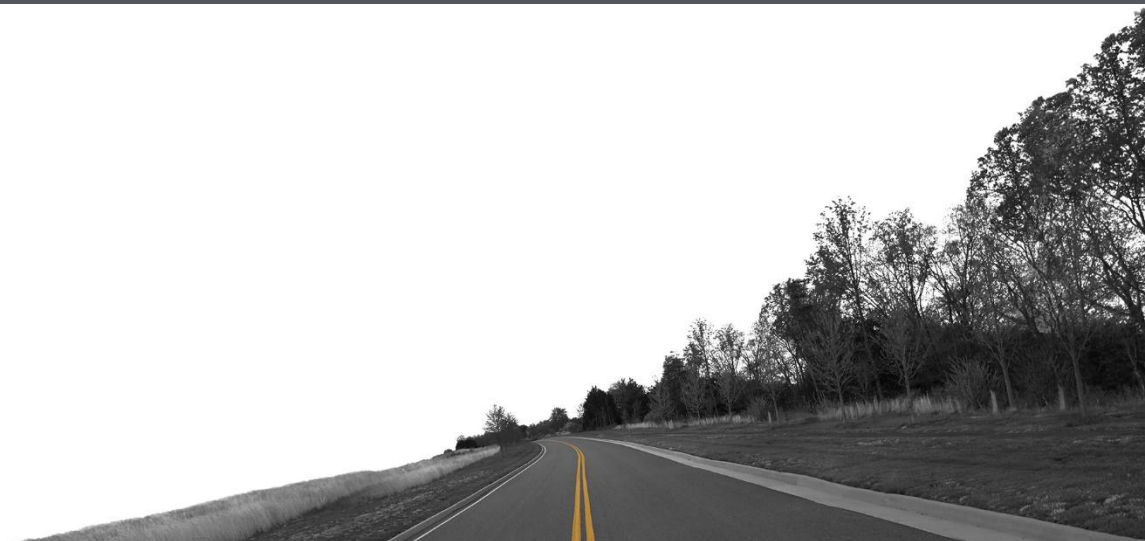
ADAS and Automated Driving

June 24, 2025

Matt Moore
Chief Insurance Operations Officer



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

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Auto Club Enterprises
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Celina Insurance Group
CHUBB
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Clearcover Insurance Company
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Farm Bureau Mutual Insurance Company of Idaho
Farmers Insurance Group
Farmers Mutual of Nebraska
Florida Farm Bureau Insurance Companies
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Gainsco Insurance
GEICO Corporation
The General Insurance
Georgia Farm Bureau Mutual Insurance Company
Goodville Mutual Casualty Company
Grange Insurance
The Hanover Insurance Group
The Hartford
Haulers Insurance Company, Inc.
Horace Mann Insurance Companies
Indiana Farm Bureau Insurance
Indiana Farmers Insurance
Just Insure
Kemper Corporation
Kentucky Farm Bureau Mutual Insurance Companies
Kin Insurance
Lemonade, Inc.
Liberty Mutual Insurance
Louisiana Farm Bureau Insurance Company
Main Street America Insurance
MAPFRE Insurance Group
Mercury Insurance Group
Mississippi Farm Bureau Casualty Insurance Company
MMG Insurance
Mountain West Farm Bureau Mutual Insurance Company
Munich Reinsurance America, Inc.
Mutual Benefit Group®
Mutual of Enumclaw Insurance Company
National General Insurance
Nationwide
NJM Insurance Group
Nodak Insurance Company
North Carolina Farm Bureau Mutual Insurance Company
North Star Mutual Insurance Company
Northern Neck Insurance Company
NYCM Insurance
Ohio Mutual Insurance Group
PEMCO Mutual Insurance Company
Plymouth Rock Assurance
Progressive Insurance
Redpoint County Mutual Insurance Company
The Responsive Auto Insurance Company
Rider Insurance
Rockingham Insurance
Root Insurance Co
Safe Auto Insurance Company
Safeco Insurance®
Samsung Fire & Marine Insurance Company
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.
United Auto
United Insurance Group
USAA
Virginia Farm Bureau Mutual Insurance
West Bend Insurance Company
Westfield

Funding associations

American Property Casualty Insurance Association
National Association of Mutual Insurance Companies

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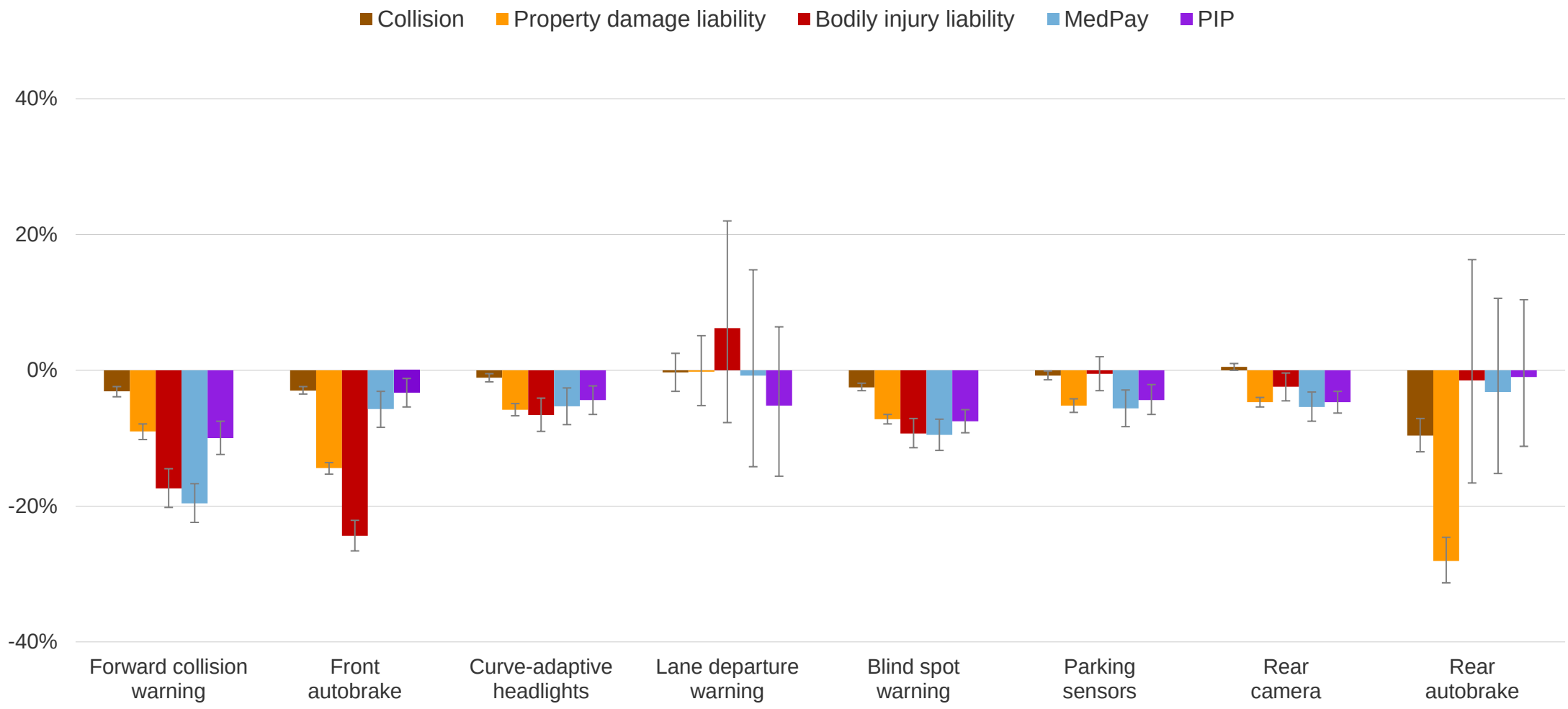
Advanced driver assistance systems

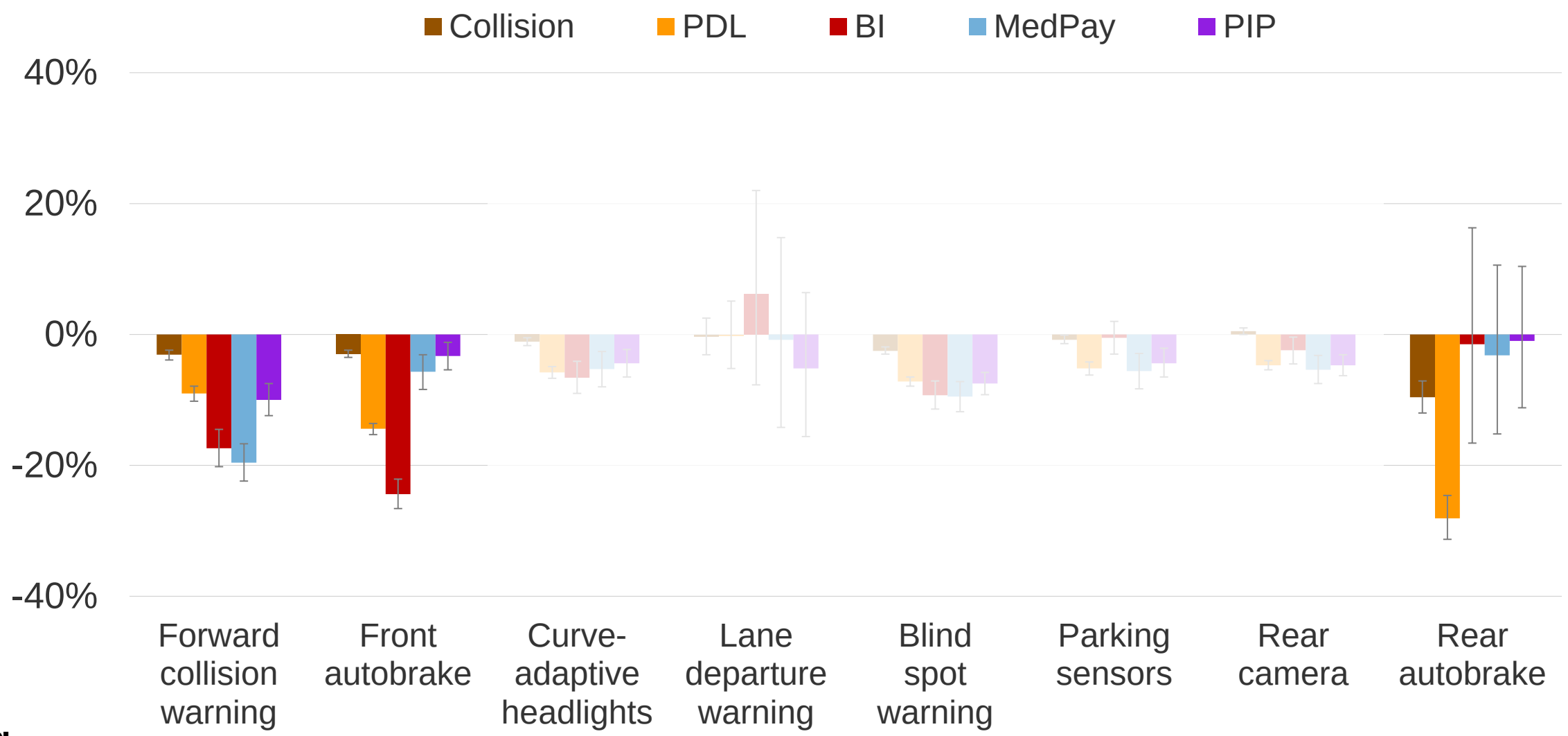
Summary of technology effects on insurance claim frequencies

Primarily first-generation implementations



Summary of technology effects on insurance claim frequency

Results pooled across automakers



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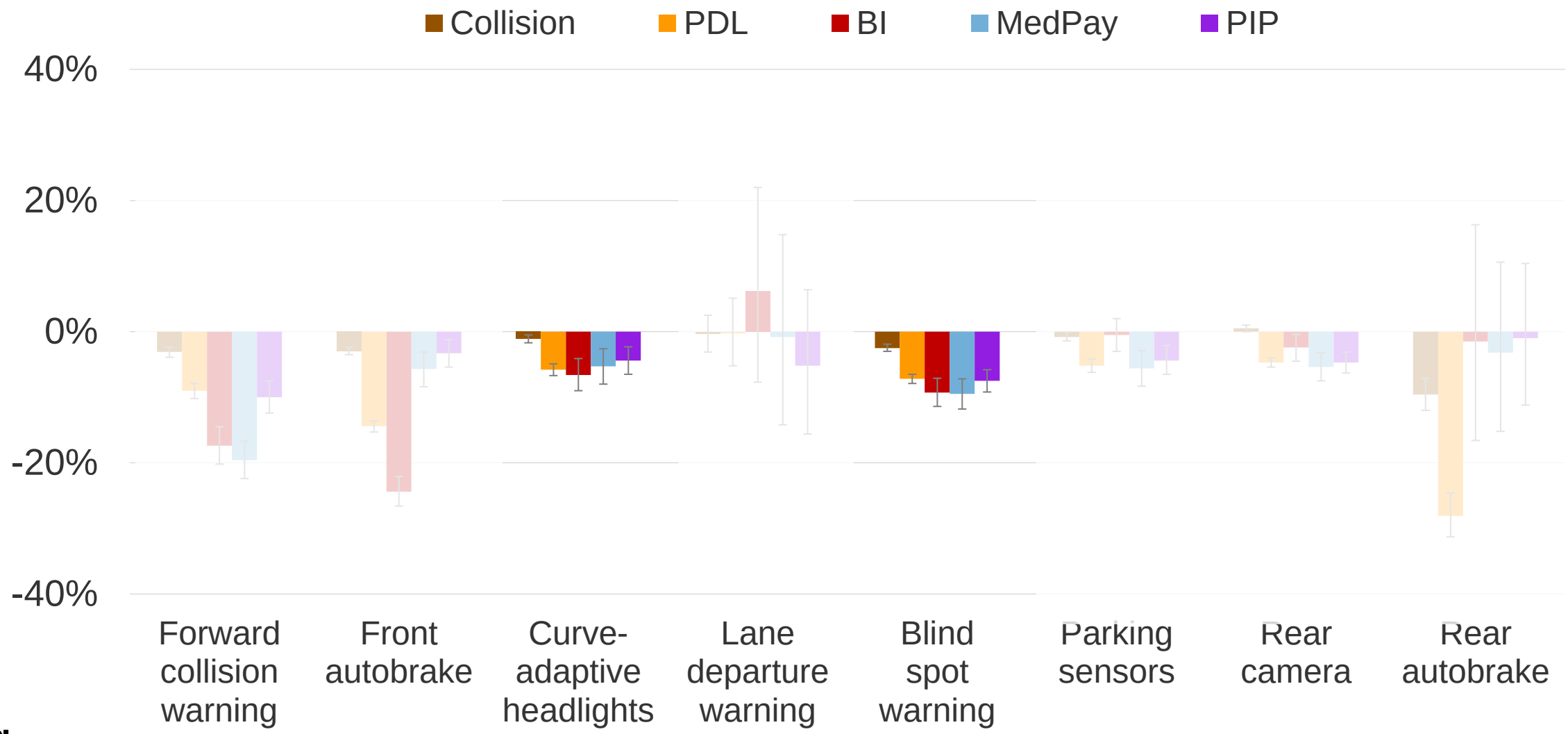
Summary of technology effects on insurance claim frequency

Results pooled across automakers



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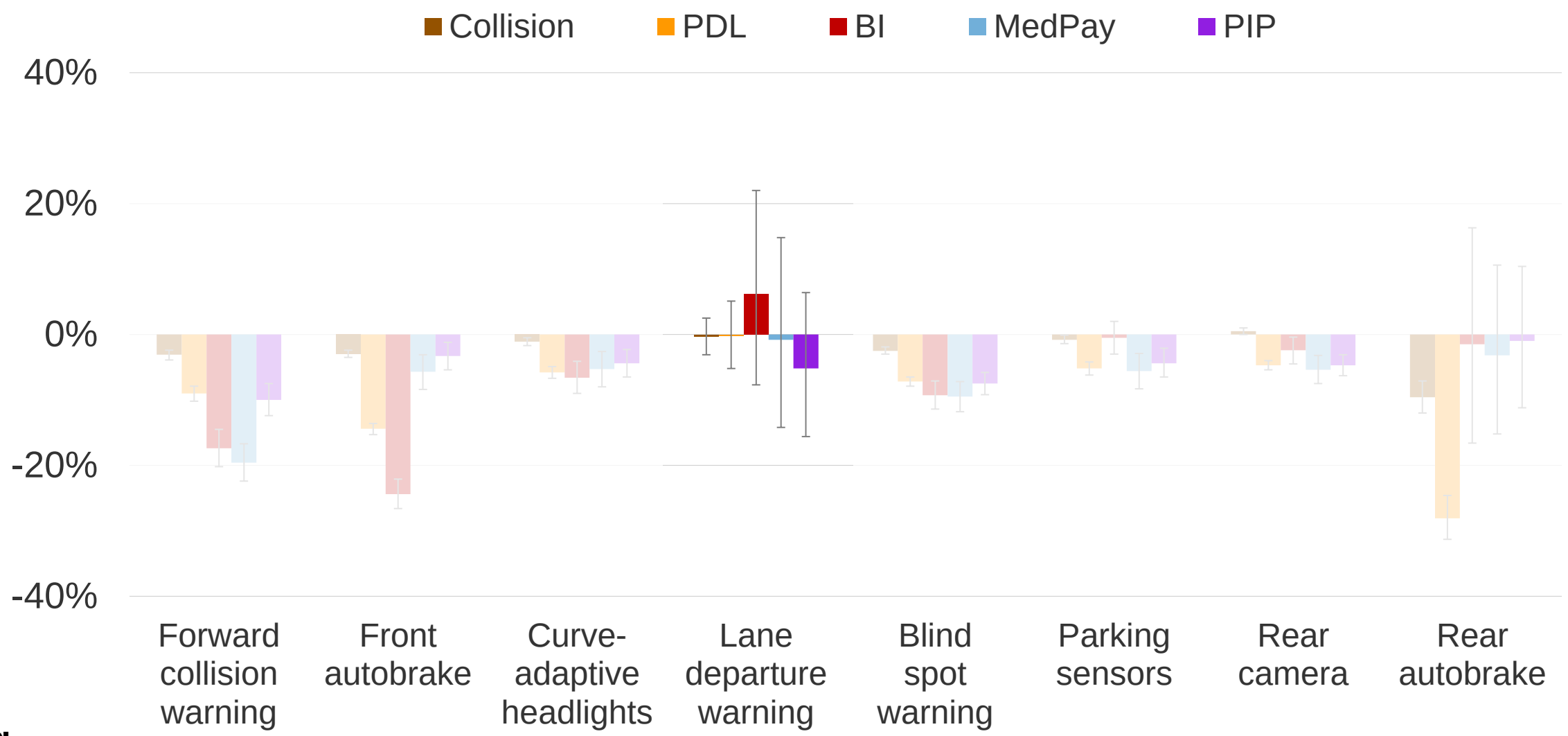
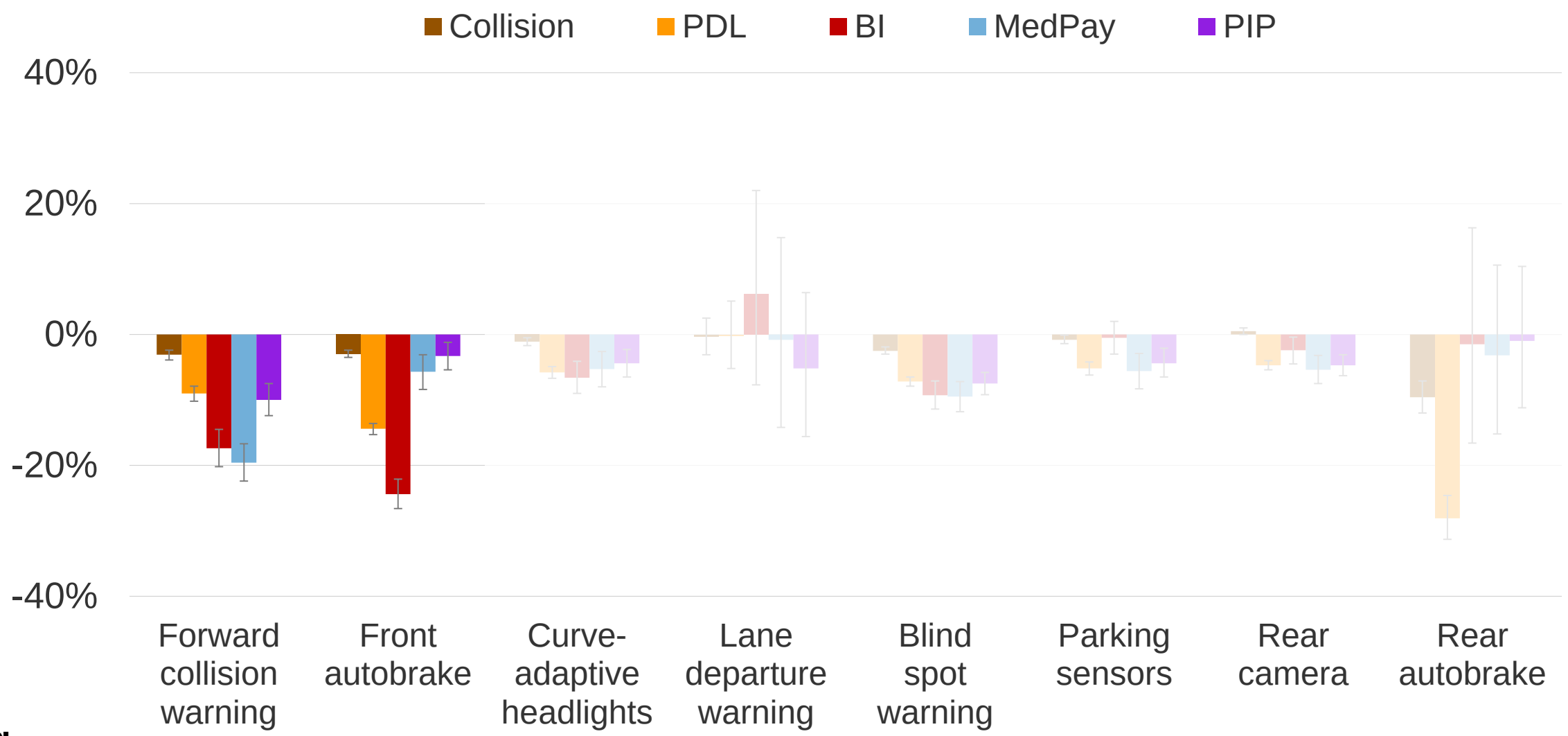
Summary of technology effects on insurance claim frequency

Results pooled across automakers



Summary of technology effects on insurance claim frequency

Results pooled across automakers



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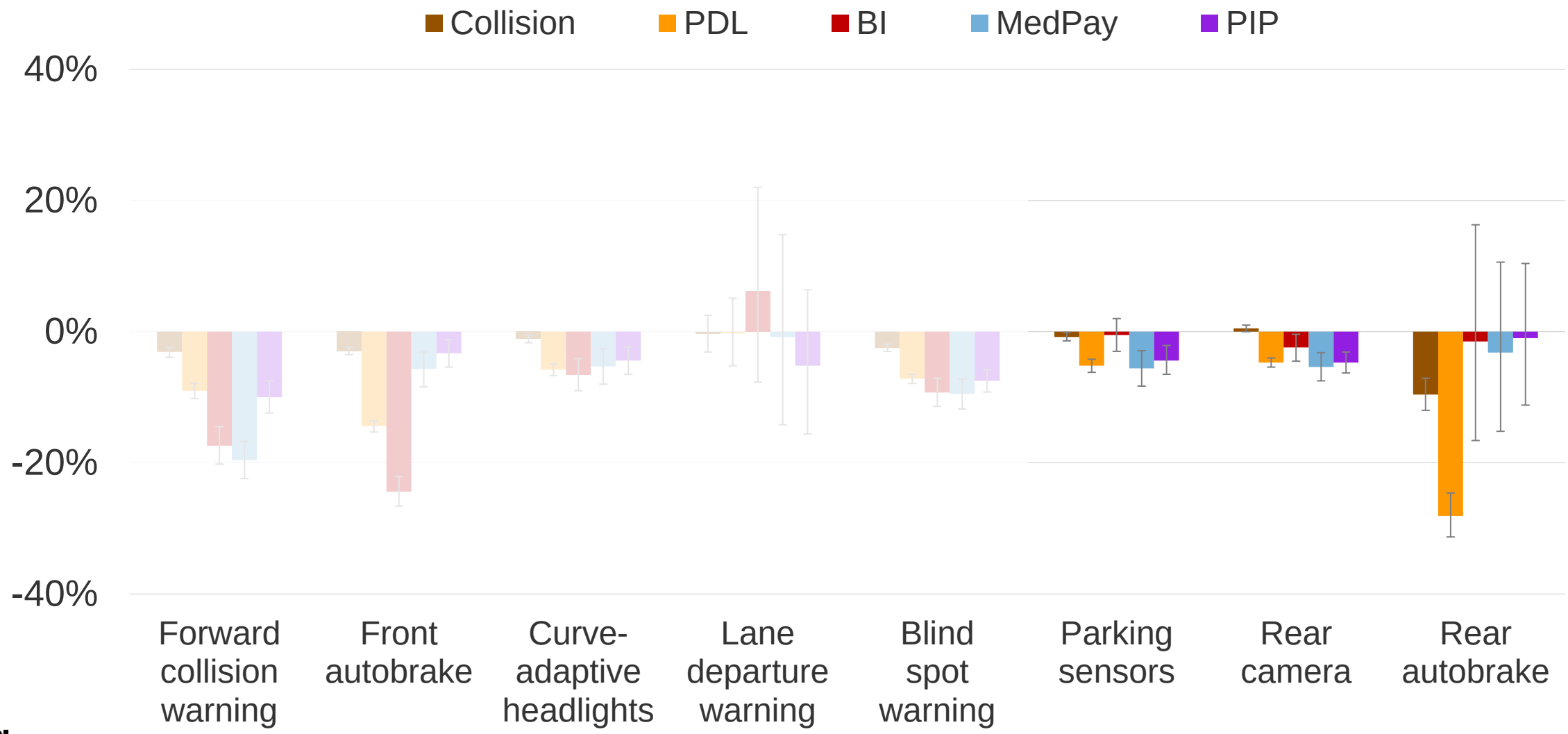
Summary of technology effects on insurance claim frequency

Results pooled across automakers



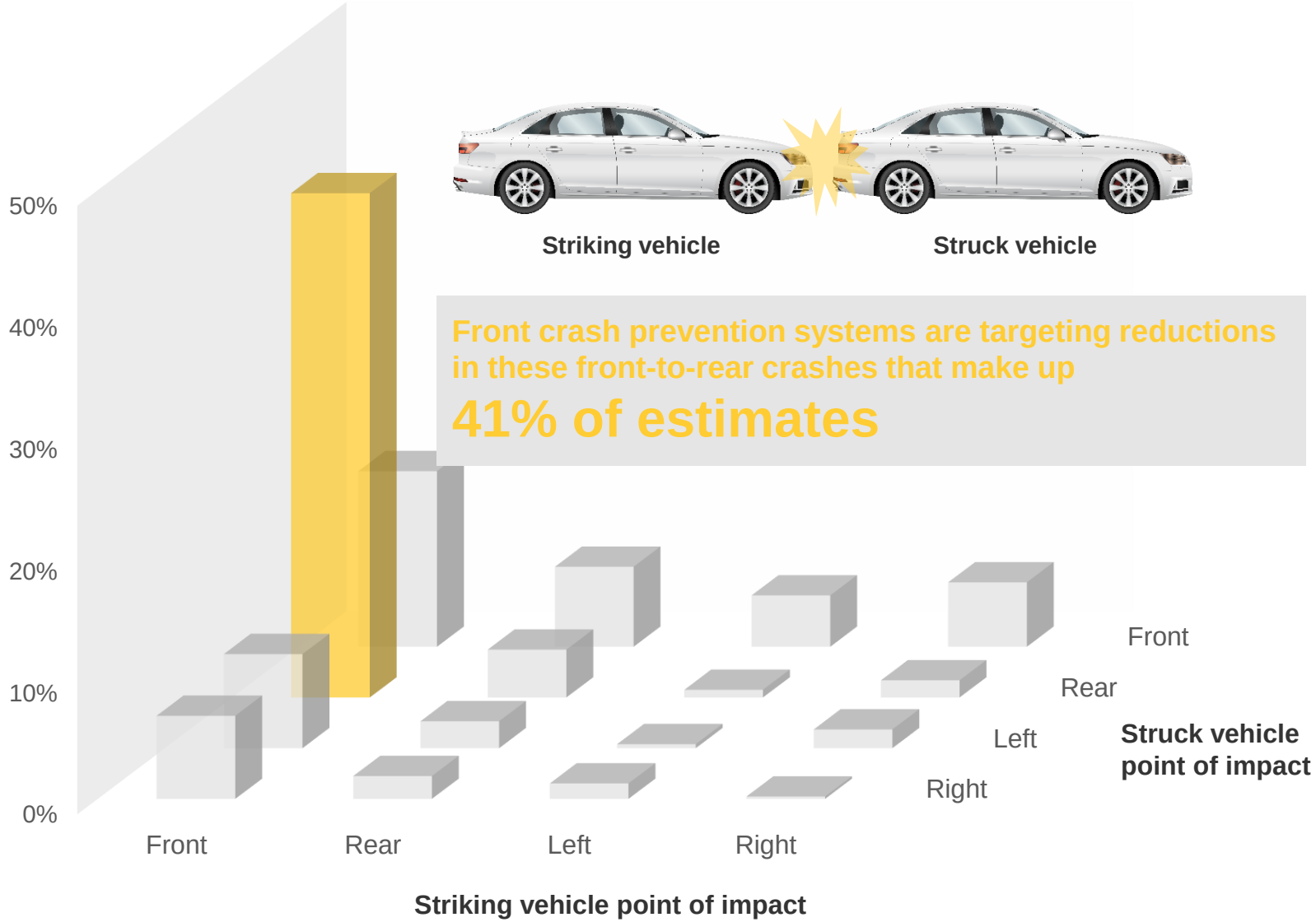
Collision and PDL estimates by point of impact

1981-2024 models

Striking vehicle | Struck vehicle

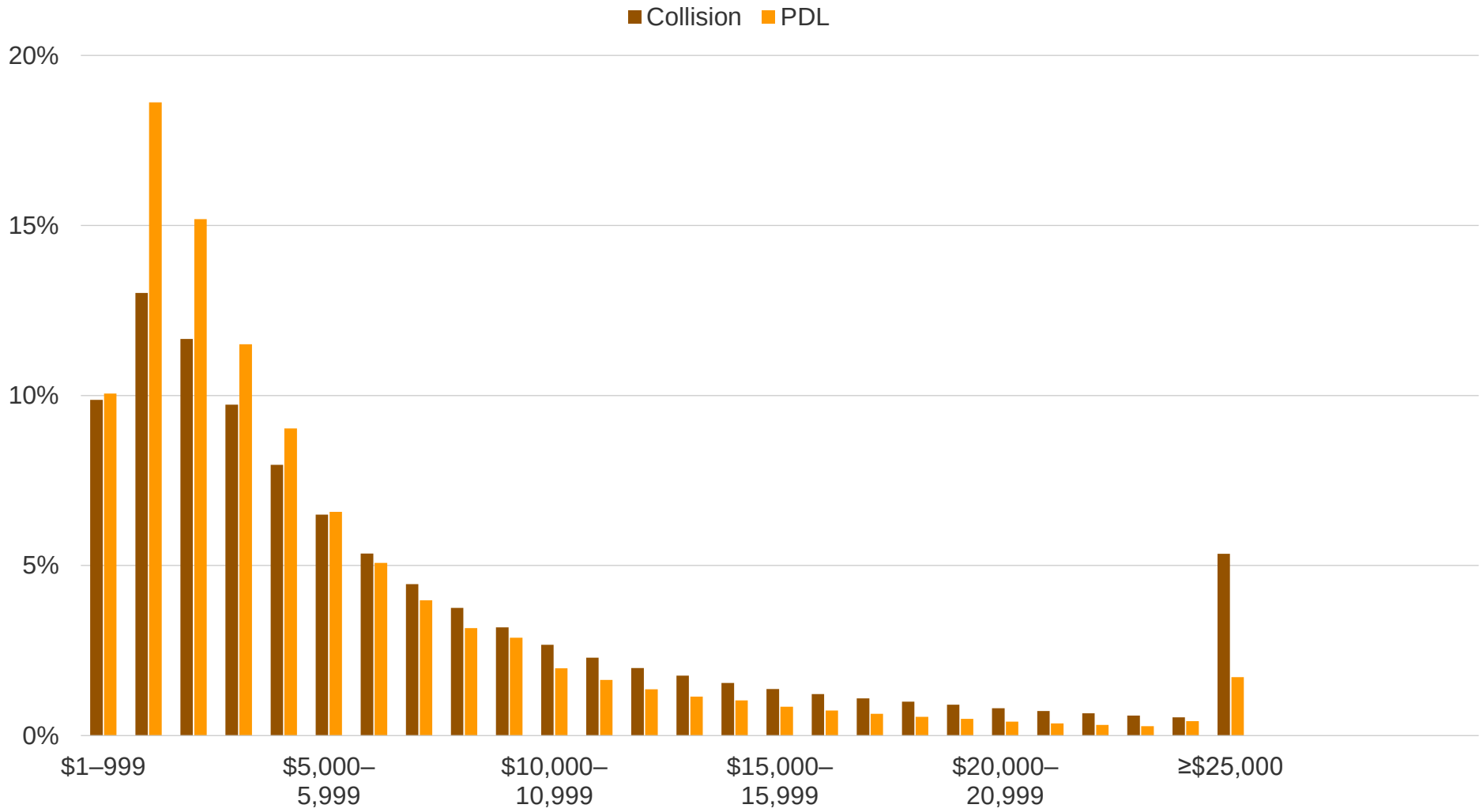
Front crash prevention systems are targeting reductions in these front-to-rear crashes that make up

41% of estimates



Distribution of collision and PDL claims, 2023 calendar year

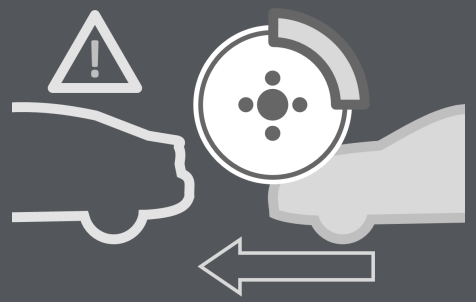
By claim size, 1981-2024 models



Crash reductions with front, lane departure and blind spot technologies

50%

With AEB

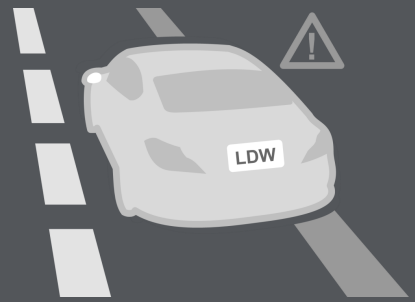


27%

With AEB
+ pedestrian detection

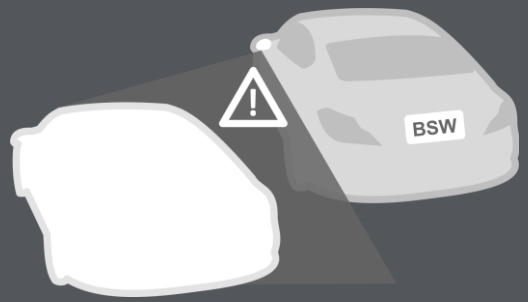
11%

With lane
departure warning



14%

With blind
spot warning



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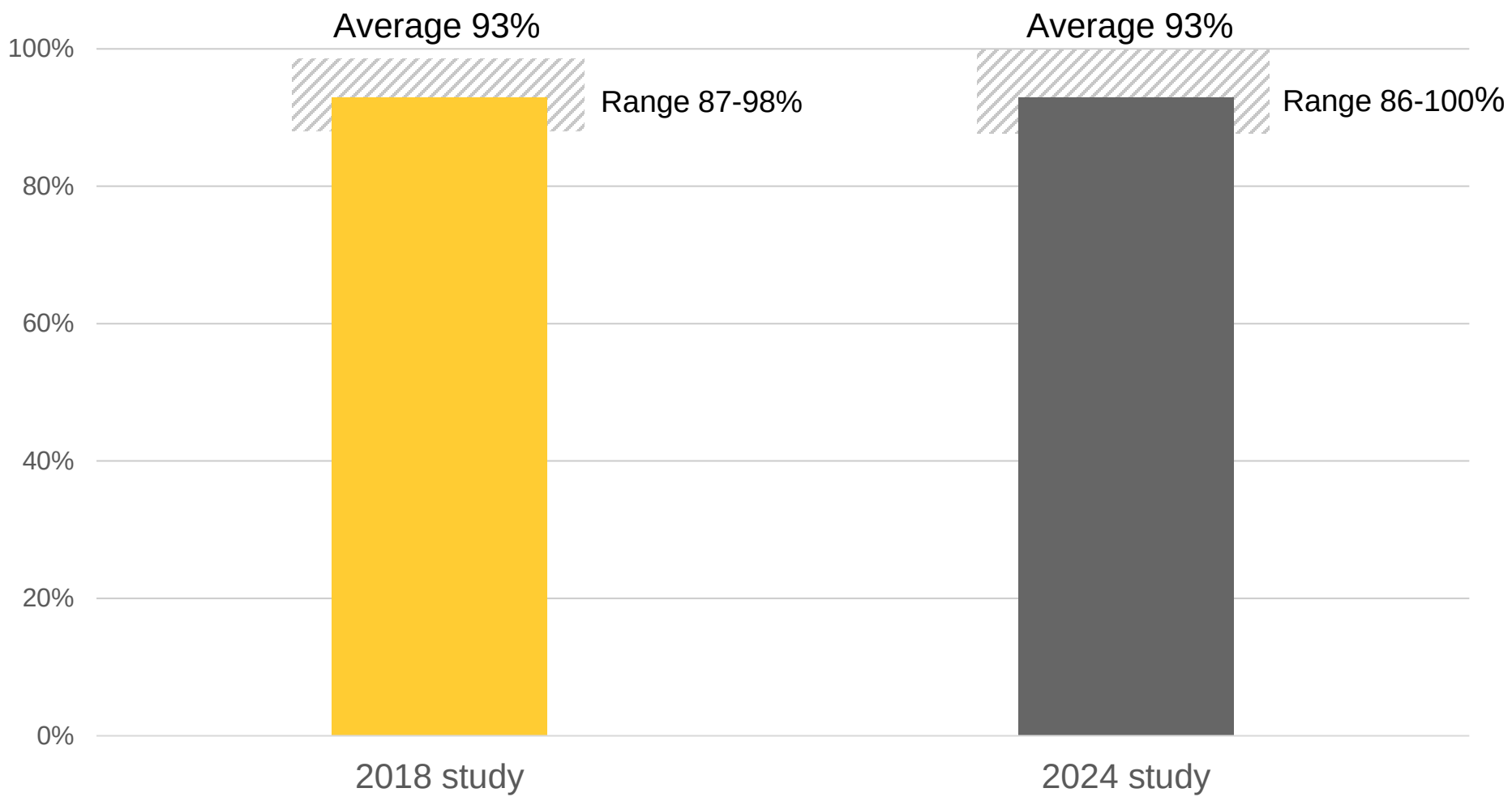
Usage rates of ADAS systems by drivers

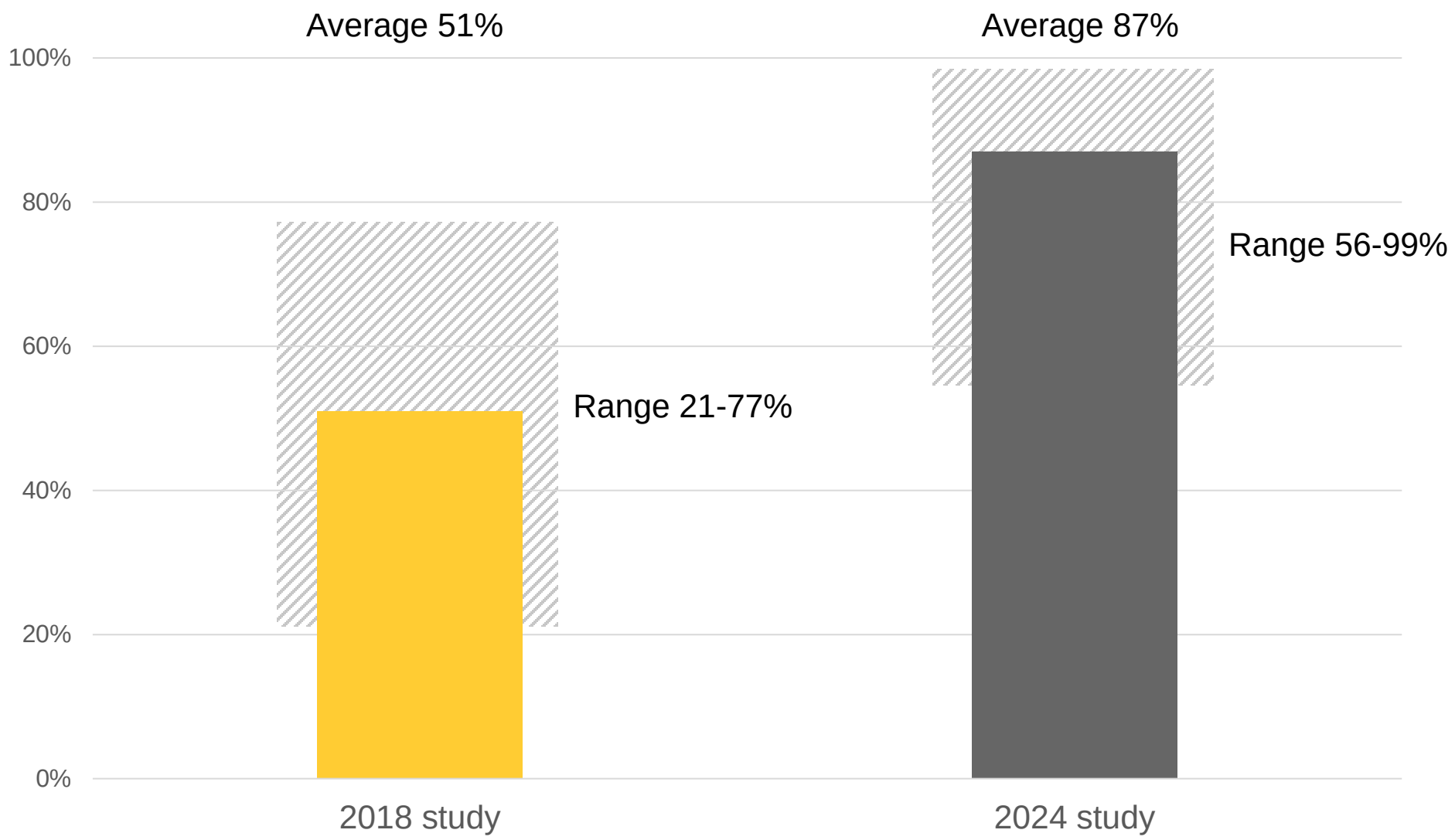
Dealership observations of front crash prevention system status

Percent with system on — mean values and range

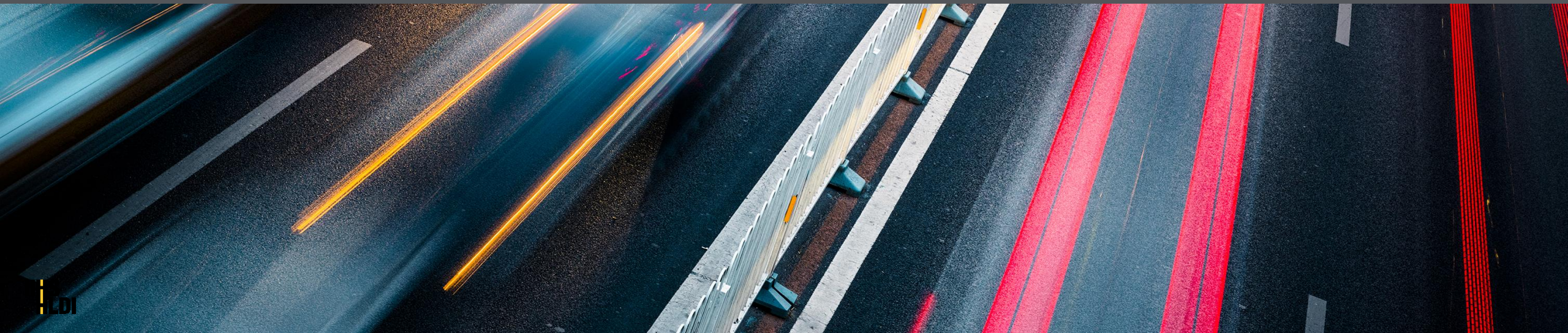


Dealership observations of lane departure mitigation system status

Percent with system on — mean values and range

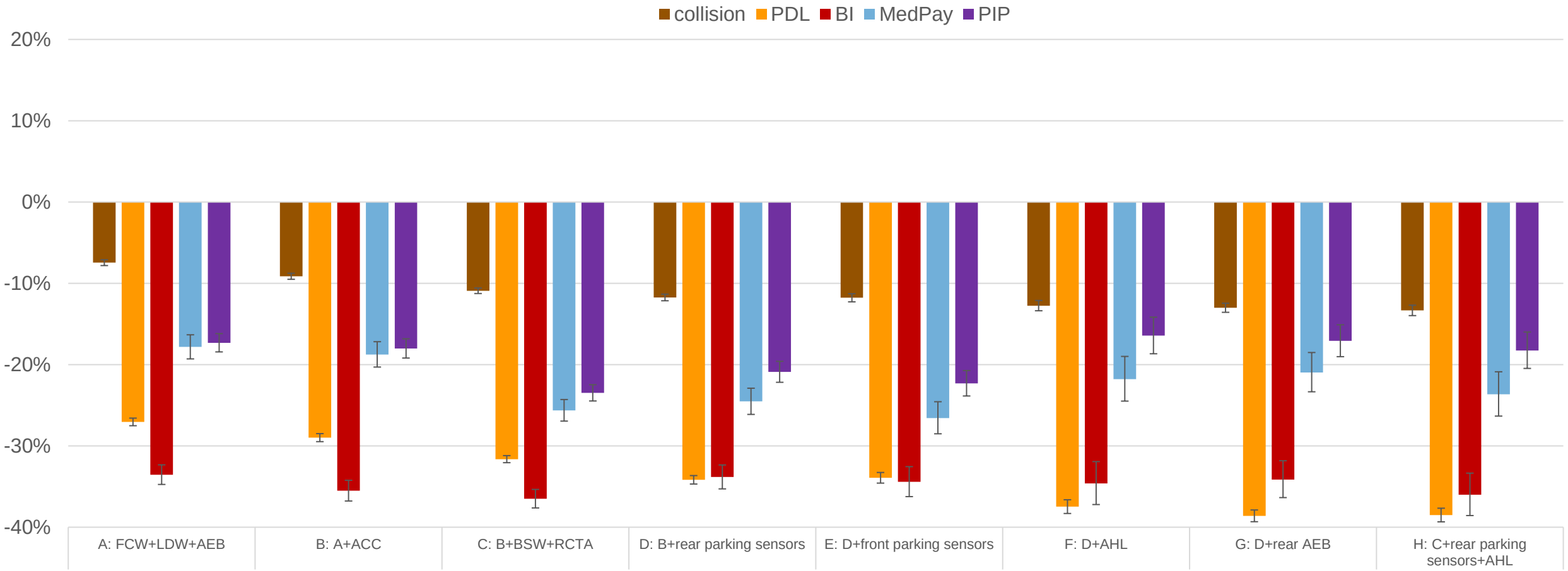


Analysis of ADAS bundles



Estimated changes in claim frequencies associated with ADAS bundles

Model years 2017 to 2022



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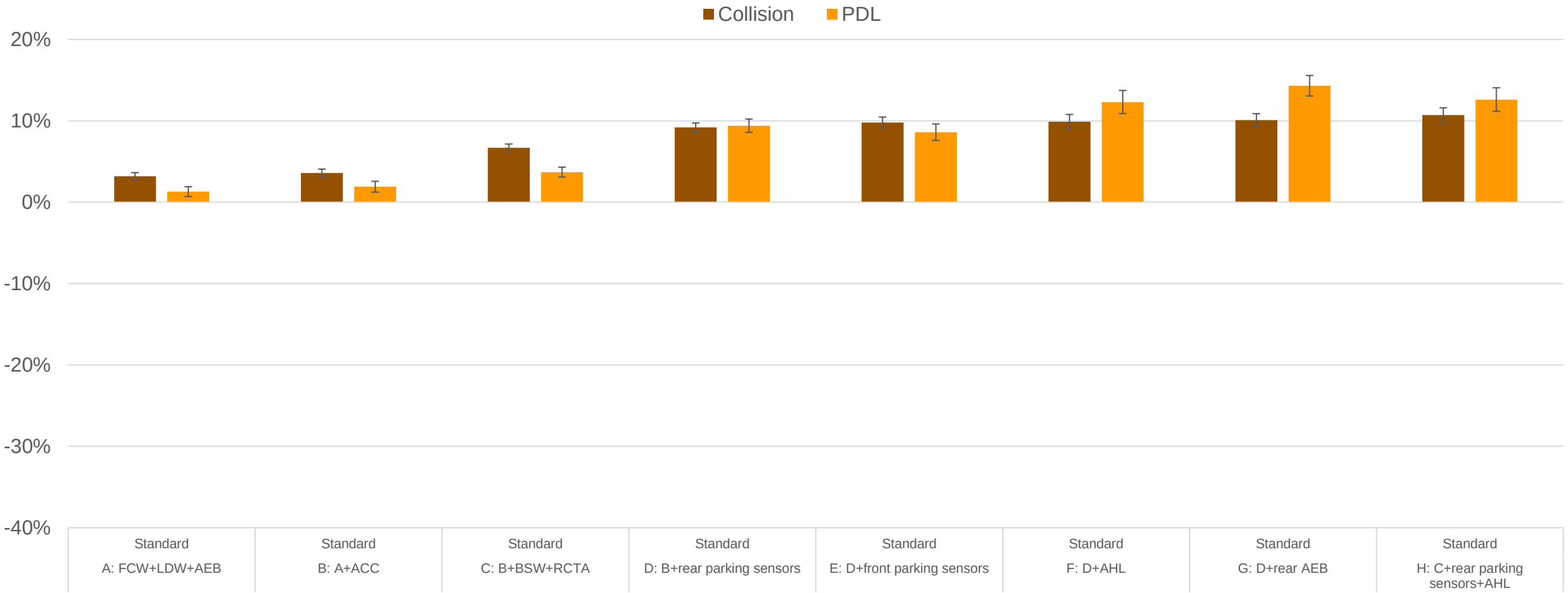
Estimated changes in claim severities associated with ADAS bundles

Model years 2017 to 2022



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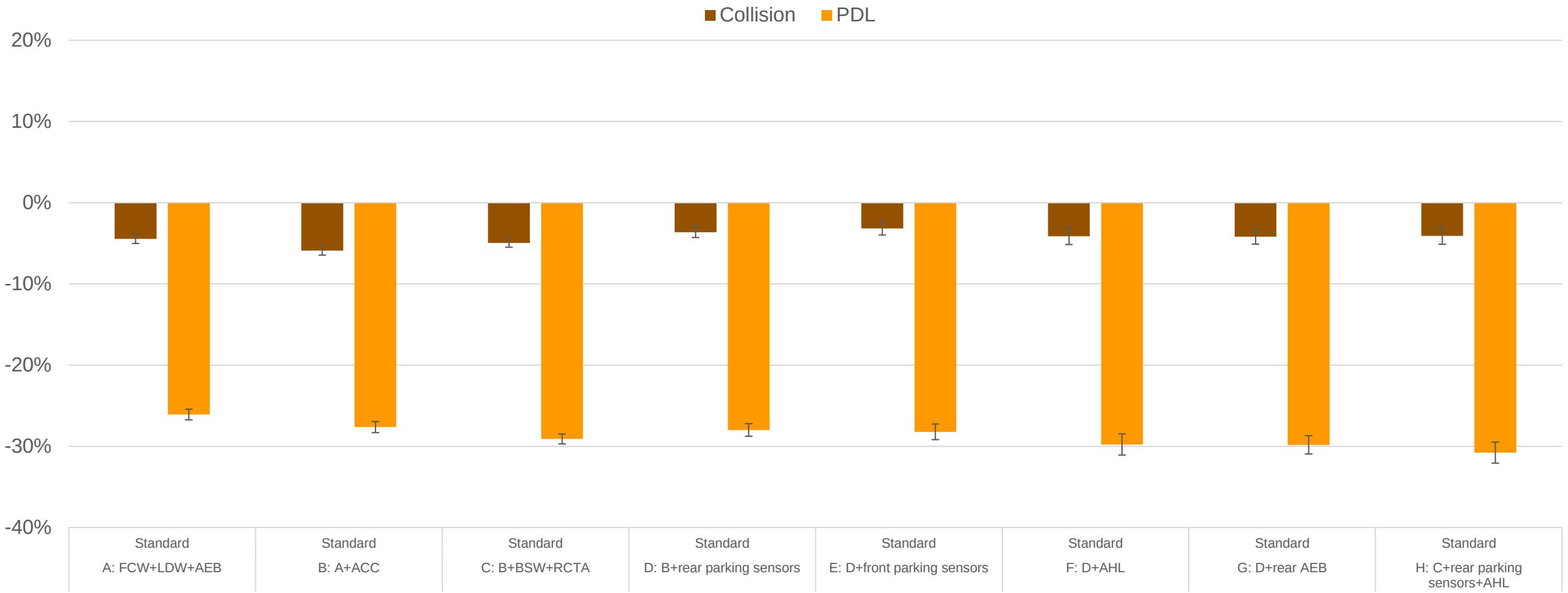
Estimated changes in overall losses associated with ADAS bundles

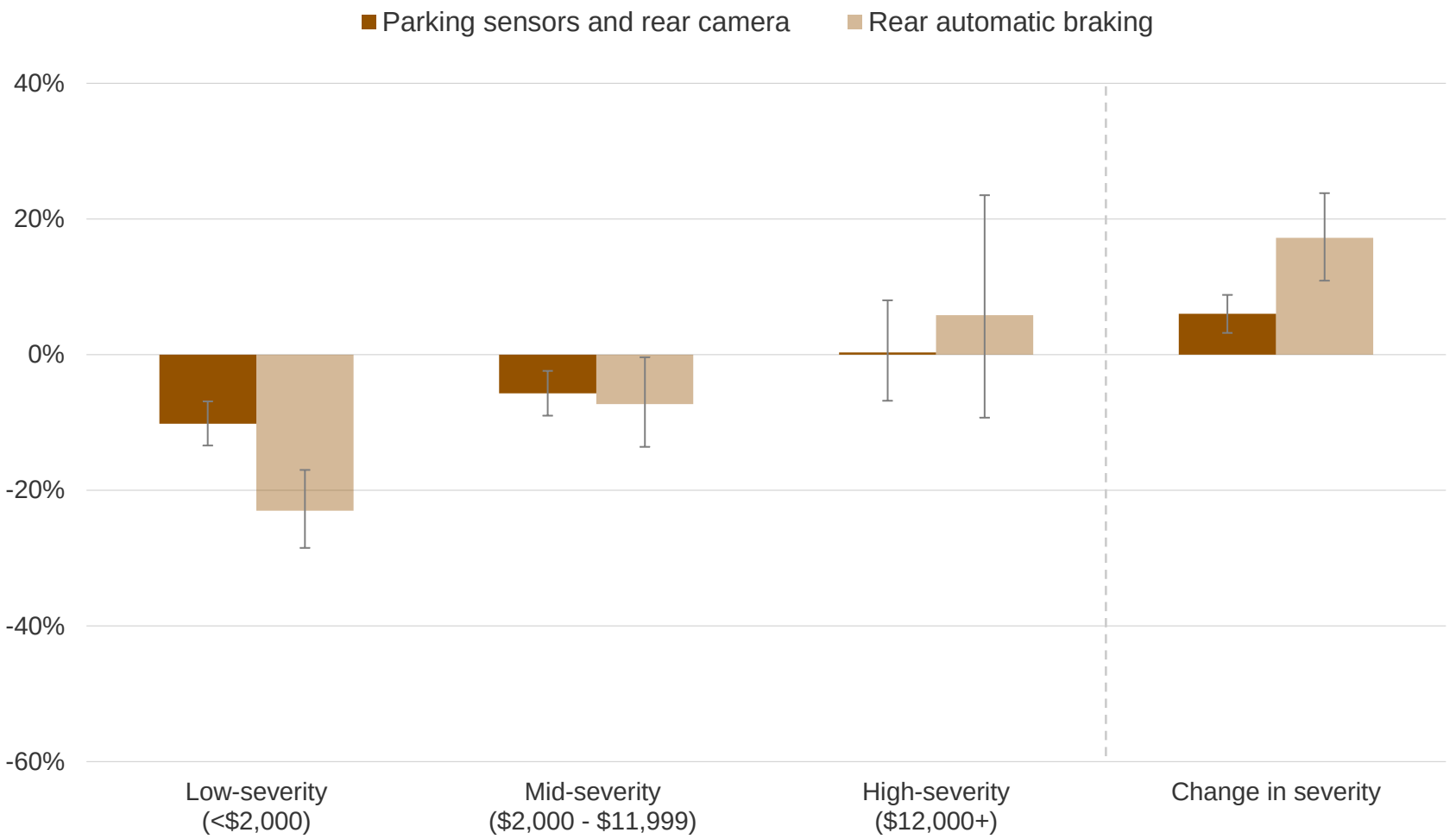
Model years 2017 to 2022



ADAS and claim severity for collision and PDL

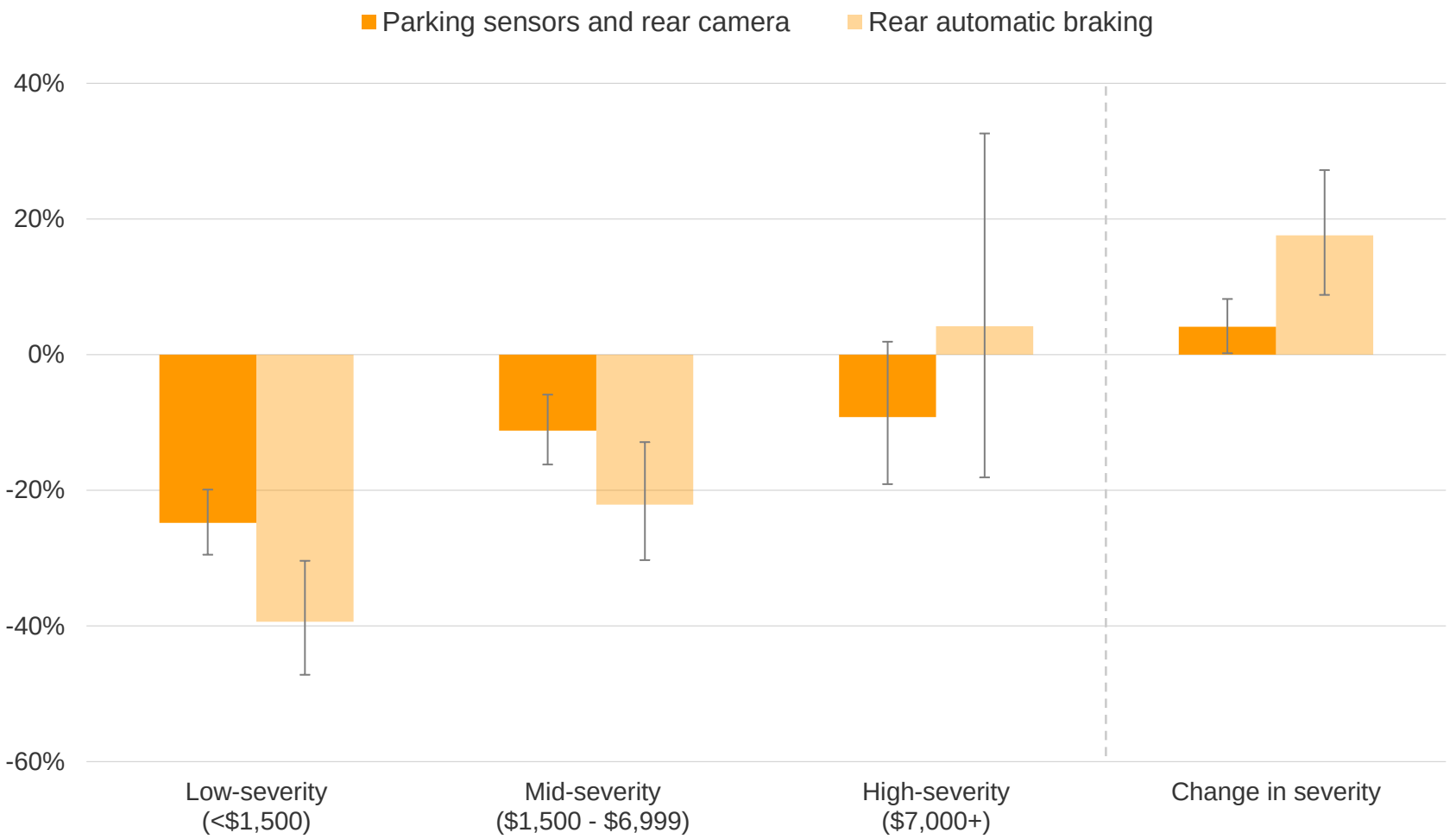
Changes in collision claim frequency by claim size

General Motors parking assist systems



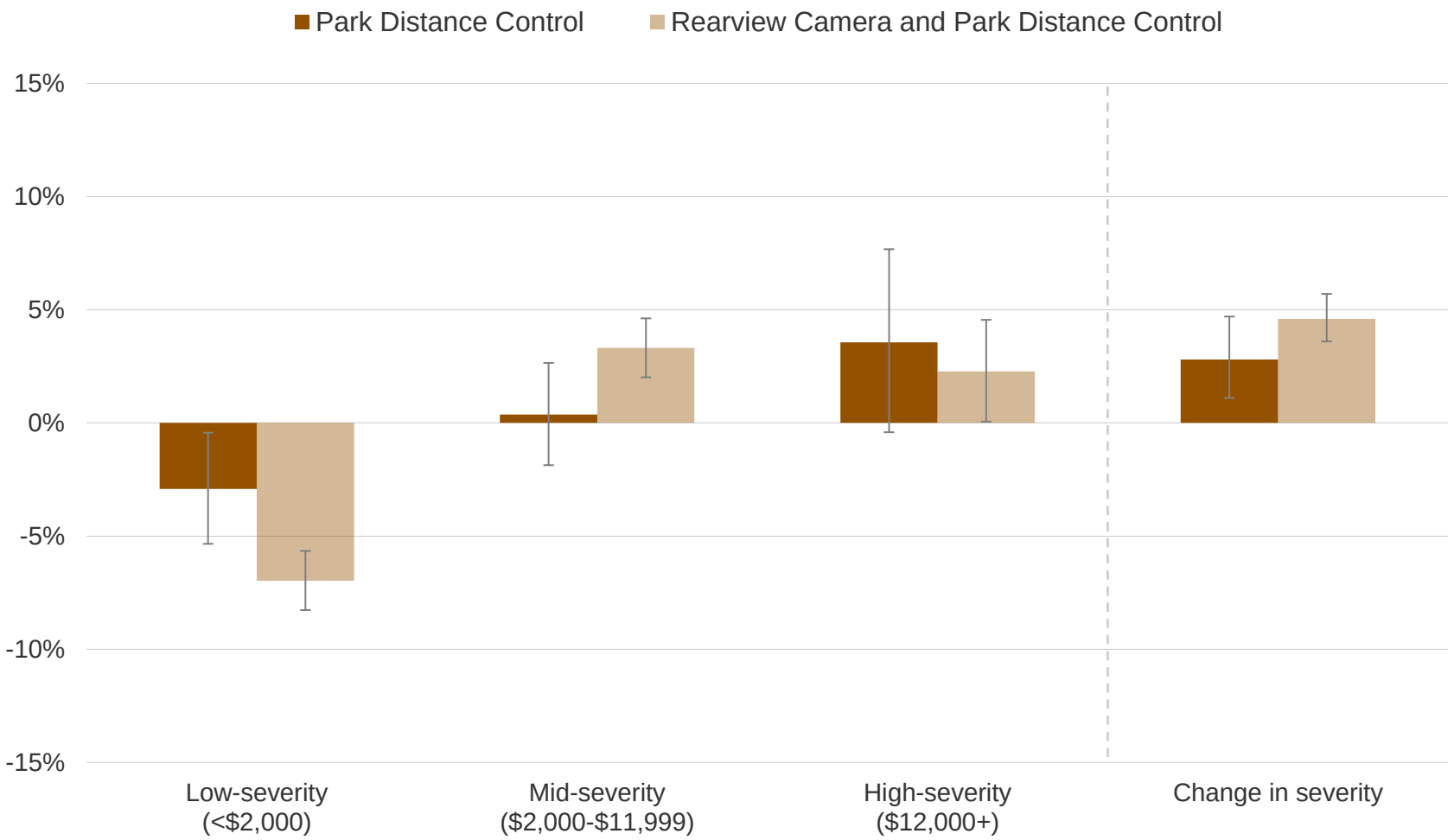
Changes in PDL claim frequency by claim size

General Motors parking assist systems



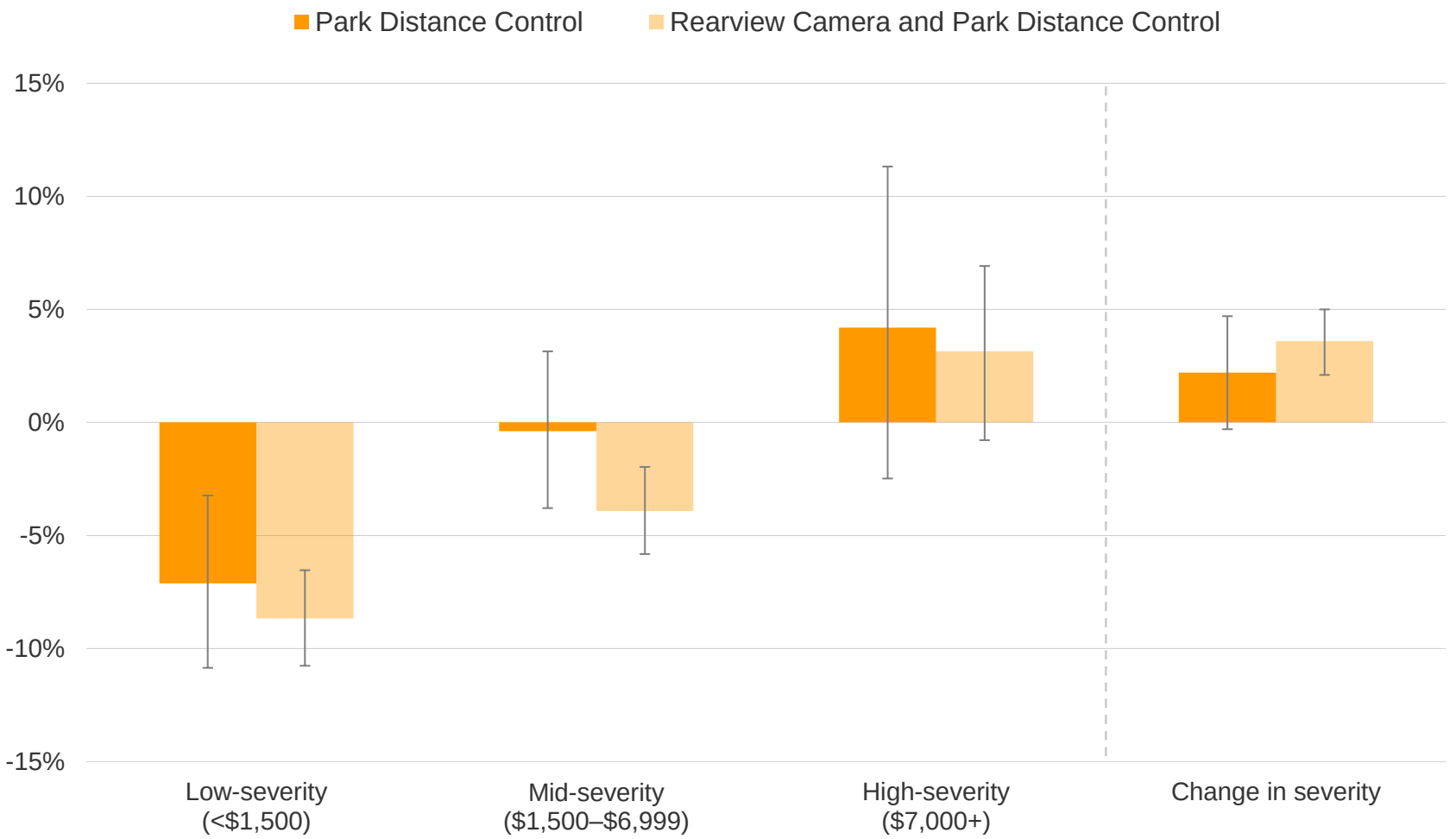
Changes in collision claim frequency by claim size

BMW parking assist systems



Changes in PDL claim frequency by claim size

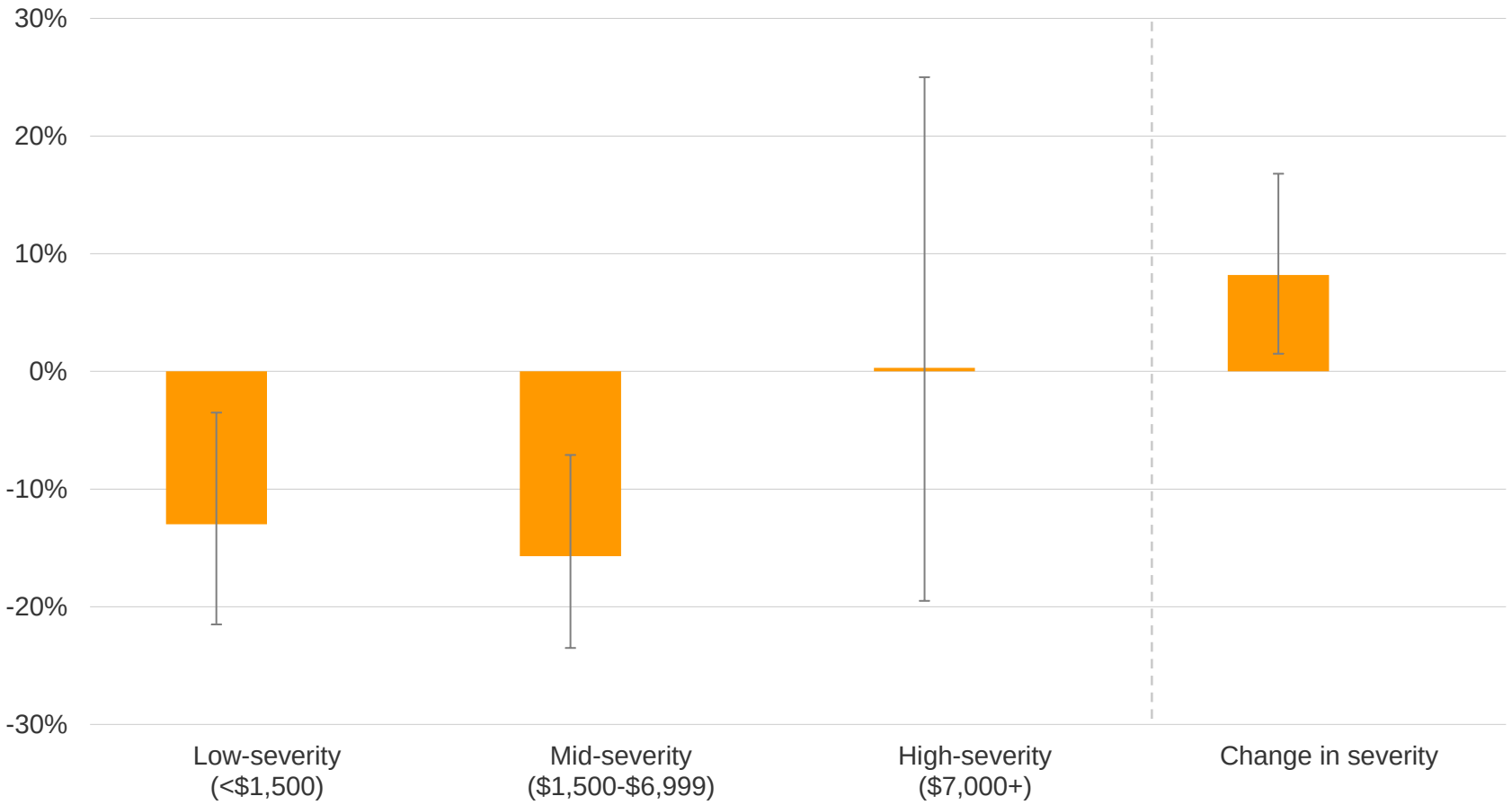
BMW parking assist systems



Operational speed ranges of front crash prevention systems impact on PDL severity

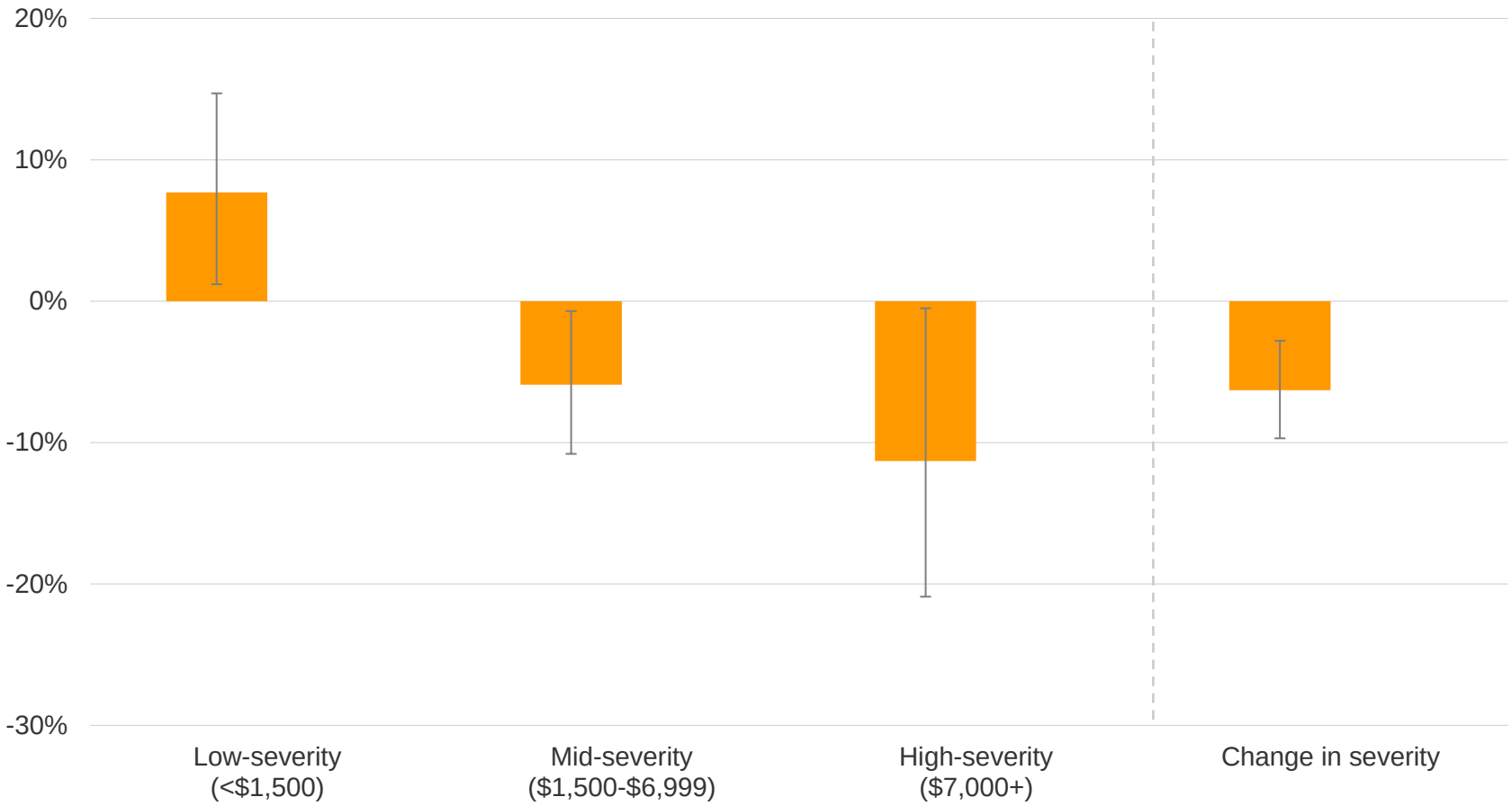
Changes in PDL claim frequency by claim size

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



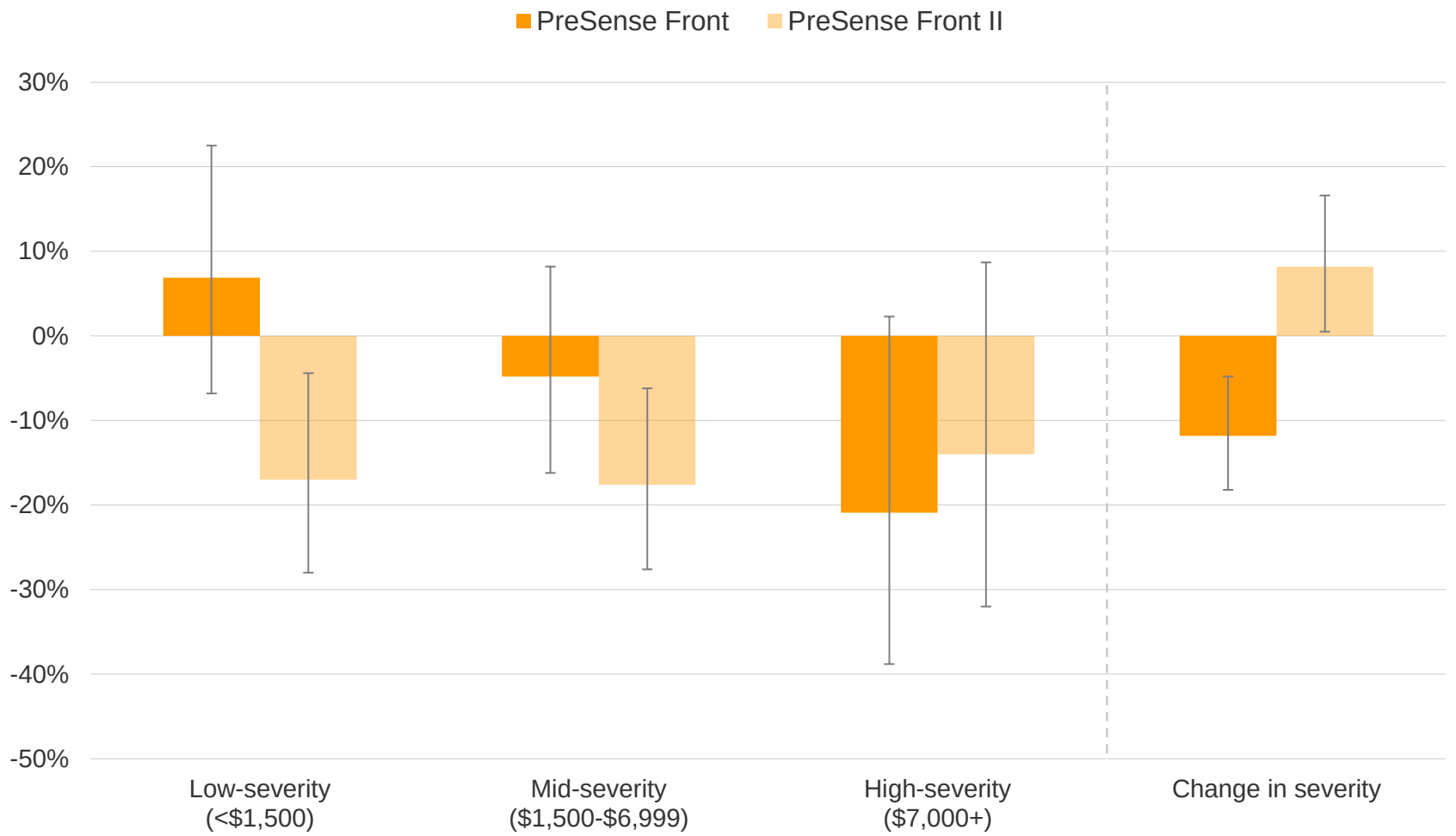
Change in PDL claim frequency by claim size

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)



AEB Testing

Original vehicle-to-vehicle front crash prevention tests

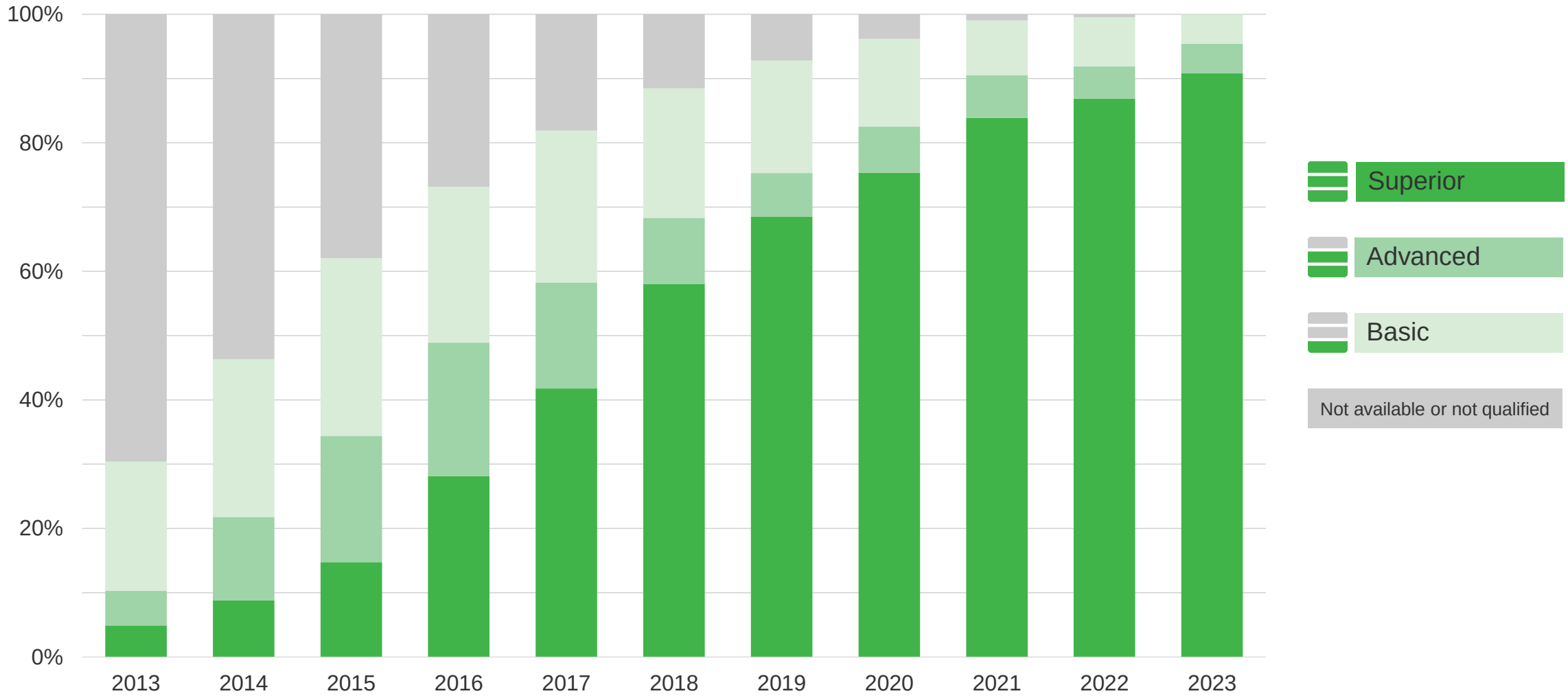
12 mph and **25 mph**

Superior Advanced Basic

Front AEB testing

Front crash prevention ratings

2013-23 models



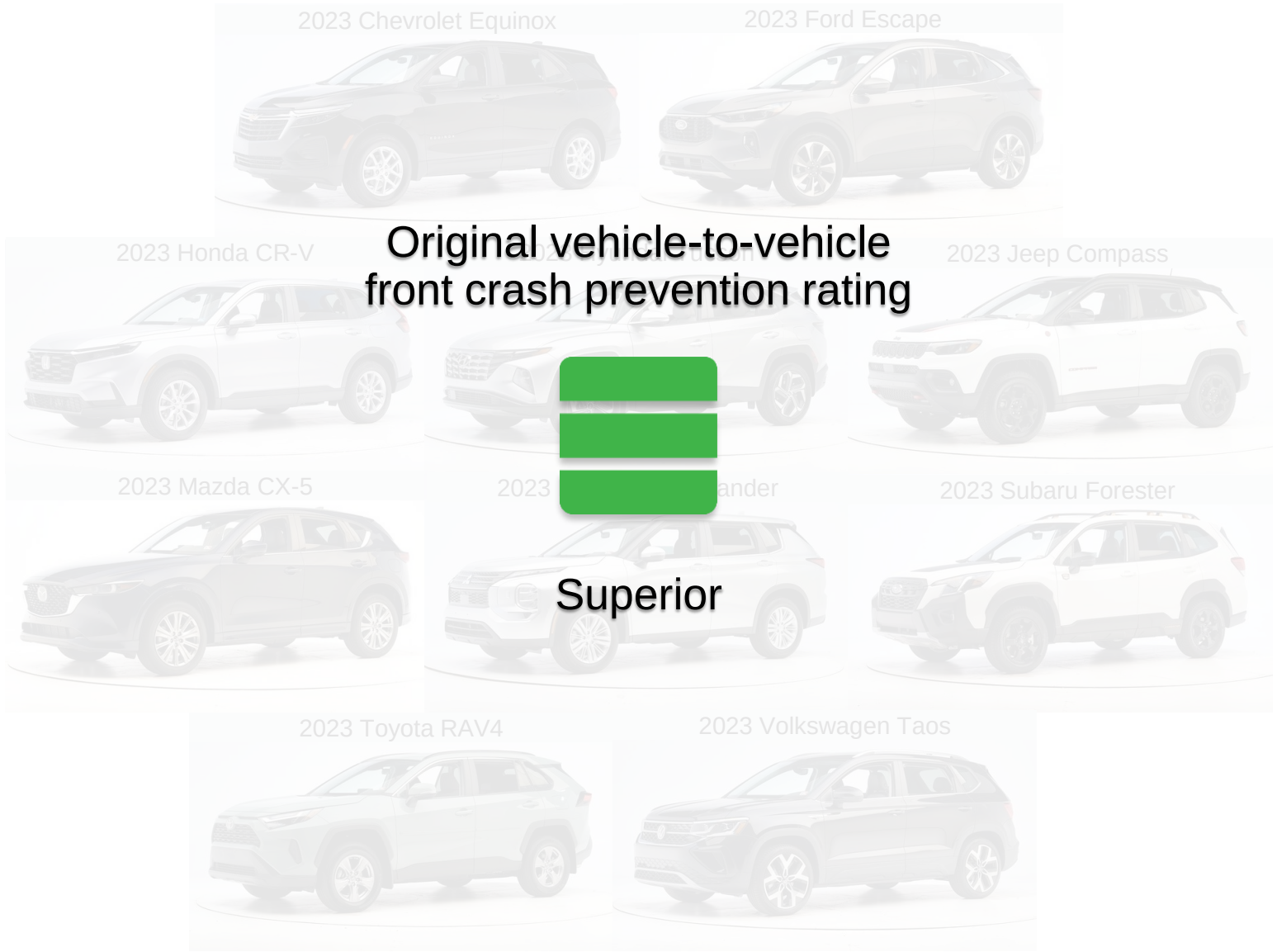
Police-reported rear-end crashes

59% occur on **30-45** mph roads

Medium or heavy trucks struck in 32% of fatal rear-end crashes

Motorcycles struck in 11% of fatal rear-end crashes

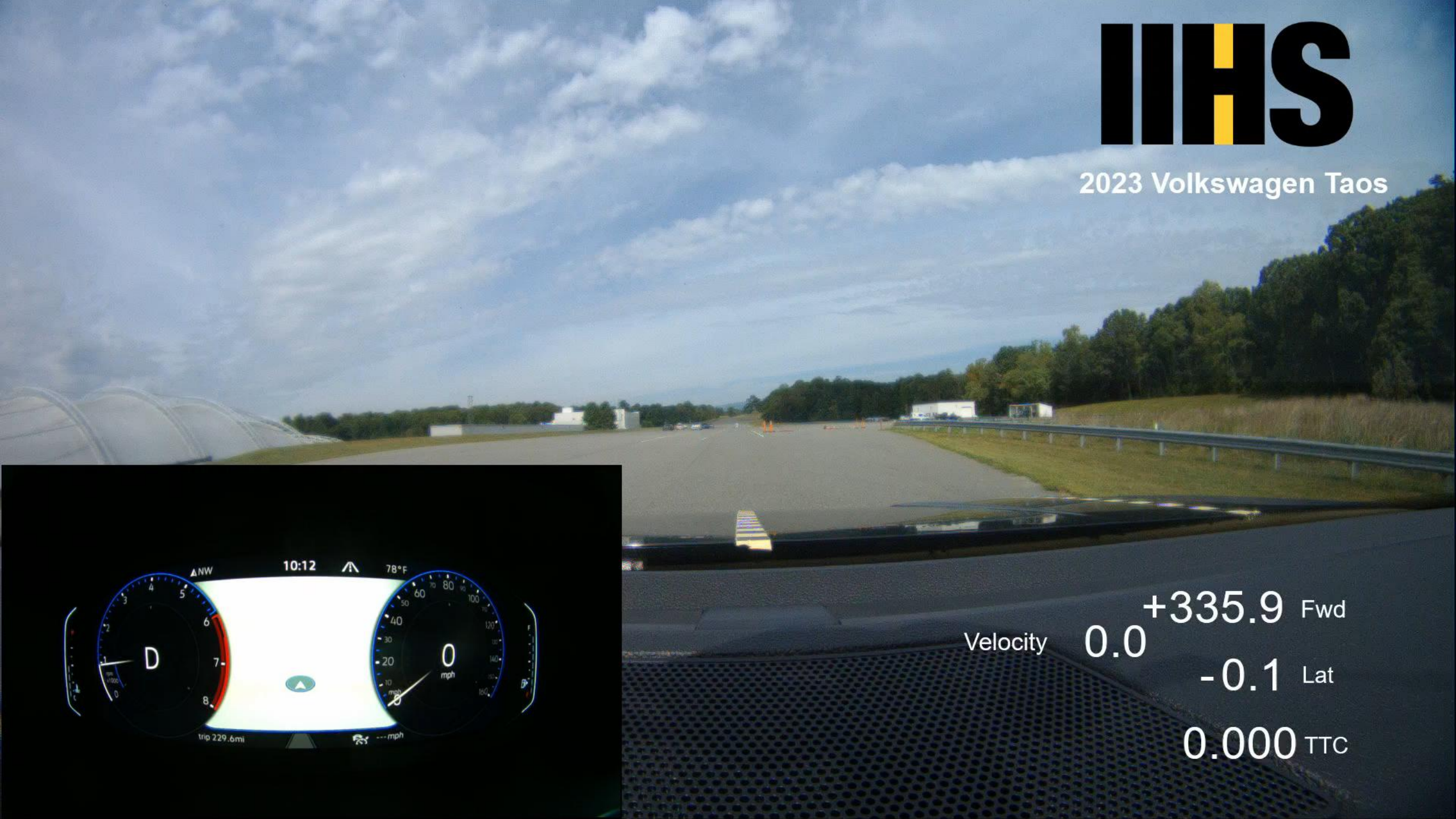
Small SUVs



Original vehicle-to-vehicle front crash prevention rating

Superior


IIHS
2023 Subaru Forester
Velocity
0.0
+363.9
Fwd
-0.7
Lat
0.000
TTC


IIHS
2023 Volkswagen Taos
NW
10:12
78°F
D
0
mph
trip 229.6mi
--- mph
Velocity
0.0
+335.9 Fwd
-0.1 Lat
0.000 TTC


IIHS
2023 Hyundai Tucson
Velocity 0.0
+284.3 Fwd
-0.2 Lat
0.000 TTC


IIHS
2023 Chevrolet Equinox
+289.8 Fwd
Velocity 0.0
+0.0 Lat
0.000 TTC
E F
C H
0
MPH

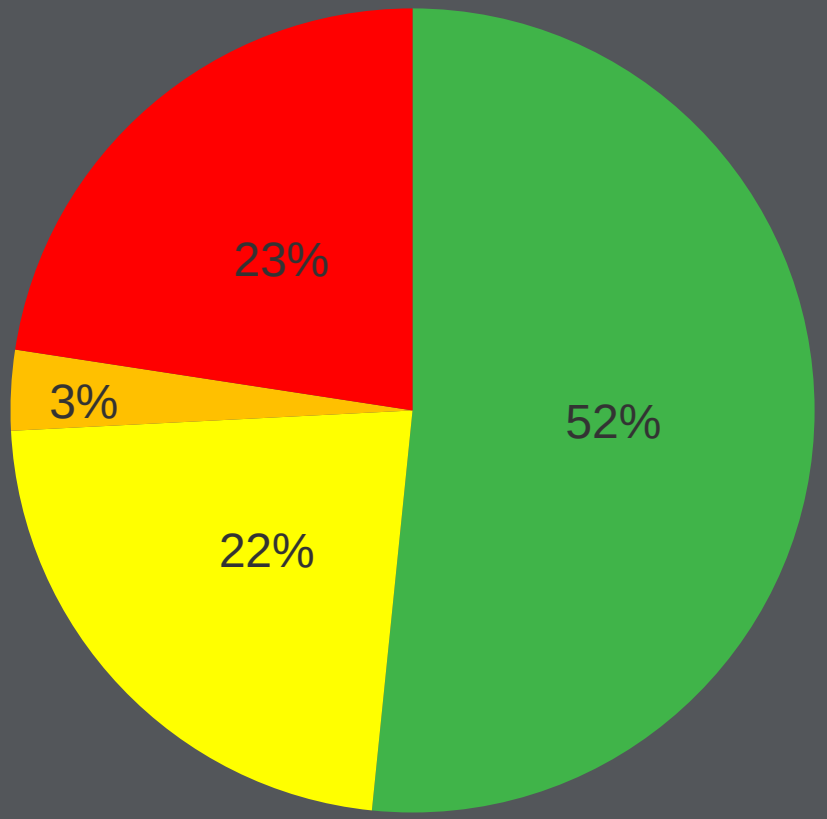
Ratings for small SUVs

G Good A Acceptable M Marginal P Poor


IIHS
2022 Subaru Forester
MPG
32
MPH
422.0
431 mi
Velocity 50.5
+147.2 Fwd
-0.0 Lat
10.513 TTC

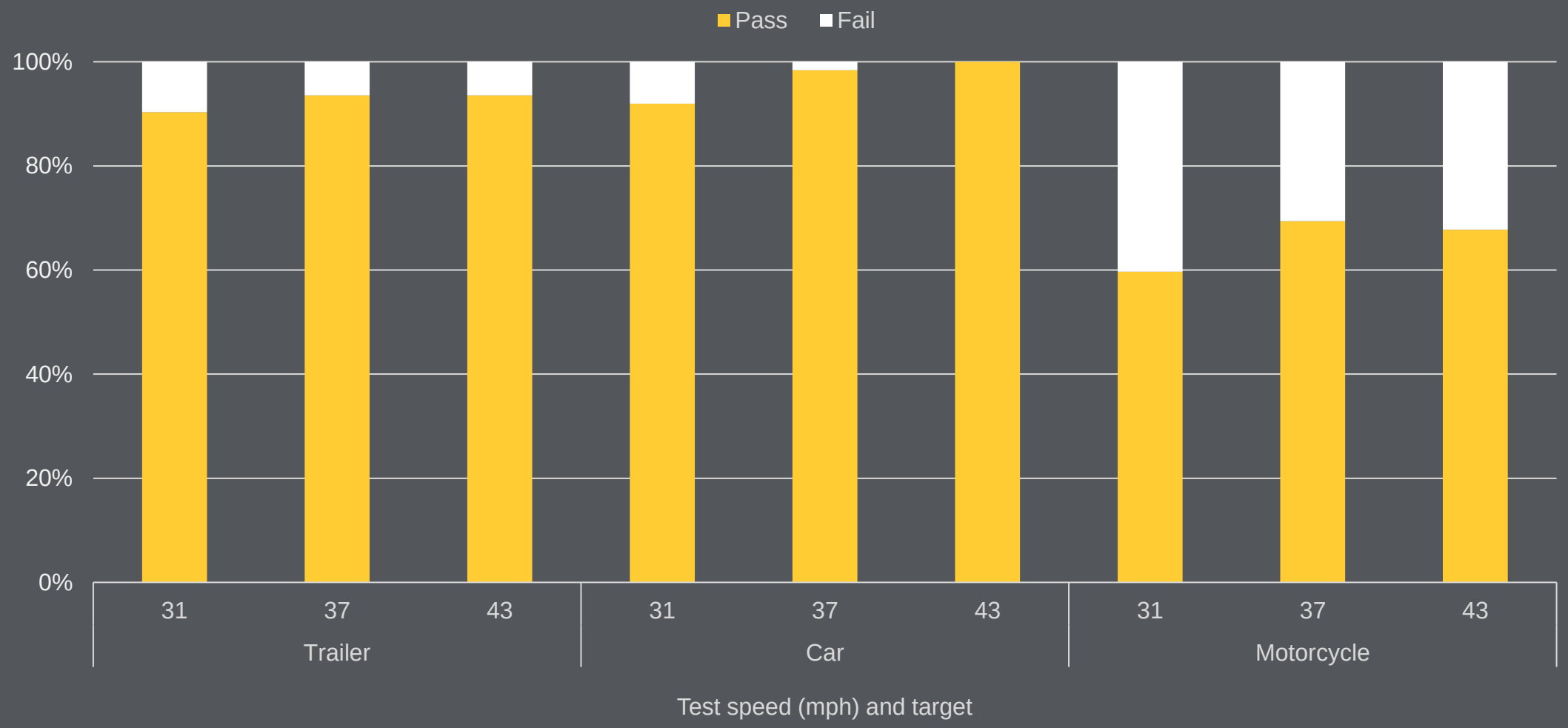
31 front crash prevention systems

February 2025



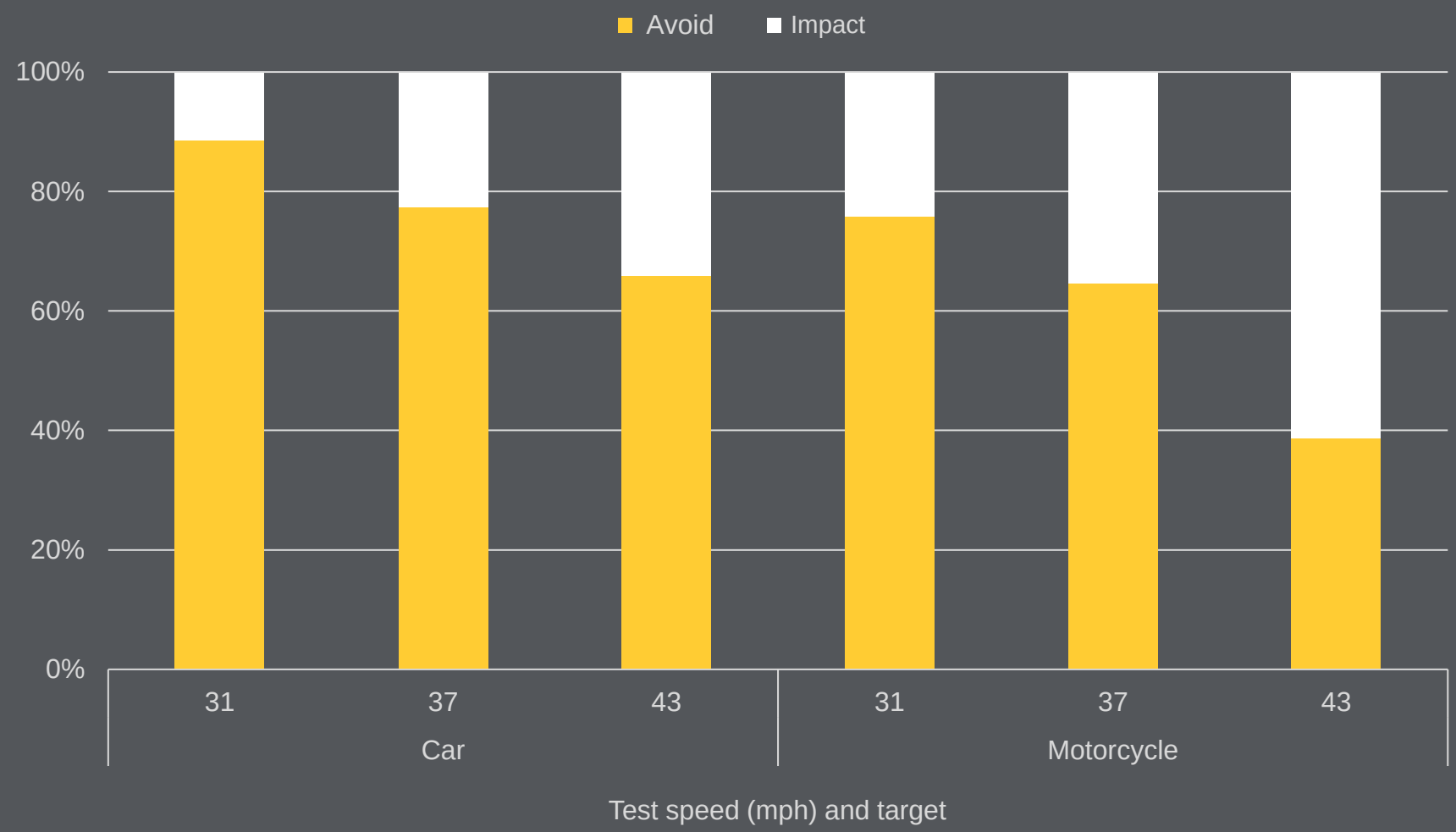
Forward collision warning criteria (2.1 seconds)

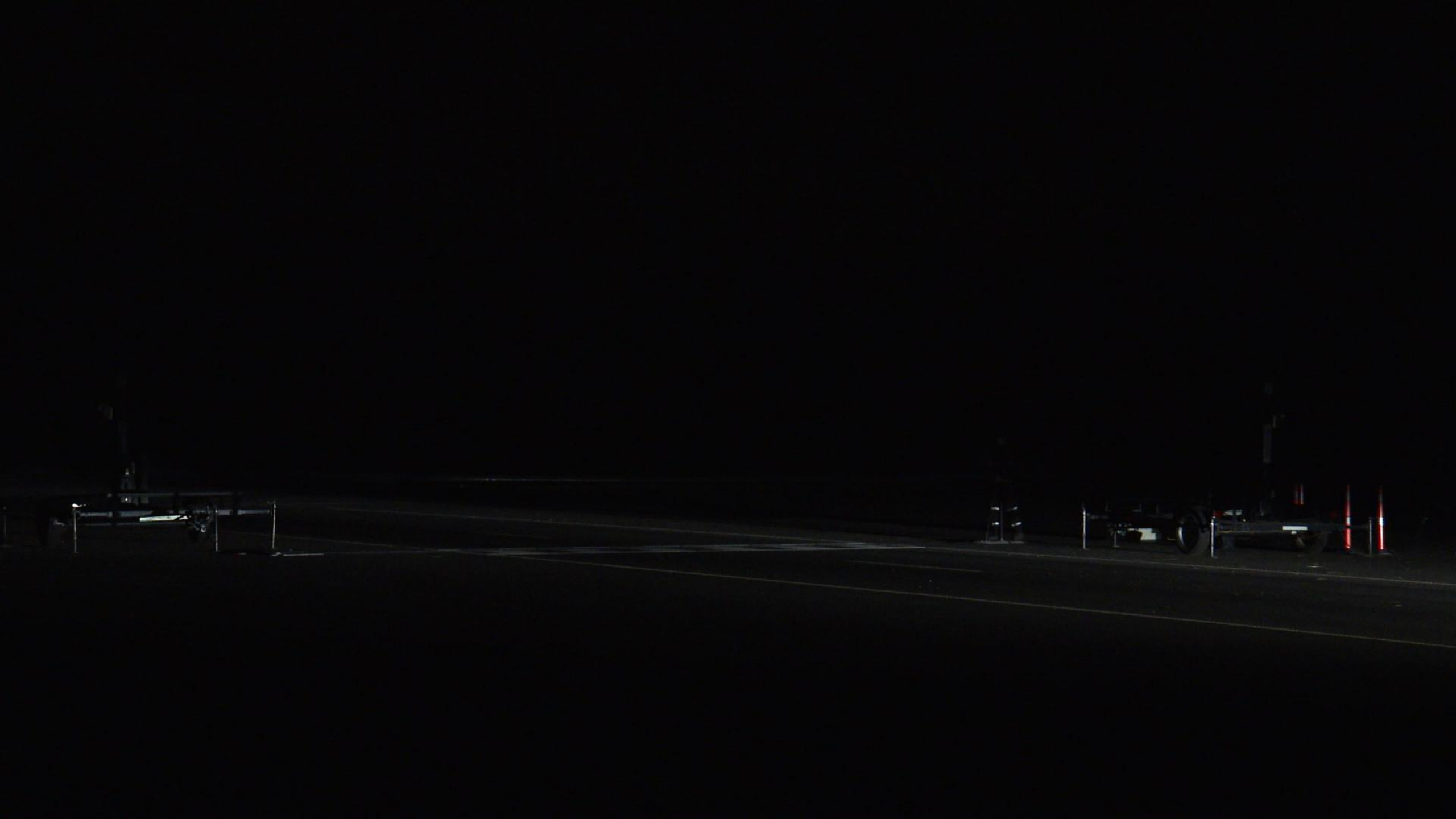
31 front crash prevention systems



Automatic emergency braking

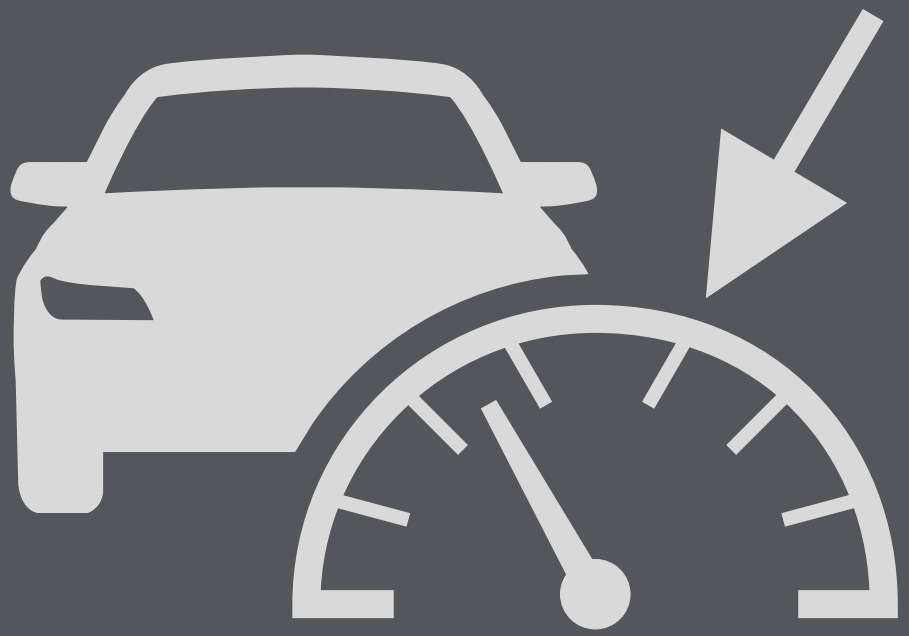
31 front crash prevention systems





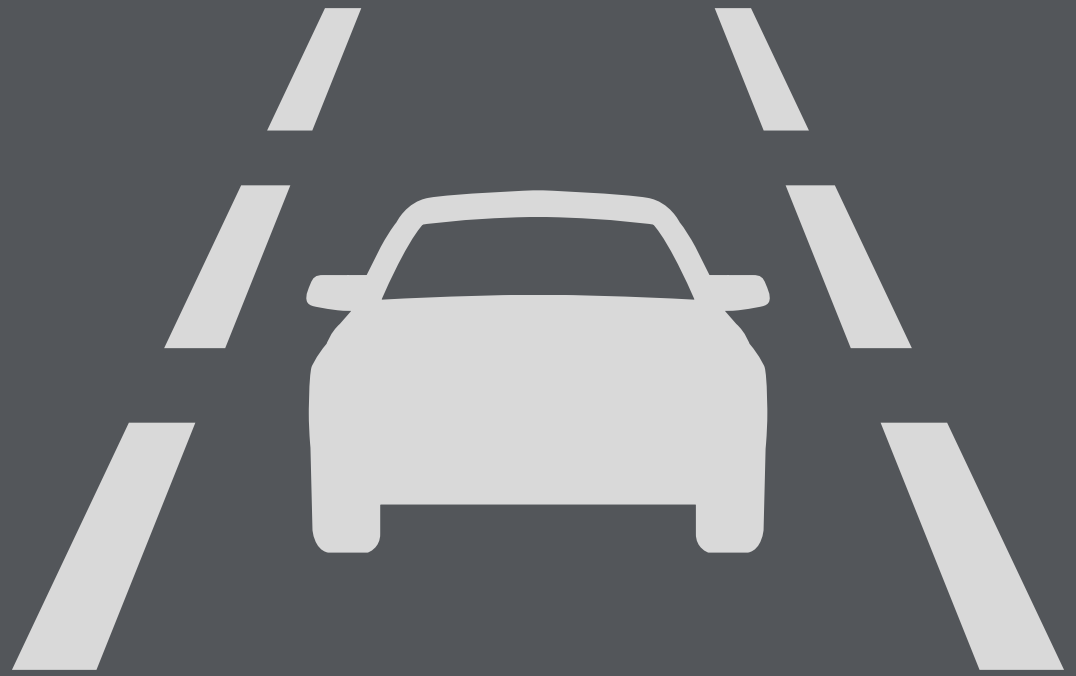
Partial driving automation

Adaptive Cruise Control



- Typically will not slow or stop for traffic lights or signs
- May not respond quickly enough if your vehicle is cut off
- May have trouble sensing certain types of vehicles
- Driver must pay attention and be ready to brake or accelerate

Lane following

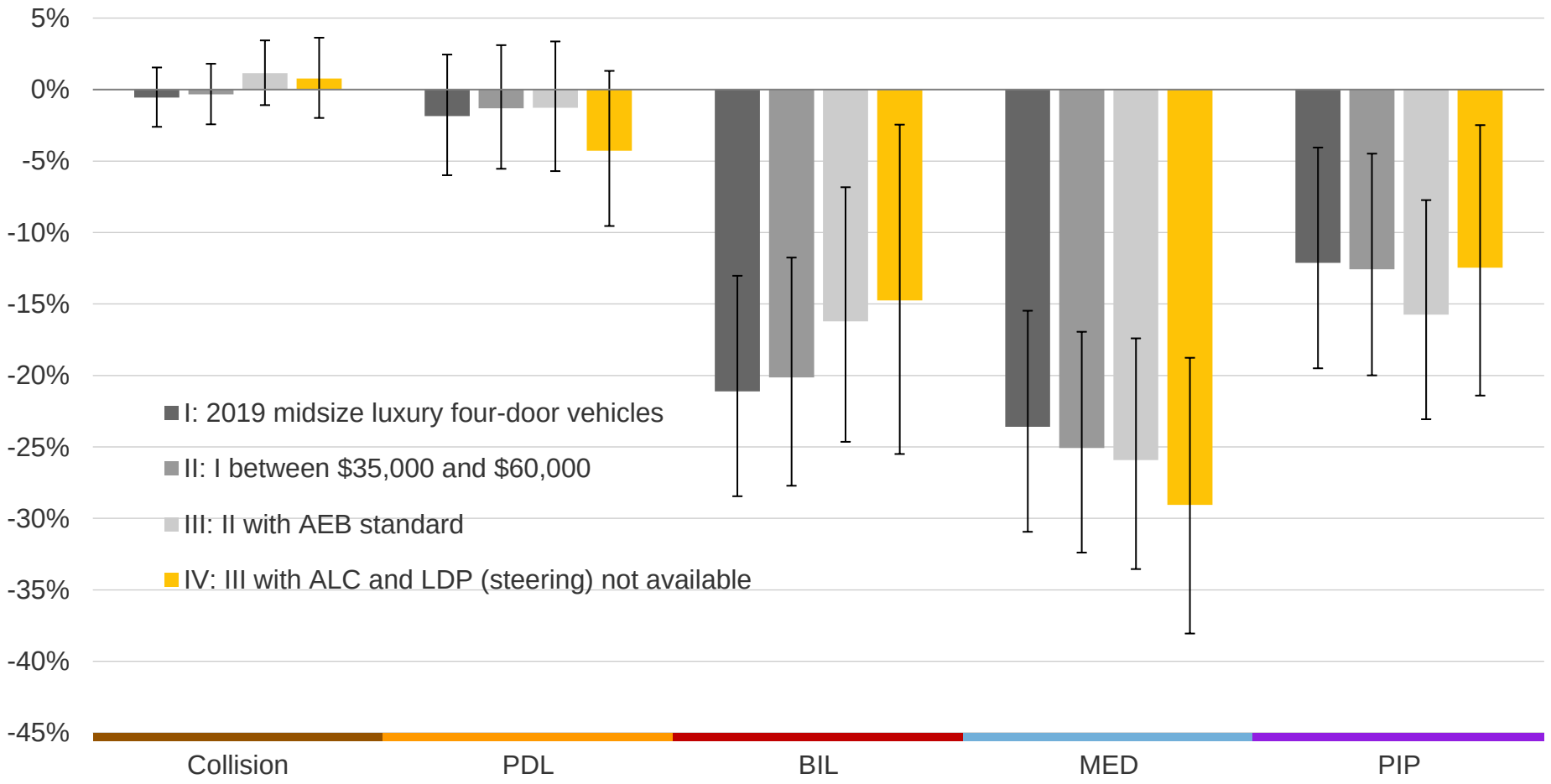


- Light conditions and road topography may limit system
- System does not work when lane markers are absent (e.g. across intersections)
- Some systems may not be able to steer through sharp curves
- Driver needs to be ready to take control without warning

Partial automation loss results

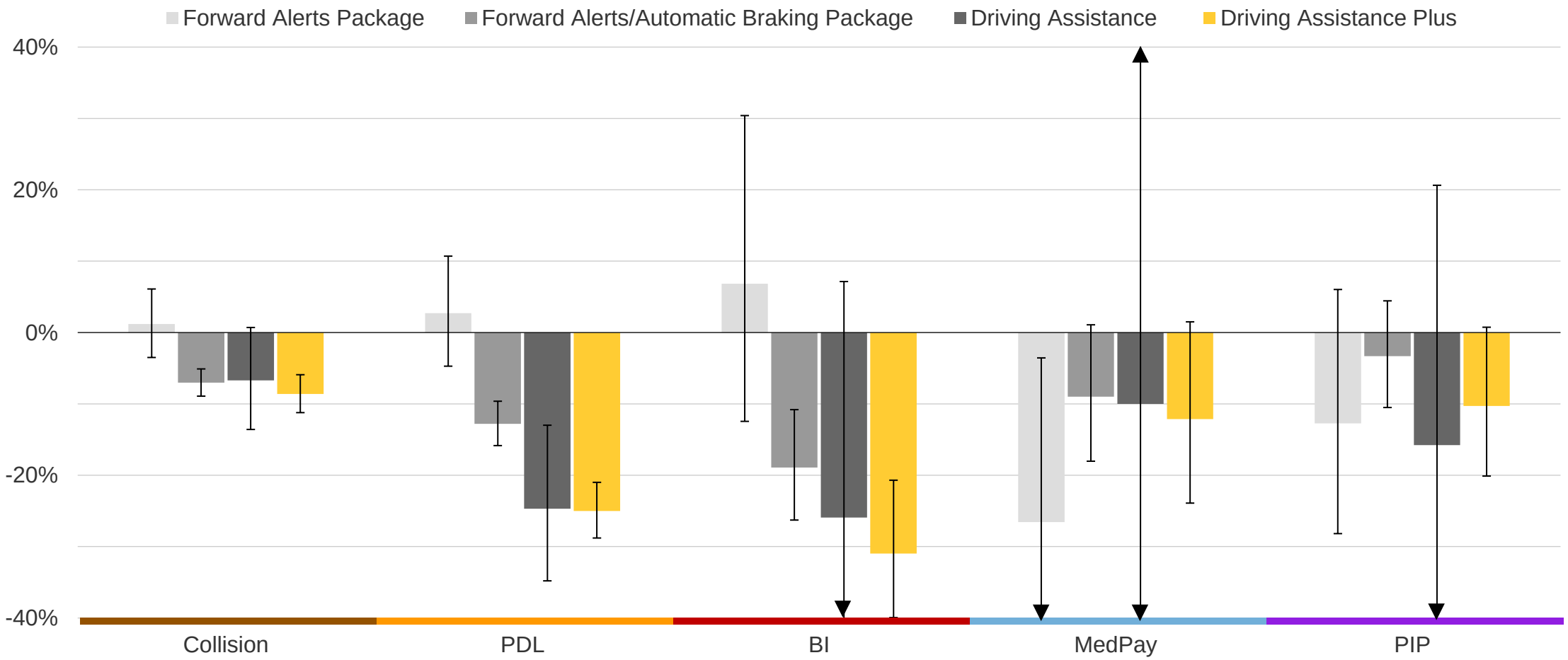
Estimated differences in claim frequency

2019 Tesla Model 3 vs. different control groups, data since 4/11/2019



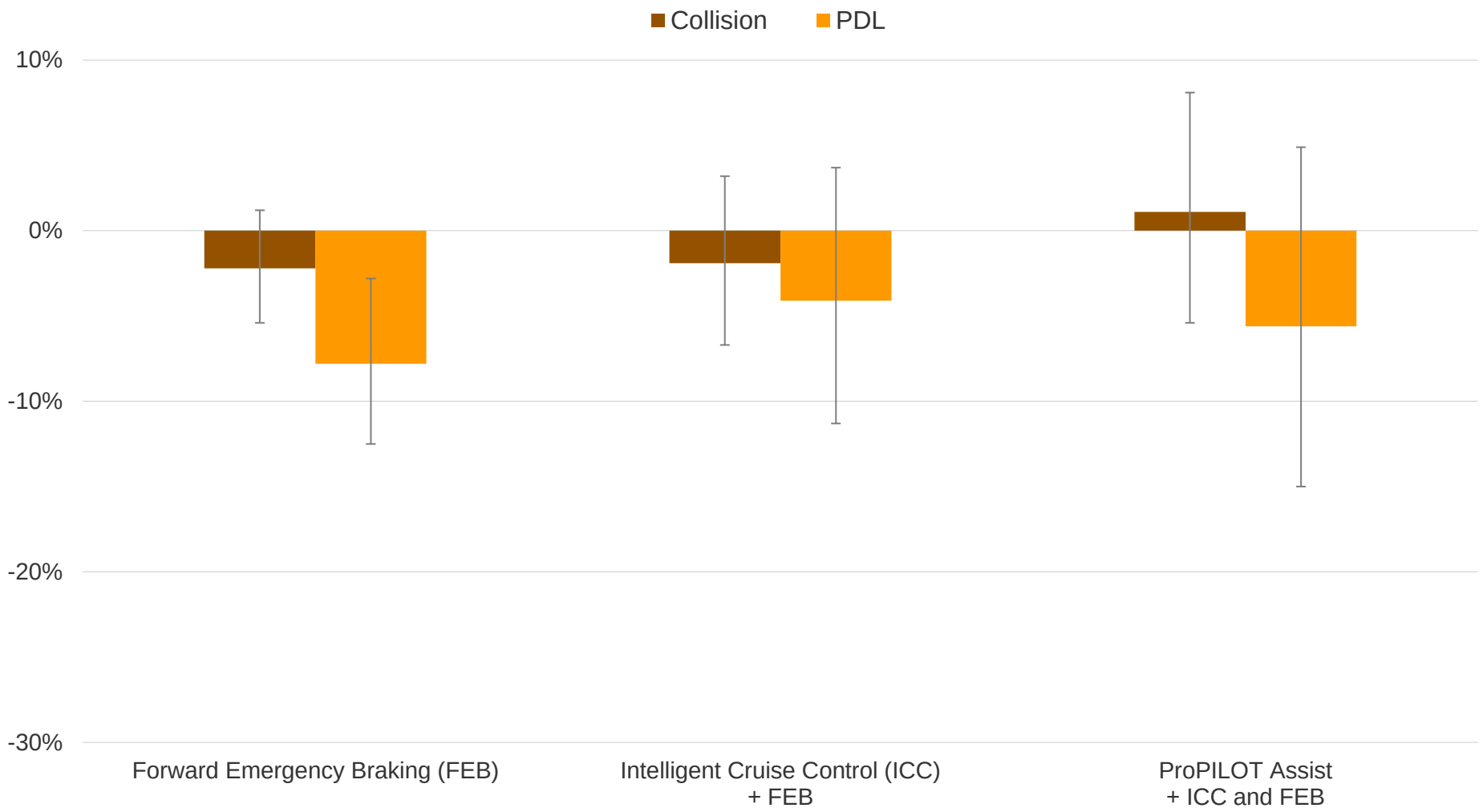
Changes in claim frequency with BMW front crash prevention

December 2021 analysis of model years 2013-17



Changes in frequency with Nissan front crash prevention system

April 2021 analysis of 2017-19 Nissan Rogue



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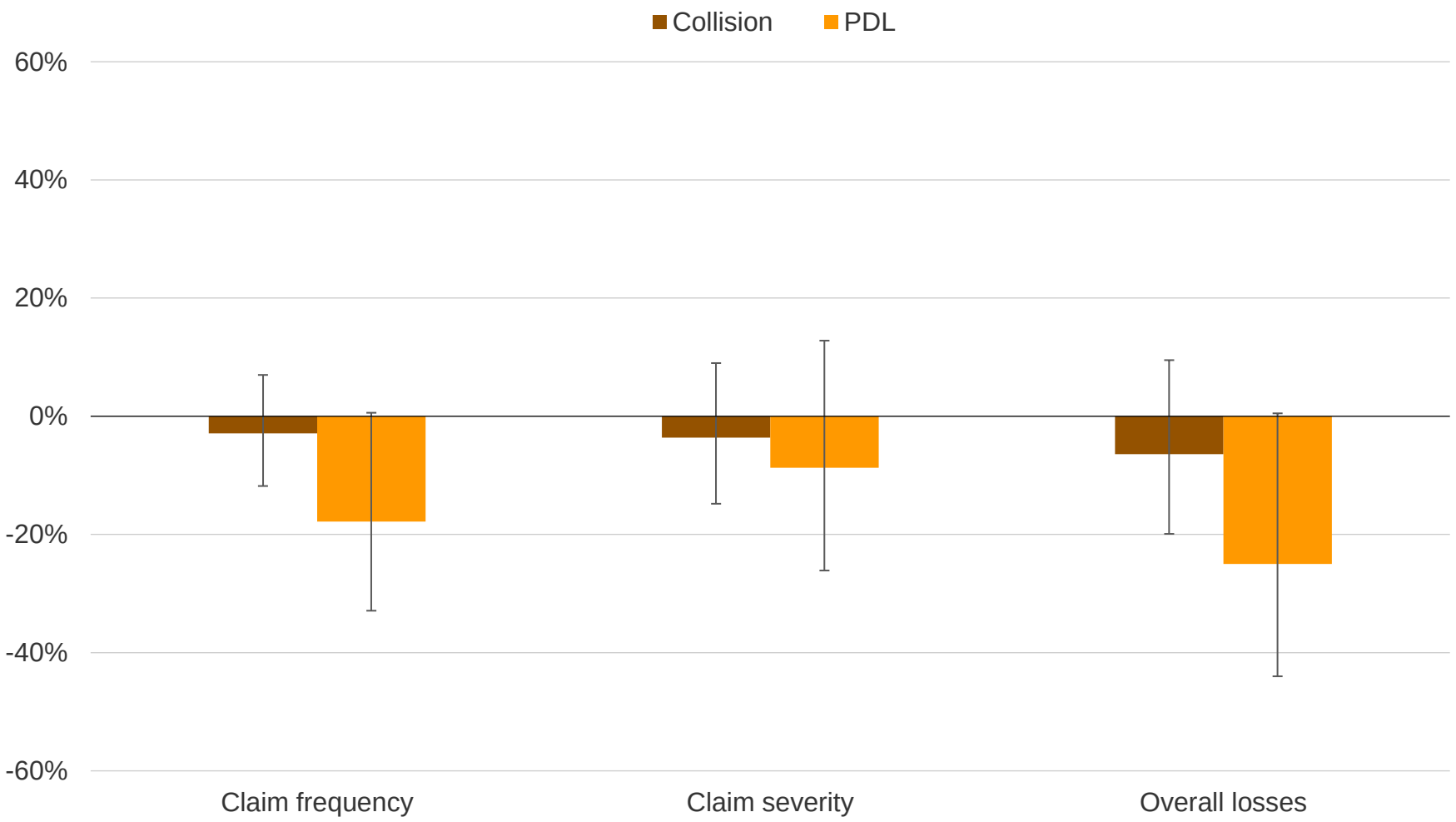
2018-20 Cadillac CT6 Super Cruise bundle changes in loss results

Through calendar year 2021




iSpot.tv
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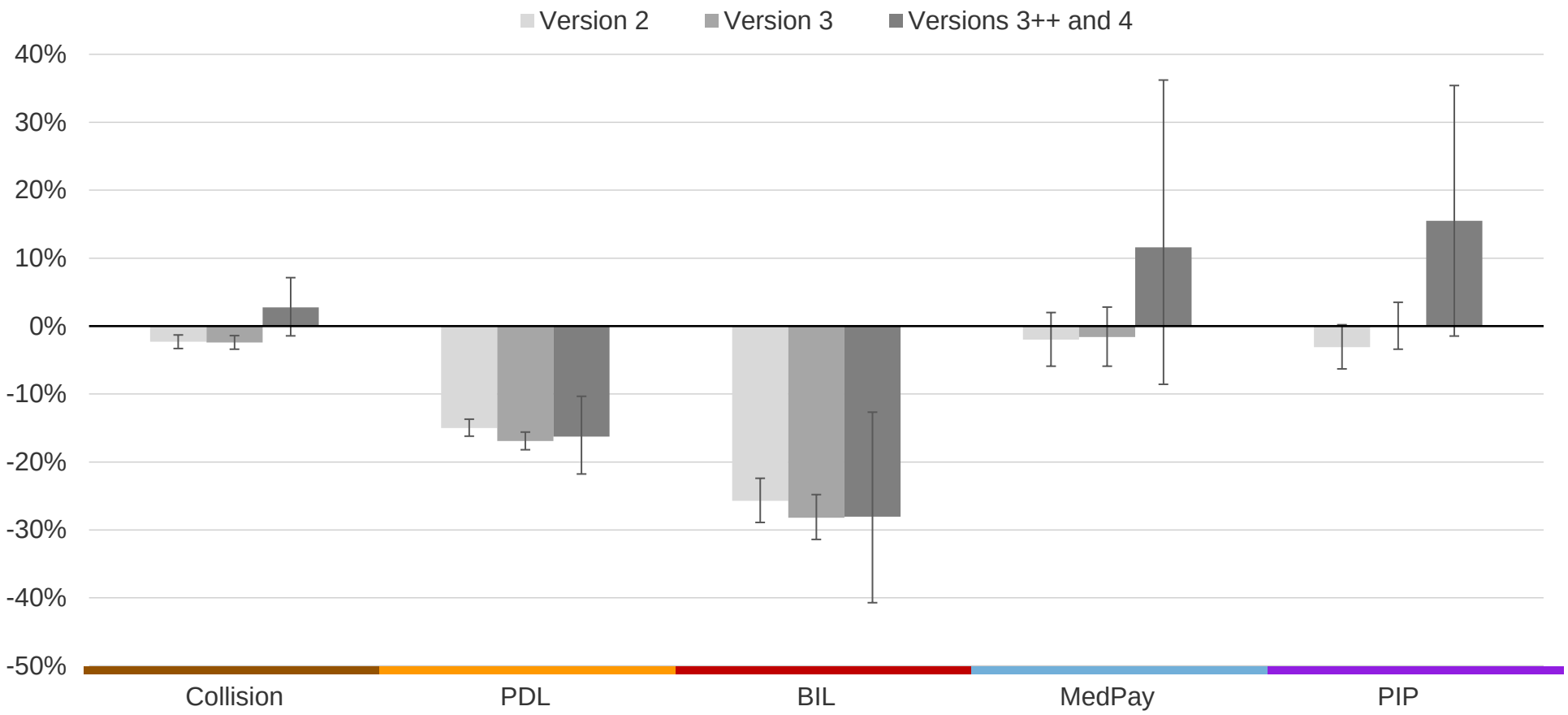
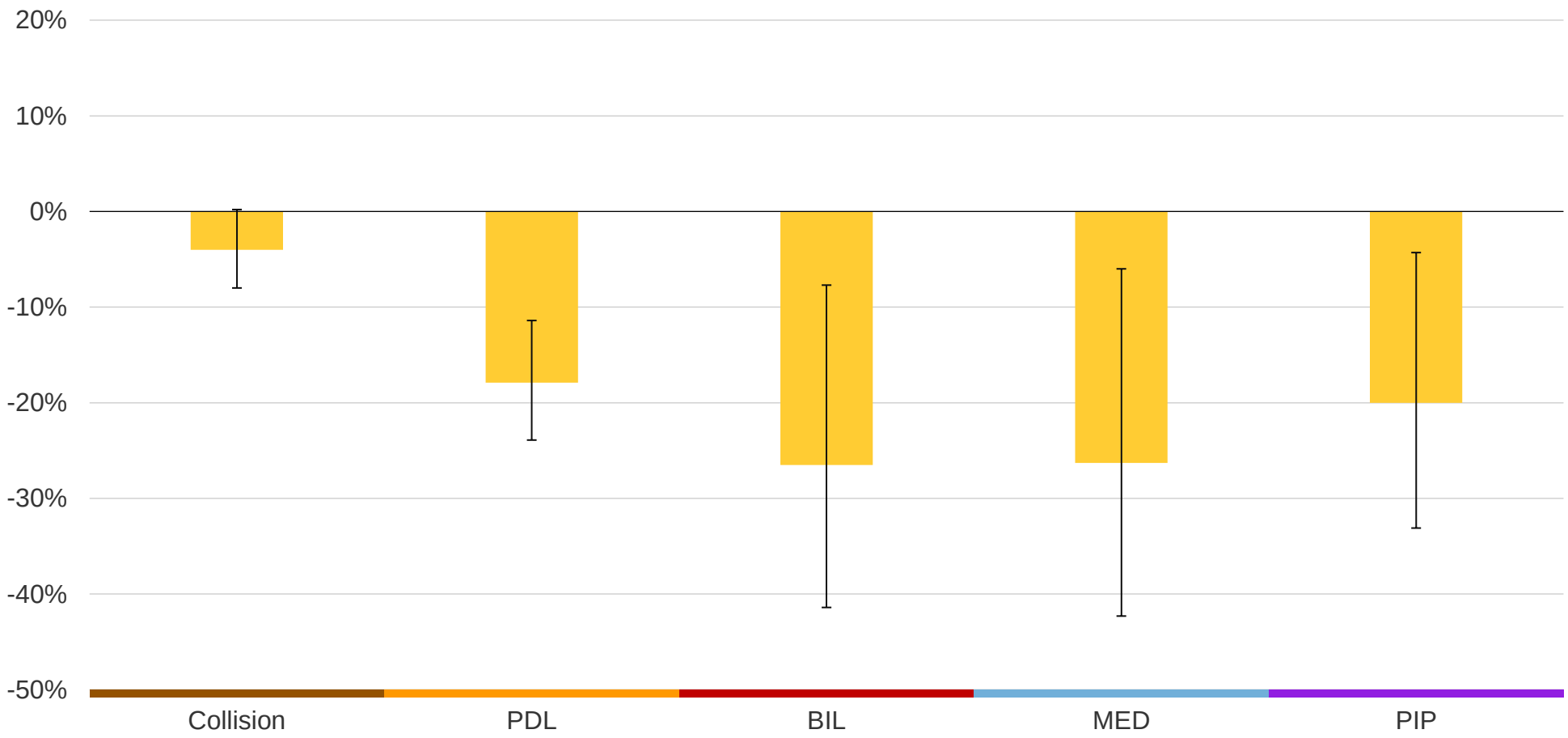
Subaru EyeSight generations

Percent change in claim frequency, by coverage type



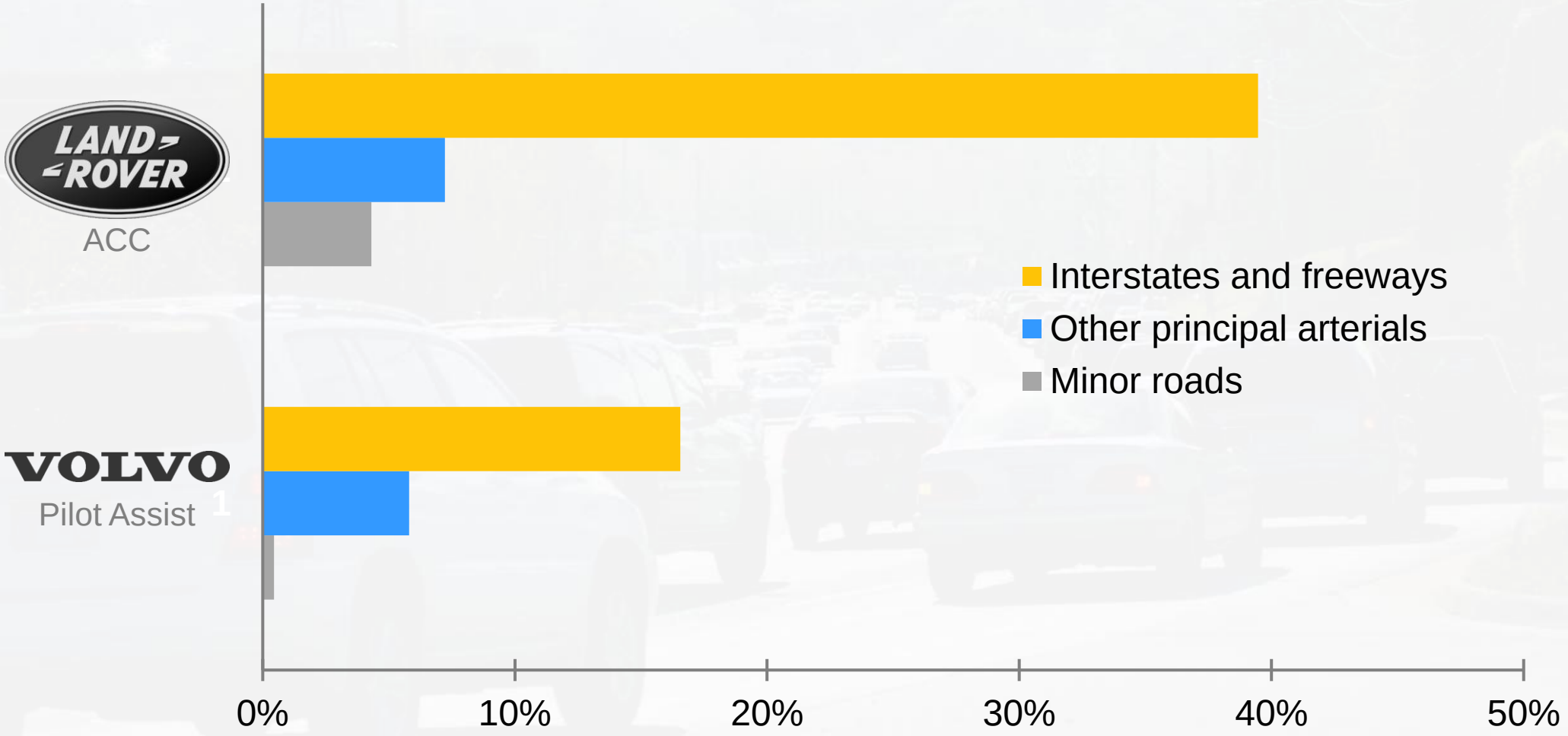
Changes in claim frequency with Audi Traffic Jam Assist

Analysis of 2017 Q7 and A4

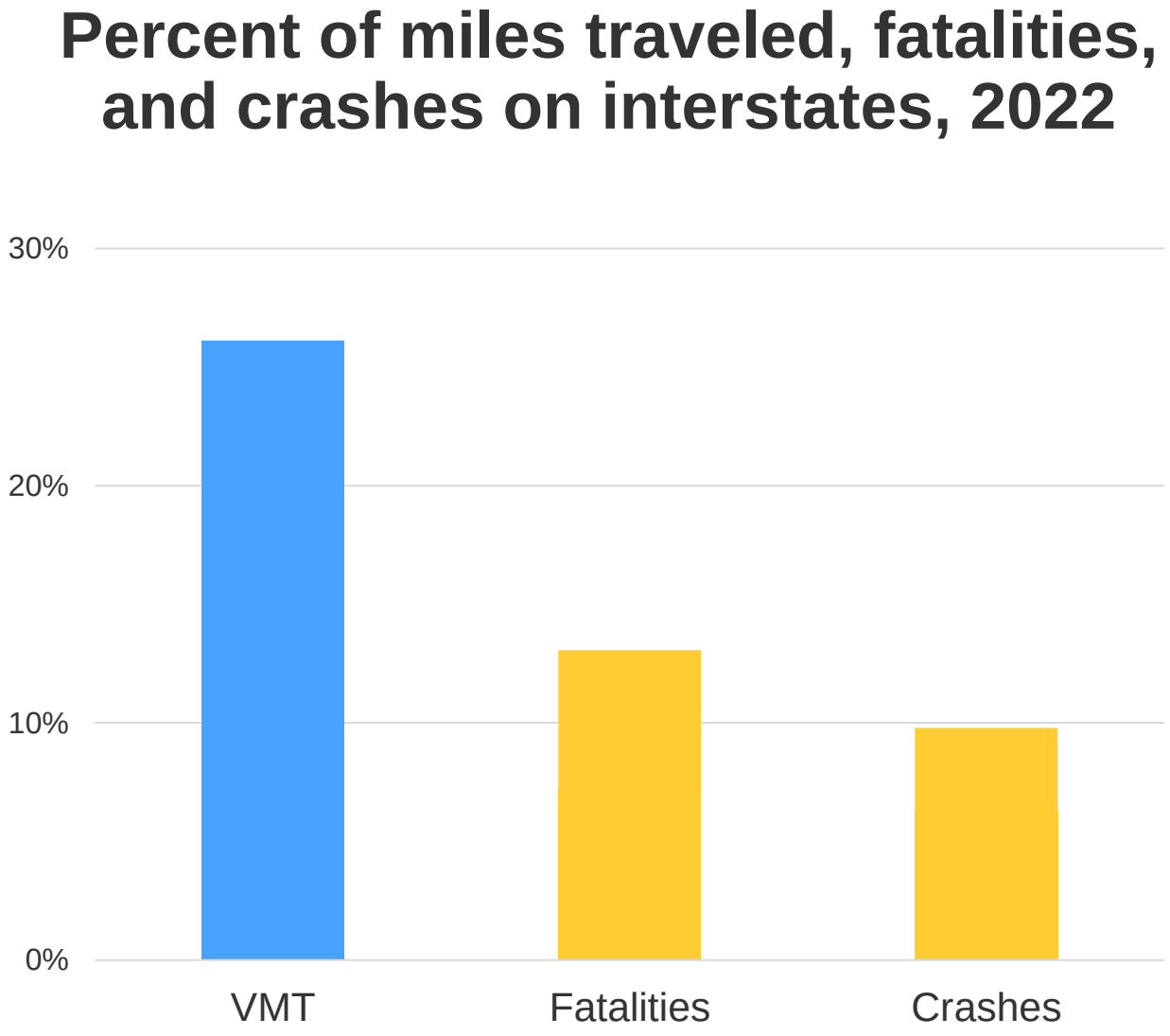


Partial automation effects in police-reported crashes

Use of driving automation by system and road type

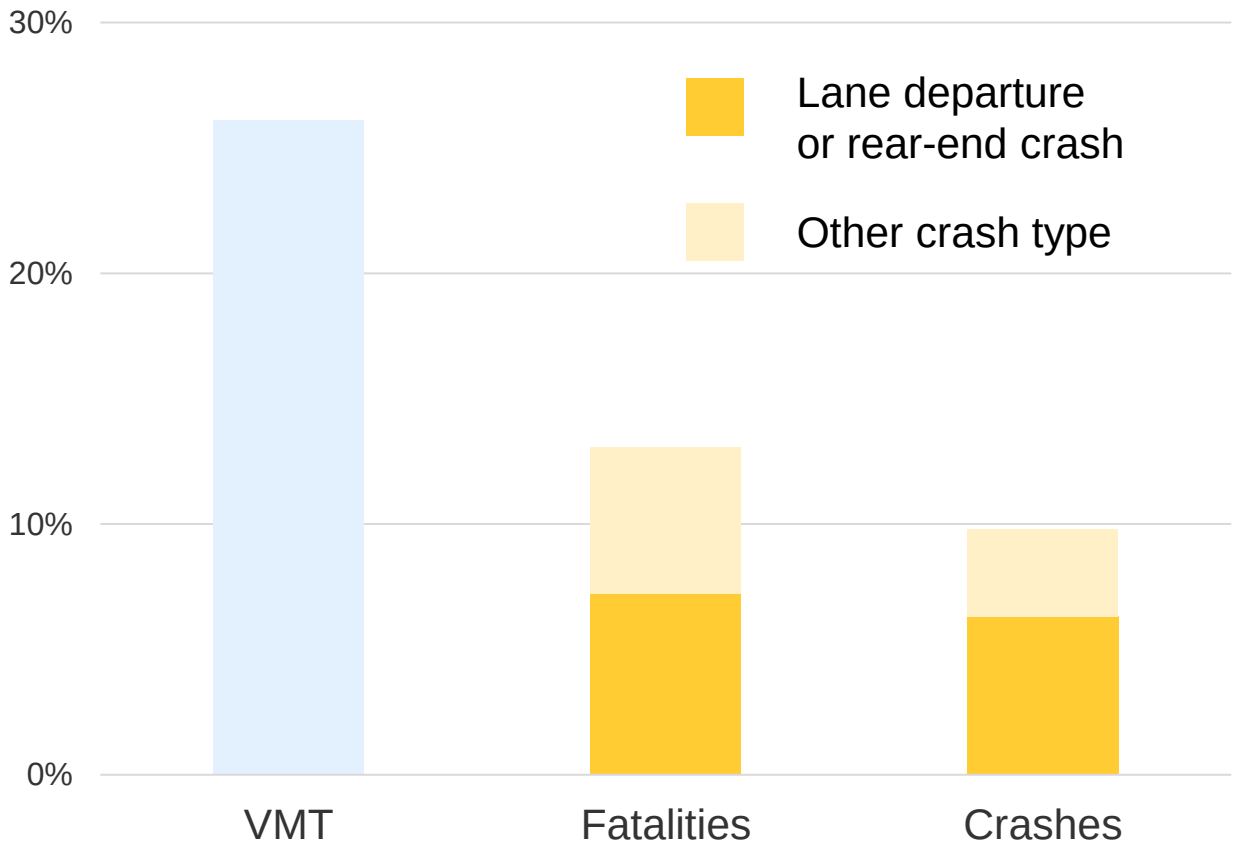


Interstate highways are among the safest roads



Only 7% of fatalities and 6% of crashes were addressable by partial driving automation systems limited to interstates

Percent of miles traveled, fatalities, and crashes on interstates, 2022



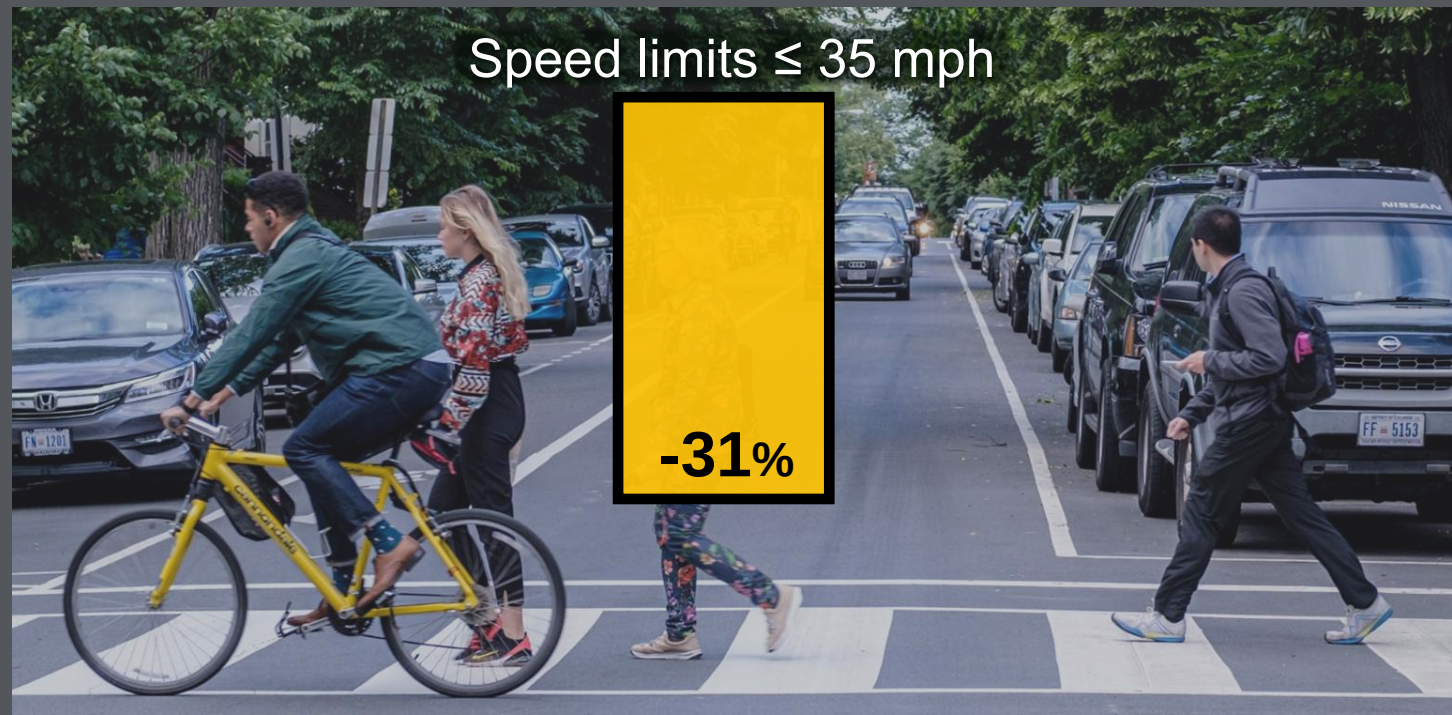
Examined crash effects on limited-access highways

and roads with speed limits ≤ 35 mph

Examined
lane departure crashes

and rear-end crashes

Lane departure crash rate reductions for Nissan vehicles with partial driving automation



☐ Statistically significant

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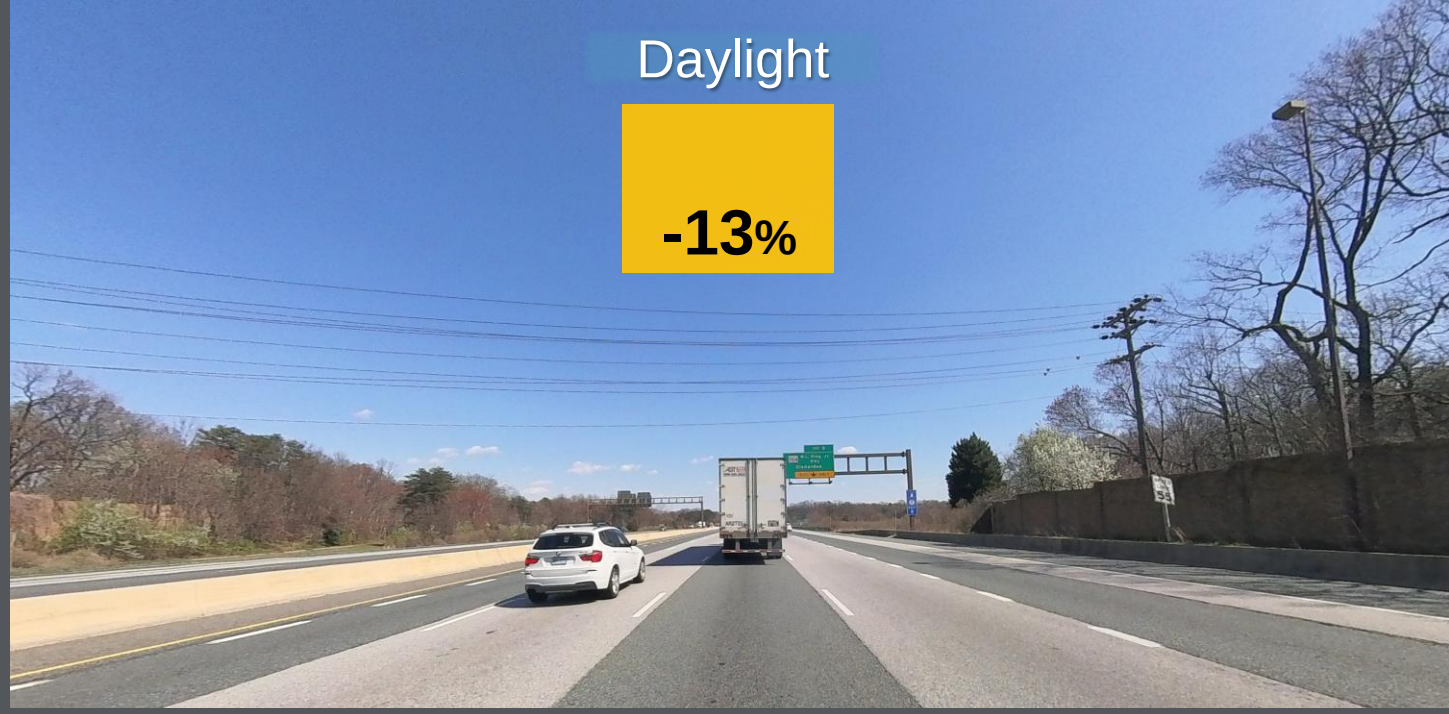
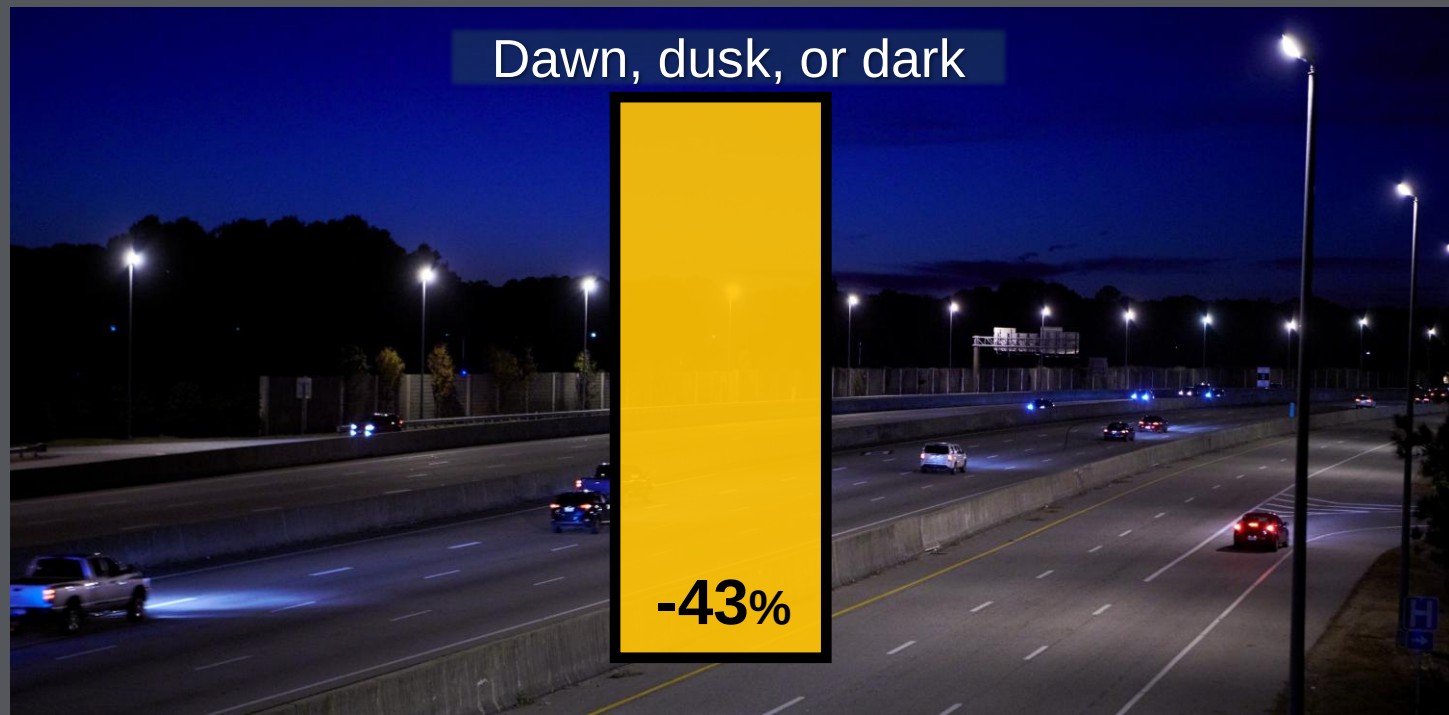
Lane departure crash rate reductions for Nissan vehicles with partial driving automation on limited-access highways



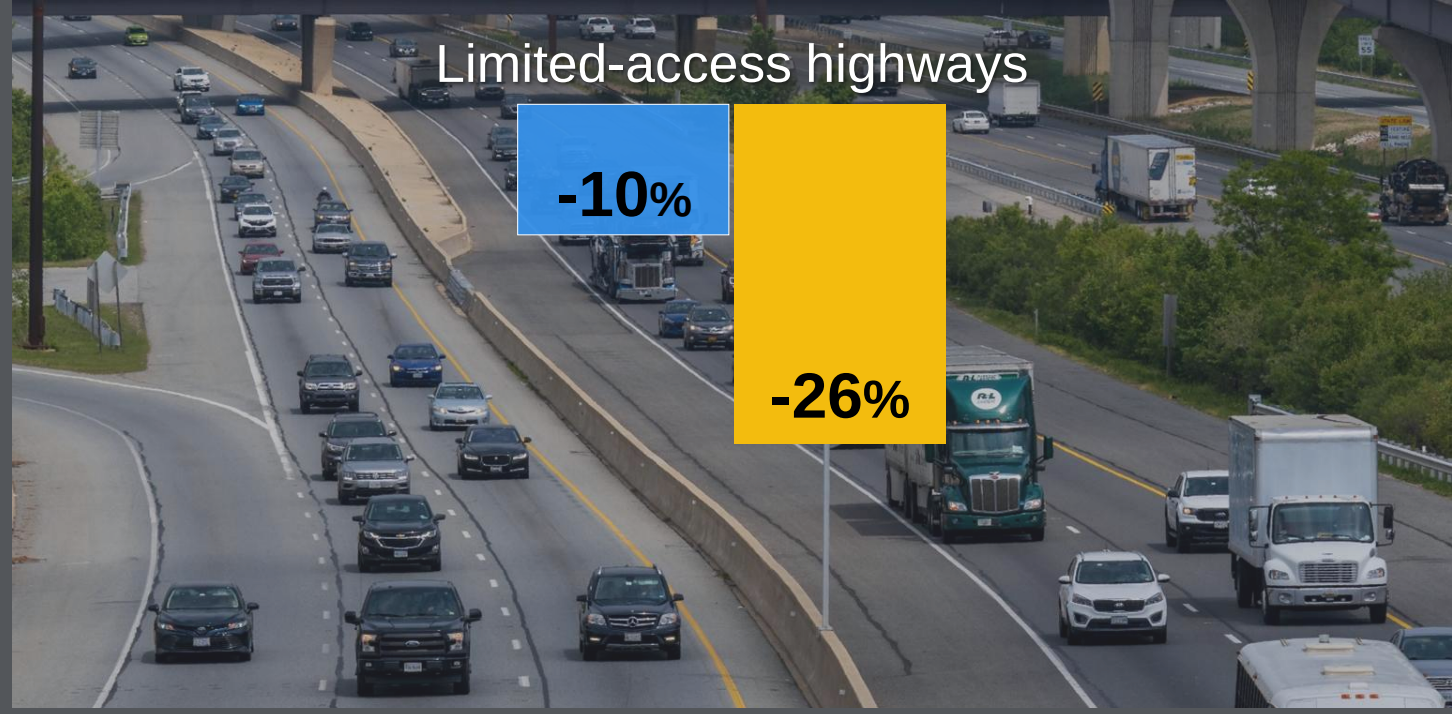


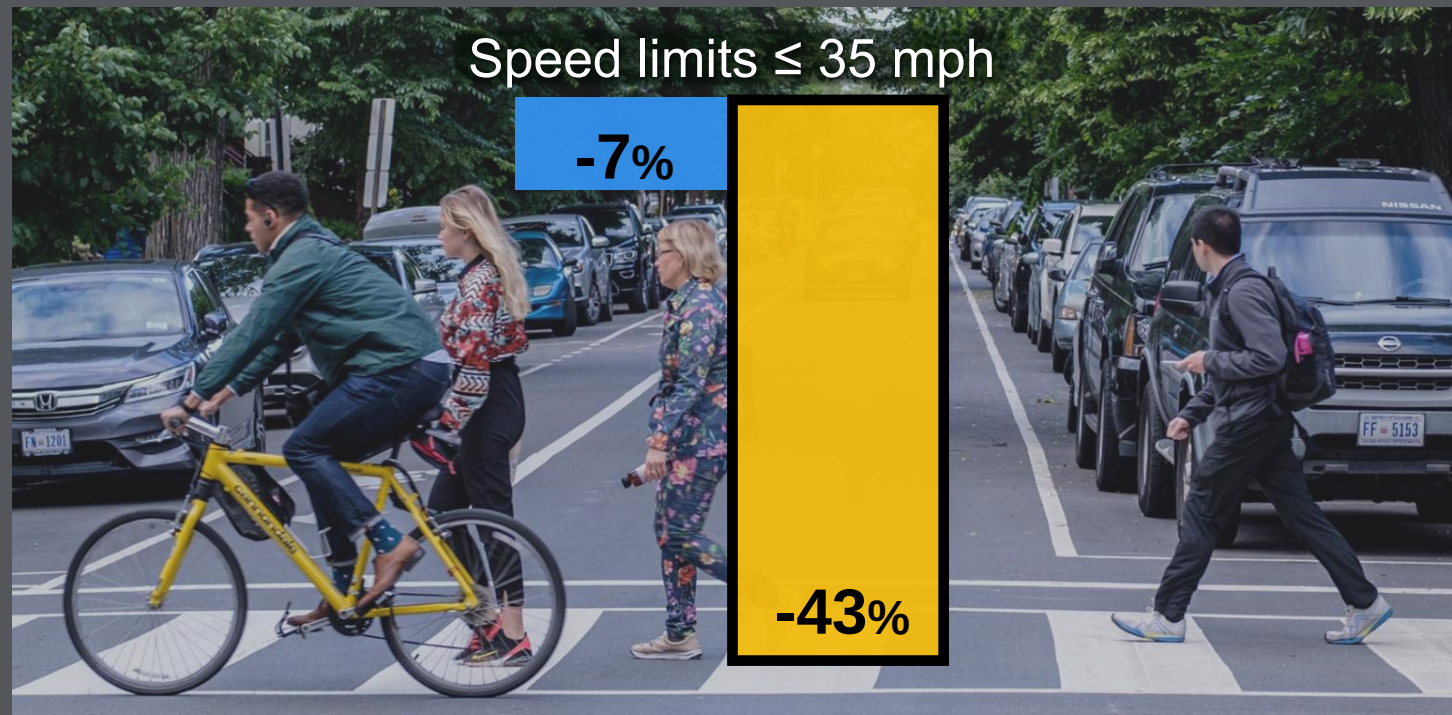
☐ Statistically significant

IIHS HLDI


GOOD
POOR
Deer targets at 200 feet
Headlights on the Rogue were rated
A
Acceptable or
P
Poor

Rear-end crash rate reductions for Nissan vehicles with adaptive cruise control and partial driving automation

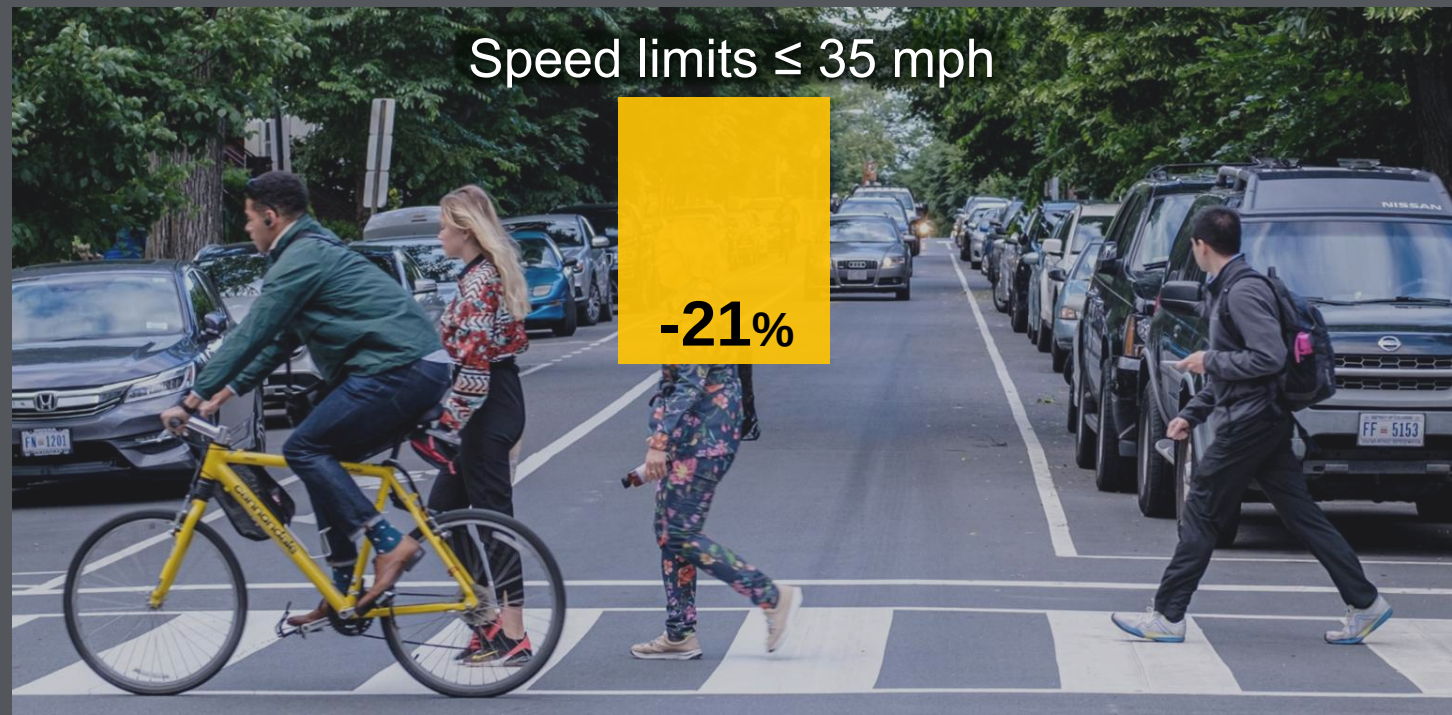




☐ Statistically significant

IIHS HLDI

Lane departure crash rate reductions for BMW vehicles with partial driving automation



☐ Statistically significant

IIHS HLDI

AEB was more capable on BMW models when paired with ACC

Without ACC
Radar system
Operated up to 35 mph

Advanced

With ACC
Fusion system
Operated at full speed range

Superior

Evaluations of partially automated systems

Not a driver replacement technology


Not a driver replacement technology

Rating component 1
Driver monitoring

- Simultaneously monitor where the driver is looking and what the driver's hands are doing
  - Eye, head, and hand monitoring

Rating component 2
Attention reminders

- Start alerting and escalate communication rapidly
- Add more alert modalities at each stage
  - Bimodal alerting within 10-15 sec
  - Trimodal alerting or vehicle slowdown within 20-30 sec

Rating component 3
Emergency escalation

- Vehicle begins slowdown to a stop or a crawl within 35 sec
- SOS call during or after slowdown
- System lockout once slowdown begins

Rating component 4
Automated lane change

- No auto-lane-change functionality, or
- Requires driver input to begin the maneuver (i.e., driver-initiated or driver-confirmed)

Rating component 5
ACC auto resume

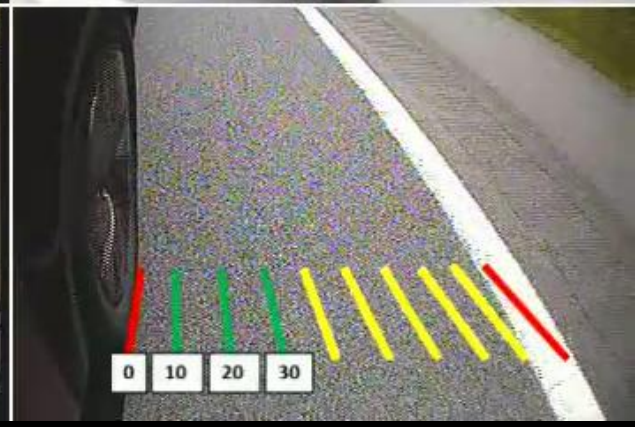
- No ACC-auto-resume functionality, or
- Requires driver is looking forward before moving or times out within 10 sec of standstill
- Times out after 2 mins of standstill regardless of driver gaze

ACC automatic resume needs limits

Rating component 6
Cooperative steering

- Lane centering must stay on while driver steers within lane
- If temporarily deactivates, lane centering must:
  1. Automatically reactivate while offset from lane's center once driver stops steering, and
  2. Clearly communicate operation status changes

Share control of the driving

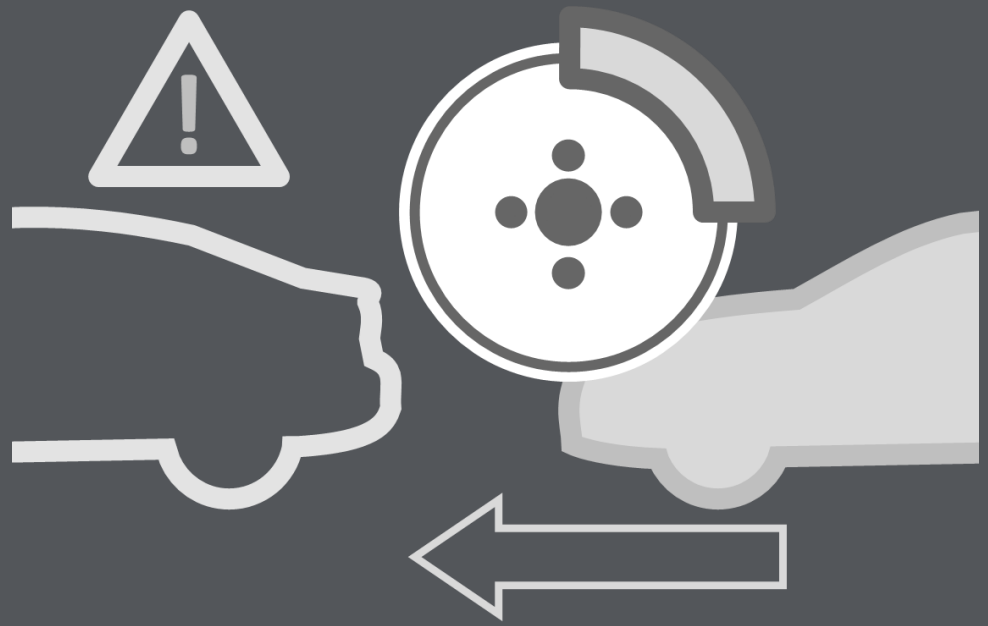


Rating component 7
Safety features

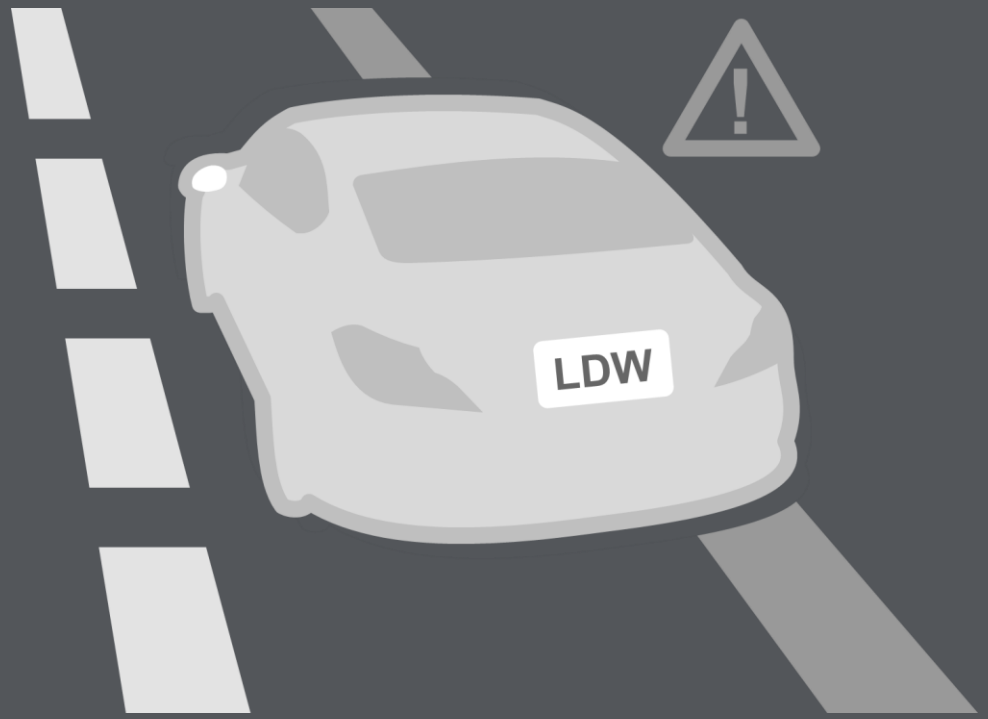
- AEB and LDP must be on and cannot be switched off while system is on
- Driver must be belted to switch on system
- If driver unbuckles while system is on, attention reminder process must begin

Crash reductions with front crash prevention and lane departure technologies

50% **With AEB**



11% **With lane departure warning**



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Overall ratings for safeguards

G Good A Acceptable M Marginal P Poor

2022-24 LS

2023-24 Sierra

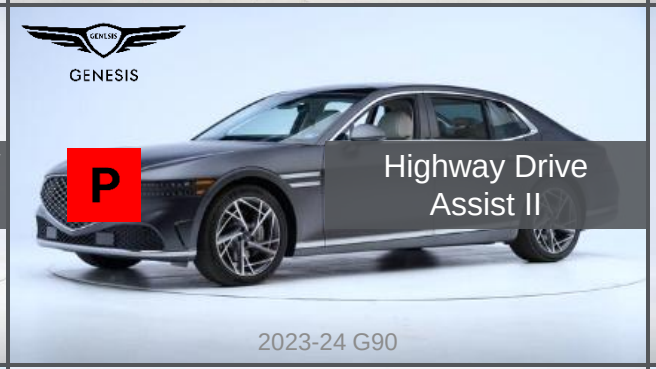
2023-24 Ariya

2023-24 X1

2021-24 Mustang Mach-E

2021-24 Mustang Mach-E

2023-24 G90



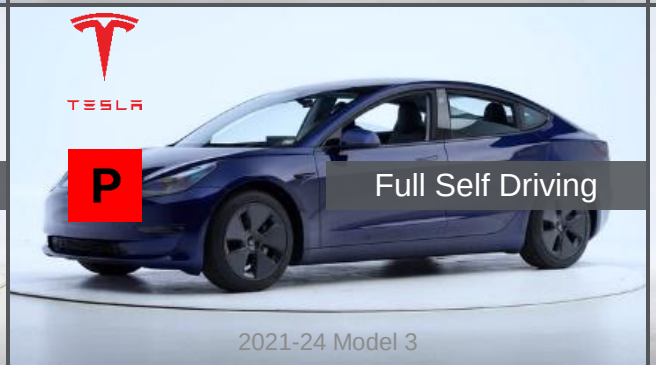
2023-24 G90

2022-24 LS

2022-23 C-Class

2023-24 Ariya

2021-24 Model 3



2021-24 Model 3

2022-24 S90

G Good

A Acceptable

M Marginal

P Poor

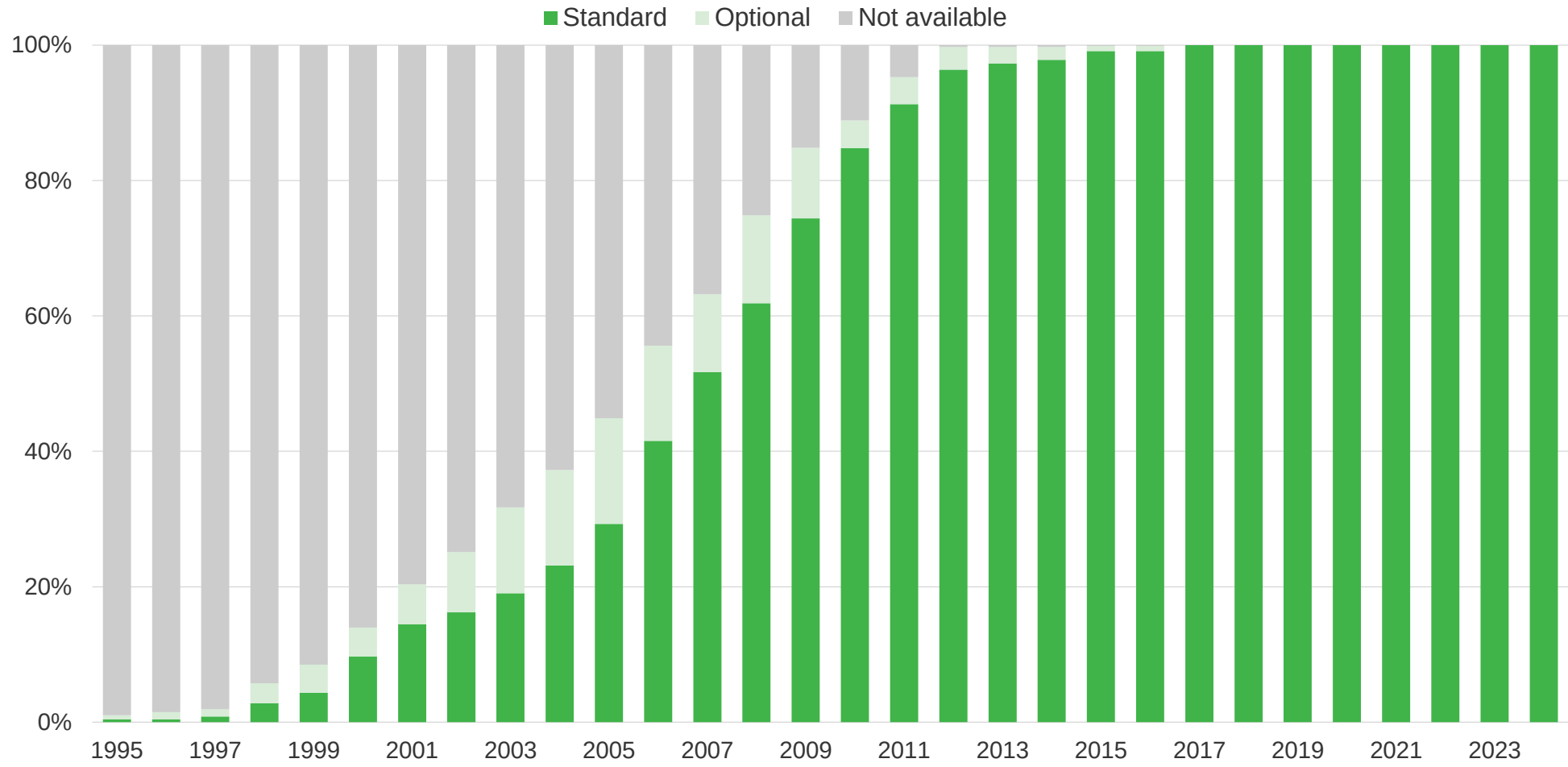
	OVERALL RATING	Driver monitoring	Attention reminders	Emergency procedures	Lane change	ACC resume	Cooperative steering	Safety features
Lexus Teammate with Advanced Drive (2022-24 Lexus LS)	A	M	G	A	G	A	G	G
General Motors Super Cruise (2023-24 GMC Sierra)	M	P	G	G	P	A	P	G
Nissan ProPILOT Assist (2023-24 Nissan Ariya)	M	M	A	M	G	G	G	A
BMW Active Driving Assistant Pro (2023-24 BMW X1)	P	M	P	A	G	P	G	A
Ford Blue Cruise (2021-24 Ford Mustang Mach-E)	P	A	G	M	G	M	G	P
Ford Co-Pilot 360 (2021-24 Ford Mustang Mach-E)	P	A	G	M	G	G	G	P
Genesis Highway Drive Assist II (2023-24 Genesis G90)	P	P	P	P	G	M	G	P
Genesis Smart Cruise Control/Lane Keeping Assist (2023-24 Genesis G90)	P	P	P	P	G	G	G	P
Lexus Dynamic Radar Cruise Control with Lane Tracing Assist (2022-24 Lexus LS)	P	P	P	P	G	G	G	M
Mercedes-Benz Distronic with Active Lane Keeping Assist (2022-23 Mercedes-Benz C-Class)	P	M	P	A	G	G	G	P
Nissan ProPILOT Assist 2.0 (2023-24 Nissan Ariya)	P	P	A	M	G	G	G	G
Tesla Autopilot, Version 2023.7.10 (2021-24 Tesla Model 3)	P	P	P	A	G	P	P	P
Tesla Full Self-Driving, Version 2023.7.10 (2021-24 Tesla Model 3)	P	P	A	A	P	P	P	P
Volvo Pilot Assist (2022-24 Volvo S90)	P	P	P	M	G	G	G	P

IIHS HLDI

Phase-in of collision avoidance systems

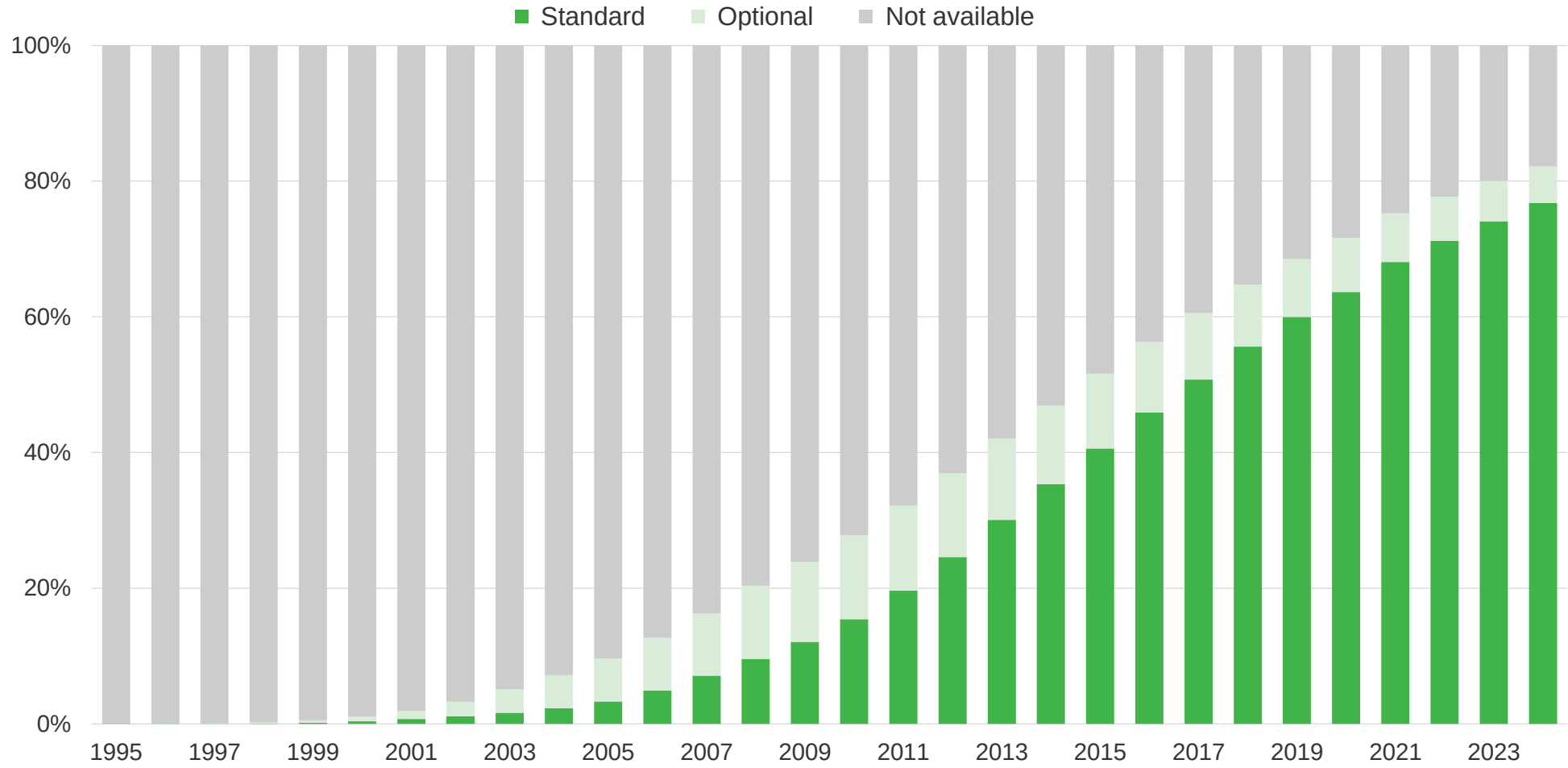
New vehicle series with ESC

By model year



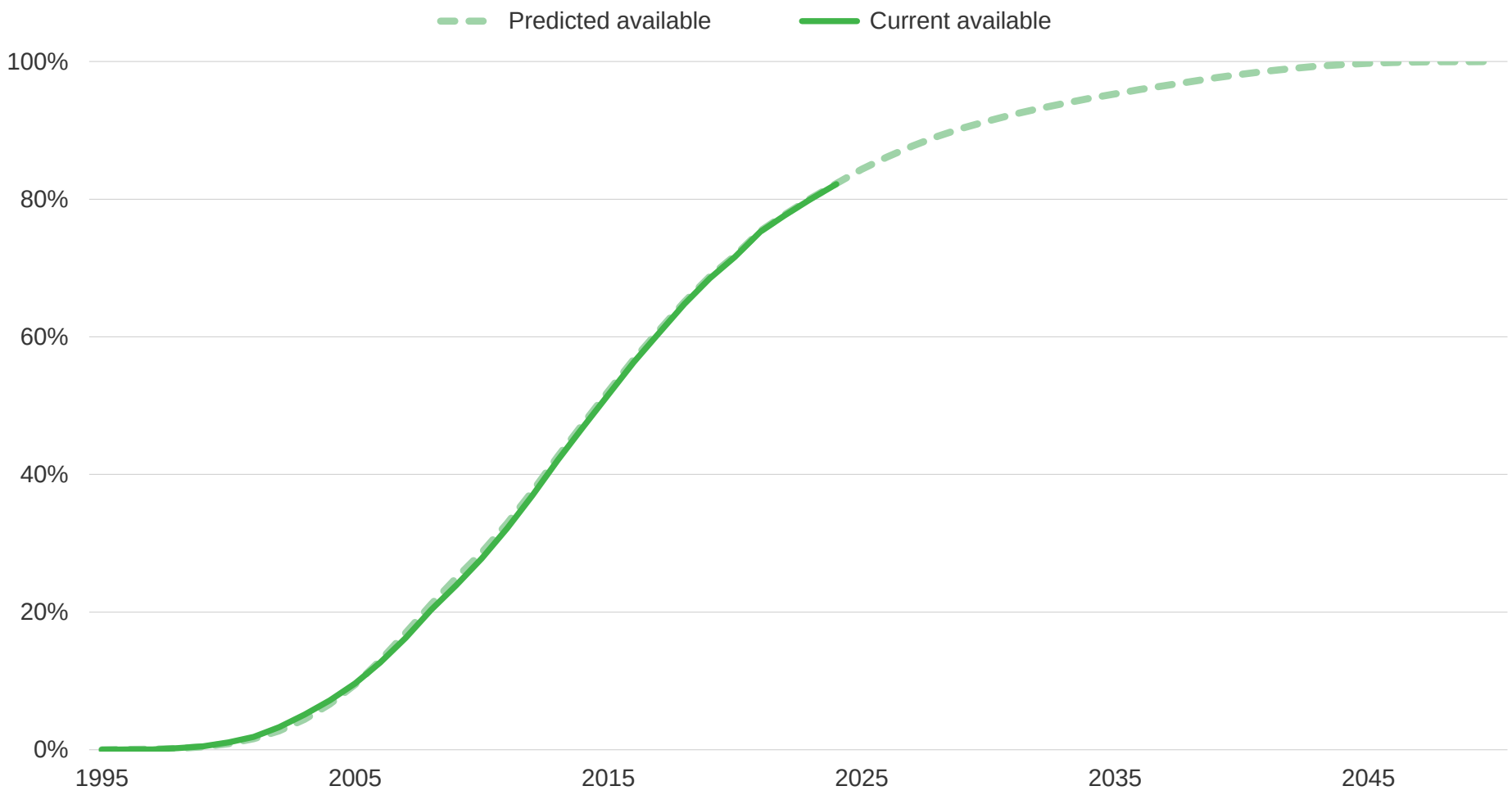
Registered vehicles with ESC

By calendar year



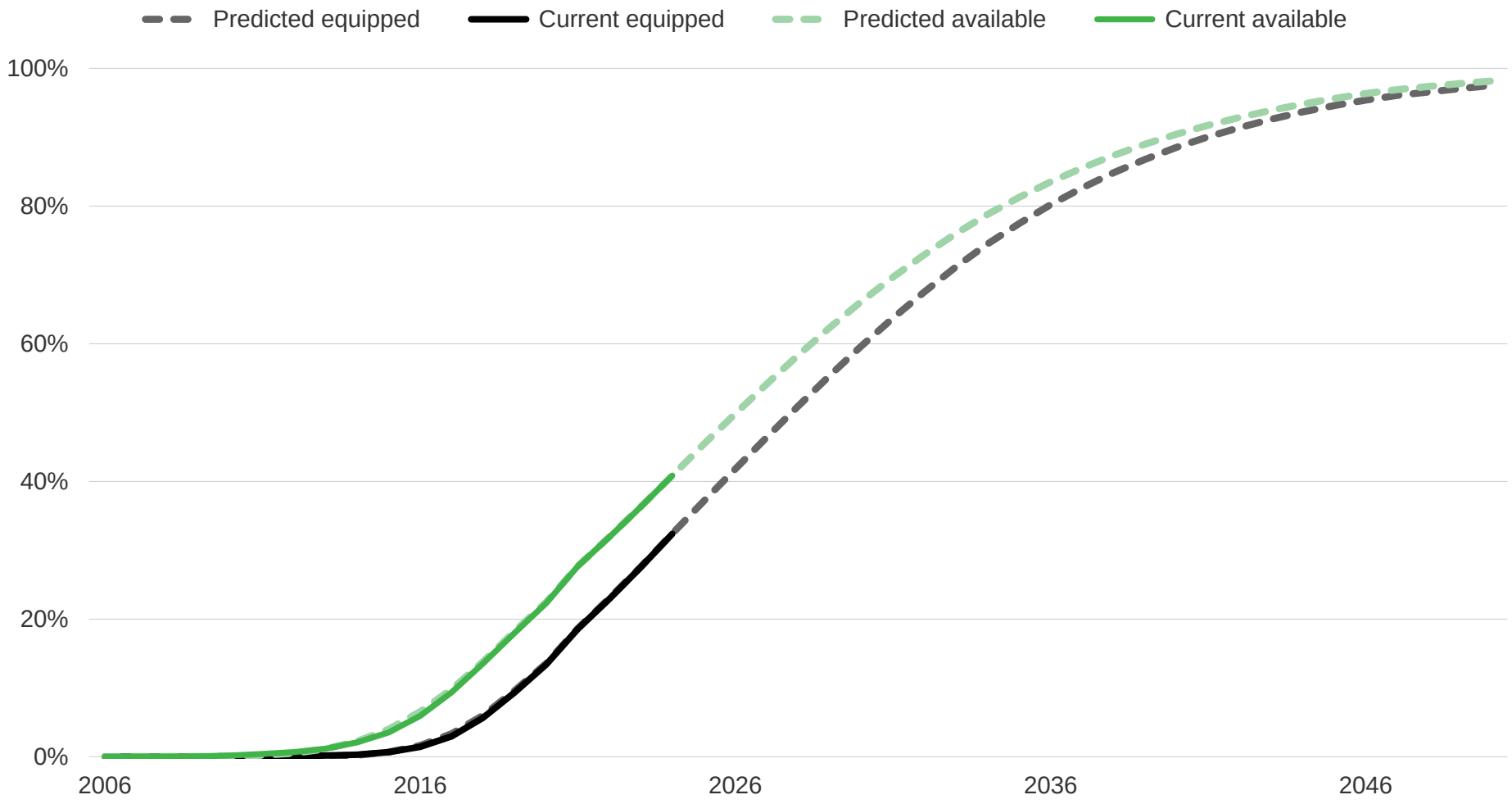
Predicted percentage of registered vehicles: ESC

By calendar year



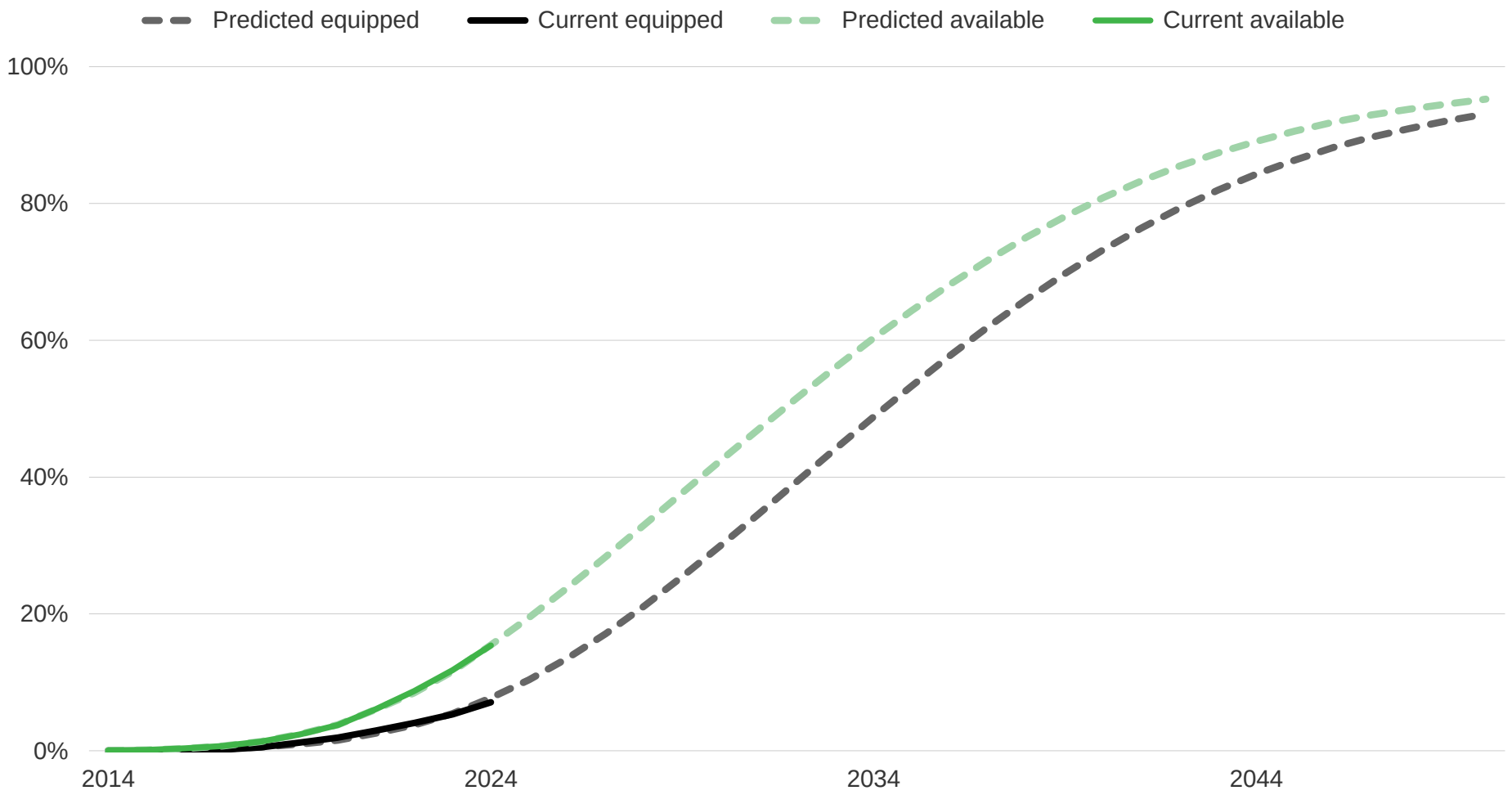
Predicted percentage of registered vehicles: front automatic emergency braking

By calendar year



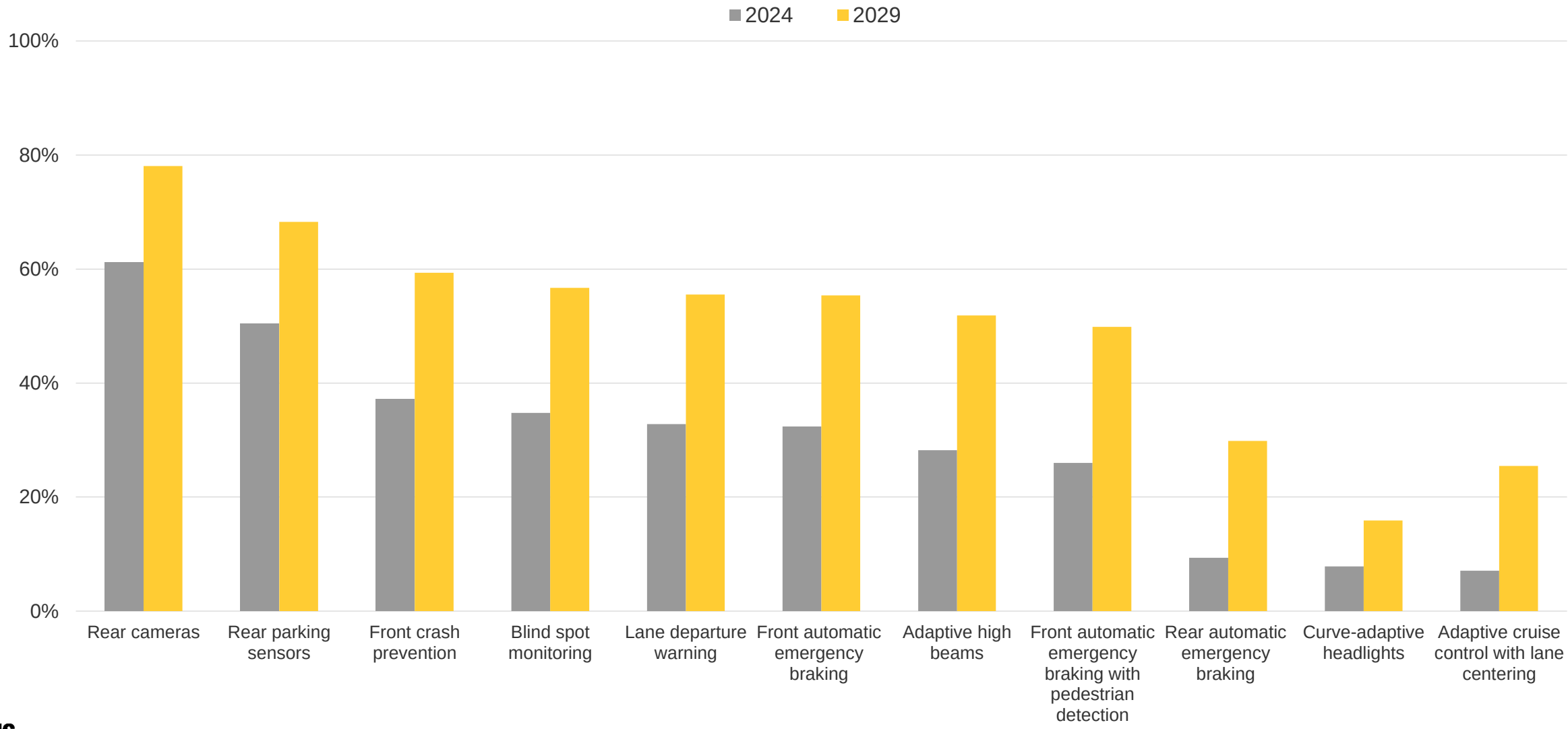
Predicted percentage of registered vehicles: adaptive cruise control with lane centering

By calendar year



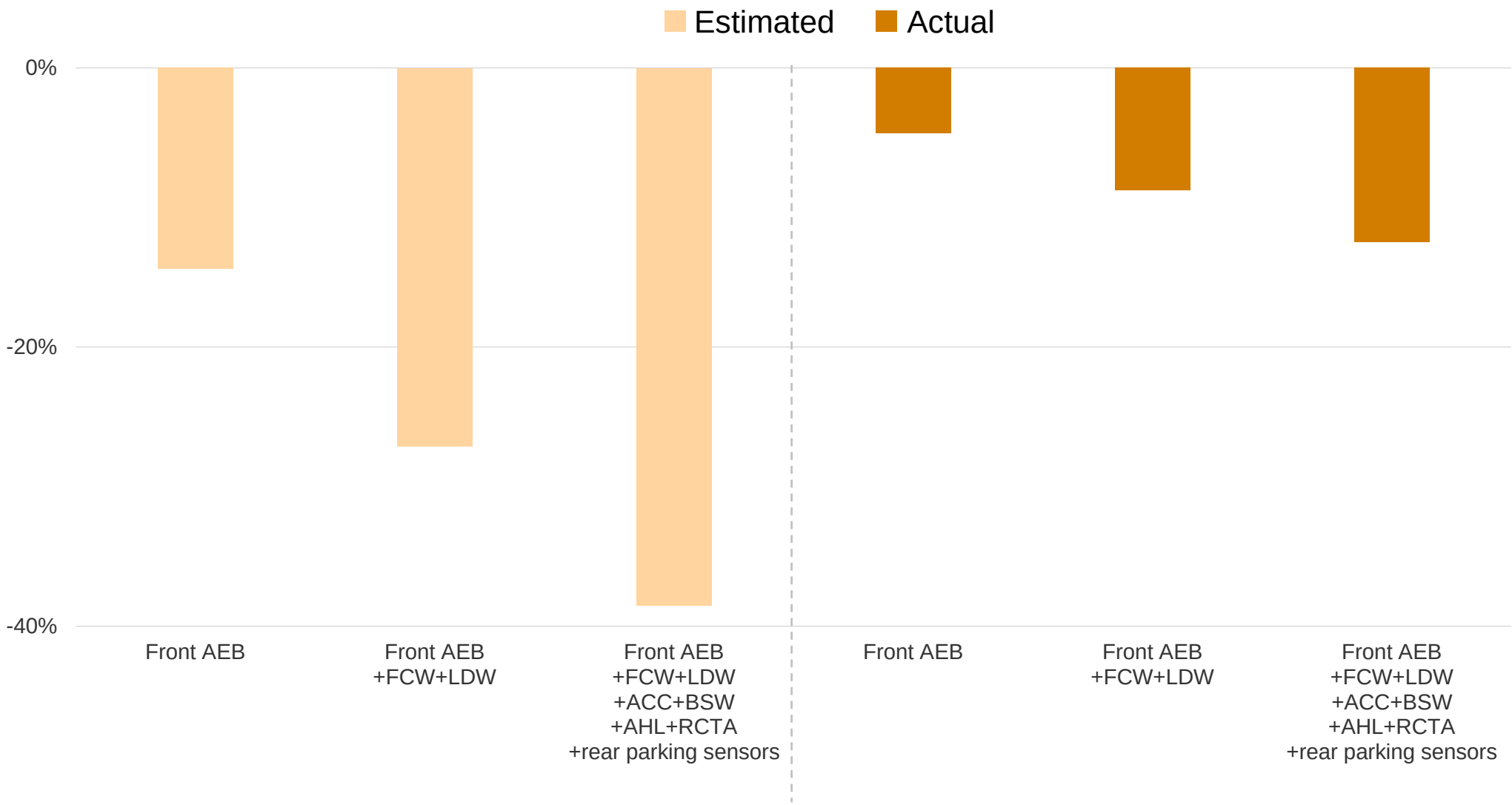
Estimated registered vehicles by feature

Calendar years 2024 and 2029



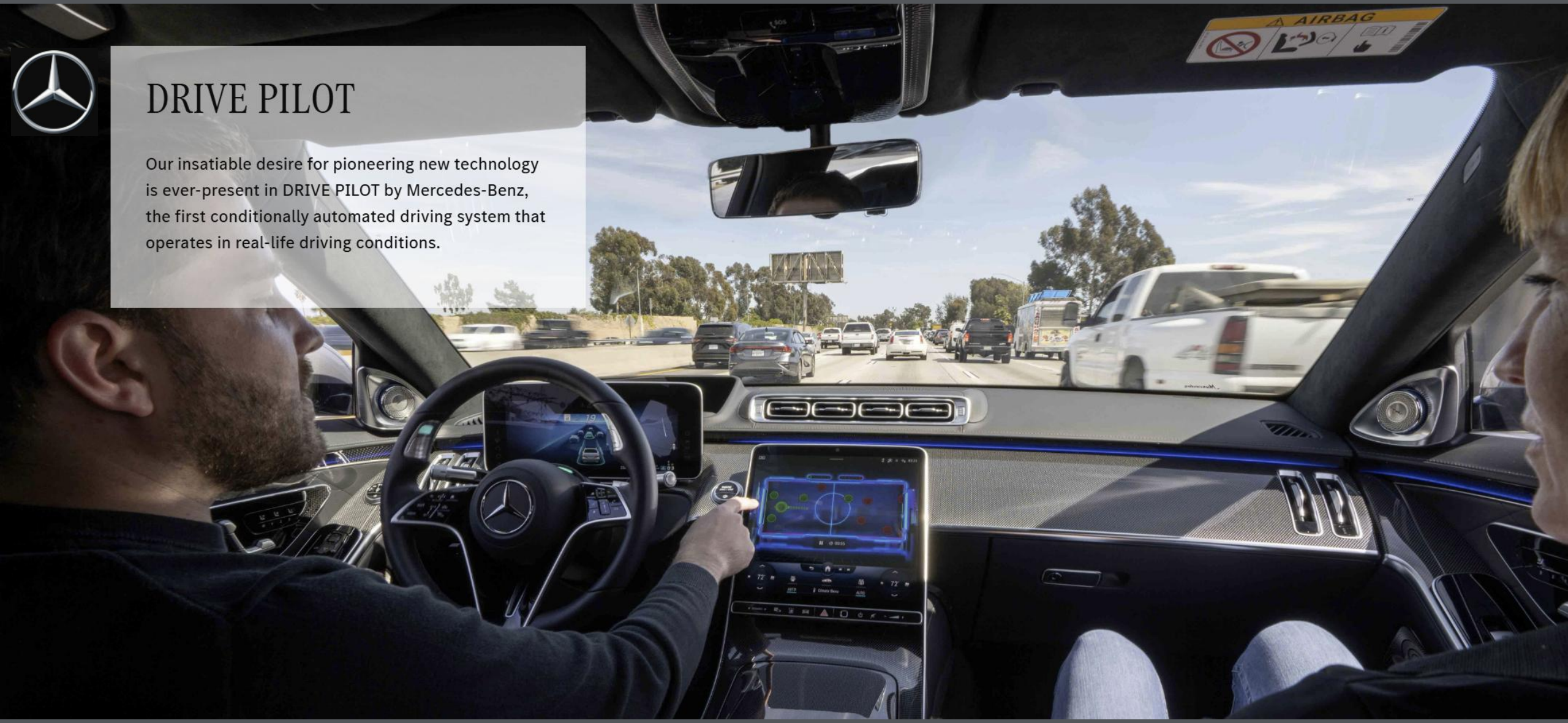
Front AEB impact on PDL claim frequency

Estimated effects on vehicle fleet assuming a **32.4%** fitment rate for front AEB



Level 3 automation

Mercedes-Benz Drive Pilot



DRIVE PILOT

Our insatiable desire for pioneering new technology is ever-present in DRIVE PILOT by Mercedes-Benz, the first conditionally automated driving system that operates in real-life driving conditions.

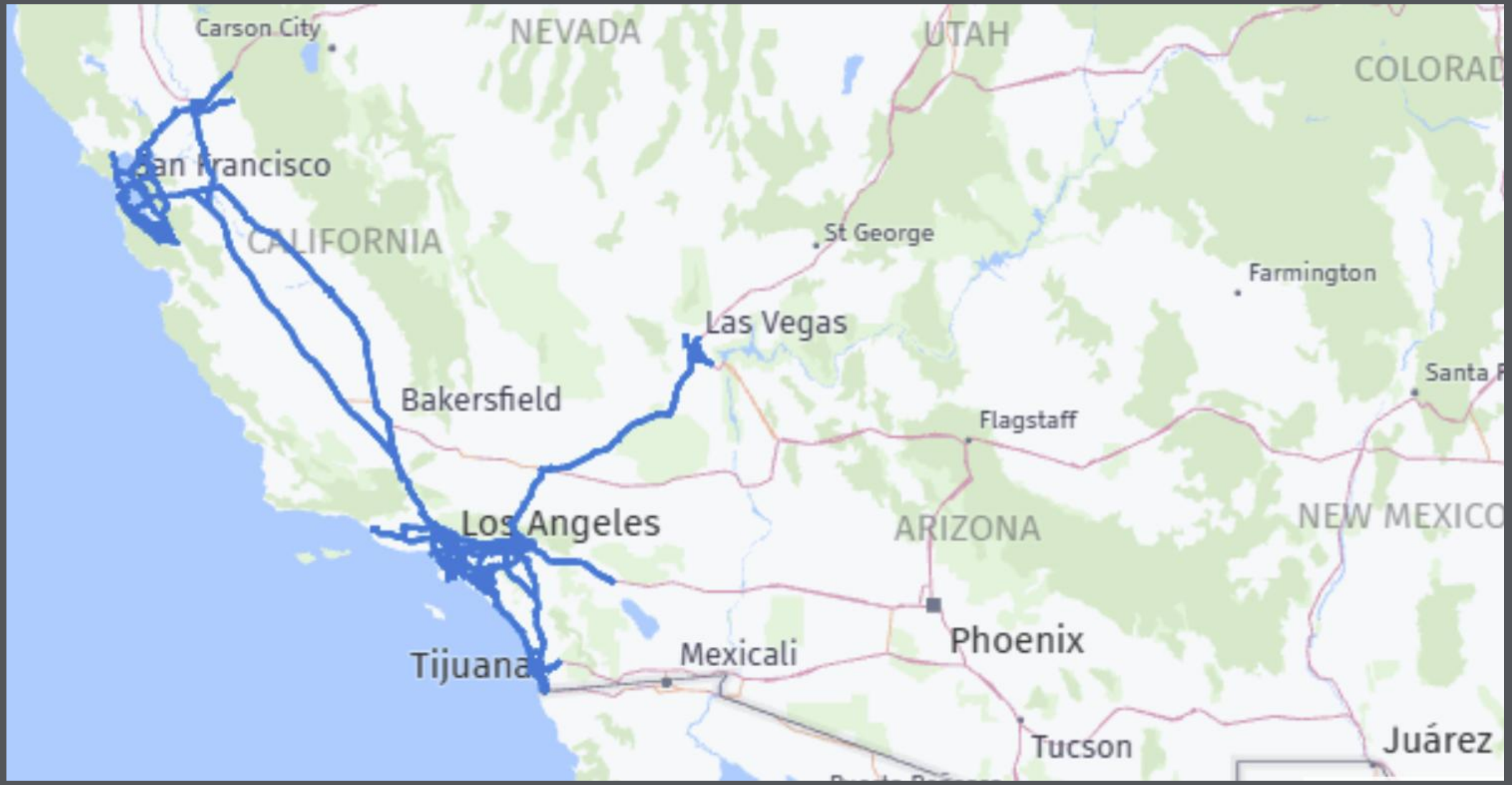
Mercedes-Benz Drive Pilot

Next level automated driving

Raising the bar in autonomous driving technology, Mercedes-Benz is the first automobile manufacturer in the US to achieve a Level 3 certification based on a 0-5 scale from the Society of Automotive Engineers (SAE)[1]. Under specific conditions, our technology allows drivers to take their hands off the steering wheel, eyes off the road — and take in their surroundings[2].

Mercedes-Benz Drive Pilot

Certified roadways



Mercedes-Benz Drive Pilot

Certified roadways

Mercedes-Benz Drive Pilot

Costs

S-class
Starting at $117,750

EQS
Starting at $104,400

- Drive Pilot additional subscription cost of $2,500 per year

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THANK YOU

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