Acknowledgement

AAA LongROAD study sponsor

AAA LongROAD collaborators that assisted in data collection and data management
Population Aging Globally

- US and world’s populations are older now than at any time in history
  - Today, 8.5% of people worldwide are age 65+; projected to reach 17% by 2050 (NIH, 2016)
  - In the US, over-65 population projected to reach 83.7 million in 2050, 21% of the population (US Census, 2014)
- The majority of people, including older adults, prefer driving to other modes of transportation
Functional Declines in Older Adults

- As people age they are more likely to have medical conditions (and take medications) that can compromise driving safety
- Three general classes of abilities that decline:
  - Psychomotor (movement)
  - Perceptual (primarily seeing)
  - Cognitive (thinking)
AAA LongROAD Study Background

- **Longitudinal Research on Aging Drivers**
- 2,990 total participants age 65-79 enrolled at baseline
- **Data collected included:**
  - Driving/health questionnaire
  - Medication review
  - Driver history and crash records
  - Medical records
  - Naturalistic driving data
  - Functional assessment
  - Vehicle inspection
  - Vehicle technology questionnaire
AAA LongROAD Study
Research Questions

• What are the risks and protective factors in older driver safety?
• What are the effects of medications on driving behavior/outcomes?
• What are the effects of declining physical functioning on self-regulation of driving?
• What is the extent/use/effect of new vehicle technology and aftermarket vehicle adaptations?
• What are the determinants of driving cessation and the impacts of cessation on health and quality of life?
Vehicle Technology Questionnaire

- Administered at baseline or when participant changes primary vehicle
- Examined older drivers’ use and attitudes toward 15 in-vehicle technologies and 12 aftermarket vehicle adaptations
Hands-on Vehicle Inspection

• Conducted bi-annually and when there is a change in the primary vehicle.
  • 15 minute inspection
  • Maintenance: tire pressure, warning lights, wiper fluid, lights, etc.
  • Damage: Dents, scratches, cracks, and rust (entire vehicle).
  • Presence of in-vehicle technology
  • Presence of aftermarket vehicle adaptations
# Results: Demographics

<table>
<thead>
<tr>
<th>Demographic Category</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age group</strong></td>
<td></td>
</tr>
<tr>
<td>65-69 years</td>
<td>42%</td>
</tr>
<tr>
<td>70-75 years</td>
<td>35%</td>
</tr>
<tr>
<td>75-79 years</td>
<td>24%</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>47%</td>
</tr>
<tr>
<td>Women</td>
<td>53%</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>White, Non-Hispanic</td>
<td>88%</td>
</tr>
<tr>
<td>Black/African American</td>
<td>7%</td>
</tr>
<tr>
<td>Asian</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
</tr>
<tr>
<td>HS deg. or less</td>
<td>11%</td>
</tr>
<tr>
<td>Some college</td>
<td>18%</td>
</tr>
<tr>
<td>Associates/Bachelor’s deg.</td>
<td>30%</td>
</tr>
<tr>
<td>Advanced college deg.</td>
<td>41%</td>
</tr>
<tr>
<td><strong>Household income</strong></td>
<td></td>
</tr>
<tr>
<td>Less than $20,000</td>
<td>5%</td>
</tr>
<tr>
<td>$20,000 - $49,999</td>
<td>21%</td>
</tr>
<tr>
<td>$50,000 - $79,999</td>
<td>24%</td>
</tr>
<tr>
<td>$80,000 - $99,999</td>
<td>14%</td>
</tr>
<tr>
<td>$100,000 or greater</td>
<td>32%</td>
</tr>
</tbody>
</table>
RESULTS
Questionnaire

In-Vehicle Technology

- Overall, 57% of participants had at least one advanced technology in their primary vehicle.
- Males tended to have higher numbers of technologies in their vehicles, as did respondents with higher incomes and education levels.
- Age group was not significantly correlated with the number of technologies.
RESULTS
Questionnaire

Prevalence of In-Vehicle Technologies

- Integrated Bluetooth: 47.4%
- Backup/parking assist: 40.1%
- Navigation assistance: 27.7%
- Voice control: 19.6%
- In-vehicle concierge: 10.5%
- Blind spot warning: 10.1%
- Emergency response: 9.6%
- Forward collision warning: 6.9%
- Adaptive cruise control: 6.0%
- Cross traffic detection: 6.0%
- Lane departure warning: 5.6%
- Adaptive headlights: 3.6%
- Fatigue/drowsy driver alert: 1.3%
- Semi-autonomous parking assist: 1.1%
- Night vision enhancement: 0.1%
Technology Prevalence
Inspection vs. Questionnaire

<table>
<thead>
<tr>
<th>Feature</th>
<th>Inspection</th>
<th>Self-Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backup/parking assist</td>
<td>40.1</td>
<td>38.3</td>
</tr>
<tr>
<td>Navigation assistance</td>
<td>27.7</td>
<td>24.8</td>
</tr>
<tr>
<td>Blind spot warning</td>
<td>10.1</td>
<td>9.6</td>
</tr>
<tr>
<td>Lane departure warning</td>
<td>6.4</td>
<td>5.6</td>
</tr>
<tr>
<td>Adaptive cruise control</td>
<td>5.3</td>
<td>6.0</td>
</tr>
<tr>
<td>Forward collision warning</td>
<td>5.1</td>
<td>6.9</td>
</tr>
<tr>
<td>Semi-autonomous parking assist</td>
<td>1.3</td>
<td>1.1</td>
</tr>
<tr>
<td>Night vision enhancement</td>
<td>0.07</td>
<td>1.9</td>
</tr>
</tbody>
</table>
RESULTS
Questionnaire

Percentage of Primary Way to Learn about How to Use Technology

- Figured it out myself: 48.9%
- Dealer: 19.8%
- Never Learned: 13.2%
- Owner’s manual: 11.8%
- Family/friend: 3.9%
- Internet: 0.1%
- Other: 1.0%

Figure 2. Reported percentages of methods for learning to use technologies averaged across technologies.
RESULTS
Questionnaire

How Often Were Technology Used?
- Average Percentage -

- Always: 43.3%
- Often: 7.5%
- Sometimes: 10.4%
- Rarely: 12.1%
- Never: 24.9%

Figure 3. Average percentage across technologies on how frequently technologies were used.
RESULTS
Questionnaire

Does Having the Technology Make You a Safer Driver?
- Percentage Responding "Yes" -

<table>
<thead>
<tr>
<th>Technology</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigation Assistance</td>
<td>96.6%</td>
</tr>
<tr>
<td>Blind spot warning</td>
<td>95.0%</td>
</tr>
<tr>
<td>Lane departure warning</td>
<td>87.0%</td>
</tr>
<tr>
<td>Forward collision warning</td>
<td>86.9%</td>
</tr>
<tr>
<td>Backup/parking assist</td>
<td>84.6%</td>
</tr>
<tr>
<td>Cross traffic detection</td>
<td>72.5%</td>
</tr>
<tr>
<td>Fatigue/drowsy driver alert</td>
<td>69.2%</td>
</tr>
<tr>
<td>Integrated Bluetooth</td>
<td>62.6%</td>
</tr>
<tr>
<td>Cell phone</td>
<td>62.4%</td>
</tr>
<tr>
<td>Adaptive headlights</td>
<td>61.1%</td>
</tr>
<tr>
<td>Adaptive cruise control</td>
<td>60.0%</td>
</tr>
<tr>
<td>Night-vision enhancement</td>
<td>43.0%</td>
</tr>
<tr>
<td>Voice control</td>
<td>25.0%</td>
</tr>
<tr>
<td>Semi-autonomous parking assist</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4. Percentages of people by technology reporting that the technology makes them a safer driver.
**RESULTS**

**Questionnaire**

**Adaptations**

• Overall, 8.96% (n=268) had at least one vehicle adaptation present

• Sex, age, education level and household income had no effect on number of adaptations

• Of those with at least one, the most prevalent adaptations were:
  - Driver seat cushions (44.8%)
  - Convex and/or multifaceted mirrors (38.8%)
  - Safety belt extensions (6.0%)
  - Upper body support (4.8%)
  - Aftermarket push button ignition (3.0%)
  - Steering wheel modification (2.6%)
Adaptations Prevalence
Inspection vs. Questionnaire

Aftermarket Vehicle Adaptation

- Cushions: Inspection 50.7%, Self-Report 44.8%
- Steering wheel modification: Inspection 44.5%, Self-Report 38.8%
- Seat belt cushion: Inspection 13.2%, Self-Report 2.6%
- Upper body support: Inspection 11.3%, Self-Report 0%
- Custom armrest: Inspection 2.6%, Self-Report 4.8%
- Seat belt extension: Inspection 2.2%, Self-Report 1.1%
- Push button ignition: Inspection 6%, Self-Report 1.4%
- Hand controls: Inspection 3%, Self-Report 0.3%
- Other: Inspection 0.4%, Self-Report 0.3%
Key Findings

• Questionnaire and inspection prevalence data were generally in good agreement
• Technologies were used frequently and generally thought to make people safer drivers
• Respondents did not work with professionals to determine the appropriateness of adaptations or to install/make them
• Need to continue to develop materials and programs that further promote awareness of the types of vehicle modifications and in-vehicle technologies that are available
Further Information

Research Briefs at aaafoundation.org

• Use, Learning and Perceptions of In-Vehicle Technologies, and Vehicle Adaptations among Older Drivers: A LongROAD Study
• Observed Maintenance, Damage, Technologies, and Adaptations among Vehicles of Older Drivers: A LongROAD Study

Journal article

Questions?
nzanier@umich.edu