

Status Report

Insurance Institute for Highway Safety | Highway Loss Data Institute

Crashes avoided

Front crash prevention slashes police-reported rear-end crashes



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January 28, 2016

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Autobrake and forward collision warning are helping drivers avoid a pitfall of traveling congested roads.

Vehicles equipped with front crash prevention are much less likely to rear-end other vehicles, IIHS has found in the first study of the feature's effectiveness using U.S. police-reported crash data.

Systems with automatic braking reduce rear-end crashes by about 40 percent on average, while forward collision warning alone cuts them by 23 percent, the study found. The autobrake systems also greatly reduce injury crashes.

If all vehicles had been equipped with autobrake that worked as well as the systems studied, there would have been at least 700,000 fewer police-reported rear-end crashes in 2013. That number represents 13 percent of police-reported crashes overall.

“The success of front crash prevention represents a big step toward safer roads,” says David Zuby, IIHS chief research officer. “As this technology becomes more widespread, we can expect to see noticeably fewer rear-end crashes. The same goes for the whiplash injuries that often result from these crashes and can cause a lot of pain and lost productivity.”

Front crash prevention is steadily becoming more prevalent, but in most cases it is offered as optional equipment. That may soon change, however. In September, the National Highway Traffic Safety Administration and IIHS announced an agreement in principle with automakers to make autobrake standard on all models.

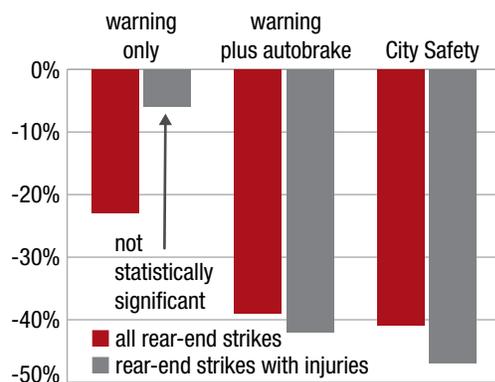
The new IIHS findings are in line with earlier research by HLDI based on insurance claim rates (see *Status Report*, Aug. 26, 2015, and July 3, 2012, at iihs.org).

Using police reports allows researchers to identify front-to-rear crashes in order to gauge front crash prevention systems' effectiveness specifically for the type of collision they are designed to address.

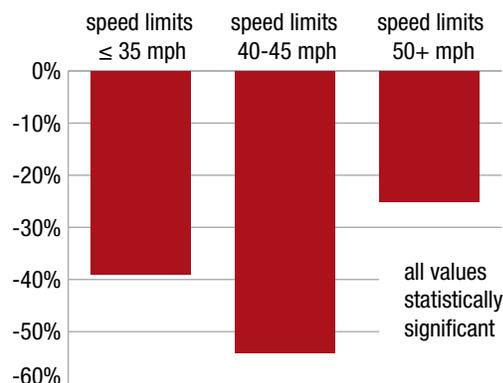
For the study, researchers looked at police-reported rear-end crashes in 22 states during 2010-14 involving Acura, Honda, Mercedes-Benz, Subaru and Volvo vehicles with optional front crash prevention. The crash rates of vehicles equipped with the technology were compared with the crash rates of the same models without front crash prevention.



Percent difference in police-reported crash rates, vehicles with front crash prevention vs. vehicles without



Percent difference in rates of police-reported rear-end strikes by speed limit, Volvo S60 and XC60 combined vs. other midsize luxury cars and SUVs combined



If all vehicles had been equipped with autobrake, there would have been at least 700,000 fewer police-reported rear-end crashes in 2013.

Individual vehicles with the technology were identified using trim level information or, in some cases, lists of vehicle identification numbers supplied by the manufacturers.

A separate analysis of City Safety, Volvo’s standard low-speed autobrake system, was conducted by comparing the S60 with other midsize luxury four-door cars and the XC60 with other midsize luxury SUVs. Unlike the City Safety-equipped Volvos, none of the comparison vehicles had standard front crash prevention.

Only rear-end crashes in which the study and comparison models struck other vehicles were considered. Crashes in which those vehicles were struck from behind but didn’t strike a vehicle in front were left out,

since front crash prevention wouldn’t be expected to prevent them.

Information from HLDI’s database was used to control for factors that might have affected crash rates, including the vehicle’s garaging location and driver characteristics.

The analyses show that forward collision warning alone reduces rear-end crashes by 23 percent, while forward collision warning with autobrake reduces them by 39 percent. The reduction for City Safety is 41 percent.

The study also shows that autobrake reduces injuries. The rate of rear-end crashes with injuries decreases by 42 percent with forward collision warning with autobrake and 47 percent with City Safety. Forward collision warning alone is associated with

a 6 percent decrease in rear-end injury crashes, though that finding isn’t statistically significant.

“Even when a crash isn’t avoided, systems that have autobrake have a good chance of preventing injuries by reducing the impact speed,” says Jessica Cicchino, the study’s author and the Institute’s vice president for research. “Still, it’s surprising that forward collision warning didn’t show more of an injury benefit, given that HLDI has found big reductions in injury claims with the feature.”

One difficulty in studying optional front crash prevention systems is that they often are packaged with other crash avoidance technologies. For example, all of the study



Front crash prevention goes by many names

IIHS adopted the umbrella term "front crash prevention" to refer to any system that uses sensors to detect other vehicles or obstacles in order to prevent or mitigate a frontal crash. The term includes systems that issue warnings, systems that automatically brake, and systems that do both.

Although useful as a descriptive phrase, "front crash prevention" may not be familiar to auto dealers. The terms "forward collision warning" and "automatic emergency braking" are somewhat more widely used. Mostly, vehicle manufacturers and dealers use their own names for these features. For example, Buick offers Forward Collision Alert and Automatic Collision Preparation. Audi's front crash prevention system is called Audi pre sense

front, while Mercedes-Benz has Distronic Plus, among other names. Adding to the confusion, manufacturers aren't always consistent. For example, they may use one name for a feature in marketing materials and another name on the window sticker. In many cases, optional front crash prevention comes as part of a package of features that has its own name as well. To assist consumers, IIHS lists the manufacturer's name — or one of the names — for the system, as well as the package name, for each vehicle rated for front crash prevention at iihs.org/ratings. This information can be found in the front crash prevention tab on the ratings page for each vehicle.

vehicles except for some Honda Accords and most of the City Safety-equipped Volvos had adaptive cruise control. Adaptive cruise control works like regular cruise control but uses sensors to track the vehicle in front to maintain a safe following distance.

It is possible that some of the observed benefit for front crash prevention systems in avoiding rear-end collisions is actually a result of adaptive cruise control. However, unlike front crash prevention, drivers must activate adaptive cruise control every time they use it, and the feature generally isn't

used for all types of driving. Lane departure warning was packaged with front crash prevention on the Hondas, Subarus and some Volvos included in the study, but it is unlikely to have affected rear-end crashes. Cicchino performed an additional analysis of City Safety vehicles to see how the effect of the system varied depending on a road's speed limit. The study vehicles had a version of City Safety that works at speeds up to 19 mph. (A newer version works at speeds up to 30 mph.)

Despite its speed limitation, City Safety had the biggest effect on roads with speed limits of 40-45 mph. The equipped Volvos rear-ended other vehicles 54 percent less frequently than comparable vehicles on those roads. The reduction was 39 percent on roads with speed limits of 35 mph or less and 25 percent on roads with speed limits of 50 mph or higher.

"At first blush it's surprising that this low-speed system was most effective on 40-45 mph roads," Cicchino says. "However, these roads tend to have many traffic



Teens get back in driver's seat as economy picks up

Teenage drivers are returning to the roads in a trend that a new HLDI analysis links to the recent economic recovery.

Teenagers have the highest crash rate per mile traveled of any drivers, so the number of young people on the roads has important safety consequences.

Teen driving began to decline sharply about a decade ago. While many observers speculated that the proliferation of cellphones and social media had made driving less attractive to teenagers, HLDI showed there was a strong relationship between the decline in teen driving and rising teen unemployment (see *Status Report*, Nov. 7, 2013, at iihs.org).

In a reversal, from 2012 to 2014, more teenagers found jobs. At the same time, more teenagers began driving, an update to the HLDI study shows.

"It seems like many teens really do want to drive after all, and much of the earlier decline in driving was due to the disproportionate effect of the economy on teen employment," HLDI Vice President Matt Moore says. "When teenagers have jobs, they have more of a need to drive, along with money to help pay for it."

For the 2013 study and the current update, HLDI analysts looked at changes in the number of rated drivers 19 and younger under collision insurance policies in 49 states and the District of Columbia. A rated driver on a policy is typically the driver in the household considered to represent the greatest loss potential for the insured vehicle (usually the teen driver if there is one).

From 2006 to 2012, the number of rated drivers 19 and younger fell. The number of rated drivers ages 35-54, referred to in the study as prime-age drivers, also dropped, but not as sharply. The result was fewer teen drivers relative to prime-age drivers.

During 2013 and 2014, teen exposure went back up, while prime-age exposure continued to decline slightly.

Expressing the change as a ratio of teen drivers to prime-age drivers controls for

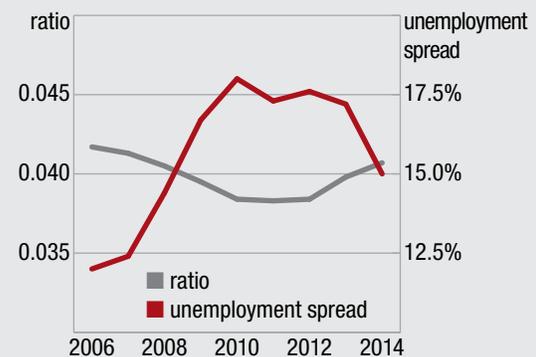
factors that aren't specific to teenagers. The ratio of teen drivers to prime-age drivers fell from 0.042 in 2006 to 0.038 in 2010 and then remained relatively constant through 2012. The ratio increased to 0.041 in 2014 as teens returned to the roads.

Meanwhile, the unemployment rate, defined as the percentage of the total labor force that is unemployed and actively seeking work, increased for both groups between 2006 and 2010, but the rise was steeper for teens. During 2013-14, the unemployment rate for both groups fell, with teens experiencing a sharper decrease.

Thus, the unemployment spread — the difference in unemployment rates for the two groups — increased during the height of the recession, leveled off after 2010 and declined in the past few years.

Looked at together, there is an inverse relationship between the unemployment

Ratio of teen drivers to prime-age drivers and unemployment spread between teens and prime-age workers



spread and the ratio of teen drivers to prime-age drivers.

Although population changes and changes in state licensing ages contributed somewhat to changes in the teen driver ratio, HLDI estimates that 67 percent of the ratio's increase between 2012 and 2014 is connected with the decreasing unemployment spread.

For a copy of the bulletin "Evaluation of changes in teenage driver exposure — an update," email publications@iihs.org. ■

lights, which reduce actual travel speeds in places. In addition, City Safety can come into play whenever there is congestion on a higher-speed road."

For copies of "Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates" and "Effectiveness of Volvo's City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates," both by J.B. Cicchino, email publications@iihs.org. ■



Most Honda owners turn off lane departure warning

Owners of Hondas with crash avoidance features are much more likely to have forward collision warning turned on than lane departure warning, IIHS researchers found in a recent observational survey.

The researchers observed vehicles brought in to Honda dealerships for service. They found that all but one of 184 models equipped with the two features had forward collision warning turned on, while only a third of vehicles had lane departure warning activated.

The findings are consistent with previous research showing that vehicle owners found lane departure warning more annoying than other crash avoidance technologies (see *Status Report*, March 13, 2014, Dec. 20, 2012, and Nov. 18, 2009, at iihs.org). They also may help explain why studies so far haven't found a consistent benefit from the feature, in contrast to forward collision warning (see *Status Report*, Aug. 26, 2015, and July 3, 2012).

Most lane departure warning systems use a camera to detect lane markings and depend on turn signal use to determine whether a driver intentionally changed lanes or not. Many people don't use turn signals consistently, so the result is a lot of alerts that drivers may perceive as false alarms. Camera sensors also may detect markings such as shifted lanes in construction zones that lead to more nuisance alerts.

"Lane departure warning has the potential to prevent a lot of the most serious crashes," says Ian Reagan, an IIHS senior research scientist and the study's lead author. "However, if people consider it a turn-signal nanny, they may not accept the feature."

For the new study, researchers observed 2013-15 Honda Accords, 2014-15 Odysseys and 2015 CR-Vs at dealerships in Germantown, Md., and Alexandria, Va.

In addition to driver preferences, another reason lane departure warning may be turned off more often in these Hondas is that it is simple to do so by pressing a

button near the instrument panel. In contrast, to turn off forward collision warning in the Accord and the Odyssey, a driver needs to navigate through several steps of the vehicle settings menu.

The CR-V has a button for its collision mitigation braking system, which includes forward collision warning. However none of the six CR-Vs observed had collision mitigation turned off.

All the vehicles retain the previous on/off setting for each of the two features from one trip to the next.

"In the future, it would be useful to compare systems with different types of alerts and levels of sensitivity to see whether those differences make people more or less likely to use the technologies," Reagan says.

For a copy of "Observed activation status of lane departure warning and forward collision warning of Honda vehicles at dealership service centers" by I.J. Reagan and A.T. McCartt, email publications@iihs.org. ■

Drivers of all ages benefit from Honda crash avoidance features

The combination of forward collision warning and lane departure warning is preventing crashes among Honda Accord drivers of all ages, a new HLDI analysis has found. The observed benefit is biggest for drivers younger than 25.

Since the 2013 model year, Honda has been equipping many of its popular Accord cars, as well as Crosstour SUVs, with camera-based forward collision warning and lane departure warning systems. The Accord's Touring trim comes with a radar-based forward collision warning system and adaptive cruise control, as well as the same lane departure warning system offered on the other trim levels.

Evidence has been mounting in recent years that vehicles equipped with front crash prevention, including Hondas, have lower insurance claim rates (see *Status Report*, Aug. 26, 2015, at iihs.org).

The observed benefit from Honda's forward collision and lane departure warning features is biggest for drivers younger than 25. That's encouraging news because they are the most crash-prone group.

In an updated analysis, which includes the most recent data available, HLDI found that the rate of claims under property damage liability insurance, which covers damage to other vehicles and property, is 10 percent lower for Accords equipped with the camera-based forward collision and lane departure warning systems.

The frequency of claims under bodily injury liability insurance, which covers injuries to occupants of other vehicles or to other road users, is 24 percent lower with the feature. Claims under medical payment coverage, for injuries to people in the insured vehicle, are 22 percent lower.

The radar-based system with adaptive cruise control is associated with a 13 percent decrease in property damage liability claim frequency and a 27 percent decrease in medical payment claim frequency. Other effects weren't statistically significant.

HLDI analysts then looked at how the effectiveness varied by driver age. Focusing on the camera-based system, they found

that the drivers younger than 25 had the biggest claim rate reductions — 15 percent under property damage liability and 45 percent under bodily injury liability. For drivers ages 25-64, the declines were 10 percent under property damage liability and 20 percent under bodily injury liability. For drivers older than 64, the decreases were 7 percent and 25 percent, but they weren't statistically significant.

A limitation of the HLDI analysis is that the age of a driver is that of the rated driver — the one assigned to a vehicle for insurance purposes within a household. That person isn't always the one driving at the time of a crash.

The large effect for drivers younger than 25 is consistent with a recent HLDI analysis on point of impact. That study found that frontal crashes accounted for a greater proportion of collision claims made by young

drivers than by drivers of other ages. Based on other analyses of crash avoidance features, it is believed that most of the benefit from Honda's technology comes from forward collision warning, not lane departure warning (see *Status Report* special issue: crash avoidance, July 3, 2012).

The large benefit for young drivers is encouraging because overall they have the highest claim frequencies of any age group.

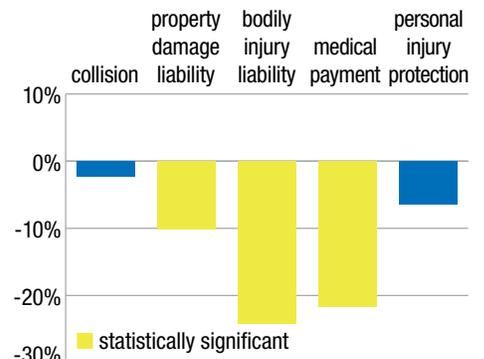
"It's good news that drivers of all ages are benefiting from Honda's forward collision and lane departure warning systems," HLDI Vice President Matt Moore says. "It's great news that the technology is helping the most crash-prone group."

For copies of the HLDI bulletins "2013-15 Honda Accord collision avoidance features," "Impact of Honda Accord collision avoidance features on claim frequency by rated driver age" and "Point of impact and claim size distribution for collision claims by rated driver age," email publications@iihs.org. ■

Percent differences in claim frequency for Hondas equipped with forward collision and lane departure warning features

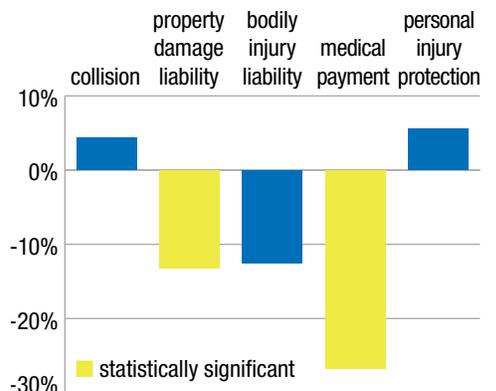
Camera-based system

Accord/Crosstour



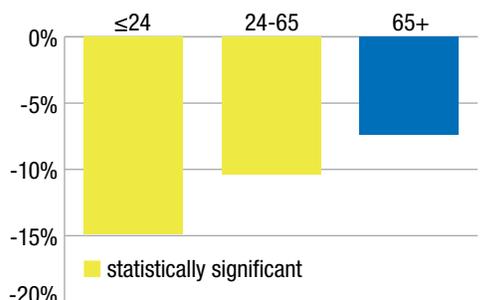
Radar-based system

Accord Touring with adaptive cruise control



Change in property damage liability claim frequency by driver age with forward collision and lane departure warning

Camera-based system



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**Vol. 51, No. 1
 January 28, 2016**

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StatusReport@iihs.org

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Editor: Kim Stewart
 Writer: Sarah Karush
 Art Director: Steve Ewens

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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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