CRASH ANALYSIS

Lessons Learned

Cary Karnstadt
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TxDOT Safety Mission and Goals

Promote Safety - Champion a culture of safety.

- Reduce crashes and fatalities by continuously improving guidelines and innovations along with increased targeted awareness and education.
- Reduce employee incidents.

- TxDOT is responsible for the collection and analysis of crash data submitted by law enforcement on form CR-3, Texas Peace Officer’s Crash Report.
What is crash data used for?

- Improve safety.
- Evaluate roadway characteristics.
- Identify roadway improvements that reduce crashes.
- Determine crash patterns associated with different highway geometries.
- Identify the human economic benefits of making various improvements.
- Prioritize roadway alternatives.
Crash Records Information System (CRIS)

- TxDOT maintains a statewide automated database for all reported motor vehicle traffic crashes received by TxDOT from DPS.

- The records retention schedule approved by the Texas State Library and Archives Commission for crash data and reports is the current calendar year plus the five previous calendar years. Data for years beyond this period is not available.

- The TxDOT CRIS Public Interface contains the data collected from the Texas Peace Officer’s Crash Report (CR-3) that may be released to the public as per Texas Transportation Code (TTC) 550.065.

- In addition to the CR-3 data, all crash records include interpreted data fields.
TxDOT has automated the process for requesting and distributing the standard and public interface.
Requesting Crash Data from CRIS

1. Create an account.
2. Submit a public interface request.
3. Select a format.
   - CSV
   - XML
4. Select a region.
   - All of Texas
   - Specific County
   - Specific City
   - Specific Agency
   - Specific MPO
5. Select a time period.
   - Begin Date
   - End Date
6. The request will be processed in approximately 24 hours and ready for download.
Commonly Used Crash Data Fields

- **Crash Identifier**
  - Crash ID

- **Date/Time**
  - Crash Date
  - Crash Day of Week
  - Crash Time

- **Location**
  - Crash Latitude
  - Crash Longitude
  - City
  - County
  - Derived Intersection

- **Facility**
  - Secondary Highway
  - Rural Flag
  - Road Part
  - Road Type
  - Intersection Related
  - Control Section

- **Crash Characteristics**
  - First Harmful Event
  - Crash Contributing Factor List
  - Manner of Collision
  - Object Struck
  - Crash Severity
  - Number of Vehicles Involved

- **Environmental Factors**
  - Weather Condition
  - Light Condition
  - Surface Condition

- **Vehicle Characteristics**
  - Vehicle Body Style
  - Vehicle Direction of Travel

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2016 TxDOT Transportation Planning Conference

June 15, 2016
The Crash Analysis Process

1. Identify sources and request crash data for study location and time period.
2. Review dates of available data and select study period for crash analysis.
3. Request crash data.
4. Identify locations with high crash experiences.
   - By frequency
   - By severity
   - By crash rate
   - By crash type
5. Investigate locations by identifying crash patterns and contributing factors.
   - Crash types
   - Manner of collision
   - Contributing factors
   - Main directions
6. Recommend strategies to reduce future crash experiences.

Crash Rate Example

<table>
<thead>
<tr>
<th>Location</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crashes (crashes/year)</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Length (miles)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Traffic (AADT)</td>
<td>10,000</td>
<td>50,000</td>
</tr>
<tr>
<td>Crash Rate (crashes/100 M VMT)</td>
<td>137</td>
<td>55</td>
</tr>
</tbody>
</table>
Crash Hotspots and Clusters Example

Crash Rates per Location (2010-2014)
Four Lane Divided Crash Rate*

* Crash rate measured per 100 million vehicle miles traveled
** ACRT = Average Crash Rate for Texas Highways

Legend:
- US 380 (Project Limit)
- Interstate
- U.S. Highway
- State Highway
- Flat Road
- Active Rail Line
- Inactive Rail Line
- City Boundary
- Military Installation
- County Boundary
- District Boundary
- Water Feature
- State or National Park

Source: TxDOT, Location Naming: Austin, June 15, 2016, 2016 TxDOT Transportation Planning Conference

1. Crash Hotspot
2. Crash Cluster

1. Crash Hotspot
2. Crash Cluster
3. Crash Cluster
Crash Hotspots and Clusters Example

Notes

All crashes within the city limits.
The main manner of collision is vehicle going straight.

Clusters

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Collision Type</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH 36</td>
<td></td>
<td>Multiple vehicles</td>
<td>May need further study since the signalized intersection has 14 crashes and a constrained ROW</td>
</tr>
</tbody>
</table>

Clash Hotspot

Crash Cluster

Cluster

<table>
<thead>
<tr>
<th>Crash Cluster</th>
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Cluster

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Localized Crash Analysis Example

River Crossing Blvd (49 crashes)

First Harmful Event

- Other Vehicle: 84%
- Animal: 8%
- Overturned: 4%
- Fixed Object: 4%

North-North (12 c)
- Rear-End (12 c)
- Failed to Control Speed (12 c)

North-South (8 c)
- Turning Left (8 c)
- Disregard Stop and Go Signal (4 c)
- Failed to Yield ROW (2 c)
- Other Factor (2 c)

North-East (7 c)
- Angle Both Going Straight (7 c)
- Failed to Yield ROW – Yield Sign (7 c)

South-South (7 c)
- Rear-End (7 c)
- Failed to Control Speed (3 c)
- Driver Inattention (2 c)
- Unsafe Lane Change (2 c)

North (5 c)
- Single Vehicle Going Straight (5 c)
- Animal on Road – Wild (4 c)
- Failed to Control Speed (1 c)

Note: Remaining 10 crashes do not have any discernable pattern. No more than four crashes have occurred on each of these movements during the past five years.
Localized Crash Analysis Example

Main Observations
- 24% North-North and 14% South-South rear-end crashes related to speeding.
- North-South and North-East crashes were significant prior to installation of signal but were eliminated after 2013.
- Animal-related crashes on NB approach, one leading to an incapacitating injury.

Possible Solutions
- Gradually reduce speed limit leading to the intersection
- Install advanced warning devices on both NB and SB approaches.

Parameter | Description
--- | ---
Traffic Control / Illumination | Signalized (after 2013). Protected left turns on NB and SB approaches. Intersection illuminated. **Speed Limit**: 55 MPH
US 281 Lane Configuration | Four-Lane Divided with separate left-turn lanes.
Crash Severity | 3 Incapacitating Injuries; No Fatal Crashes
Useful Sources of Comparison and Validation

Statewide Average Crash Rates

Other Sources

District and Local Staff Knowledge

Research Studies

NHTSA
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Federal Motor Carrier Safety Administration
Key Concerns

Joint Designation of Facilities

Geocoding of Crashes

Crash Directions and Descriptions
Multiple Designation of Facilities

Analyze crashes coded on each of the designated facilities.
Differentiate between crashes coded on joint intersections.
Rely on geocoding not only on data fields.
Crash Directions and Descriptions

<table>
<thead>
<tr>
<th>Crash 1</th>
<th>Crash 2</th>
<th>Crash 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manner of Collision:</strong> SD Both Right Turn</td>
<td><strong>Manner of Collision:</strong> SD Both Going Straight – Rear End</td>
<td><strong>Manner of Collision:</strong> SD One Straight – One Stopped</td>
</tr>
<tr>
<td><strong>Directions:</strong> North - North</td>
<td><strong>Directions:</strong> Northeast - Northeast</td>
<td><strong>Directions:</strong> Northeast - Northeast</td>
</tr>
</tbody>
</table>

The same type of crash may be coded in different ways.
Lessons Learned

- When analyzing crashes at an intersection, it is advisable to request crash data coded on all intersecting roads to get a more comprehensive picture of the entire crash experience at that intersection.

- In the case of multiple designations, it is advisable to request crash data coded on each of the designated facilities.

- In the case of joint intersections, make sure the crashes are coded on the right facility by making sense of the directions and manner of collision.

- It is advisable to rely on the geocoding of crashes to determine exact location of a crash.

- The same type of crash may be coded using different directions and different manners of collision.
Thank you
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