Systemic Safety Analysis for Local Roads

Traffic Records Forum

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Agenda

1. Overview of the Systemic Approach
2. Systemic Safety Analysis Steps and Tools
3. Systemic Approach Results
Crash Potential

23 USC §148 “A State shall identify highway safety improvement projects on the basis of crash experience, crash potential, crash rate, or other data-supported means…”

on all public roads...

Systemic Safety Improvement

23 USC §148 (a)(12)

“Systemic Safety Improvement” – an improvement that is widely implemented based on high-risk roadway features that are correlated with particular crash types rather than crash frequency.
Systemic Safety Analysis – FHWA definition

“Data-driven process that involves analytical techniques to identify sites for potential safety improvement and suggests projects for safety investment not typically identified through the traditional site analysis approach.”

Terminology

• **Site-Specific approach** (aka hot-spot or high crash location):
  – deploying site-specific improvements at locations with the highest frequency of crashes

• **Systematic Approach** (aka systemwide):
  – deploy countermeasures at all locations

• **Systemic approach**:
  – deploy low-cost countermeasures at locations with the greatest risk
Question:

• Which approach is crash-based?

a) Hot Spot
b) Systematic
c) Systemic

Fatal Crash Locations
Example: Major Fatal Crash Types in Texas by FHWA Focus Area

<table>
<thead>
<tr>
<th>Crash Type</th>
<th>2014</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
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<tr>
<td>Roadway Departure</td>
<td>1912</td>
<td>54%</td>
</tr>
<tr>
<td>Pedestrian/Bicycle</td>
<td>544</td>
<td>15%</td>
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<tr>
<td>Intersection</td>
<td>800</td>
<td>23%</td>
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<tr>
<td>TOTAL</td>
<td>3256</td>
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</tbody>
</table>


Fatal crash locations are random

Source: Pexels
Fatal crash types are predictable

Systemic Approach in Medicine...

• Think about how doctors provide care to their patients...
• Inquire about your
  – Family health history
  – Personal health history
  – Diet/behavior
• Use this information to assess your risk to develop certain diseases
• Proactively work to minimize risk before major issues develop later in life
How Healthy is Your Road System?


Benefits of Systemic Safety Analysis

- Stronger basis for decisions
  - Accounts for exposure and randomness
- Effective use of resources
  - Focuses resources on crash risks that are most prevalent
- Data-driven approach
- More proactive approach
  - Doesn’t “chase” crashes
- Consistency
  - Provides consistent analytical basis for distribution of resources
A systemic illustration...

• You could select High-Friction Surface Treatment locations on fatal crash data alone... but considering other roadway characteristics would likely lead to a better risk-based solution.

  • Curve Radius
  • Traffic Volume
  • Wet-Weather Crashes
  • Friction Data

Site-Specific vs. Systemic (Total crashes)

Budget = $3M

• Site-specific
  – 3 roundabouts @ $1M/intersection
  – 40% reduction/intersection
  – 10-20 crashes/year before treatment
  – Benefit = reduce 12 – 24 crashes/year

• Systemic
  – 500 intersections @ $6000/intersection
  – 5% reduction/intersection
  – 3 crashes/year before treatment
  – Benefit = reduce 75 crashes/year
Benefits of Systemic Safety Planning

South Carolina Example
• Systemic intersection improvement program
  – Signing
  – Pavement Marking
  – Signal Enhancements
• Signalized
  – Benefit Cost Ratio – 4:1
• Stop-Controlled
  – Benefit-Cost Ratio – 12:1

Reasons for a Systemic Approach

Minnesota
• Rural paved secondary
  – 22,000 miles
  – 13,000 intersections
  – 19,000 curves
  – 0 locations > 1.0 severe crash/year

Note: 60% of Minnesota’s severe crashes (fatal + serious injury) occurred on local system (with half on county owned roads)
Systemic Safety Analysis Process and Tools

Local Road Safety Plans

https://youtu.be/Wzdm796Moi8
NACE “Do-It-Yourself” Local Road Safety Plan pilot

- Increase # of states using this proven safety countermeasure
- Nine states, 41 Local Agencies
- Blended Delivery
LRSP Pilot Program Includes

- Training
- Technical Support
- Access to Crash Data
- Data Analysis Support
- Resources Website
- In-Person Workshop
- An LRSP!

LRSP Creed

“Do what you can, with what you have, where you are.”

- Theodore Roosevelt
Systemic Safety Planning Process

Step 1: Identify Focus Crash Types and Risk Factors

Screen and Prioritize Candidate Locations

Select Countermeasures

Prioritize Projects

Step 1: Identify Focus Crash Types, Facility Types, and Risk Factors

Identify Focus Crash Types and Risk Factors
  - Task 1: Select Focus Crash Types
  - Task 2: Select Focus Facilities
  - Task 3: Identify and Evaluate Risk Factors

Screen and Prioritize Candidate Locations

Select Countermeasures

Prioritize Projects
Task 1: Identify Focus Crash Types

Fatal and Severe Injury Crashes (2007-2011) Percent by Jurisdiction

<table>
<thead>
<tr>
<th>Emphasis Area</th>
<th>Statewide 114,592 mi</th>
<th>Total Fatal/Serious Injury</th>
<th>Pedestrian</th>
<th>Bicycle</th>
<th>Heavy Vehicle</th>
<th>Road Departure</th>
<th>Intersection</th>
<th>Head-on and Sideswipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fatal/Serious Injury</td>
<td>100%</td>
<td>63,443</td>
<td>11,786</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian</td>
<td>19%</td>
<td>3,390</td>
<td>3,123</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicycle</td>
<td>5%</td>
<td>16,668</td>
<td>8,122</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intersection</td>
<td>41%</td>
<td>2,892</td>
<td>2,414</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head-on and Sideswipe</td>
<td>5%</td>
<td>3,071</td>
<td>1,051</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Typical Data Request Process...

Get Request
Be Annoyed
Do it because you have to
Avoid more requests!

Credit: Reg Souleyrette, TRF Session on Traffic Safety Data Services
### Crash Summary Report example #1

**Location:** Accident History for All Locations

<table>
<thead>
<tr>
<th>Severity</th>
<th>PDO: 118</th>
<th>NHI: 52</th>
<th>Injured 79</th>
<th>Fat: 2</th>
<th>Killed 2</th>
<th>Total: 172</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Crash Type</th>
<th>Overturning: 35</th>
<th>Other Non Collision: 6</th>
<th>Pedestrians: 1</th>
<th>Broadsided: 11</th>
<th>Head On: 4</th>
<th>Rear End: 16</th>
<th>Total: 173</th>
</tr>
</thead>
</table>

|---------------------|------------|--------|-----------------|------|-------|------|----------|--------|

<table>
<thead>
<tr>
<th>Road Conditions</th>
<th>Dry: 134</th>
<th>Wet: 5</th>
<th>Muddy: 1</th>
<th>Snowy: 6</th>
<th>Icy: 20</th>
<th>Salty: 3</th>
<th>Foreign Material: 0</th>
<th>With Road Treatment: 3</th>
<th>Unknown: 0</th>
<th>Total: 173</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of Vehicles</th>
<th>One Vehicle: 119</th>
<th>Two Vehicles: 53</th>
<th>Three or More: 0</th>
<th>Unknown: 0</th>
<th>Total: 172</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Location</th>
<th>On Road: 67</th>
<th>Off Road: 104</th>
<th>Unknown: 1</th>
<th>Total: 172</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Mainline/Ramps/Frontage Rds</th>
<th>Mainline: 169</th>
<th>Ramps: 1</th>
<th>Frontage/Ramp Inter: 0</th>
<th>Frontage Roads: 2</th>
<th>Total: 173</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Vehicle Types</th>
<th>Passenger Car/Van: 72</th>
<th>Passenger Car/Van w/Trailer: 1</th>
<th>Total: 73</th>
</tr>
</thead>
</table>

### Crash Summary Report example #2

**Overview**

**Year:** Please Select a Year...  
**District Name:** Select a District...  
**County Name:**  

<table>
<thead>
<tr>
<th>DOT District</th>
<th>County</th>
<th>County Severity Score</th>
<th>County Vehicle Miles Traveled</th>
<th>County Crash Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOT District 1</td>
<td>1</td>
<td>22,028</td>
<td>8,447,412.09</td>
<td>2.62</td>
</tr>
<tr>
<td>DOT District 1</td>
<td>2</td>
<td>137,134</td>
<td>20,810,809.17</td>
<td>415.51</td>
</tr>
<tr>
<td>DOT District 2</td>
<td>3</td>
<td>138,437</td>
<td>22,101,525.13</td>
<td>549.86</td>
</tr>
<tr>
<td>DOT District 3</td>
<td>4</td>
<td>13,304</td>
<td>4,840,756.43</td>
<td>293.17</td>
</tr>
<tr>
<td>DOT District 4</td>
<td>5</td>
<td>229,467</td>
<td>34,378,281.73</td>
<td>494.47</td>
</tr>
<tr>
<td>DOT District 5</td>
<td>6</td>
<td>14,947</td>
<td>3,128,375.47</td>
<td>395.15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DOT District</th>
<th>County</th>
<th>County Severity Score</th>
<th>County Vehicle Miles Traveled (VMT)</th>
<th>District Crash Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOT District 1</td>
<td>1</td>
<td>22,028</td>
<td>8,447,412.09</td>
<td>320.72</td>
</tr>
<tr>
<td>DOT District 2</td>
<td>2</td>
<td>137,134</td>
<td>20,810,809.17</td>
<td>292.50</td>
</tr>
<tr>
<td>DOT District 3</td>
<td>3</td>
<td>138,437</td>
<td>22,101,525.13</td>
<td>313.92</td>
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<tr>
<td>DOT District 4</td>
<td>4</td>
<td>13,304</td>
<td>4,840,756.43</td>
<td>251.47</td>
</tr>
<tr>
<td>DOT District 5</td>
<td>5</td>
<td>229,467</td>
<td>34,378,281.73</td>
<td>309.88</td>
</tr>
<tr>
<td>DOT District 6</td>
<td>6</td>
<td>14,947</td>
<td>3,128,375.47</td>
<td>277.83</td>
</tr>
<tr>
<td>DOT District 7</td>
<td>7</td>
<td>553,021</td>
<td>55,567,243.56</td>
<td>474.58</td>
</tr>
</tbody>
</table>
--Crash Summary Report example #2--

### Location

<table>
<thead>
<tr>
<th>Year:</th>
<th>2014, 2015, 2016, 2017, Nom</th>
<th>District</th>
<th>District Seven-</th>
<th>County Name:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Contributing Factor</th>
<th>Incident Count</th>
<th>Vehicle Maneuver</th>
<th>Incident Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Contributing Factors</td>
<td>19,041</td>
<td>Backing</td>
<td>3,058</td>
</tr>
<tr>
<td>Following too close</td>
<td>6,524</td>
<td>Changing lanes</td>
<td>1,549</td>
</tr>
<tr>
<td>Failed to yield</td>
<td>3,860</td>
<td>Entering/leaving driveway</td>
<td>188</td>
</tr>
<tr>
<td>Improper backing</td>
<td>2,538</td>
<td>Entering/leaving parking</td>
<td>629</td>
</tr>
<tr>
<td>Impaired clearance</td>
<td>1,747</td>
<td>Passing U-turn</td>
<td>194</td>
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<tr>
<td>Changed lanes improperly</td>
<td>1,376</td>
<td>Negotiating a curve</td>
<td>905</td>
</tr>
<tr>
<td>Driver lost control</td>
<td>1,235</td>
<td>Other</td>
<td>80</td>
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<tr>
<td>Other</td>
<td>1,824</td>
<td>Pedestrian</td>
<td>2,677</td>
</tr>
<tr>
<td>Pedestrian or other distraction (distracted)</td>
<td>926</td>
<td>Passing</td>
<td>272</td>
</tr>
<tr>
<td>Reaction to object or animal</td>
<td>685</td>
<td>Right</td>
<td>1</td>
</tr>
<tr>
<td>Improper turn</td>
<td>838</td>
<td>Stopped</td>
<td>5,879</td>
</tr>
<tr>
<td>Drunk or impaired</td>
<td>465</td>
<td>Straight</td>
<td>15,613</td>
</tr>
<tr>
<td>Under the influence (DUI)</td>
<td>350</td>
<td>Turning Left</td>
<td>3,869</td>
</tr>
<tr>
<td>Distracted</td>
<td>356</td>
<td>Turning Right</td>
<td>2,951</td>
</tr>
<tr>
<td>Too fast for conditions</td>
<td>350</td>
<td></td>
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</table>
### Crash Summaries and Comparisons

#### 2013-2017 County X Data

<table>
<thead>
<tr>
<th>年度</th>
<th>整体数据</th>
<th>事故</th>
<th>总数据</th>
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#### By Collision Type

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#### By Roadway Surface

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#### By Function Relationship

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#### By Contributing Circumstance

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*注意：以上数据为2013-2017年期间的交通事故总结和比较，具体数字请参考原始资料。*
Task 2: Select “focus facility”

The facility type on which the focus crash type most frequently occurs.

- Rural, Two-Lane Highways
- Urban, Signalized Intersections
- Horizontal Curves
- Rural, Thru-STOP Intersections
- Unpaved Roads

Task 2: Select Focus Facilities

- 5 years, Severe Roadway Departure
- State System 4,400 crashes
- Rural 2,500 crashes
  - Undivided 2,165
  - Divided 375
  - 1 Lane 1
  - 2 Lanes 2,090
  - 3 Lanes 35
  - 4 Lanes 39
- Urban 1,900 crashes
  - Undivided 1,102
  - Divided 798
  - 2 Lanes 897
  - 3 Lanes 28
  - 4 Lanes 170
  - 5-6 Lanes 7
  - 55+ mph 336
  - Unknown 1
Develop Crash Tree Diagrams

**5 Year Crashes St Louis County**

- 11,970

**Source:** MADAT Crash Data, 2006-2010
**Date of Analysis:** Stated in text and visual reference under image.

---

**Crash Tree Diagram example**

- 5-year County Road Crashes: 818
  - 170

**Intersection**
- 344 (42%)
  - 62 (20%)
  - 252 (79%)

**Non-Intersection**
- 47 (42%)
  - 105 (52%)
  - 130 (68%)

**Animal**
- 1 (1%)

**Non-Animal**
- 170 (90%)
  - 29 (52%)
  - 99 (80%)

---

**Image Source:** St. Louis County Road Safety Plan 315

---

*Slight Latency in Names*
Crash Tree Diagram example

Crash Tree Combinations

**Primary**
- State / local
- Rural / urban
- Segment / intersection
- Segment type
  - Freeway, multilane, two-lane, one-way
- Intersection control
  - Signalized
  - Unsignalized
  - Uncontrolled

**Secondary**
- Tangent / curve
- High-speed / low-speed
- Street lighting
- District or regions
- Traffic volume
- Lane width
- Shoulder type/width
- Alignment
- Land use
Helpful Hints

• Crash trees can include all injury crashes or just severe injury crashes for one focus crash type
• Examine total and severe crash categories
• Experience suggests 100+ crashes for identifying risk patterns
  – Increase sample size by:
    • Increasing number of years
    • Increasing geographic area (region instead of county)
    • Include minor injuries
  – Note: For smaller or rural jurisdictions, less crash data can be utilized for analysis.

Crash Tree Diagram Tool
Task 3: Identify and Evaluate Risk Factors

- Identify potential risk factors
- Evaluate risk factors
- Select final risk factors

What we mean by “risk factor”

A representation of risk in terms of the observed characteristics associated with the locations where the targeted crash types occurred.

- Volume
- Alignment
- Intersection Control
- Presence of Shoulders
- ...
Potential Risk Factors

Roadway features:
• Number of lanes
• Lane width
• Shoulder width / type
• Median width / type
• Horizontal curvature
  – Superelevation
  – Delineation
  – Advance warning
  – Speed differential
  – Visual trap
• Pavement condition / friction
• Roadside features
  – Sideslope design
  – Clear zone
• Driveway density
• Other features
  – Rumble strips
  – Lighting
  – On-street parking

Potential Risk Factors

Intersection features:
• Traffic control device
• Left-turn or right-turn lanes
• Skew angle
• Advance warning signs
• Located in or near horizontal curve
• Type of development (e.g., commercial)
• Signals
  – Left-turn phasing
  – Number of signal heads vs. number of lanes
  – Backplates
  – Right-turn-on-red
  – Overhead versus pedestal mounted
Potential Risk Factors

Pedestrian-related features:
• Type of intersection control
• Crosswalk presence
• Lanes to cross/crossing distance
• Pedestrian signal/type
• Sidewalk presence
• Adjacent land uses
• Lighting

Potential Risk Factors

Other general features:
• Traffic volume
• Speed
  – Posted, operating
• Railroad crossing
• Automated enforcement
• Adjacent land use type
  – Schools, commercial, or alcohol-sales establishments
• Bus stops (presence and location)
Qualitative Approach to Risk Factors

• Use qualitative ratings when needed:
  – Good, Fair, Not-So-Good (curve radius, roadside, etc.)
  – High, Medium, Low (traffic volumes, crash frequency, etc.)
• It is important to include the risk factors that are key to your roadway network

“There’s a lack of quantitative data, but there’s a wealth of qualitative data.”

Linda, National Park Service

Evaluate Potential Risk Factors

• What is future crash potential
  – Descriptive statistics
  – Published research
Descriptive Statistics Analysis

![Descriptive Statistics Analysis](image1.png)

Descriptive Statistics Analysis

![Descriptive Statistics Analysis](image2.png)
Descriptive Statistics Analysis

Presence of Potential Risk Factor

- Narrow Clearzone: 23% of System, 38% of Severe
- Passing Lane: 25% of System, 20% of Severe
- Street Lighting: 8% of System, 5% of Severe
- Paved Shoulder: 44% of System, 12% of Severe

Arterial & Collectors (356 miles)
- Percent of Road Miles:
  - Arterial & Collectors: 33%
  - Local Roads: 67%
- Percent Injury Crashes:
  - Arterial & Collectors: 72%
  - Local Roads: 23%
- Percent Severe:
  - Arterial & Collectors: 81%
  - Local Roads: 19%
Descriptive Statistics Analysis

- **Edge Clearance**
  - Edge Clearance 1
  - Edge Clearance 2
  - Edge Clearance 3

  - Percent of Curve Inventory: 267
  - Percent Injury: 226
  - Percent Severe: 36

<table>
<thead>
<tr>
<th>Speed Limit</th>
<th>Segment Data</th>
<th>Crash data</th>
<th>Curve</th>
<th>Non-curve</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mph</td>
<td>53</td>
<td>21</td>
<td>14</td>
<td>7%</td>
</tr>
<tr>
<td>25 mph</td>
<td>39</td>
<td>21</td>
<td>15</td>
<td>6%</td>
</tr>
<tr>
<td>30 mph</td>
<td>53</td>
<td>24</td>
<td>13</td>
<td>7%</td>
</tr>
<tr>
<td>35 mph</td>
<td>196</td>
<td>130</td>
<td>44</td>
<td>38%</td>
</tr>
<tr>
<td>40 mph</td>
<td>222</td>
<td>123</td>
<td>61</td>
<td>30%</td>
</tr>
<tr>
<td>45 mph</td>
<td>13</td>
<td>11</td>
<td>4</td>
<td>3%</td>
</tr>
<tr>
<td>50 mph</td>
<td>9</td>
<td>11</td>
<td>4</td>
<td>3%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ADT Total</th>
<th>Segment Data</th>
<th>Crash data</th>
<th>Curve</th>
<th>Non-curve</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-19</td>
<td>603</td>
<td>195</td>
<td>44</td>
<td>14%</td>
</tr>
<tr>
<td>20-49</td>
<td>396</td>
<td>105</td>
<td>66</td>
<td>24%</td>
</tr>
<tr>
<td>50-99</td>
<td>271</td>
<td>163</td>
<td>67</td>
<td>26%</td>
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<tr>
<td>100-199</td>
<td>98</td>
<td>137</td>
<td>56</td>
<td>20%</td>
</tr>
<tr>
<td>200-399</td>
<td>69</td>
<td>94</td>
<td>50</td>
<td>14%</td>
</tr>
<tr>
<td>400-999</td>
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<td>4%</td>
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<table>
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<th>Segment Data</th>
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<th>Curve</th>
<th>Non-curve</th>
</tr>
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<tbody>
<tr>
<td>1-2</td>
<td>7</td>
<td>11</td>
<td>4</td>
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<tr>
<td>2-3</td>
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<td>2%</td>
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<tr>
<td>4-5</td>
<td>258</td>
<td>26</td>
<td>18</td>
<td>8%</td>
</tr>
<tr>
<td>6-10</td>
<td>390</td>
<td>46</td>
<td>25</td>
<td>11%</td>
</tr>
<tr>
<td>11-15</td>
<td>63</td>
<td>52</td>
<td>36</td>
<td>16%</td>
</tr>
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<td>16-20</td>
<td>58</td>
<td>91</td>
<td>37</td>
<td>22%</td>
</tr>
<tr>
<td>21-25</td>
<td>330</td>
<td>125</td>
<td>65</td>
<td>39%</td>
</tr>
<tr>
<td>26-30</td>
<td>57</td>
<td>64</td>
<td>22</td>
<td>10%</td>
</tr>
<tr>
<td>30+</td>
<td>17</td>
<td>31</td>
<td>15</td>
<td>9%</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Speed Diff</th>
<th>Segment Data</th>
<th>Crash data</th>
<th>Curve</th>
<th>Non-curve</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>51</td>
<td>18</td>
<td>17</td>
<td>14%</td>
</tr>
<tr>
<td>6-10</td>
<td>113</td>
<td>72</td>
<td>30</td>
<td>20%</td>
</tr>
<tr>
<td>11-15</td>
<td>256</td>
<td>205</td>
<td>14</td>
<td>29%</td>
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<tr>
<td>16-20</td>
<td>87</td>
<td>86</td>
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<td>24%</td>
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<td>21-25</td>
<td>43</td>
<td>48</td>
<td>12</td>
<td>20%</td>
</tr>
<tr>
<td>25+</td>
<td>12</td>
<td>2</td>
<td>1</td>
<td>2%</td>
</tr>
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</table>
Risk Factor Collection Ideas

- Use aerial imagery, video logs
- Sign inventory, other mgmt systems
- Collect during slow times – maintenance crews, interns, sign folks, plow operators,…
- Use qualitative values when quantitative hasn’t been collected

Risk Factors (WA Counties 2017)

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRASHES/SEVERITY/RATE</td>
<td>23</td>
</tr>
<tr>
<td>ADT</td>
<td>19</td>
</tr>
<tr>
<td>HORIZONTAL CURVES</td>
<td>16</td>
</tr>
<tr>
<td>FUNCTIONAL CLASS</td>
<td>14</td>
</tr>
<tr>
<td>POSTED SPEED</td>
<td>12</td>
</tr>
<tr>
<td>FIXED OBJECTS/CLEAR ZONE</td>
<td>12</td>
</tr>
<tr>
<td>ROAD/LANE WIDTH</td>
<td>11</td>
</tr>
<tr>
<td>SHOULDER WIDTH</td>
<td>9</td>
</tr>
<tr>
<td>SURFACE TYPE</td>
<td>5</td>
</tr>
<tr>
<td>EMBANKMENT SLOPE/HEIGHT</td>
<td>5</td>
</tr>
<tr>
<td>ILLUMINATION PRESENCE</td>
<td>5</td>
</tr>
</tbody>
</table>

Avg. = 6 risk factors
Systemic Approach Results

Results of Minnesota’s Systemic Approach

Source: Mark Vizecky, MnDOT
Safety Program Results

Fatal / Suspected Serious Injury Crashes

County Results

County Road Fatal & Suspected Serious Injury Crashes
2008-2012 vs 2013-2017

- Horizontal Curve Crashes
- Alcohol-Related Crashes
- Crashes in the Dark (No Street Lights)
- Motorcycles in Crashes

20% 45% 20% 20%
County Results – Crash Types

County Road Fatal & Suspected Serious Injury Crashes 2008-2012 vs 2013-2017
Top Crash Types

<table>
<thead>
<tr>
<th>Crash Type</th>
<th>2008-2012</th>
<th>2013-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hit Fixed Object Crashes</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td>Overturn Crashes</td>
<td>36%</td>
<td>31%</td>
</tr>
<tr>
<td>Angle (T) Crashes</td>
<td>13%</td>
<td>12%</td>
</tr>
<tr>
<td>Hit Pedestrian Crashes</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Head On Crashes</td>
<td>12%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Over Center Line Drivers

Local Road Safety Plans - 2019*

Over 200 Federally Recognized Tribes have Safety Plans

* Estimate of LRSPs

NACRE/FHWA LRSP Pilot State

LRSP
FHWA LRSP County
NACRE LRSP County

1% 100%

Developing County Plans Statewide
Developing Regional Plans

DC PR FLH
NACE “Do-It-Yourself” LRSP Pilot - Round 3 – Fall 2019

• Let us know if your state would be interested!

Webinars  Support Team  Direct Assistance  In-Person Workshop

EDC-5: Focus on Reducing Rural Roadway Departures (FoRRRwD)

• Reduce the potential for serious injury and fatal roadway departure crashes on all public rural roads by increasing the **systemic deployment** of proven countermeasures.
EDC-5: Safe Transportation for Every Pedestrian (STEP)

Systemic application of cost-effective countermeasures with known safety benefits can help reduce pedestrian fatalities at both uncontrolled and signalized crossing locations.

Questions?

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515.233.7323
Jerry.Roche@dot.gov

https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/ddsacfm