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Acura collision avoidance features: initial results

This analysis examines three Acura collision avoidance features — Collision Mitigation Braking System, Active Front Lighting System, and Blind Spot Information. Vehicles with Collision Mitigation Braking show significant reductions in property damage liability claims, as would be expected from a forward collision warning system. Results for the other two features are not significant, nor are they patterned as expected. Additional data is needed before conclusions can be drawn.

Introduction

Collision avoidance technologies are becoming popular in U.S. motor vehicles, and more and more automakers are touting the potential safety benefits. However, the actual benefits in terms of crash reductions still are being measured. This Highway Loss Data Institute bulletin examines the early insurance claims experience for Acura vehicles fitted with three features:

Collision Mitigation Braking System is Acura's term for a forward collision warning system that includes some autonomous emergency braking. The system is an enhancement of Acura's Adaptive Cruise Control system, which uses a radar sensor behind the front grille to maintain a particular speed and distance interval from traffic ahead, both of which are set by the driver. With collision mitigation, the system will also provide visual and auditory warnings when speed and distance indicates risk of a crash with the leading traffic and, if the driver does not respond by reducing speed, the system will tug at the seat belt to get the driver's attention and begin braking to mitigate — but probably not prevent — the crash. Collision mitigation becomes functional at speeds over 10 mph and deactivates when speed drops below 10 mph. The system operates whether or not Adaptive Cruise Control is activated. Collision mitigation can be deactivated by the driver but will reactivate at the next ignition cycle. Adaptive Cruise Control is always present on vehicles with Collision Mitigation Braking, and therefore the analysis cannot separate out the individual effects of these features. Adaptive Cruise Control is available at speeds over 25 mph and must be activated by the driver during each ignition cycle. Adaptive Cruise Control cannot bring the vehicle to a complete stop. Once activated, it continues until the driver deactivates it or until vehicle speed falls below 25 mph.

Active Front Lighting System is Acura's term for headlamps that respond to driver steering input. It uses sensors to measure vehicle speed, steering angle and vehicle yaw while small electric motors turn the headlights accordingly, up to 20 degrees, to facilitate vision around a curve at night. At a stop, the right headlight turns right when you turn the steering wheel to the right. However, the left headlight does not turn left when you turn the steering wheel to the left to prevent the light from pointing at oncoming traffic. Once the headlights are turned on by the driver, Active Front Lighting goes on after the vehicle has been driven a short distance. The system can be deactivated by the driver but will reactivate the next time the headlights are turned on.

Blind Spot Information is Acura's term for a side view assist system that alerts drivers to vehicles that are adjacent to them. There are two radar sensors, one in each corner of the rear bumper to scan a range behind and to the side of the vehicle, areas commonly known as driver blind spots. If a vehicle is detected in a blind spot, a warning light on the appropriate A-pillar is illuminated. If the driver activates a turn signal in the direction a vehicle has been detected, the warning light will flash. The system is functional at speeds over 6 mph and can be deactivated by the driver. At the next ignition cycle Blind Spot Information will be in the previous on/off setting.

Method

Vehicles

Collision Mitigation Braking (with Adaptive Cruise Control), Active Front Lighting, and Blind Spot Information are offered as optional equipment on various Acura models. The presence or absence of some of these features is not always discernible from the information encoded in the vehicle identification numbers (VINs), but rather, this must be determined from build information maintained by the manufacturer. Acura supplied HLDI with the VINs for any vehicles that were equipped with at least one of the collision avoidance features listed above. Vehicles of the same model year and series identified by Acura as not having these features served as the control vehicles in the analysis. It should be noted that some of these vehicles may have been equipped also with Rear Parking Sensors or Rear View Camera (MDX and RL), but no VIN-level information was supplied about rear sensors or cameras. Therefore, it must assumed that these features — which can affect some insurance losses — were equally distributed among the controls and the study vehicles. Certain features are always bundled together on a vehicle and cannot be standalone features. The MDX and ZDX vehicles that have collision mitigation also have Blind Spot Information. **Table 1** lists the vehicle series and model years included in the analysis and the exposure for each vehicle, measured in insured vehicle years. The exposure of each feature in a given series is shown as a percentage of total exposure.

Table 1 : Feature exposure by vehicle series

Make	Series	Model year range	Active Front Lighting System	Collision Mitigation Braking System (includes Adaptive Cruise Control)	Blind Spot Information	Total exposure
Acura	MDX 4dr 4WD	2010-11		12%	12%	42,123
Acura	RL 4dr 4WD	2005-11	97%	4%		174,044
Acura	ZDX 4dr 4WD	2010-11		28%	28%	2,034

Insurance data

Automobile insurance covers damages to vehicles and property as well as 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, collision, bodily injury liability, personal injury protection and medical payment coverages. Exposure is measured in insured vehicle years. An insured vehicle year is one vehicle insured for one year, two for six months, etc.

Because different crash avoidance features may affect different types of insurance coverage, it can be 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. Property damage liability (PDL) coverage insures against vehicle 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 (each insured vehicle pays for its own damage in a crash, regardless of who's at fault). Coverage of injuries is more complex. Bodily injury (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 coverage, this information is analyzed only in states where the at-fault driver has first obligation to pay for injuries (33 states with traditional tort insurance systems). Medical payment coverage (MedPay), 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's 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 vehicle feature while controlling for other covariates. The covariates included calendar year, model year, garaging state, vehicle density (number of registered vehicles per square mile), rated driver age group, rated driver gender, rated driver marital status, deductible range (collision coverage only), and risk. For each safety feature supplied by the manufacturer a binary variable was included. Based on the model year and series a single variable called SERIESMY was created for inclusion in the regression model. Statistically, including such a variable in the regression model is equivalent to including the interaction of series and model year. Effectively, this variable restricted the estimation of the effect of each feature within vehicle series and model year, preventing the confounding of the collision avoidance feature effects with other vehicle design changes that could occur from model year to model year.

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. Estimates for overall losses were derived from the claim frequency and claim severity models. Estimates for frequency, severity, and overall losses are presented for collision and property damage liability. For PIP, BI and MedPay 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 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: 78.9 percent for PIP, 67.8 percent for BI, and 61.6 percent for MedPay. The low severity range was <$1,000 for PIP and MedPay, <$5,000 for BI; high severity covered all loss payments greater than that.

A separate regression was performed for each insurance loss measure for a total of 15 regressions (5 coverages x 3 loss measures each). 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. 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 the effect of Collision Mitigation Braking System on PDL claim frequency was -0.15293; thus, vehicles with the feature had 14.2 percent fewer PDL claims than expected ((exp(-0.15293)-1)*100=-14.2).

Results

Results for Acura's Collision Mitigation Braking System are summarized in **Table 2**. The lower and upper bounds represent the 95 percent confidence limits for the estimates. For vehicle damage losses, frequency of claims are generally down while the average cost of the remaining claims is slightly higher and overall losses are slightly lower. Only the reduction in frequency of property damage liability claims, 14.2 percent, is statistically significant (indicated in blue in the table).

For injury losses, overall frequency of claims (paid plus reserved) decrease for all coverages, but none of the decreases is significant, and the confidence bounds are quite wide. Among paid claims, those of higher severity tend to show larger reductions in frequency, but still the reductions are not statistically significant, and the confidence bounds are even larger due to the reduced sample size.

Table 2 : Change in insurance losses for Collision Mitigation Braking System (includes Adaptive Cruise Control)									
Vehicle damage coverage type	Lower bound	FREQUENCY	Upper bound	Lower Bound	SEVERITY	Upper bound	Lower bound	OVERALL LOSSES	Upper bound
Collision	-11.2%	-3.1%	5.7%	-$452	$31	$567	-$52	-$9	$41
Property damage liability	-25.9%	**-14.2%**	-0.6%	-$323	$69	$523	-$24	-$10	$7

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	-46.5%	-15.0%	35.0%	-45.5%	9.8%	121.1%	-78.8%	-41.3%	62.5%
Medical payments	-40.8%	-3%	58.8%	-12.9%	119.5%	453.4%	-67.7%	-25%	74%
Personal injury protection	-40.1%	-16.5%	16.4%	-74.3%	-36%	59.4%	-42.7%	-13.1%	31.8%

Results for Acura's Active Front Lighting System are summarized in **Table 3**. Again, the lower and upper bounds represent the 95 percent confidence limits for the estimates. Reductions in loss claims are estimated for both first- and third-party vehicle damage coverages, resulting in somewhat lower losses per insured vehicle year (overall losses). However, none of the estimated effects for active lighting on collision or PDL losses is statistically significant.

Under injury coverages, the frequency of claims is lower for both MedPay and PIP, but not for BI, and none of the differences is statistically significant. Among paid claims, there appears to be a reduction in high severity injury claims under all coverages, though still not statistically significant and the confidence bounds are quite large. No pattern is observed for low severity claims and the confidence bounds are even larger.

Table 3 : Change in insurance losses for Active Front Lighting System									
Vehicle damage coverage type	Lower bound	FREQUENCY	Upper bound	Lower Bound	SEVERITY	Upper bound	Lower bound	OVERALL LOSSES	Upper bound
Collision	-11.9%	-2%	9%	-$466	$12	$556	-$40	-$4	$38
Property damage liability	-20.3%	-6.3%	10.3%	-$418	-$9	$473	-$20	-$5	$14

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	-38.2%	8.7%	91%	-51.9%	39.4%	304.1%	-68%	-23.6%	82.7%
Medical payments	-59.7%	-28.2%	27.8%	-92.1%	-25.9%	597.1%	-65.5%	-24.9%	63.3%
Personal injury protection	-38.6%	-7.9%	38.1%	-43.9%	88.7%	535.2%	-50.1%	-16.7%	39.3%

Results for Acura's Blind Spot Information system are summarized in **Table 4**. The lower and upper bounds represent the 95 percent confidence limits for the estimates. Both vehicle damage loss frequencies are lower with the blind spot information feature, with larger reductions for PDL than collision; however, neither reduction is statistically significant and, in the case of collision, the small reduction in frequency is more than offset by an increase in average cost of the remaining claims. The $19 reduction in loss payments per insured vehicle year for PDL coverage is encouraging but still not statistically significant.

Under injury coverages, the pattern is unclear, and the confidence bounds for all estimated effects are quite large. The central finding is that the data are insufficient.

Table 4 : Change in insurance losses for Blind Spot Information									
Vehicle damage coverage type	Lower bound	FREQUENCY	Upper bound	Lower Bound	SEVERITY	Upper bound	Lower bound	OVERALL LOSSES	Upper bound
Collision	-18.5%	-5.4%	9.7%	-$523	$315	$1,315	-$70	$3	$94
Property damage liability	-34%	-16.2%	6.3%	-$739	-$187	$512	-$38	-$19	$8

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	-47%	24.1%	190.6%	-37.9%	116%	651.6%	-43.5%	197.3%	1463.9%
Medical payments	-60%	-5%	125.7%	-89.6%	-37.8%	272.4%	-60.7%	41.8%	411.3%
Personal injury protection	-21.5%	43.1%	161%	-81.8%	-0.2%	446.5%	-26.8%	58.5%	243.3%

Discussion

The results for these three Acura collision avoidance features — Collision Mitigation Braking System (with Adaptive Cruise Control), Blind Spot Information, and Active Front Lighting System — are encouraging. Collision mitigation, in particular, shows reductions in claim frequencies across all coverages. Additionally, the pattern of findings for vehicle damage coverages is consistent with the expected benefits; that is, the reduction in claims is greater for PDL coverage than for collision coverage. Collision Mitigation Braking is operative in following traffic and intended to reduce the occurrence and/or severity of front-to-rear collisions, and those types of crashes are more common among PDL claims than among collision claims, which include many single vehicle crashes. Adaptive Cruise Control, which is always bundled with Collision Mitigation Braking, if used, could reduce the likelihood that drivers get into situations that lead to a crash.

Analyses of Active Front Lighting indicate a benefit in claims reductions, but the effects are not significant, and the pattern is not consistent with expectations. For example, the prevalence of single-vehicle crashes at night suggests that active lighting would have a greater effect on collision coverage than PDL. However, to the extent that this feature is effective, it appears to reduce PDL claims more than collision claims. Making the pattern even more perplexing is the fact just 7 percent of police-reported crashes occur between 9 p.m. and 6 a.m. and involve more than one vehicle. Given the reduction in PDL claim frequency (6.3 percent), this would mean that over 70 percent of night time PDL claims were prevented. This raises questions about the exact source of the estimated benefits: Does active lighting work because the lamps are steerable or is there something else about cars with active lighting that has not been adequately accounted for in the current analyses?

Although not statistically significant, results for Blind Spot Information are patterned as expected. Incursion into occupied adjacent lanes would be expected to result in two-vehicle crashes that lead to PDL claims against the encroaching driver. Again, although neither estimate is statistically significant, the estimated reduction in PDL claims is much larger than that estimated for collision claims. This is consistent with the fact that the reduction in collision claims from such crashes would be diluted by the many single-vehicle crashes that result in collision claims and are unaffected by blind spot information.

Taken alone, these data leave much uncertainty about the real-world effectiveness of Acura's collision-avoidance features. The benefits seen for Collision Mitigation Braking are consistent with those identified for Volvo City Safety (HLDI, 2011) — another system intended to prevent front-to-rear crashes — and indicate that the warning system probably is having some benefit. It's still too early to tell if the autonomous emergency braking feature is having additional benefit, as this is not expected to reduce the frequency of crashes but only the resulting severity. In that regard, the increase in average cost of the remaining vehicle damage claims is not encouraging, but the confidence bounds are quite wide. Conclusions about the other features examined — even tentative conclusions — must wait for additional data, both from additional experience with Acuras and also from other vehicle makes fitted with similar technology.

Limitations

There are limitations to the data used in this analysis. At the time of a crash, the status of a feature is not known. The features in this study can be deactivated by the driver and there is no way to know how many of the drivers in these vehicles turned off a system prior to the crash. If a significant number of drivers do turn these features off, 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. Information on point of impact and the vehicle's transmission status is not available. The technologies in this report target certain crash types. For example, Blind Spot Information is designed to prevent sideswipe type collisions. 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 are associated with increased costs. The type of person who selects this additional cost may be different from the person declining. While the analysis controls for several driver characteristics, there may be other uncontrolled attributes associated with people who select these features that are different among people who do not.

References

Highway Loss Data Institute. 2011. Volvo City Safety loss experience — initial results. Loss bulletin Vol. 28, No. 6. Arlington, VA.

Appendix : Illustrative regression results — collision frequency

Parameter		Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value
Intercept		1	-8.3515		0.3931	-9.1220	-7.5811	451.37	<0.0001
Calendar year	2004	1	-0.4270	-34.8%	0.2364	-0.8904	0.0364	3.26	0.0709
	2005	1	0.0435	4.4%	0.0445	-0.0438	0.1308	0.95	0.3286
	2006	1	-0.0116	-1.2%	0.0335	-0.0773	0.0541	0.12	0.7286
	2007	1	0.0917	9.6%	0.0292	0.0345	0.1490	9.87	0.0017
	2008	1	0.0395	4%	0.0282	-0.0158	0.0947	1.96	0.1614
	2009	1	0.0348	3.5%	0.0272	-0.0186	0.0882	1.63	0.2015
	2011	1	0.0094	0.9%	0.0259	-0.0413	0.0601	0.13	0.7172
	2010	0	0		0	0	0		
Vehicle model year and series	2010 MDX 4dr 4WD	1	-0.6334	-46.9%	0.3175	-1.2556	-0.0112	3.98	0.0460
	2011 MDX 4dr 4WD	1	-0.7472	-52.6%	0.3187	-1.3720	-0.1225	5.50	0.0191
	2005 RL 4dr 4WD	1	-0.3810	-31.7%	0.3220	-1.0121	0.2501	1.40	0.2367
	2006 RL 4dr 4WD	1	-0.3603	-30.3%	0.3222	-0.9917	0.2712	1.25	0.2635
	2007 RL 4dr 4WD	1	-0.4246	-34.6%	0.3211	-1.0540	0.2048	1.75	0.1861
	2008 RL 4dr 4WD	1	-0.3579	-30.1%	0.3222	-0.9893	0.2735	1.23	0.2666
	2009 RL 4dr 4WD	1	-0.4388	-35.5%	0.3262	-1.0781	0.2006	1.81	0.1786
	2010 RL 4dr 4WD	1	-0.2985	-25.8%	0.3300	-0.9452	0.3483	0.82	0.3657
	2011 RL 4dr 4WD	1	-0.2076	-18.7%	0.4119	-1.0148	0.5997	0.25	0.6143
	2010 ZDX 4dr 4WD	1	-0.1332	-12.5%	0.3249	-0.7700	0.5036	0.17	0.6818
	2011 ZDX 4dr 4WD	0	0		0	0	0		

Appendix : Illustrative regression results — collision frequency

Parameter		Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value
Rated driver age group	14-20	1	-0.0135	-1.3%	0.0792	-0.1687	0.1417	0.03	0.8649
	21-24	1	0.3072	36.0%	0.0646	0.1806	0.4338	22.61	<0.0001
	25-39	1	0.1906	21.0%	0.0220	0.1474	0.2337	74.93	<0.0001
	65+	1	0.0982	10.3%	0.0230	0.0531	0.1433	18.23	<0.0001
	Unknown	1	-0.0480	-4.7%	0.0398	-0.1260	0.0301	1.45	0.2284
	40-64	0	0		0	0	0		
Rated driver gender	Male	1	-0.0071	-0.7%	0.0202	-0.0466	0.0324	0.12	0.7256
	Unknown	1	-0.1748	-16.0%	0.0439	-0.2608	-0.0887	15.85	<0.0001
	Female	0	0		0	0	0		
Rated driver marital status	Single	1	0.2463	27.9%	0.0240	0.1992	0.2934	105.19	<0.0001
	Unknown	1	0.2633	30.1%	0.0427	0.1796	0.3469	38.04	<0.0001
	Married	0	0		0	0	0		
Risk	Nonstandard	1	0.2267	25.4%	0.0282	0.1714	0.2820	64.50	<0.0001
	Standard	0	0		0	0	0		
State	Alabama	1	-0.1181	-11.1%	0.2429	-0.5942	0.3580	0.24	0.6269
	Arizona	1	-0.3956	-32.7%	0.2415	-0.8690	0.0778	2.68	0.1015
	Arkansas	1	-0.4271	-34.8%	0.2697	-0.9556	0.1014	2.51	0.1132
	California	1	-0.1291	-12.1%	0.2311	-0.5821	0.3239	0.31	0.5764
	Colorado	1	-0.1853	-16.9%	0.2370	-0.6497	0.2792	0.61	0.4343
	Connecticut	1	-0.2477	-21.9%	0.2359	-0.7101	0.2147	1.10	0.2937
	Delaware	1	-0.1446	-13.5%	0.2574	-0.6490	0.3599	0.32	0.5744
	District of Columbia	1	0.3615	43.5%	0.2510	-0.1305	0.8535	2.07	0.1498
	Florida	1	-0.4921	-38.9%	0.2319	-0.9466	-0.0376	4.50	0.0338
	Georgia	1	-0.3481	-29.4%	0.2347	-0.8081	0.1120	2.20	0.1381
	Hawaii	1	-0.1277	-12.0%	0.2640	-0.6452	0.3898	0.23	0.6286
	Idaho	1	-0.4292	-34.9%	0.3206	-1.0575	0.1992	1.79	0.1807
	Illinois	1	-0.2105	-19.0%	0.2326	-0.6664	0.2454	0.82	0.3656
	Indiana	1	-0.3830	-31.8%	0.2518	-0.8765	0.1104	2.31	0.1281
	Iowa	1	-0.3286	-28.0%	0.3103	-0.9368	0.2796	1.12	0.2896
	Kansas	1	-0.4180	-34.2%	0.2469	-0.9019	0.0659	2.87	0.0904
	Kentucky	1	-0.5863	-44.4%	0.2740	-1.1234	-0.0493	4.58	0.0324
	Louisiana	1	0.0222	2.2%	0.2447	-0.4573	0.5018	0.01	0.9276
	Maine	1	-0.3658	-30.6%	0.4049	-1.1593	0.4278	0.82	0.3663
	Maryland	1	-0.1215	-11.4%	0.2325	-0.5773	0.3342	0.27	0.6013
	Massachusetts	1	0.0366	3.7%	0.2371	-0.4281	0.5012	0.02	0.8774
	Michigan	1	0.2192	24.5%	0.2428	-0.2568	0.6952	0.81	0.3667
	Minnesota	1	-0.2572	-22.7%	0.2414	-0.7303	0.2158	1.14	0.2866
	Mississippi	1	-0.2945	-25.5%	0.2678	-0.8194	0.2305	1.21	0.2715
	Missouri	1	-0.3255	-27.8%	0.2415	-0.7987	0.1478	1.82	0.1777
	Montana	1	0.0376	3.8%	0.3470	-0.6426	0.7177	0.01	0.9138
	Nebraska	1	-0.3995	-32.9%	0.2884	-0.9646	0.1657	1.92	0.1659

Appendix : Illustrative regression results — collision frequency									
Parameter		Degrees of freedom	Estimate	Effect	Standard error	Wald 95% confidence limits		Chi-square	P-value
	Nevada	1	-0.3395	-28.8%	0.2551	-0.8394	0.1604	1.77	0.1831
	New Hampshire	1	-0.0394	-3.9%	0.2560	-0.5412	0.4625	0.02	0.8778
	New Jersey	1	-0.1780	-16.3%	0.2326	-0.6339	0.2779	0.59	0.4441
	New Mexico	1	-0.2699	-23.7%	0.2723	-0.8035	0.2638	0.98	0.3216
	New York	1	-0.0509	-5.0%	0.2315	-0.5047	0.4028	0.05	0.8259
	North Carolina	1	-0.5858	-44.3%	0.2369	-1.0501	-0.1215	6.12	0.0134
	North Dakota	1	-0.1745	-16.0%	0.5511	-1.2548	0.9057	0.10	0.7515
	Ohio	1	-0.3258	-27.8%	0.2361	-0.7885	0.1370	1.90	0.1677
	Oklahoma	1	-0.1432	-13.3%	0.2515	-0.6361	0.3498	0.32	0.5692
	Oregon	1	-0.2525	-22.3%	0.2423	-0.7274	0.2225	1.09	0.2975
	Pennsylvania	1	-0.0947	-9.0%	0.2320	-0.5494	0.3600	0.17	0.6831
	Rhode Island	1	-0.0351	-3.4%	0.2573	-0.5395	0.4693	0.02	0.8916
	South Carolina	1	-0.4679	-37.4%	0.2486	-0.9552	0.0194	3.54	0.0598
	South Dakota	1	-0.4356	-35.3%	0.5031	-1.4217	0.5504	0.75	0.3866
	Tennessee	1	-0.3693	-30.9%	0.2402	-0.8400	0.1015	2.36	0.1242
	Texas	1	-0.3717	-31.0%	0.2327	-0.8278	0.0844	2.55	0.1102
	Utah	1	-0.7246	-51.5%	0.2614	-1.2369	-0.2122	7.68	0.0056
	Vermont	1	-0.3147	-27.0%	0.3689	-1.0377	0.4084	0.73	0.3937
	Virginia	1	-0.2223	-19.9%	0.2328	-0.6785	0.2339	0.91	0.3396
	Washington	1	-0.3025	-26.1%	0.2356	-0.7642	0.1593	1.65	0.1992
	West Virginia	1	-0.9880	-62.8%	0.3601	-1.6937	-0.2823	7.53	0.0061
	Wisconsin	1	-0.2542	-22.4%	0.2462	-0.7367	0.2283	1.07	0.3019
	Wyoming	1	-1.3263	-73.5%	0.7440	-2.7844	0.1318	3.18	0.0746
	Alaska	0	0		0	0	0		
Deductible range	0-250	1	0.6052	83.2%	0.0276	0.5511	0.6593	481.07	<0.0001
	251-500	1	0.3616	43.6%	0.0241	0.3144	0.4088	225.51	<0.0001
	1001+	1	-0.3644	-30.5%	0.1461	-0.6507	-0.0780	6.22	0.0126
	501-1000	0	0		0	0	0		
Registered vehicle density	0-99	1	-0.2368	-21.1%	0.0374	-0.3102	-0.1634	39.99	<0.0001
	100-499	1	-0.1157	-10.9%	0.0202	-0.1554	-0.0760	32.67	<0.0001
	500+	0	0		0	0	0		
Active Front Lighting System		1	-0.0203	-2.0%	0.0544	-0.1268	0.0863	0.14	0.7093
Collision Mitigation Braking System		1	-0.0318	-3.1%	0.0446	-0.1191	0.0556	0.51	0.4759
Blind Spot Information		1	-0.0559	-5.4%	0.0757	-0.2043	0.0926	0.54	0.4608

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The Highway Loss Data Institute is a nonprofit public service organization that gathers, processes, and publishes insurance data on the human and economic losses associated with owning and operating motor vehicles.