



USING THE NEW SHRP2 NATURALISTIC DRIVING STUDY SAFETY DATABASES TO EXAMINE SAFETY CONCERNS FOR OLDER DRIVERS

AUTHORS: Dr. Michael Knodler, PI; Dr. Siby Samuel; Dr. Song Gao, Tracy Zafian, Ravi Agrawal
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ABSTRACT

Motivation:

Drivers age 65 and over have higher rates of crashes and of crash-related fatalities than middle-age drivers. Drivers in this age group are especially over-represented in crashes during left turns at signalized intersections. This study was proposed to learn more about the factors contributing to this trend, utilizing information collected through the SHRP2 (the second Strategic Highway Research Program) naturalistic driving study (NDS). The study was also designed as a proof of concept project to assess the usefulness of NDS data for examining such research questions.

Methods:

The NDS data used for this study included information on drivers, vehicles, and trips. The data were entered into different regression and machine learning models to see which factors most influenced the occurrence of left-turn signalized intersection crashes among drivers age 65 and over.

Results:

In the dataset, the most common left turn intersection crashes (71% of the total) involved vehicles hitting a curb or leaving the roadway. Most of the statistically significant variables impacting whether the drivers crashed were related to health, vision, and cognitive factors.

DATA & ANALYSIS

NDS Data from Virginia Tech Transportation Institute

- Drivers age 65+, trips with signalized intersections, focus on trips with intersection left turns; comparison group 30-49 year olds
- Driver data: from pre-study questionnaires & screenings
- Vehicle data: speed, acceleration
- Event data: crash, near crash, baseline, event severity
- Video data: scored at UMass; 868 videos, 285 with left turns

Type of Event	Count of Trips Left Turns Drivers Age 65+
Crash	26
Near Crash	72
Baseline	102

Crash Severity	Count of Trips Left Turns Drivers Age 65+
I – Most Severe	4
II – Police Reportable	3
III – Minor	10
IV – Tire strike, low risk	9
Total	26

Data Models for Analysis

- Developed and tested a number of regression and machine learning models, using the NDS data, to learn more about the key factors contributing to the left turn crashes, for drivers age 65+

RESULTS

- The shown health, vision, and cognitive factors had the biggest statistically significant impact on whether a driver age 65+ had a left-turn crash.
- The presence of these conditions affected drivers' ability to monitor oncoming traffic, and to see monitor oncoming traffic and to see and gauge the edges of the road well.

Of Drivers 65 & Over with Left Turn Crashes, % with Condition or Challenge For those with with highest correlations to crashing

Condition or challenge	%
Visual Search Impairment (mild or more)	87.0%
Visual Field of View Impairment (mild or more)	56.5%
Clock Drawing Test Errors (minor or more)	95.7%
Psychiatric Conditions	65.2%
Nervous System/Sleep Disorders	34.8%

Best Performing Models for Predicting Left Turn Crash or No Crash Among Drivers 65 & Over

Significant Variables (P-values)	R-Squared & Adj. R-Squared	Inputs	Model	Performance
Nervous System/Sleep Conditions (0.001) Severe Arthritis (0.049) Impaired Field of View (0.038)	0.730/ 0.669	Medical, Behavior, Video and Vehicle Data (10 Variables)	Logistic Regression	Training Accuracy: 83.8% Validation Accuracy: 76.5%
Gap Decision (0.037) Nervous System/Sleep Conditions (0.003) Severe Arthritis (0.052)	0.803/ 0.728	Medical, Behavior, Video and Vehicle Data (15 Variables)	Random Forest	Training Accuracy: 100.0% Validation Accuracy: 83.0%

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CONCLUSIONS

- The study's data and finding provide information to help understand contributing factors for older driver left-turn crashes at signalized intersections.
- Past research has shown that older drivers can benefit from training to help them negotiate signalized intersections and left turns, and adjust to age-related and physical limitations.
- The generalizability of the findings of this study, and the statistical significance of the results, may be limited somewhat by the small number of crashes dataset.