# Local and Rural Road Safety Data

## Introduction

The process of identifying, analyzing, and treating roadway safety problems on local and rural roads relies heavily on the availability of road safety data. Crash reports completed by law enforcement officers are combined with roadway characteristic and traffic volume data gathered by traffic engineering or public works staff to identify crash history, analyze risk factors, establish needs, and evaluate treatments. Law enforcement and engineering agencies need to work together closely to understand the requirements for safety data and the importance of this information in developing plans and programs to treat road safety issues. This document highlights the types of information required, the application of this information, and additional resources that can be consulted by local and rural road owners to improve safety data for their agency.

## How are Safety Data Used?

Funding programs administered by the State Departments of Transportation, such as the Highway Safety Improvement Program (HSIP), rely upon a data-driven safety planning process. Applying for local or rural road safety project funding oftentimes requires the applicant to use safety data as part of the safety planning process to justify the need for the project. Therefore, local agencies that collect, store, and process safety data are better positioned to compete for funding under these programs.

The safety planning process consists of four steps:[1]

- Step 1: Collect Crash, Roadway, and Traffic Data
- Step 2: Record Information for Safety Analysis
- Step 3: Analyze Data
- Step 4: Select and Prioritize Countermeasures

### Step 1: Collect Crash, Roadway and Traffic Data[2]

Law enforcement investigated crash reports are the principal sources of information for crash data. State and local law enforcement officers complete a standard form[3] that generally captures the following data:[4]

- Date & time of crash
- Crash severity (e.g., fatal injury, property damage only)
- Crash type (e.g., angle, rear-end, head-on, run-off-the-road)
- Location
- Site Conditions (e.g., weather, surface conditions, lighting)
- Number and types of vehicles involved
- Driver information (e.g., name, age, gender)
- Passenger data
- Contributing circumstances

In addition to crash data, roadway characteristic and traffic data typically collected by engineering or public works agencies are useful to help identify risks and to choose appropriate countermeasures. These data include:

- Roadway surface type
- Number of Lanes and width(s)
- Shoulder type and width
- Median type and width
- Roadway miles
- Roadway alignment (horizontal and vertical)
- ntersection configuration
- Traffic control devices
- Number and locations of driveways
- Traffic volume
- Intersection type

### Step 2: Record Information for Analysis

Crash data are compiled and recorded by the State or local (e.g. city, county, and township) law enforcement officers at the reportable crash scene. Later, their crash data are entered into a database for storage and processing. Roadway characteristics and traffic data are collected by State and local transportation agencies to populate roadway inventory databases. Agencies with data processing capability and expertise will use electronic data processing, whereas those with limited funds and no electronic data processing capabilities may rely on a paper-based record of crashes and manual processing.

### Step 3: Analyze Data

Crash, roadway, and traffic data are combined to analyze crash patterns for the purpose of identifying high-crash locations, crash trends, and potential improvement strategies. There are a number of methods that can be used to characterize crash patterns, including crash frequencies, rates, severity of crashes, location of crashes, over-representation of certain types of crashes in the data set, and driver actions such as speeding, failure to yield the right-of-way, and impairment. The results of the data analysis are examined to determine patterns in crash types, locations, and potential causes.

### Step 4: Select Countermeasures

Improvement strategies or safety countermeasures are selected to treat identified safety problems. There are many potential strategies available to treat problems depending on the contributing factors. Safety professionals generally classify these into four categories: engineering, enforcement, education, and emergency response (4E's).[5] Crash patterns and characteristics provide a basis to understand the type of actions needed to treat a particular safety problem. For example, analysis of crash data at an intersection may suggest the need to modify the geometric design or traffic control to reduce a high frequency of right-angle crashes. A high frequency of crashes related to speeding may indicate a need to increase enforcement. A comprehensive approach is generally the best option.

## Alternative Methods for Processing Safety Information

Storing, retrieving, and processing crash data can be time consuming and costly. Electronic data processing systems can reduce the burden. However, local and rural agencies often times do not have the financial or staff resources required to develop or maintain a system. In such cases, compiling and storing crash reports can be accomplished by combining manual and electronic data processing. For example, one county government reported using high school interns to enter crash data into an Excel spreadsheet for processing. University students may be available to assist in developing and designing a system in exchange for college credit.[6] This can reduce development costs for local and rural road agencies while providing a level of electronic data processing capability.

As an alternative to formal crash databases and crash reports, agencies, police officers, and maintenance staff may be consulted to identify high-risk locations. Physical evidence such as skid marks at a crash site and maintenance records indicative of crash-related damage could be used to identify existing safety problems and sites for potential safety treatment. Local residents may report problem locations to the local engineer and public officials, who can identify locations based on citizen complaints. Road Safety Audits[7] can also be used to identify and make recommendations to mitigate the safety issues identified.

While it may take more effort to collect data from the aforementioned sources, methods exist to address lack of complete crash data. For example, roadway features that are generally related to particular crash types might be identified as candidates for systemic, low-cost treatments in the absence of crash data. Identifying higher risk locations based on the presence of roadway features with known risk can be useful in identifying the need for safety treatments on a system-wide basis.

## Example

The table below summarizes lane departure crash data that Thurston County, WA assembled for the 2006 – 2010 time period from the Washington State Department of Transportation (WSDOT) crash database. The table compares this local data against statewide averages during the same period.[8] Between 2006 and 2010, 177 fatal and serious injury crashes occurred in Thurston County. The data shows that the horizontal curve crashes are overrepresented in the County. In addition, the proportion of roadway departure crashes in horizontal curves is greater in Thurston County than for either the combined County roadway system in Washington or the statewide roadway system. As a result, Thurston County selected lane departure crashes on horizontal curves as their focus crash type.

Crash Data for Lane Departure Crashes Thurston County, WA, 2006-2010 (Percentage)

| 2006 – 2010 Collision History | | Fatal & Serious Crashes – Thurston County (%) | Fatal & Serious Crashes – Statewide (%) | Difference (%) |
|---|---|---|---|---|
| **Overall Numbers** | Total number of collisions | 3 | 2 | 1 |
| **By Collision Type** | Hit fixed object | 48 | 27 | 21 |
| | Overturn | 10 | 11 | (1) |
| | Angle (left turn) | 9 | 16 | (7) |
| | Head on | 7 | 5 | 2 |
| **By Light Condition** | Daylight | 52 | 58 | (6) |
| | Dark – no street lights | 33 | 16 | 17 |
| **By Junction Relationship** | Intersection-related | 19 | 33 | (14) |
| | Driveway-related | 5 | 7 | (2) |
| | Non-Intersection | 77 | 60 | 17 |
| **Hit Fixed Object Crashes Only – By Fixed Object Hit** | Tree/stump (stationary) | 14 | 5 | 9 |
| | Roadway ditch | 7 | 3 | 4 |
| | Utility pole | 7 | 3 | 4 |
| **By Roadway Curvature** | Straight and level | 42 | 54 | (12) |
| | Horizontal curve (all) | 45 | 26 | 19 |
| **By Speed Limit (Number of Drivers)** | 35 mph | 28 | 35 | (7) |
| | 50 mph | 69 | 16 | 53 |
| **By Contributing Circumstance (Number of Drivers)** | Exceeding safe/stated speed | 48 | 31 | 17 |
| | Under influence of alcohol/ drugs | 42 | 25 | 17 |
| | Over centerline | 16 | 10 | 6 |
| | Inattention/distraction | 11 | 13 | (2) |
| **By Driver Age Group** | Ages 16-20 | 26 | 20 | 6 |
| | Ages 41-50 | 28 | 26 | 2 |
| **By Seat Belt/Car Seat Use (Number of Occupants)** | No restraint | 33 | 25 | 8 |

An inspection of the data contained in this table suggests that during this period lane departure crashes in Thurston County, when compared against the statewide average, were more likely to involve: striking a fixed object, during dark, at non-intersection locations, on horizontal curves, on roads with a 50 mph speed limit, and while exceeding safe/posted speed, under the influence of alcohol/drugs. Based on these data, Thurston County pursued a program to focus on treating lane departure crashes at horizontal curves.

## Resources

There is a wide range of resources available that can assist local and rural road users in improving safety data collection, processing, and application.


AASHTO, *Highway Safety Manual: Volume 3 – Crash Modification Factors* (Washington, DC: 2010).

Federal Highway Administration, *Roadway Safety Information Analysis: A Manual for Local Rural Road Owners,* FHWA-SA-11-10. (Washington, DC: January 2011).

T. MacDonald, *Iowa's Traffic Safety Analysis Manual* (Ames, IA: Iowa State University, December 2011).

T Strauss and L. Geadelmann, *Evaluation Framework for the Creation and Analysis of Integrated Spatially-Referenced Driver-Crash Database* (Ames, IA: Midwest Transportation Consortium, April 2009).

Transportation Research Board, *NCHRP Synthesis 321: Roadway Safety Tools for Local Agencies: A Synthesis of Highway Practice,* National Cooperative Highway Research Program (Washington, DC: TRB, 2004).

Transportation Research Board, *NCHRP Report 500: Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, Volume 19: A Guide for Collecting and Analyzing Safety Highway Safety Data Volume*. (Washington, DC: TRB, 2005).

Transportation Research Board, *NCHRP Report 500: Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, Volume 21: Safety Data and Analysis in Developing Emphasis Area Plans* (Washington, DC: TRB, 2005).


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[1] Federal Highway Administration, *Roadway Safety Information Analysis: A Manual for Local Rural Road Owners* (Washington, DC: January 2011), p. 10.

[2] Moving Ahead for Progress in the 21st Century Act (MAP-21) (P.L. 112-141) requires State Departments of Transportation (DOTs) to develop safety data systems to support safety analysis.

[3] These forms can vary by jurisdiction so it is important that local and rural road operators recognize the need to provide a consistent form reflecting the needs of their information system.

[4] Sometimes the crash diagram and narrative on the crash report have the most information about how the crash occurred and input from the drivers and witnesses.

[5] For examples of countermeasures see the Federal Highway Administration's Crash Modification Factors (CMF) Clearinghouse, available online at: www.cmfclearinghouse.org

[6] Steps to ensure privacy is maintained should be put in place.

[7] Road Safety Audit (RSA) is the formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team.

[8] Federal Highway Administration, *Systemic Safety Project Selection Tool*, FHWA-SA-13-019 (Washington, DC: July 2013). Available at: http://safety.fhwa.dot.gov/systemic/fhwasa13019/