

Status Report

Insurance Institute for Highway Safety | Highway Loss Data Institute

Challenge accepted

57 models clinch 2019 IIHS safety awards



**ALSO IN
THIS ISSUE**

Vol. 53, No. 9

December 19, 2018

- ▶ Driver acceptance of lane departure prevention systems may hinge on timing of steering interventions
- ▶ Test protocol for pedestrian detection systems paves way for ratings



Lexus ES

Nearly five dozen 2019 models meet stricter criteria to qualify for a 2019 *TOP SAFETY PICK+* or *TOP SAFETY PICK* award from the Institute. The 30 first-tier “plus” award winners earn the highest rating for passenger-side protection in a small overlap front crash and have good-rated available headlights, while the 27 winners of the second-tier award qualify with an acceptable or higher rating in the newest IIHS crash test and the nighttime headlight evaluation.

All 57 vehicles in this elite group earn good ratings in the Institute’s five other crashworthiness evaluations and have an available automatic emergency braking system that rates advanced or superior for front crash prevention.

This marks the sixth time that the Institute has raised the bar to earn the *TOP SAFETY PICK+* award since introducing it in the 2013 model year to recognize vehicles that offer a superior level of safety. The *TOP SAFETY PICK* accolade was launched in the 2006 model year to help consumers identify vehicles with the highest safety ratings. Over the years, IIHS has added to and strengthened criteria for both awards to encourage manufacturers to speed up safety advances.

“We challenged manufacturers to provide the best possible protection in a range of crash scenarios and equip vehicles with an automatic emergency braking system to avoid crashes, as well as offer headlights that give drivers confidence when traveling at night,” says IIHS-HLDI President David Harkey.

IIHS now requires a good rating in the passenger-side small overlap front test to earn *TOP SAFETY PICK+* vs. an acceptable or good rating for the 2018 award. An acceptable or good rating in the test is a new criterion for 2019 *TOP SAFETY PICK*.

“Fifteen brands hit all the marks to give consumers shopping for a new car a wide variety of 2019 models to consider.”

More models have standard front crash prevention

Across manufacturers, the majority of award winners qualify only when optionally equipped because good or acceptable headlights and an advanced- or superior-rated front crash prevention system aren’t part of their base trims.

Twenty automakers have pledged to equip virtually all passenger vehicles with autobrake by 2022. Many are on track to beat the deadline under a voluntary commitment brokered in 2015 by IIHS and the National Highway Traffic Safety Administration.

“Among the 57 vehicles that qualify for either of our 2019 awards, 31 of them have a standard front crash prevention system,” Harkey says. “What’s impressive is that all but one winner earn the highest rating of superior in our track tests, even though an advanced rating is enough to qualify.”

A variety of choices

Cars and SUVs account for the bulk of the *TOP SAFETY PICK+* winners in most size classes. Missing are microcars, minicars, minivans and pickups. All classes except for microcars and pickups are represented among the *TOP SAFETY PICK* winners.

The Subaru brand leads with seven 2019 *TOP SAFETY PICK+* winners. They are the Ascent, Crosstrek, Impreza sedan and wagon, Legacy, Outback and WRX. The Forester falls shy of the top award because its headlights rate acceptable, but the small SUV qualifies for *TOP SAFETY PICK*.

Hyundai Motor Co. owns the Hyundai, Kia and Genesis brands. The Hyundai and Kia nameplates earn four and five *TOP SAFETY PICK+* awards, respectively, while Genesis has three *TOP SAFETY PICK+* awards. Hyundai also earns six *TOP SAFETY PICKs*, and Kia earns three.

Mercedes-Benz and Toyota Motor Corp. and its Lexus brand qualify for three *TOP SAFETY PICK+* awards each. BMW »

2019 TOP SAFETY PICK+

- ▶ Good ratings in the driver-side and passenger-side small overlap front, moderate overlap front, side, roof strength and head restraint tests
- ▶ Advanced or superior rating for front crash prevention
- ▶ Good headlight rating

Small cars	<p>Honda Insight</p> <p>Hyundai Elantra (built after September 2018)</p> <p>Kia Forte</p> <p>Kia Niro hybrid</p> <p>Kia Niro Plug-In Hybrid</p> <p>Subaru Crosstrek</p> <p>Subaru Impreza 4-door sedan</p> <p>Subaru Impreza wagon</p> <p>Subaru WRX</p>
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Midsize cars	<p>Hyundai Sonata</p> <p>Kia Optima</p> <p>Subaru Legacy</p> <p>Subaru Outback</p> <p>Toyota Camry</p>
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Midsize luxury cars	<p>Genesis G70</p> <p>Lexus ES</p>
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Large car	<p>Toyota Avalon (built after September 2018)</p>
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Large luxury cars	<p>BMW 5 series</p> <p>Genesis G80</p> <p>Genesis G90</p> <p>Mercedes-Benz E-Class 4-door sedan</p>
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Small SUVs	<p>Hyundai Kona</p> <p>Mazda CX-5</p>
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Midsize SUVs	<p>Hyundai Santa Fe</p> <p>Kia Sorento</p> <p>Subaru Ascent</p>
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Midsize luxury SUVs	<p>Acura RDX</p> <p>BMW X3</p> <p>Mercedes-Benz GLC</p> <p>Mercedes-Benz GLE-Class</p>
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2019 TOP SAFETY PICK

- ▶ Good ratings in the driver-side small overlap front, moderate overlap front, side, roof strength and head restraint tests
- ▶ Acceptable or good rating in the passenger-side small overlap front test
- ▶ Advanced or superior rating for front crash prevention
- ▶ Acceptable or good headlight rating

Minicars	<p>Hyundai Accent</p> <p>Kia Rio 4-door sedan</p>
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Small cars	<p>Hyundai Elantra GT</p> <p>Hyundai Ioniq Hybrid</p> <p>Hyundai Ioniq Plug-in Hybrid (built after July 2018)</p> <p>Kia Soul</p> <p>Nissan Kicks</p> <p>Toyota Corolla 4-door hatchback</p>
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Midsize cars	<p>Honda Accord</p> <p>Nissan Altima</p>
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Midsize luxury cars	<p>Audi A3</p> <p>Audi A4</p> <p>Mercedes-Benz C-Class 4-door sedan</p>
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Large car	<p>Kia Cadenza</p>
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Small SUVs	<p>BMW X2</p> <p>Honda CR-V</p> <p>Hyundai Tucson</p> <p>Mazda CX-3</p> <p>Mitsubishi Outlander</p> <p>Subaru Forester</p>
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Midsize SUVs	<p>Honda Pilot</p> <p>Hyundai Santa Fe XL</p> <p>Mazda CX-9</p> <p>Nissan Pathfinder (built after August 2018)</p> <p>Toyota Highlander</p>
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Minivans	<p>Chrysler Pacifica</p> <p>Honda Odyssey</p>
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For details on these and other vehicles go to [iihs.org/ratings](https://www.iihs.org/ratings).

(« from p. 2) earns two top-tier awards and a *TOP SAFETY PICK*. Honda and its Acura brand pick up two *TOP SAFETY PICK+* awards and four *TOP SAFETY PICKs*. Mazda has one *TOP SAFETY PICK+* and two *TOP SAFETY PICKs* for 2019.

Near misses on headlights, passenger-side crash protection

Besides the Forester, 17 other vehicles just missed achieving the top award because of acceptable-rated headlights. The Honda Accord, Mitsubishi Outlander, Nissan Altima and Toyota Corolla are among this group. IIHS began rating headlights in

passenger side as they made improvements to achieve better performance in the driver-side small overlap front test, introduced in 2012. IIHS began rating vehicles in the passenger-side test in 2017 and added it to award criteria for 2018.

Five vehicles fell short of *TOP SAFETY PICK+* because of an acceptable rating in the passenger-side small overlap test and acceptable-rated headlights. These are the Chrysler Pacifica, Hyundai Accent, Nissan Kicks, Nissan Pathfinder and Toyota Highlander.

“Several automakers still need to bring their vehicles up to speed when it comes to offering advanced levels of safety and

Under the IIHS test verification program, manufacturers can submit their own test data for certain ratings. If a model has a good driver-side small overlap rating, automakers may submit video footage and data from a passenger-side test conducted using the IIHS protocol, and IIHS will evaluate the information and assign a rating. The ratings are subject to occasional audit tests. Verification allows more vehicles to vie for a 2019 *TOP SAFETY PICK+* award than IIHS would have time to test on its own.

As 2019 progresses, the winner’s list will grow as new models are evaluated. By the



Subaru Outback

The Subaru brand leads with seven 2019 *TOP SAFETY PICK+* winners. They are the Ascent, Crosstrek, Impreza sedan and wagon, Legacy, Outback and WRX. The Forester falls shy of the top award because its headlights rate acceptable but qualifies for *TOP SAFETY PICK*.

2016 based on research showing that many headlights don’t do a good job of adequately lighting the road at night while limiting glare for oncoming drivers.

Passenger-side protection in small overlap crashes was a hurdle that kept four vehicles from reaching *TOP SAFETY PICK+* status. The Honda Pilot, for example, has good-rated headlights and a superior-rated auto-brake system, but an acceptable rating in the passenger-side small overlap front test limits the SUV to a *TOP SAFETY PICK* award.

The Institute developed the passenger-side small overlap front crash test after it became clear that some manufacturers weren’t paying sufficient attention to the

headlights that provide good visibility,” Harkey says.

Absent from the winner’s circle are Fiat Chrysler’s Dodge, Jeep and Ram brands; Ford and its Lincoln brand; General Motors’ Buick, Cadillac, Chevrolet and GMC brands; and Tesla.

The Ford Fusion and the Ram 1500 crew cab, for instance, are held back by underperforming headlights. Several Dodge and Ford models with older designs still lack a good rating for driver-side protection in a small overlap front crash.

Volvo hasn’t yet qualified for a 2019 award due to missing passenger-side small overlap front test results.



Nissan Altima

The Nissan Altima is among the 18 vehicles that just miss the 2019 top-tier award because they lack good-rated headlights.

fall of 2018, 34 vehicles had earned the 2018 *TOP SAFETY PICK+* award, and 54 had earned 2018 *TOP SAFETY PICK*. ■

Early intervention, gentle steering inputs may hold the key to driver acceptance of lane departure prevention systems

Guiding drivers to stay in their lanes with slight nudges from the steering wheel and subtle braking as soon as tires start to drift versus later and more abrupt interventions may be key to boosting use of lane departure prevention systems, a new IIHS study indicates.

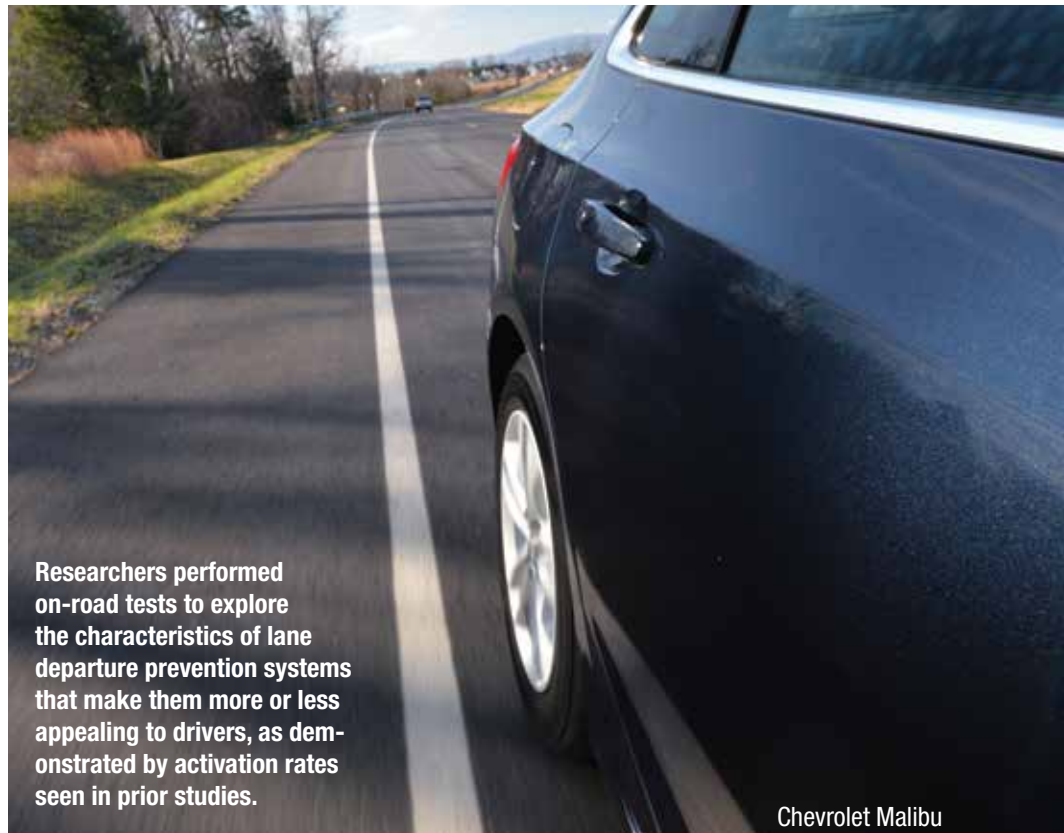
Of all current crash avoidance technologies, features meant to help drivers stay in their travel lane get turned off the most. Still, some lane departure prevention systems manage to escape driver scorn.

A 2017 IIHS observational survey of vehicles brought to dealership service centers found that lane departure prevention systems in General Motors and Volvo vehicles were more likely to be active than ones in Ford and Honda models (see *Status Report*, June 22, 2017, at iihs.org). All of the systems are designed to keep vehicles in their lanes by warning, braking, and/or steering, and drivers can deactivate them.

In new on-road tests, IIHS researchers dug into the characteristics of lane departure prevention systems from Ford, General Motors, Honda and Volvo to evaluate where steering or braking occurred relative to lane markings, and whether the efforts successfully kept the vehicles in their travel lanes.

The test vehicles included a Chevrolet Malibu with Lane Keep Assist, Ford Fusion with Lane Keeping System, and Honda Accord with Road Departure Mitigation — all 2016 model cars — and a 2018 model Volvo S90 with Lane Keeping Aid.

The specific functions of each system vary slightly, but all are designed to help avoid crashes due to unintended lane departures, which can occur when drivers are distracted or drowsy. If sensors detect the vehicle approaching a lane marking when the turn signal isn't activated, the system acts to redirect the vehicle with automated steering or braking. Each system also may try to get the driver's attention with auditory, visual or tactile warnings.



Researchers performed on-road tests to explore the characteristics of lane departure prevention systems that make them more or less appealing to drivers, as demonstrated by activation rates seen in prior studies.

Chevrolet Malibu

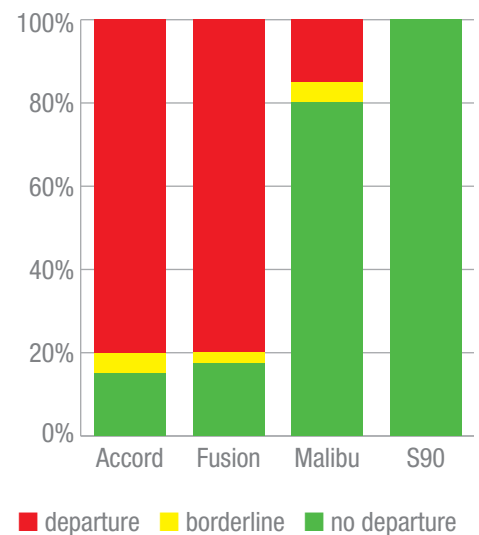
IIHS technicians outfitted all of the vehicles with two exterior and two interior cameras, plus a data logger with a GPS antenna to record vehicle speed, latitude and longitude. Yaw rate also was recorded. Tests were conducted at 50 mph with cruise control engaged on a four-lane divided road.

In each vehicle, a test driver induced 40 lane drifts on left and right curves by steering the vehicle straight into the curve so that vehicles departed in the opposite direction and 40 lane drifts on straightaways by slight steering input to direct the vehicle to the left and right lane markers.

Researchers used video from the outboard cameras and video from the camera aimed at the steering wheel to assess whether a vehicle crossed lane markers by more than 35 centimeters (about 14 inches) on any of its trials. »

Did car depart lane by more than 35 cm?

Percentage of trial outcomes across all scenarios with a solid lane marker





Volvo S90

The Volvo S90's lane-keeping system had a much higher than average observed use rate in a prior IIHS study of vehicles at service centers.

Waiting too long to initiate steering input or failing to prevent lane drifts greater than 35 centimeters may be what is prompting some drivers to turn off lane departure prevention systems.

(« from p. 5) Both the Malibu and S90 systems provided steering input further inside the lane than the Accord and Fusion, and they produced the lowest mean peak changes in the yaw rate. On both curves and straightaways, the Malibu and S90 avoided a much larger proportion of lane marker crossings exceeding 35 centimeters than the Accord and Fusion.

The S90 avoided crossing the inside edge of solid lane markers by more than 35 centimeters on 100 percent of the trials, and the Malibu avoided doing so on 80 percent of the trials. In contrast, the Accord and Fusion avoided crossing lane markers by more than 35 centimeters in less than 20 percent of the trials.

“Intervention that comes sooner rather than later may allow for more subtle input that keeps the vehicle in its lane, and it may encourage drivers to leave lane departure prevention on once they have experienced the system,” says Ian Reagan, a senior research scientist with IIHS and the study’s lead author.

“Waiting too long to initiate steering input or failing to prevent lane drifts greater than 35 centimeters may be what is prompting some drivers to turn off the systems,” he says.

For a copy of “Exploring relationships between observed activation rates and functional attributes of lane departure prevention” by I.J. Reagan, J.B. Cicchino and C.J. Montalbano, email StatusReport@iihs.org. ■

Pedestrian detection test protocol guides coming IIHS ratings

In November, IIHS shared with manufacturers the protocol engineers use to evaluate automatic emergency braking systems that can detect and brake for pedestrians in preparation for the early 2019 release of the first IIHS ratings of this feature.

The pedestrian autobrake test is the fourth crash avoidance evaluation in the Institute’s battery of safety tests, alongside ratings of front crash prevention, rear crash prevention and headlights.

IIHS engineers have been conducting research tests with a variety of cars and SUVs to pave the way for the new program. A group of 11 small SUVs, all 2018–19 models, will be the first rated.

In line with IIHS ratings for front and rear crash prevention, vehicles will be rated as basic, advanced or superior, based on their ability to avoid or mitigate a crash with pedestrian dummies in track tests at different speeds.

The tests simulate these potential collisions:

- ▶ An adult pedestrian crosses a street from the right side of the vehicle and perpendicular to its path, with an impact location, in cases when autobrake doesn’t intervene, midway between the vehicle center line and right edge of the vehicle’s front end;
- ▶ A child pedestrian runs across a street from behind two vehicles parked on the right side of the vehicle’s path, with a potential impact location on its front end at the center line;
- ▶ An adult pedestrian in the lane near the road’s edge facing away from traffic, midway between the vehicle’s center line and right side.

Points are awarded based on average speed reductions for five repeated test runs in clear weather on dry pavement during the daytime. Tests are conducted at 20 (12 mph) and 40 km/h (25 mph) in the perpendicular adult and child scenarios, and at 40 and 60 km/h (37 mph) in the parallel adult scenario. Systems that issue a timely warning get a 1-point credit in the parallel adult test.

“The test with the small child dummy is the toughest,” says David Aylor, manager of active safety testing at IIHS. “The dummy is hidden by a car and an SUV parked on the right side of the road as the test vehicle approaches, so there’s no clear sight line for the cameras — or driver — until the dummy emerges in the vehicle’s path.”

Although crashes involving child pedestrians are rare in comparison to ones involving adults, engineers are designing these systems to take into account this vulnerable population.

About a third of 2019 models have a standard autobrake system with pedestrian detection capabilities, and another third have an optional system that responds to pedestrians.

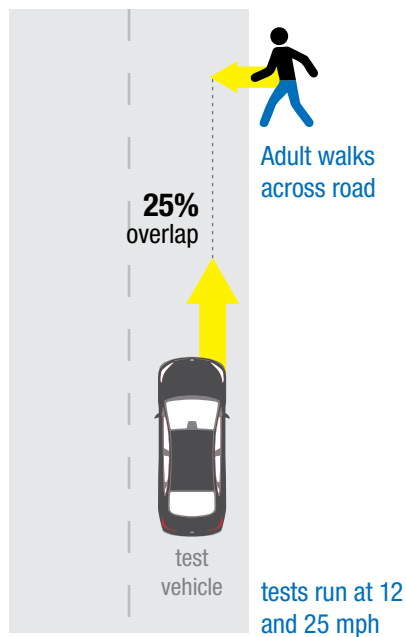
Autobrake with pedestrian detection already is making a difference in insurance claims. A 2017 HLDI analysis found that Subaru vehicles equipped with pedestrian detection had claim rates for pedestrian injuries that were 35 percent lower than the same vehicles without the system (see *Status Report*, May 8, 2018, at iihs.org).



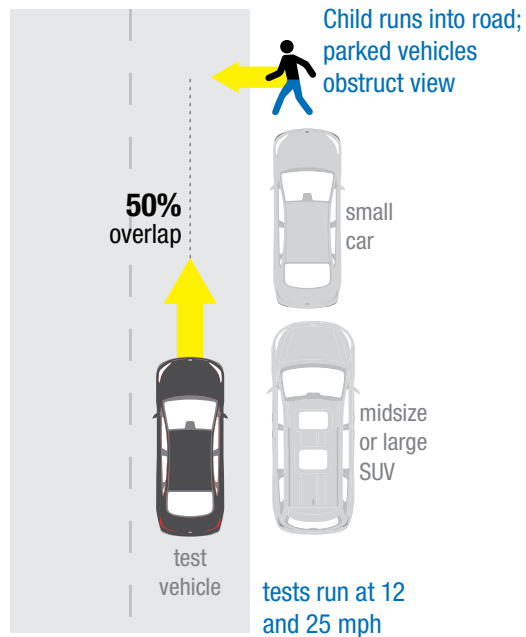
Infiniti QX60

Pedestrian test scenarios

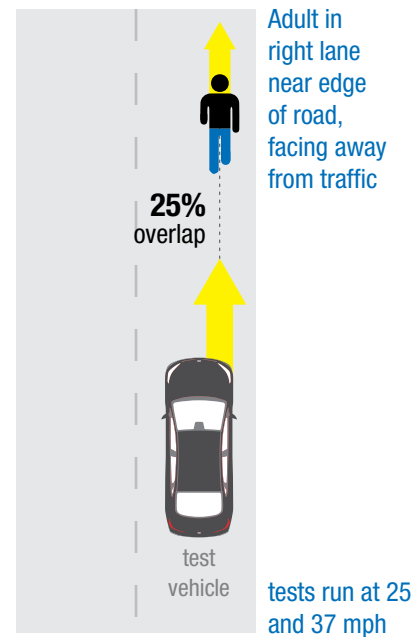
Perpendicular adult



Perpendicular child



Parallel adult



A 2011 IIHS analysis of 2005-09 crash data estimated that pedestrian detection systems could potentially mitigate or prevent up to 65 percent of single-vehicle crashes with pedestrians in the three most common crash configurations and 58 percent of pedestrian deaths in these crashes (see *Status Report*, March 30, 2011).

A total of 5,977 pedestrian deaths occurred in 2017. Of these, 170

were children younger than age 13. Although pedestrian fatalities in 2017 were 20 percent lower than in 1975, they have increased 45 percent since reaching their lowest point in 2009.

For a copy of the IIHS Pedestrian Autonomous Emergency Braking Test Protocol, go to www.iihs.org/iihs/ratings/technical-information/technical-protocols. ■

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Lane departure prevention may win over drivers with gentle steering inputs ▶ 5

Pedestrian detection test protocol guides coming IIHS ratings ▶ 6

Vol. 53, No. 9
December 19, 2018

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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.

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Selective Insurance Company of America
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