Older Occupant Injury Research at NHTSA

Stephen A. Ridella
Chief, Human Injury Research Division
National Highway Traffic Safety Administration
US Department of Transportation

NTSB Safety, Mobility, and Aging Drivers Public Forum
November 9, 2010
An Approach to Older Occupant Research

Eliminate Crashes due to Aging
Reduce Transportation-Related Fatalities and Injuries due to Aging

Improve the Understanding of the Problem
Older Driver Safety
Older Occupant Protection
Older Pedestrian Safety

Data Needs
Behavioral Approach
Vehicle Approach
Behavioral Approach
Vehicle Approach
Behavioral Approach
Vehicle Approach
Data Needs: Improve Understanding Older Occupant Injuries

- Extensive Body of Existing Research
  - Several NASS studies conducted on injury incidence by age
  - CIREN data can inform more on injury causation/mechanisms

- Specific Injury Analyses for Older Occupants Required
  - Effects of gender and body mass index
  - Pre-existing medical conditions and co-morbidities
  - Injury causation and mechanisms with respect to crash direction and severity
  - Age affects severe injury outcome for almost every body region in every crash mode
Preliminary Data
(combined NASS-CIREN analysis)

➢ Risk of Chest and Head Injuries Increased for Older Occupants

Male, Belted, Driver, BMI=24 kg/m², Pass Car, 20 mph DV (side impact)
Preliminary Data
(2000-2006 NASS)

Increased Incidence of Rib Fracture

Percent Rib Fractures by Age and Delta V

- Low
- Moderate
- High

Crash Severity

- Age < 40
- Age 40 - 64
- Age >= 65
NHTSA Biomechanics Research
(Emphasis on Older Occupant)

- **Data**
  - CIREN: Injury Causation/Mechanisms
    - Over 300 cases of Older Occupant Injuries with In-Depth Analysis

- **Evaluation of Injury Biomechanics**
  - Thoracic injury research
  - Head/Brain injury research

- **Evaluation of Crash Dummy Response**
  - Evaluate current dummies for older occupant biofidelity
  - Determine suitability to predict older occupant injury
  - Determine revised injury criteria

- **Computer Modeling of Older Occupants**
Chest Injury Research

- Characterize Age/Gender Changes in Rib Cage
- Develop Parametric Rib Cage Computer Model

Model Inputs
- Age
- Gender
- Percentile

Model Parameters
- Shape/size mesh
- Cortical thickness
- Bone density
- Mechanical properties

Chest CT scans collected, ages 0-100
Chest Injury Research

6 Year Old

29 Year Old

73 Year Old
Head Injury Research

• Characterize Age/Gender Changes to Head and Brain
• Develop Parametric Head Computer Model

**Inputs**
- Age
- Gender
- Percentile

**Brain/Skull Model Parameters**
- Shape/size mesh
- Cortical thickness
- Bone density
- Anatomic regional geometry
Summary

- An Approach to Older Occupant Research
- Understanding Injuries and Causation is a Critical Path
- Research Projects Aimed at Most Frequent Injuries
- Determine Dummies, Models and Test Procedures that Address Reducing Incidence and Severity of Injuries for Older Occupants