Highway Loss Data Institute Bulletin

Pedestrian-Related Bodily Injury Liability Claim Frequencies, Hybrids versus their Conventional Counterparts

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INTRODUCTION

Hybrid vehicles generate little noise when operating under battery power making them harder for pedestrians to detect. This may increase the likelihood of pedestrians being struck by hybrids. If this is the case, bodily injury (BI) claim frequencies for claims without associated collision or property damage liability (PDL) claims should be higher for hybrids than for their non-hybrid versions. It is expected that a large proportion of the BI claims without associated collision or property damage liability claims are pedestrian or bicyclist related. Hereafter BI claims without associated collision or property damage liability claims will be referred to as injury only BI claims. The purpose of this study is to determine if the injury only BI claim frequency for hybrids differs from the non-hybrid versions of the same vehicles. To facilitate interpretation of the injury only BI claim frequencies, this study will also examine the difference in claim frequencies for BI claims with associated vehicle damage (BI claims with an associated collision or PDL claim) between hybrids and non-hybrids.

METHODS

Insurance coverages – Automobile insurance covers damage 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 bodily injury liability (BI), collision, and property damage liability (PDL) coverages. Bodily injury 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. In this study, bodily injury liability losses were restricted to data from traditional tort states. Property damage liability coverage insures against physical damage that at-fault drivers cause to other people's vehicles and property in crashes. Collision coverage insures against physical damage to an at-fault driver's vehicle sustained in a crash with an object or other vehicle.

Concurrent coverage and injury only BI claims – Concurrent coverage means a vehicle is insured under two or more relevant coverage types at the time of a loss-in this study BI, collision and PDL. In forming the data for this study, exposure and claim data for BI were joined with those for collision and PDL at the VIN (vehicle identification number) level so that during the overlapped exposure period the association between claims can be explored to identify whether a BI claim occurs in an injury-only crash that has associated vehicle damage.

Vehicles studied – To be included in this study, a hybrid series must have had either an exact non-hybrid counterpart to be matched for a hybrid/non-hybrid series pair (e.g., Toyota Camry sedan) or a carefully selected non-hybrid comparable enough to be used in the pairing (e.g. Lexus GS 450 hybrid/Lexus GS 350). Also, both the hybrid and its non-hybrid counterpart must have at least one injury only BI claim. The Toyota Prius and the Honda Insight were excluded because they do not have a non-hybrid counterpart. Seventeen hybrid series and their non-hybrid counterparts were included in the analysis. Mild hybrids (Chevrolet Malibu, Saturn Aura and Saturn Vue) were also excluded from the study. Mild hybrids operate differently than full hybrids. A full hybrid can operate using the gasoline engine only, electric power only, or a combination of both; however, a mild hybrid uses the gasoline engine or a combination of gasoline engine and electric power. Since mild hybrids are never in complete electric mode, they do not operate as quietly as full hybrids. The Honda Civic and Honda Accord were also eliminated. The Honda vehicles operate more like traditional hybrids then mild hybrids yet at low speeds power is supplied by both the electric battery and the gasoline motor. Studied vehicles included 2002-2010 models during 2004-2010 calendar years with only the four most current model years studied per calendar year, totaling 25,382 BI claims and 2,890,386 years of exposure.

Analysis methods – BI claim frequencies, defined as claims per 1,000 insured vehicle years, measure how likely a vehicle is to inflict injuries on vehicle occupants or others on the road. In order to establish a basis for comparison, a Poisson regression was performed to compare frequencies of BI claims with associated vehicle damage between the hybrid and non-hybrid groups while controlling for other factors. This regression provides an estimate of the difference in crash rates between hybrids and non-hybrids and illustrates differences in crash rates that the model cannot control for, such as driver differences not captured in the demographic covariates or differences in driving patterns not captured in the garaging zip code. A second Poisson regression compared injury only BI claim frequencies between the hybrid and non-hybrid groups using the same model.

The primary predictor was the hybrid status of the vehicle, a categorical variable. The other independent variables in this analysis included calendar year, rated driver age, rated driver gender, marital status, risk, registered vehicle density (number of registered vehicles per square mile), garaging state, vehicle series and vehicle age. Vehicles with an age of -1 (e.g., 2011 models in 2010 calendar year) were grouped into vehicles with age 0.

RESULTS

Table 1 summarizes the results of the Poisson regression analysis of claim frequency for BI claims with associated vehicle damage and is based upon the loss data of the 17 hybrid/non-hybrid series with concurrent coverage. Results for all independent variables except for driver gender and hybrid status had p-values less than 0.05, which indicates that their effects on BI claim frequency for claims with associated vehicle damage were statistically significant.

Table 1 Summary Results of Poisson Regression Analysis of Claim Frequency for BI Claims with Associated Vehicle Damage

	Degree of Freedoms	Chi-Square	P-Value
Calendar Year	6	62.01	<0.0001
Rated Driver Age Group	4	475.06	<0.0001
Rated Driver Gender	2	1.62	0.4458
Rated Driver Marital Status	2	274.67	<0.0001
Rated Driver Risk	1	101.05	<0.0001
State	32	1373.45	<0.0001
Vehicle Density	2	429.41	<0.0001
Vehicle Age	1	67.41	<0.0001
Vehicle Series	16	108.13	<0.0001
Hybrid Status	1	1.34	0.2473

Table 2 lists details of the estimates of BI claim frequencies for claims with associated vehicle damage for the independent variables. Only states with the highest and lowest effects are listed, along with the comparison state of California. Detailed results for all states are listed in Appendix A.

Table 2 Detailed Results of Poisson Regression Analysis of Claim Frequency for BI Claims with Associated Vehicle Damage

Parameter	Degrees of Freedom	Estimate	Odds Ratio	Standard Error	Likelihood Ratio 95% Confidence Limits		Wald Chi-square	p-value
Intercept	1	-10.4947		0.043	-10.5791	-10.4104	59459	<0.0001
Calendar Year								
2004	1	0.0547	0.0562	0.1205	-0.1814	0.2909	0.21	0.6497
2005	1	0.1114	0.1178	0.0522	0.0091	0.2137	4.56	0.0328
2006	1	0.0489	0.0501	0.0316	-0.0131	0.1109	2.39	0.1223
2007	1	0.1120	0.1185	0.0214	0.0701	0.1540	27.43	<0.0001
2008	1	0.0309	0.0314	0.0176	-0.0037	0.0654	3.06	0.0802
2010	1	-0.0950	-0.0906	0.0221	-0.1384	-0.0516	18.43	<0.0001
2009	0	0	0	0	0	0	.	.
Rated driver age group								
<25	1	0.5403	0.7165	0.0249	0.4915	0.5892	470.55	<0.0001
25-39	1	0.1634	0.1775	0.0161	0.1319	0.1949	103.38	<0.0001
65+	1	0.0141	0.0142	0.0213	-0.0277	0.0559	0.44	0.5090
Unknown	1	0.1425	0.1532	0.0313	0.0812	0.2039	20.71	<0.0001
40-64	0	0	0	0	0	0	.	.
Rated driver gender								
Male	1	0.0000	0.0000	0.0167	-0.0328	0.0327	0	0.9977
Unknown	1	-0.0461	-0.0451	0.0365	-0.1176	0.0254	1.6	0.2063
Female	0	0	0	0	0	0	.	.

Table 2 Detailed Results of Poisson Regression Analysis of Claim Frequency for BI Claims with Associated Vehicle Damage (cont'd)

Parameter	Degrees of Freedom	Estimate	Odds Ratio	Standard Error	Likelihood Ratio 95% Confidence Limits		Wald Chi-square	p-value
Marital status								
Married	1	-0.1842	-0.1682	0.0366	-0.2559	-0.1125	25.35	<0.0001
Single	1	0.1126	0.1192	0.0366	0.0408	0.1844	9.45	0.0021
Unknown	0	0	0	0	0	0	.	.
Risk								
Non Standard	1	0.2078	0.2310	0.0202	0.1681	0.2474	105.59	<0.0001
Standard	0	0	0	0	0	0	.	.
State								
Vermont	1	-0.8418	-0.5691	0.1656	-1.1664	-0.5172	25.84	<0.0001
Wyoming	1	-0.7722	-0.5380	0.2055	-1.1749	-0.3695	14.13	0.0002
Iowa	1	-0.7349	-0.5204	0.0783	-0.8883	-0.5815	88.16	<0.0001
Arkansas	1	0.0099	0.0099	0.0577	-0.1032	0.1231	0.03	0.8634
Nevada	1	0.2111	0.2350	0.0481	0.1169	0.3054	19.27	<0.0001
Louisiana	1	0.4156	0.5153	0.0293	0.3582	0.4729	201.65	<0.0001
California	0	0	0	0	0	0	.	.
Vehicle density								
0-99	1	-0.3978	-0.3282	0.0204	-0.4378	-0.3579	381.17	<0.0001
100-499	1	-0.2306	-0.2059	0.0163	-0.2626	-0.1986	199.11	<0.0001
500+	0	0	0	0	0	0	.	.
Vehicle age	1	0.0795	0.0827	0.0097	0.0605	0.0985	67.18	<0.0001
Vehicle series								
Nissan Altima	1	0.0660	0.0682	0.0194	0.0281	0.1040	11.62	0.0007
Ford Escape	1	0.0067	0.0067	0.0219	-0.0362	0.0496	0.09	0.7606
Ford Escape 4WD	1	-0.1316	-0.1233	0.0288	-0.1881	-0.0751	20.81	<0.0001
Ford Fusion	1	-0.0487	-0.0475	0.0827	-0.2108	0.1135	0.35	0.5562
Lexus GS 450/350	1	-0.3128	-0.2686	0.0692	-0.4483	-0.1772	20.46	<0.0001
Toyota Highlander	1	-0.1227	-0.1155	0.0352	-0.1917	-0.0537	12.15	0.0005
Toyota Highlander 4WD	1	-0.0954	-0.0910	0.0304	-0.1550	-0.0358	9.85	0.0017
Mercury Mariner	1	-0.1277	-0.1199	0.0739	-0.2726	0.0172	2.98	0.0842
Mercury Mariner 4WD	1	-0.1434	-0.1336	0.0682	-0.2770	-0.0098	4.42	0.0354
Lexus RX 400/330	1	-0.1813	-0.1658	0.0665	-0.3116	-0.0509	7.43	0.0064
Lexus RX 400/330 4WD	1	-0.1479	-0.1375	0.0455	-0.2371	-0.0588	10.59	0.0011
Chevrolet Tahoe	1	-0.0736	-0.0710	0.0531	-0.1777	0.0306	1.92	0.1662
Chevrolet Tahoe 4WD	1	-0.0946	-0.0903	0.0650	-0.2219	0.0328	2.12	0.1456
Mazda Tribute	1	0.0354	0.0360	0.0771	-0.1158	0.1865	0.21	0.6467
GMC Yukon	1	0.1174	0.1246	0.0803	-0.0401	0.2749	2.14	0.1439
GMC Yukon 4WD	1	-0.1709	-0.1571	0.0887	-0.3446	0.0029	3.71	0.0540
Toyota Camry	0	0	0	0	0	0	.	.
Hybrid status								
Hybrid	1	0.0242	0.0245	0.0208	-0.0167	0.0650	1.34	0.2462
Conventional	0	0	0	0	0	0	.	.

Figure 1 further illustrates the difference in frequencies for BI claims with associated vehicle damage between hybrids and their non-hybrid counterparts. The frequency for BI claims with associated vehicle damage for hybrids was estimated to be 2.4% (p=0.246) higher than that for their non-hybrid counterparts. This difference was not statistically significant.

Figure 1 Estimated Relative Claim Frequencies for BI Claims with Associated Vehicle Damage

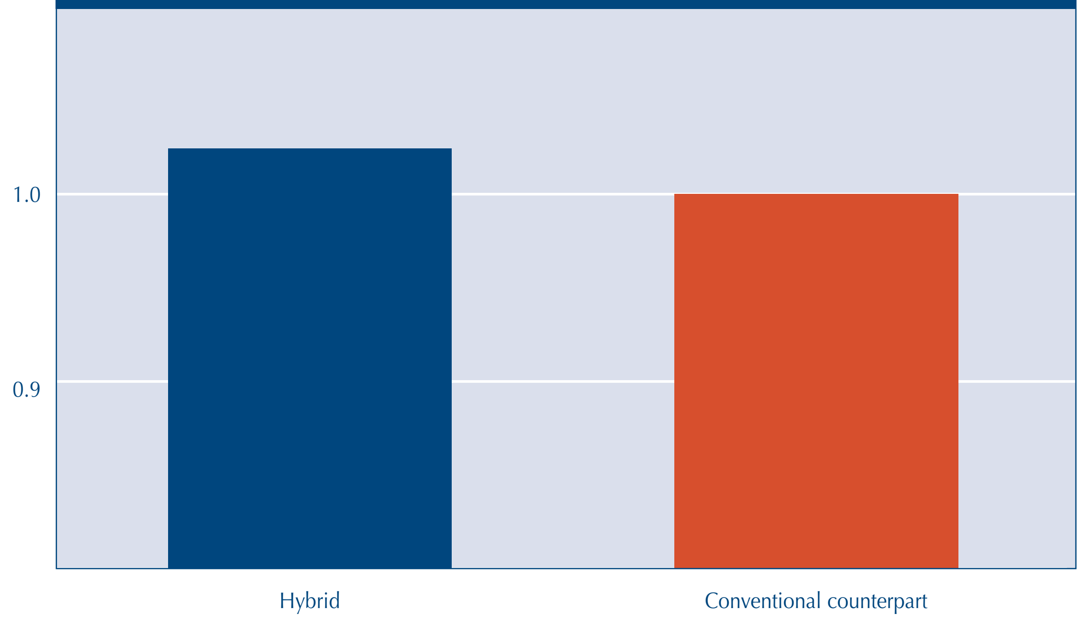


Table 3 summarizes results of the Poisson regression analysis of injury only BI claim frequencies. The number of BI claims used in this regression was just 9% of the number of claims used in the BI claim frequencies with associated vehicle damage (2,034 versus 23,348). Most of the covariates including the hybrid status variable had p-values less than 0.05, indicating their effects on injury only BI claim frequencies were statistically significant.

Table 3 Summary Results of Poisson Regression Analysis of Injury Only BI Claim Frequency

	Degree of Freedoms	Chi-Square	P-Value
Calendar Year	6	10.13	0.1192
Rated Driver Age Group	4	19.46	0.0006
Rated Driver Gender	2	5.60	0.0609
Rated Driver Marital Status	2	37.55	<0.0001
Rated Driver Risk	1	7.04	0.0080
State	32	227.71	<0.0001
Vehicle Age	1	3.74	0.0532
Vehicle Density	2	71.48	<0.0001
Vehicle Series	16	32.31	0.0091
Hybrid Status	1	7.10	0.0077

Table 4 lists details of the estimates of injury only BI claim frequencies for the independent variables. Only states with the highest and lowest effects are listed, along with the comparison state of California. The results for Wyoming are based on limited data and differ greatly from the rest of the states but the difference is not statistically significant. Detailed results for all states are listed in Appendix B.

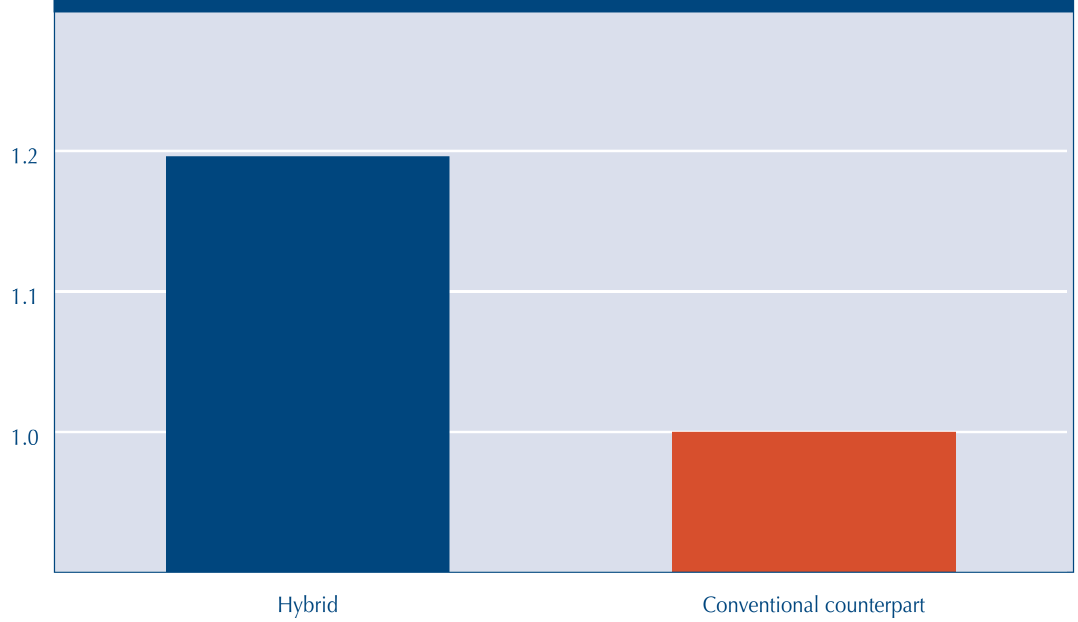
TABLE 4 DETAILED RESULTS OF POISSON REGRESSION ANALYSIS OF INJURY ONLY BI CLAIM FREQUENCY

Parameter	Degrees of Freedom	Estimate	Odds Ratio	Standard Error	Likelihood Ratio 95% Confidence Limits		Wald Chi-Square	p-value
Intercept	1	-12.8197		0.1494	-13.1126	-12.5268	7359.29	<0.0001
Calendar Year								
2004	1	0.78090	1.18344	0.31430	0.16490	1.39680	6.17	0.0130
2005	1	0.20680	0.22974	0.17940	-0.14490	0.55840	1.33	0.2491
2006	1	0.10750	0.11349	0.10690	-0.10200	0.31700	1.01	0.3146
2007	1	0.11320	0.11986	0.07340	-0.03080	0.25710	2.38	0.1233
2008	1	0.03460	0.03521	0.05980	-0.08260	0.15170	0.33	0.5630
2010	1	-0.09700	-0.09244	0.07580	-0.24560	0.05160	1.64	0.2006
2009	0	0	0	0	0	0	.	.
Rated driver age group								
<25	1	0.3724	0.4512	0.0898	0.1964	0.5485	17.19	<0.0001
25-39	1	0.0422	0.0431	0.0555	-0.0665	0.1509	0.58	0.4467
65+	1	0.0025	0.0025	0.0703	-0.1353	0.1403	0.00	0.9719
Unknown	1	0.1921	0.2118	0.0966	0.0027	0.3814	3.95	0.0468
40-64	0	0	0	0	0	0	.	.
Rated driver gender								
Male	1	-0.0342	-0.0336	0.0593	-0.1504	0.0820	0.33	0.5643
Unknown	1	0.2729	0.3138	0.1280	0.0219	0.5238	4.54	0.0331
Female	0	0	0	0	0	0	.	.
Marital status								
Married	1	-0.1153	-0.1089	0.1303	-0.3707	0.1400	0.78	0.3760
Single	1	0.2676	0.3068	0.1287	0.0154	0.5198	4.33	0.0376
Unknown	0	0	0	0	0	0	.	.
Risk								
Non Standard	1	0.1931	0.2130	0.0713	0.0534	0.3328	7.34	0.0068
Standard	0	0	0	0	0	0	.	.
State								
Wyoming	1	-8.2142	-0.9997	26.4373	-60.0303	43.6018	0.10	0.7560
South Dakota	1	-1.8077	-0.8360	1.0024	-3.7723	0.1569	3.25	0.0713
Nebraska	1	-1.5303	-0.7835	0.4502	-2.4127	-0.6478	11.55	0.0007
Montana	1	0.1079	0.1139	0.3426	-0.5636	0.7794	0.10	0.7528
Nevada	1	0.1509	0.1629	0.1667	-0.1757	0.4775	0.82	0.3653
Louisiana	1	0.2758	0.3176	0.0974	0.0849	0.4667	8.02	0.0046
California	0	0	0	0	0	0	.	.
Vehicle density								
0-99	1	-0.4646	-0.3716	0.0700	-0.6018	-0.3274	44.04	<0.0001
100-499	1	-0.4189	-0.3422	0.0567	-0.5302	-0.3077	54.51	<0.0001
500+	0	0	0	0	0	0	.	.
Vehicle age	1	0.0643	0.0664	0.0333	-0.0010	0.1295	3.73	0.0536
Vehicle series								
Nissan Altima	1	0.0195	0.0197	0.0658	-0.1094	0.1484	0.09	0.7667
Ford Escape	1	-0.2540	-0.2243	0.0791	-0.4090	-0.0989	10.30	0.0013
Ford Escape 4WD	1	-0.2833	-0.2467	0.0995	-0.4784	-0.0882	8.10	0.0044
Ford Fusion	1	-0.2232	-0.2000	0.2964	-0.8040	0.3577	0.57	0.4515
Lexus GS 450/350	1	-0.2184	-0.1962	0.2081	-0.6263	0.1895	1.10	0.2939
Toyota Highlander 2WD	1	-0.2334	-0.2082	0.1187	-0.4660	-0.0008	3.87	0.0492
Toyota Highlander 4WD	1	-0.3035	-0.2618	0.1044	-0.5081	-0.0989	8.46	0.0036
Mercury Mariner	1	-0.3037	-0.2619	0.2703	-0.8334	0.2261	1.26	0.2612
Mercury Mariner 4WD	1	-0.4289	-0.3488	0.2538	-0.9264	0.0686	2.86	0.0911
Lexus RX 400/330 2WD	1	-0.3262	-0.2783	0.2196	-0.7567	0.1042	2.21	0.1374
Lexus RX 400/330 4WD	1	-0.2108	-0.1901	0.1403	-0.4859	0.0642	2.26	0.1330

TABLE 4 DETAILED RESULTS OF POISSON REGRESSION ANALYSIS OF INJURY ONLY BI CLAIM FREQUENCY (CONT'D)								
PARAMETER	DEGREES OF FREEDOM	ESTIMATE	ODDS RATIO	STANDARD ERROR	LIKELIHOOD RATIO 95% CONFIDENCE LIMITS		WALD CHI-SQUARE	P-VALUE
Chevrolet Tahoe	1	0.1161	0.1231	0.1667	-0.2106	0.4429	0.49	0.4860
Chevrolet Tahoe 4WD	1	-0.0478	-0.0467	0.2130	-0.4652	0.3697	0.05	0.8225
Mazda Tribute	1	0.0596	0.0614	0.2619	-0.4538	0.5729	0.05	0.8201
GMC Yukon	1	-0.7203	-0.5134	0.4111	-1.5261	0.0854	3.07	0.0798
GMC Yukon 4WD	1	-0.2203	-0.1977	0.3045	-0.8171	0.3765	0.52	0.4694
Toyota Camry	0	0	0	0	0	0	.	.
HYBRID STATUS								
Hybrid	1	0.1791	0.1961	0.0662	0.0494	0.3088	7.32	0.0068
Conventional	0	0	0	0	0	0	.	.

Figure 2 further illustrates the difference of injury only BI claim frequencies between hybrids and their non-hybrid counterparts. Injury only BI claim frequency for hybrids was estimated to be 19.6% (p=0.0068) higher than that for their non-hybrid counterparts.

FIGURE 2 ESTIMATED RELATIVE INJURY ONLY BI CLAIM FREQUENCIES



DISCUSSION

The injury only BI claim frequency for hybrids was estimated to be 19.6% (p=0.0068) higher than that for their non-hybrid counterparts. Claim frequencies for BI claims with associated vehicle damage were included in this study as a control or basis for comparison to the injury only BI claim frequencies. The difference in vehicle damage related BI claim frequencies illustrate differences in crash rates between hybrids and non-hybrids for which the model cannot control. The damage related BI claim frequencies for hybrids were estimated to be 2.4% (p=0.246) higher than that for their non-hybrid counterparts. This estimate is not statistically significant so the real difference in damage related BI frequencies might be zero. However, if we assume it is a robust estimate then this indicates hybrids are 17.2% (19.6%-2.4%) more likely to inflict injuries on pedestrians than their non-hybrid counterparts. This finding is consistent with findings from the National Highway Traffic Safety Administration (NHTSA) (Hanna, 2009). NHTSA found that hybrid vehicles had a higher rate of pedestrian and bicyclist crashes than non-hybrid vehicles.

In 2011, Congress gave the Department of Transportation three years to establish a requirement for equipping quiet vehicles with sounds to warn pedestrians about a vehicle's approach. Once the final rule is issued, manufacturers will have three years to fully comply. Some manufacturers have already added noise voluntarily. For example, the electric Nissan Leaf produces an airplane-like whooshing sound at low speeds.

LIMITATIONS

There are limitations to the data used in this analysis. Although injury only BI claims are consistent with pedestrian or other non-occupant injuries, our data do not allow us to know definitively if a crash involved a pedestrian. As a result there may be some crashes included that are not pedestrian related. Likewise, some pedestrian crashes may have been excluded unintentionally. For example, a crash in which a person was struck that resulted in a bodily injury and also caused damage to the vehicle would have been excluded because a collision claim would have been filed for the damaged vehicle. Hybrids typically only operate under battery power (thus making less noise) when the vehicle is traveling at low speeds. The HLDI data do not have the vehicle speed at the time of the crash, so we do not know if the hybrid was operating under battery or by the internal combustion engine.

REFERENCES

Hanna, R. 2009. Incidence of pedestrian and bicyclist crashes by hybrid electric passenger vehicles. Report no. DOT HS-811-204. Washington, DC: National Highway Traffic Administration.

Appendix A Detailed Results of Poisson Regression Analysis of Claim Frequency for BI Claims with Associated Vehicle Damage

Parameter	Degrees of Freedom	Estimate	Odds Ratio	Standard Error	Likelihood Ratio 95% Confidence Limits		Wald Chi-square	p-value
State								
Vermont	1	-0.8418	-0.5691	0.1656	-1.1664	-0.5172	25.84	<0.0001
Wyoming	1	-0.7722	-0.5380	0.2055	-1.1749	-0.3695	14.13	0.0002
Iowa	1	-0.7349	-0.5204	0.0783	-0.8883	-0.5815	88.16	<0.0001
Maine	1	-0.6476	-0.4767	0.1218	-0.8863	-0.4090	28.29	<0.0001
Wisconsin	1	-0.6318	-0.4684	0.0533	-0.7362	-0.5274	140.64	<0.0001
Montana	1	-0.6280	-0.4663	0.1579	-0.9376	-0.3184	15.81	<0.0001
Nebraska	1	-0.5630	-0.4305	0.0873	-0.7340	-0.3919	41.61	<0.0001
South Dakota	1	-0.5391	-0.4167	0.1635	-0.8596	-0.2187	10.87	0.0010
Indiana	1	-0.4966	-0.3914	0.0499	-0.5945	-0.3988	98.98	<0.0001
Colorado	1	-0.4928	-0.3891	0.0518	-0.5943	-0.3913	90.62	<0.0001
Tennessee	1	-0.4822	-0.3826	0.0421	-0.5647	-0.3998	131.38	<0.0001
Idaho	1	-0.4773	-0.3795	0.1133	-0.6994	-0.2551	17.73	<0.0001
Ohio	1	-0.4672	-0.3732	0.0323	-0.5305	-0.4038	209.01	<0.0001
New Hampshire	1	-0.4649	-0.3718	0.0776	-0.6170	-0.3127	35.86	<0.0001
Connecticut	1	-0.4094	-0.3360	0.0427	-0.4931	-0.3257	91.86	<0.0001
Missouri	1	-0.3690	-0.3086	0.0420	-0.4513	-0.2867	77.17	<0.0001
Virginia	1	-0.3424	-0.2899	0.0290	-0.3991	-0.2856	139.69	<0.0001
Illinois	1	-0.3421	-0.2897	0.0274	-0.3958	-0.2884	156.13	<0.0001
Rhode Island	1	-0.2871	-0.2496	0.0696	-0.4236	-0.1506	16.99	<0.0001
North Carolina	1	-0.2522	-0.2229	0.0307	-0.3124	-0.1921	67.53	<0.0001
Alabama	1	-0.2266	-0.2028	0.0440	-0.3129	-0.1404	26.51	<0.0001
Alaska	1	-0.2036	-0.1842	0.1198	-0.4383	0.0311	2.89	0.0891
West Virginia	1	-0.1869	-0.1705	0.0650	-0.3143	-0.0595	8.26	0.0040
New Mexico	1	-0.0829	-0.0796	0.0687	-0.2175	0.0517	1.46	0.2273
Mississippi	1	-0.0810	-0.0778	0.0542	-0.1872	0.0251	2.24	0.1347
Oklahoma	1	-0.0781	-0.0751	0.0511	-0.1782	0.0221	2.33	0.1266
Arizona	1	-0.0505	-0.0492	0.0381	-0.1252	0.0242	1.76	0.1850
Georgia	1	-0.0382	-0.0375	0.0281	-0.0933	0.0169	1.84	0.1747
South Carolina	1	0.0092	0.0092	0.0406	-0.0704	0.0888	0.05	0.8212
Arkansas	1	0.0099	0.0099	0.0577	-0.1032	0.1231	0.03	0.8634
Nevada	1	0.2111	0.2350	0.0481	0.1169	0.3054	19.27	<0.0001
Louisiana	1	0.4156	0.5153	0.0293	0.3582	0.4729	201.65	<0.0001
California	0	0	0	0	0	0	.	.

APPENDIX B DETAILED RESULTS OF POISSON REGRESSION ANALYSIS OF INJURY ONLY BI CLAIM FREQUENCY

Parameter	Degrees of Freedom	Estimate	Odds Ratio	Standard Error	Likelihood Ratio 95% Confidence Limits		Wald Chi-square	p-value
State								
Wyoming	1	-8.2142	-0.9997	26.4373	-60.0303	43.6018	0.1	0.7560
South Dakota	1	-1.8077	-0.8360	1.0024	-3.7723	0.1569	3.3	0.0713
Nebraska	1	-1.5303	-0.7835	0.4502	-2.4127	-0.6478	11.6	0.0007
Alaska	1	-1.3506	-0.7409	0.7107	-2.7435	0.0424	3.6	0.0574
Iowa	1	-1.1431	-0.6812	0.3063	-1.7434	-0.5427	13.9	0.0002
Oklahoma	1	-0.9506	-0.6135	0.2412	-1.4233	-0.4780	15.5	<0.0001
Wisconsin	1	-0.8545	-0.5745	0.1964	-1.2394	-0.4696	18.9	<0.0001
Missouri	1	-0.8398	-0.5682	0.1660	-1.1652	-0.5144	25.6	<0.0001
Virginia	1	-0.7795	-0.5414	0.1100	-0.9951	-0.5639	50.2	<0.0001
Alabama	1	-0.7407	-0.5232	0.1792	-1.0920	-0.3894	17.1	<0.0001
Tennessee	1	-0.7141	-0.5104	0.1507	-1.0096	-0.4187	22.4	<0.0001
Colorado	1	-0.6770	-0.4919	0.1825	-1.0347	-0.3192	13.8	0.0002
Ohio	1	-0.6374	-0.4713	0.1110	-0.8550	-0.4199	33.0	<0.0001
Maine	1	-0.5407	-0.4177	0.3828	-1.2909	0.2094	2.0	0.1577
New Hampshire	1	-0.4855	-0.3846	0.2655	-1.0058	0.0348	3.3	0.0674
Indiana	1	-0.4791	-0.3807	0.1606	-0.7939	-0.1642	8.9	0.0029
West Virginia	1	-0.3408	-0.2888	0.2324	-0.7964	0.1148	2.2	0.1426
Arkansas	1	-0.3177	-0.2722	0.2172	-0.7435	0.1081	2.1	0.1436
North Carolina	1	-0.3169	-0.2716	0.1015	-0.5159	-0.1179	9.7	0.0018
New Mexico	1	-0.3133	-0.2690	0.2500	-0.8034	0.1767	1.6	0.2102
Georgia	1	-0.2927	-0.2538	0.0989	-0.4867	-0.0988	8.8	0.0031
Mississippi	1	-0.2742	-0.2398	0.1927	-0.6519	0.1035	2.0	0.1548
Illinois	1	-0.2194	-0.1970	0.0831	-0.3822	-0.0566	7.0	0.0083
Connecticut	1	-0.1784	-0.1634	0.1232	-0.4199	0.0631	2.1	0.1478
Rhode Island	1	-0.1271	-0.1194	0.2061	-0.5310	0.2767	0.4	0.5373
Vermont	1	-0.1240	-0.1166	0.3840	-0.8766	0.6285	0.1	0.7467
South Carolina	1	-0.1171	-0.1105	0.1425	-0.3964	0.1622	0.7	0.4112
Idaho	1	-0.1068	-0.1013	0.3079	-0.7103	0.4967	0.1	0.7287
Arizona	1	-0.0358	-0.0352	0.1267	-0.2841	0.2125	0.1	0.7774
Montana	1	0.1079	0.1139	0.3426	-0.5636	0.7794	0.1	0.7528
Nevada	1	0.1509	0.1629	0.1667	-0.1757	0.4775	0.8	0.3653
Louisiana	1	0.2758	0.3176	0.0974	0.0849	0.4667	8.0	0.0046
California	0	0	0	0	0	0	.	.

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