Work Zone Safety Data: Looking for Insights

By
Kenneth S. Opiela, PE, PhD
Highway Research Engineer
FHWA Turner-Fairbank Highway Research Center

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Work Zone Safety Data:

- Police crash reports
- Incident reports
- OHSA reports
- Insurance claims
- Road safety audit reports
Related Data:

- Traffic data (e.g., volumes, mix, distributions)
- Project logs
- Citation/compliance data
- Complaints
- Conditions data (e.g., weather)
- Performance data (e.g., lighting levels)
- Driver studies (e.g., speed, lane position, car following, alertness, visual capabilities)
Goal:

DATA

INTEGRATION & ANALYSES

INFORMATION

IMPROVEMENTS
FHWA Efforts:

• WZ Safety Research
• Integrated WZ Team (=> WZ Impacts Rule)
• Highway Safety Information System (HSIS)
• Model Minimum Uniform Crash Criteria (MUUCC)
• Technology Development (e.g., barriers, ITS, Quickzone)
• Construction Process Improvement (ACTT, TCCC, Highways for Life)
FHWA/National Interests in Data:

- Safety Monitoring (FHWA & AASHTO goals)
- Development & Validation of Standards
  - MUTCD (WZ interface with drivers)
  - CFR (project requirements, like TCPs)
- Guidelines for Improved Practice (e.g., NCHRP 3-69 “Designs for WZs on High Speed Facilities)"
- Technology Development (e.g., ITS, crash tests)
- Special Investigations (e.g., NTSB study of LEO deployments in WZs)
Others with Interests in Safety Data:

• States
  – Direct responsibilities for highways
  – Safety monitoring & improvement
  – Contracting & project oversight
  – Traffic operations
  – Liability

• Contractors
  – Risk management/insurance
  – Timely project completion
  – profit
Data Analyses:

• Descriptive statistics
  – Numbers/tabulations
  – Cross tabulations

• Comparative statistics
  – Measures of significance
  – Identification of critical factors

• Model building
  – Understand relationships
  – Apply to new situations
Work Zone Accident Exposure Study:

- Construction projects selected by States
- WZ staging & TCPs obtained (duration/lengths)
- Work zone crashes from HSIS
- Roadway features identified
- Traffic volumes estimated
- Projects logs and other data captured
Work Zone Project Database:

- Maryland: 63 projects
- Washington: 36 projects
- Minnesota: 25 projects
- California: 14 projects

Total: 138 sites
(255 stages)
Analysis Efforts:

• Statistical analyses comparing “During” and “Before” crash rates & ratios at the:
  – Project-level
  – Stage-level
  – Work zone segment levels

• Investigate influence of:
  – project type
  – highway type
  – work zone type
  – Day/night conditions
  – Driver characteristics & behavior
  – other factors
WA Before/During WZ Crashes by Severity

- **Fatal**:
  - Before: 6
  - During: 6

- **Injury**:
  - Before: 546
  - During: 697

- **PDO**:
  - Before: 610
  - During: 778

Color codes: **Red** for Before, **Green** for During.
<table>
<thead>
<tr>
<th>State</th>
<th>Before</th>
<th>During</th>
<th>During</th>
<th>PDO</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>0.6</td>
<td>0.4</td>
<td>0.5</td>
<td>66.8</td>
</tr>
<tr>
<td>WA</td>
<td>0.4</td>
<td>0.5</td>
<td>0.4</td>
<td>52.5</td>
</tr>
<tr>
<td>MD</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>51.6</td>
</tr>
<tr>
<td>MN</td>
<td>0.3</td>
<td>1.3</td>
<td>26.3</td>
<td>72.4</td>
</tr>
</tbody>
</table>

**WZ Crash Severity** (percentage)
WZ Accident Rate by Functional Class

Ratio (Accident Rate of "During" Construction/Accident Rate of "Before" Construction)

- Highest
- SD+
- Mean
- SD-
- Lowest

Functional Class:
- Rural Major Arterial
- Rural Minor Arterial
- Urban Major Arterial
- Urban Minor Arterial
- Rural Interstate
- Urban Interstate
Ratio of WZ Accidents Before – During by Functional Class

<table>
<thead>
<tr>
<th>Functional Class</th>
<th>Ratio (Accident Rate of &quot;During&quot; Construction/Accident Rate of &quot;Before&quot; Construction)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Major Arterial</td>
<td>![Graph Data] (Highest, SD+, Mean, SD-, Lowest)</td>
</tr>
<tr>
<td>Rural Minor Arterial</td>
<td>![Graph Data] (Highest, SD+, Mean, SD-, Lowest)</td>
</tr>
<tr>
<td>Urban Major Arterial</td>
<td>![Graph Data] (Highest, SD+, Mean, SD-, Lowest)</td>
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</tbody>
</table>
WZ Accident Rate by Type of Project

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Accident Rate (crashes/million vehicle miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widen</td>
<td>[Data points]</td>
</tr>
<tr>
<td>Resurface</td>
<td>[Data points]</td>
</tr>
<tr>
<td>Rehabilitate</td>
<td>[Data points]</td>
</tr>
<tr>
<td>Other</td>
<td>[Data points]</td>
</tr>
</tbody>
</table>

Legend:
- **Highest**
- **SD+**
- **Mean**
- **SD-**
- **Lowest**
WZ Crash Rate by Road Type

Legend
- ▲ Highest
- ◆ SD+
- ■ Mean
- ◈ SD-
- △ Lowest

Accident Rate (crashes/million vehicle miles)

Roadway Type
- 2 lane undivided
- 4 lane undivided
- 4 lane divided
- 4 lane freeway
- 6 or more lane freeway
- Multi-lane divided
CA WZ Crashes by ADT Levels

![Graph showing the relationship between Accident Rate (crashes/million vehicle miles) and ADT (1000's). The graph includes a Legend indicating:
- Current ADT
- 0.90 of current ADT]
Future Agenda:

- Implementation of Impacts Rule
  - Increased effort to gather WZ data
  - Use of data for WZ safety & mobility management
  - Periodic reviews to improve policies & practices

- Development of tools & technologies
- Modification & additions to WZ standards & guidelines
ARTBA/Contractors Role:

• Promote safety
• Support safety directors
• Help build better understanding with data
  – Attention to details
  – Timely reporting
• Regular monitoring of safety trends
Questions ✎✎✎✎✎
Ratio of Before-During WZ Crashes by Road Type

Legend
- ▲ Highest
- ▲ SD+
- ▲ Mean
- ▲ SD-
- ▲ Low est

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</thead>
<tbody>
<tr>
<td>2 lane undivided</td>
<td>0.5</td>
</tr>
<tr>
<td>4 lane undivided</td>
<td>1.5</td>
</tr>
<tr>
<td>4 lane divided</td>
<td>2.5</td>
</tr>
<tr>
<td>4 lane freeway</td>
<td>3.0</td>
</tr>
<tr>
<td>6 or more lane freeway</td>
<td>3.5</td>
</tr>
<tr>
<td>Multi-lane divided</td>
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Federal Highway Administration
Department of Transportation
Ratio of Before-During WZ Crashes by Project Type

Legend
- ▲ Highest
- ♦ SD+
- ■ Mean
- ○ SD−
- △ Lowest

Project Type
- Widen
- Resurface
- Rehabilitate
- Other

Ratio (Accident Rate of “During” Construction/Accident Rate of “Before” Construction)