An Update on the Vulnerable Road User In-Depth Crash Investigation Study

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NHTSA
Motivation

- Pedestrian fatalities have been increasing
- Lack of modern in-depth pedestrian crash data
- Various research needs across NHTSA

Source: Governors Highway Safety Administration
VICIS Study

Vulnerable Road User In-depth Crash Investigation Study (VICIS)

Figure 3
Percentage of Total Fatalities Who Were Pedestrians, by State, 2020

Sacramento County, CA

Atlantic County, NJ

Tarrant County, TX

Dallas County, TX
VICIS Study

- Inclusion criteria:
  - Only pedestrians (no bikes, scooters, or conveyances)
  - Struck by vehicle moving forward
  - Vehicle inspection or photos of contact damage required

- No Sampling – PSUs screen local police crash reports and select cases
Data Collection

1. Crash Avoidance
   - Pre-crash scenarios and sightlines
   - Speed and trajectory of vehicle and pedestrian
   - Environment, weather, and lighting

2. Crashworthiness
   - Vehicle inspections/photos documenting contacts
   - Pedestrian injuries from medical records
Data Collection

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   • Pedestrian injuries from medical records
Data Collection

3. Infrastructure
- Roadway features
- Pedestrian facilities and warnings
- Streetlighting

4. Human Behavior
- Detailed interview forms for driver and pedestrian
- Distractions, impairment, trip purpose, risk-taking behavior
VICIS Cases

• Case enrollment for six months: July to Dec 2022

• 93 total cases collected across four sites

• PSU data entry ongoing, not all crash cases fully populated
Preliminary Case Distributions

Pedestrian Sex

- Male: 57%
- Female: 43%

Pedestrian Age

- Frequency distribution across different age groups:
  - [0, 10]: 2
  - [10, 20]: 10
  - [20, 30]: 12
  - [30, 40]: 14
  - [40, 50]: 18
  - [50, 60]: 18
  - [60, 70]: 10
  - [70, 80]: 6
  - [80, 90]: 2

Age (years)
Preliminary Case Distributions

**Land Use**
- Urban: 78%
- Rural: 12%
- Private: 10%

**Roadway Functional System**
- Principal Arterial: 31%
- Major Collector: 15%
- Local: 12%
- Minor Arterial: 19%
- Interstate/Freeways: 12%
- Private: 11%
- Local: 12%
Preliminary Case Distributions

**Light Condition**
- Daylight: 49%
- Dark, but lighted: 38%
- Dawn: 1%

**Weather**
- Clear: 94%
- Cloudy: 3%
- Rain: 3%
Preliminary Case Distributions

Crash Location
- At Intersection: 32%
- Not at Intersection: 50%
- Intersection-Related: 11%
- Non-Trafficway Location: 7%

Motorist Maneuver
- Straight: 61%
- Left Turn: 30%
- Right Turn: 9%
Preliminary Case Distributions

Vehicle Impact Speed

Data Source for Impact Speed

- Crash investigator calculation: 32%
- No impact speed calculated or estimated: 26%
- EDR image: 6%
- Police Calculation: 2%
- Driver/witness/police estimates: 34%
Preliminary Case Distributions

PCR Injury (KABCO)

- **K - Killed**: 18%
- **A - Incapacitating Injury**: 29%
- **B - Nonincapacitating Injury**: 34%
- **C - Possible Injury**: 19%
Preliminary Case Distributions

Front-to-Top Plane Transition Height

<table>
<thead>
<tr>
<th>WAD (cm)</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>65-70</td>
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<tr>
<td>70-75</td>
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<td>80-85</td>
<td>4</td>
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<td>85-90</td>
<td>6</td>
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<tr>
<td>90-95</td>
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<td>7</td>
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<tr>
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<tr>
<td>105-110</td>
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<tr>
<td>110-115</td>
<td>3</td>
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<tr>
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<tr>
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<tr>
<td>135-140</td>
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</tbody>
</table>

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65
Preliminary Case Distributions

Pedestrian-to-Vehicle Interaction

- Unknown: 25%
- Wrap: 23%
- Thrown Forward: 21%
- Snagged, dragged by vehicle: 2%
- Fender Vault: 4%
- Roof Vault: 4%
- Knocked to Pavement: 21%

Pedestrian falls to the ground immediately in front of the vehicle
Injury and Engineering Center (IEC)

- CIREN Engineering Centers
  - Wake Forest University
  - Medical College of Wisconsin

- Review medical records and code injuries
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- Review medical records and code injuries
- Perform injury causation analysis
- Determine kinematic trajectories
- Review crash avoidance calculations
Next Steps

• Case enrollment – complete

• Crash data population by PSU’s – ongoing

• Injury and engineering analysis by IEC’s – started

• Quality control and case publishing by NHTSA – future
Questions?

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