**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.

**ACKNOWLEDGMENTS**

We gratefully acknowledge and thank the Technical Advisory Committee members, and New England Transportation Consortium and UMass Transportation Center staff, for their help with this research.

**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 and gauge the edges of the road well.

**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.

**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

**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+

**BEST PERFORMING MODELS FOR PREDICTING LEFT TURN CRASH OR NO CRASH AMONG DRIVERS 65 & OVER**

<table>
<thead>
<tr>
<th>Significant Variables (P-values)</th>
<th>R-Squared &amp; Adjusted R-Squared</th>
<th>Inputs</th>
<th>Model</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nervous System/Sleep Conditions (0.001)</td>
<td>0.730/0.669</td>
<td>Medical, Behavior, Video and Vehicle Data (10 Variables)</td>
<td>Logistic Regression</td>
<td>Training Accuracy: 83.5% Validation Accuracy: 76.5%</td>
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<tr>
<td>Severe Arthritis (0.049)</td>
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<td>Impaired Field of View (0.038)</td>
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<tr>
<td>Nervous System/Sleep Conditions (0.003)</td>
<td>0.803/0.728</td>
<td>Medical, Behavior, Video and Vehicle Data (15 Variables)</td>
<td>Random Forest</td>
<td>Training Accuracy: 100.0% Validation Accuracy: 83.0%</td>
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<td>Severe Arthritis (0.052)</td>
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