



# Status Report

Insurance Institute for Highway Safety | Highway Loss Data Institute

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## Making way for e-scooters

With automation, more familiarity  
means less focus

IIHS awards drive headlight improvements

Standard autobrake becomes the norm



# Most e-scooter rider injuries happen on sidewalk, study finds

City planners and many pedestrians have wondered how to get electric scooters off the sidewalk, but two new studies from IIHS raise a different question: Just where *should* e-scooters be ridden?

“We didn’t see many e-scooter crashes with motor vehicles, and that may be a result of riders sticking mostly to the sidewalk,” says Jessica Cicchino, IIHS vice president for research and the lead author of the studies. “On the other hand, there are legitimate concerns that sidewalk riders could crash into pedestrians.”

Already, many cities have enacted restrictions limiting e-scooter use on sidewalks or ordinances barring them from pedestrian areas altogether. Neighborhood associations and advocacy groups like the National Disability Rights Network have also pushed for more stringent regulations.

To explore how e-scooters are affecting road safety, IIHS researchers interviewed more than 100 e-scooter riders whose injuries brought them to the emergency room at George Washington University Hospital in Washington, D.C., between March and November 2019. One study examined how the severity of their injuries varied according to where and how they were injured. A second one compared the rider demographics, usage patterns and injuries with those of 377 bicyclists who were interviewed as part of an earlier study.

Broadly speaking, the researchers found that e-scooter riders suffered injuries more frequently per mile traveled than bicyclists, but bicyclists were 3 times as likely as scooter riders to be hit by motor vehicles. In contrast, e-scooter riders were twice as likely as bicyclists to get injured because of a pothole or crack in the pavement or other infrastructure like a signpost or curb.

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## /i\ IIHS RESEARCH

“Severity of e-scooter rider injuries associated with trip characteristics” by J.B. Cicchino, P.E. Kulie and M.L. McCarthy

“Injuries related to electric scooter and bicycle use in a Washington, DC, emergency department” by J.B. Cicchino, P.E. Kulie and M.L. McCarthy

To request these papers, email [researchpapers@iihs.org](mailto:researchpapers@iihs.org).

## Are electric scooters

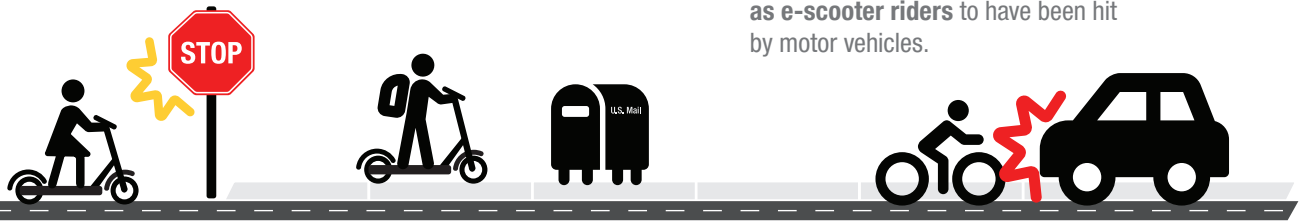
## more dangerous than bikes?

E-scooter riders are **injured more frequently per mile traveled** than bicyclists.

Injured e-scooter riders are **twice as likely as bicyclists** to have struck a pothole, curb, signpost, etc.

Nearly 3 out of 5 injured e-scooter riders were hurt **while riding on the sidewalk**.

**BUT** injured bicyclists are **3 times as likely as e-scooter riders** to have been hit by motor vehicles.



“When you’re riding a bicycle, because you’re sitting down, you can do a lot with your legs,” says 45-year-old Eze Amos of Charlottesville, Virginia, who recently switched from an e-scooter to an electric bike. “If you brake suddenly with a scooter, you will fly off it. If there’s a little hole in the road, you will fly off it.”

Nearly 3 out of 5 e-scooter riders were injured riding on the sidewalk — and about a third of these riders got those injuries in places where sidewalk riding is prohibited. Only about 1 out of 5 was injured riding in the bike lane, multiuse trail or other off-road location.

Only about a quarter of the injured scooter riders were commuting to work. The rest were running errands or riding for fun or a social trip, like 23-year-old Kavita Kothari, who used shared e-scooters on trips to D.C. while she was a student at the University of Maryland. She and her friends typically rode on the sidewalk.

“We used the bike lane when one was available,” she says. “But I personally don’t feel safe riding a scooter in the middle of traffic.”

Past research has shown that most e-scooter riders prefer the bike lane overall, and the Institute found that one was rarely available in the instances in which riders were injured in the road or sidewalk. Moreover, riding alongside pedestrians may not be sustainable as usage continues to expand.

E-scooter companies like Bird, Lime, Lyft and Uber have seen ridership soar over the past several years, as urban planners and environmentalists seek to encourage micro-mobility and eliminate short car trips that

contribute to greenhouse gas emissions. Shared e-scooters logged 86 million trips in the U.S. in 2019. Though e-scooter programs stalled as COVID-19 began, that number may grow as the pandemic grinds on and commuters look for socially distanced alternatives to the bus and subway.

At the same time, e-scooter riders may find they aren’t entirely welcome on any part of their city’s transportation network. Posters in bike forums sometimes complain about slow scooters in the bike lane, while some city administrators are struggling to get e-scooter riders off the sidewalk or force them to go even slower.

Operators were required to cap the top speed of e-scooters at 10 mph in D.C. beginning in January 2019, and sidewalk riding is prohibited in certain areas downtown. Cities like Denver and San Antonio have banned e-scooters from the sidewalks altogether, and other communities have contracted with e-scooter companies to keep them off the sidewalk or control their speeds. But that could be a trade-off where safety is concerned.

“The picture is still not clear when it comes to where scooters should be ridden,” says Cicchino. “Our results suggest that moving scooters off the sidewalk could put riders at risk of more severe injuries, but as things stand they might be suffering these lesser injuries more often.”

The e-scooter riders who were hurt riding in motor vehicle travel lanes were more likely to sustain moderately severe injuries than those hurt riding on sidewalks, bike lanes or multiuse trails. Moving vehicles accounted for only 13 percent of the injuries to e-scooter riders, compared with 40 percent for bicycles.

Despite the prevalence of sidewalk riding, only six nonriders came to the emergency room with injuries caused by e-scooters during the study period. Four of them were pedestrians or bicyclists who fell tripping over, hitting or trying to avoid an e-scooter that wasn’t in use.

Bicyclists and e-scooter riders sustained different kinds of injuries, but they were mostly of similar severity.

About 60 percent of both groups sustained minor injuries and 9 percent in each group were admitted to the hospital. E-scooter riders treated in the emergency room suffered concussions with loss of consciousness and skull fractures more often than bicyclists. Only 2 percent of the injured e-scooter riders reported wearing a helmet, compared with 66 percent of bicyclists treated in the emergency room. One likely explanation is that most e-scooters are shared, and using one is often a spontaneous decision.

“I would probably never carry a helmet, because I don’t ride [e-scooters] that often,” explains D.C. resident Jessica Ruf, 24. “If they provided one, I probably wouldn’t use it because of hygiene.”

Scooter usage may continue to grow rapidly for quite some time, but some of the minor injuries suffered by riders may also disappear as the market matures. Nearly 40 percent of the interview subjects were injured on their first ride. In contrast, among the bicyclists interviewed in the emergency room, 80 percent said they cycle most days of the week during their main riding season.

“Inexperience increases crash risk for virtually every form of transportation,” says Cicchino. ■



# Drivers let their focus slip as they get used to partial automation

Drivers fidget with electronics and take both hands off the wheel more often as they develop trust in automated systems, new research from IIHS and the Massachusetts Institute of Technology's AgeLab shows.

To investigate how experience with automation affects driver disengagement, the researchers studied the driving behavior of 20 Massachusetts-based volunteers over a month's time as they gained familiarity with advanced driver assistance features, examining how often they removed both hands from the steering wheel or took their attention away from the road to do things like use their cell phone or adjust the controls on the vehicle's console.

One group of 10 drove a Land Rover Range Rover Evoque equipped with adaptive cruise control (ACC), which automatically keeps the vehicle traveling at a speed chosen by the driver while maintaining a pre-established following distance. Another 10 drove a Volvo S90 with both ACC and Pilot Assist, a partially automated system that combines ACC with lane-centering technology that keeps the vehicle positioned laterally in the travel lane.

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## /i\ IIHS RESEARCH

“Disengagement from driving when using automation during a 4-week field trial”  
by I.J. Reagan et al.

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

Under the classification system developed by SAE International, the levels of automation range from 0 (no automation) to 5 (fully self-driving). Level 1 systems can assist the driver with one driving task; ACC fits into this category. Level 2 systems, such as Pilot Assist, can assist with two tasks. Level 2 is the highest level of automation available in production vehicles today.

When the drivers first received the vehicles, there was little or no difference in how frequently they showed signs of disengagement, whether they were driving manually, using ACC or using Pilot Assist. After a month, however, they were substantially more likely to let their focus slip or take their hands off the wheel when using automation, and the impact of Volvo's Level 2 system was more dramatic than that of ACC alone, says IIHS Senior Research Scientist Ian Reagan, the lead author of the study.

“Drivers were more than twice as likely to show signs of disengagement after a month of using Pilot Assist compared with the beginning of the study,” Reagan says. “Compared with driving manually, they were more than 12 times as likely to take both hands off the wheel after they'd gotten used to how the lane centering worked.”

Pilot Assist and similar systems like Tesla's Autopilot, Cadillac's Super Cruise and Mercedes-Benz's Intelligent Drive are not designed to replace the driver. They have trouble negotiating many common road features, so the driver must be in control at all times. However, with the automation

managing steering and speed — quite well in some cases — it's easy for the driver to lose focus.

“This study supports our call for more robust ways of ensuring the driver is looking at the road and ready to take the wheel when using Level 2 systems,” says Reagan. “It shows some drivers may be getting lulled into a false sense of security over time.”

Earlier this year, IIHS issued a series of recommendations for improving how such systems monitor whether the driver is paying attention and how the systems react when that focus falters (see “Automated systems need stronger safeguards to keep drivers focused on the road,” March 12, 2020). The European New Car Assessment Program recently launched ratings for driver assistance systems that assess those capabilities in addition to how well the systems control the vehicle's speed and steering. However, U.S. regulators have yet to develop similar ratings or standards for evaluating partial automation systems.

When it comes to the effect of technology on driver behavior, the new study illustrates some clear differences between stand-alone ACC and the combination of ACC and lane centering.

In contrast with the disengagement observed with Pilot Assist, drivers of the S90 were less likely to become disengaged while using ACC than while driving manually, and that didn't change much over time. However, this observation was based on limited data, as by the end of the month most S90



# IIHS award criteria push manufacturers to scrap inferior headlights

At least 10 manufacturers have improved their 2021 headlight offerings by eliminating or modifying inferior choices, according to new IIHS ratings.

The *TOP SAFETY PICK+* award is driving the improvements. Beginning in 2020, vehicles have only been able to qualify for the higher of the Institute's two awards if they come equipped with good or acceptable headlights across all trims.

Those tougher requirements marked the latest stage in an effort that IIHS began five years ago to address a longstanding problem. About half of all fatal crashes in the U.S. occur in the dark, and more than a quarter occur on unlit roads. Nevertheless, manufacturers have historically sold many models with several different headlight systems of varying quality.

The Institute's first step to encourage better vehicle lighting was to introduce headlight ratings in 2016. At that time, the best-available headlights on only two of the 95 models IIHS tested earned a good rating (see "Headlights are still an afterthought on many vehicles," February 18, 2020). The next year, IIHS added headlight ratings to its award criteria.

IIHS adopted the more stringent 2020 criteria for *TOP SAFETY PICK+* to encourage manufacturers to make good-functioning headlights standard equipment. The new headlight requirement will remain in place for the 2021 awards.

"It's common sense that quality headlights protect against nighttime and other low-light crashes," says IIHS President David Harkey. "But even when manufacturers have offered good headlights, too often they were expensive add-ons that could be hard to find."

Many 2020 models fell short of the Institute's highest award as a result of the new headlight requirement. But manufacturers have reacted swiftly. In many cases, they simply stopped offering the systems that didn't perform well enough in IIHS tests.

For model year 2020, 85 out of 185 models tested could be purchased with good-rated headlights. In eight of those models, the good headlights were *(continued on next page)*

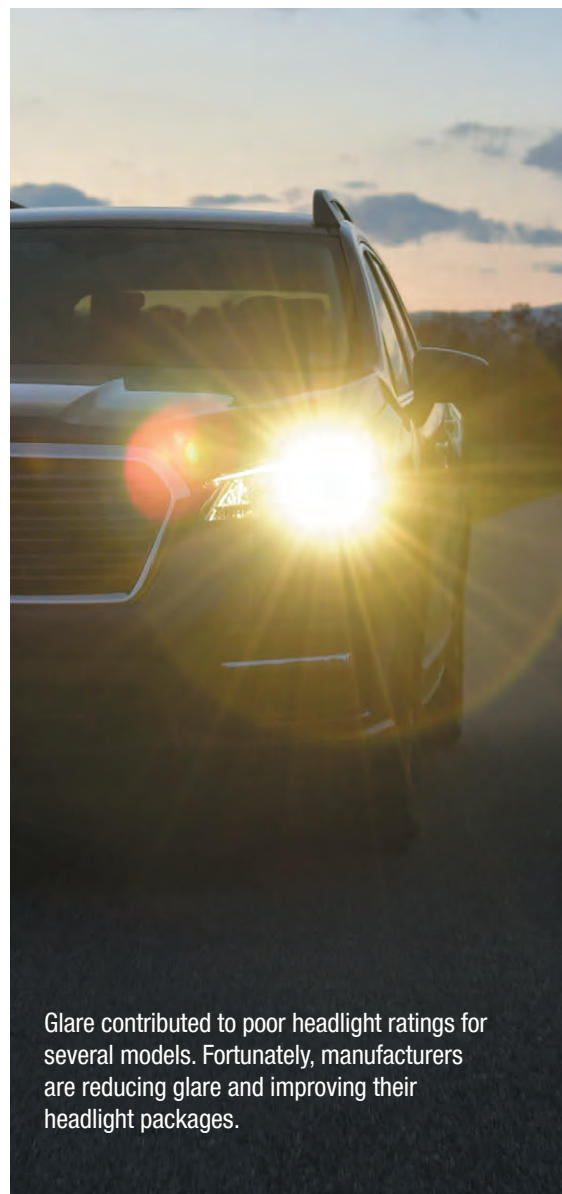
drivers who used either automated system used Pilot Assist rather than ACC.

Drivers of the Evoque, who used ACC often, were more likely to look at or pick up a cell phone while using the assistance technology than when driving manually, and that tendency increased substantially as they grew familiar with ACC. On the other hand, increased familiarity did not result in more frequent texting or other kinds of cell phone manipulation known to increase crash risk. Unlike drivers using Pilot Assist, drivers using ACC in both the Evoque and the S90 weren't any more likely to remove both hands from the wheel than when driving manually.

These differences could be important in weighing the impact on crash risk from ACC versus partial automation that combines ACC with lane centering. Field tests have suggested that ACC, by controlling speed and following distance, may have safety benefits that go beyond those provided by forward collision warning and automatic emergency braking. But neither field test data nor recent analysis of insurance claims shows similar safety benefits with the addition of lane centering.

At the same time, a number of high-profile crashes involving partial automation have demonstrated how dangerous too much trust in technology can be.

"Crash investigators have identified driver disengagement as a major factor in every probe of fatal crashes involving partial automation we've seen," says Reagan. ■



Glare contributed to poor headlight ratings for several models. Fortunately, manufacturers are reducing glare and improving their headlight packages.

(“Headlights” continued) standard. A total of 42 model year 2020 vehicles came exclusively with good- or acceptable-rated headlights.

Model year 2021 appears slated for further improvement.

So far, manufacturers have boosted 10 models to *TOP SAFETY PICK+* from *TOP SAFETY PICK* by eliminating or changing poor or marginal headlight packages. These include the Audi A7, Honda Accord, Hyundai Palisade, Mazda CX-30, Nissan Altima, Subaru Ascent, Toyota Highlander, Volvo S60, Volvo XC40 and Volvo XC60. The Honda Odyssey, which did not earn either award for the 2020 model because its pedestrian crash avoidance system was never evaluated, also qualifies for *TOP SAFETY PICK+* for the 2021 model with the elimination of two inferior headlight choices.

In addition to meeting the headlight criteria, *TOP SAFETY PICK* and *TOP SAFETY PICK+* winners must have good ratings in each of the Institute’s six crashworthiness tests. They also need available front crash prevention that earns advanced or superior ratings in both vehicle-to-vehicle and vehicle-to-pedestrian evaluations.

Carmakers also improved the headlights on four more vehicles that had earned *TOP SAFETY PICK+* awards for their 2020 models — the Acura RDX, Subaru Forester, Subaru Legacy and Subaru

Outback. Previously, these vehicles were available with different headlights that earned both good and acceptable ratings. For 2021, good-rated headlights are standard.

BMW also improved the headlights on the 2021 BMW 5 series by eliminating a marginal option. Though the vehicle doesn’t qualify for either award since its pedestrian crash avoidance has not been rated, every 2021 BMW 5 series now comes with good-rated headlights.

“More manufacturers are going to a single headlight package for many 2021 models, which is a big win for consumers,” Harkey says. “Sometimes, taking an inferior piece of equipment off the market is as important as the invention of a better one.”

IIHS rates headlights on the distance that their low beams and high beams illuminate straight and curved roads. On a straightaway, good-rated low beams illuminate the right side of the road ahead to at least 325 feet. Poor ones might light up 220 feet or even less.

IIHS engineers also deduct points for headlights that produce glare that can momentarily blind oncoming drivers. Extra credit is awarded for systems with high-beam assist, a feature that automatically switches between high beams and low beams, since research shows that most drivers don’t use their high beams enough. ■

## Models with improved headlights

	2021 model year		2020 model year	
	Headlight rating	Award	Headlight rating	Award
Acura RDX	G	■	G A	■
Audi A7	A A	■	A A P	■
BMW 5 series	G	■	G M	■
Honda Accord	G A	■	A M	■
Honda Odyssey	A	■	A M P	■
Hyundai Palisade	G	■	G M	■
Mazda CX-30	G G	■	G P	■
Nissan Altima	A A	■	A M	■
Subaru Ascent	G	■	G P	■
Subaru Forester	G	■	G A A	■
Subaru Legacy	G	■	G A	■
Subaru Outback	G	■	G A	■
Toyota Highlander	G A	■	G A P	■
Volvo S60	G	■	G M	■
Volvo XC40	G	■	G P	■
Volvo XC60	A	■	A M	■

G Good     M Marginal     ■ *TOP SAFETY PICK+*  
A Acceptable     P Poor     ■ *TOP SAFETY PICK*

“Sometimes, taking an inferior piece of equipment off the market is as important as the invention of a better one.”



The Volvo S60 previously was available with good or marginal headlights. The 2021 model comes only with good headlights.



# 10 automakers fulfill autobrake pledge ahead of schedule

Ten automakers have fulfilled a voluntary commitment to equip nearly all new light-duty vehicles they produce for the U.S. market with automatic emergency braking (AEB) — well ahead of the 2022-23 deadline.

The 10 manufacturers put the technology on more than 95 percent of units they produced between Sept. 1, 2019, and Aug. 31, 2020. Another three automakers exceeded 90 percent. However, five of the 20 automakers that signed the commitment equipped fewer than half their vehicles with AEB.

Of the 10 automakers that met the commitment ahead of schedule, four — Audi, Tesla, Mercedes-Benz and Volvo — did so last year, according to manufacturer reports. This year, they are joined by BMW, Hyundai, Mazda, Subaru, Toyota and Volkswagen.

The reports are submitted annually by the 20 manufacturers that pledged to equip at least 95 percent of their light-duty cars and trucks with a gross vehicle weight of 8,500 pounds or less with the crash avoidance technology by the production year beginning Sept. 1, 2022. The commitment was brokered in 2015 by IIHS and the National Highway Traffic Safety Administration.

“This voluntary effort is succeeding in getting an important crash prevention technology into vehicles quickly,” says IIHS President David Harkey. “It’s great to see AEB become a mainstream safety feature that’s now standard equipment not just on luxury cars and SUVs, but on affordable models as well.”

In addition to the 10 manufacturers already meeting the AEB commitment, another three — Ford, Honda and Nissan — put the technology on 9 out of 10 vehicles they produced in the last year.

That represents a big jump for Ford, from 65 percent in 2019 and just 6 percent the year before.

Ford is also ahead of the game for the next stage of the commitment — installing AEB on vehicles in the 8,501-10,000-pound range by 2025-26. Ford has equipped 62 percent of those heavier vehicles with AEB.

Of the four other automakers that reported producing vehicles in that range for the U.S. market, Fiat Chrysler was at 11 percent and Nissan 9 percent. Mercedes-Benz and General Motors were both at zero.

The voluntary commitment doesn’t specify phase-in targets, but Fiat Chrysler, General Motors, Jaguar Land Rover, Maserati, Mitsubishi and Porsche have some catching up to do to meet the 2022-23 deadline for light-duty vehicles. In the past year, they equipped fewer than half of the units they produced with AEB.

Under the terms, manufacturers must attest that the AEB on their vehicles meets certain performance standards for both forward collision warning and automatic braking.

The voluntary commitment is expected to prevent 42,000 crashes and 20,000 injuries by 2025. The estimate is based on IIHS research that found that front crash prevention systems with both forward collision warning and automatic braking cut rear-end crashes by half. ■

## Percent of vehicles produced Sept. 1 to Aug. 31 with AEB

As reported by manufacturer for light-duty vehicles weighing 8,500 pounds or less

	2019	2020
Tesla	100	100
Volvo	100	100
Audi	99	99
BMW	84	99
Subaru	84	99
Volkswagen	92	98
Mercedes-Benz	99	97
Toyota/Lexus	92	97
Hyundai/Genesis	78	96
Mazda	80	96
Honda/Acura	86	94
Nissan/Infiniti	86	93
Ford/Lincoln	65	91
Kia	59	75
Porsche	38	55
Maserati	69	48
General Motors	29	47
Mitsubishi	5	39
Fiat Chrysler	10	14
Jaguar Land Rover	0	0



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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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