Risk of Serious Injury and Fatality in Tree and Pole Crashes:  
Early Findings from NCHRP 17-43

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Fatalities in Single-Vehicle Crashes
[FARS 2009, most harmful event, cars and light trucks only]

Objectives

- What are the characteristics of tree and pole crashes in the U.S.?
Approach

- National Automotive Sampling System/Crashworthiness Data System (NASS/CDS) 1997-2009
- NCHRP 17-22 dataset (1997-2001)
- Tree or Pole most harmful event
- Exclude rollovers
- Passenger Cars and Light Trucks only

Tree/Pole Data Set
(NASS/CDS 1997-2009)

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>Weighted Cases</th>
<th>Annual Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crashes</td>
<td>6,065</td>
<td>2,448,462</td>
<td>188,343</td>
</tr>
<tr>
<td>Injury Crashes</td>
<td>5,049</td>
<td>1,301,639</td>
<td>100,126</td>
</tr>
<tr>
<td>Serious Injury</td>
<td>2,284</td>
<td>179,747</td>
<td>13,827</td>
</tr>
<tr>
<td>Fatal Crashes</td>
<td>763</td>
<td>39,991</td>
<td>3,076</td>
</tr>
</tbody>
</table>
NCHRP 17-22 Data Set
Tree and Pole Impacts only

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>Weighted Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crashes</td>
<td>259</td>
<td>147,572</td>
</tr>
<tr>
<td>Injury Crashes</td>
<td>239</td>
<td>98,767</td>
</tr>
<tr>
<td>Serious Injury Crashes</td>
<td>119</td>
<td>15,906</td>
</tr>
<tr>
<td>Fatal Crashes</td>
<td>40</td>
<td>4,323</td>
</tr>
</tbody>
</table>

Approach
Distribution of crashes and injury severity by:

- Delta-V
- Vehicle type
- Crash mode
- Lateral Offset
- Impact Speed
- Land use
- Highway type
- Belt use
- Body region
- Ejection
- PDOF
- Tree / Pole Condition
- Impact Location
- Seating Location
- Damage Extent
- Airbag Availability
Approach

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What are the Characteristics of Serious Tree/Pole Crashes?
Frontal Impacts are Most Common...
... But Side Impacts are Most Lethal

(Distribution of Tree/Pole Crashes by Crash Mode, NASS/CDS 1997-2009)

Tree/Pole Crashes by Total Delta-V
(NASS/CDS 1997-2008)

Median Delta-V  
all crashes =14.9 mph

Median Delta-V  
Serious injury crashes =21.7 mph
Tree/Pole Side Crashes by Impact Speed
(NCHRP 17-22)

- Median Delta-V Serious injury crashes = 26.5 mph

Tree/Pole Side Crashes by Lateral Offset
(NCHRP 17-22)

- Median Lateral Offset Serious injury crashes = 12.5 ft
Who are the Seriously-Injured Occupants?

Tree/ Pole Crash Injuries by Restraint Use
(NASS/CDS 1997-2009)
Ejections in Serious Tree/Pole Crashes (NASS/CDS 1997-2008)

- No Ejection: 88%
- Partial Ejection: 5%
- Unknown: 0.4%
- Complete Ejection: 7%

Preliminary Findings

- Approx. 5000 Tree and Pole fatalities/year
- 2/3 of Seriously Injured Occupants are unbelted
- 50% of Tree/Poles in Serious Crashes are within 12 feet (4 m) of road
- 50% of Serious Crashes under 26 mph (42 kph) at impact
- Side curtains beneficial in side impacts to tree / poles
Acknowledgements

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- NCHRP 17-43 Project Panel
- NCHRP 17-22, 17-11 and FHWA Rollover project research teams