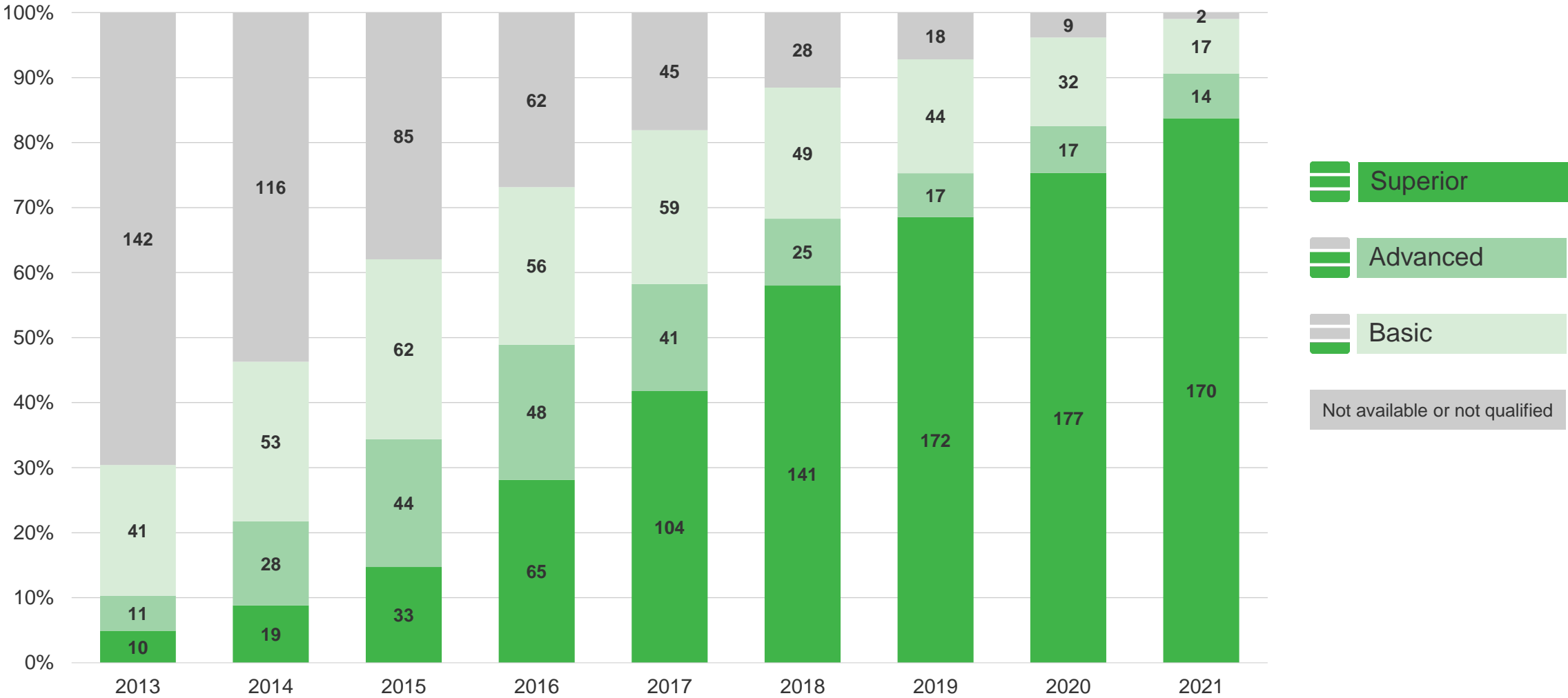


Subaru Outback
6 point superior



Front crash prevention ratings

2013-21 models



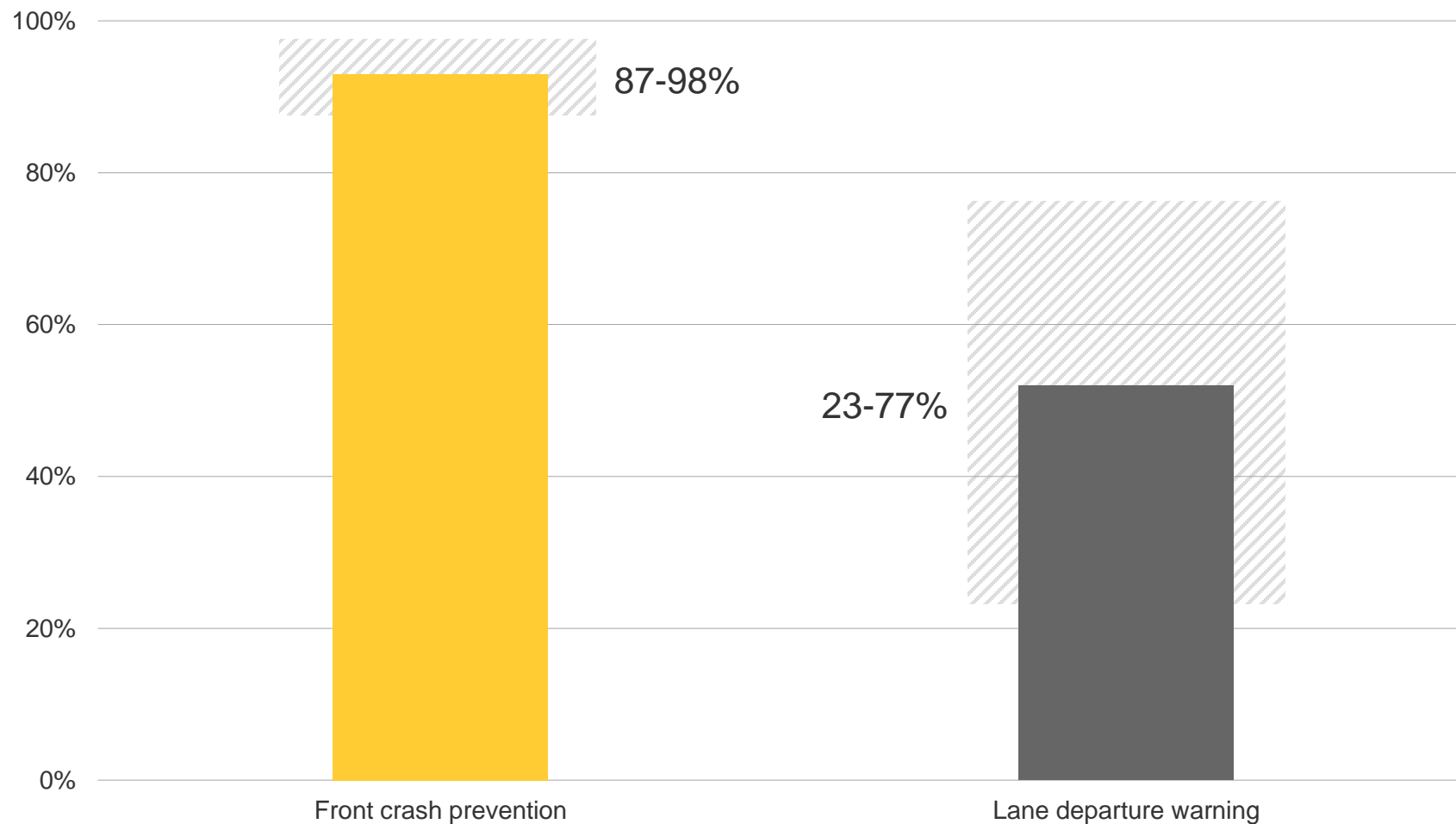


20 automakers
(99+% of the U.S. market)
have committed to making
autobrake standard by September 2022



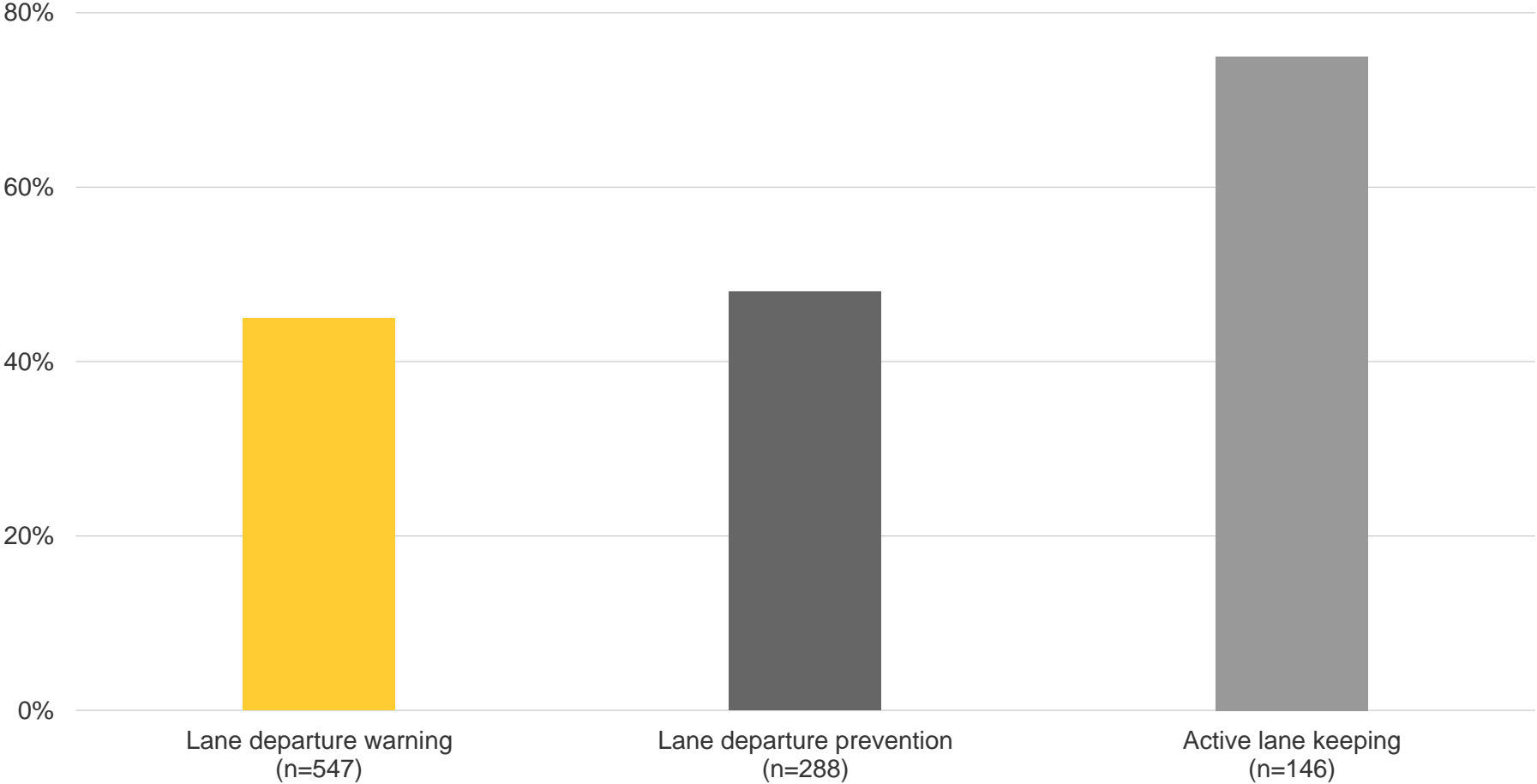
Status of crash avoidance systems

Percent with system on — mean values and value range



On-off status by maximum observable lane-maintenance intervention level

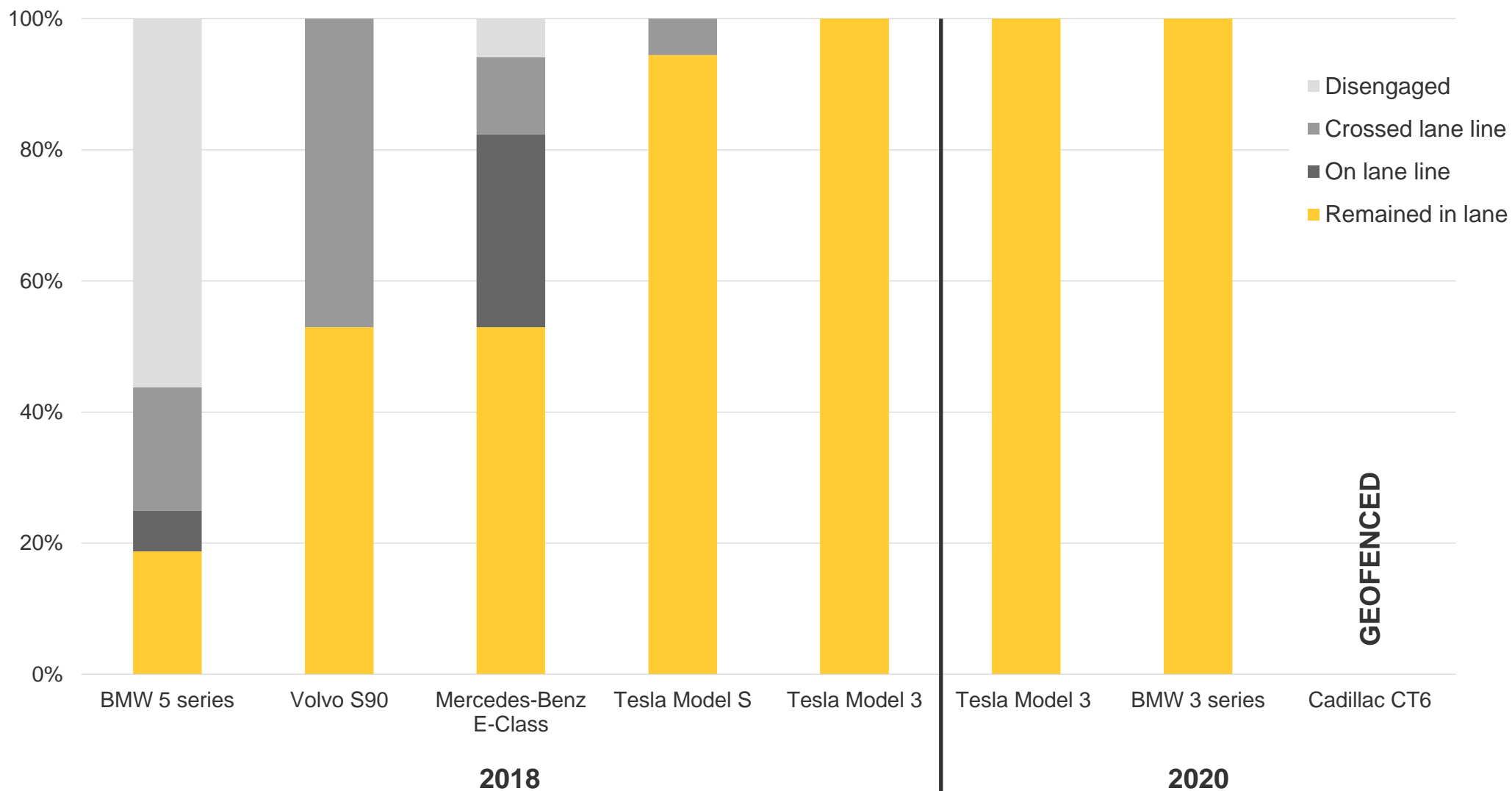
Percent with system on



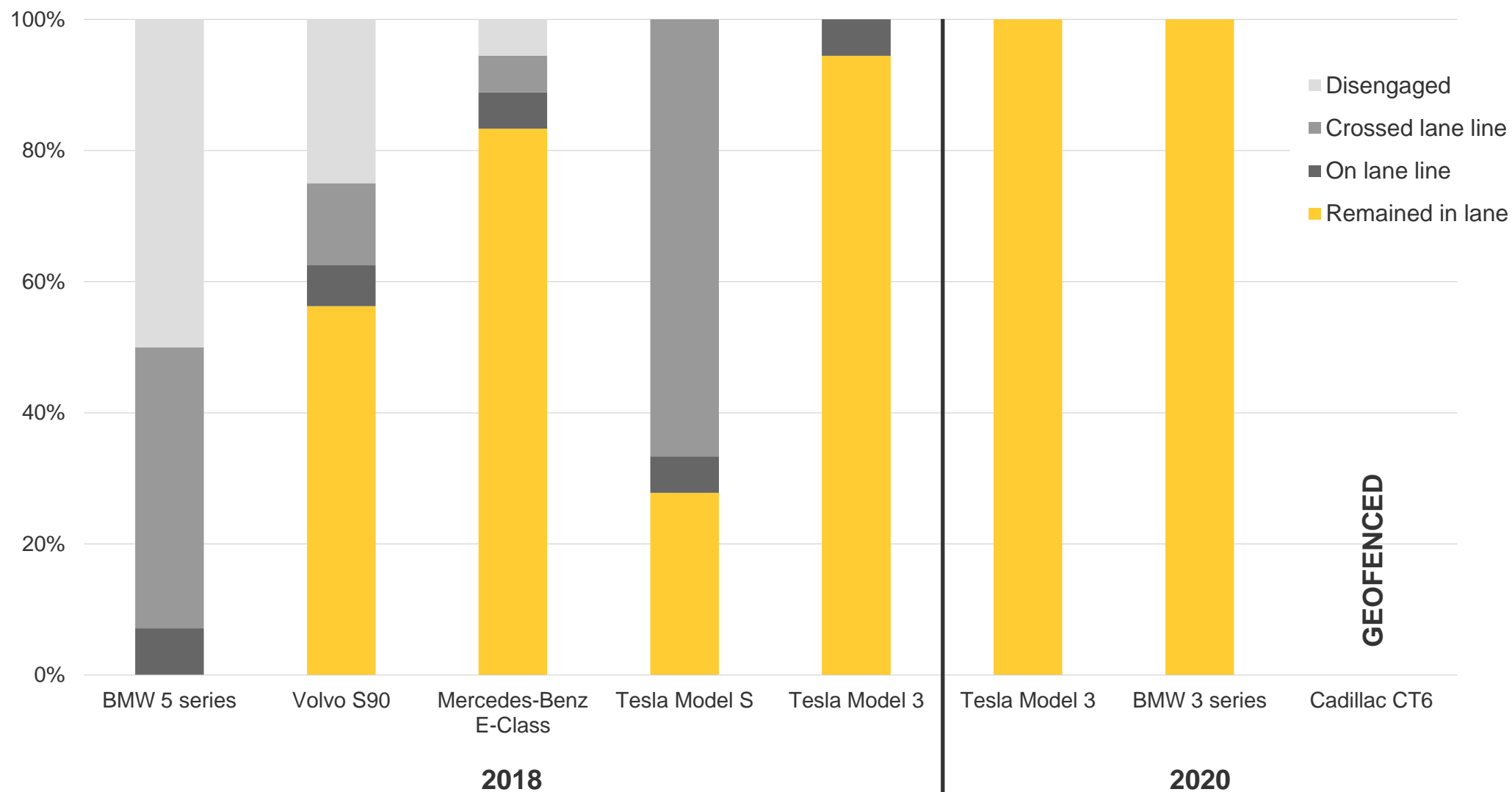
Understanding Level 2 automation



Lane keeping in curves

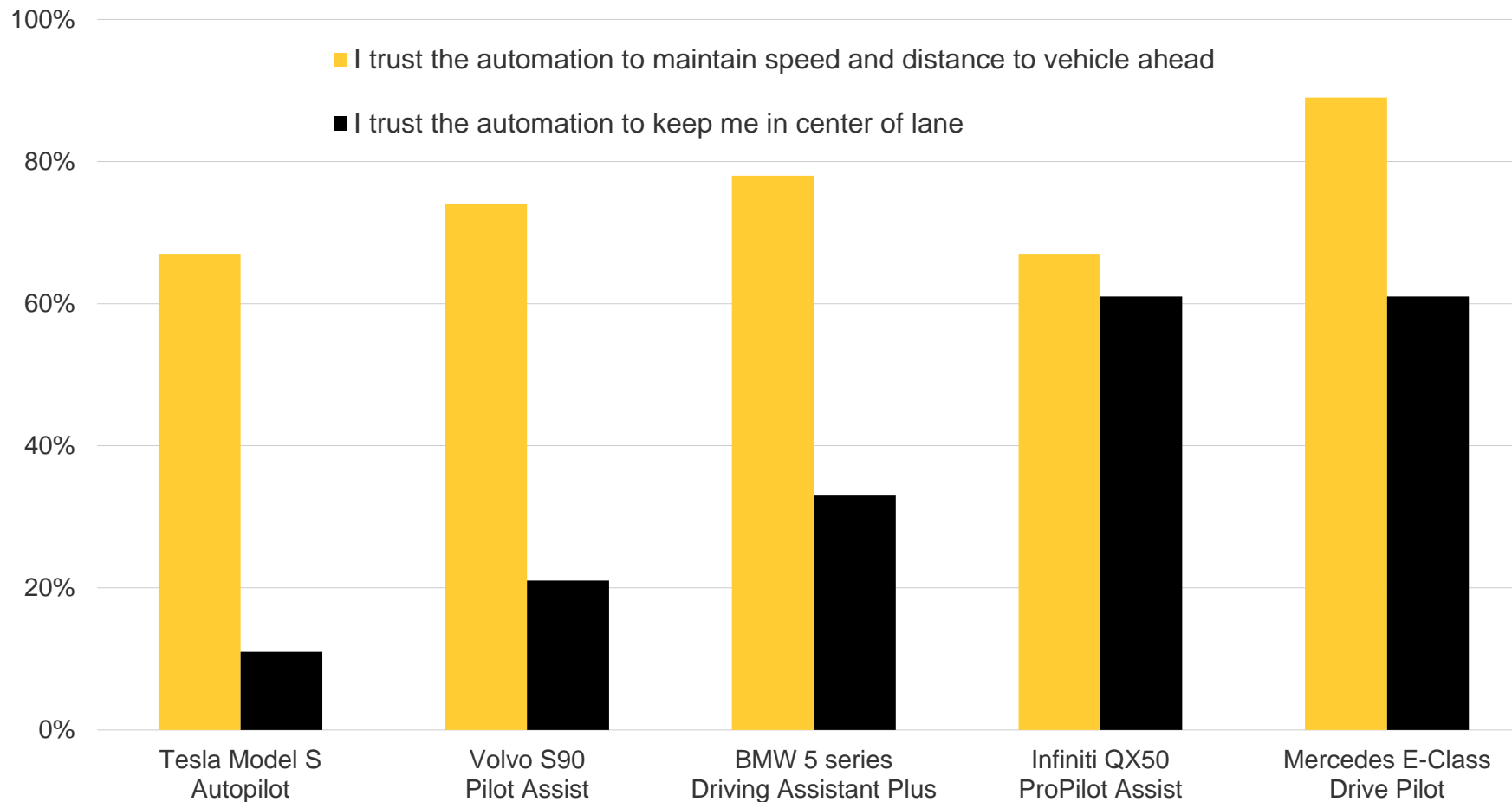


Lane keeping on hills



Adaptive cruise control trusted more than active lane keeping

Drivers who agreed or strongly agreed



Recommended escalating attention reminders

Level 2 automation

1



Visual reminder

2



More urgent visual reminder + an audible or physical alert

3



Visual + audible + physical alerts

4



Visual + audible + physical alerts + pulse braking



Advertisement:

Lane valet

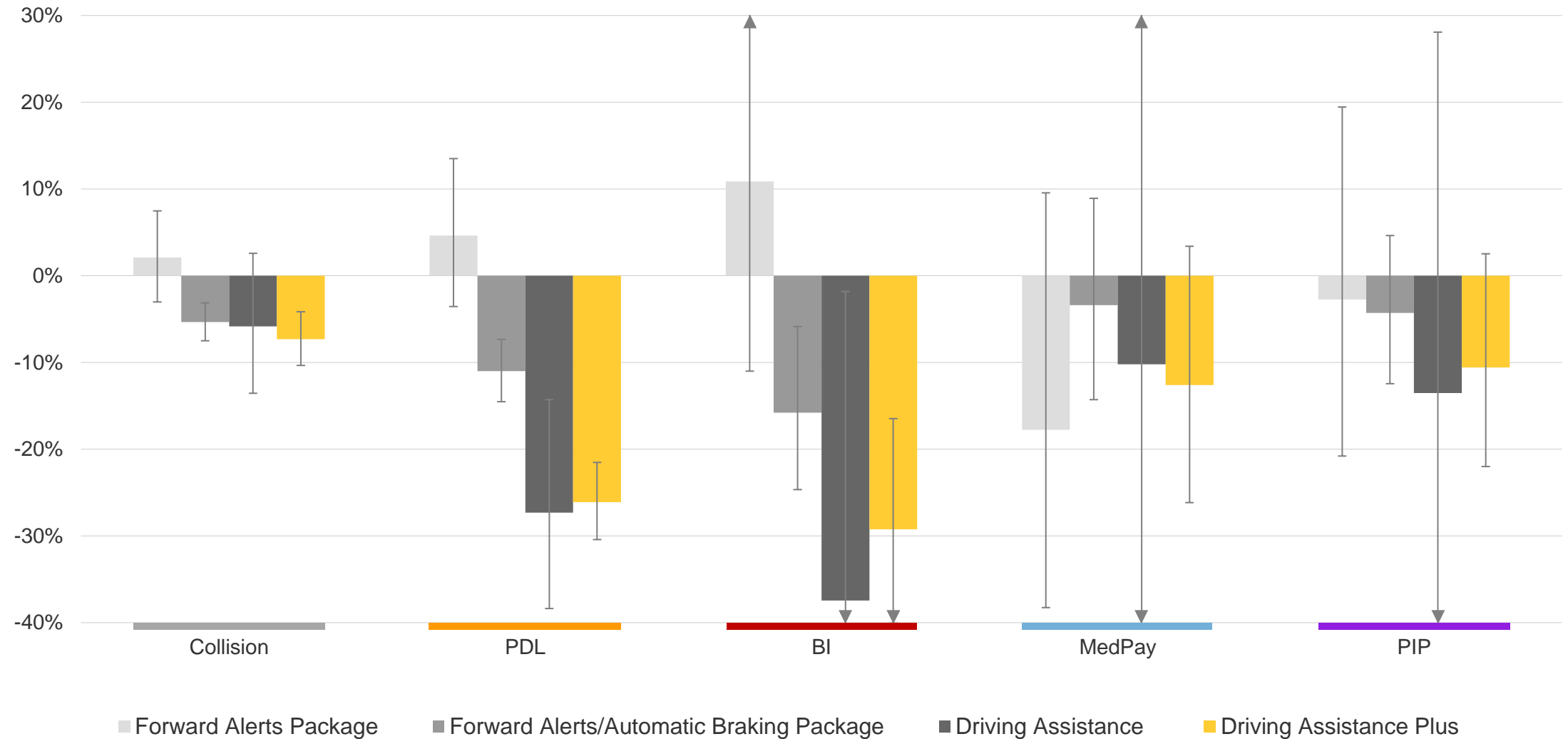


Evaluations of Level 2 systems



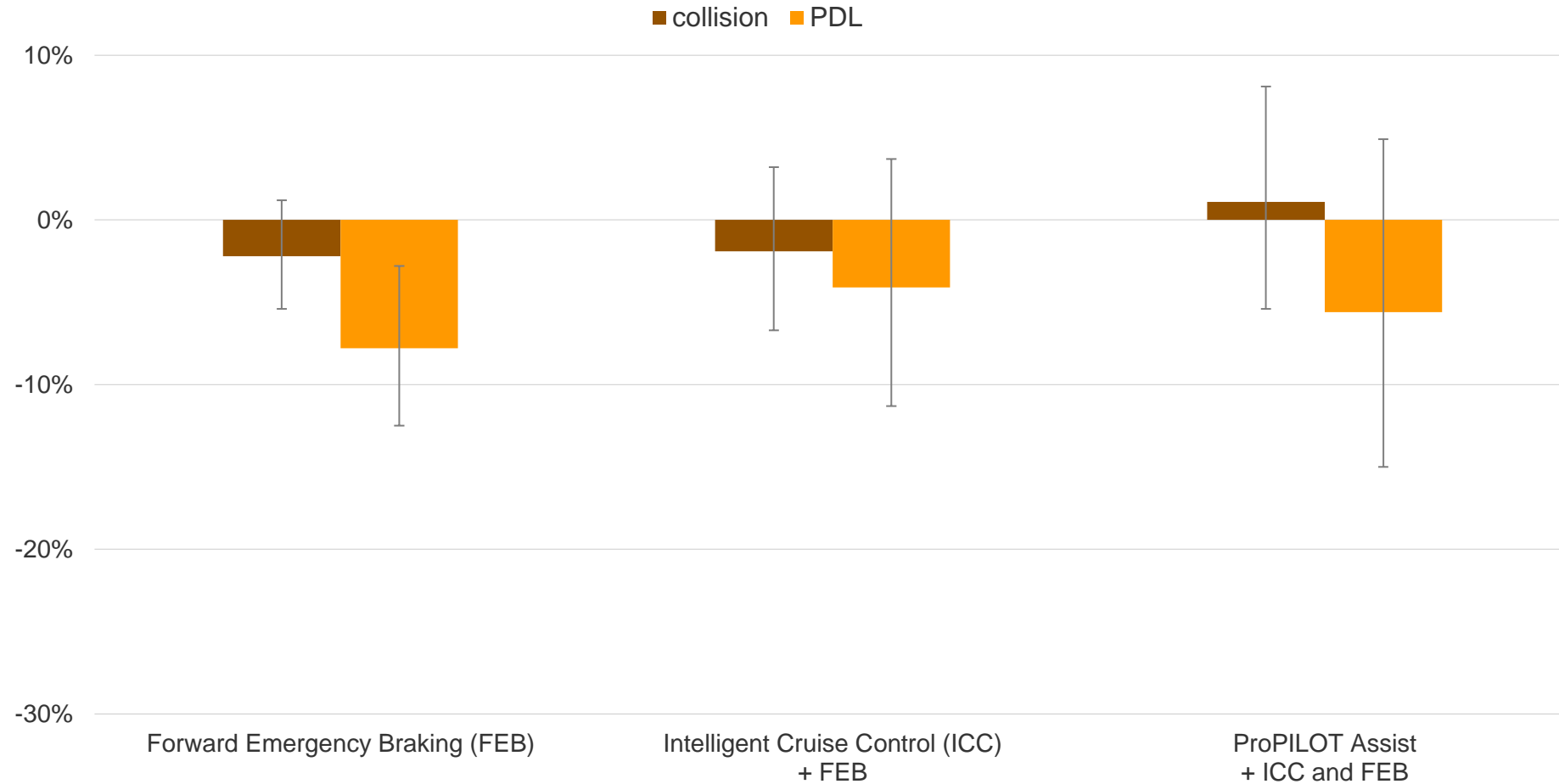
Changes in frequency with BMW front crash prevention

December 2019 analysis of model years 2013-17



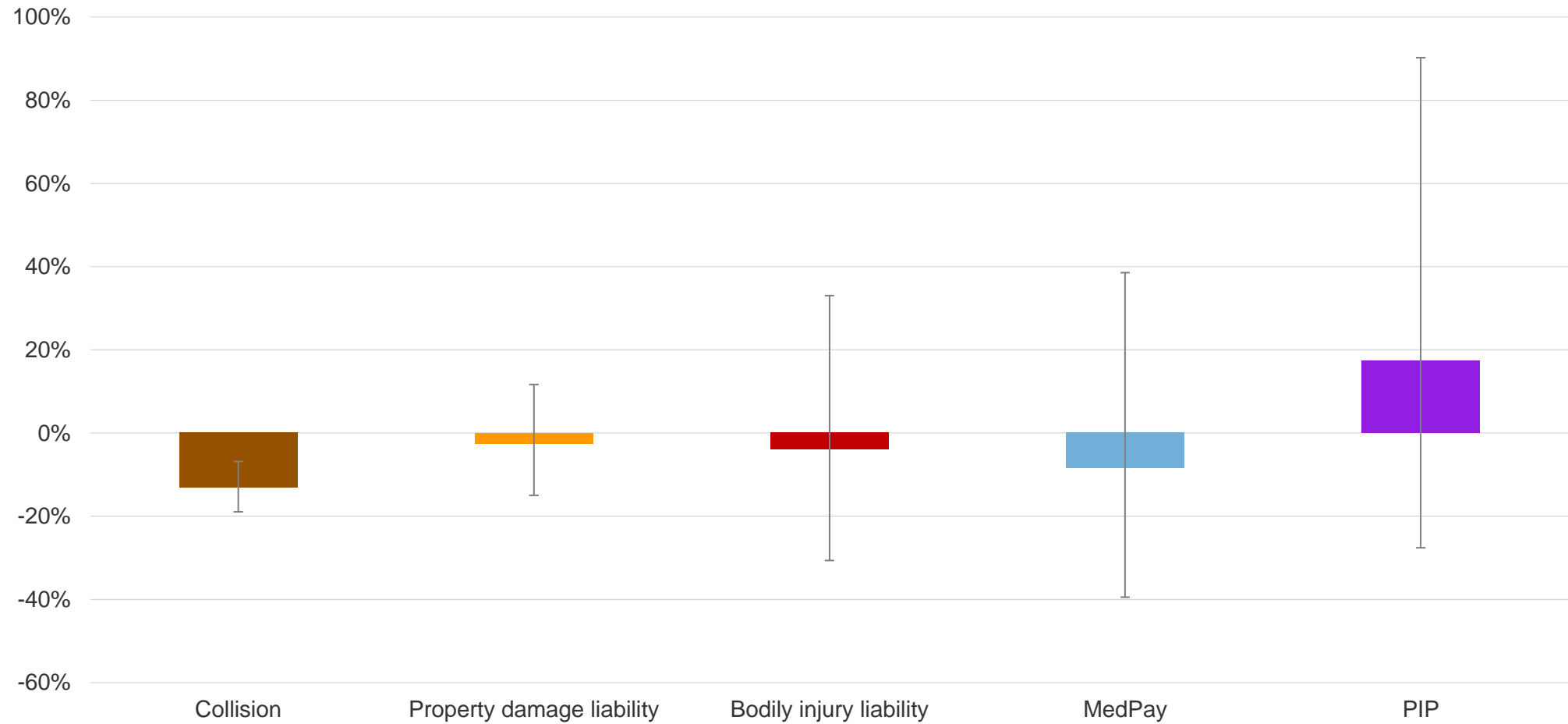
Changes in frequency with Nissan front crash prevention system

April 2021 analysis of 2017-19 Nissan Rogue



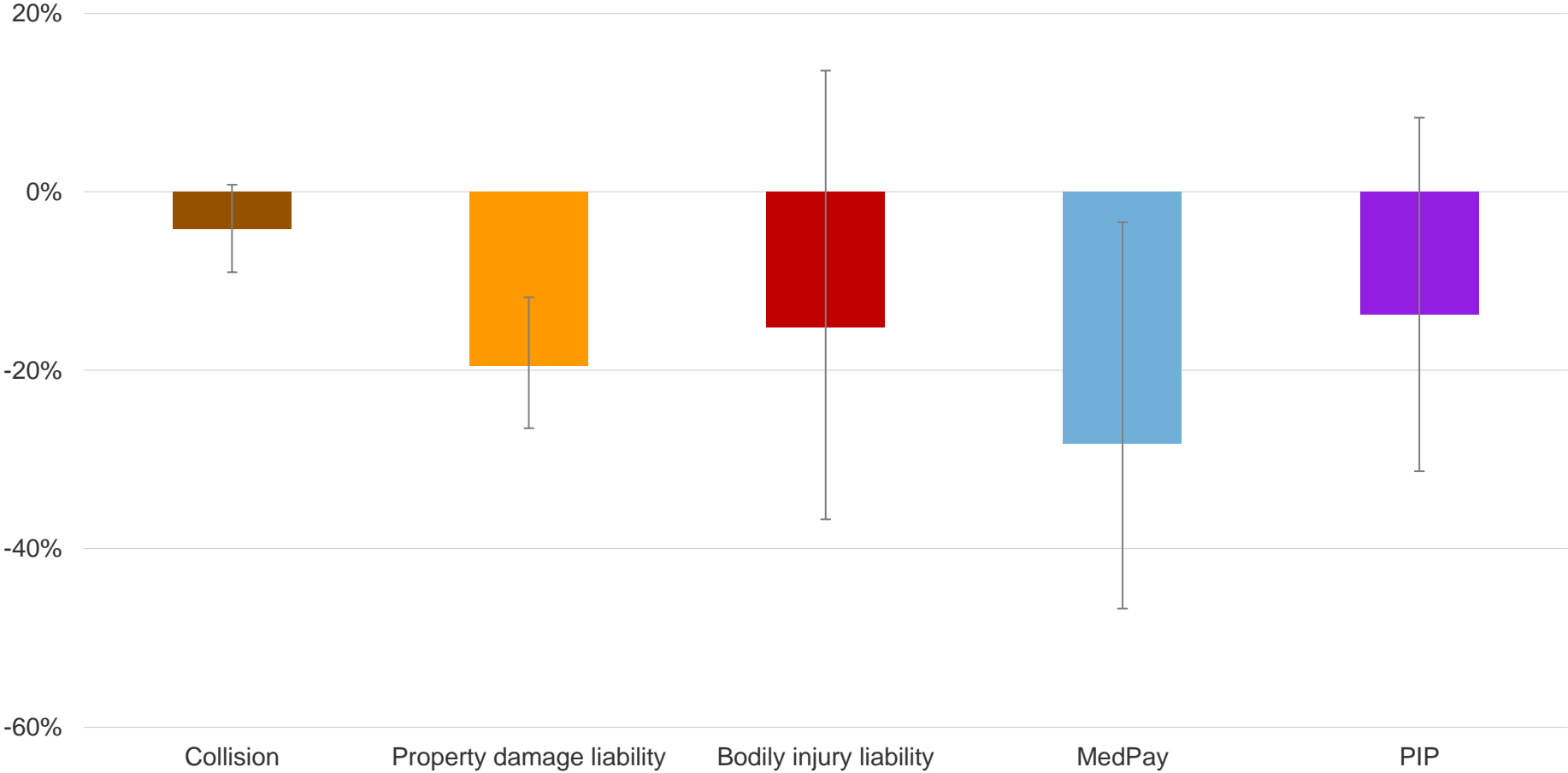
Changes in frequency with Tesla Model S Autopilot

September 2017 analysis



Changes in frequency with Audi Traffic Jam Assist

April 2020 analysis of 2017 Q7 and A4



iSpot.tv



00:00



00:00



Cadillac Super Cruise



SUPPORT FUNCTIONALITY

CADILLAC CONNECTED SERVICES[±]

Super Cruise functionality is enabled by a data connection for real-time, precise positioning and periodic Super Cruise map updates. In order to operate Super Cruise, you must have an active and eligible Cadillac Connected Services[±] plan. Super Cruise vehicles are also connected to OnStar[®] Emergency Services[±], so Emergency-Certified OnStar Advisors can assist drivers should they become nonresponsive while Super Cruise is active.

All Super Cruise-equipped vehicles include 3 years of connectivity to support functionality, after which a Connected Services[±] plan must be purchased.

Mercedes-Benz Rear-wheel steering



- \$575 per year in Germany for 10-degree rear steering on EQS
- Requires the parking package with a 360-degree camera

Will autonomous vehicles be safer than human drivers?





94%

**of crashes involve
human error**

Source: National Motor Vehicle Crash Causation Survey (NMVCCS)

94%

The infographic consists of a large yellow circle on the left and several smaller grey and white circles on the right. The yellow circle contains the text '94% of crashes involve human error'. The grey circles contain '62% sensing and perceiving' and '10% incapacitation'. The white circles contain '44% planning and deciding', '27% execution and performance', and '17% predicting'. The circles are arranged in a hierarchical manner, with the largest circle at the top left and smaller circles branching out to the right.

of crashes involve
human error

Source: National Motor Vehicle Crash Causation Survey (NMVCCS)

62%

sensing and
perceiving

10%
incapacitation

44%

planning and
deciding

27%

execution and
performance

17%
predicting



44%
planning and
deciding

27%
execution and
performance

17%
predicting

Drivers need to perform complex, interconnected behaviors



44%
of crashes

Planning and deciding factors

Such as speeding





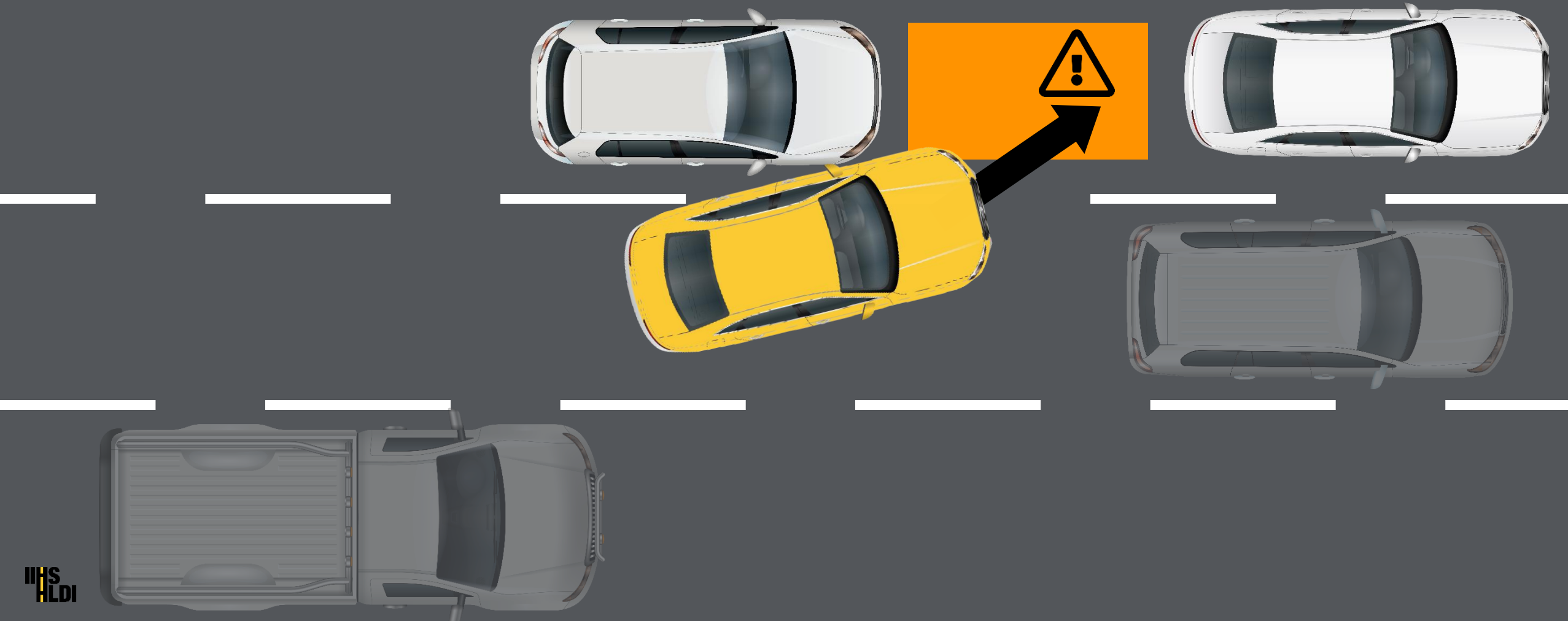
Execution and performance factors
Such as overcompensation

27%
of crashes

17%
of crashes

Predicting factors

Such as misjudging gap in traffic or speed of other road users



Consumer convenience vs. safety

Autonomous vehicle designs that prioritize one might come at the cost of the other



Consumer convenience vs. safety

Autonomous vehicle designs that prioritize one might come at the cost of the other



Consumer convenience vs. safety

Autonomous vehicle designs that prioritize one might come at the cost of the other



Consumer convenience vs. safety

Autonomous vehicle designs that prioritize one might come at the cost of the other



No federal regulation and guidance on autonomous vehicle safety



Effectiveness of front crash prevention systems on large trucks



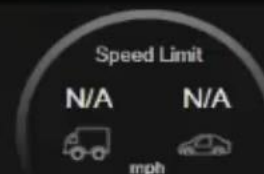




BRAKE ☐ OFF
 ABS ☐ OFF
 ATC ☐ OFF
 CRUISE CONTROL ☒ ON
 DRIVER SEAT BELT ☐ N/A



THROTTLE ☒ 100%
 ENG LOAD ☒ 58%
 PTO ☐ N/A
 ENGINE ☒ N/A
 ENG RETARDER ☐ N/A



FORWARD /
 BACKWARD
 0.01
 SIDE TO SIDE
 0.00

2:39:31.00 PM

MAP

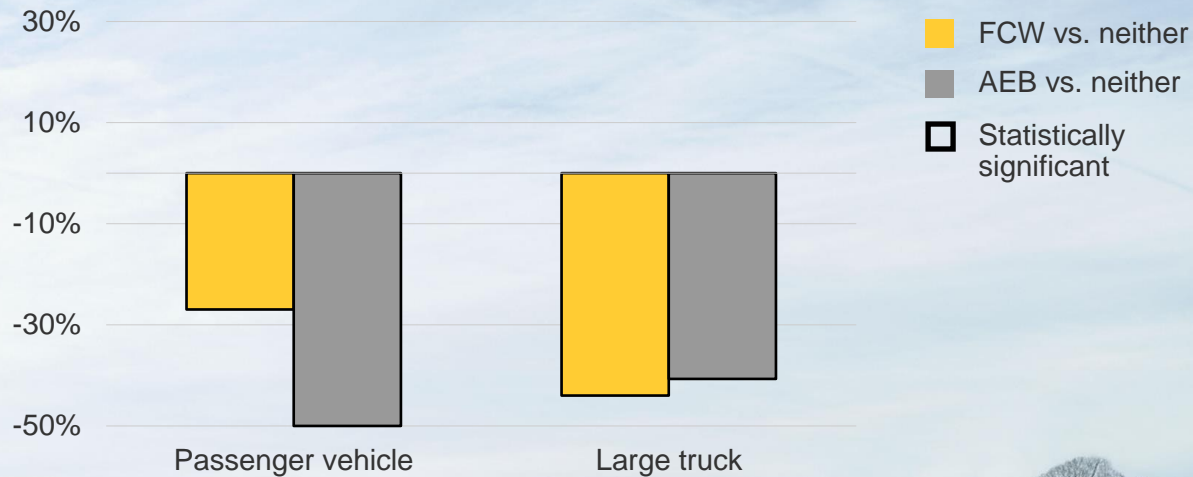
CHART

SELECT ANY 2 OPTIONS

☒ FOLLOWING TIME (SD) ☒ FOLLOWING TIME (ECM) ☒ TIME TO COLLISION ☒ FORWARD / BACKWARD ☒ SIDE TO SIDE

Effects on front-to-rear crash rates

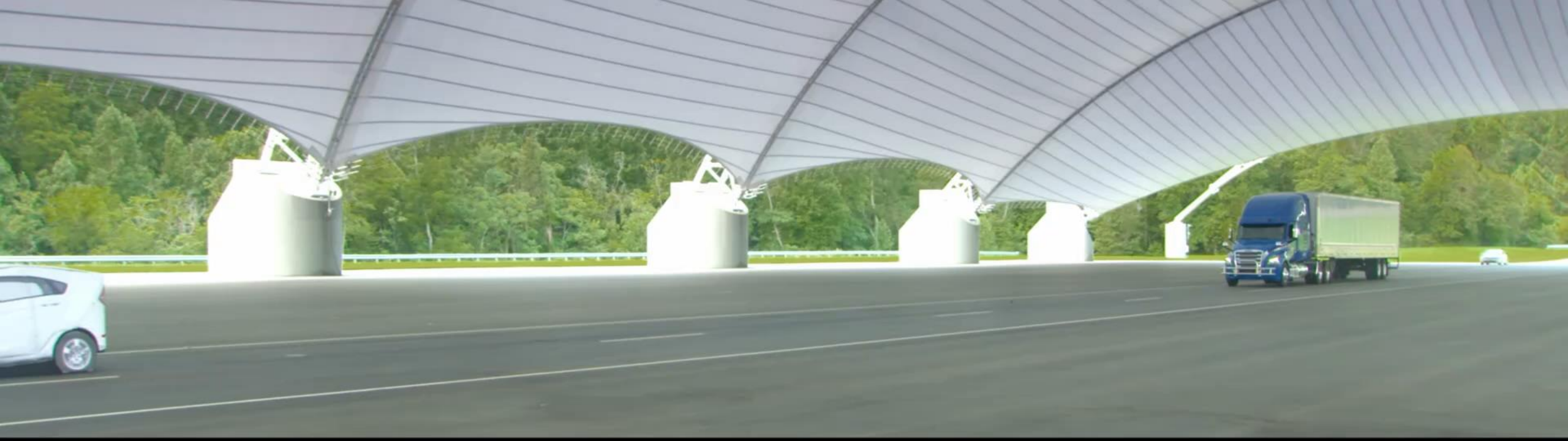
Police-reportable crashes



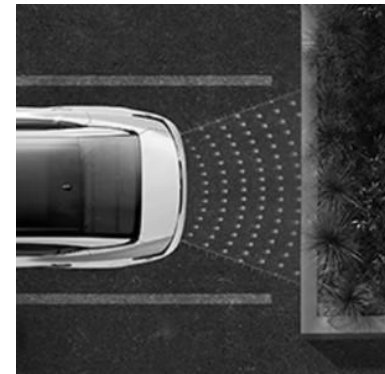
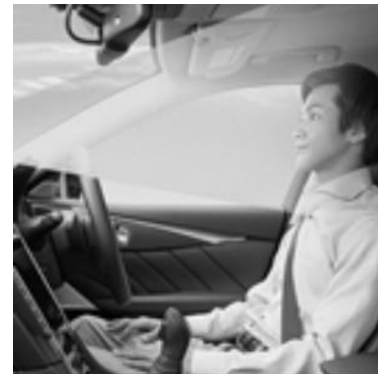
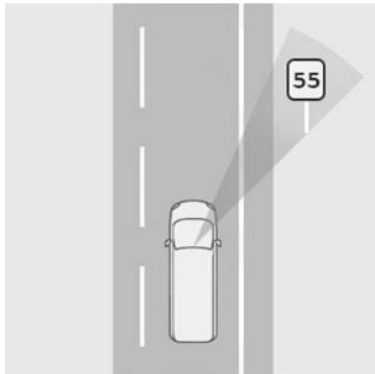
Large truck AEB testing

30 mph into stationary target

August 2020

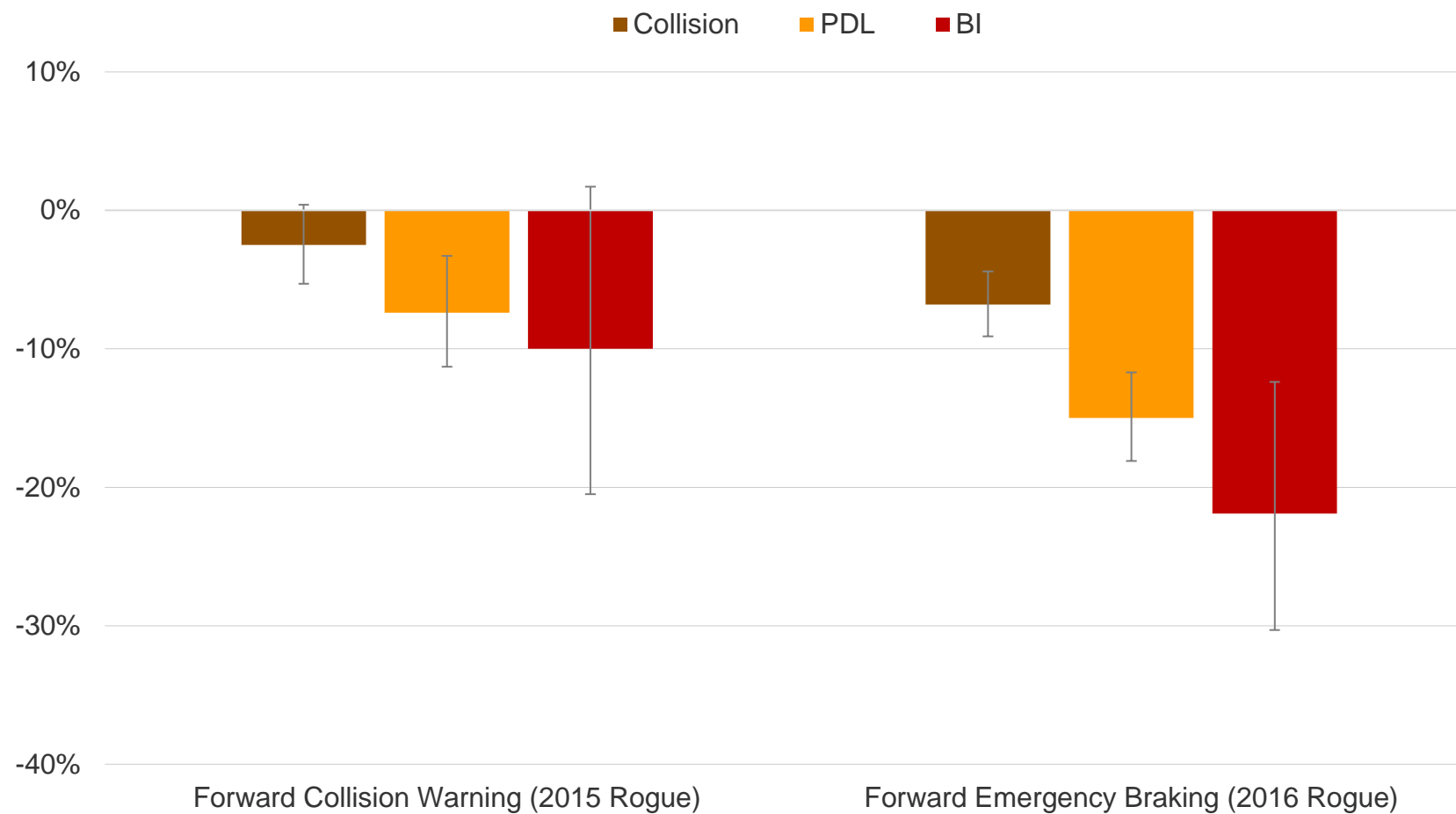


Nissan collision avoidance features



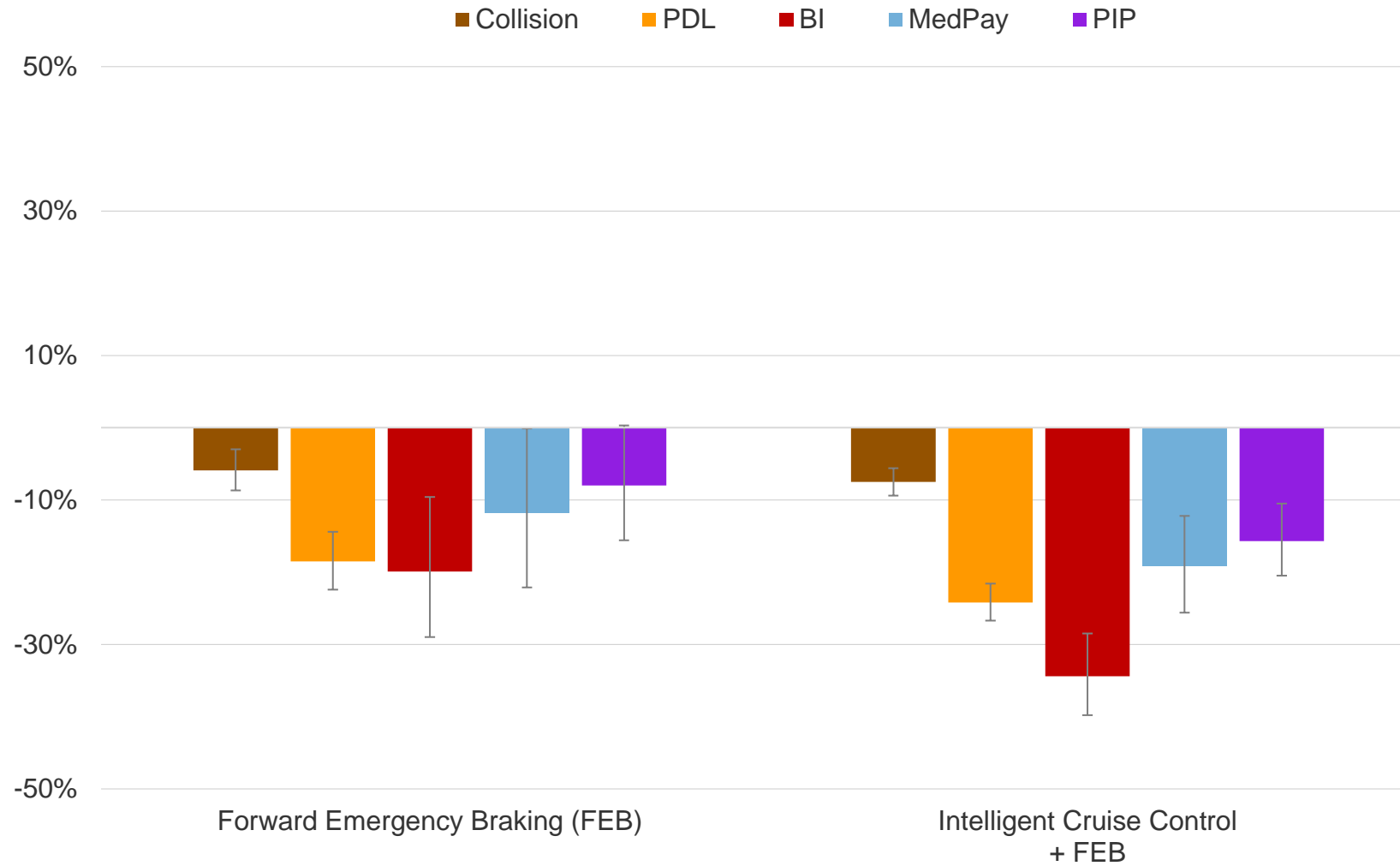
Changes in claim frequency for FCW/FEB

By coverage type, 2015 vs. 2016 Nissan Rogue



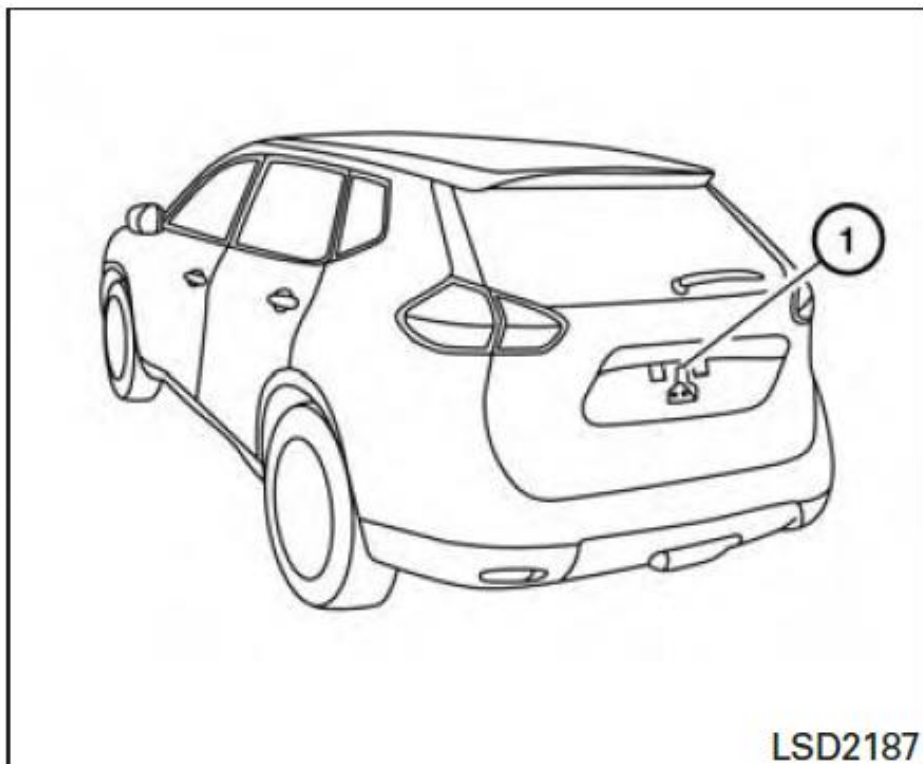
Changes in claim frequency associated with collision avoidance

2016-19 Altima, Murano, and Sentra



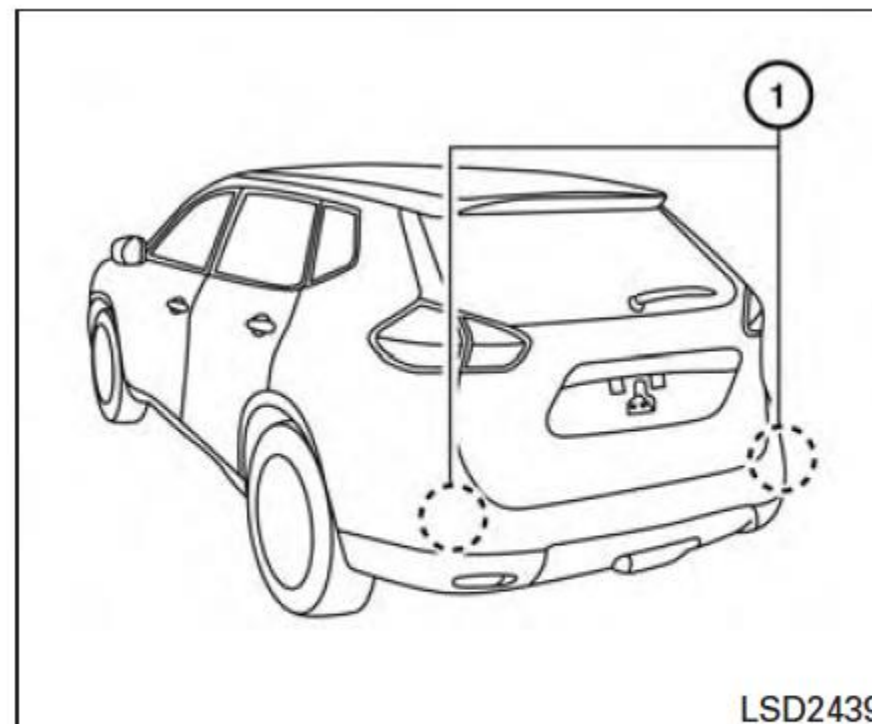
Blind spot monitor location by model year

2015 Nissan Rogue



The BSW/LDW systems use the rear view monitor camera unit ① with automatic washer and blower.

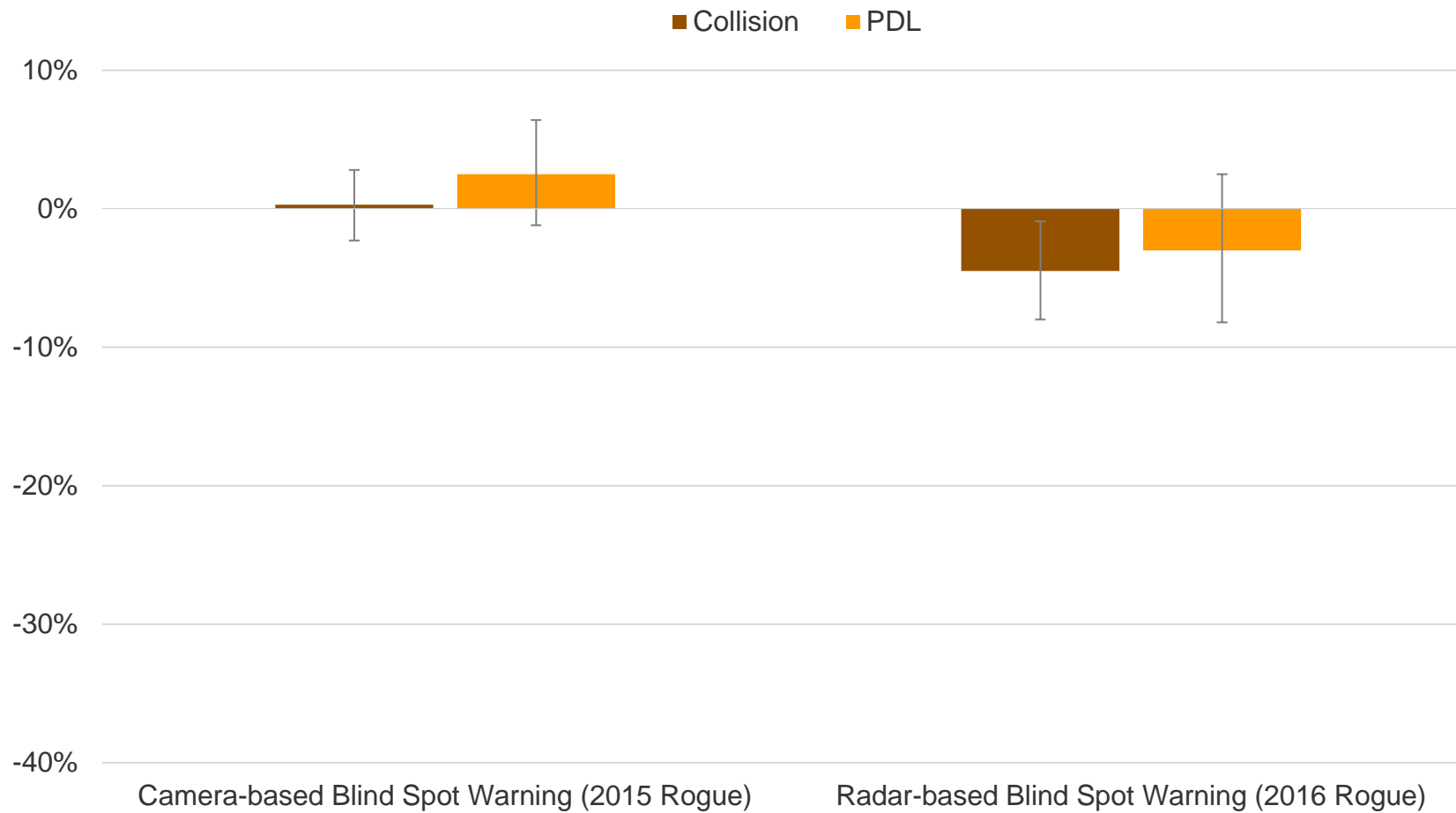
2016 Nissan Rogue



The BSW system uses radar sensors ① installed near the rear bumper to detect other vehicles in an adjacent lane.

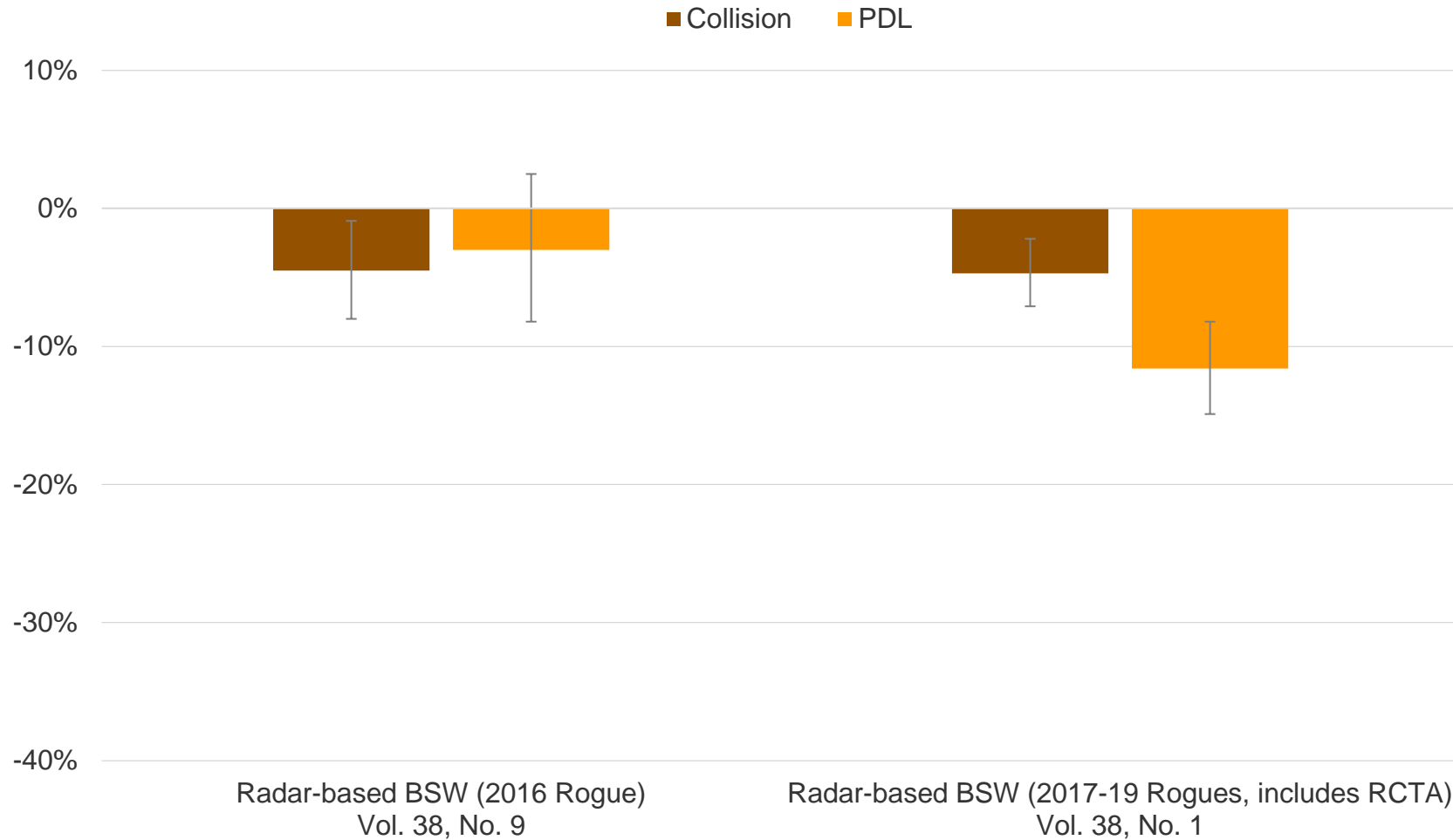
Changes in claim frequency for blind spot warning (BSW)

2015 vs. 2016 Nissan Rogue



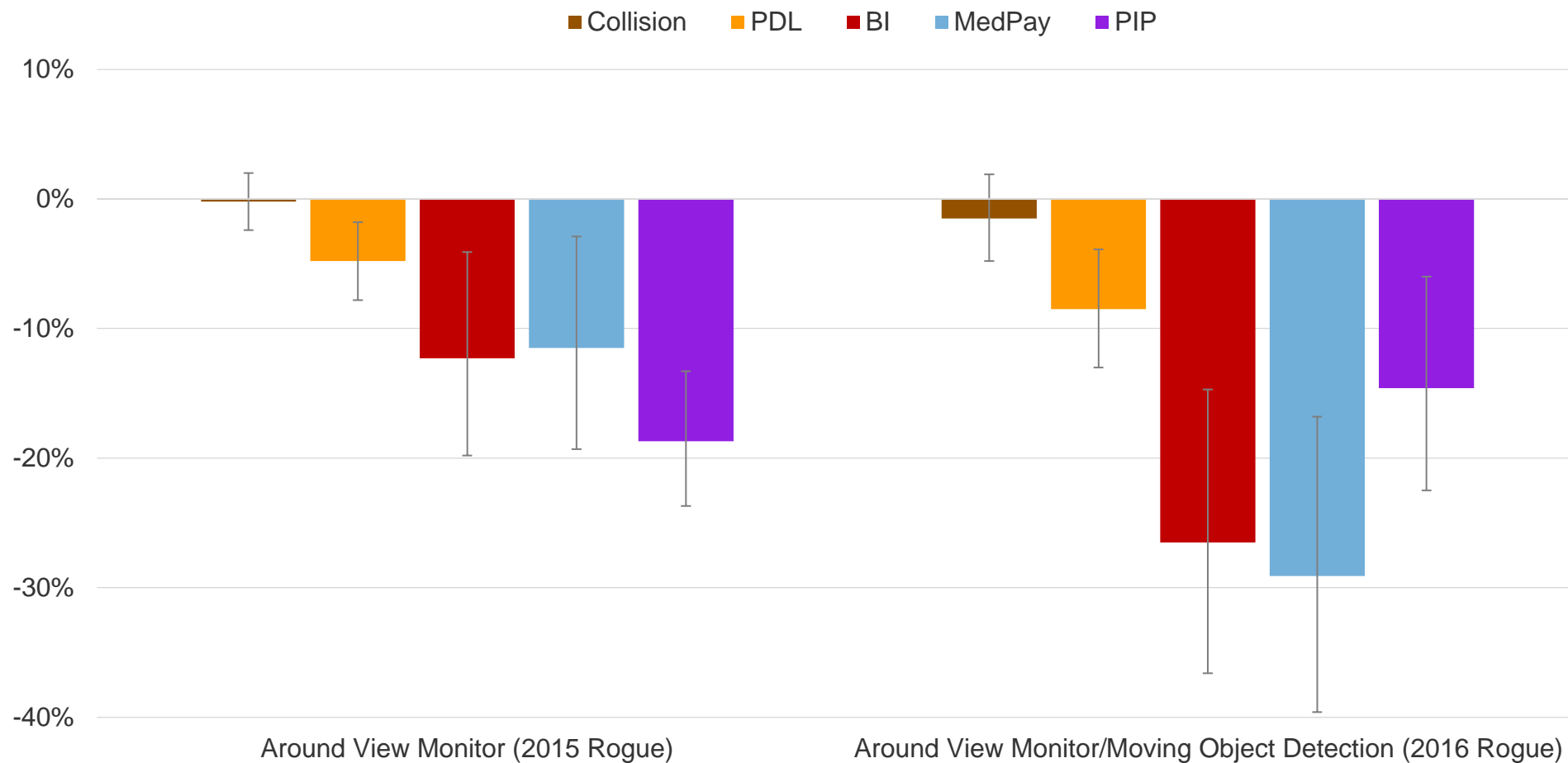
Changes in claim frequency for BSW and BSW + rear cross traffic alert

2016 vs. 2017-19 Nissan Rogue



Changes in claim frequency for Around View Monitor

2015 vs. 2016 Nissan Rogue

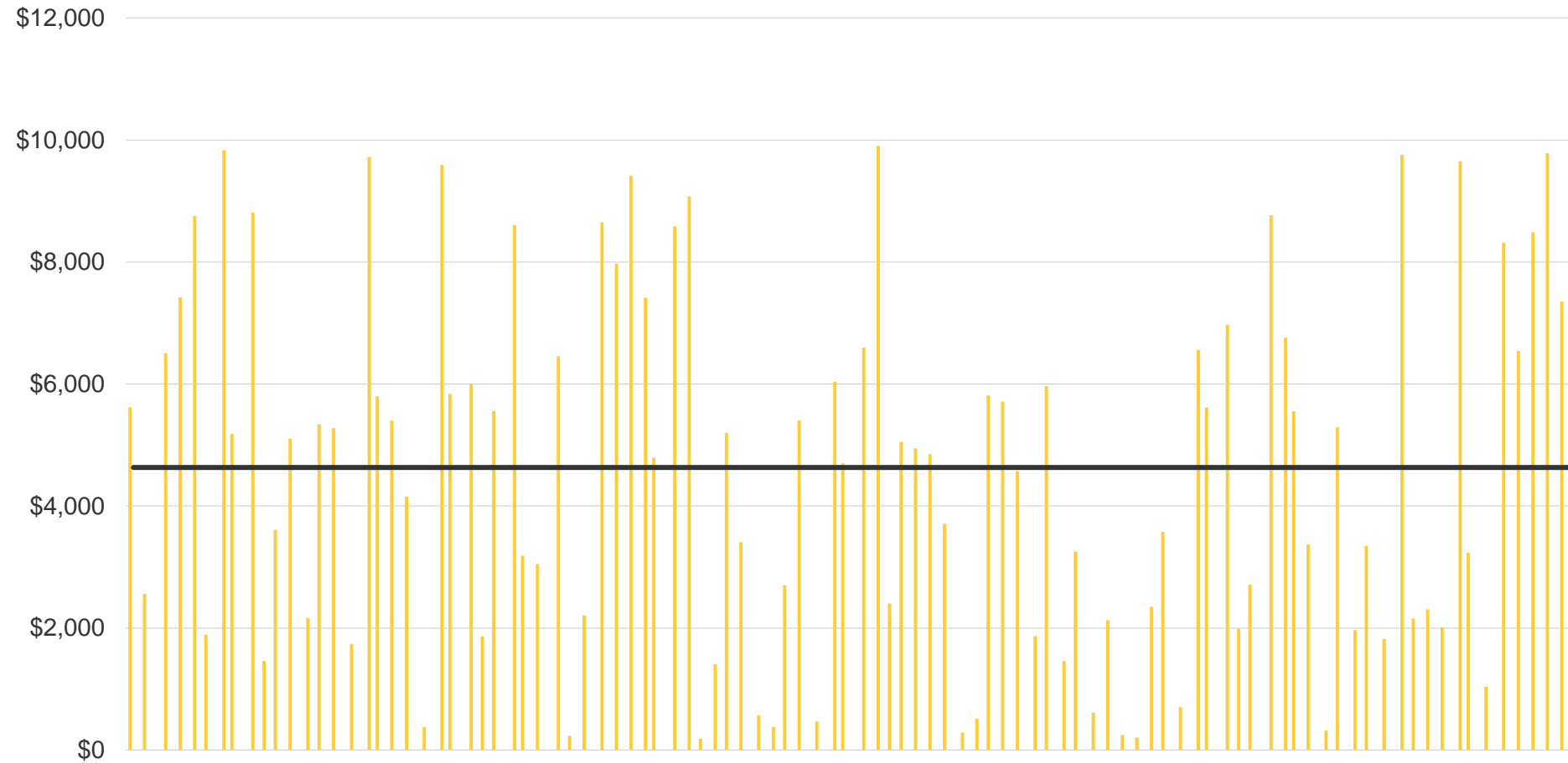


Do ADAS affect collision and PDL severity?



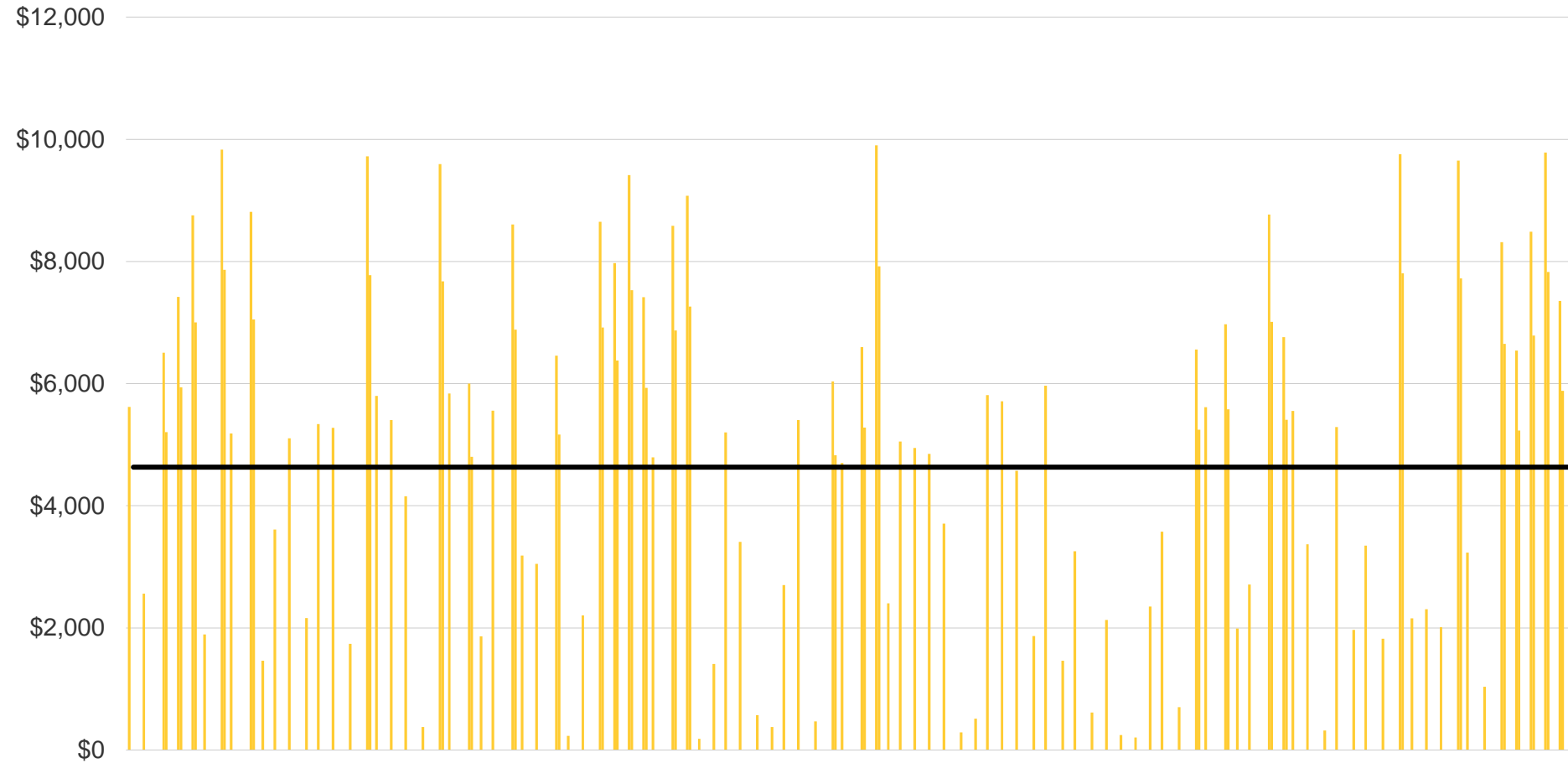
Examples of mean shifting

Scenario 1: System prevents low dollar claims



Examples of mean shifting

Scenario 2: System mitigates high dollar claims

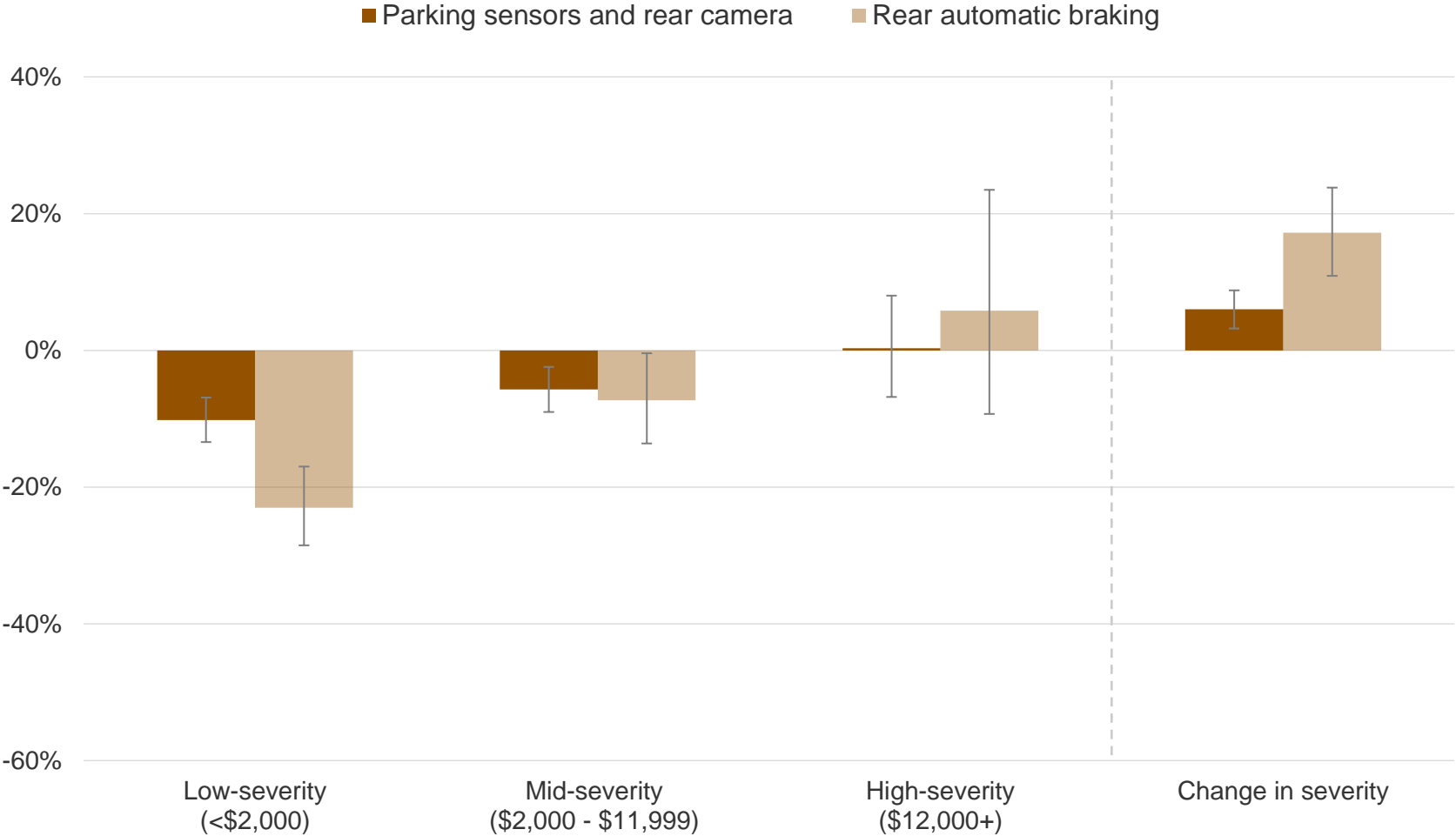


What can we learn from evaluations of parking systems?



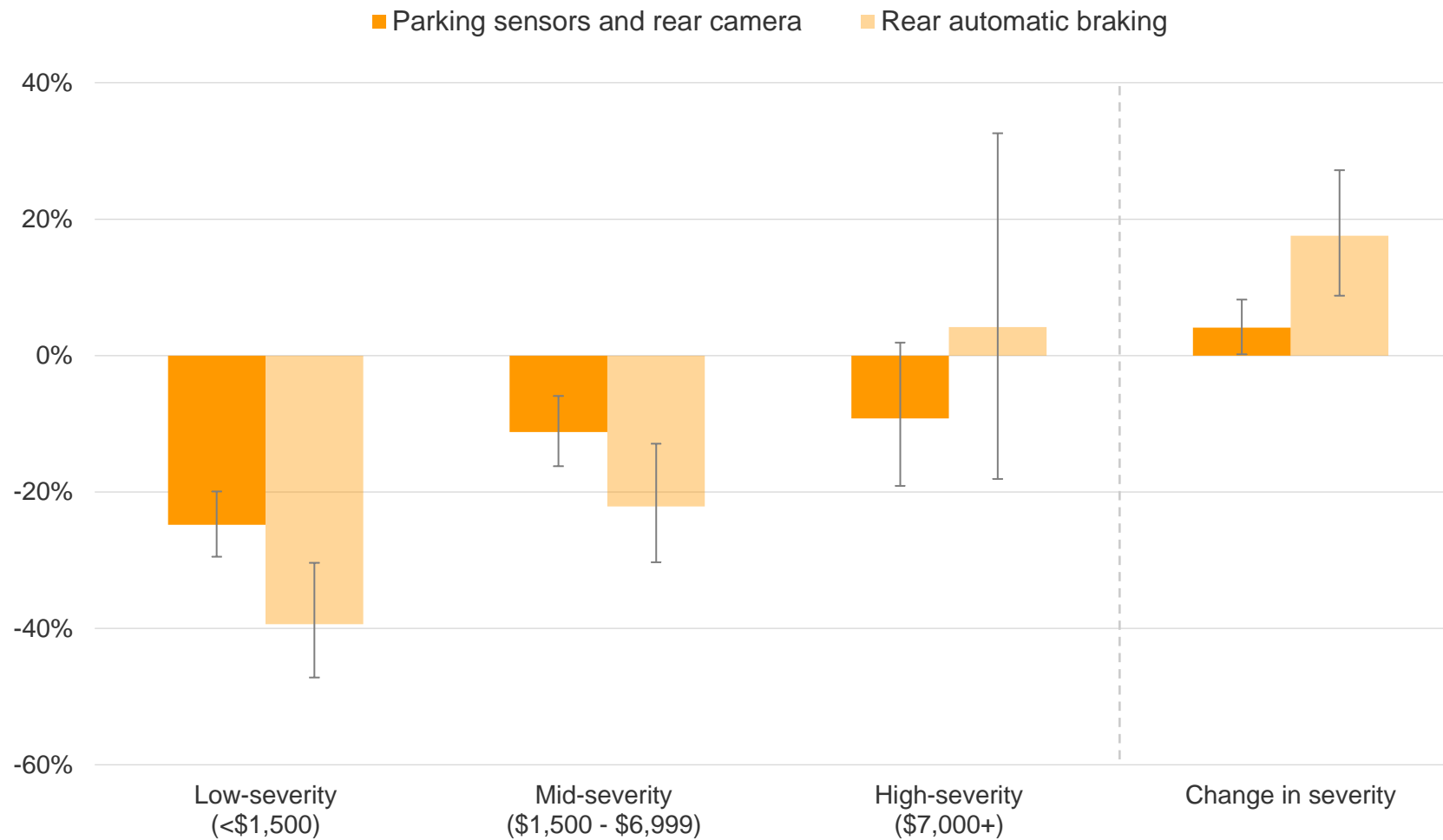
Changes in collision claim frequency by claim size

General Motors parking assist systems



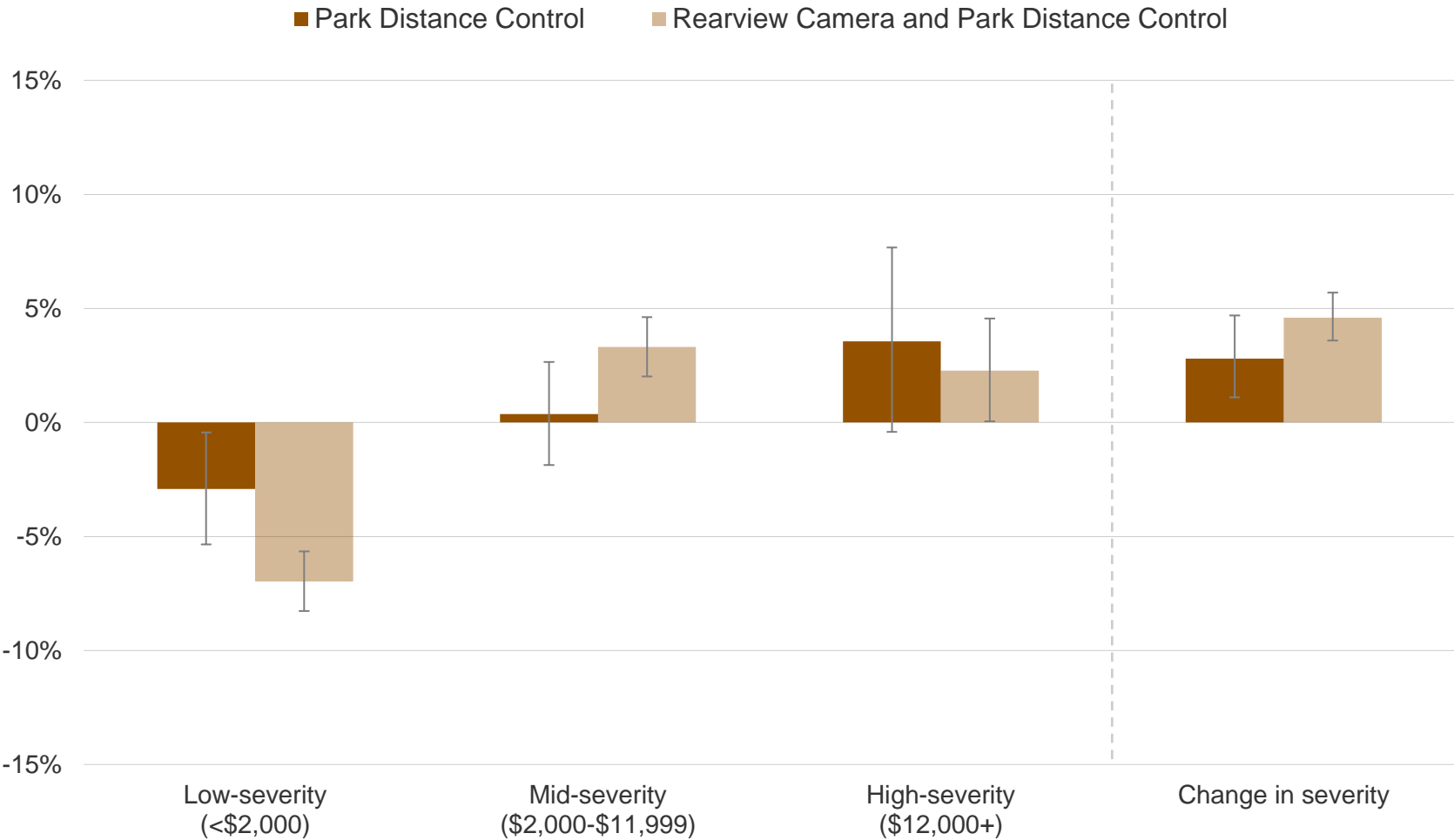
Changes in PDL claim frequency by claim size

General Motors parking assist systems



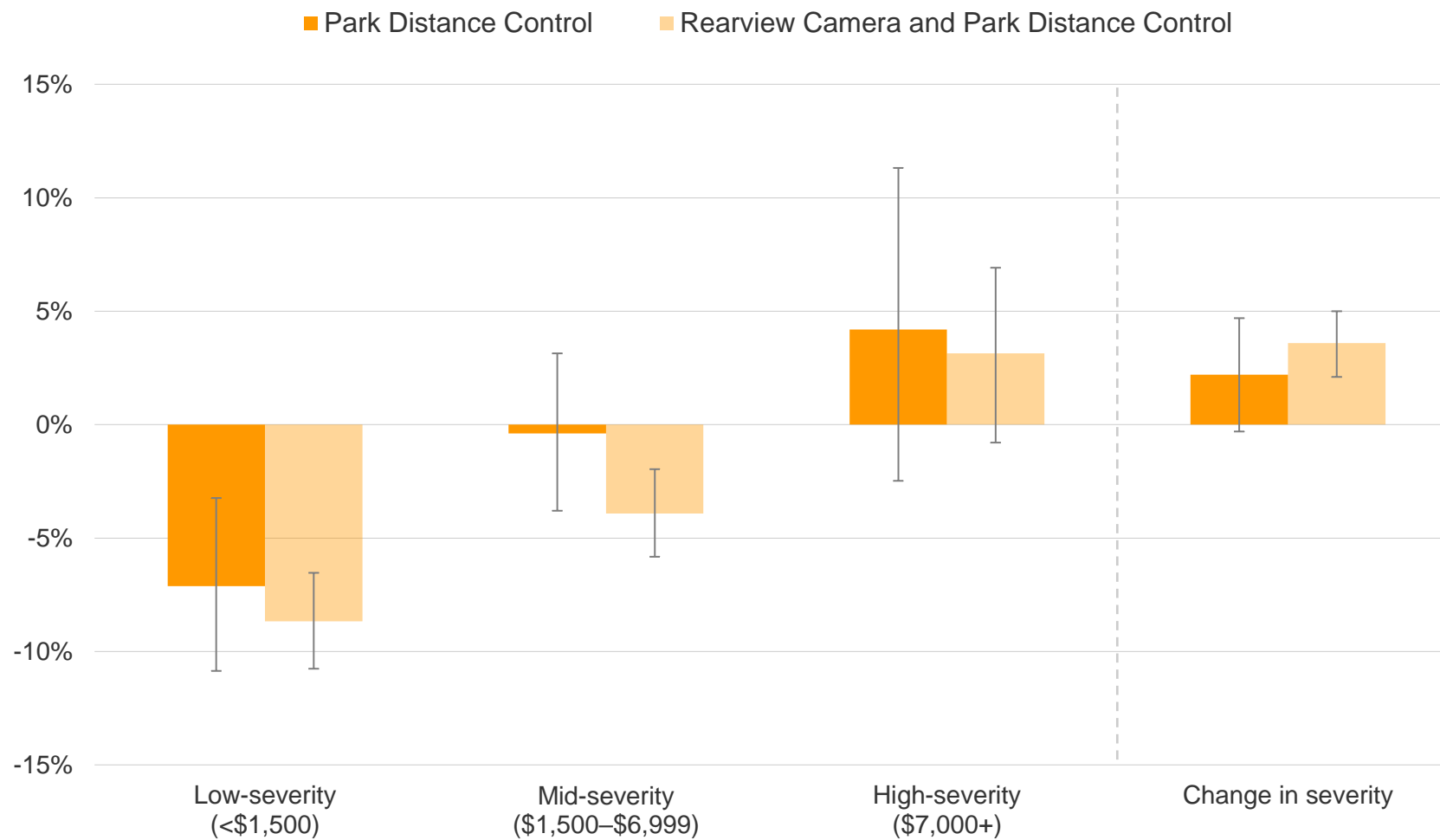
Changes in collision claim frequency by claim size

BMW parking assist systems



Changes in PDL claim frequency by claim size

BMW parking assist systems

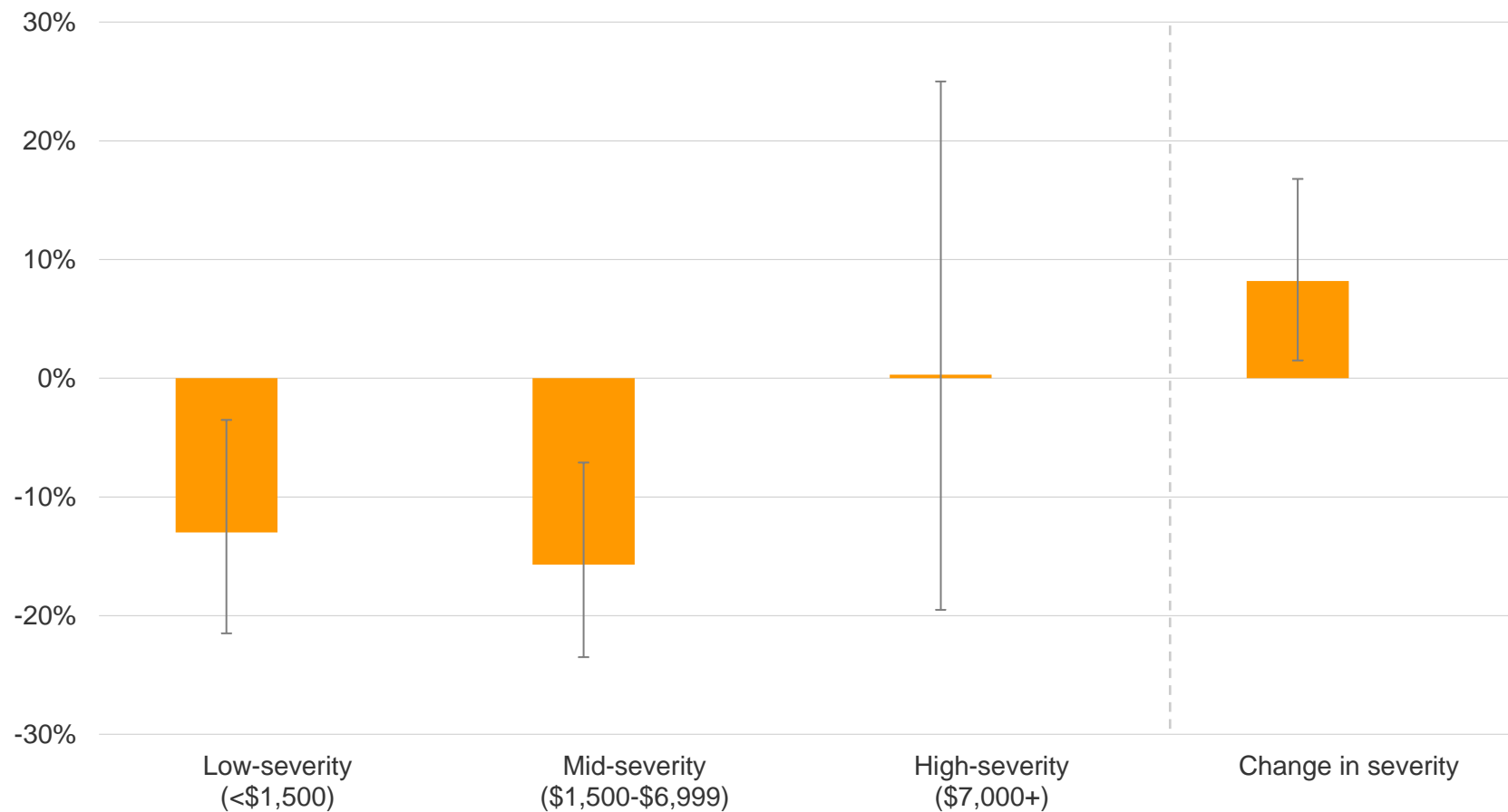


Do operational speed ranges of front crash prevention systems affect PDL severity?



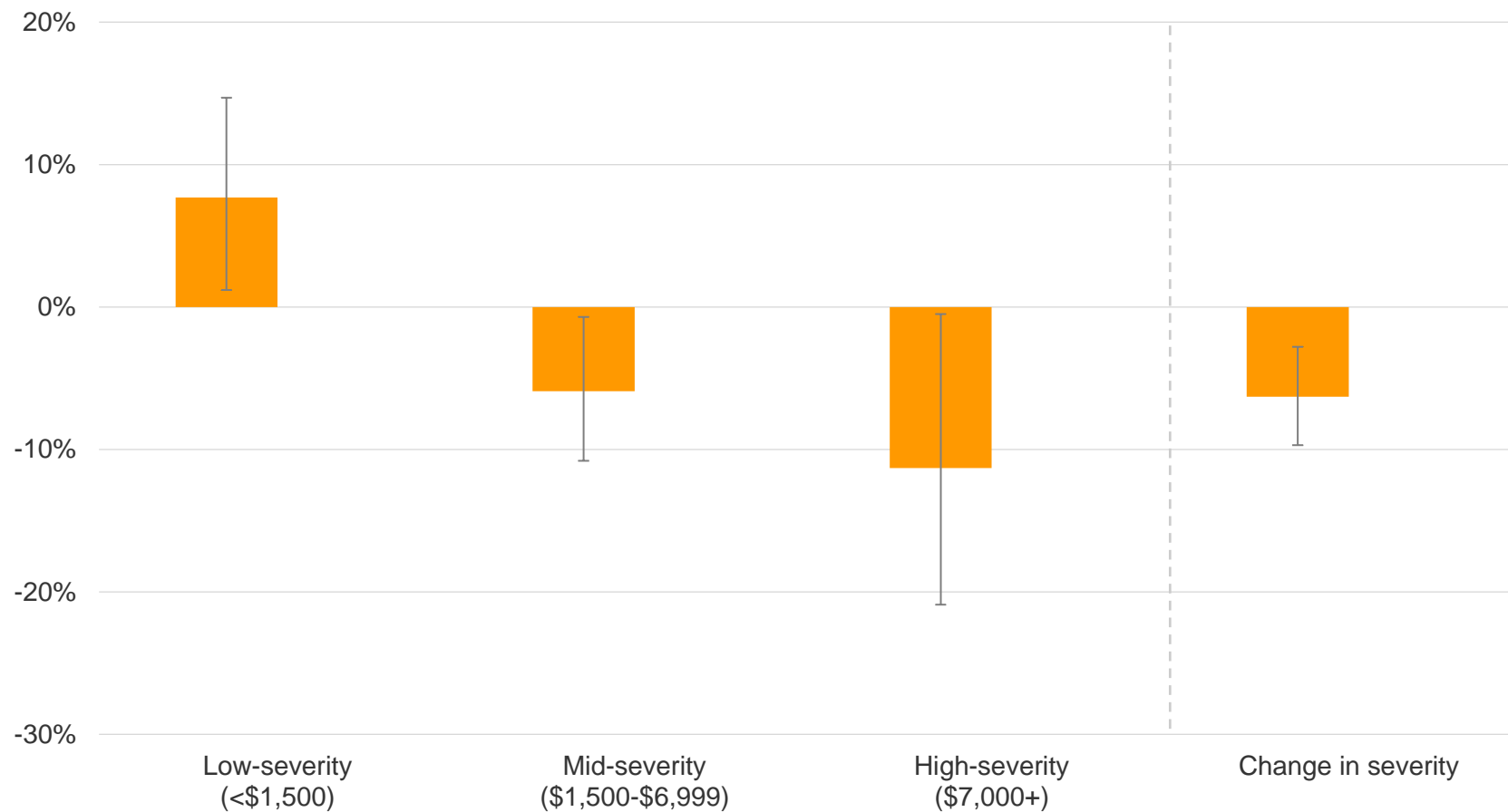
Changes in PDL claim frequency by claim size

Mazda's Smart City Brake Support (speeds 2-18 mph)



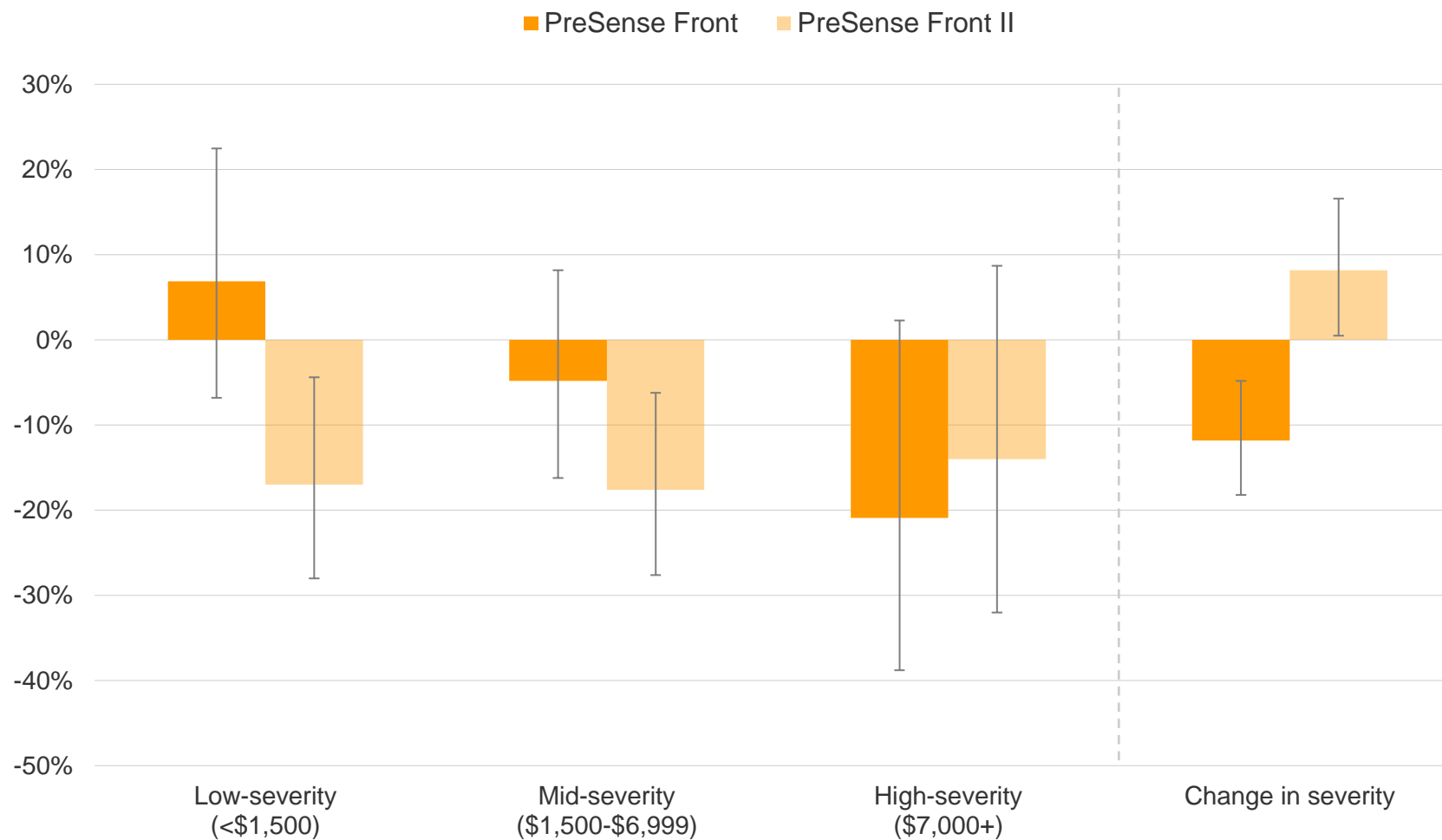
Change in PDL claim frequency by claim size

General Motors Forward Collision Alert with Lane Departure warning (speeds >25 mph)



Changes in PDL claim frequency by claim size

Audi's PreSense Front (speeds >19 mph) and PreSense Front II (all speeds)

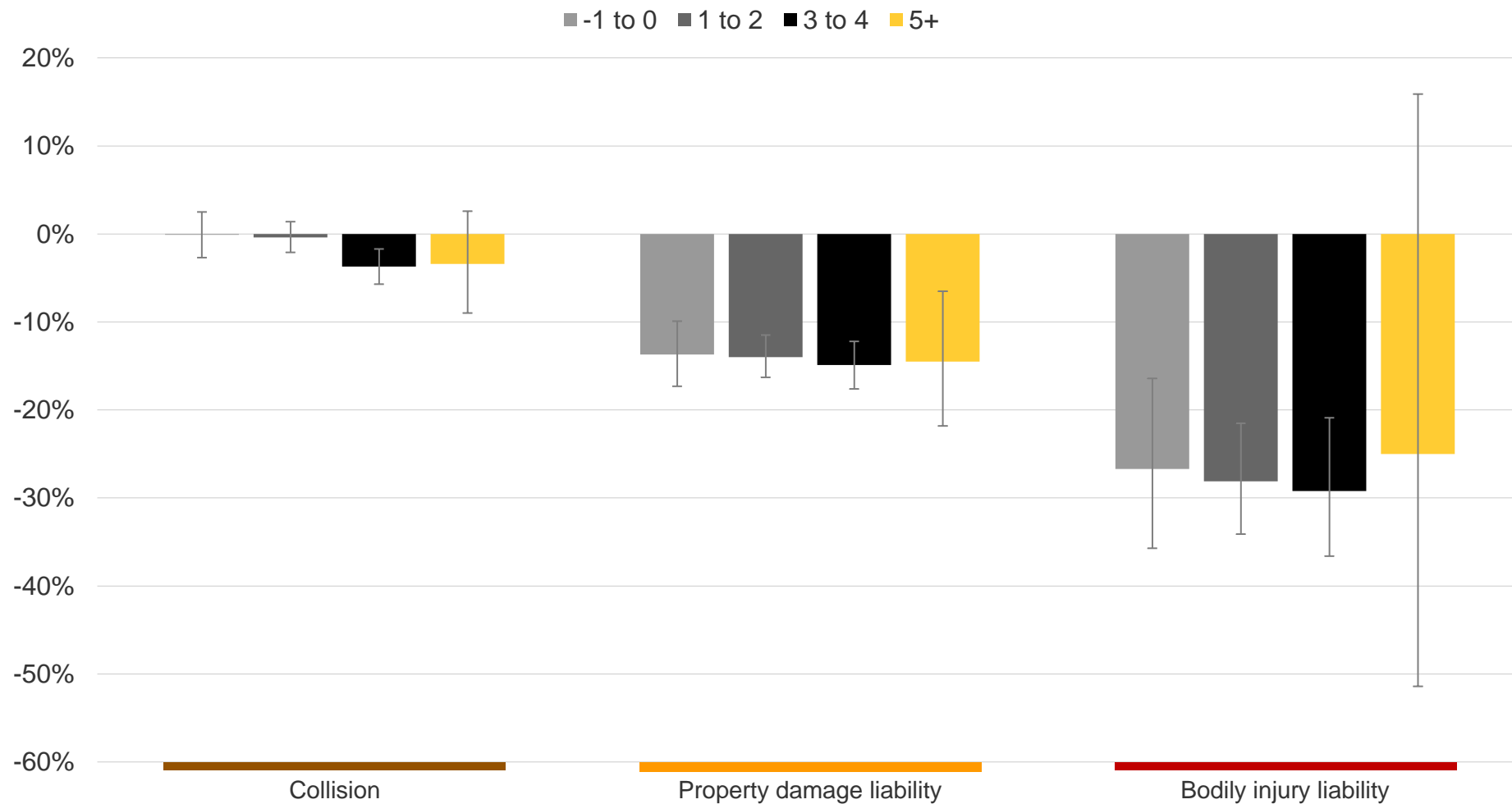


Do ADAS benefits vary?



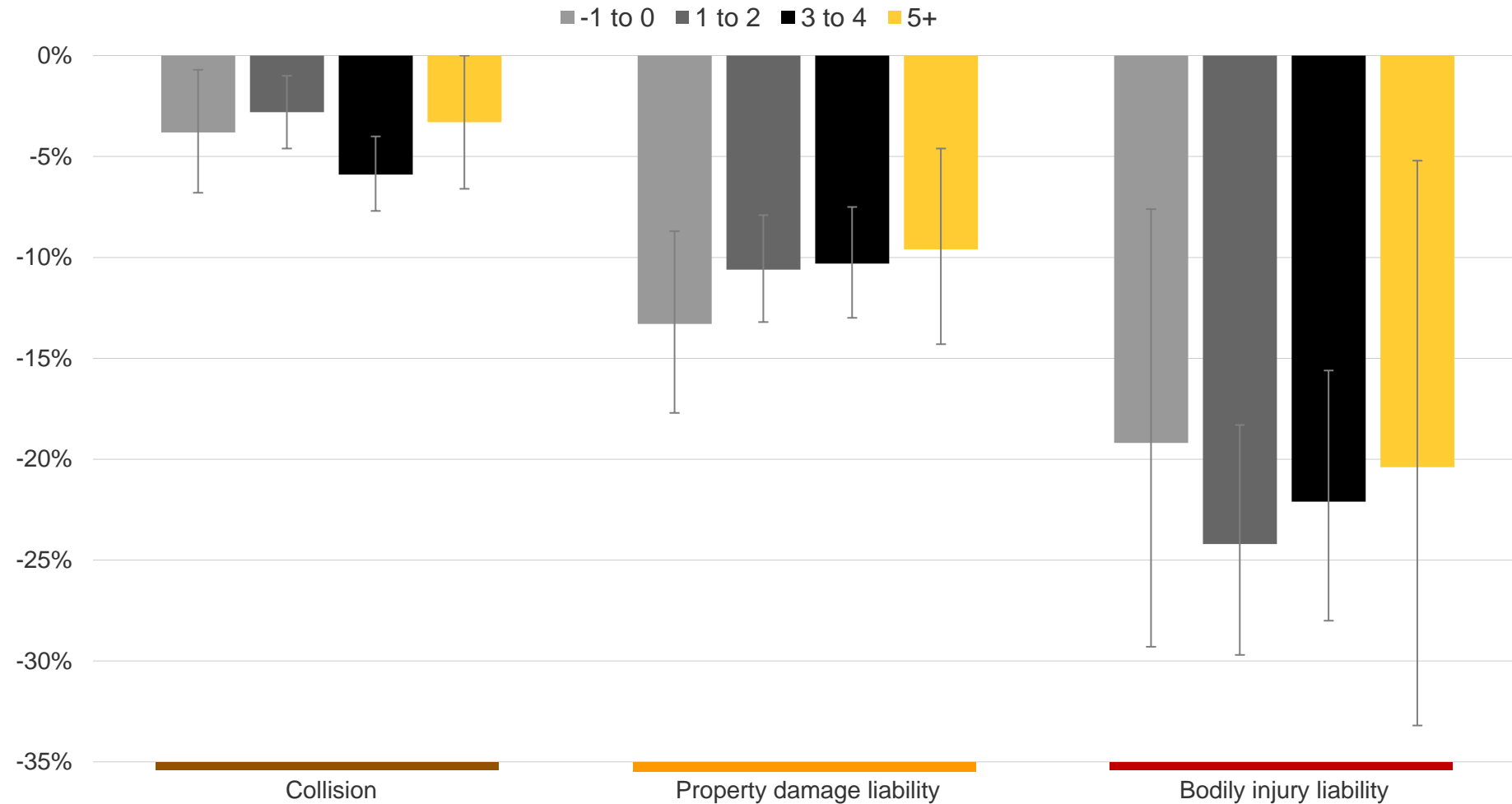
Subaru EyeSight effect on frequency

By coverage type and vehicle age



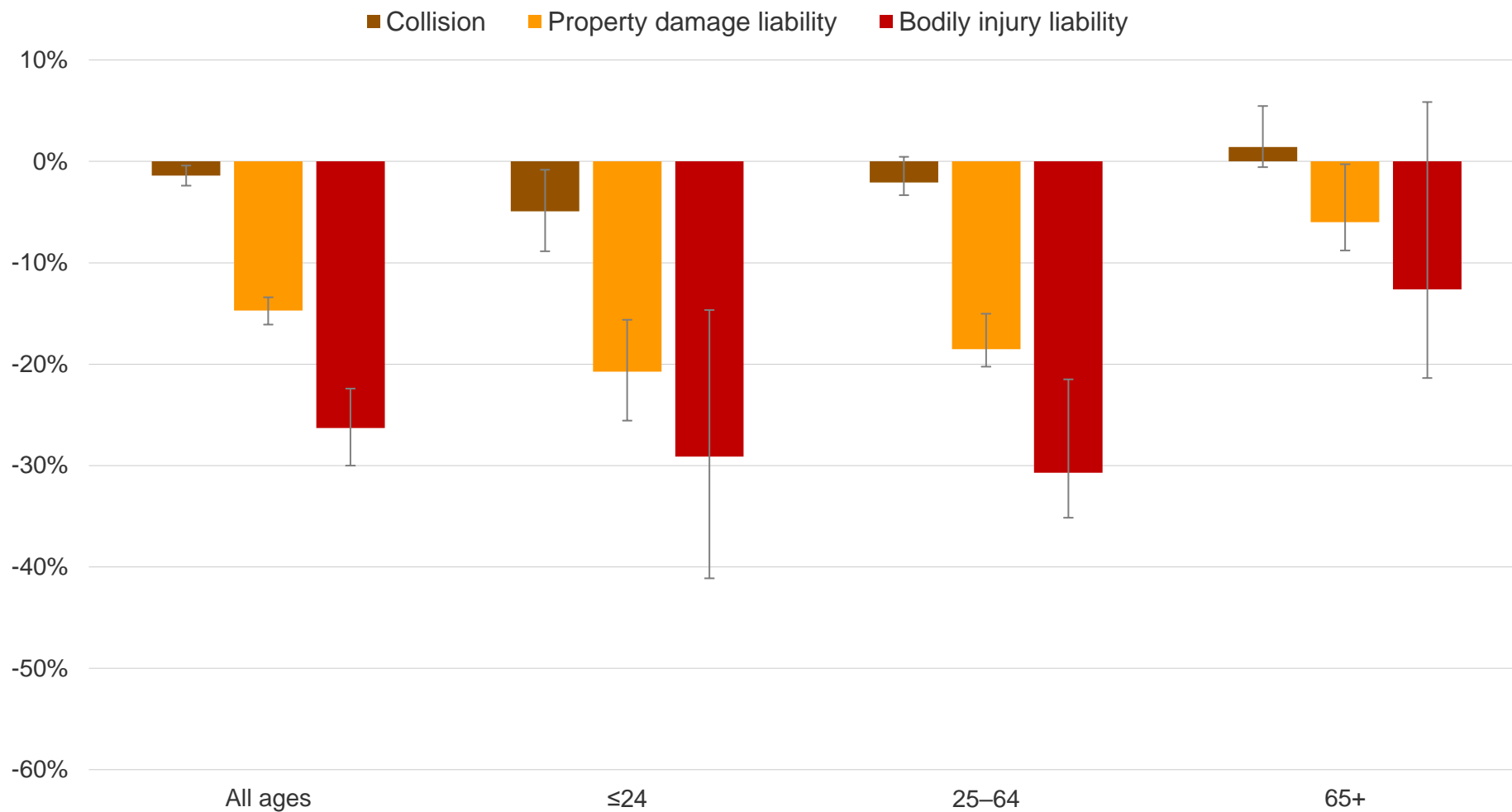
Honda Accord with FCW and LDW effect on frequency

By coverage type and vehicle age



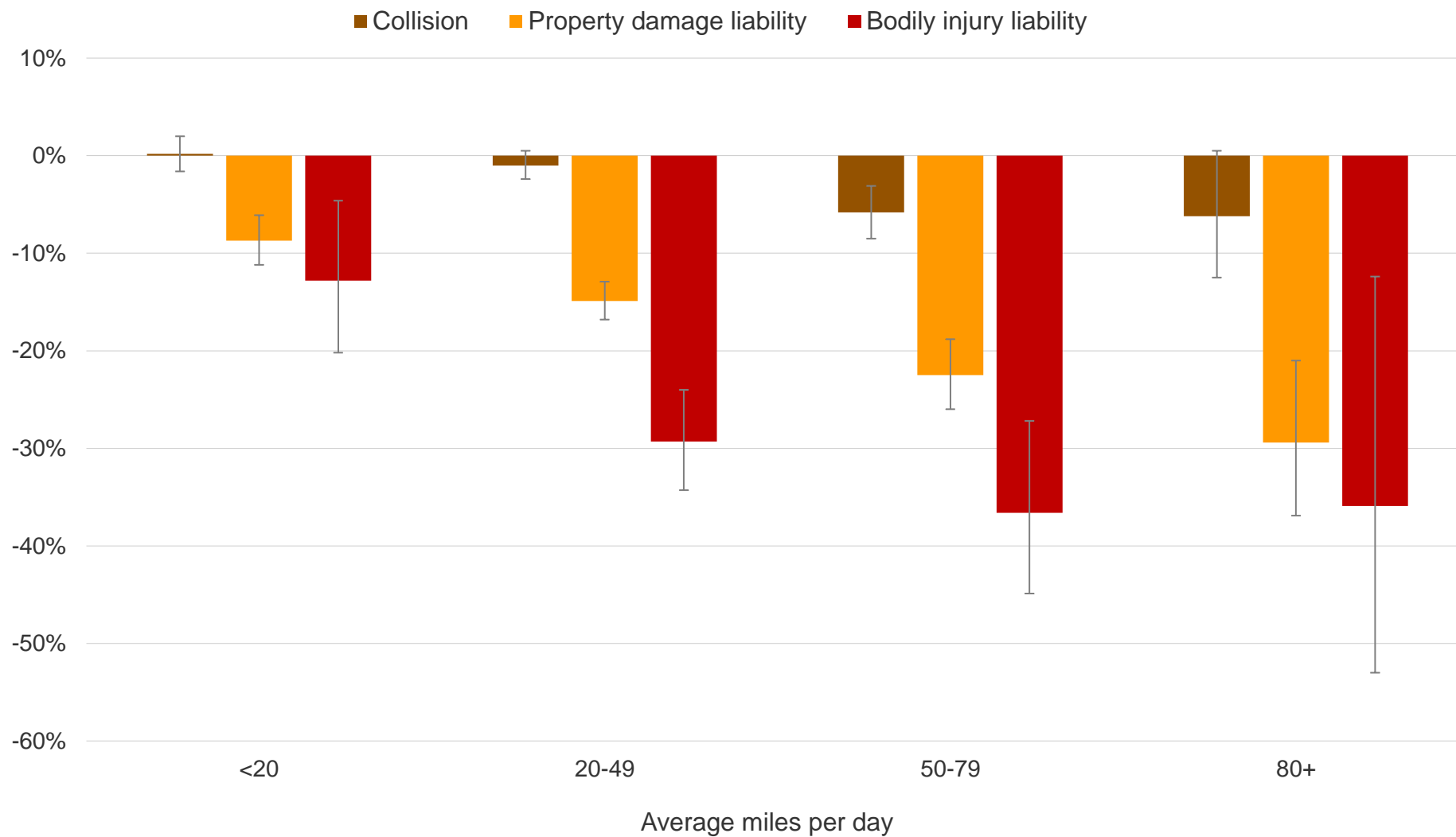
Subaru EyeSight effect on frequency

By coverage type and rated driver age



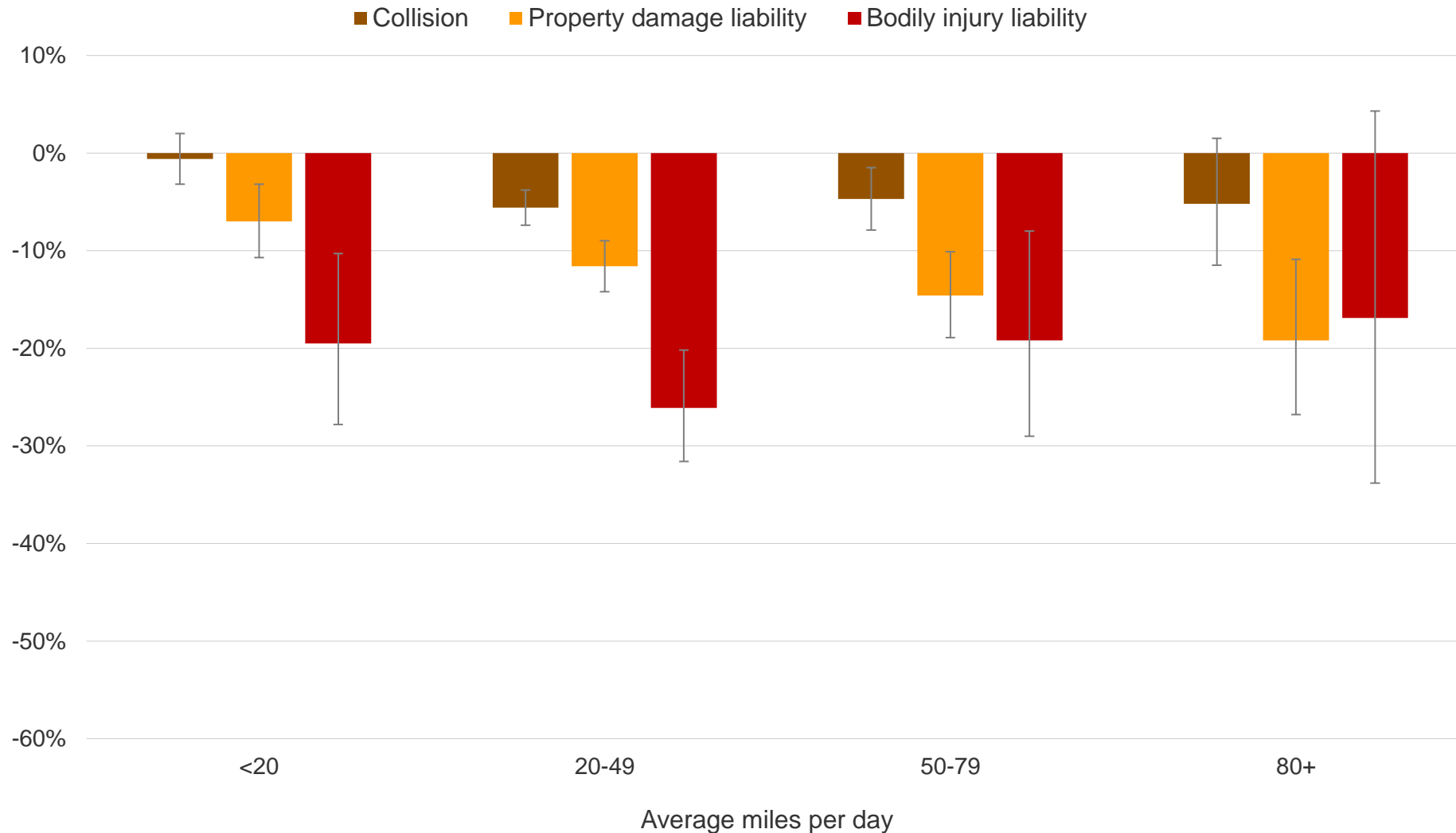
Subaru EyeSight effect on frequency

By coverage type and mileage



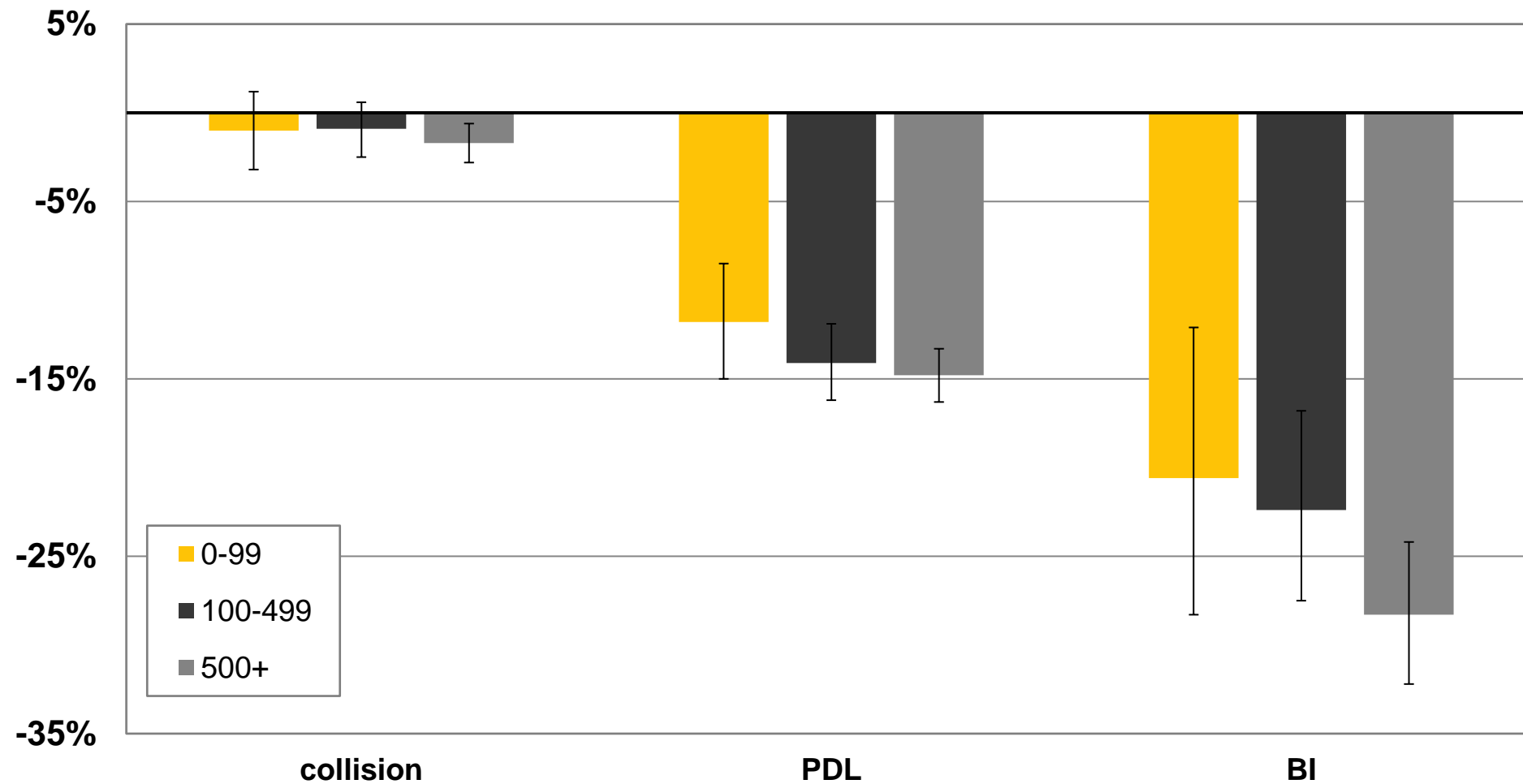
Honda Accord with FCW and LDW effect on frequency

By coverage type and mileage



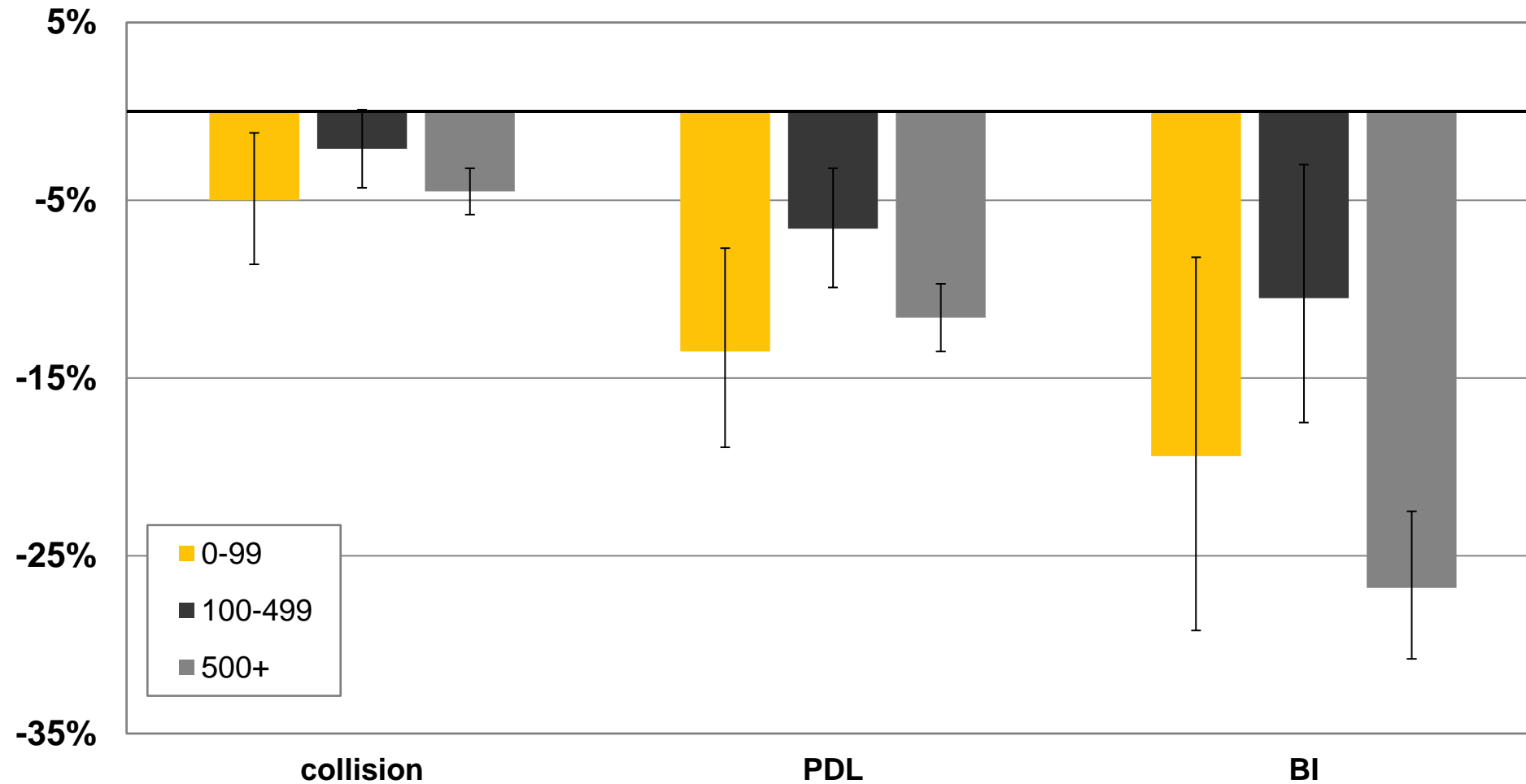
Changes in claim frequency for Subaru EyeSight

By coverage type and registered vehicle density



Changes in claim frequency for Honda Accord FCW/LDW

By coverage type and registered vehicle density

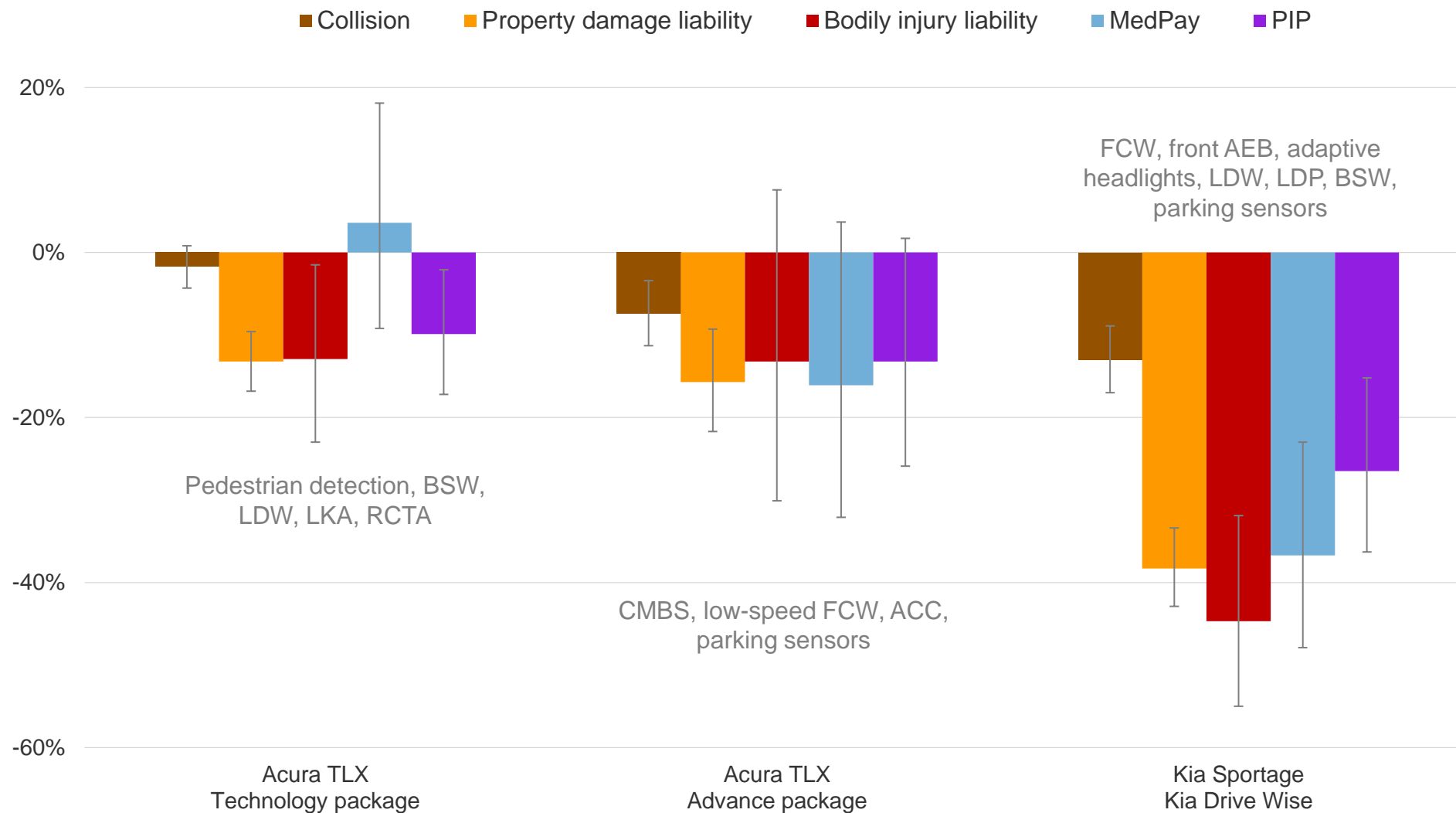


Bundled ADAS features



Summary of technology bundles

Change in claim frequency

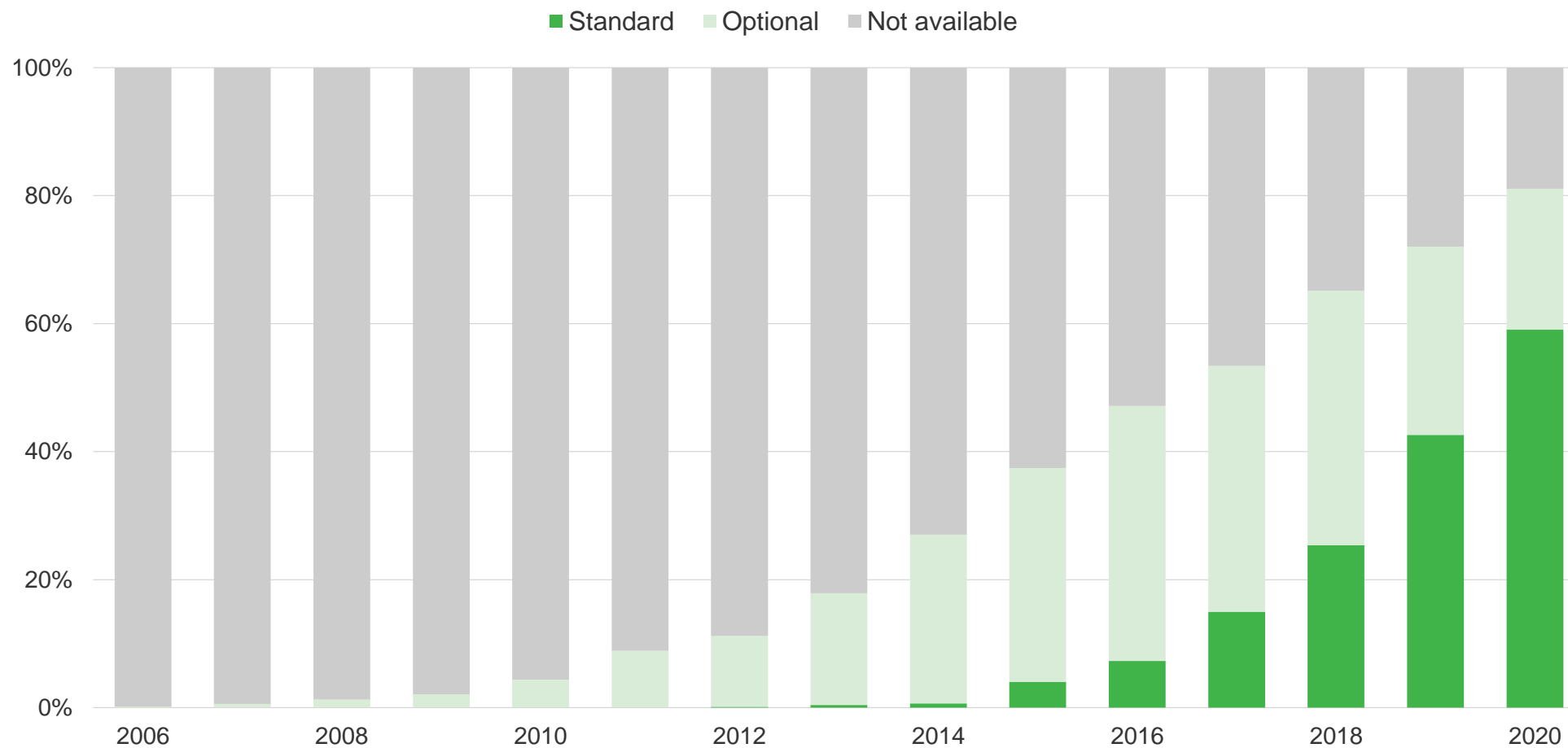


Phase-in of collision avoidance systems



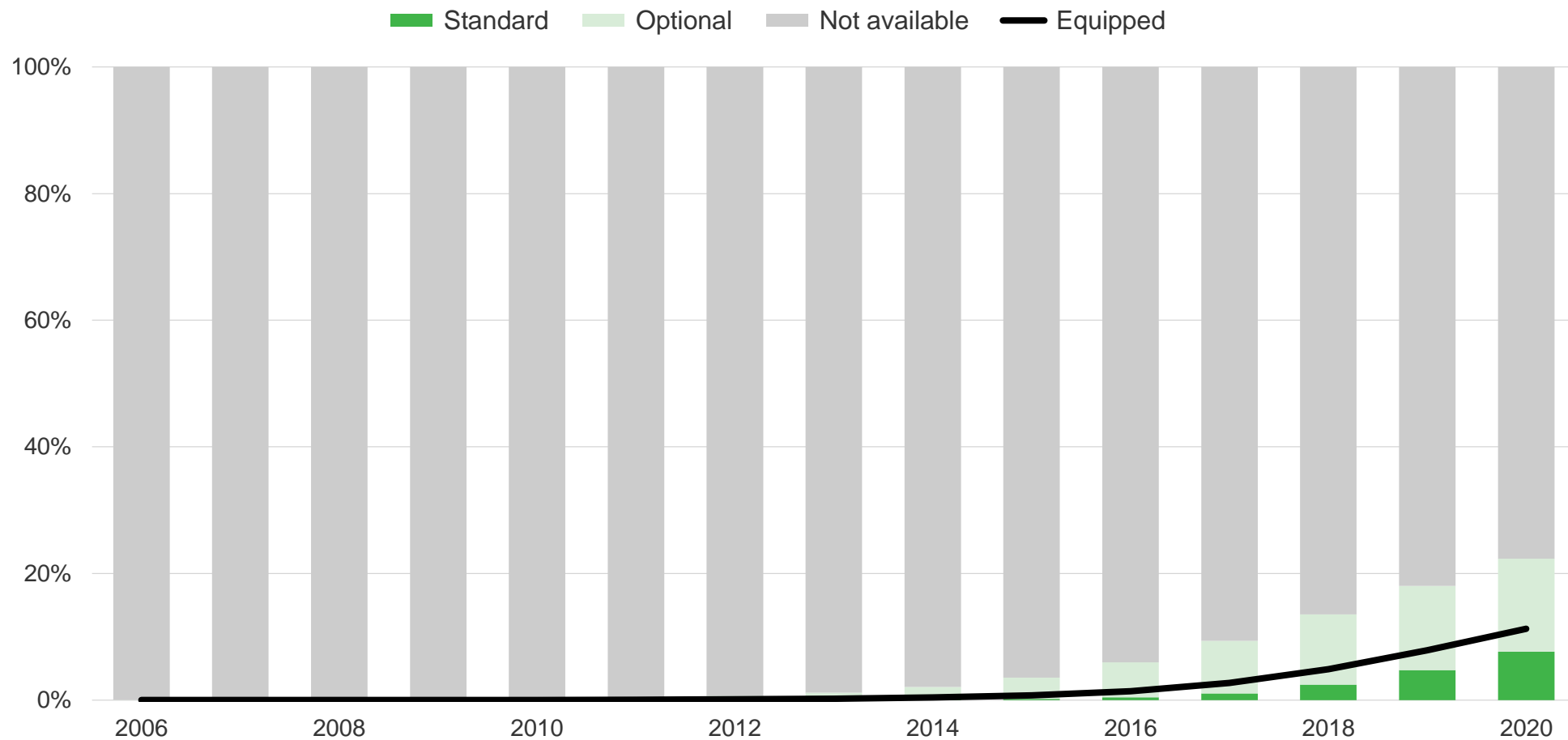
New vehicle series with front automatic emergency braking

By model year



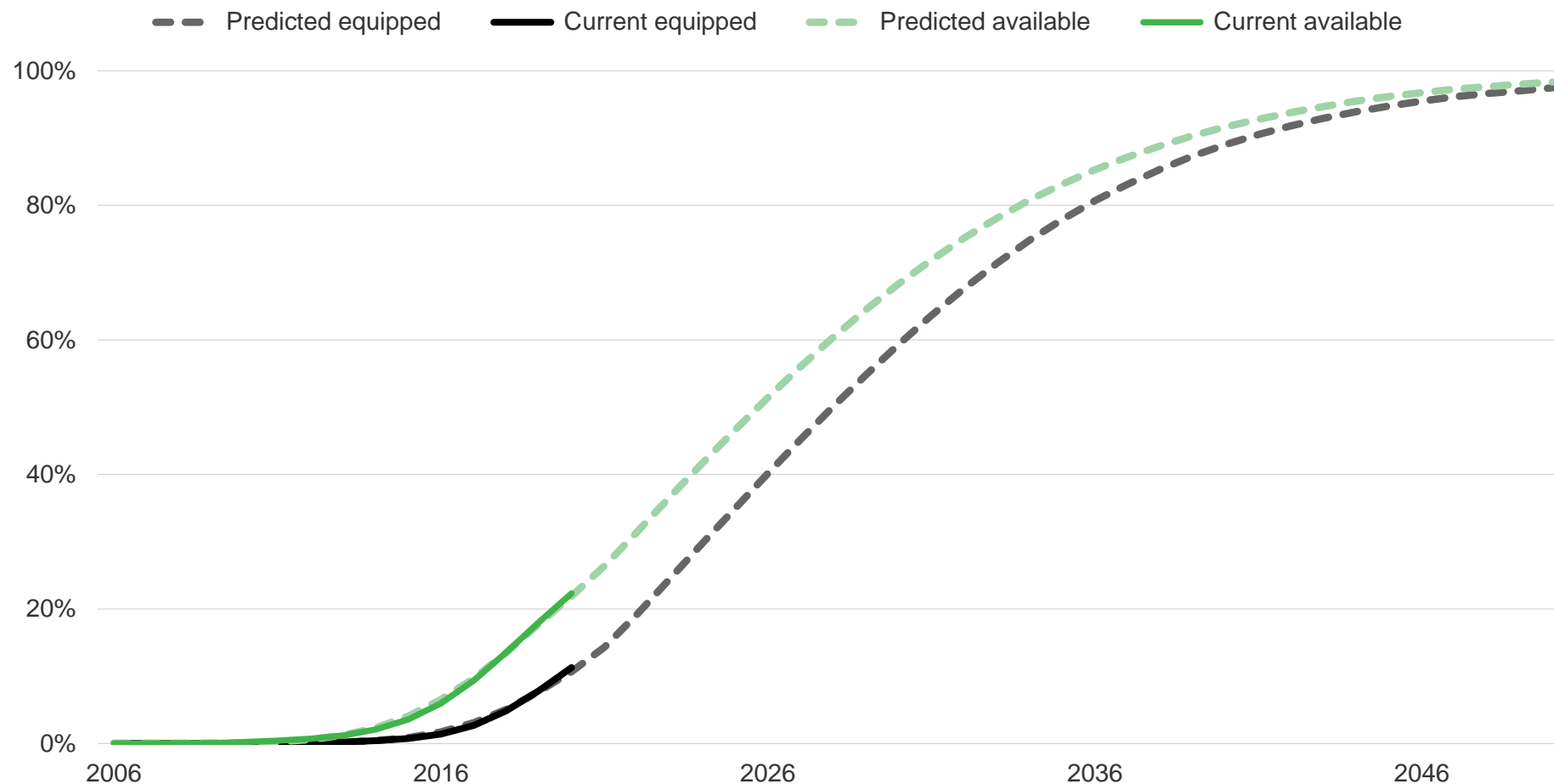
Registered vehicles with front automatic emergency braking

By calendar year



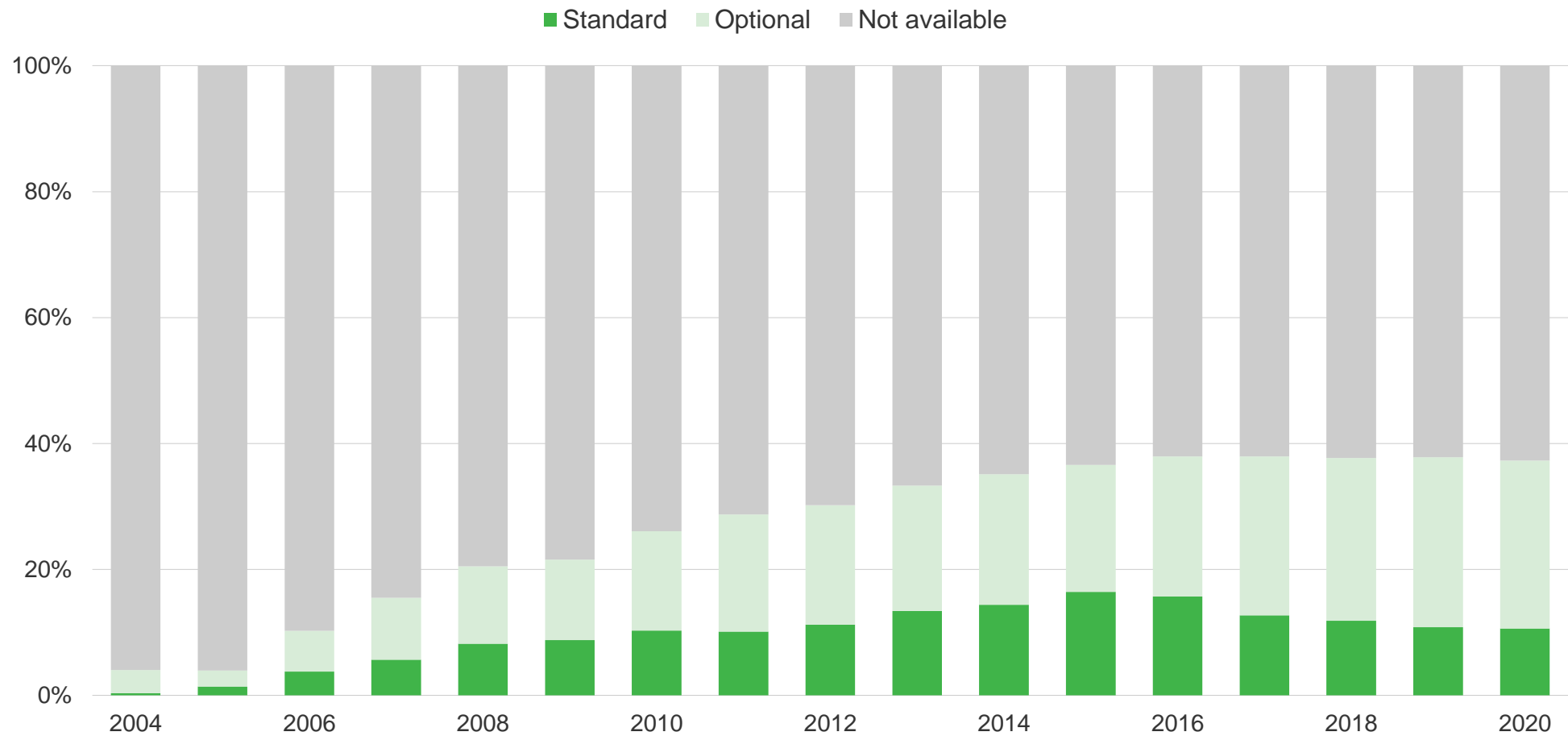
Predicted percentage of registered vehicles with front automatic emergency braking

By calendar year



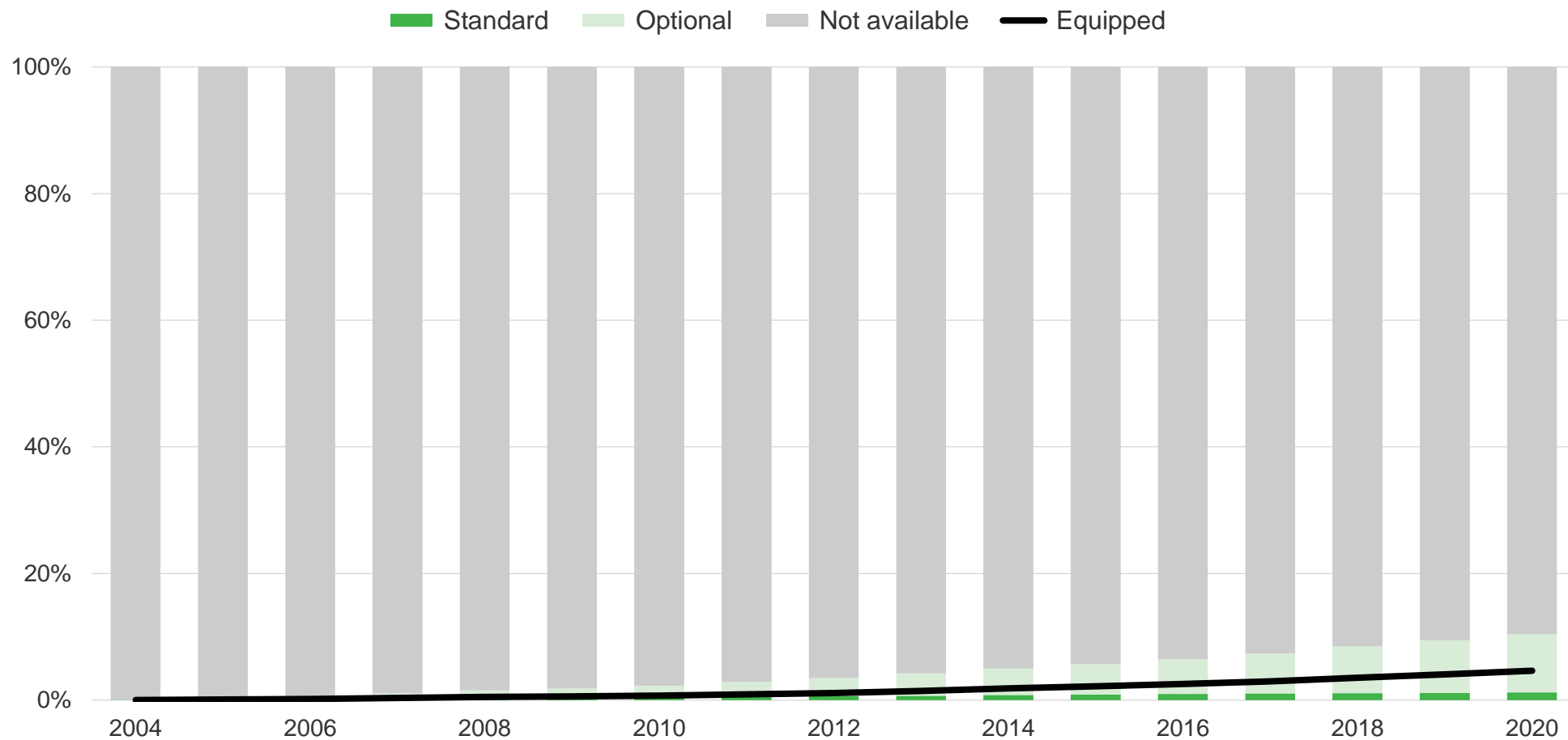
New vehicle series with adaptive headlights

By model year



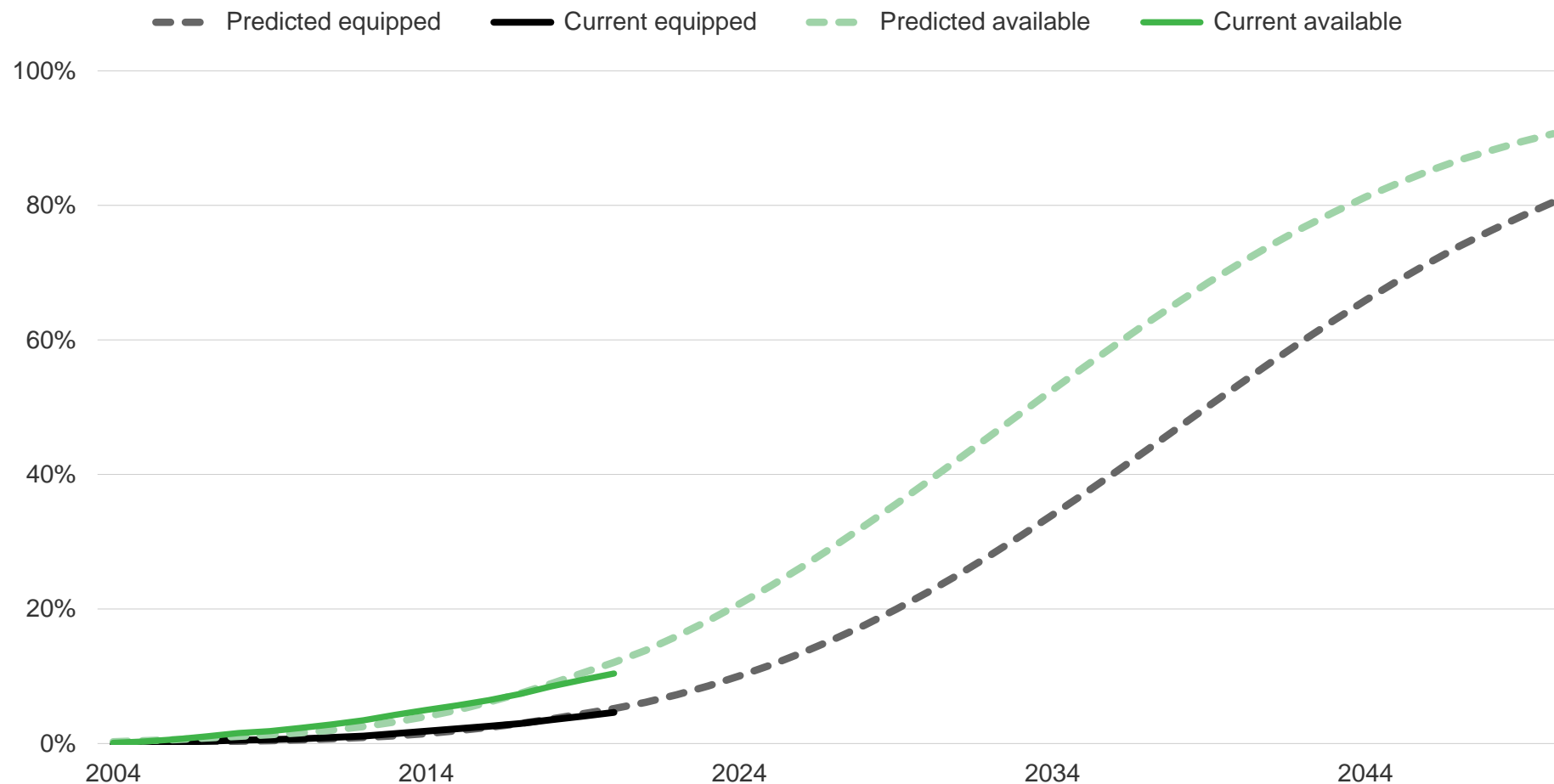
Registered vehicles with adaptive headlights

By calendar year



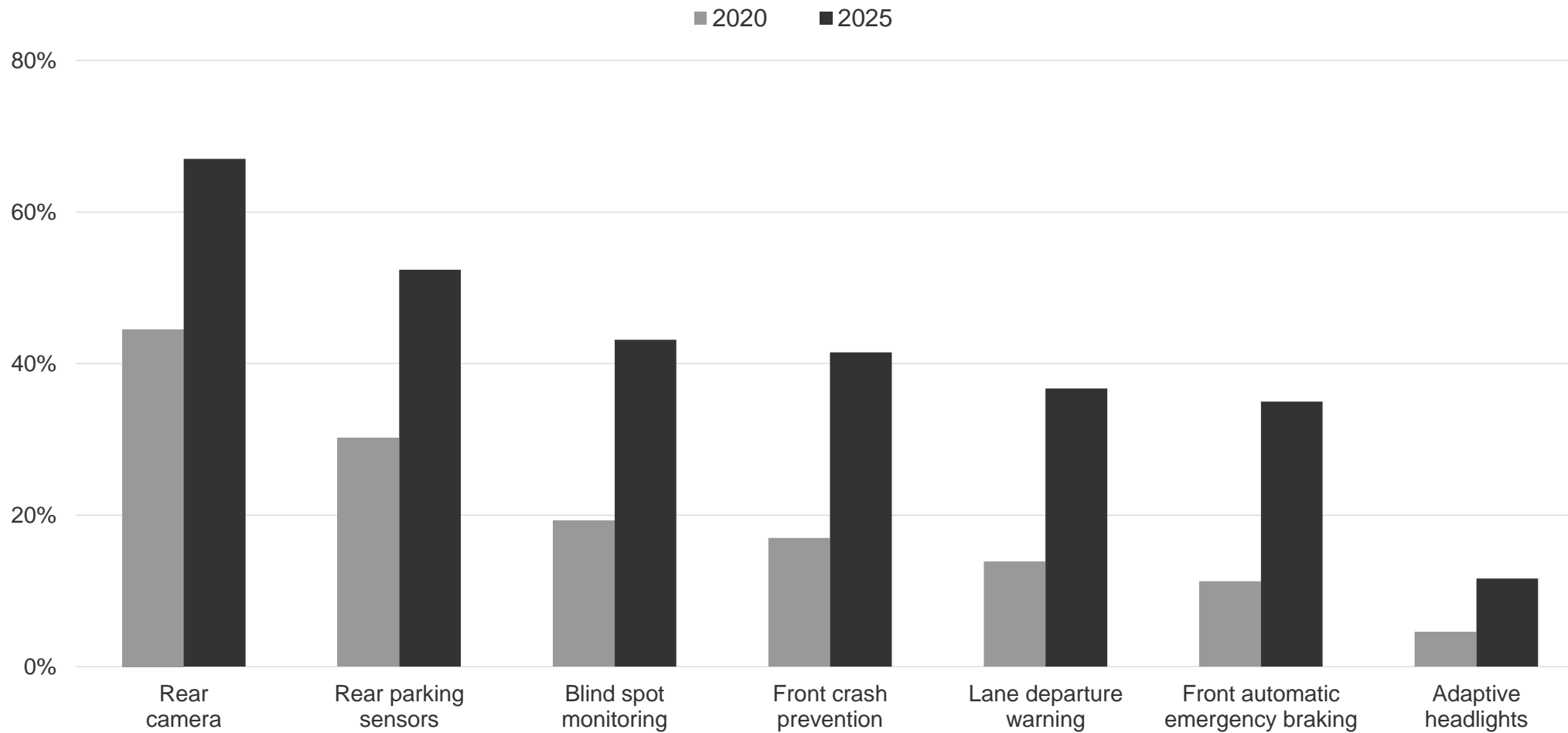
Predicted percentage of registered vehicles with adaptive headlights

By calendar year



Estimated registered vehicles by feature

Calendar years 2020 and 2025



Insurance Institute for Highway Safety
Highway Loss Data Institute

iihs.org



/iihs.org



@IIHS_autosafety



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IIHS

THANK YOU



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