Recent Trends in Mileage:

An Insurance Industry Perspective

Matt Moore- Sr. VP HLDI

Dave Grove- VP Product Management

Ohio Mutual

Dan Hill- National Sales Director

CARFAX

The "Matrix", Mileage and Revised Measures

Casualty Actuarial Society
Ratemaking, Product and Modeling Seminar

March 20, 2018

Matt Moore, Senior VP - HLDI

iihs.org

IIHS is an independent, nonprofit scientific and educational organization dedicated to reducing the losses — deaths, injuries and property damage — from crashes on the nation's roads.

HLDI shares this mission by analyzing insurance data representing human and economic losses from crashes and other events related to vehicle ownership.

Both organizations are wholly supported by auto insurers.

Member groups

AAA Carolinas	The General Insurance	Plymouth Rock Assurance
Acceptance Insurance	Georgia Farm Bureau Mutual Insurance Company	Progressive Insurance
Alfa Alliance Insurance Corporation	Goodville Mutual Casualty Company	PURE Insurance
Alfa Insurance	Grange Insurance	Qualitas Insurance Company
Allstate Insurance Group	Hallmark Financial Services	Redpoint County Mutual Insurance Company
American Family Mutual Insurance Company	Hanover Insurance Group	The Responsive Auto Insurance Company
American National	The Hartford	Rider Insurance
Ameriprise Auto & Home	Haulers Insurance Company, Inc.	Rockingham Group
Amica Mutual Insurance Company	Horace Mann Insurance Companies	RSA Canada
Auto Club Enterprises	Imperial Fire & Casualty Insurance Company	Safe Auto Insurance Company
Auto Club Group	Indiana Farmers Mutual Insurance Company	Safeco Insurance
Auto-Owners Insurance	Infinity Property & Casualty	Samsung Fire & Marine Insurance Company
Bitco Insurance Companies	Kemper Corporation	SECURA Insurance
California Casualty Group	Kentucky Farm Bureau Mutual Insurance Companies	Sentry Insurance
Censtat Casualty Company	Liberty Mutual Insurance Company	Shelter Insurance Companies
CHUBB	Louisiana Farm Bureau Mutual Insurance Company	Sompo America
Colorado Farm Bureau Mutual Insurance Company	The Main Street America Group	South Carolina Farm Bureau Mutual Insurance Company
Concord Group Insurance Companies	Mercury Insurance Group	Southern Farm Bureau Casualty Insurance Company
COUNTRY Financial	MetLife Auto & Home	State Auto Insurance Companies
CSAA Insurance Group	Mississippi Farm Bureau Casualty Insurance Company	State Farm Insurance Companies
CSE Insurance Group	MMG Insurance	Tennessee Farmers Mutual Insurance Company
Desjardins Insurance	Munich Reinsurance America, Inc.	Texas Farm Bureau Insurance Companies
Direct General Corporation	Mutual Benefit Group	The Travelers Companies
Elephant Insurance Company	Mutual of Enumclaw Insurance Company	United Educators
EMC Insurance Companies	Nationwide	USAA
Erie Insurance Group	New Jersey Manufacturers Insurance Group	Utica National Insurance Group
Esurance	Nodak Mutual Insurance Company	Virginia Farm Bureau Mutual Insurance
Farm Bureau Financial Services	Norfolk & Dedham Group	West Bend Mutual Insurance Company
Farm Bureau Insurance of Michigan	North Carolina Farm Bureau Mutual Insurance Company	Western National Insurance Group
Farm Bureau Mutual Insurance Company of Idaho	Northern Neck Insurance Company	Westfield Insurance
Farmers Insurance Group	Ohio Mutual Insurance Group	XL Group plc
Farmers Mutual Hail Insurance Company of Iowa	Old American County Mutual Fire Insurance Company	
Farmers Mutual of Nebraska	Old American Indemnity Company	
Florida Farm Bureau Insurance Companies	Oregon Mutual Insurance Company	**Funding associations**
Frankenmuth Insurance	Paramount Insurance Company	American Insurance Association
Gainsco Insurance	Pekin Insurance	National Association of Mutual Insurance Companies
GEICO Corporation	PEMCO Insurance	Property Casualty Insurers Association of America

HLDI data providers have 84% share of PPA

21st Century Insurance

Alfa Alliance Insurance Corporation

Allstate Insurance Group

American Family Mutual Insurance

American National Family of Companies

Amica Mutual Insurance Company

Auto Club Group

Automobile Insurers Bureau of Massachusetts

Chubb & Son

COUNTRY Financial

CSAA Insurance Group

Erie Insurance Group

Esurance

Farm Bureau Financial Services

Farmers Insurance Group of Companies

Florida Farm Bureau Insurance Companies

Foremost

GEICO Corporation

Hanover Insurance Group

The Hartford

Kemper Preferred

Kentucky Farm Bureau Insurance

Liberty Mutual Insurance Company

MetLife Auto and Home

National General

Nationwide

New Jersey Manufacturers Insurance Group

PEMCO Insurance

Plymouth Rock Assurance

Progressive Corporation

Rockingham Group

Safeco Insurance Companies

SECURA Insurance

Sentry Insurance

State Farm Insurance Companies

Tennessee Farmers Mutual Insurance Company

Texas Farm Bureau

The Travelers Companies

USAA

Haddon matrix

Recognizing opportunities to make a difference

	pre-crash	during crash	after crash
people	graduated licensing impaired driving laws automated enforcement	safety belts helmets	medical bracelets general health
vehicles	crash avoidance technology	airbags crashworthiness truck underride guards	automatic collision notification fuel system integrity
environment	roundabouts rumble strips	roadside barriers breakaway poles	emergency medical services long-term rehabilitation

Effect of adding mileage to collision model

Best and worst collision frequencies

2015-17 passenger vehicles

Vehicle	Frequency
Mitsubishi Mirage G4	~190
Scion FR-S/Toyota 86 series	~160
Mitsubishi Lancer	~155
Mitsubishi Lancer 4WD	~150
Kia Optima hybrid	~147
Chevrolet Corvette Z06...	~45
Jeep Wrangler 2dr SWB...	~43
Lamborghini Huracan 2dr...	~42
Ford Mustang Shelby...	~40
Ferrari California T...	~40
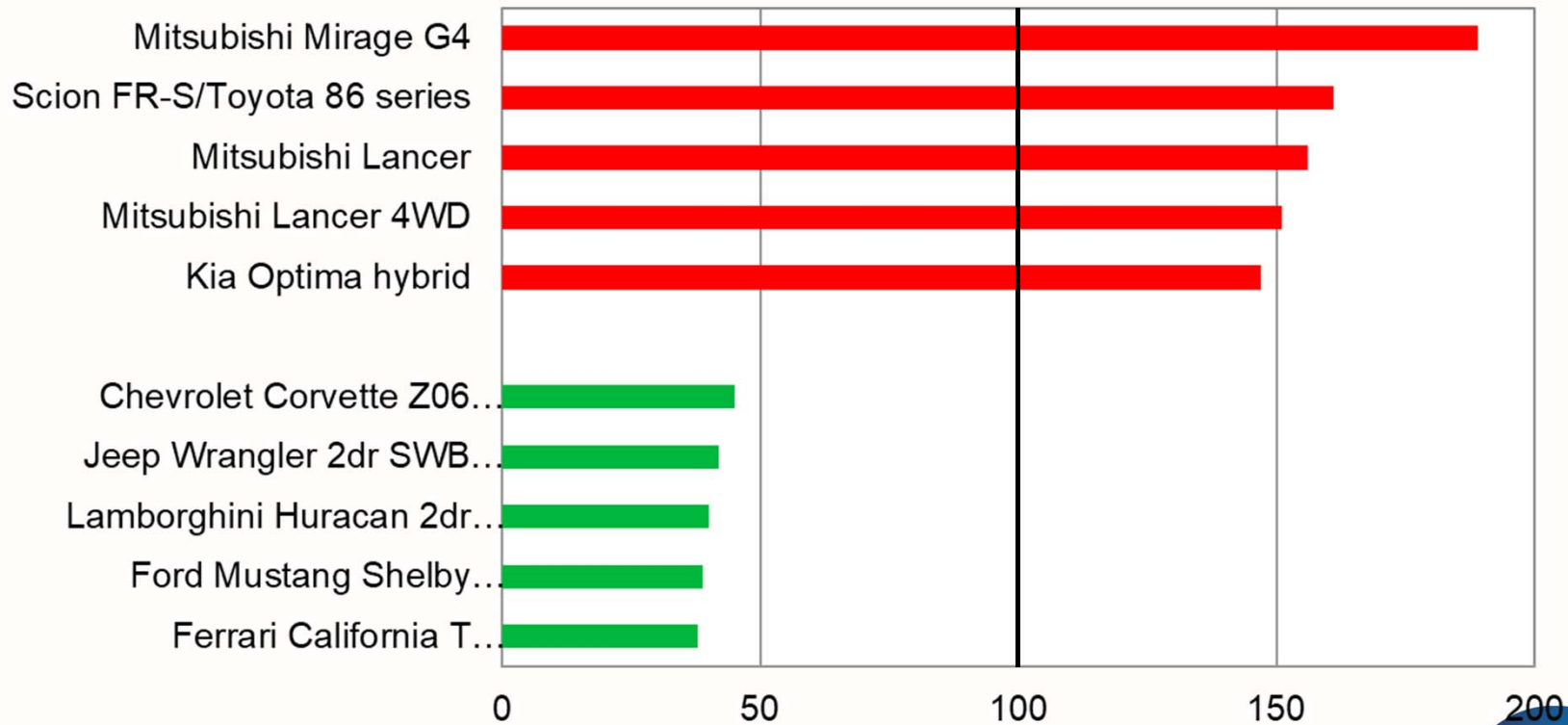
= 7.4 claims per 100
insured vehicle years

Average miles per day is computed for each calendar year

Example for a vehicle with no changes in rated driver factors

(38,000 - 30,000)/181 days

= 44.2 MPD

(57,000 - 38,000)/304 days

= 62.5 MPD

Nov 1, 2014	May 1, 2015	Feb 28, 2016
30,000 miles	38,000 miles	57,000 miles

| 181 days | 304 days | |
| 61 days | 120 days | 245 days | 59 days |

365 days

Jan 1, 2015   Dec 31, 2015
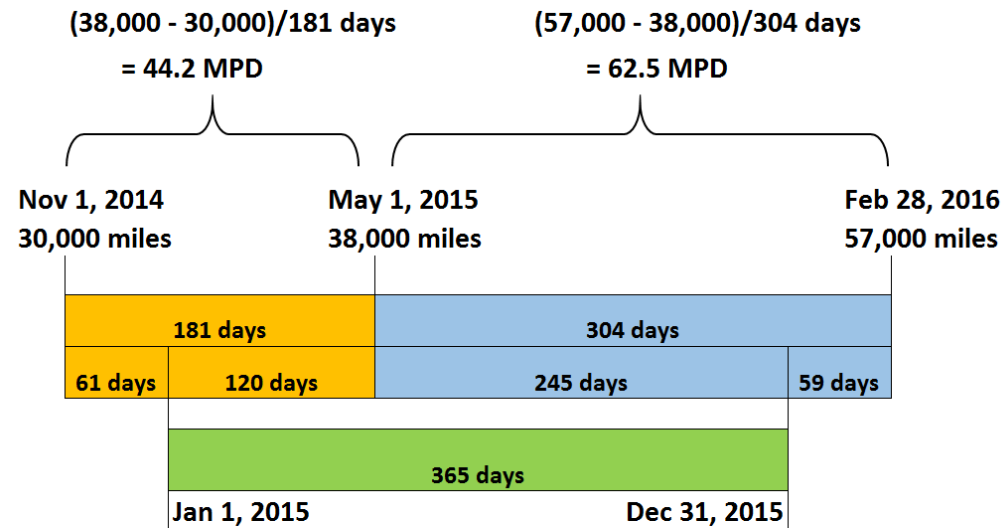
[(120 x 44.2) + (245 x 62.5)] / 365

= 56.5 MPD for 2015

Collision claim frequency by average miles per day, 2013-15 models
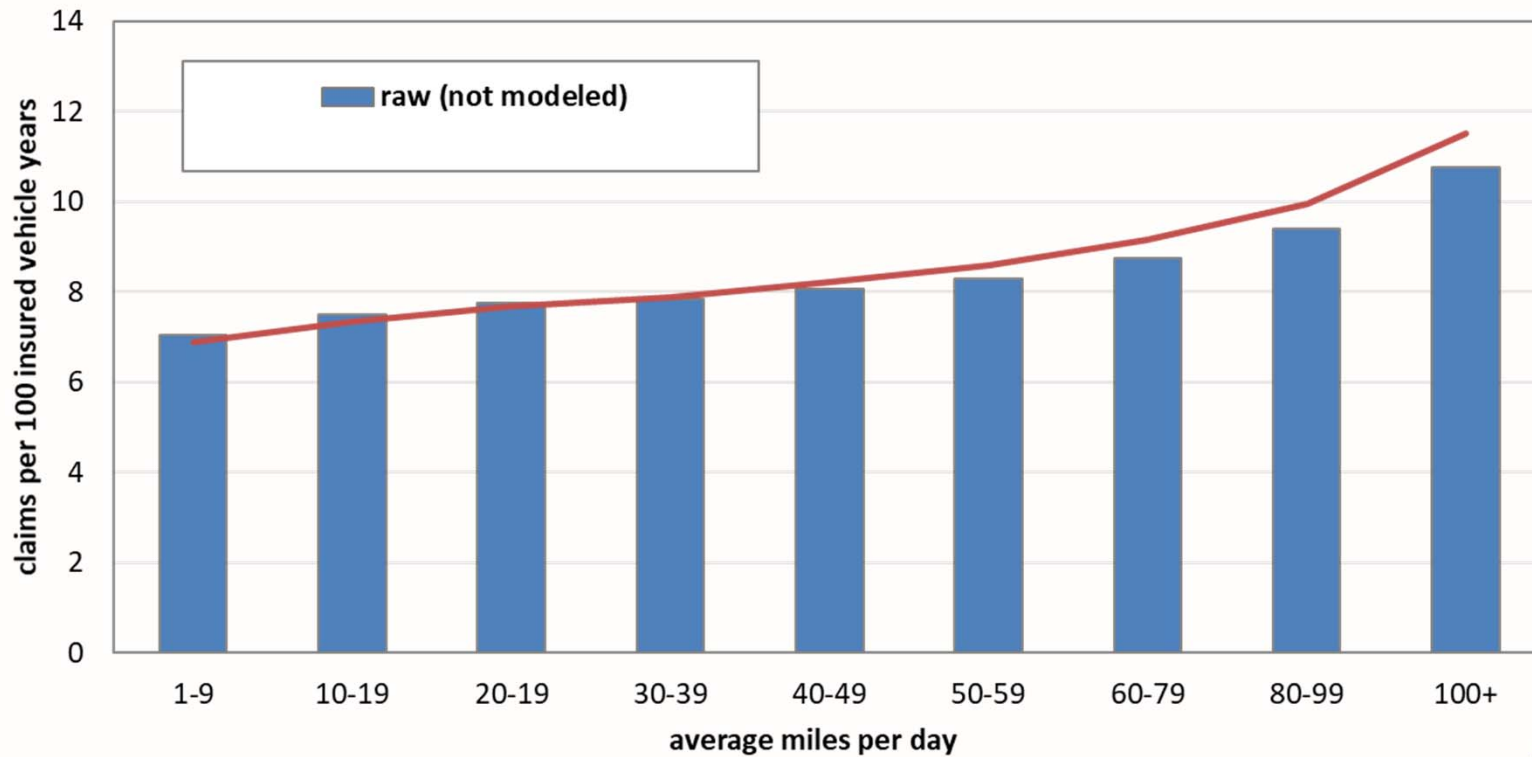
Distribution of percent change in collision claim frequency from adding average miles per day to the model
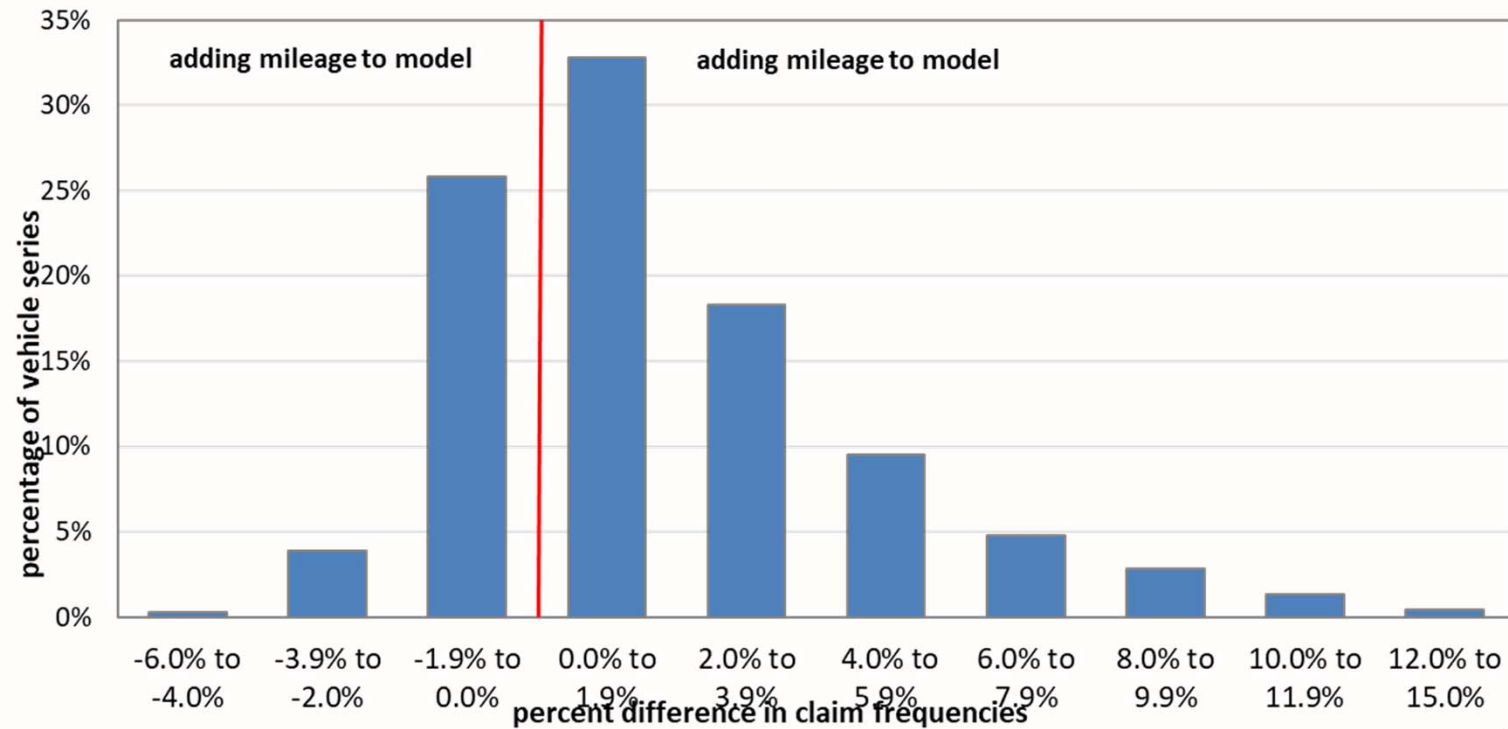
Comparison of relative collision claim frequencies

By vehicle type and size class, 2013-15 models
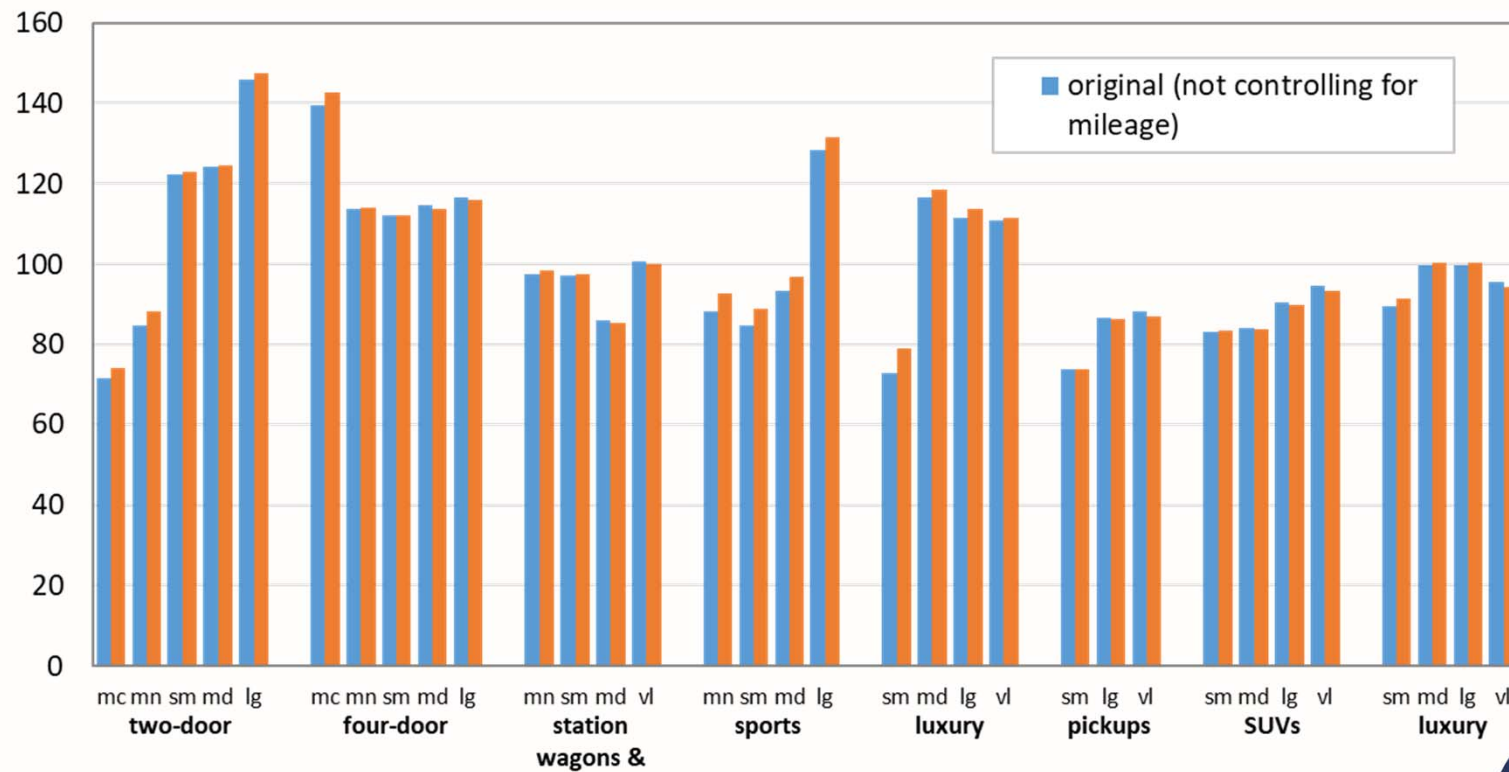
Vehicle series with the largest percentage increase in collision claim frequency

From adding average MPD to the model, 2013-15 models

vehicle series	size and type	model years	exposure	relative claim frequency		percent change	average MPD
				original	mileage adjusted		
Tesla Model S 4dr electric 4WD	Large luxury car	2014-15	2,356	133	151	14%	35.1
Ford Edge 4dr	Midsize SUV	2015	1,353	47	53	13%	40.8
Ford Edge 4dr 4WD	Midsize SUV	2015	1,681	55	62	12%	37.4
Chevrolet Corvette Z06 2dr	Midsize sports car	2015	1,547	45	50	11%	18.1
Mini Cooper	Mini four-door car	2015	2,043	97	108	11%	38.2
Tesla Model S 4dr electric	Large luxury car	2013-15	39,862	145	161	11%	33.3
Mercedes-Benz C class 4dr	Midsize luxury car	2015	3,098	104	115	11%	38.1
Jeep Renegade 4dr 4WD	Small SUV	2015	1,683	69	77	11%	42.1
Ferrari 458 convertible	Midsize sports car	2013-15	1,823	36	40	11%	5.0
Fiat 500 electric	Mini two-door car	2013-15	7,581	66	73	11%	23.8

Vehicle series with the largest percentage decrease in collision claim frequency

From adding average MPD to the model, 2013-15 models

vehicle series	size and type	model years	exposure	relative claim frequency		percent change	average MPD
				original	mileage adjusted		
Toyota Prius v hybrid	Small station wagon	2013-15	79,989	108	105	-4%	41.5
Toyota Prius plug-in hybrid	Small four-door car	2013-15	27,256	102	98	-3%	43.1
Volkswagen Jetta hybrid	Midsize four-door car	2013-15	10,742	130	125	-3%	43.2
Toyota Avalon hybrid	Large four-door car	2013-15	41,781	115	111	-3%	41.0
Ram C/V Tradesman cargo	Large cargo van	2013-15	1,920	86	83	-3%	54.6
Toyota Prius hybrid	Small four-door car	2013-15	311,932	111	107	-3%	43.4
Toyota Camry hybrid	Midsize four-door car	2013-15	79,880	128	125	-3%	41.2
Toyota Sequoia 4dr 4WD	Large SUV	2013-15	20,658	106	103	-3%	38.4
Ford Fusion hybrid	Midsize four-door car	2013-15	80,995	118	115	-3%	45.8
Toyota Tundra CrewMax	Large pickup	2013-15	42,923	90	88	-3%	44.5

Vehicle mileage by rated driver factors

Conversion of miles per day to miles per year

miles per day	miles per year
10	3,650
20	7,300
30	10,950
40	14,600
50	18,250
60	21,900
70	25,550
80	29,200
90	32,850
100	36,500

Distribution of average miles per day for 2005, 2009, and 2013 models in calendar year 2014
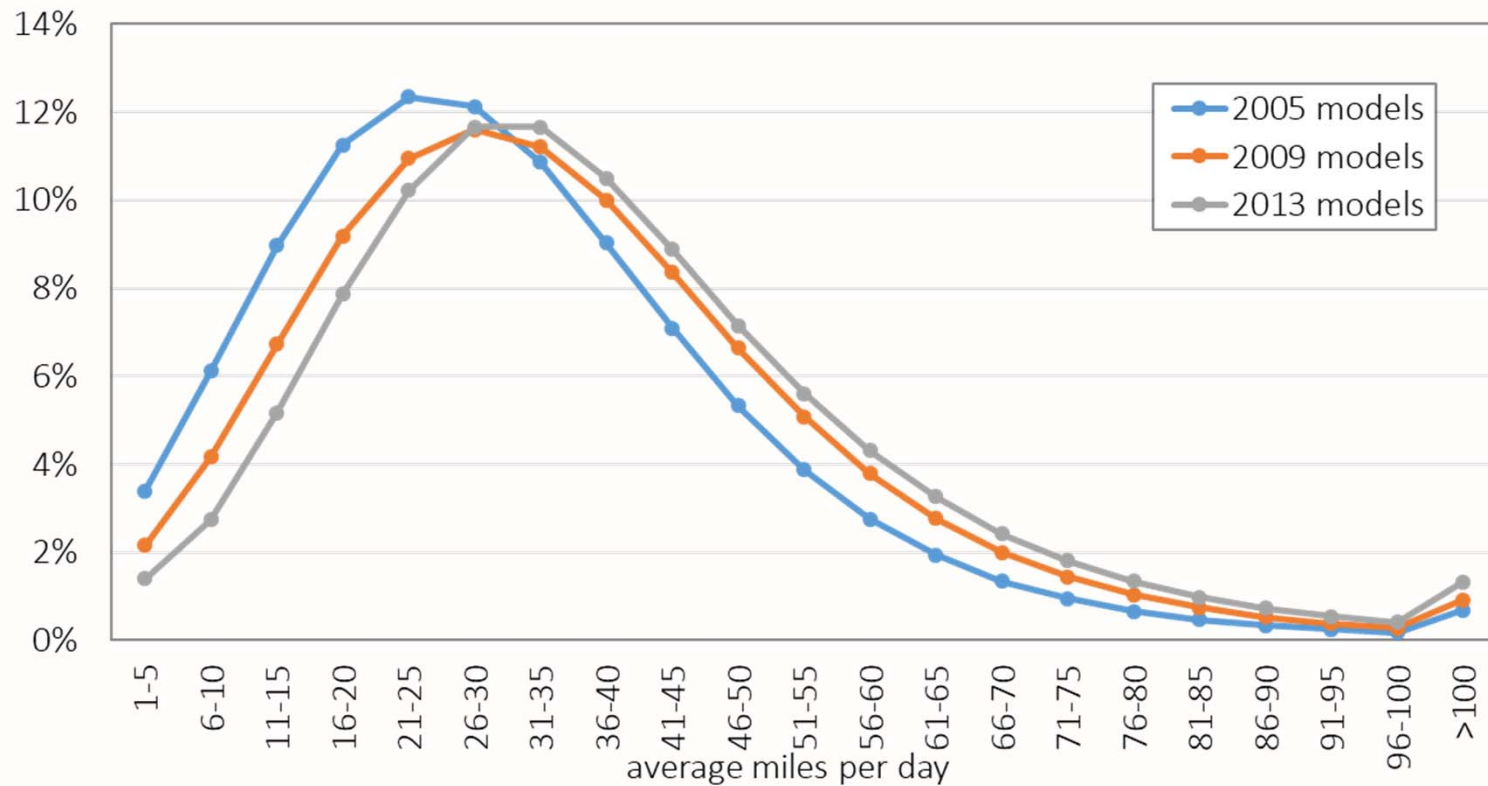
Average miles per day by rated driver age and gender, 2005-14 models
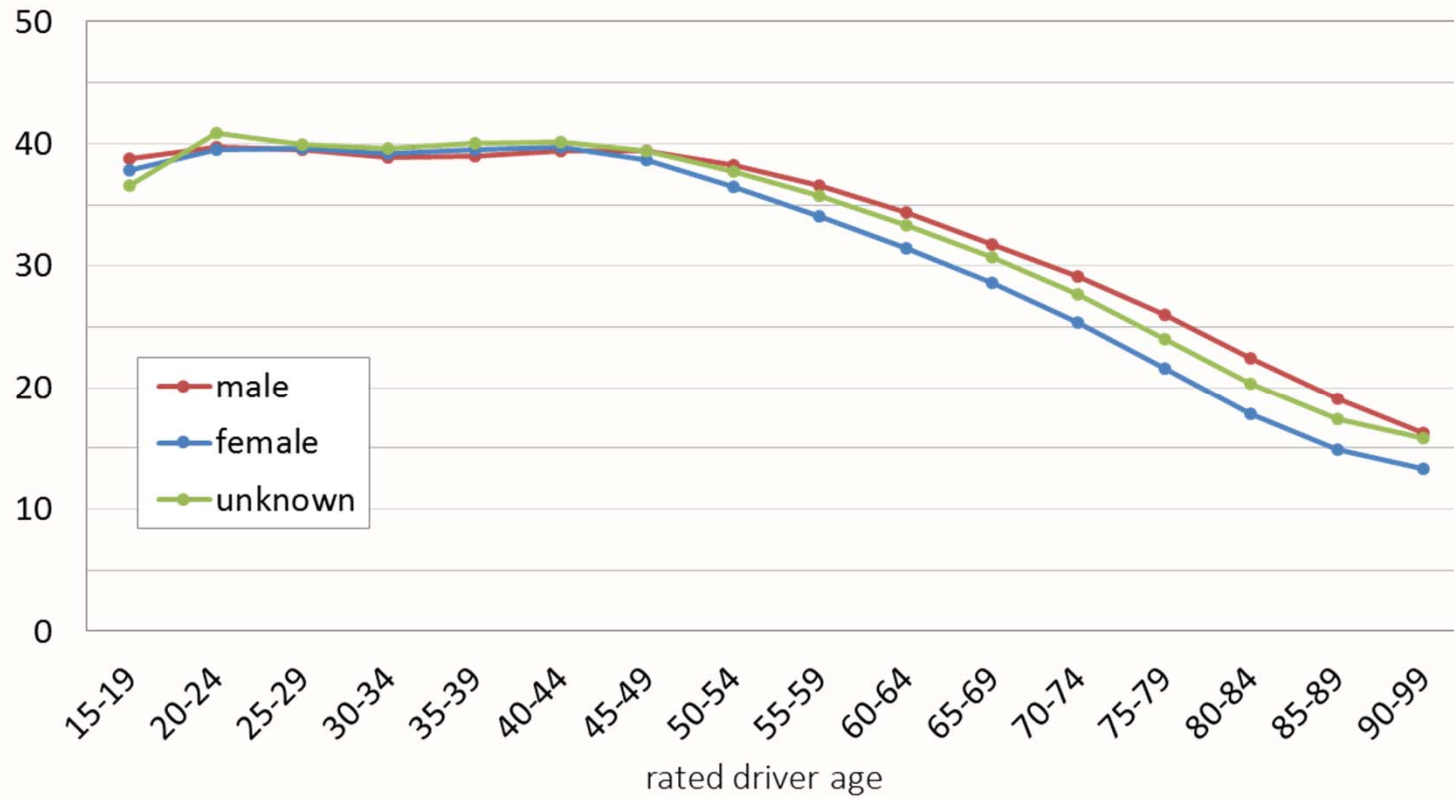
Average miles per day by risk and rated driver age, 2005-14 models
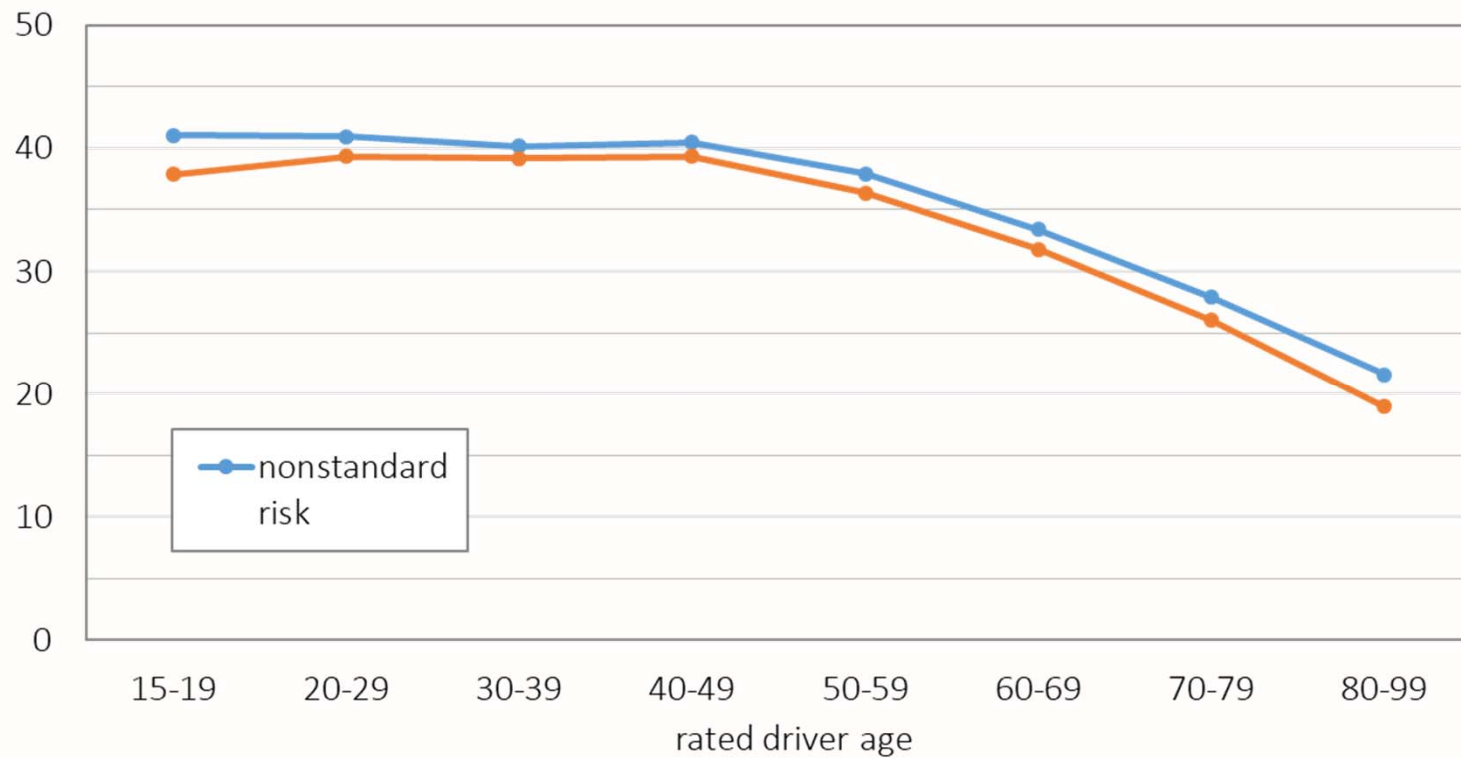
Vehicle mileage by geography

Average miles per day by county

2005-14 models

Legend:
- ≥ 47
- 44 to 46.9
- 41 to 43.9
- 38 to 40.9
- 35 to 37.9
- < 35
- insufficient data
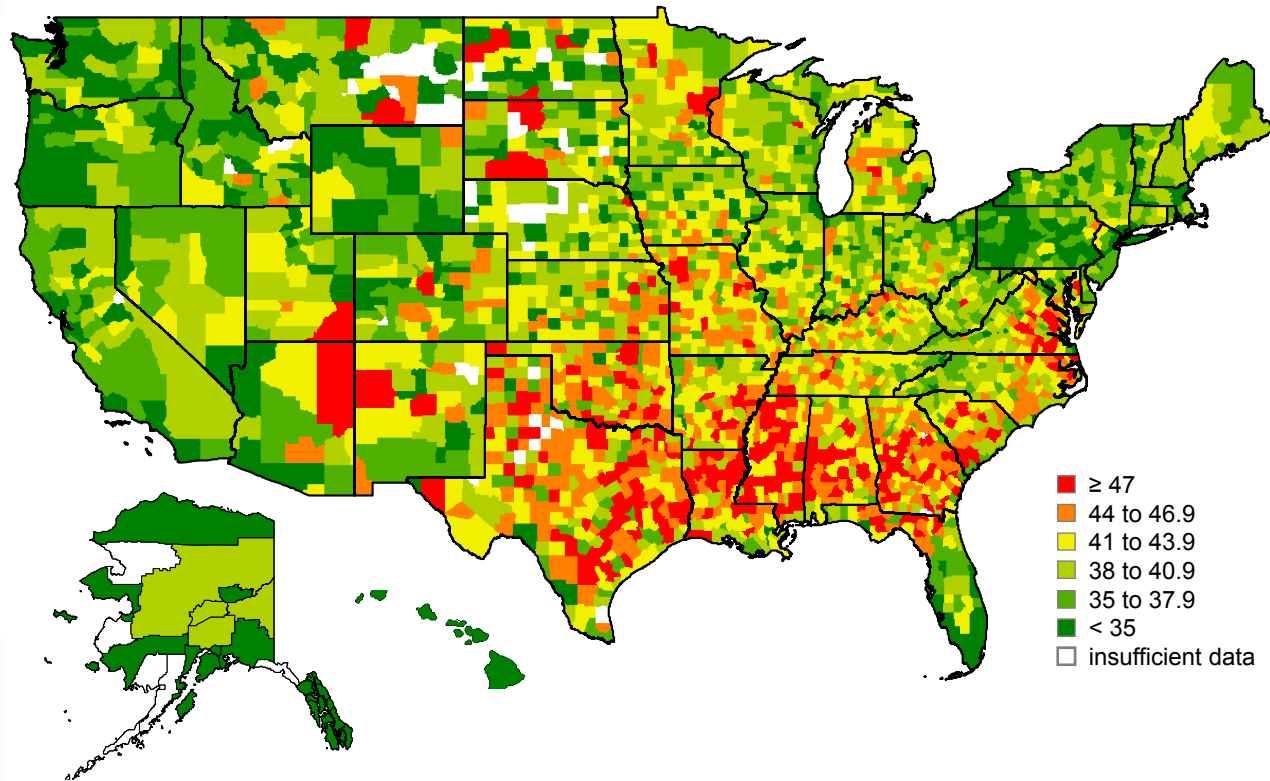
Average miles per day by county

Southwestern United States, 2005-14 models

Average miles per day by county

New York-Newark-Jersey City metropolitan area 2005-14 models
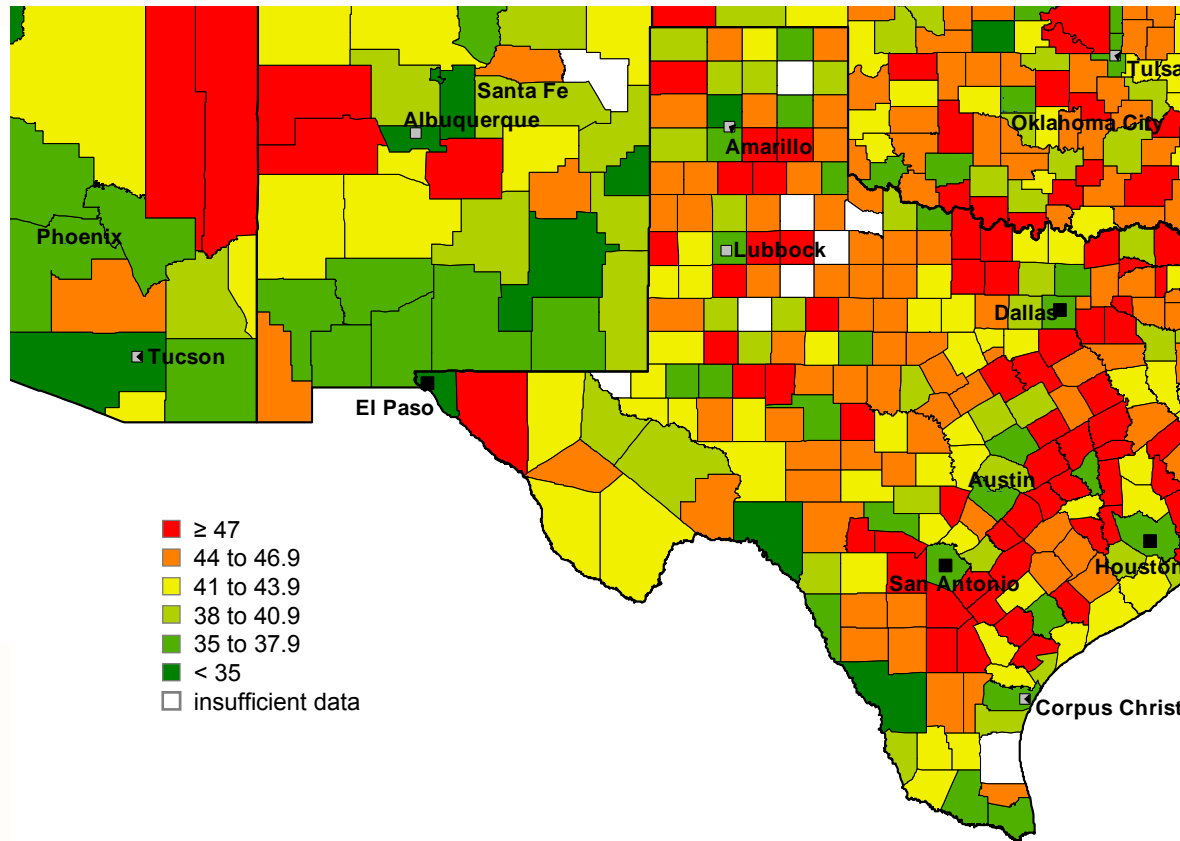
Average miles per day by county

Washington-Arlington-Alexandria metropolitan area, 2005-14 models
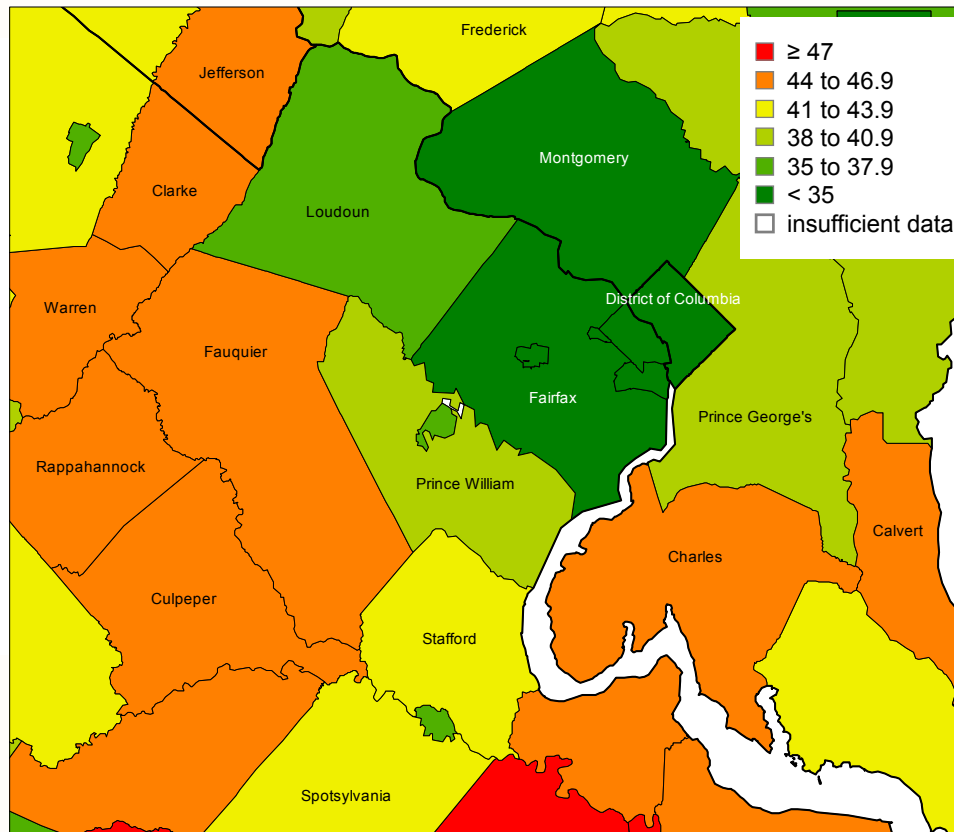
Average miles per day by county

Atlanta-Sandy Springs-Roswell metropolitan area, 2005-14 models
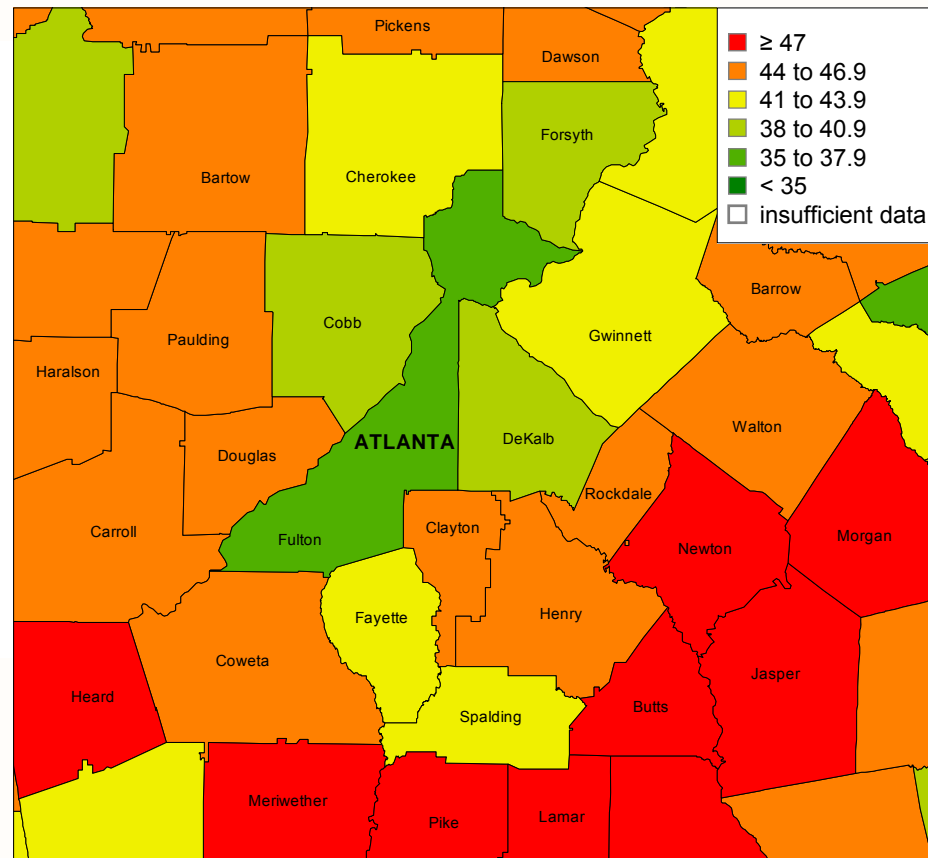
Average miles per day by vehicle density and model year for calendar year 2014
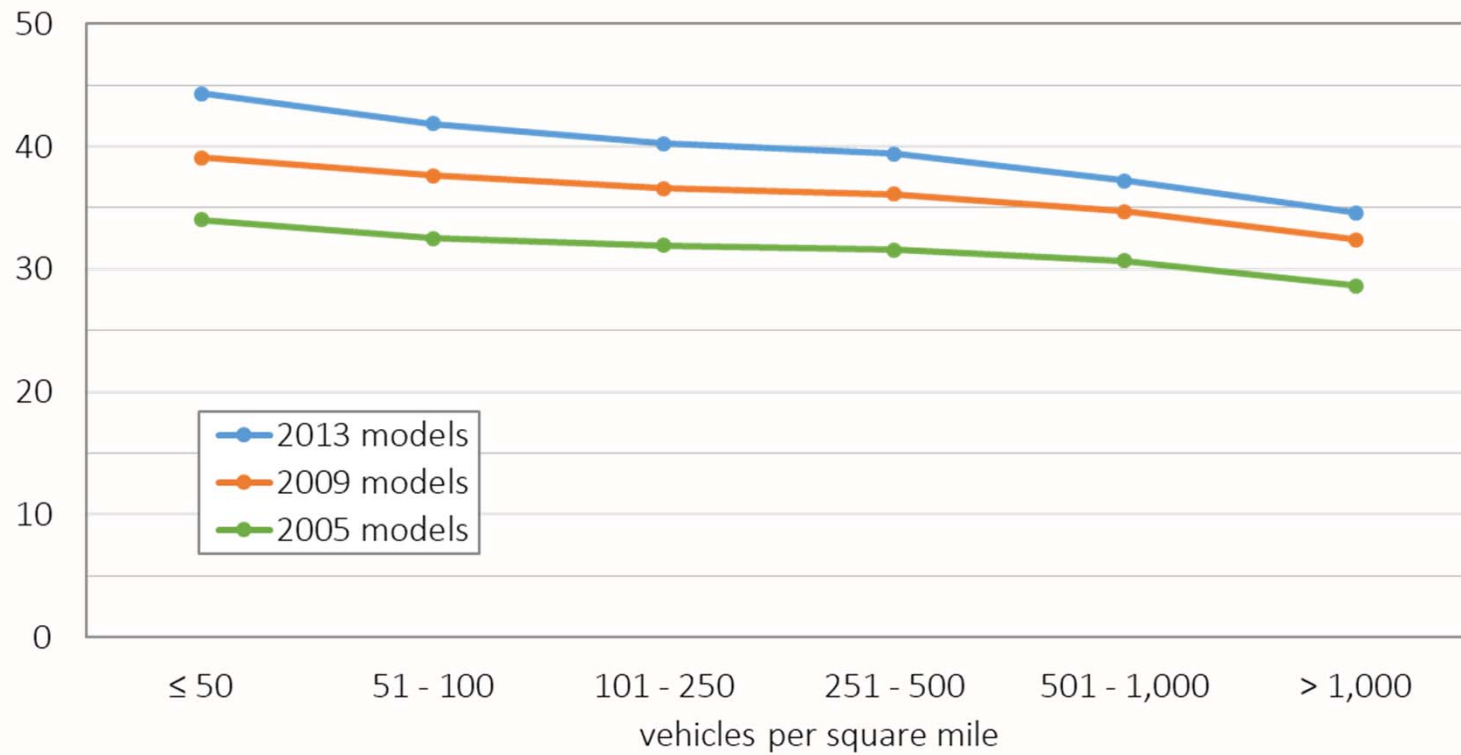
Insurance losses for incomplete vehicles

Ford E-350 Econoline wagon

incomplete

complete

finished incomplete

GMC Sierra 3500 pickup

incomplete

finished incomplete

complete

finished incomplete

Insurance losses for incomplete vehicles

Loss data

	complete vehicles	incomplete vehicles
collision exposure (years)	115,463,822	923,516
collision claims	4,898,579	18,738
PDL (years)	115,463,822	923,516
PDL total claims	3,756,235	29,019
BI (years)	70,200,696	717,166
BI total claims	584,255	5,479

Insurance losses for incomplete vehicles

Method

vehicle pairs	138
model years	1998-2016
calendar years	1997-2016
covariates	calendar year, vehicle pair, model year, state, vehicle density, driver age, driver gender, driver marital status, deductible, risk, miles driven per day, and incomplete vehicle indicator

Difference in collision losses for incomplete vehicles relative to complete vehicles

With and without mileage
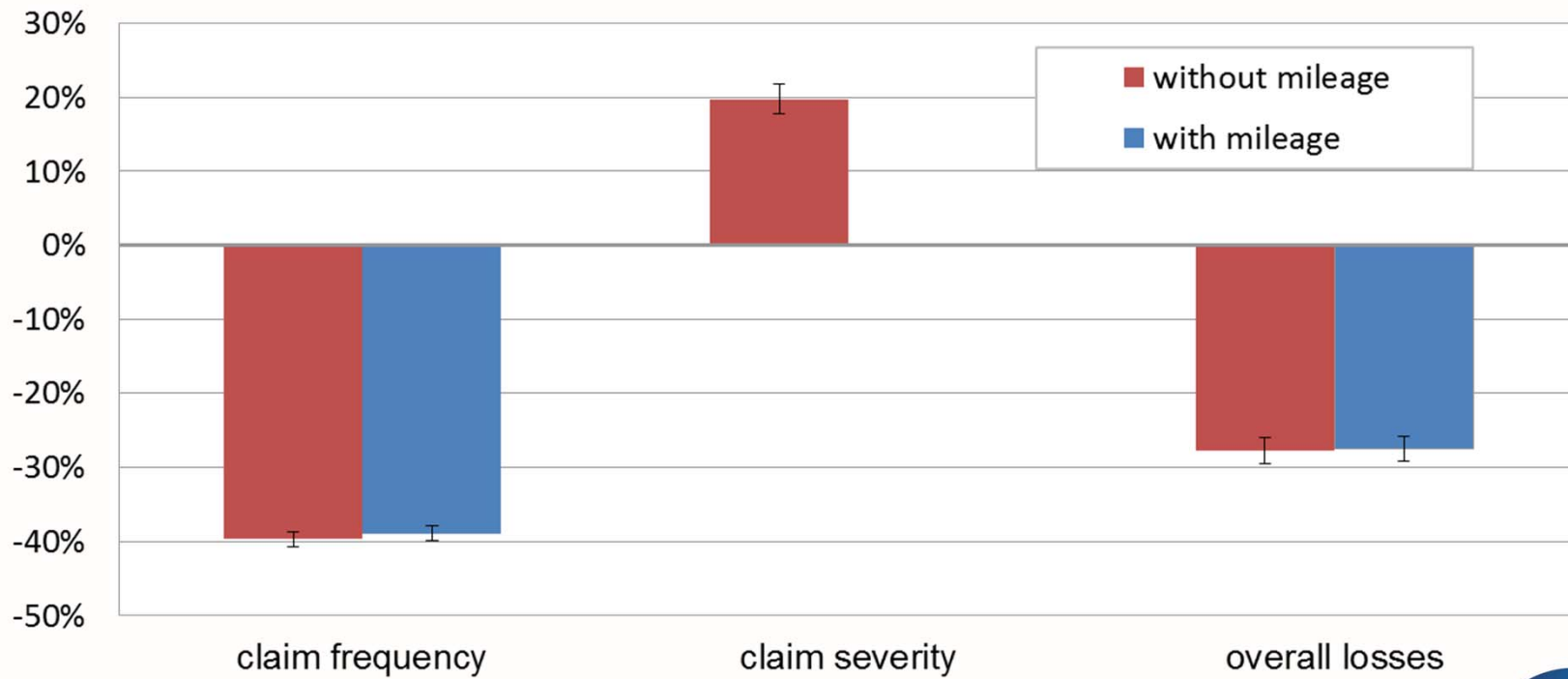
Difference in PDL losses for incomplete vehicles relative to complete vehicles

With and without mileage
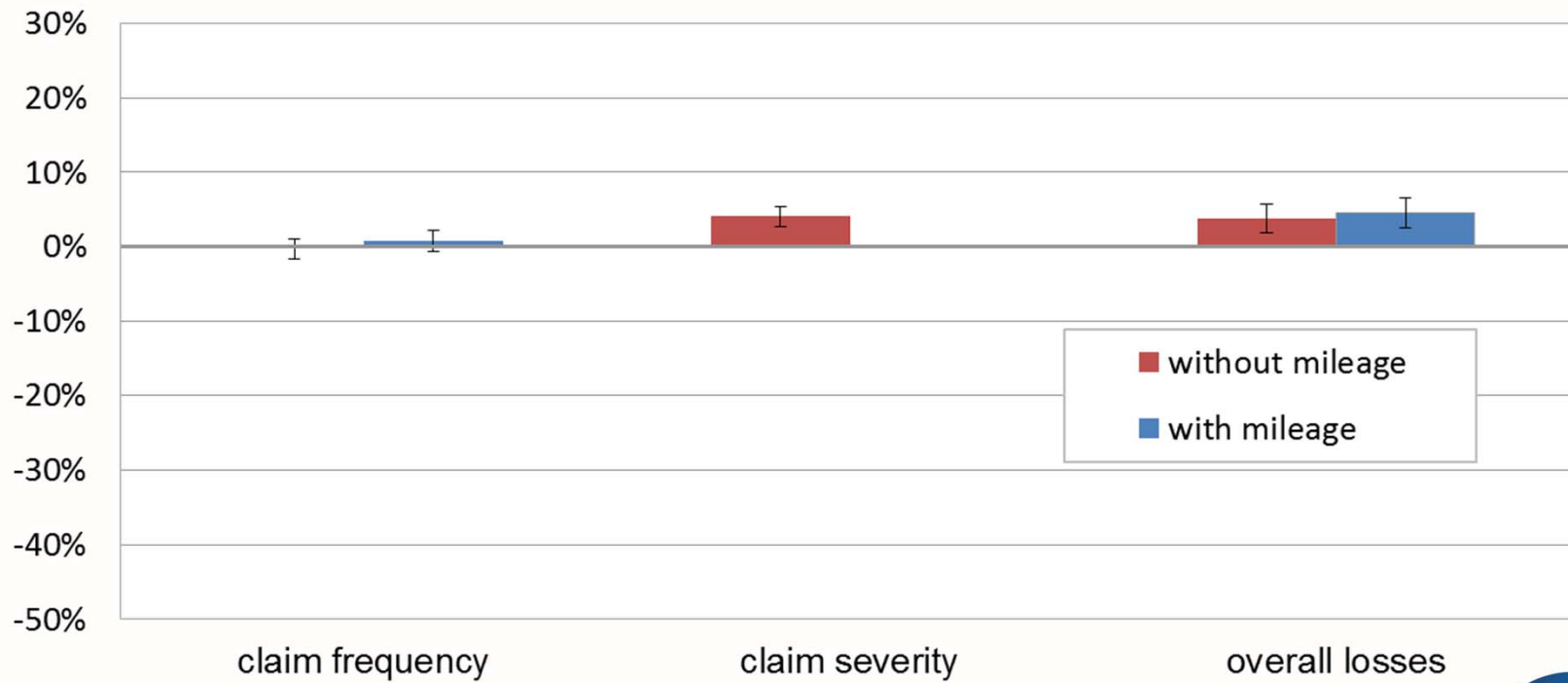
Difference in BI losses for incomplete vehicles relative to complete vehicles

With and without mileage
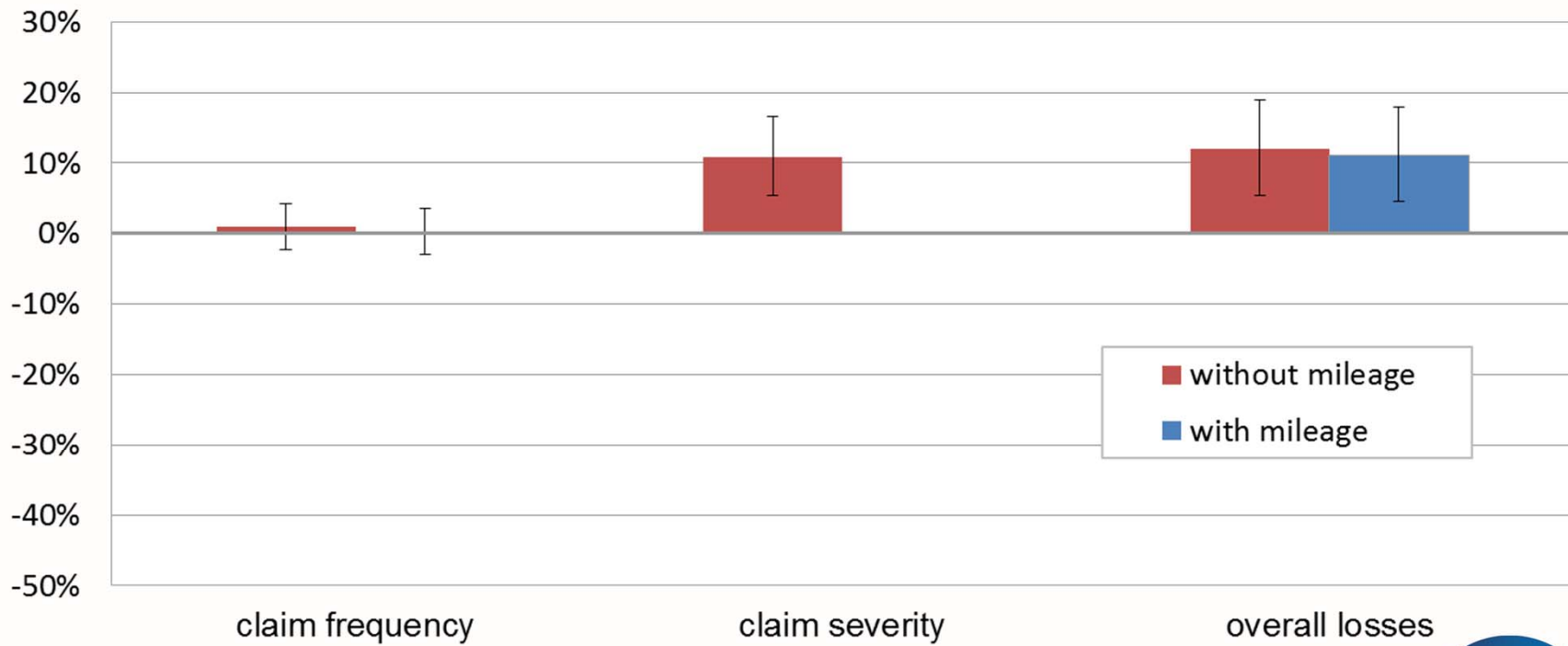
Distribution of average daily miles for incomplete and complete vehicles under collision coverage
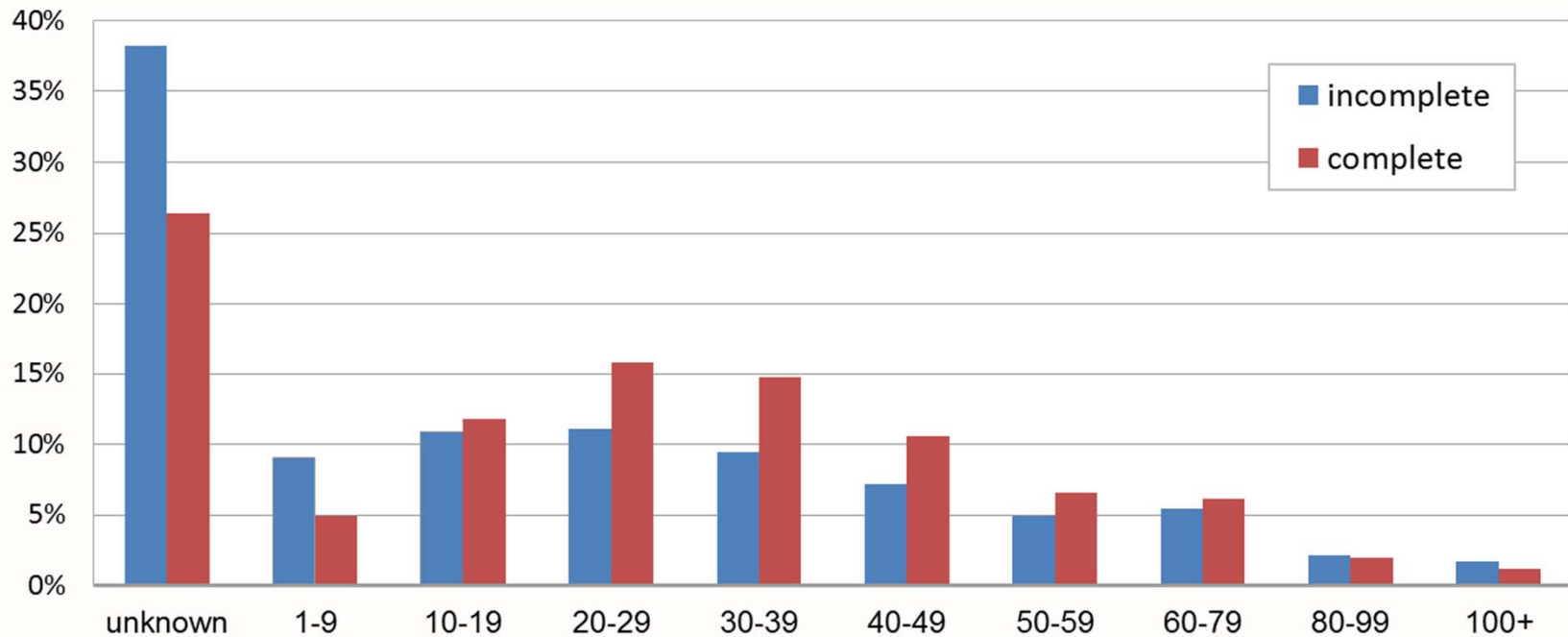
Chevrolet Silverado and GMC Sierra model level differences controlling for mileage

Chevrolet Silverado and GMC Sierra

Regression study design

model years	2011-14
calendar years	2010-14
total exposure	2,204,286
fleet exposure	247,878
covariates	calendar year, model year, state, vehicle density, rated driver age group, gender, marital status, deductible, risk
study variable	fleet vs. non-fleet

Chevrolet Silverado and GMC Sierra

Exposure by model
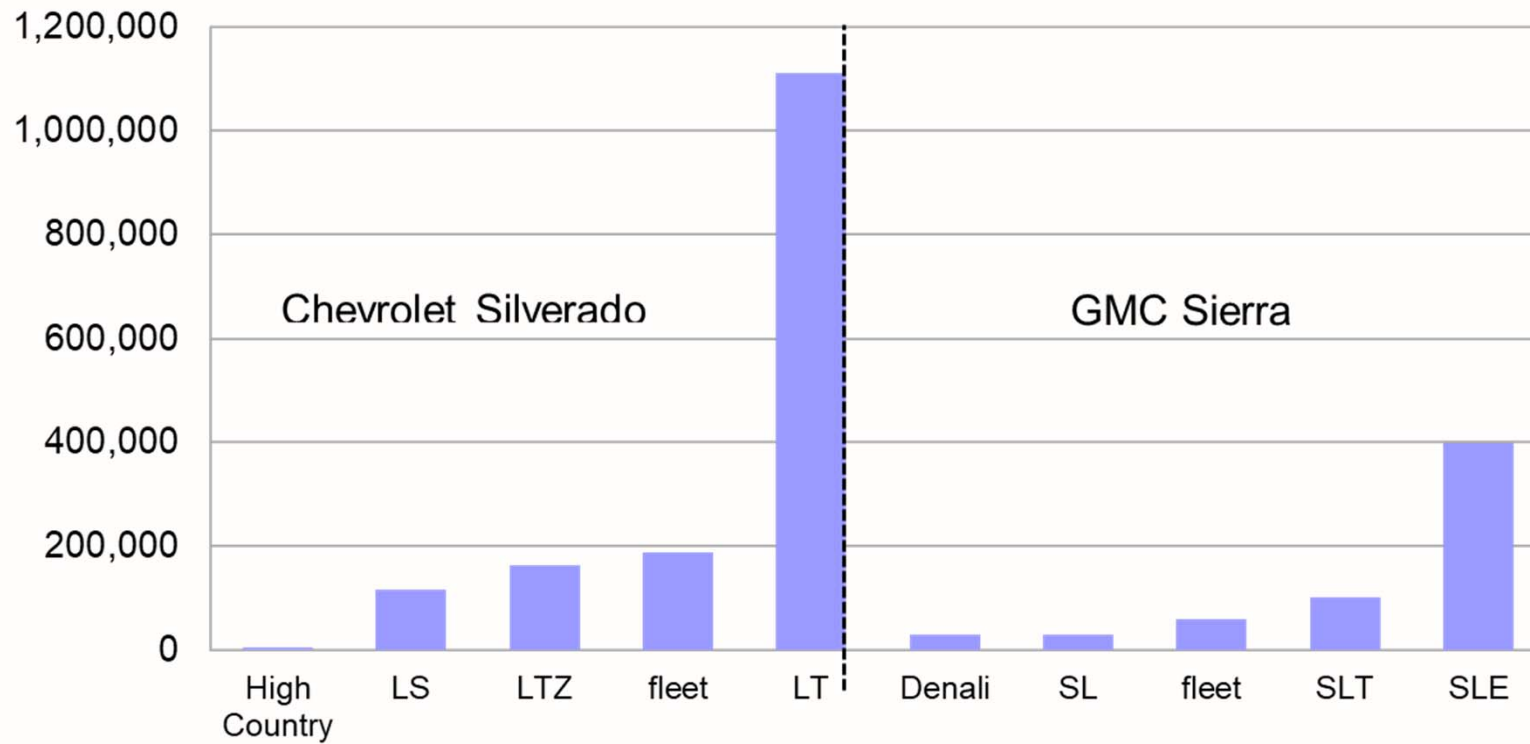
Chevrolet Silverado and GMC Sierra

Average miles per day by model
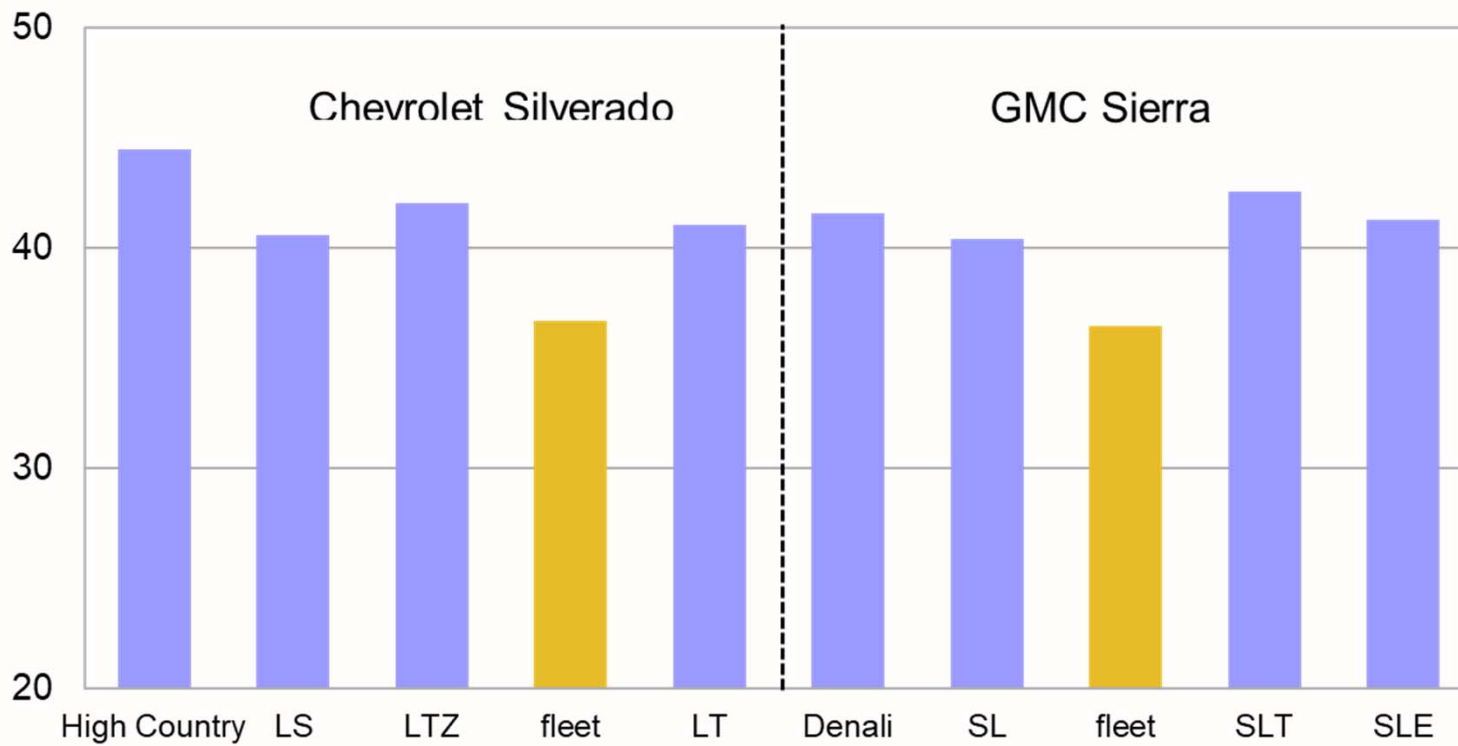
Estimated differences in collision and PDL claim frequencies for fleet models vs. non-fleet models

With and without mileage
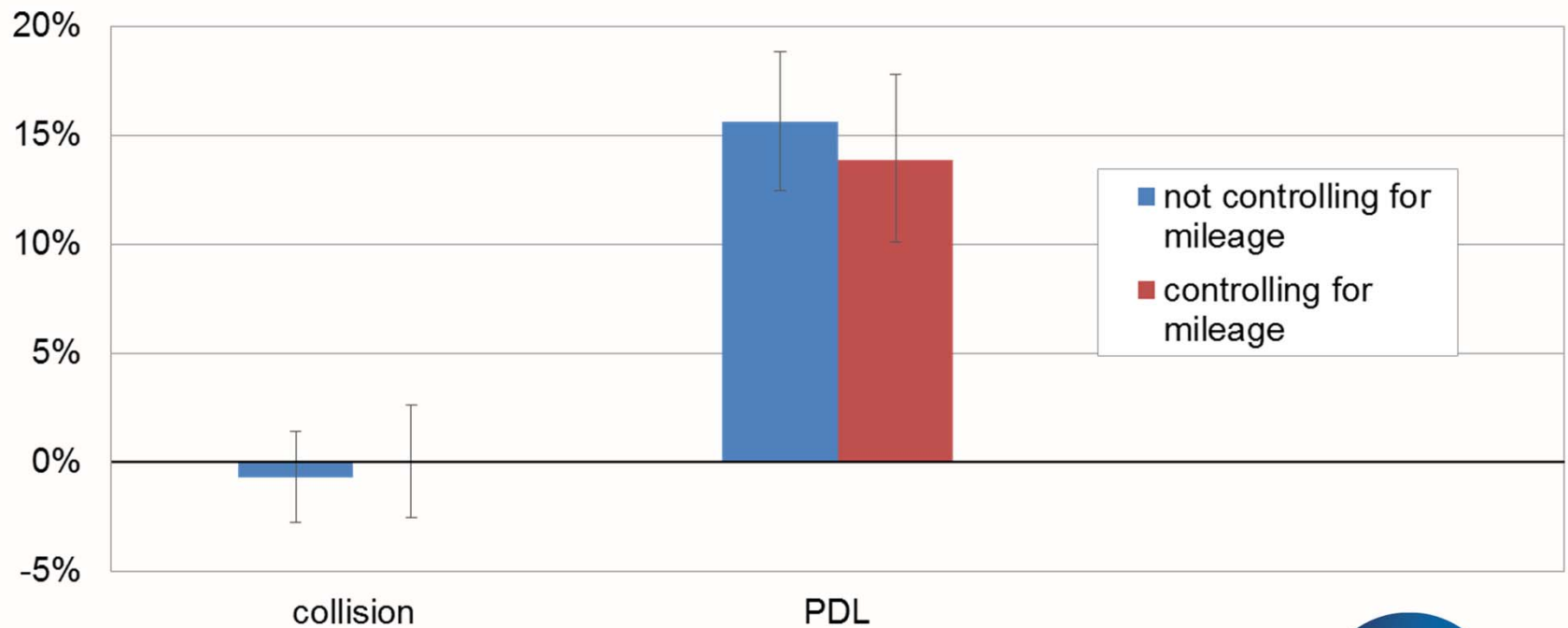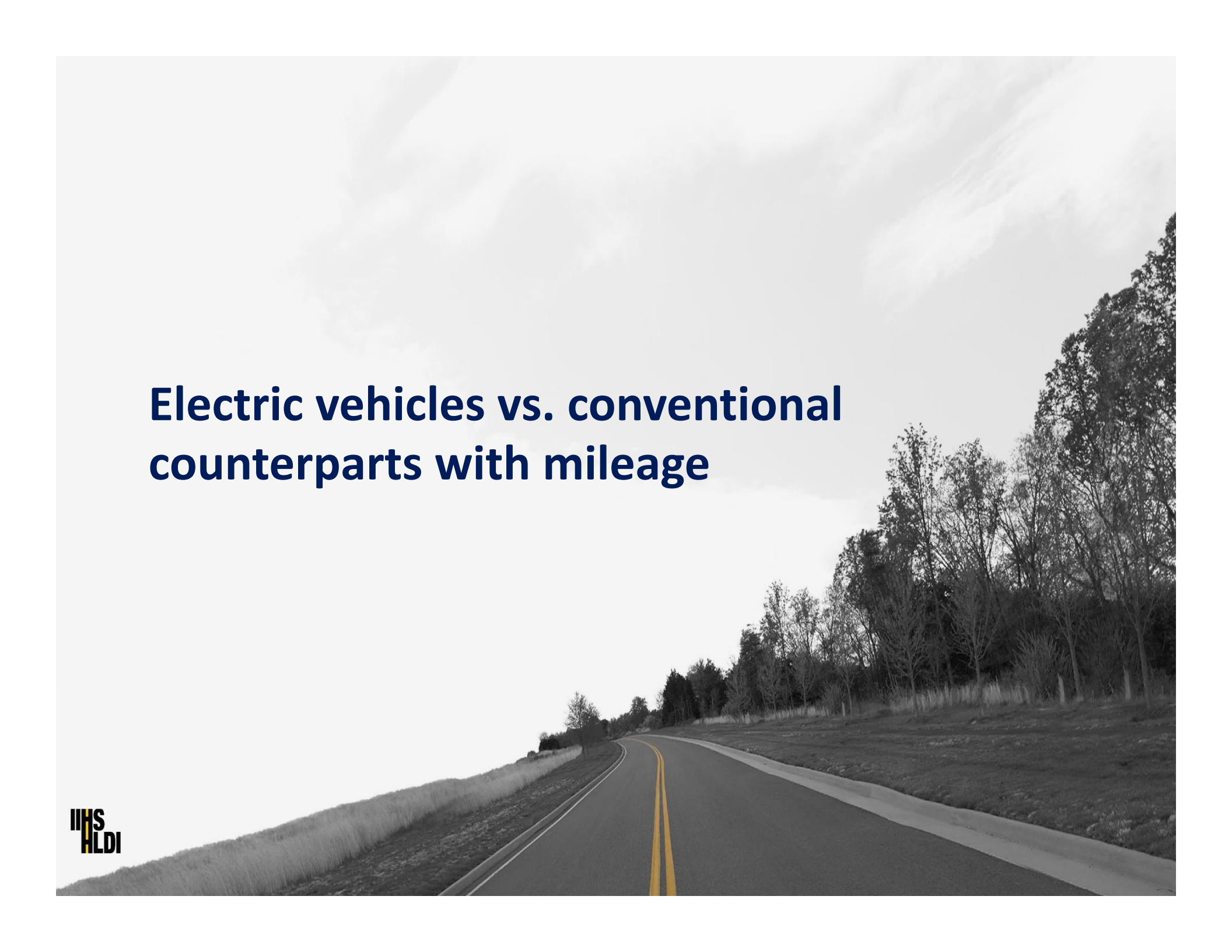
Chevrolet Silverado and GMC Sierra

Collision claim frequency by PDL claim frequency by model
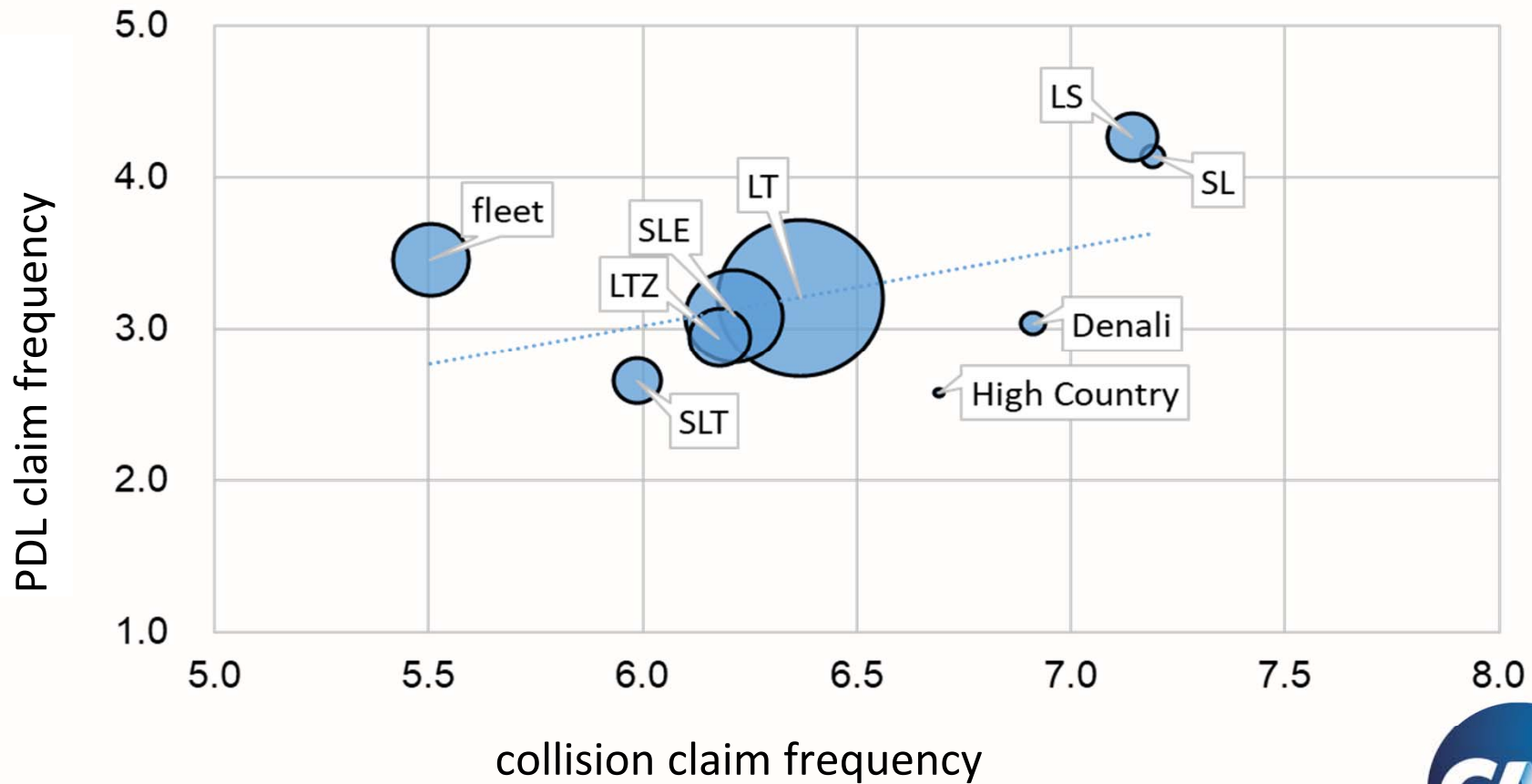
Electric vehicles vs. conventional counterparts with mileage

Registered electric vehicles

Includes all electric vehicles, calendar years 2008-16
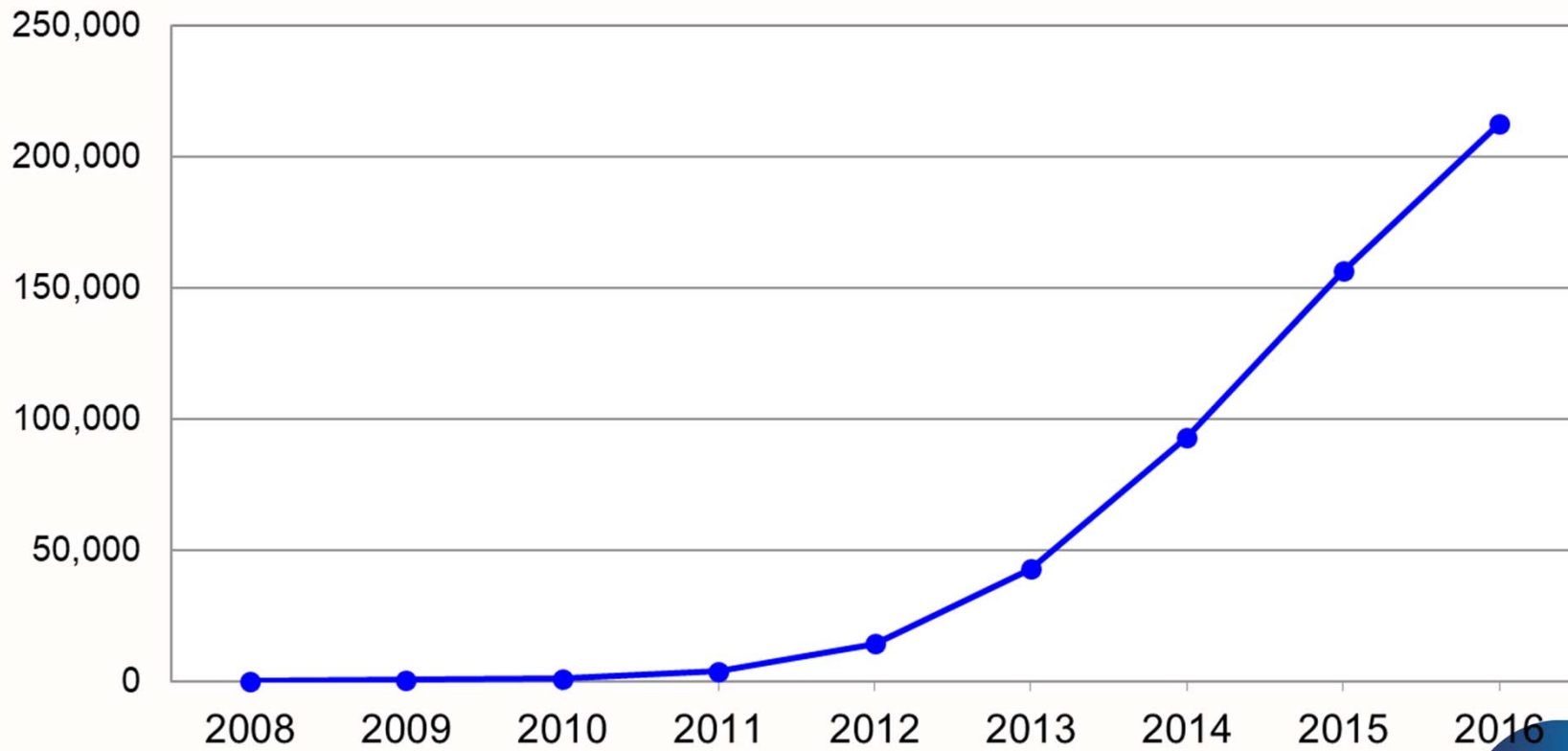
Percent of electric vehicles in registered vehicle fleet

Includes all electric vehicles, calendar years 2008-16
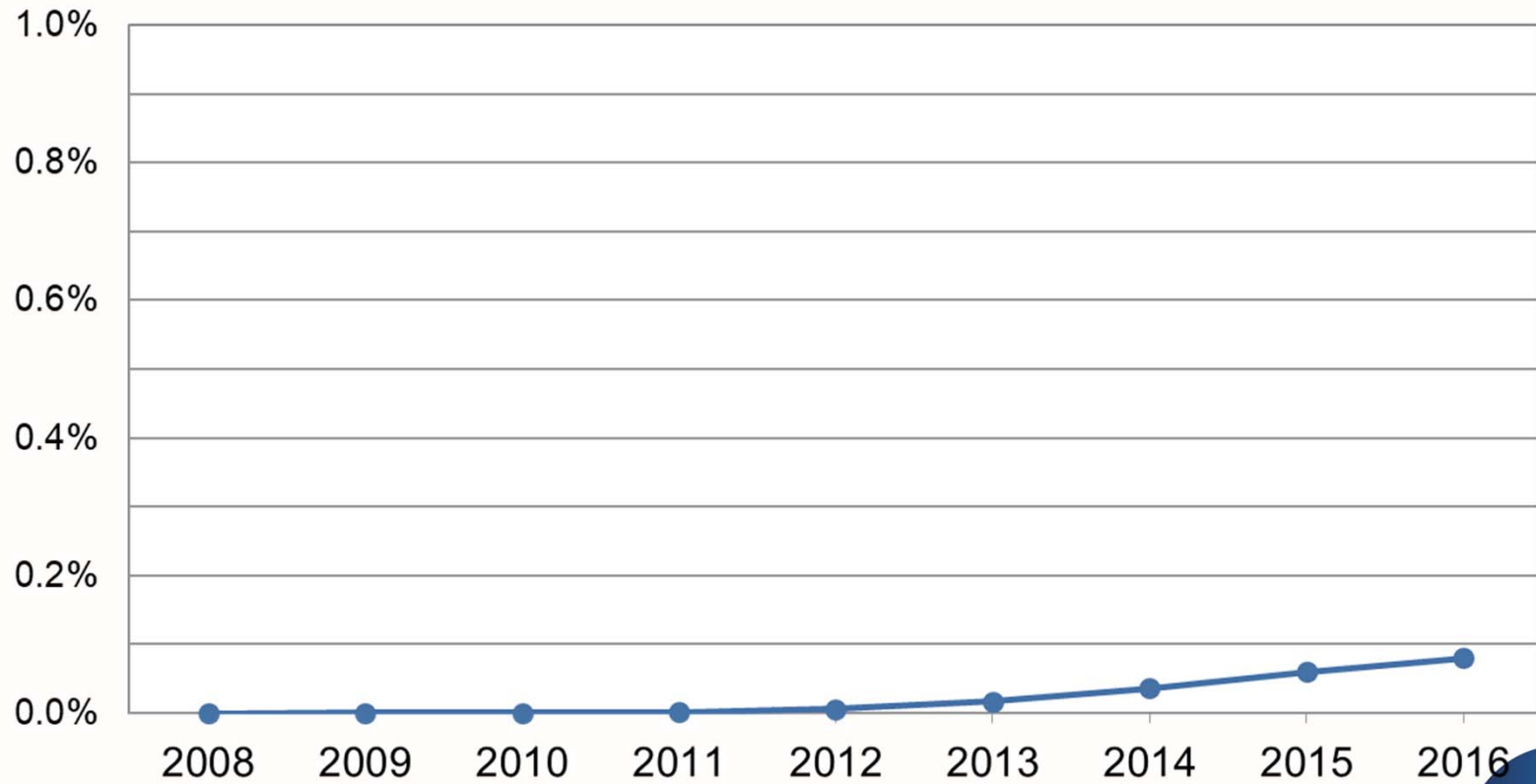
Electric vehicles and their conventional counterparts

Exposure summary

vehicle	model years	total exposure	percent electric
Ford Focus EV 5-door	2012-17	1,026,122	1%
Toyota RAV4 EV 2WD	2012-14	569,222	1%
Kia Soul EV station wagon	2015-17	327,800	1%
Fiat 500 EV 2-door	2013-17	188,169	14%
Chevrolet Spark EV 5-door	2014-16	137,806	6%
Smart ForTwo EV	2011, 2013-15	61,021	12%
Volkswagen E-Golf	2015-16	55,072	16%
BMW 1 series Active E	2011	22,971	4%
Smart ForTwo EV convertible	2013-15	4,885	15%
total		**2,318,553**	**3%**

Electric vehicles and their conventional counterparts

Percent of total exposure, includes only study population

97% conventional
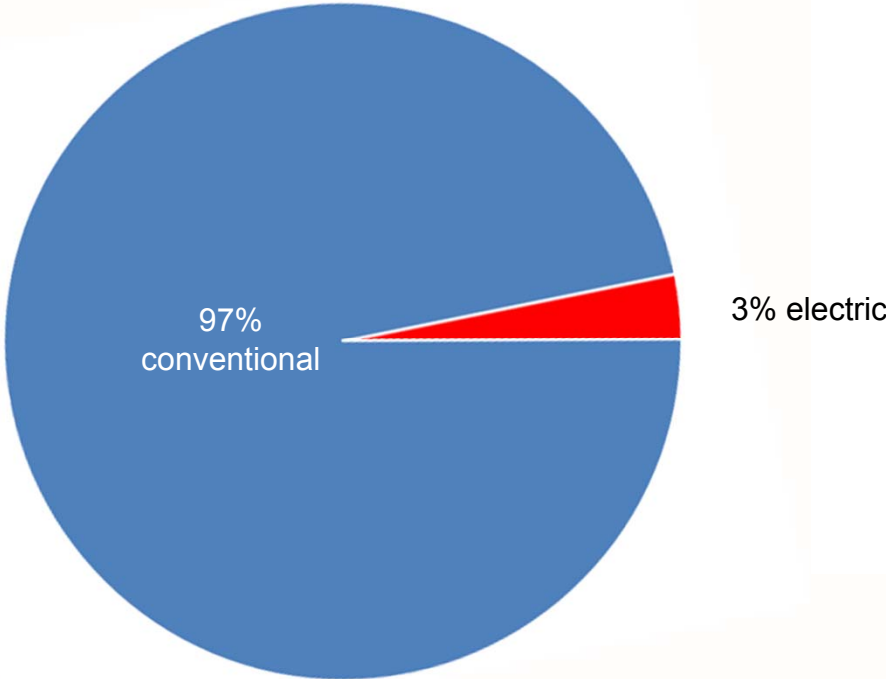
3% electric

Average base price
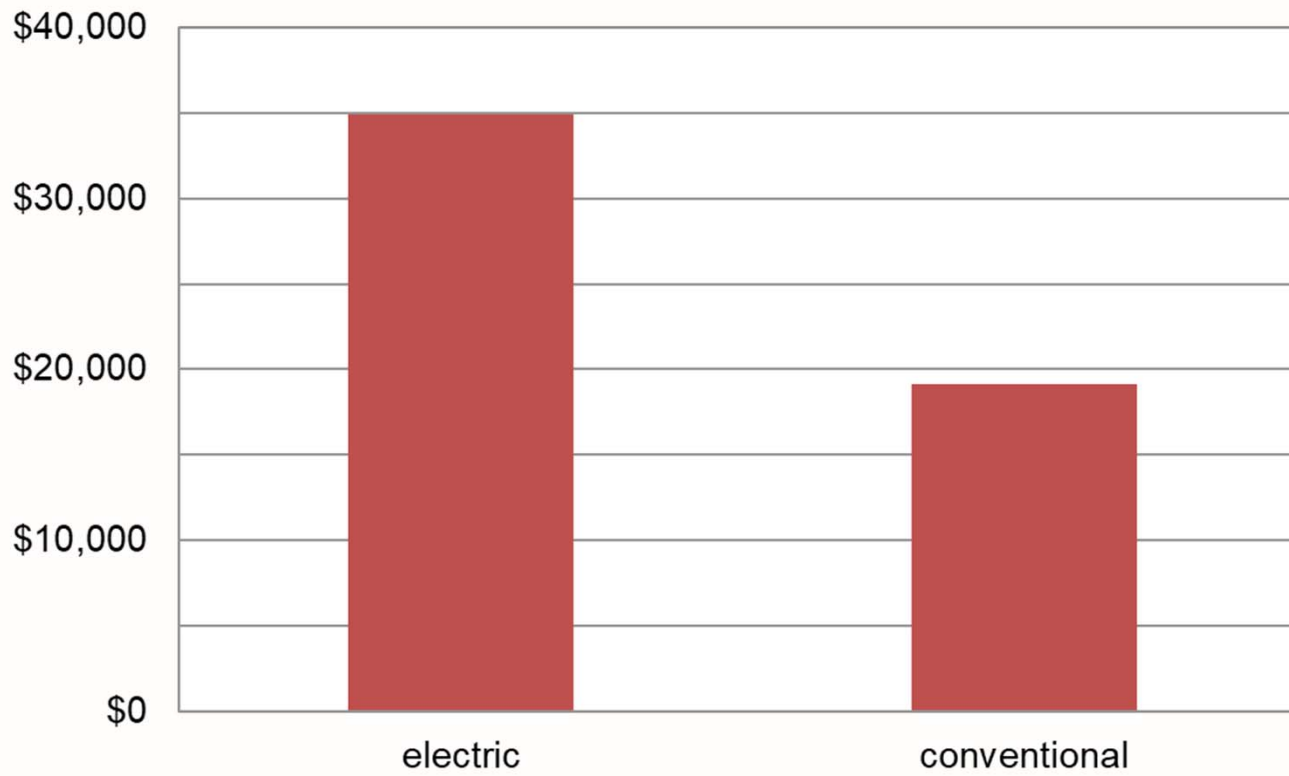
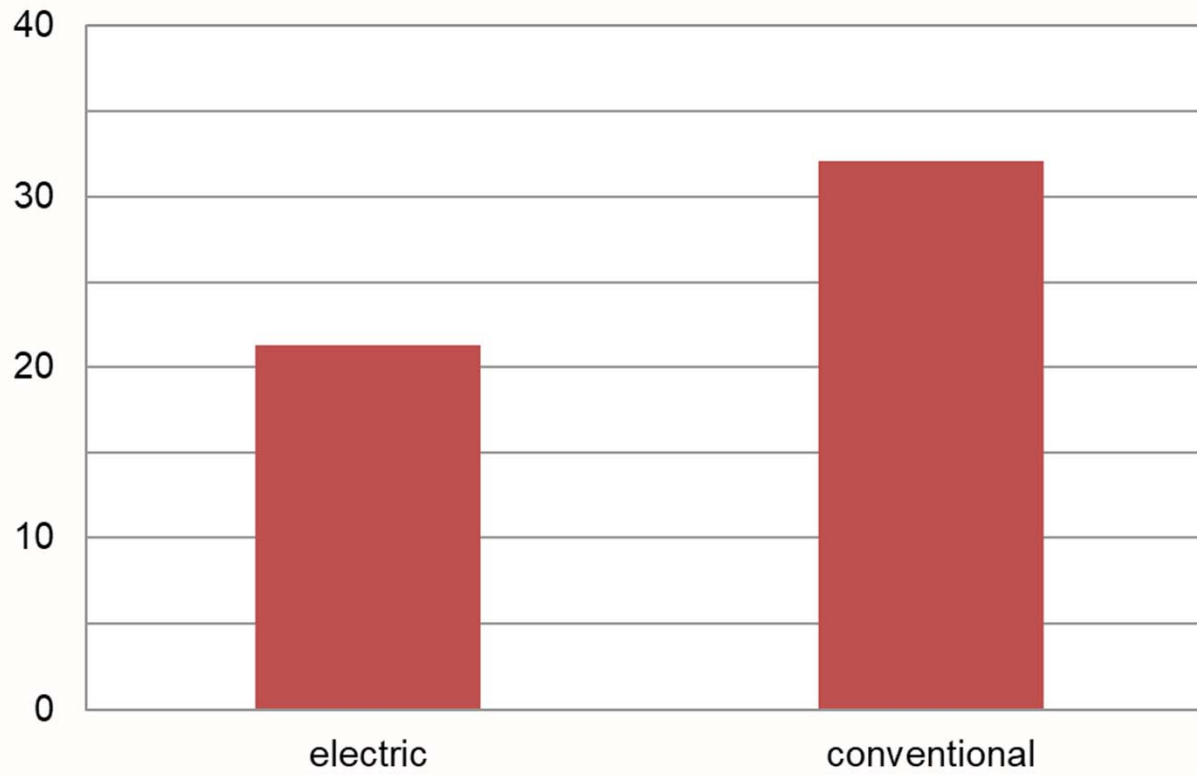# Average curb weight (lbs.)
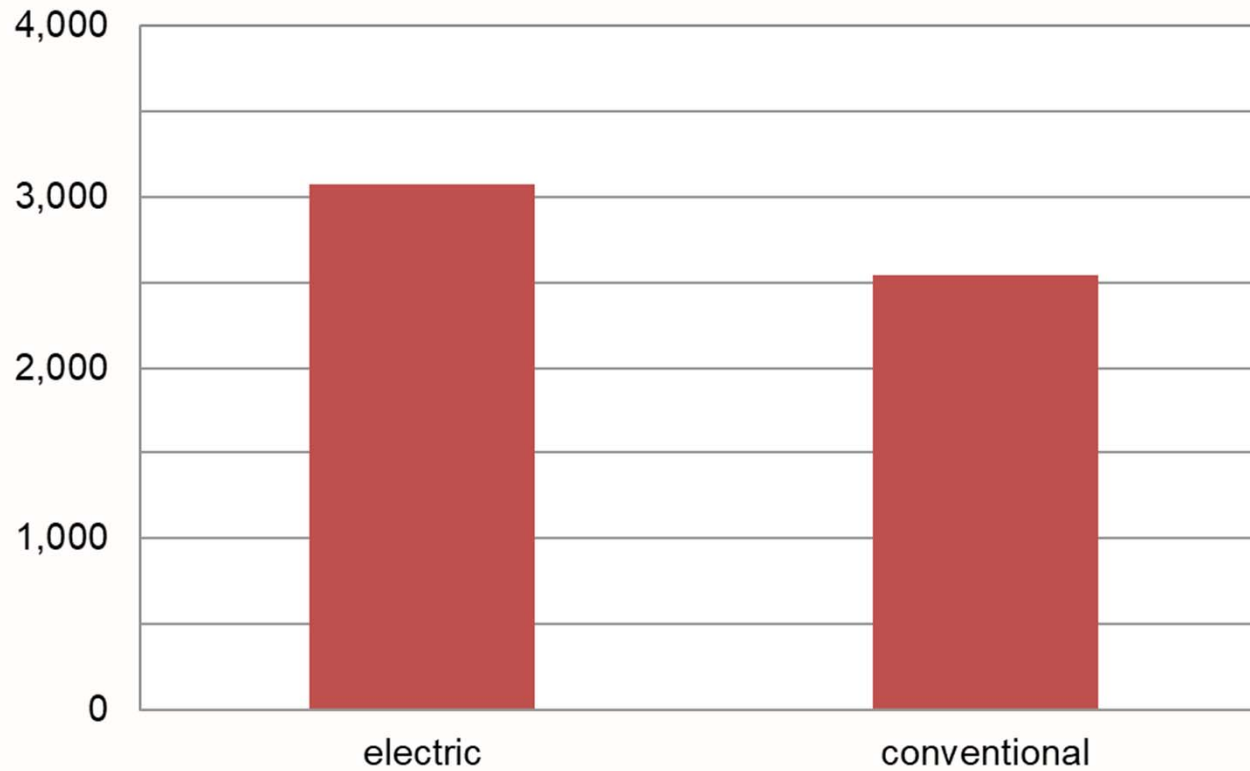
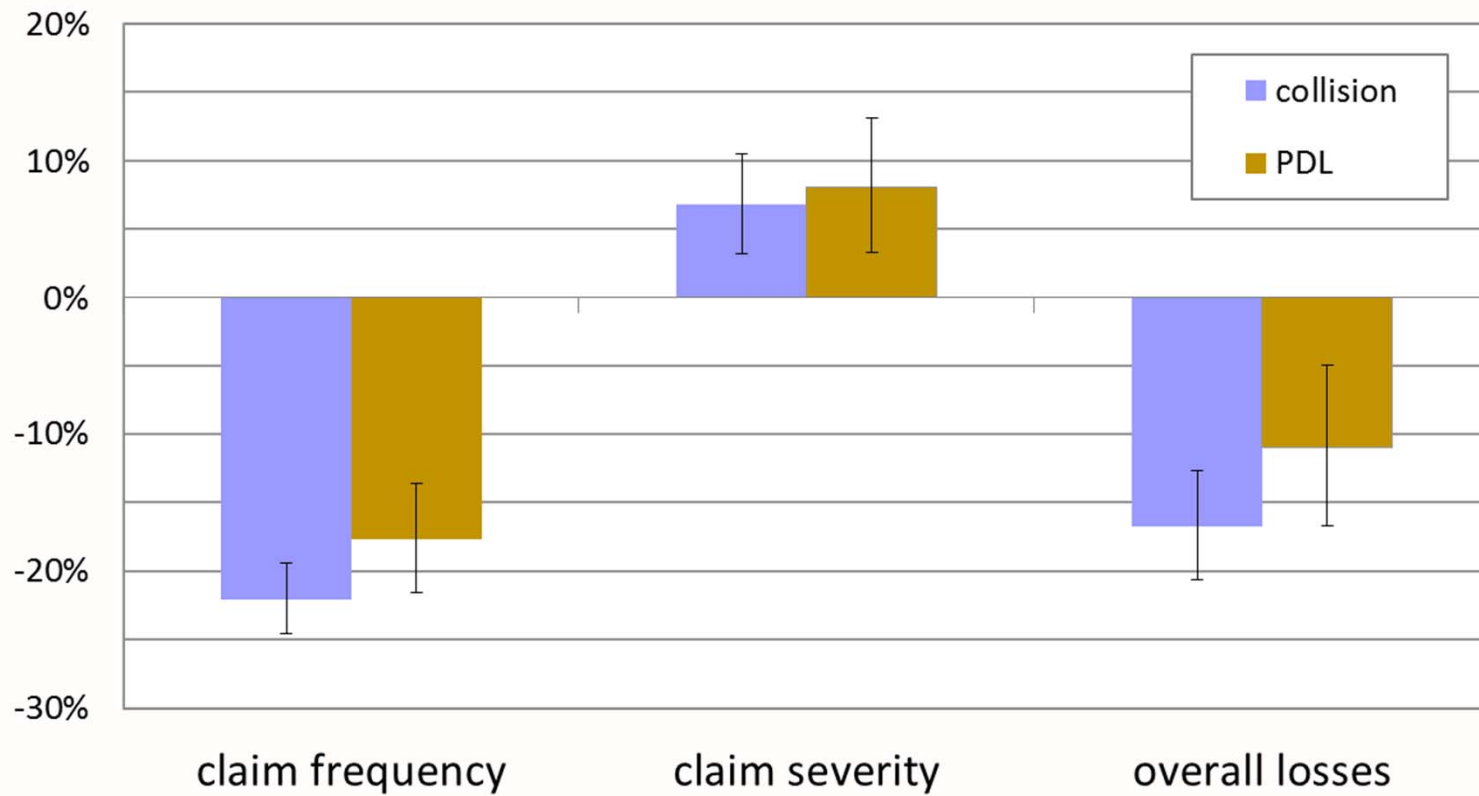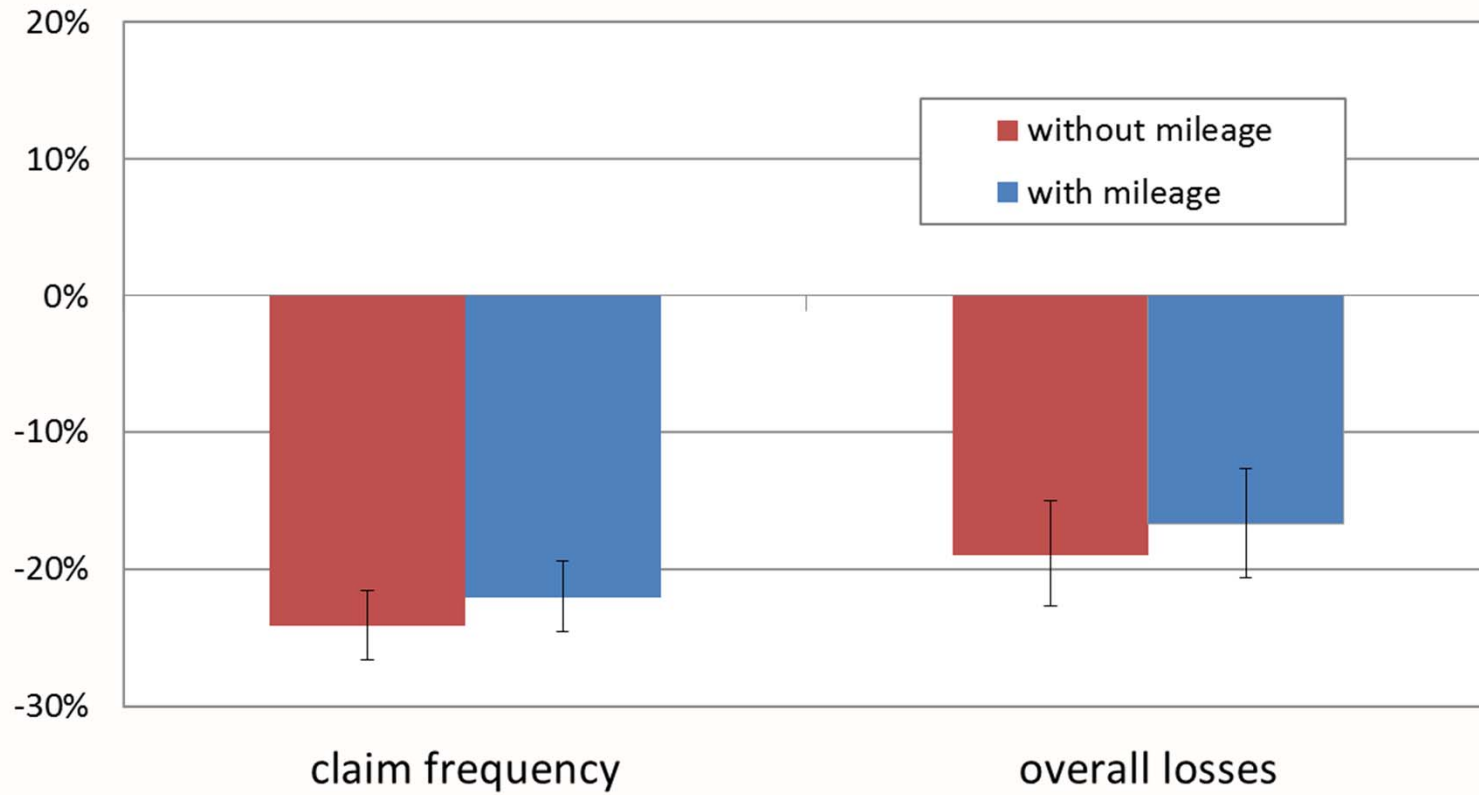# Average miles per day

Estimated collision and PDL losses
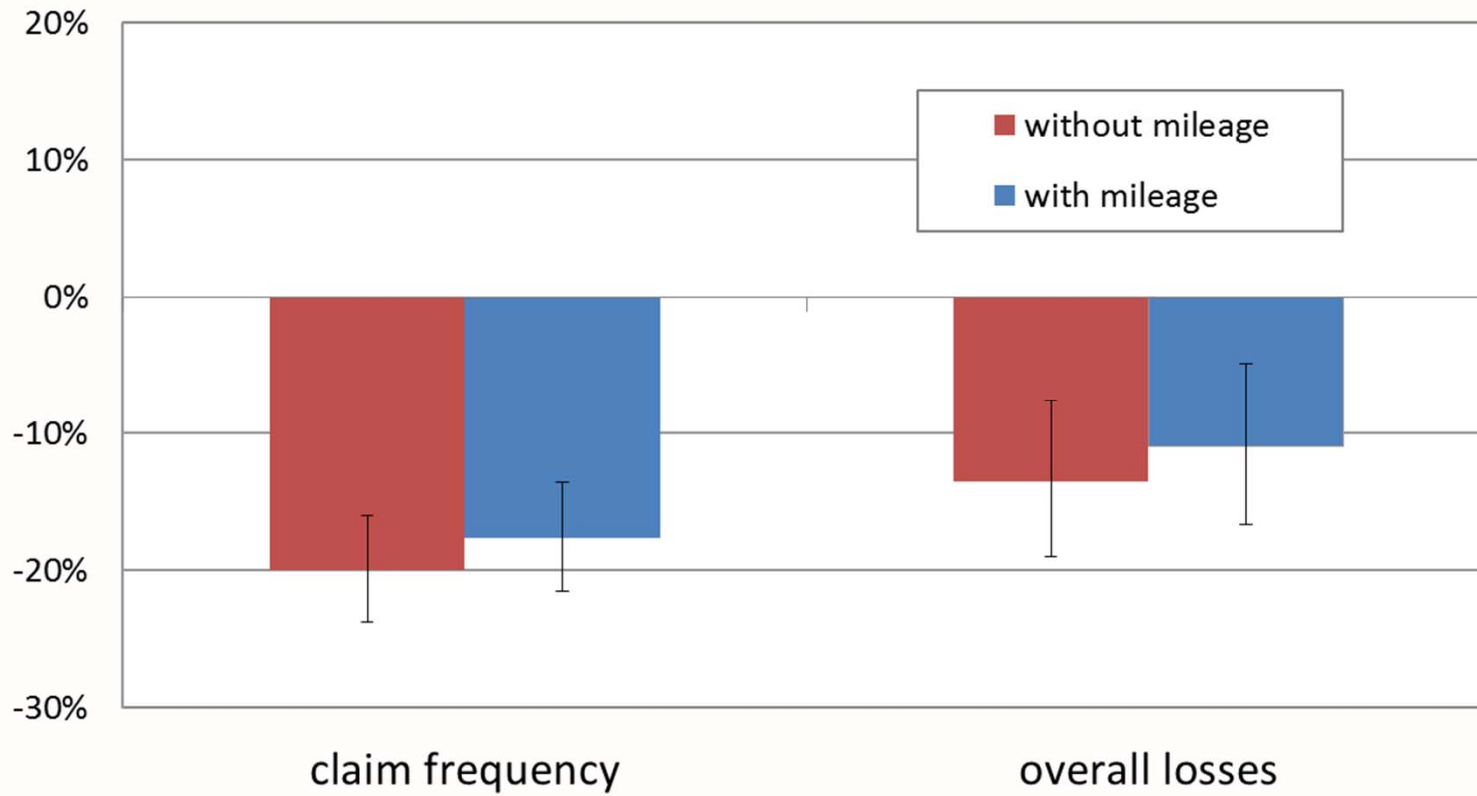
Electric vs. conventional

Estimated collision losses

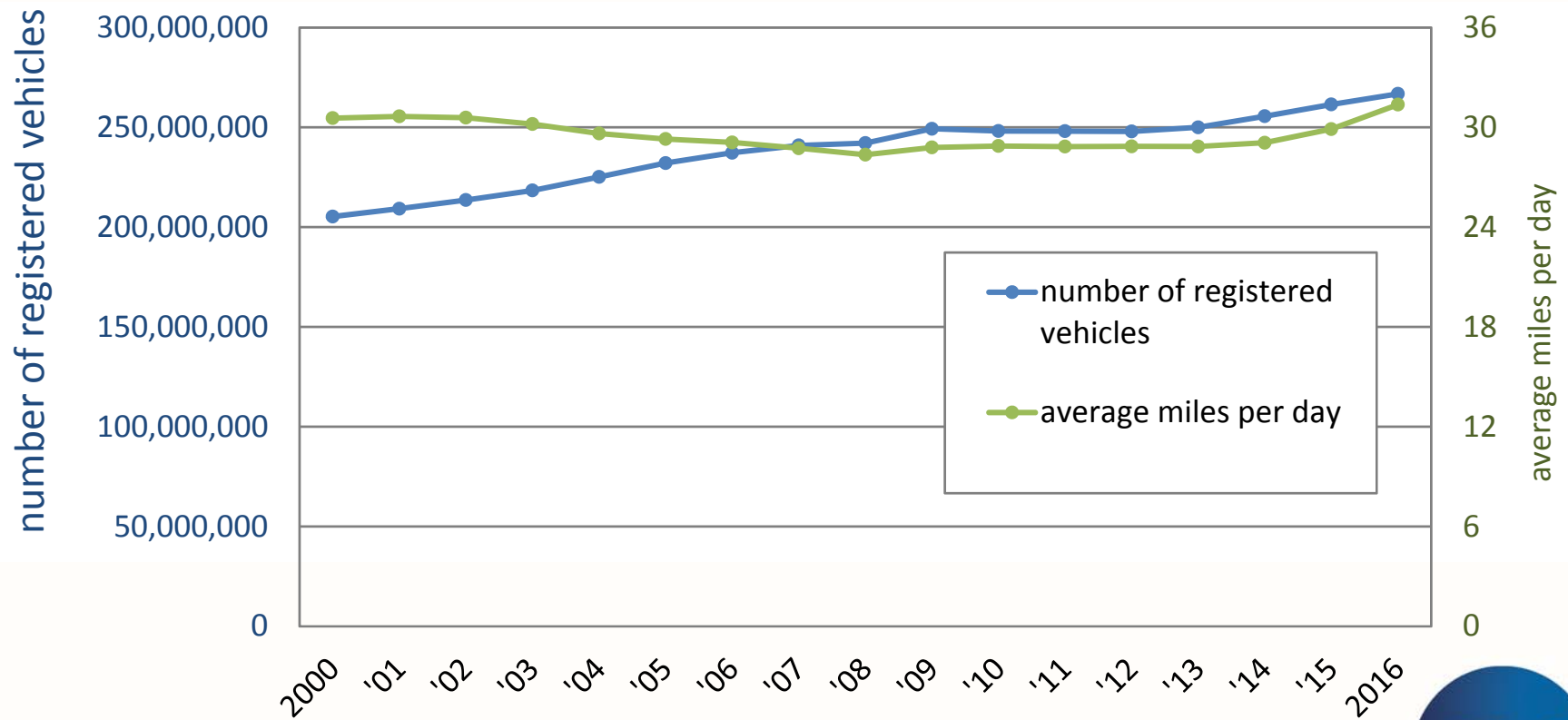Electric vs. conventional, with and without mileage

Estimated PDL losses
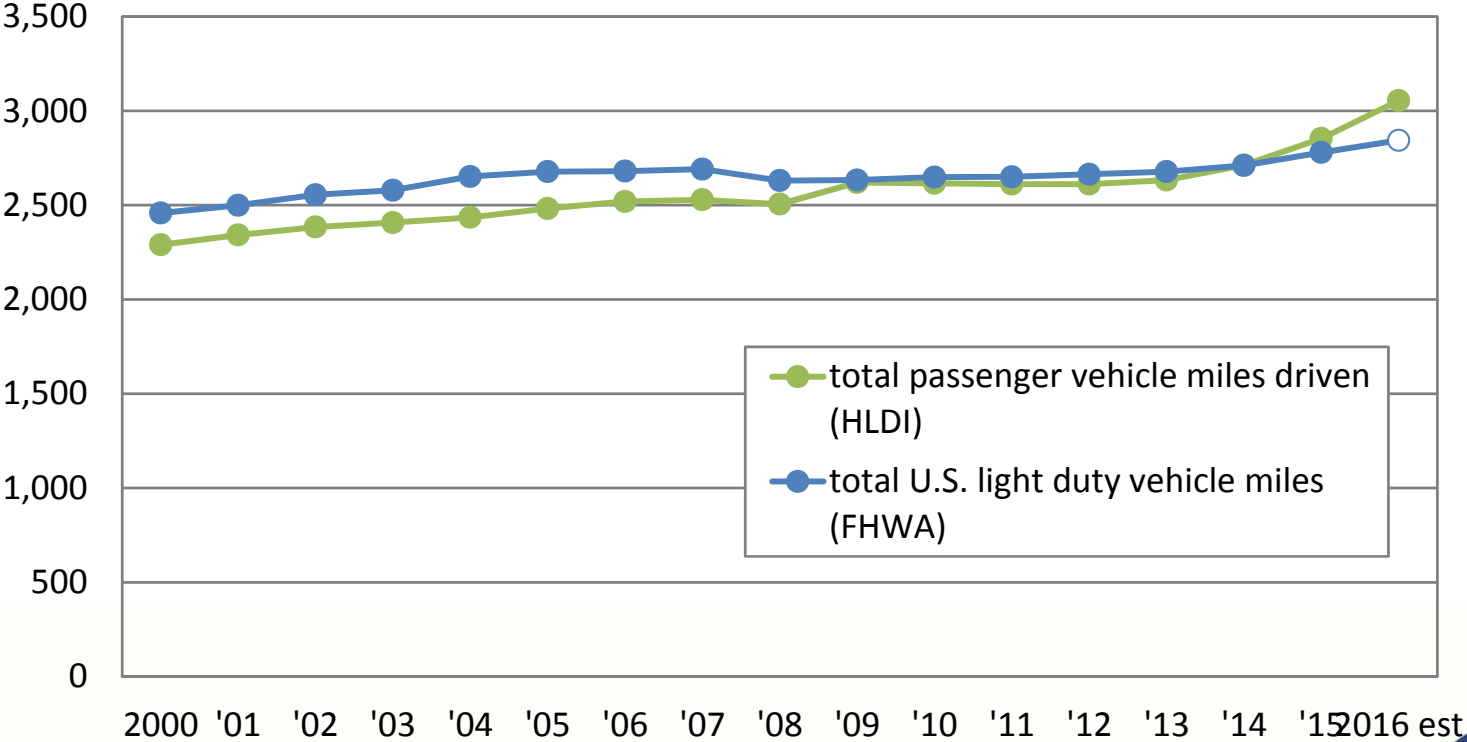
Electric vs. conventional, with and without mileage
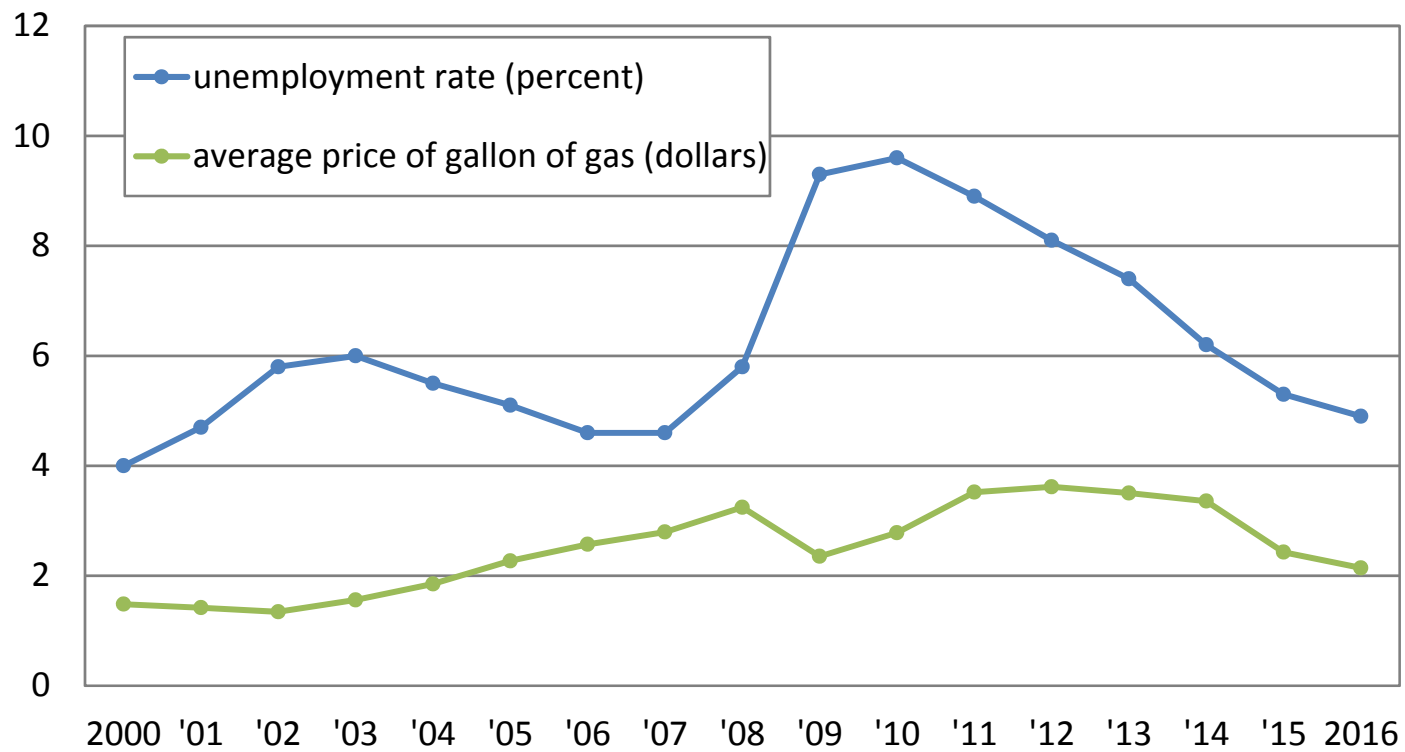
**Total miles driven in U.S.
by calendar year**

Average miles per day and number of registered vehicles by calendar year
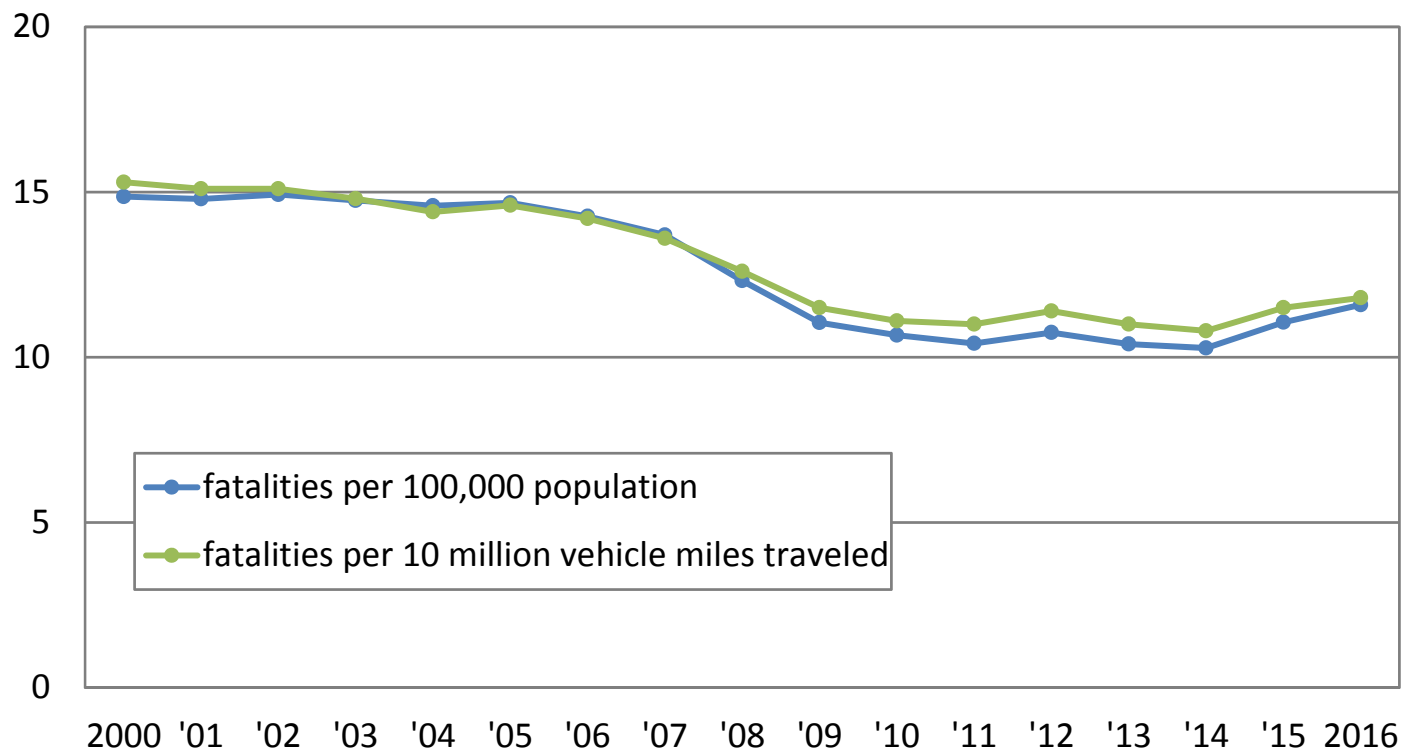
Billions of vehicle miles driven by calendar year

Annual unemployment rate and average price of gas by calendar year
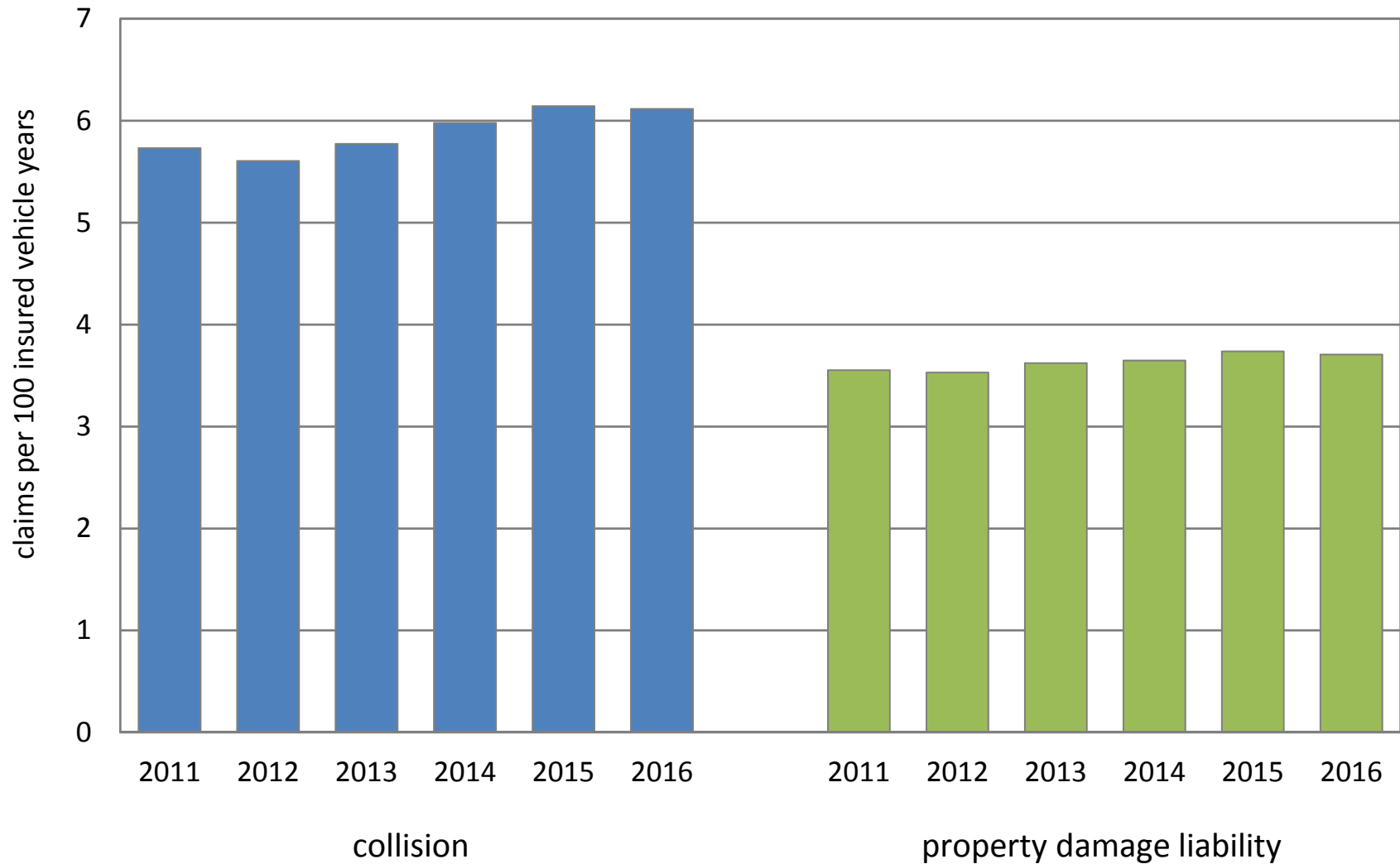
Motor vehicle fatalities in the U.S. by calendar year

Collision and PDL claim frequency by calendar year

Based on vehicles up to 20 years old

Comparison of trends

Results presented relative to calendar year 2011

IIHS
HLDI

Insurance Institute for Highway Safety
Highway Loss Data Institute
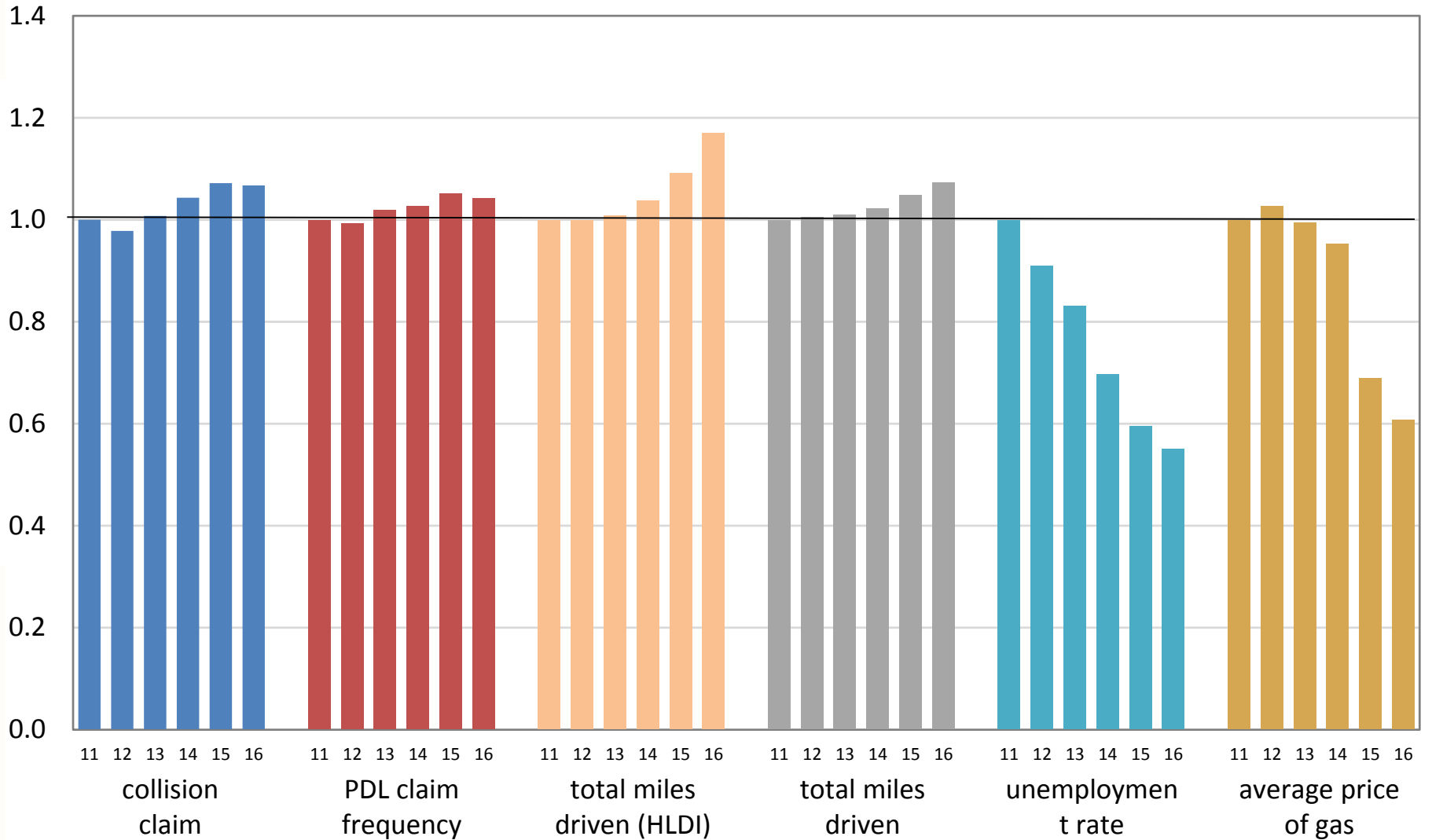
More information at iihs.org and on our social channels:

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Mileage- Industry Use Case

Dave Grove
## Ohio Mutual Insurance Group

Mileage: a Differentiator

- In 2014 our private passenger standard auto loss ratio was **63.17%**, with a direct written premium growth of **4.1%** over prior year

- We were seeking something to improve profitability and differentiate ourselves in the eyes of our independent agents

- Were considering telematics and a usage-based insurance program
  - had concerns over cost, implementation, and agency adoption

- We turned to mileage
  - challenges: how to implement and verify
  - partnering with Carfax, we implemented mileage into rating in May of 2015
  - initially we were able to verify mileage for 60% of our vehicles

Mileage: a Difference Maker

- Offered as a discount on both new and renewal book
  - for first product offering we initially offered up to a 30% discount
  - impact was -4.0% for those who we identified as driving less
  - overall impact that year was .8%
- Have since rolled out to 5 of our 6 personal auto states
- Last year our private passenger standard auto loss ratio was **58.54%**, with a direct written premium growth of **9.7%** over prior year
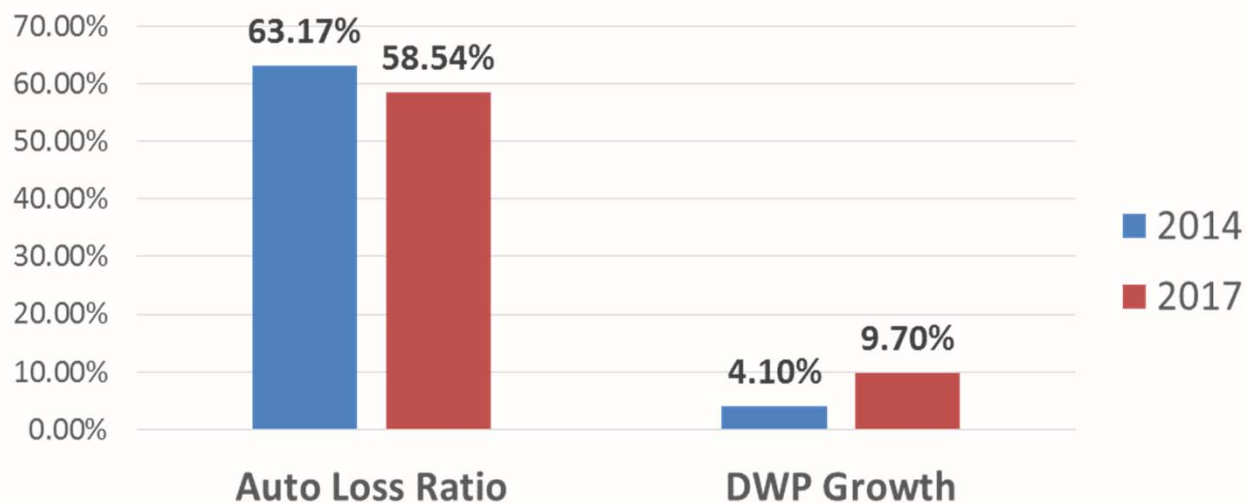
Verified Annual Mileage:

Application for Auto Insurance

Dan Hill

CARFAX Banking & Insurance Group

Auto Insurance Challenges…

Annual Mileage

Drivers with verified annual miles over:

➢ 15,000 Miles: frequency jumps 30 points and LR over 4 points. 25% of all drivers.

➢ 20,000 Miles: frequency jumps 46 points and LR 12 points. 6% of all drivers.

➢ 25,000 Miles: frequency jumps 70 points and LR 14 points. 2% of all drivers.

> "Failure to identify these higher risk vehicles and rate them accordingly represents a major source of unmanaged loss costs."

Source: TransUnion One Way Study - 2016

Auto Insurance Opportunities…

Use of Verified Annual Mileage:

➢ **Accuracy:** verified vs customer reported

➢ **Segmentation**: replace traditional proxies with verified road exposure

➢ **Fairness:** provide accurate discounts for verified road exposure

➢ **Availability:** high hit ratio over time.

➢ **Modeling Sets:** accurate data to trend make, models, territories, etc.

Mileage Data Challenges…

Disruptions:

➢ New Ownership: re-starts the odometer reading process

➢ Severe Collision Events: cause temporary drop in mileage

➢ Timing: Data Lag from sources

Mileage Data Challenges…

Data Sources:

➢ Miles vs Kilometers: US sources often miss the odometer settings

➢ Data Points: Need lots of suppliers to get sufficient recent readings

➢ No Consistent Government Source: wide intervals, estimations from road strips- not individual vehicle data.

➢ Telematics: difficult to get started, many factors to consider i.e. cost, lag, data interpretation

Data Challenges…

Controlling for confounding variables:

Strong Correlation	Some Correlation	Weak Correlation

• Driver Age
• Vehicle Type
• Length of Ownership
• Territory
    • Urbanity Index
    • US Census Data
	• Driver Gender
	• Vehicle Age
	• Marital Status
	• Use Class
	• Driver:Vehicle Ratio
		• Vehicle Symbol
		• Credit-Based Insurance Score
		• Self-reported Mileage
		• Vehicle Value

Mileage Data Challenges…

Fraud:

➢ Rollbacks: present in 2.6% of all readings

➢ VIN Cloning: must recognize duplicate vehicles

➢ Title Washing: Not all states recognize all title brands

Mileage Data Best Practices

➢ Offer aggressive discounts for verified low mileage drivers

➢ Cap top and bottom of curve for discounts and surcharges

➢ Use renewal dec sheets to provide notice on mileage changes- no need to separate notice (California)

➢ Not FCRA data - focus on getting the annual mileage correct with the customer and not analysis of the process.

➢ Use photos of ODO to help resolve customer questions. See Vehcon for best validation.

Mileage Data Conclusions

➢ Mileage is a critical data element that is not fully accounted for in pricing.

➢ Other class factors have long been surrogates for mileage but are grossly inadequate.

➢ Customer reported mileage is unreliable for pricing.

➢ There is no prefect solution, options range based on cost, difficulty.

➢ Verified Annual Mileage has great benefits in pricing accuracy, customer acquisition and retention.

Questions and Discussion