The shifting U.S. vehicle fleet and its impact on auto insurance and auto safety

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Saving lives. Preventing harm.

IIHS-HLDI mission:

To reduce deaths, injuries and property damage from motor vehicle crashes through **research and evaluation** and through **education** of consumers, policymakers and safety professionals.

Member groups

IIHS and HLDI are wholly supported by these auto insurers and insurance associations

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Funding associations

American Property Casualty Insurance Association National Association of Mutual Insurance Companies

IIHS crashworthiness ratings and the registered vehicle fleet



IIHS crashworthiness programs



Side impact 2003



Roof strength 2009

1995 Moderate overlap front

2004 Head restraints





2012 Small overlap front: driver-side



2017 Small overlap front: passenger-side





Crashworthiness ratings by model year

Improvements beginning in 1995





















2021 ratings for registered vehicles

Date results first released



Death and injury risk for

G D VS.

ratings in **IIHS** tests





Fatality risk in side-impact crashes is

> 70% LOWER

in addition to benefit of side airbag head protection



Neck injury risk in rear crashes is

> 15% LOWER

Risk of neck injury requiring 3+ months treatment is

> 35% **LOWER**

Vehicle fleet characteristics



Auto sales vs. HLDI vehicle series



Distribution of vehicles by type



Changes in vehicle specs

1983-2021 model years

Cars Pickups SUVs



Passenger cars



Distribution of passenger cars by size





Distribution of cars by type



Luxury vehicles and sports cars relative to other cars



Passenger cars relative to other vehicles







Distribution of pickups by size



Where are pickups located?

Ratio of pickup collision exposure to all other vehicle types



Distribution of collision exposure by drive type



2WD pickups relative to 4WD pickups



Distribution of pickup collision exposure by cab type







Distribution of SUVs by type



Distribution of SUVs by size



SUVs relative to other vehicles



2WD SUVs relative to 4WD SUVs



Collision exposure distribution by gender, risk, drive type and pickup cab



Gender distribution by vehicle class

1990 vs. 2020 model years



Distribution of vehicle fleet by class and registered vehicle density

1990 and 2020 model years

Car Luxury car SUV Luxury SUV Pickup



Suburban
Distribution of vehicle fleet by class and rated driver age

1990 and 2020 model years

Car Luxury car SUV Luxury SUV Pickup



Young (<25)

Prime (25-65)

Injury rates in multiple-vehicle crashes



Collision and PDL claims by point of impact

Vehicles of same size and weight, 2000-14 models



Injury rate by point of impact

Vehicles of same size and weight, 2000-14 models

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Injury rate by vehicle type

Vehicles of different size and weight, 2000-14 models



Pickup cab configuration and injury losses



Estimated change in MedPay losses

By cab configuration and pickup size relative to small regular cabs



Estimated changes in PIP losses

By cab configuration and pickup size relative to small regular cabs



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Phase-in of alternative powertrains



Proportion of vehicles with turbo/supercharged, hybrid or electric powertrains in 2021

By model year

Turbo/supercharged Hybrids Electrics



Actual vs. predicted proportion of vehicle registrations

By engine type and calendar year



Loss results of electric vehicles vs. conventional counterparts



Electric vehicles and their conventional counterparts

Exposure summary

Vehicle	Model years	Total exposure	Percent electric
Ford Focus EV 5-door	2012-18	2,010,190	1%
Toyota RAV4 EV 2WD	2012-14	983,617	1%
Kia Soul EV station wagon	2015-19	1,259,616	1%
Fiat 500 EV 2-door	2015-19	391,562	16%
Chevrolet Spark EV 5-door	2014-16	327,469	6%
Smart ForTwo EV	2013-17	111,787	12%
Volkswagen E-Golf	2015-19	195,498	17%
Hyundai Kona 4-door	2019-20	16,996	7%
Smart ForTwo EV convertible	2013-15, 2017	9,378	13%
Total		5,306,113	3%

Estimated collision and PDL losses

Electric vs. conventional



Estimated collision losses over time



Estimated PDL losses over time



Estimated injury coverage claim frequencies

Electric vs. conventional



-50%

Estimated difference in the injury rate of electric vehicles and their conventional counterparts



Tesla Model 3



VIN counts for 2018-19 electric vehicles

By series, as of February 2022



VIN counts for 2018-19 midsize luxury four-door vehicles

By make, as of February 2022



Control group selection

		Exposure of Tesla Model 3	Exposure of control group
Group A	All 2018-19 midsize luxury four-door vehicles	582 236	1,683,727
Group B	A with base price between \$35,000 and \$60,000		1,509,780
Group C	B with AEB standard	1,151,759	
Group D	C without active lane centering (ALC) and lane departure prevention (LDP) that provides steering assist		484,888

Estimated differences in claim frequency

Tesla Model 3 vs. midsize luxury control groups



Estimated differences in PDL insurance losses

Tesla Model 3 vs. midsize luxury control groups



Theft results for electric vehicles vs. conventional counterparts



Estimated theft losses

Electric versus conventional



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Claim size distribution

Electric vehicles versus conventional counterparts



Electric exposure



Model Year 2021 VIN counts by vehicle type

Electric versus conventional





Percent distribution of collision estimates and average damage amounts by point of impact and vehicle type

1981-2020 model years, 2019 calendar year



N= 3,022,514

IIHS HLDI N= 631,901

N= 1,924,498

Where are pickups located?

Ratio of pickup collision exposure to all other vehicle types



Where are electric vehicles located?

Ratio of electric collision exposure to all other vehicle types



What are the most recent HLDI ADAS results?



Summary of technology effects on insurance claim frequency

Results pooled across automakers



Summary of technology effects on insurance claim frequency

Results pooled across automakers



Summary of technology effects on insurance claim frequency

Results pooled across automakers


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Results pooled across automakers



Summary of technology effects on insurance claim frequency

Results pooled across automakers



Summary of technology effects on insurance claim frequency

Results pooled across automakers



Do ADAS benefits vary?



By coverage type and vehicle age



■ -1 to 0 ■ 1 to 2 ■ 3 to 4 ■ 5+

By coverage type and rated driver age



By coverage type and mileage, mileage data provided by CARFAX



By coverage type and registered vehicle density



■ 0-99 ■ 100-499 ■ 500+

Bundled ADAS features



Summary of technology bundles

Change in claim frequency



Phase-in of collision avoidance systems



New vehicle series with adaptive cruise control with lane centering By model year



Registered vehicles with adaptive cruise control with lane centering By calendar year



Predicted percentage of registered vehicles with adaptive cruise control with lane centering

By calendar year



Estimated registered vehicles by feature

Calendar years 2021 and 2026



CAS Capability Model

Content **Traits** Areas Skills

Visual framework that articulates and provides guidance on the traits, skills and knowledge important for most property/casualty actuaries

> Use the model to self-assess your levels of professional attributes in 18 different areas

Then identify areas of opportunity to learn and grow and plan your professional development journey



CAS Capability Model



Content Area

Property & Casualty Insurance Industry

Knowledge of industry operations (e.g. contracts, underwriting, and the regulatory environment)

- Levels of automation
- Makeup of the vehicle fleet
- Impact of electric vehicles



CAS Capability Model

Level 1:

Industry operations, including how the actuarial function influences processes and regulations applicable to one's practice.

Level 2:

The property and casualty industry environment, including laws and regulations applicable to practice, as well as any imminent changes that may impact practice.

Level 2

P&C industry environment applicable to practice

- Private Passenger Auto
- Commercial Auto

Level 3:

Emerging trends in the industry relevant to one's practice area and role and demonstrate thought leadership in predicting the impact of these emerging trends.



Insurance Institute for Highway Safety Highway Loss Data Institute

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THANK YOU



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