

Comparing the Characteristics of the Target and Bullet Vehicle for Injury Severity in Two Vehicle Crashes

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Abstract

This paper undertakes an in-depth analyses of the driver reaction and crash severity of the target and bullet vehicles in two vehicle crashes. Previous driver reaction and crash predictive modelling are reviewed. Statistical analysis (Cross tabulation, Chi-Square test and T- test) are conducted to identify the relationship between injury severity human; vehicle; road geometric; environmental; and crash or dynamic factors for the target and bullet vehicle. The 2009 – 2014 National Automotive Sampling System-Crashworthiness Data System (NASS-CDS) is used in the analysis. The results indicates that struck and striking drivers are differentiated in terms of the human factors, age, gender, and delta V. For instance, high percentage of severe or fatalities is related to:

- a) male drivers over female (Figure 1).
- b) struck over striking vehicles at delta V more than 20 km/hr (Figure 3).
- c) risky segments; non interchange and non-junction or intersection. Right angle crashes are the most risky for driver among other crashes types.

Future work could investigated the differences between single and two vehicle crashes related to crash severity and driver avoidance manoeuvres.

Background

Road traffic injuries are amongst the most important health, societal, and economical issues in the world. Worldwide there are an estimated more than 1.2 million people killed in road accidents each year and approximately between 20 and 50 million non-fatal injuries (Peden, 2008). Thus, various studies have investigated injury severity from five point of views depending on the influencing factors. These factors are categories into the following five groups: 1) human characteristics; 2) vehicle characteristics; 3) road geometric characteristics; 4) environmental characteristics; 5) crash or dynamic factors. There is a lack in literature in terms of analyzing the characteristics of each vehicle individually in the dynamic point of view

Method

A Chi-Square Goodness of Fit test and T-test are conducted to distinguish between target and bullet vehicles in related to crash severities. Three groups of analysis of real-world crash classified into “Serious Injuries, Minor Injuries, and Property Damage Only (PDO)”. Each group is also explored through the use of associated paramters.

Results

Before answering the research question. The associated factors is outlined, as well as a detailed explanations of the anlaysis that is under gone. The summary of each part of the analysis are presented (See Figure 1, 2 and Table 1), and finally some recommendations as to future used for the data are suggested.

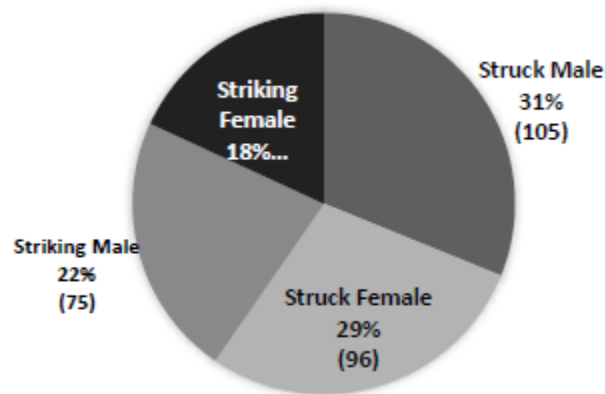


Figure 1. Severe and Fatal Percentage of Severe and Fatal Collisions related to gender for Struck and Striking Vehicles

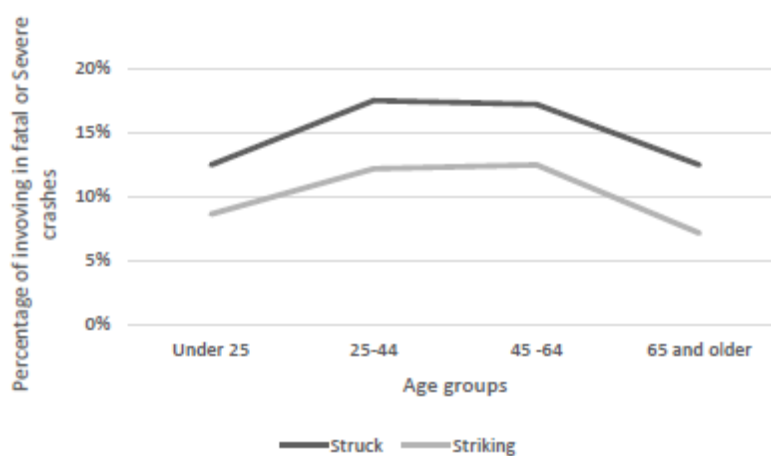


Figure 2. Severe and Fatal Percentage of Severe and Fatal Collisions related to age for Struck and Striking Vehicles

Table 1. Relationship between delta V and the severity of crashes

Struck								
Change in velocity KM/HR.	PDO		Severe or Fatal		Minor		Total	
0 - 19	1263	69%	13	10%	779	45%	2055	56%
20 - 39	511	28%	50	40%	765	44%	1326	36%
40 - 59	62	3%	34	27%	152	9%	248	7%
60 and over	6	0%	27	22%	33	2%	66	2%
Sub. Total	1842	100%	124	100%	1729	100%	3695	100%
Total	1842	50%	124	3%	1729	47%	3695	100%

Striking								
Change in velocity KM/HR.	PDO		Severe or Fatal		Minor		Total	
0 - 19	1282	67%	17	20%	786	43%	2085	54%
20 - 39	550	29%	24	29%	878	48%	1452	38%
40 - 59	68	4%	18	21%	146	8%	232	6%

60 and over	14	1%	25	30%	25	1%	64	2%
Sub. Total	1914	100%	84	100%	1835	100%	3833	100%
Total	1914	50%	84	2%	1835	48%	3833	100%
P value for Chi-Square of Struck	<0.0001							
P value for Chi-Square of Striking	<0.0001							

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