Safety-Related Performance Measures

Safety impacts commonly measured as:

- Crashes
- Safety Surrogates
- Worker Accidents

Source: TTI
Work Zone Crash Performance Measures

• # Crashes or change in # of crashes
  – Per time period(s) of interest

• Change in crash rate per vehicle mile traveled
  – Per time period(s) of interest
  – Aggregated across projects

• Change in % distribution of crashes by severity, type, manner of collision, etc.

• Change in crash costs
Crashes

Existing Agency Data Sources

- Statewide traffic crash records database entries
- Crash report forms (hard-copy or electronic)
- TOC incident database entries
- Emergency response/service patrol dispatch logs

Future Sources

- Agency-collected work zone crash information
- Connected vehicle initiative data

Source: Las Vegas FAST
<table>
<thead>
<tr>
<th>Data Source</th>
<th>Key Considerations and Trade-offs</th>
</tr>
</thead>
</table>
| Statewide Crash Records Database               | • Limited work zone features and activities information  
• Time lags in obtaining crash data for a given work zone                                                                                                   |
| Electronic or hard copy crash report forms     | • Limited work zone features and activities information  
• Requires manual coding  
• May need to work with multiple enforcement agencies                                                                                           |
| TOC operator incident logs                     | • Includes non-reported as well as reported crashes  
• Includes non-crash events                                                                                                                          |
| Dispatch Logs of Emergency Response or Service Patrols | • Likely to include non-traffic crash events as well  
• Potential privacy concerns                                                                                                                         |
| Agency-collected crash and work zone database  | • Significant agency effort required  
• Requires upper agency support and emphasis                                                                                                           |
| Connected vehicle data                          | • Date of availability still uncertain                                                                                                                       |
Tracking Crash Frequency Trends

Case 1:

- Work zone on roadway that normally experiences 5 crashes per month
- Have had 7, 3, 10, 7 crashes in past 4 months during work zone (+40%, -40%, +100%, +40%)

Source: Ullman et al. FHWA-HOP-11-033
Minimum number of crashes in the work zone that would indicate that crashes have increased relative to what was expected

Number of crashes expected if the work zone had not occurred

- 90 percent chance that crashes have increased
- 75 percent chance that crashes have increased
- 50 percent chance that crashes have increased

Nugenix
### Tracking Work Zone Crash Trends (cont’d)

<table>
<thead>
<tr>
<th>Typical Number of Crashes</th>
<th>Actual Crashes in Work Zone</th>
<th>Change for Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>90</td>
<td>+20%</td>
</tr>
<tr>
<td>75</td>
<td>100</td>
<td>+33%</td>
</tr>
<tr>
<td>70</td>
<td>100</td>
<td>+43%</td>
</tr>
<tr>
<td>60</td>
<td>80</td>
<td>+33%</td>
</tr>
</tbody>
</table>
Work Zone Safety Surrogate Performance Measures

• Speeds
  – Compliance percentage
  – Variance
• Change in emergency response dispatches
• Work zone inspection scores
• Frequency of erratic maneuvers
  – High deceleration rates
  – Short times-to-collision (headways)
  – Forced merges
Safety Surrogates

Existing Agency Data Sources

- Speed data collected by hand-held devices
- Speed data extracted from ITS sensors
- Travel times
- Videotaped traffic behaviors at key locations
- Work zone inspection scores

Future Sources

- Microscopic traffic simulation output
- Connected vehicle initiative data

Source: Gettman et al. FHWA-HRT-08-051

Source: Oregon DOT
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</table>
| All data types                                  | • Correlation to crashes not yet fully verified  
• Most can be obtained relatively quickly        |
| TOC or work zone ITS speed sensor data          | • Value of data depends on the locations of the sensors.  
• Need to verify data availability and archival once work starts |
| Speed data collected with hand-held radar or lidar | • Data collection easy to accomplish  
• Useful for assessing speed behaviors  
• Inconspicuous data collection techniques required |
| Travel times through the work zone               | • Speed change locations can indicate problems  
• Can be used to assess compliance with wz speed limit |
| Videotaped traffic behavior                     | • Can be difficult to find a unobtrusive viewing point  
• Data analysis is labor intensive  
• Requires precise definition of behaviors of interest |
<table>
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</thead>
<tbody>
<tr>
<td>Work zone inspection scores</td>
<td>• Requires significant effort to establish scoring/ratings</td>
</tr>
<tr>
<td></td>
<td>• Correlation of scores to actual safety levels not yet verified</td>
</tr>
<tr>
<td>Traffic simulation output (analyzed with SSAM)</td>
<td>• Significant coding and calibration effort required</td>
</tr>
<tr>
<td></td>
<td>• Correlation to actual work zone safety conditions not yet verified</td>
</tr>
<tr>
<td>Connected vehicle data</td>
<td>• Date of availability still uncertain</td>
</tr>
</tbody>
</table>
Worker Accident Performance Measures

• Frequency of worker accidents
• Worker injury rates per hours of work
• Distributions of injury types, contributing factors
Worker Accidents

Existing Agency Data Sources

- Agency or contractor worker injury records
- State worker compensation commission accident statistics
- Bureau of Labor statistics database

Future Sources

- Connected vehicle initiative data

Source: TTI
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<th>Key Considerations and Trade-offs</th>
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</table>
| Agency or contractor worker injury records     | • Use must be monitored due to privacy concerns  
                                                • Small sample size for many companies will make it difficult to identify trends                                                                                   |
| State worker compensation commission statistics | • Useful for comparisons to agency or contractor accident trends  
                                                • Level of detail will be limited                                                                                                                                   |
| BLS, OSHA worker accident statistics           | • Useful for comparisons to agency or contractor accident trends  
                                                • Level of detail will be limited                                                                                                                                   |
| Agency-collected work zone crash and accident database | • Significant effort required  
                                                • Requires upper agency support and emphasis  
                                                • Use of accident reports must be monitored carefully due to privacy concerns                                                                                     |
Discussion

• Are there other Safety-related measures you have thought about using in your agency? Why are you considering those?

• How would you use these or other safety measures to decide how to modify your agency’s current policies or practices?