Examination of Factors Determining Fault in Multi-Vehicle Conflicts Using the SHRP2 Data

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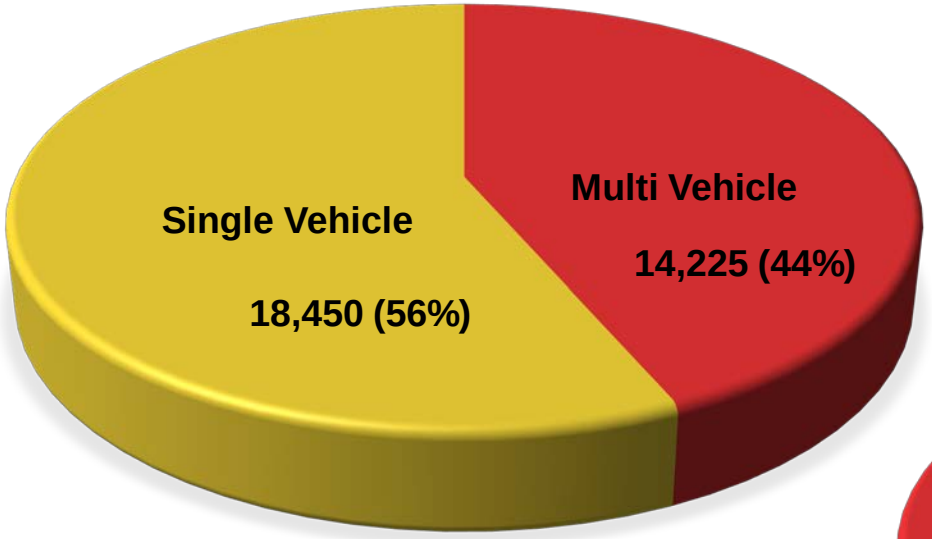
Overview

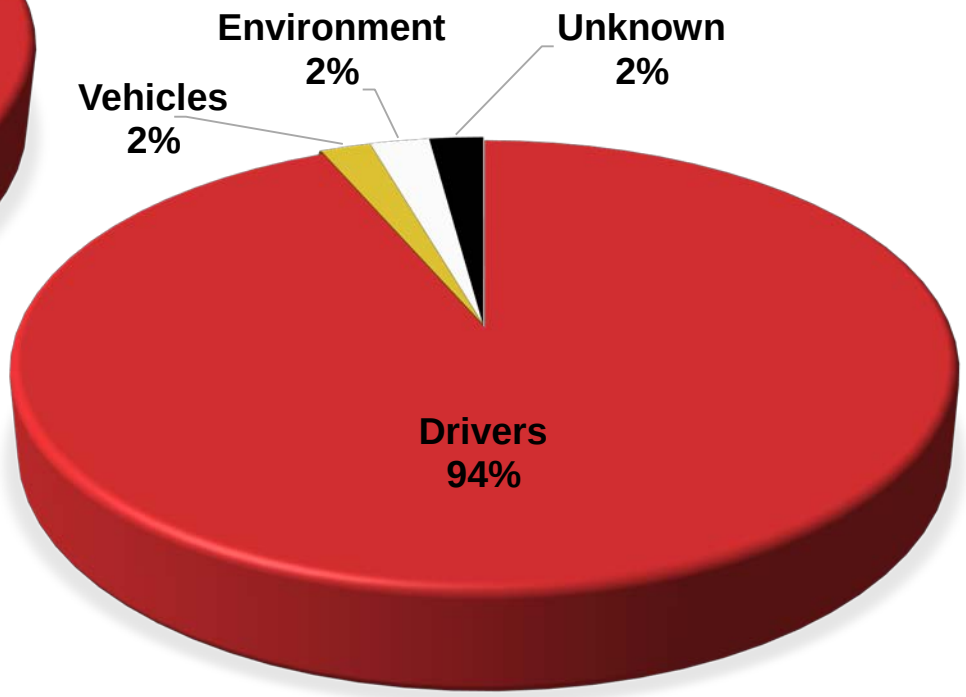
- Introduction
- Literature Review
- Data Description
- Statistical Methodology
- Results
- Research Implications

Introduction



NHTSA Data - 2014

What factors influence the **likelihood** of a driver being **at fault** when involved in a **multi-vehicle** conflict?



National Motor Vehicle Crash Causation Survey 2005-2007

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Literature Review

- Odds of being at fault:
  - Higher: Male drivers
    Non-vehicle owners
    Suspended or revoked license
    Unlicensed drivers
  - Lower: Older populations
    Working from home
    Daily commute less than 15 minutes

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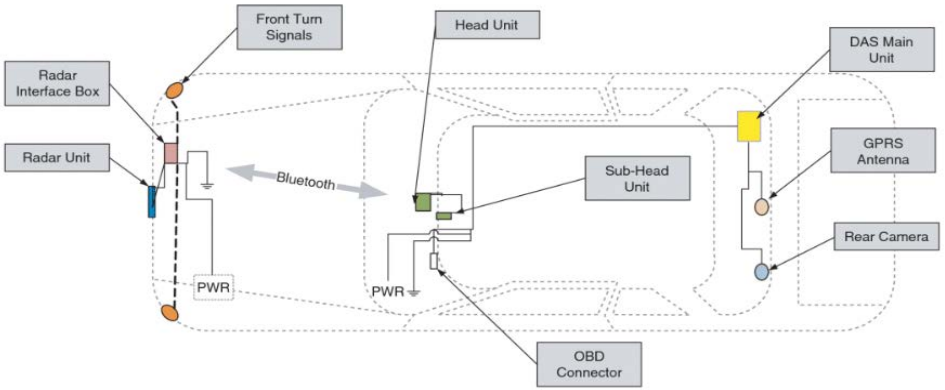
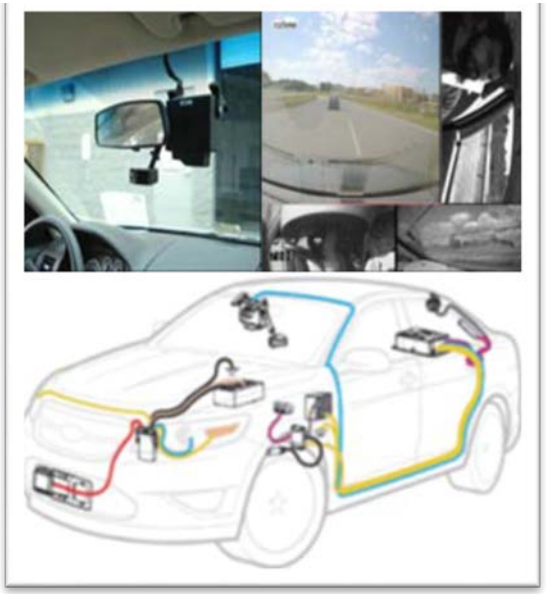
Data

SHRP 2 Naturalistic Driving Study





- 3092 drivers
- 3900 vehicle drivers
- 3 years of data
- 1600 crashes
- 2900 near-crashes

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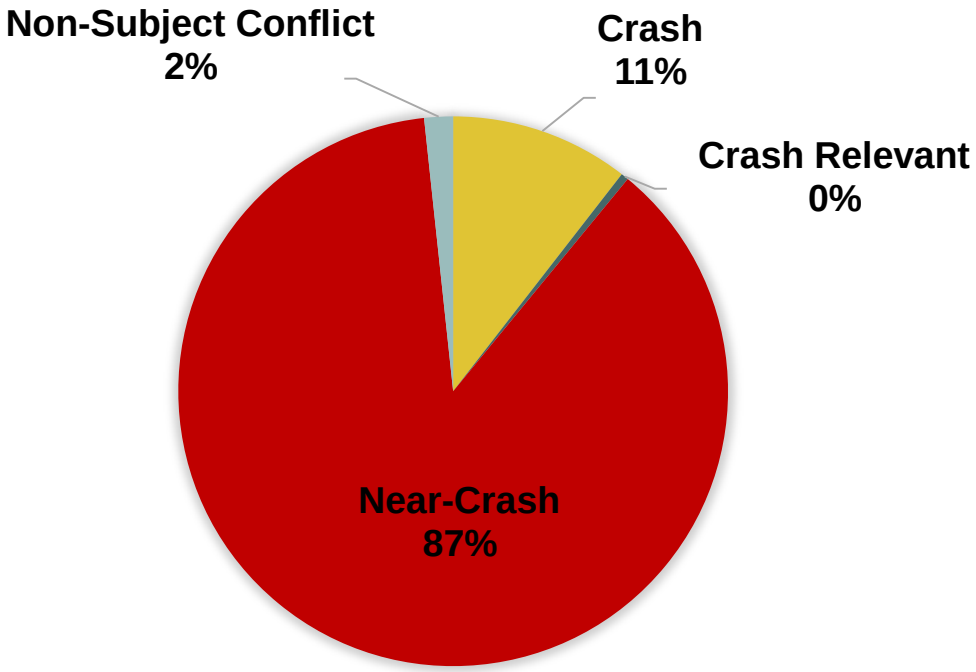
Requested Data

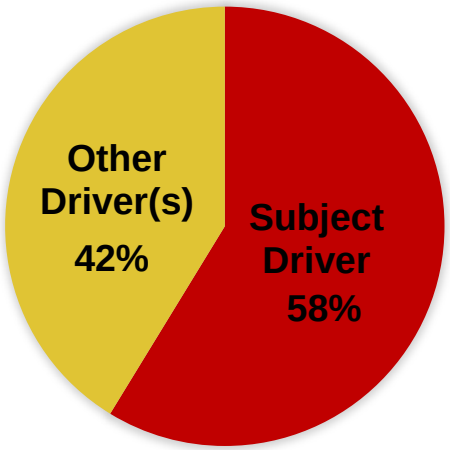
1,360 multi-vehicle conflicts
684 unique drivers

- Driver behavior
- Driver demographic
- Driving history
- Driving knowledge
- Risk perception
- Risk taking
- Sleep habits
- Event characteristics
- Trip information
- Vehicle information

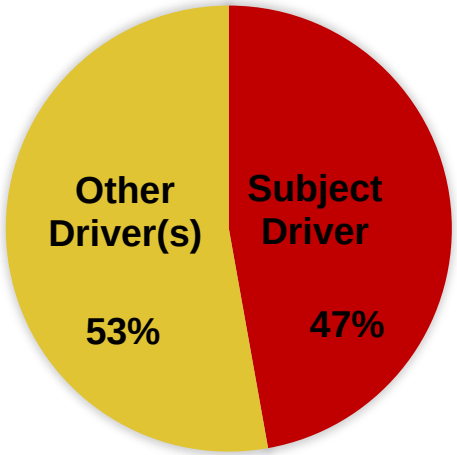
Requested Data

Event Distribution





Near-Crash



Crash

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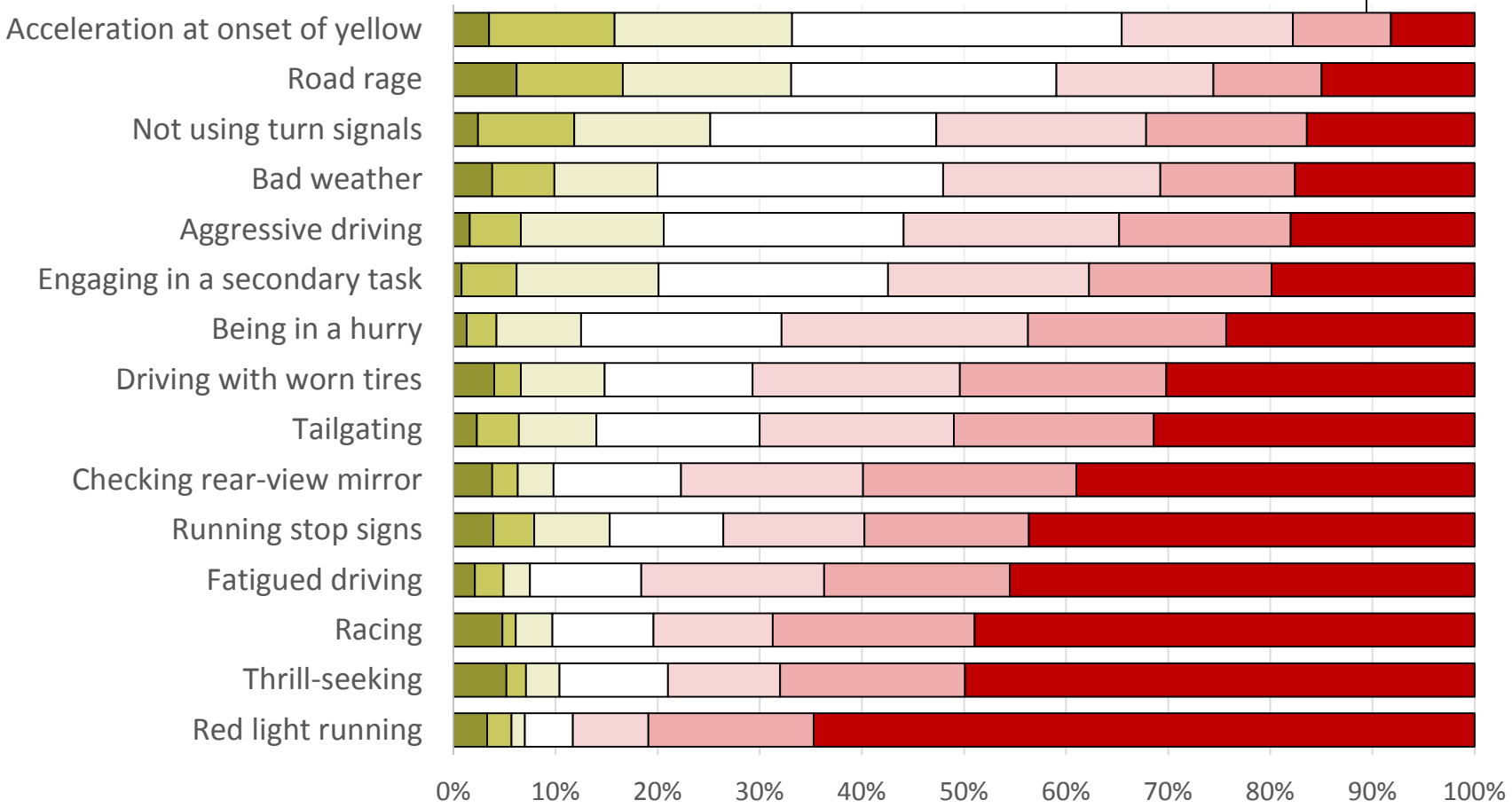
Requested Data

Summary Statistics

	Total Sample	Unique Drivers
Variable	Mean	Mean
At-Fault Subject Driver (Yes/No)	0.56	-
Full Time Worker (Yes/No)	0.46	0.45
Unemployed (Yes/No)	0.08	0.08
No Children at Home (Yes/No)	0.74	0.73
Driver Feels Fatigued Nearly Every day (Yes/No)	0.16	0.15
Female (Yes/No)	0.48	0.51
Latino / Hispanic (Yes/No)	0.09	0.07
Education Beyond High School (Yes/No)	0.91	0.90
Two Parent Household (Yes/No)	0.59	0.62
Driver Rental Status is Owned (Yes/No)	0.74	0.75
Income 50,000+ (Yes/No)	0.63	0.63
No Traffic Violations in Past 3 Years (Yes/No)	0.58	0.55
No Crashes in Past 3 Years (Yes/No)	0.64	0.67

Requested Data

Risk Perception Survey Results



Statistical Methodology

- Binary logistic regression model:
  - Binary variable=1 if the subject driver is at fault,
  - Binary variable=0 otherwise

$$log\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_k x_{ki}$$

- Mixed effect binary logistic regression model

$$p_i = \int \frac{EXP(\beta x_i + \varepsilon_i)}{1+\mathrm{EXP}(\beta x_i + \varepsilon_i)} f(\beta|\varphi) d\beta$$

Results

Logistic Regression Model

Parameter	Pooled (Naïve) Model			Random Effect Model		
	Coeff.	Std. Error	p-value	Coeff.	Std. Error	p-value
Intercept	0.585	0.117	.000	0.632	0.134	0.000
Full Time Worker	-0.257	0.111	.021	-0.325	0.130	0.012
Driver perceives tailgating as high risk	-0.490	0.119	.000	-0.517	0.137	0.000
Driver perceives acceleration at onset of yellow as low risk	0.773	0.342	.024	0.844	0.338	0.012
Driver feels fatigued nearly everyday	0.269	0.154	.080	0.307	0.185	0.098
No crashes in past 3 years	-0.198	0.117	.090	-0.208	0.134	0.119
Log Likelihood at Convergence	-912.305			-909.708		
Restricted Log Likelihood	-932.027					

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Results

Odds Ratios

Parameter	Pooled (Naïve) Model	Random Effect Model
Intercept	N/A	N/A
Full Time Worker	0.77	0.72
Driver perceives tailgating as high risk	0.61	0.60
Driver perceives acceleration at onset of yellow as low risk	2.17	2.32
Driver feels fatigued nearly everyday	1.31	1.36
No crashes in past 3 years	0.82	0.81

Research Implications

- Pricing strategy for insurance companies
- Set countermeasures
- Improve public education
- Develop programs

Thank You!

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SHRP2