



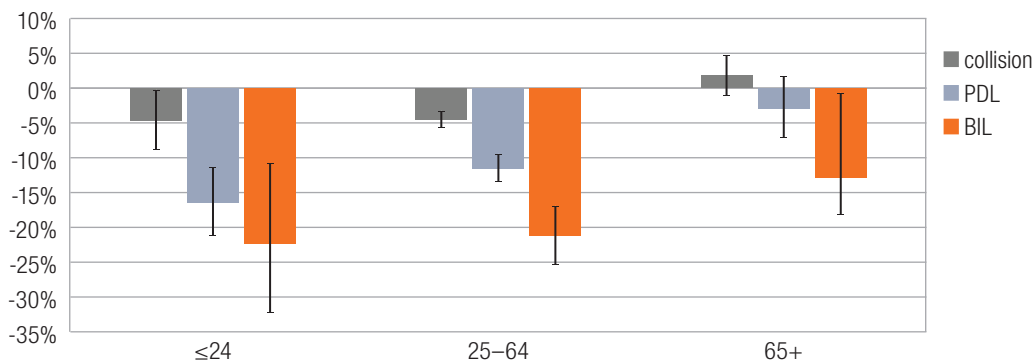
Impact of Honda Accord collision avoidance features on claim frequency by rated driver age

► Summary

Previous Highway Loss Data Institute (HLDI) studies have shown that many collision avoidance systems are associated with claim frequency reductions. This bulletin uses insurance loss data for the popular Honda Accord to provide an updated look at how those benefits vary by driver age. This is the fourth time this study has been conducted, yet it is important to continue to understand the potential benefits of these systems. The first analysis conducted in 2015 yielded significant results for five of the 15 estimates for FCW and LDW. The additional exposure in this report has resulted in twice as many significant results. The number of significant results for LaneWatch has increased from four to eleven.

The current results bolster the findings of the three prior studies (HLDI, 2015, 2016, 2017) that indicated the Accord's forward collision avoidance system has the largest benefits for the youngest age group for collision, property damage liability (PDL) and bodily injury (BI) liability coverages and narrow the previous confidence bounds. In contrast, the property damage liability and bodily injury benefits for Honda's LaneWatch blind spot detection system were shown to be highest for the oldest drivers. However, an additional supplemental analysis indicates that the observed benefits may not be due to LaneWatch but to other differences between vehicles with and without the feature.

Change in claim frequency by rated driver age and coverage type for FCW and LDW



► Introduction

The Insurance Institute for Highway Safety and the Highway Loss Data Institute (HLDI) have done a significant amount of research on collision avoidance systems, and the insurance loss benefits for front crash prevention are clear. These systems are associated with claim frequency reductions for all crash-related coverage types. Evaluations of police reported crashes show reductions in front-to-rear crashes and associated injuries. There are additional questions related to front crash prevention systems that need to be answered, however. One such question is how much the benefits of front crash prevention systems vary by rated driver age. The Honda Accord offers a unique opportunity to offer insights into this secondary question for several reasons. As one of the best-selling vehicles in America, the Accord provides enough data to examine losses by driver age. Additionally, it is available in just three vehicle variants (sedan, coupe and crosstour) with a limited number of features, making this group of 2013–15 vehicles fairly homogenous.

Prior HLDI studies have shown Honda’s forward collision warning with lane departure warning (FCW/LDW) and LaneWatch systems are beneficial (HLDI, 2019a), especially for rated drivers younger than 25 (HLDI, 2015, 2016, 2017). This HLDI bulletin updates those prior analyses with more exposure. The features included in this analysis are as follows:

Forward Collision Warning (FCW) uses a camera system located behind the windshield to assess the risk of a collision with leading traffic. The warning system has three driver-selectable range settings. When a potential crash is detected, lights flash in the heads-up display, the FCW indicator blinks, and a continuous beep sounds. The system is active only at speeds over 10 mph and can be deactivated by the driver. At each ignition cycle, the system defaults to the previous on/off setting. Vehicles with FCW also have LDW.

Lane Departure Warning (LDW) utilizes the same camera as forward collision warning to also identify traffic lane markings. Audio and visual warnings alert the driver if the vehicle is deviating from the intended lane. The system is functional at speeds between 40 and 90 mph, but does not warn the driver if the turn signal is on or the system determines the movement to be sufficiently sudden as to be evasive. The system can be deactivated by the driver. At each ignition cycle, the system defaults to the previous on/off setting.

LaneWatch is Honda’s term for a passenger-side-only blind spot monitor. A camera mounted behind the external passenger-side rearview mirror monitors the passenger side of the vehicle and displays an 80-degree field of view on the console-mounted information screen when the turn signal indicator is activated. Reference lines are also provided to indicate proximity. Both the turn signal indicator and reference lines are driver-controllable settings and can be deactivated. Upcoming navigation system instructions/maneuvers can also be given priority over the LaneWatch display. The entire LaneWatch system can be deactivated by the driver. At each ignition cycle, the system defaults to the previous on/off setting.

All the vehicles in this study were equipped with rear cameras. Because there were no vehicles without this feature, camera effectiveness could not be evaluated in this analysis. The vehicles in this analysis also may have been equipped with optional rear parking sensors. The analysis did not control for this feature, because the availability of rear parking sensors on a vehicle was not discernible from the vehicle identification number (VIN).

► Method

Vehicles

The vehicles included in this study are available in several different trim levels, which bundle together different equipment and features. Depending on the trim level, the collision avoidance features in this study are either standard or not available. The trim levels can be determined by the first ten digits of the VIN, so it is possible to identify vehicles with and without the collision avoidance features.

LaneWatch and the combination of FCW and LDW are offered as standard equipment on several 2013–15 Honda Accord models (trims). The Touring trim level of the Accord four-door was excluded from the analysis, because it is equipped with a different FCW system that uses a radar system instead of a camera and includes adaptive cruise control functionality. A prior HLDI analysis (2019a) indicated this system also is associated with reductions in losses. However, there is too little data by rated driver age to include it in this study. Honda Accord vehicles without these features served as the control vehicles in the current report.

Table 1 lists the exposure (measured in insured vehicle years) for the age groups included in the analysis. Seventy-five percent of the exposure is in the 25–64 age group, followed by 19 percent for drivers 65 and older, and 7 percent for the youngest age group (24 and younger).

Table 1: 2013–15 Honda Accord collision exposure by rated driver age				
Age	December 2015 exposure	December 2016 exposure	December 2017 exposure	Current exposure
≤24	64,154	113,614	163,871	299,249
25–64	771,854	1,356,598	1,941,338	3,325,810
65+	197,308	334,576	493,109	837,133

Rated drivers

The rated driver is the driver who is considered to represent the greatest loss potential for the insured vehicle. In a multiple-vehicle/driver household, how a driver is assigned to a vehicle can vary by insurance company and state. Information on the actual driver at the time of a loss is not available in the HLDI database. In the current study, the rated driver age groups were 24 and younger, 25–64, and 65 and older.

Insurance data

Automobile insurance covers damages to vehicles and property in crashes plus injuries to people involved in crashes. Different insurance coverages pay for vehicle damage versus injuries, and different coverages may apply depending on who is at fault. The current study is based on property damage liability (PDL), collision, bodily injury (BI) liability, personal injury protection (PIP), and medical payment (MedPay) coverages. Exposure is measured in insured vehicle years. An insured vehicle year is one vehicle insured for 1 year, two vehicles insured for 6 months, etc.

Because different crash avoidance features may affect different types of insurance coverage, it is important to understand how coverages vary among the states and how this affects inclusion in the analyses. Collision coverage insures against vehicle damage to an at-fault driver's vehicle sustained in a crash with an object or other vehicle; this coverage is common to all 50 states. PDL coverage insures against physical damage that at-fault drivers cause to other people's vehicle and property in crashes; this coverage exists in all states except Michigan, where vehicle damage is covered on a no-fault basis (the policy of each insured vehicle pays for the damage done to it in a crash, regardless of who is at fault).

Coverage of injuries is more complex. BI liability coverage insures against medical, hospital, and other expenses for injuries that at-fault drivers inflict on occupants of other vehicles or others on the road. Although motorists in most states may have BI liability coverage, this information is analyzed only in states where the at-fault driver has first obligation to pay for injuries (in the 33 states with traditional tort insurance systems). MedPay coverage, also sold in the 33 states with traditional tort insurance systems, covers injuries to insured drivers and the passengers in their vehicles, but not injuries to people in other vehicles involved in the crash. Seventeen other states employ no-fault injury systems (personal injury protection coverage, or PIP) that pay up to a specified amount for injuries to occupants of involved-insured vehicles, regardless of who is at fault in a collision. The District of Columbia has a hybrid insurance system for injuries and is excluded from the injury analysis.

Statistical methods

Regression analysis was used to quantify the effect of each vehicle feature by rated driver age while controlling for the other features and covariates. The covariates included calendar year, model year, garaging state, vehicle density (number of registered vehicles per square mile in the garaging zip code area), rated driver gender, rated driver marital status, deductible range (collision coverage only), and risk. For each safety feature studied, a binary variable was included. Claim frequency was modeled using a Poisson distribution, whereas claim severity (average loss payment per claim) was modeled using a Gamma distribution. Both models used a logarithmic link function. A separate regression was performed for each age group for a total of three regressions per feature per coverage.

Estimates for overall losses were derived from the claim frequency and claim severity models. Estimates for claim frequency, claim severity, and overall losses are presented for collision and PDL coverages. For PIP, BI, and MedPay coverages, three frequency estimates are presented. The first frequency is the frequency for all claims, including those that already have been paid and those for which money has been set aside for possible payment in the future, known as claims with reserves. The other two claim frequencies include only paid claims separated into low- and high-severity ranges. Note that the percentage of all injury claims that were paid by the date of analysis varies by coverage: 75.7 percent for PIP, 72.4 percent for BI, and 62.3 percent for MedPay. The low-severity range was less than \$1,000 for PIP and MedPay and less than \$5,000 for BI; high-severity covered all loss payments greater than that.

For space reasons, only the estimates for the individual crash avoidance features are shown on the following pages. To illustrate the analyses, however, the **Appendix** contains full model results for collision claim frequencies in age group 25–64. To further simplify the presentation here, the exponent of the parameter estimate was calculated, 1 was subtracted, and the resultant multiplied by 100. The resulting number corresponds to the effect of the feature on that loss measure. For example, the estimate of FCW/LDW effect on collision claim frequency for age group 25–64 was -0.0462; thus, for rated drivers 25–64, vehicles with FCW/LDW had 4.5 percent fewer collision claims than vehicles without FCW/LDW ($\exp(-0.0462)-1 \times 100 = -4.5$).

► Results

Full results for Honda’s collision avoidance systems by rated driver age group are presented in **Tables 2–7**. For each system, there are three tables of results—one for each rated driver age group (14–24, 25–64, 65+). Results by rated driver age group for FCW/LDW are contained in **Tables 2–4**; LaneWatch results are in **Tables 5–7**. The lower and upper bounds represent the 95 percent confidence limits for the estimates. Estimates that are statistically significant at the 95 percent confidence level are bolded.

FCW/LDW system

Results for the Honda Accord’s FCW system including LDW for rated drivers younger than 25 are summarized in **Table 2**. For vehicle damage losses, claim frequency was down for collision and PDL coverages by 4.6 percent and 16.5 percent, respectively. Both decreases were statistically significant.

For injury losses, claim frequency showed reductions for all the three coverage types, with the BI liability reduction being significant. Among paid claims, BI liability claim frequency showed a significant reduction for high-severity claims.

Table 2: Change in insurance losses for Forward Collision Warning (FCW) and Lane Departure Warning (LDW), for rated drivers younger than 25

Vehicle damage coverage type	Lower bound	FREQUENCY	Upper bound	Lower bound	SEVERITY	Upper bound	Lower bound	OVERALL LOSSES	Upper bound
Collision	-8.7%	-4.6%	-0.5%	-3.0%	1.5%	6.1%	-9.1%	-3.2%	2.9%
Property damage liability	-21.3%	-16.5%	-11.4%	-1.9%	4.1%	10.5%	-20.1%	-13.1%	-5.4%

Injury coverage type	Lower bound	FREQUENCY	Upper bound	Lower bound	LOW SEVERITY FREQUENCY	Upper bound	Lower bound	HIGH SEVERITY FREQUENCY	Upper bound
Bodily injury liability	-32.4%	-22.3%	-10.7%	-38.5%	-20.7%	2.2%	-39.9%	-26.4%	-10.1%
Medical payment	-22.0%	-6.3%	12.4%	-45.4%	-9.3%	50.9%	-22.2%	2.0%	33.7%
Personal injury protection	-13.2%	-0.9%	13.0%	-32.8%	-7.2%	28.2%	-12.0%	5.0%	25.2%

Results for the Honda Accord’s FCW system including LDW for rated drivers 25–64 are summarized in **Table 3**. For vehicle damage losses, claim frequencies showed a significant 4.5 percent decrease for collision and a significant 11.5 percent decrease for PDL. Claim severities were up 0.6 percent for collision and down 3.8 percent for PDL, respectively. Only the result for PDL was statistically significant, resulting in a significant 3.9 percent decrease in overall losses for collision and a significant 14.8 percent decrease for PDL.

For injury losses, the frequency of claims was significantly lower for all three coverage types. Among paid claims, claim frequency showed benefits, and nearly all the reductions were significant.

Table 3: Change in insurance losses for Forward Collision Warning (FCW) and Lane Departure Warning (LDW), for rated drivers 25–64

Vehicle damage coverage type	Lower bound	FREQUENCY	Upper bound	Lower bound	SEVERITY	Upper bound	Lower bound	OVERALL LOSSES	Upper bound
Collision	-5.8%	-4.5%	-3.2%	-0.9%	0.6%	2.2%	-5.9%	-3.9%	-1.9%
Property damage liability	-13.4%	-11.5%	-9.5%	-5.9%	-3.8%	-1.7%	-17.5%	-14.8%	-12.1%

Injury coverage type	Lower bound	FREQUENCY	Upper bound	Lower bound	LOW SEVERITY FREQUENCY	Upper bound	Lower bound	HIGH SEVERITY FREQUENCY	Upper bound
Bodily injury liability	-25.2%	-21.2%	-17.0%	-30.1%	-23.2%	-15.6%	-31.3%	-25.7%	-19.6%
Medical payment	-26.3%	-22.3%	-18.1%	-33.4%	-22.4%	-9.6%	-30.2%	-24.9%	-19.1%
Personal injury protection	-13.6%	-9.9%	-6.1%	-14.9%	-5.2%	5.6%	-15.8%	-11.2%	-6.2%

Results for Honda Accord’s FCW system including LDW for rated drivers 65 and older are summarized in **Table 4**. For PDL coverage, claim frequency was associated with an insignificant 3 percent reduction. Claim severity was reduced by 5.4 percent, resulting in a significant 8.2 percent reduction in overall losses. For collision coverage, claim frequency increased slightly (1.8 percent) whereas claim severity and overall losses were reduced by 4.6 and 2.8, respectively. Only the claim severity reduction was statistically significant.

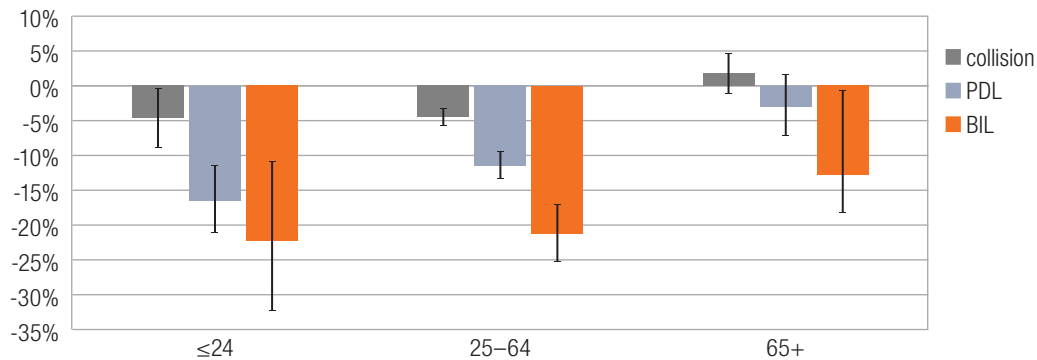
For injury losses, the frequency of claims was lower for all three coverage types. Reductions for BI liability and Med-Pay were statistically significant. Among paid claims, claim frequency showed benefits, with some reductions being significant.

Table 4: Change in insurance losses for Forward Collision Warning (FCW) and Lane Departure Warning (LDW), for rated drivers 65+									
Vehicle damage coverage type	Lower bound	FREQUENCY	Upper bound	Lower bound	SEVERITY	Upper bound	Lower bound	OVERALL LOSSES	Upper bound
	Collision	-1.0%	1.8%	4.7%	-7.5%	-4.6%	-1.5%	-6.8%	-2.8%
Property damage liability	-7.1%	-3.0%	1.3%	-9.4%	-5.4%	-1.1%	-13.6%	-8.2%	-2.4%

Injury coverage type	Lower bound	FREQUENCY	Upper bound	Lower bound	LOW SEVERITY FREQUENCY	Upper bound	Lower bound	HIGH SEVERITY FREQUENCY	Upper bound
	Bodily injury liability	-23.0%	-12.8%	-1.1%	-43.7%	-29.8%	-12.4%	-25.0%	-9.1%
Medical payment	-31.4%	-22.7%	-12.8%	-36.8%	-8.8%	31.6%	-32.9%	-20.8%	-6.6%
Personal injury protection	-17.8%	-8.8%	1.1%	-23.1%	0.4%	31.0%	-23.0%	-11.8%	0.9%

Figure 1 shows the changes in collision, PDL, and BI liability claim frequencies for Honda’s FCW system including LDW by rated driver age. In general, the claim frequency for BI had the largest reduction in all age groups, followed by PDL. For collision, the youngest drivers benefited the most from the FCW/LDW system, with a significant 4.6 percent reduction in claim frequency. Prime age drivers (25–64) also benefited, with a significant 4.5 percent reduction to collision claim frequency. Drivers 65 and older were associated with a slight, but not significant, increase in collision claim frequency. For PDL, reductions ranged from an insignificant 3.0 percent for drivers 65 and older to a significant 16.5 percent for the youngest drivers. For BI liability, the largest effect was for the youngest drivers, with a significant 22.3 percent reduction in claim frequency. Reductions were also significant for the other age groups, with a 21.2 percent reduction for drivers 25–64 and a 12.8 percent reduction for drivers 65 and older.

Figure 1: Change in claim frequency by rated driver age and coverage type for FCW and LDW



LaneWatch

Results for Honda Accord's LaneWatch system for rated drivers younger than 25 are summarized in **Table 5**. For vehicle damage losses, claim frequency showed a significant 6.1 percent decrease for collision and a significant 8.6 percent decrease for PDL. Claim severities were down 1.6 percent for collision and 5.7 percent for PDL, respectively. Only the result for PDL was statistically significant, resulting in a significant 7.7 percent decrease in overall losses for collision and a significant 13.8 percent decrease for PDL.

For injury losses, the frequency of claims was lower for all coverage types, and the MedPay and PIP reductions were statistically significant. Among paid claims, claim frequency showed some significant benefits for high-severity claims.

Table 5: Change in insurance losses for LaneWatch, for rated drivers younger than 25

Vehicle damage coverage type	Lower bound	FREQUENCY	Upper bound	Lower bound	SEVERITY	Upper bound	Lower bound	OVERALL LOSSES	Upper bound
	Collision	-9.8%	-6.1%	-2.3%	-5.6%	-1.6%	2.5%	-12.8%	-7.7%
Property damage liability	-13.4%	-8.6%	-3.5%	-10.7%	-5.7%	-0.5%	-20.2%	-13.8%	-7.0%

Injury coverage type	Lower bound	FREQUENCY	Upper bound	Lower bound	LOW SEVERITY FREQUENCY	Upper bound	Lower bound	HIGH SEVERITY FREQUENCY	Upper bound
	Bodily injury liability	-21.1%	-10.6%	1.3%	-30.8%	-13.1%	9.0%	-22.9%	-7.7%
Medical payment	-28.8%	-15.7%	-0.1%	-47.9%	-16.9%	32.6%	-42.4%	-25.8%	-4.6%
Personal injury protection	-23.0%	-13.0%	-1.6%	-33.6%	-10.7%	20.2%	-28.9%	-16.2%	-1.2%

Results for Honda Accord's LaneWatch system for rated drivers age 25–64 are summarized in **Table 6**. For vehicle damage losses, claim frequency was down for collision and PDL coverages by 3.4 and 9.3 percent, respectively. Both decreases were statistically significant.

For injury losses, the frequency of claims was lower for all three coverage types. The reductions for BI liability and PIP were statistically significant. Among paid claims, claim frequency showed a benefit, especially for high-severity claims.

Table 6: Change in insurance losses for LaneWatch, for rated drivers 25–64

Vehicle damage coverage type	Lower bound	FREQUENCY	Upper bound	Lower bound	SEVERITY	Upper bound	Lower bound	OVERALL LOSSES	Upper bound
	Collision	-4.7%	-3.4%	-2.1%	-4.7%	-3.3%	-1.9%	-8.4%	-6.6%
Property damage liability	-11.2%	-9.3%	-7.5%	-2.4%	-0.3%	1.7%	-12.3%	-9.7%	-7.0%

Injury coverage type	Lower bound	FREQUENCY	Upper bound	Lower bound	LOW SEVERITY FREQUENCY	Upper bound	Lower bound	HIGH SEVERITY FREQUENCY	Upper bound
	Bodily injury liability	-15.9%	-11.8%	-7.5%	-15.9%	-8.3%	0.0%	-17.2%	-11.1%
Medical payment	-8.5%	-3.8%	1.1%	-10.2%	3.7%	19.7%	-9.4%	-2.9%	4.0%
Personal injury protection	-11.7%	-8.2%	-4.5%	-14.8%	-5.6%	4.6%	-13.0%	-8.5%	-3.8%

Results for Honda Accord's LaneWatch system for rated drivers 65 and older are summarized in **Table 7**. For vehicle damage losses, claim frequencies showed a significant 7.3 percent decrease for collision and a significant 13.2 percent decrease for PDL. The changes in neither collision claim severity nor PDL claim severity were statistically significant. As a result, overall losses under both collision and PDL coverages were significantly reduced by 7.5 percent and 12.6 percent, respectively.

For injury losses, the frequency of claims was lower for all coverage types, and the BI liability and PIP estimates were significant. Among paid claims, claim frequency showed benefits for high-severity claims across all three injury-related coverage types.

Table 7: Change in insurance losses for LaneWatch, for rated drivers 65+

Vehicle damage coverage type	Lower bound	FREQUENCY	Upper bound	Lower bound	SEVERITY	Upper bound	Lower bound	OVERALL LOSSES	Upper bound
Collision	-9.8%	-7.3%	-4.6%	-3.4%	-0.3%	3.0%	-11.3%	-7.5%	-3.5%
Property damage liability	-16.8%	-13.2%	-9.4%	-3.6%	0.7%	5.2%	-17.8%	-12.6%	-7.0%

Injury coverage type	Lower bound	FREQUENCY	Upper bound	Lower bound	LOW SEVERITY FREQUENCY	Upper bound	Lower bound	HIGH SEVERITY FREQUENCY	Upper bound
Bodily injury liability	-33.0%	-24.3%	-14.4%	-27.9%	-10.8%	10.5%	-42.6%	-30.7%	-16.4%
Medical payment	-20.0%	-9.9%	1.5%	-41.0%	-14.9%	22.7%	-27.9%	-15.2%	-0.2%
Personal injury protection	-25.8%	-17.9%	-9.1%	-39.7%	-21.7%	1.7%	-29.7%	-19.8%	-8.5%

Comparison results

Table 8 shows the differences in the claim frequency estimates for the FCW system with LDW by rated driver age for the current study and the three prior versions of this study. The results for the FCW/LDW system showed little, if any, benefit for collision coverage across the age groups. However, for PDL, claim frequency was reduced significantly. For the injury coverages, reductions were seen across all coverage types and age groups with the exception of the PIP frequencies for the youngest drivers in the prior versions of the study. Many of the reductions were significant in the latest analysis. The BI claim frequency reduction remained significant, although with each successive study, the size of the effect was smaller than the prior estimates for the youngest drivers.

Table 8: Change in Forward Collision Warning (FCW) and Lane Departure Warning (LDW) claim frequencies, initial vs. updated results

Vehicle damage coverage type	≤24				25–64				65+			
	December 2015	December 2016	December 2017	Current	December 2015	December 2016	December 2017	Current	December 2015	December 2016	December 2017	Current
Collision	0.4%	-0.1%	-1.6%	-4.6%	-2.9%	-3.0%	-3.9%	-4.5%	0.9%	2.3%	2.8%	1.8%
Property damage liability	-14.9%	-12.5%	-15.6%	-16.5%	-10.4%	-11.8%	-11.6%	-11.5%	-7.4%	-7.4%	-5.5%	-3.0%

Injury coverage type	December 2015	December 2016	December 2017	Current	December 2015	December 2016	December 2017	Current	December 2015	December 2016	December 2017	Current
Bodily injury liability	-44.5%	-35.6%	-25.5%	-22.3%	-19.7%	-19.2%	-19.9%	-21.2%	-25.2%	-19.2%	-19.6%	-12.8%
Medical payment	-9.1%	-6.2%	-0.7%	-6.3%	-23.1%	-21.1%	-23.2%	-22.3%	-18.4%	-29.7%	-22.2%	-22.7%
Personal injury protection	21.5%	3.6%	9.6%	-0.9%	-8.5%	-8.6%	-10.4%	-9.9%	-11.5%	-16.9%	-10.7%	-8.8%

Table 9 shows the differences in the claim frequency estimates for LaneWatch by rated driver age for the current study and the three prior HLDI bulletins. The results showed significant reductions across the age groups for collision and PDL. Results for the injury coverages were encouraging, with many significant reductions.

Table 9: Change in LaneWatch claim frequencies, initial vs. updated results

Vehicle damage coverage type	≤24				25–64				65+			
	December 2015	December 2016	December 2017	Current	December 2015	December 2016	December 2017	Current	December 2015	December 2016	December 2017	Current
Collision	-7.8%	-8.8%	-8.4%	-6.1%	-3.5%	-4.4%	-4.2%	-3.4%	-7.4%	-8.7%	-8.8%	-7.3%
Property damage liability	-7.1%	-10.4%	-9.2%	-8.6%	-9.4%	-8.9%	-9.7%	-9.3%	-7.9%	-8.9%	-11.3%	-13.2%
Injury coverage type												
Bodily injury liability	—	4.8%	-7.2%	-10.6%	-18.7%	-15.8%	-14.4%	-11.8%	-3.2%	-12.8%	-17.8%	-24.3%
Medical payment	-16.5%	-17.0%	-23.9%	-15.7%	-3.1%	-4.3%	-3.8%	-3.8%	-8.9%	4.7%	-9.6%	-9.9%
Personal injury protection	-22.5%	-17.0%	-20.8%	-13.0%	-11.2%	-13.0%	-10.4%	-8.2%	-17.5%	-13.9%	-16.1%	-17.9%

► Discussion

FCW systems are designed to prevent or mitigate front-to-rear crashes, which typically result in PDL and sometimes BI claims. In a prior HLDI analysis of the Honda FCW/LDW system, large significant claim frequency benefits were observed (2019a).

The current study found benefits of the FCW/LDW system for all rated driver age groups, which is consistent with the 2017 HLDI study. However, the benefit was diminished for rated drivers over 65 compared with those under 65. The finding that the benefits of the FCW/LDW system diminished with driver age is consistent with prior HLDI research. A study on the Subaru’s EyeSight system (HLDI, 2019b) also found reduced PDL claim frequency benefits for older drivers. Earlier studies (HLDI, 2014) have also shown that claim frequencies are higher for younger drivers and they have more frontal crashes than drivers of other ages. Those results are consistent with the findings in this research that the younger drivers may benefit more from front crash prevention systems like FCW/LDW. However, the youngest rated driver age group (24 and younger) has the least exposure and the estimates have large confidence bounds.

LaneWatch, a passenger-side blind spot detection system, is designed to prevent incursion into an occupied adjacent lane that would be expected to result in a two-vehicle crash leading to a PDL claim against the encroaching driver. With the additional exposure, many of the results for LaneWatch are now statistically significant. The PDL and BI liability benefits for the oldest group were higher than the other two groups. For all age groups, the estimated reduction in PDL claims is larger than the reduction estimated for collision claims. This is consistent with the fact that the reductions in collision claims from such crashes would be diluted by the many single-vehicle crashes that result in collision claims and are unaffected by the LaneWatch system.

As previously mentioned, the collision avoidance systems are tied to the vehicle trim levels. In prior HLDI studies on the Honda systems, a supplemental analysis was performed to ensure that the measured differences were attributable to the collision avoidance features and not the trim levels. The supplemental analysis used loss data for model year 2012 Honda Accord vehicles. Although the Honda Accord was redesigned in 2013, the trim levels in 2012–15 were comparable. The inclusion of loss data for the 2012 model year, in which no crash avoidance features were present, allowed the supplemental analysis to include the vehicle trim level in addition to the control variables used in the primary analysis.

Thus, the supplemental analysis assumes that loss differences attributable to the different trim levels were the same in both model years. Results for the FCW/LDW system in both the primary and supplemental analysis were consistent. However, the supplemental estimates for the LaneWatch system are showing increased PDL claim frequencies. This suggests that the positive results may not be due to LaneWatch but to other, uncontrolled factors. Because the data for the rated drivers in this report are somewhat limited, this supplemental analysis cannot be conducted reliably. As the data matures, similar results are expected.

► Limitations

There are limitations to the data used in this analysis. The features in this study can be deactivated by the driver, and there is no way to know if they were switched on or off when the documented crashes occurred. Surveys conducted by the Insurance Institute for Highway Safety indicate that large majorities of drivers with these types of systems leave them on (Reagan, Cicchino, Kerfoot, & Weast, 2018). If a significant number of drivers do turn these features off, however, any reported reductions may actually be underestimates of the true effectiveness of these systems.

Additionally, the data supplied to HLDI does not include detailed crash information. The specific crash types addressed by the different technologies cannot be isolated in these analyses. For example, it is not known how many of the crashes in the rear-vision camera analysis involved backing up, which is the only maneuver during which this camera is active. All collisions, regardless of the ability of a feature to mitigate or prevent the crash, are included in the analysis.

All of these features are optional and associated with increased costs. The type of person who selects these options may be different from the person who declines to purchase them. While the analysis controls for several driver characteristics, there may be other uncontrolled attributes associated with people who select these features.

► Next steps

Future analysis includes performing similar analysis on other collision avoidance systems previously evaluated by HLDI.

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► **Appendix**

Appendix: Illustrative regression results — collision frequency in age group 25–64

Parameter	Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value
Intercept	1	-8.5173		0.0342	-8.5843	-8.4502	62006.30	<0.0001
Calendar year	2012	-0.5454	-42.0%	0.0603	-0.6637	-0.4272	81.75	<0.0001
	2013	0.0085	0.9%	0.011	-0.0131	0.0302	0.59	0.4412
	2014	0.0508	5.2%	0.0079	0.0353	0.0664	41.10	<0.0001
	2015	0.0554	5.7%	0.0067	0.0422	0.0685	68.41	<0.0001
	2016	0.0516	5.3%	0.0064	0.0390	0.0642	64.29	<0.0001
	2017	0.0098	1.0%	0.0065	-0.0029	0.0226	2.28	0.1313
	2019	-0.0205	-2.0%	0.0066	-0.0336	-0.0074	9.47	0.0021
	2018	0						
Vehicle model year and series	2013 Accord 2D	0.0814	8.5%	0.0339	0.0149	0.1479	5.77	0.0163
	2014 Accord 2D	0.1093	11.5%	0.0347	0.0413	0.1773	9.94	0.0016
	2015 Accord 2D	0.1182	12.5%	0.0351	0.0492	0.1872	11.29	0.0008
	2013 Accord 4D	-0.0072	-0.7%	0.0329	-0.0719	0.0573	0.05	0.8252
	2014 Accord 4D	0.0125	1.3%	0.033	-0.0521	0.0772	0.14	0.7045
	2015 Accord 4D	0.0421	4.3%	0.0330	-0.0226	0.1070	1.63	0.2022
	2013 Accord Crosstour 4dr 2WD	-0.0023	-0.2%	0.0382	-0.0772	0.0725	0.00	0.9513
	2013 Accord Crosstour 4dr 4WD	0.0429	4.4%	0.0401	-0.0358	0.1217	1.14	0.2852
	2014 Accord Crosstour 4dr 2WD	-0.0047	-0.5%	0.0452	-0.0933	0.0839	0.01	0.9171
	2015 Accord Crosstour 4dr 2WD	0.0239	2.4%	0.0472	-0.0686	0.1166	0.26	0.6117
	2015 Accord Crosstour 4dr 4WD	0.0011	0.1%	0.0478	-0.0925	0.0949	0.00	0.9802
	2014 Accord Crosstour 4dr 4WD	0						
Rated driver age group	25–29	0.1500	16.2%	0.0064	0.1374	0.1625	548.13	<0.0001
	30–39	0.0257	2.6%	0.0054	0.0151	0.0363	22.64	<0.0001
	50–59	-0.0589	-5.7%	0.0056	-0.07	-0.0479	109.66	<0.0001
	60–64	-0.1035	-9.8%	0.0073	-0.1179	-0.0891	198.75	<0.0001
	40–49	0						
Rated driver gender	Male	-0.0552	-5.4%	0.0039	-0.063	-0.0473	191.49	<0.0001
	Unknown	-0.1101	-10.4%	0.0246	-0.1584	-0.0618	19.99	<0.0001
	Female	0						
Rated driver marital status	Single	0.2080	23.1%	0.0042	0.1998	0.2163	2435.80	<0.0001
	Unknown	0.1321	14.1%	0.0233	0.0865	0.1778	32.17	<0.0001
	Married	0						
Risk	Nonstandard	0.2637	30.2%	0.0086	0.2468	0.2805	939.38	<0.0001
	Standard	0						
State	Alabama	0.0039	0.4%	0.0183	-0.032	0.0399	0.05	0.8297
	Alaska	0.1406	15.1%	0.1075	-0.0701	0.3513	1.71	0.1909
	Arizona	0.0855	8.9%	0.0167	0.0527	0.1183	26.16	<0.0001
	Arkansas	0.0065	0.7%	0.0298	-0.0519	0.0651	0.05	0.8255
	California	0.3571	42.9%	0.0078	0.3418	0.3724	2091.13	<0.0001
	Colorado	0.0759	7.9%	0.0221	0.0326	0.1192	11.80	0.0006
	Connecticut	0.1108	11.7%	0.0179	0.0756	0.1459	38.16	<0.0001
	Delaware	0.1113	11.8%	0.0305	0.0514	0.1711	13.27	0.0003

Appendix: Illustrative regression results — collision frequency in age group 25–64

Parameter	Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value
Dist of Columbia	1	0.6175	85.4%	0.031	0.5566	0.6785	394.55	<0.0001
Florida	1	-0.1144	-10.8%	0.0099	-0.134	-0.0949	131.68	<0.0001
Georgia	1	0.0086	0.9%	0.0119	-0.0148	0.0320	0.52	0.4711
Hawaii	1	0.1758	19.2%	0.0294	0.118	0.2336	35.55	<0.0001
Idaho	1	-0.1254	-11.8%	0.0516	-0.2266	-0.0242	5.90	0.0151
Illinois	1	-0.0120	-1.2%	0.0125	-0.0367	0.0125	0.92	0.3373
Indiana	1	-0.0615	-6.0%	0.0199	-0.1006	-0.0224	9.51	0.0020
Iowa	1	-0.1759	-16.1%	0.0372	-0.249	-0.1028	22.26	<0.0001
Kansas	1	-0.0950	-9.1%	0.0291	-0.1522	-0.0378	10.62	0.0011
Kentucky	1	-0.2554	-22.5%	0.0275	-0.3095	-0.2013	85.70	<0.0001
Louisiana	1	0.2664	30.5%	0.0144	0.2381	0.2947	341.09	<0.0001
Maine	1	0.0270	2.7%	0.0522	-0.0753	0.1294	0.27	0.6044
Maryland	1	0.2932	34.1%	0.0113	0.2709	0.3155	665.08	<0.0001
Michigan	1	0.3648	44.0%	0.0204	0.3247	0.405	317.57	<0.0001
Minnesota	1	-0.1124	-10.6%	0.021	-0.1535	-0.0712	28.66	<0.0001
Mississippi	1	0.1172	12.4%	0.0236	0.0709	0.1635	24.63	<0.0001
Missouri	1	-0.1187	-11.2%	0.0217	-0.1614	-0.0761	29.76	<0.0001
Montana	1	-0.3879	-32.2%	0.095	-0.5742	-0.2017	16.67	<0.0001
Nebraska	1	-0.1854	-16.9%	0.0407	-0.2654	-0.1055	20.68	<0.0001
Nevada	1	0.0718	7.4%	0.0243	0.0241	0.1195	8.72	0.0031
New Hampshire	1	0.2177	24.3%	0.0303	0.1582	0.2773	51.36	<0.0001
New Jersey	1	0.0405	4.1%	0.0104	0.0201	0.0609	15.15	0.0001
New Mexico	1	0.0580	6.0%	0.0343	-0.0093	0.1255	2.85	0.0912
New York	1	0.3322	39.4%	0.009	0.3145	0.35	1350.59	<0.0001
North Carolina	1	-0.1819	-16.6%	0.0132	-0.2079	-0.1559	187.85	<0.0001
North Dakota	1	0.0023	0.2%	0.0663	-0.1277	0.1323	0.00	0.9720
Ohio	1	-0.1310	-12.3%	0.0129	-0.1564	-0.1057	102.46	<0.0001
Oklahoma	1	-0.1119	-10.6%	0.0254	-0.1619	-0.062	19.32	<0.0001
Oregon	1	-0.0266	-2.6%	0.0252	-0.0761	0.0228	1.12	0.2907
Pennsylvania	1	0.2095	23.3%	0.0115	0.187	0.2321	331.97	<0.0001
Rhode Island	1	0.2262	25.4%	0.0285	0.1702	0.2822	62.71	<0.0001
South Carolina	1	-0.0734	-7.1%	0.0169	-0.1067	-0.0401	18.71	<0.0001
South Dakota	1	-0.0697	-6.7%	0.0716	-0.2101	0.0707	0.95	0.3306
Tennessee	1	0.0259	2.6%	0.0163	-0.006	0.0579	2.53	0.1114
Utah	1	-0.1289	-12.1%	0.0301	-0.1880	-0.0698	18.27	<0.0001
Vermont	1	0.1155	12.2%	0.0632	-0.0084	0.2394	3.34	0.0677
Virginia	1	0.0743	7.7%	0.0115	0.0517	0.0969	41.64	<0.0001
Washington	1	0.0249	2.5%	0.0177	-0.0098	0.0596	1.98	0.1595
West Virginia	1	-0.2184	-19.6%	0.0471	-0.3107	-0.1261	21.50	<0.0001
Wisconsin	1	-0.0489	-4.8%	0.022	-0.0921	-0.0057	4.93	0.0264
Wyoming	1	-0.0429	-4.2%	0.0994	-0.2379	0.152	0.19	0.6659
Texas	0							
Deductible range								
0–250	1	0.1683	18.3%	0.005	0.1584	0.1781	1121.59	<0.0001
501–1000	1	-0.2598	-22.9%	0.0057	-0.2711	-0.2484	2023.50	<0.0001

Appendix: Illustrative regression results — collision frequency in age group 25–64

Parameter	Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value	
	1001+	1	-0.7042	-50.5%	0.031	-0.765	-0.6434	515.45	<0.0001
	251–500	0							
Registered vehicle density	0–99	1	-0.2527	-22.3%	0.0074	-0.2674	-0.238	1141.46	<0.0001
	100–499	1	-0.1613	-14.9%	0.0048	-0.1709	-0.1517	1087.99	<0.0001
	500+	0							
LaneWatch		1	-0.0348	-3.4%	0.0067	-0.0480	-0.0216	26.73	<0.0001
FCW/LDW		1	-0.0462	-4.5%	0.0071	-0.0602	-0.0323	42.24	<0.0001



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