Safety Data Management, Governance and Integration

Stuart Thompson, FHWA
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Data Management, Governance, & Integration

- 2012 Capabilities Assessment
- 2018 Capabilities Assessment
- Data Integration Guide
- Data Management and Governance Guide
Safety Data Integration Steps

**Preparation**

1. Lay the Foundation
2. Conduct Gap Analysis
3. Establish Data Governance Process
4. Develop Data Collection and Integration Plan
5. Identify Training Needs for Data Collection, Integration, and Analysis

**Implementation**

6. Perform Data Integration
7. Develop and Deploy the Extract, Transform & Load Process
8. Conduct Analyses
9. Perform Effectiveness Evaluation
Data Management & Governance

1. Strategic Vision & Mission for Data
2. Data Management Policies & Procedures
3. Data Governance Board
4. Division Mission & Goals
5. Safety Data Programs
6. Community of Interest
7. Data Stewards & Custodians
## Define Challenges

<table>
<thead>
<tr>
<th>System</th>
<th>Technology</th>
<th>Institutional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data collection</td>
<td>Analysis tools</td>
<td>Governance structure</td>
</tr>
<tr>
<td>Redundancies</td>
<td>Consistent results</td>
<td>Data sharing agreements</td>
</tr>
<tr>
<td>Accessibility</td>
<td>Functionality</td>
<td>Data management</td>
</tr>
<tr>
<td>Usability</td>
<td>Data reports</td>
<td>Training</td>
</tr>
<tr>
<td>Timeliness</td>
<td>Legacy systems</td>
<td>Funding and resources</td>
</tr>
<tr>
<td>Data integration</td>
<td>Database design</td>
<td></td>
</tr>
</tbody>
</table>
Safety Data Analysis and Management

Tim Harmon, VHB
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Exercise #1

- GIS/IT/planners
- Safety engineers
- ARNOLD
- MIRE FDE
- SHSP
- HSIP
- TRCC

- PBPD
- HSM
- Network screening
- Safety countermeasures
- SPF$s$ and CMFs
- Priority?
Safety Data/Traffic Records

- Roadway segments
- Intersections
- Ramps
- Traffic
- Projects
- Horizontal curves
- Roadside
- Rail-highway crossings

- Crashes
- Vehicles
- Drivers
- ED/vital/inj surveillance
- Citation
- Adjudication
Safety Engineering

• Not just crash summary and analysis
• Includes roadway, traffic, and project data
• Segmentation
• Predictive statistics
• Accessibility
• Integration
• Visualization
• Reporting
DOGBERT CONSULTS

YOU NEED TO DO DATA MINING TO UNCOVER HIDDEN SALES TRENDS.

IF YOU MINE THE DATA HARD ENOUGH, YOU CAN ALSO FIND MESSAGES FROM GOD.

. . . SALES TO LEFT-HANDED SQUIRRELS ARE UP . . . AND GOD SAYS YOUR TIE DOESN'T GO WITH THAT SHIRT.
Network-level vs. Project-level data

- MIRE 2.0 — 205
- FDE — 37
- Analysis
- Decision-making
- Performance
- Screening
- Design
- Evaluation
Prioritizing Data Needs

1. Define Business Needs
2. Identify Desired Analysis Capabilities and Data Requirements
3. Catalog Available Data
4. Conduct Gap Analysis
5. Prioritize Data

Data Source Elements (Available Data):
- Intersection Identifier
- Unique Approach Identifiers
- Location Along Approach Streets
- Number of intersecting Legs
- Major-Road AADT and Year

MIRE FDE Elements (Desired Data):
- Unique Junction Identifier
- Unique Approach Identifiers
- Location Along Approach Streets
- Intersection/Junction Geometry
- Major Road AADT and Year
- Minor Road AADT and Year

FHWA Priorities in Roadway Safety Data Guide
# Safety Data Usage

<table>
<thead>
<tr>
<th>Component</th>
<th>Crash</th>
<th>Exposure</th>
<th>Roadway</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Screening</td>
<td>Crash counts by severity at the site level (intersections and segments)</td>
<td>Traffic volume and segment length</td>
<td>Area type (rural or urban), number of lanes, median type, intersection control, and number of legs</td>
<td>Safety performance functions (SPFs) or other thresholds by facility type</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Three to five years of police crash reports and details for each location</td>
<td>Traffic volume and turning movement counts</td>
<td>Traffic operations, roadway design, and roadside design features</td>
<td>Adjacent land use, road user behavior, and road user demographics</td>
</tr>
<tr>
<td>Countermeasure Selection</td>
<td>Three to five years of police crash reports and details for each location</td>
<td>Traffic volume and turning movement counts</td>
<td>Traffic operations, roadway design, and roadside design features</td>
<td>List of crash contributing factors and countermeasure details</td>
</tr>
<tr>
<td>Economic Appraisal</td>
<td>Expected change in crashes due to treatment</td>
<td>Current and future traffic volume</td>
<td>Site characteristics to identify suitable crash modification factors (CMFs)</td>
<td>Applicable CMFs, average crash costs, and service life of treatment</td>
</tr>
<tr>
<td>Safety Effectiveness Evaluation</td>
<td>Crash counts by severity before and after treatment for each site</td>
<td>Traffic volume before and after treatment for each site</td>
<td>Site characteristics to define a suitable reference group or comparison group</td>
<td>Treatment details, including location and implementation date, SPFs</td>
</tr>
</tbody>
</table>
## Network Screening Measures

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Crash</th>
<th>Roadway</th>
<th>Traffic</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Crash Frequency</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crash Rate</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equivalent Property Damage Only Average Crash Frequency</td>
<td>X</td>
<td>X</td>
<td></td>
<td>Crash Costs</td>
</tr>
<tr>
<td>Level of Service of Safety</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>SPF</td>
</tr>
<tr>
<td>Excess Predicted Average Crash Frequency Using SPFs</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>SPF</td>
</tr>
<tr>
<td>Probability of Specific Crash Types Exceeding Threshold</td>
<td>X</td>
<td>X</td>
<td></td>
<td>SPF</td>
</tr>
<tr>
<td>Proportions of Specific Crash Types</td>
<td>X</td>
<td>X</td>
<td></td>
<td>SPF</td>
</tr>
<tr>
<td>Expected Average Crash Frequency with EB Adjustments</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>SPF</td>
</tr>
<tr>
<td>Equivalent Property Damage Only Average Crash Frequency</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>SPF</td>
</tr>
<tr>
<td>Excess Expected Average Crash Frequency with EB Adjustments</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>SPF</td>
</tr>
</tbody>
</table>
Common Challenges

• Intersections/legs
• Local road traffic – collect or not?
• Ramp traffic
• Non-motorized traffic/facilities
• Project and countermeasure data
• Inter-agency data sharing
• Consolidating LRS across state/enterprise
• NG911
Common Issues

• Not working together
• Overwhelmed
• Tunnel vision

• Integration
• Temporality
  – Crashes
  – Traffic
  – Projects
Exercise #2

- LRS
- LRM
- ETL
- R&H, Exor, etc.
- Event tables
- Geocoding/geolocation
- Data models
- Business rules
- Data management
- Data integration
- Data integrity
How to make friends as an adult
# Speaking Their Language

<table>
<thead>
<tr>
<th>A</th>
<th>AAA</th>
<th>American Automobile Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>AAAFTS</td>
<td>American Automobile Association Foundation for Traffic Safety</td>
</tr>
<tr>
<td>A</td>
<td>AADT</td>
<td>annual average daily traffic</td>
</tr>
<tr>
<td>A</td>
<td>AAMA</td>
<td>American Automobile Manufacturers Association</td>
</tr>
<tr>
<td>A</td>
<td>AAMVA</td>
<td>American Association of Motor Vehicle Administrators</td>
</tr>
<tr>
<td>A</td>
<td>AAR</td>
<td>Association of American Railroads</td>
</tr>
<tr>
<td>A</td>
<td>AASHO</td>
<td>American Association of State Highway Officials (outdated; former name of AASHTO)</td>
</tr>
<tr>
<td>A</td>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
</tr>
<tr>
<td>A</td>
<td>ABA</td>
<td>American Bus Association</td>
</tr>
<tr>
<td>A</td>
<td>ABS</td>
<td>anti-lock braking system (in vehicles)</td>
</tr>
<tr>
<td>A</td>
<td>AC</td>
<td>advanced construction</td>
</tr>
<tr>
<td>A</td>
<td>ACC</td>
<td>adaptive cruise control</td>
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<tr>
<td>A</td>
<td>ACEC</td>
<td>American Consulting Engineers Council</td>
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<tr>
<td>A</td>
<td>ACF</td>
<td>average crash frequency</td>
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<tr>
<td>A</td>
<td>ACI</td>
<td>American Concrete Institute</td>
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<tr>
<td>A</td>
<td>ADA</td>
<td>Americans with Disabilities Act</td>
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<tr>
<td>A</td>
<td>ADA</td>
<td>Assistant Division Administrator</td>
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<tr>
<td>A</td>
<td>ADHS</td>
<td>Appalachian Development Highway System</td>
</tr>
<tr>
<td>A</td>
<td>ADT</td>
<td>average daily traffic</td>
</tr>
<tr>
<td>A</td>
<td>AICP</td>
<td>American Institute of Certified Planners</td>
</tr>
</tbody>
</table>
Takeaways

• Safety engineers depend on GIS

• Safety engrs. may not be able to convey their needs

• ETLs and application support usually required

• Most safety engineers do not own the data they consume

• Incorporate safety into the enterprise

• Make friends
Contacts

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