How-to-Develop a Pedestrian Safety Action Plan

Data Collection and Analysis

Presented by:
Charlie Zegeer
Director, PBIC

May 18, 2011
Workshop for Developing a Pedestrian Safety Action Plan
Collecting Data to Identify Pedestrian Safety Problems
Learning Objectives

At the end of this module, you will be able to:

Describe WHAT and HOW meaningful and useful data needs to be identified, collected, and integrated to develop and implement your Pedestrian Safety Action Plan.
Subjects Covered

- Data Collection Goals
- Data Collection Guidelines
- Types of Safety Projects
- Types of data – beyond crash reports
Data Collection Goals

- Identify high crash locations, corridors, areas
- Identify locations, corridors, areas with high crash potential
- Prioritize high crash locations, corridors, areas
- Identify appropriate treatments
Data Collection Guidelines

- Be sure to go to the field site and observe conditions

- Collect only what you need

- Collect only what you can use
  - Do you need 5 years’ worth of data if 3 years’ worth give you a good idea of the problem?
  - Do you need crash data for the entire state to be collected if you’re focused on a small area?
  - Do you need detailed reports if the raw numbers give a good picture of the problem?

- But don’t jump to conclusions too soon: incomplete data could give a false perspective of the problem
Data Collection Guidelines

- Timely crash data
  - Try to get the most recent data possible
  - Make sure they go back far enough to be representative (min 3 years)
  - Don’t go too far back: conditions change over time
Types of Safety Projects

1. Spot Locations (individual intersections and non-intersections)
2. Corridors (½ mile to 5 or more miles in length)
3. Targeted Areas (neighborhood, business district, or large area where pedestrian crashes are high)
4. Entire Jurisdictions (addressed through system-wide changes)
Types of Safety Projects: Spot Locations

Example: Single intersection with high crash rate
Types of Safety Projects: Corridors

Example: Long corridor with high crash rate

Random micblock xings
No sidewalks
Dispersed land uses
Corridors Solutions Are Repeatable
Types of Safety Projects: Targeted Areas

Example: midblock dash in CBD
Types of Safety Projects: Entire Jurisdiction

Example: Lack of ped heads at signals
Why is this important?

➡ You don’t need to collect all pedestrian crash data and exposure data (pedestrian counts) for the entire system before you can start solving problems.

➡ If a pedestrian safety problem has been identified as one of these 4 types, you can collect limited data and start implementing countermeasures right away.
How to figure out extent of problem

Plot crashes on a map: Corridor problem
Plot crashes on a map: Area-wide problem
Example Community: Miami-Dade County, FL
Collecting Data to Identify Pedestrian Safety Problems

Identify and quantify pedestrian safety deficiencies:

- Collision data: Computerized records and police reports
- Roadway/Sidewalk inventories
- Traffic characteristics
- Pedestrian counts and behavioral studies
- Pedestrian policies and guidelines
- Pedestrian surveys
- Needs assessments
- Make a site visit
Collision Data: Computerized Records And Police Reports

Elements of a good crash database:

⇒ Includes ALL available pedestrian crashes

⇒ Timely

⇒ Accurate (requires review of police narrative)

⇒ Computerized (with programs to assist in identifying problem locations)

⇒ Recommended to routinely geo-code all pedestrian crashes
Collision Data: Police Reports

UNIT ONE, WHILE MAKING A RIGHT TURN FROM SOUTHBOUND 19TH AVENUE TO WESTBOUND THUNDERBIRD ROAD, FAILED TO STOP AT A RED LIGHT AND YIELD RIGHT-OF-WAY AND STRUCK UNIT TWO WHICH WAS WALKING EASTBOUND ON THUNDERBIRD ROAD CROSSING 19TH AVENUE IN A STRIPED PEDESTRIAN CROSSWALK.

INJURED TAKEN TO BY THUNDERBIRD HOSPITAL BY SELF.
Roadway/Sidewalk Inventories

- Missing sidewalks

- Road and Traffic Characteristics
  - ADT
  - Width
  - Speed

- Pedestrian counts & surveys

These should result in Needs Assessment
Roadway/Sidewalk Inventories
Missing Sidewalks
Roadway/Sidewalk Inventories
Road Characteristic

Wide street
Roadway/Sidewalk Inventories
Traffic Characteristics

Busy street
Behavior Studies

Human Factors: Beyond the Data:

- The “Design Pedestrian” and Characteristics of Pedestrian Travel
- Characteristics of the Driver
- Walking Level of Quality/Level of Service (LOQ/LOS)
Human Factors: Beyond the Data

Characteristics of Pedestrians

- Waits for light
- Crosses against light
Human Factors: Beyond the Data

Characteristics of Drivers
Human Factors: Beyond the Data

Poor walking environment – low ped LOS

Walking Level of Quality/Level of Service (LOQ/LOS)
Walking Level of Quality/Level of Service (LOQ/LOS)

Rich walking environment – high ped LOS
Collecting Data Summary

1. Pedestrian safety problems should be identified and sorted by spot locations, corridors or jurisdictional problems

2. Collision data should be recorded in a timely manner

3. Pedestrians and drivers should be observed in the field

4. The data should be related to the pedestrian environment
Learning Objectives

You should be able to:

- Describe WHAT and HOW meaningful and useful data needs to be identified, collected, and integrated to develop and implement your Pedestrian Safety Action Plan.
Questions?
Analyzing Information and Prioritizing Concerns
Learning Objectives

At the end of this module, you should be able to:

Describe HOW to analyze and integrate the data to develop and implement your Pedestrian Safety Action Plan.
Subjects Covered

- Categorizing Pedestrian Safety Concerns
- Identifying high-crash locations
- Selecting Appropriate Countermeasures
- Determining the Extent of Implementation
- Prioritizing Pedestrian Improvements
Categorizing Concerns for Pedestrian Safety

Same as before:

- Spot Locations (individual intersections and non-intersections)
- Corridors (½ mile to 5 or more miles in length)
- Targeted Areas (a neighborhood, business district, or a large area where pedestrian crashes are high)
- Entire Jurisdictions (addressed through system-wide changes)
Crash Typing

Available tools:

- **PBCAT software**
- **Field reviews**
- **Roadway Safety Audits**

1. **Dart/Dash**
   The pedestrian walked or ran into the roadway at an intersection or midblock location and was struck by a vehicle. The motorist’s view of the pedestrian may have been blocked until an instant before the impact.

2. **Multiple Threat/Trapped**
   The pedestrian entered the roadway in front of stopped or slowed traffic and was struck by a multiple-threat vehicle in an adjacent lane after becoming trapped in the middle of the roadway.

3. **Through Vehicle at Unsignalized Location**
   The pedestrian was struck at an unsignalized intersection or midblock location. Either the motorist or the pedestrian may have failed to yield.

4. **Turning Vehicle**
   The pedestrian was attempting to cross at an intersection, driveway, or alley and was struck by a vehicle that was turning right or left.

5. **Through Vehicle at Signalized Location**
   The pedestrian was struck at a signalized intersection or midblock location by a vehicle that was traveling straight ahead.

6. **Walking Along Roadway**
   The pedestrian was walking or running along the roadway and was struck from the front or from behind by a vehicle.
Ped/Bike Crash Analysis Tool (PBCAT)
Field Reviews
Determining Extent of Implementation

Phasing projects:

- Geographically (treat an area or corridor)
- By urgency (potential for fatals come first)
- By opportunity (piggy-backing)
- By type of treatment (sidewalks, lighting)

Duration of Improvement:

- Short-term (temporary)
- Long-term (permanent)
Phasing Projects Geographically: Treat an Area or Corridor

Example: Series of downtown curb extensions
Phasing Projects Geographically: Treat an Area or Corridor

Example: Consider adding raised median islands
Phasing Projects by Opportunity: Piggy-backing

Example: Adding sidewalk to bridge project
Phasing Projects by Type of Treatment: Sidewalks - Lighting

Example: Building sidewalks to schools
Duration of Improvement: Short-term (temporary)

Example: Adding curbs to realign skewed intersection
Duration of Improvement: Long-term (permanent)

Example: Adding sidewalks & landscaping to realign skewed intersection
Prioritizing Pedestrian Improvements

- Overlapping priorities method
- Developing a ranking system
Overlapping priorities method
Developing a ranking system

Sample Implementation Strategy:

Retrofitting existing roadways with sidewalks – how to develop a program to fill in missing sections of sidewalks over 20 years
How do you make such a daunting task manageable?

Seattle example: divide it into bite-size chunks, with overlapping priorities.
How to Develop a Pedestrian Safety Action Plan – Data Collection & Analysis
Develop a Ranking System

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity of problem (how many crashes have occurred or are likely to occur)</td>
<td>15</td>
</tr>
<tr>
<td>Effectiveness of solution</td>
<td>15</td>
</tr>
<tr>
<td>Probable use (travel demand)</td>
<td>15</td>
</tr>
<tr>
<td>Likelihood of funding</td>
<td>10</td>
</tr>
<tr>
<td>Feasibility (constructability: piggy-backing, available ROW etc)</td>
<td>15</td>
</tr>
<tr>
<td>Public support</td>
<td>15</td>
</tr>
<tr>
<td>Cost</td>
<td>15</td>
</tr>
<tr>
<td>Bonus: achieves other goals (motorist/bicyclist safety, aesthetics)</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
Summary Analyzing Information

- Data should be analyzed so it leads to positive pedestrian safety improvements.
- Implementation strategies should be developed that make use of existing resources, and that can be explained to the public and elected officials.
Intersection Safety Indices

Pedestrian and Bicyclist Intersection Safety Indices

Research Report

February 2006

Pedestrian and Bicyclist Intersection Safety Indices

User Guide

February 2006

How to Develop a Pedestrian Safety Action Plan – Data Collection & Analysis
Safety Measures

- **Crashes***
- **Conflicts*** – sudden change in speed or direction
- **Avoidance maneuvers** – any change in speed or direction
- **Safety ratings** – experts’ rating of perceived safety

* Too few crashes and conflicts for statistical model development.
Data Collection: Physical Characteristics

- Traffic control
- Vehicle speeds
- Number of legs
- One-way/two-way
- Number of lanes
- Median islands
- Curb radii
- Driveway density

- On-street parking
- Pedestrian crossing
- Pedestrian signs and signals
- Street lighting
- Surrounding development
- RTOR allowance
Data Collection: Safety Ratings

- Each site had an intersection sketch and a video clip from one or two camera angles
Ped ISI Model

Significant variables:

- Presence of traffic signal (-)
- Presence of stop sign (-)
- Number of through vehicle lanes (+)
- 85th percentile vehicle speed (+)
- Main street ADT when signal present (+)
- Commercial area (+)
User Guide

Accompanying User Guide gives practitioners tools for easy implementation of Ped and Bike ISI

Quick Reference Tables

<table>
<thead>
<tr>
<th>Main Rd Thru Lns</th>
<th>1 Through Lane</th>
<th>2 Through Lanes</th>
<th>3 Through Lanes</th>
<th>4 Through Lanes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Rd Speed</td>
<td>25 30 35 40 45</td>
<td>25 30 35 40 45</td>
<td>25 30 35 40 45</td>
<td>25 30 35 40 45</td>
</tr>
<tr>
<td>ADT</td>
<td>1000</td>
<td>1.6</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>5000</td>
<td>1.6</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>10000</td>
<td>1.6</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>15000</td>
<td>1.6</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>20000</td>
<td>1.6</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>25000</td>
<td>1.6</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>30000</td>
<td>1.6</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>35000</td>
<td>1.6</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>40000</td>
<td>1.6</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>45000</td>
<td>1.6</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>50000</td>
<td>1.6</td>
<td>1.8</td>
<td>2.2</td>
</tr>
</tbody>
</table>
# User Guide

> **Spreadsheet Calculator**

## Pedestrian Safety Index Model

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pedestrian Safety Index Model</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Name of crosswalk</td>
<td>Pedestrian Example #1</td>
</tr>
<tr>
<td>5</td>
<td>SIGNAL</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Signalized (1=yes, 0=no)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>STOP</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Stop Controlled (1=yes, 0=no)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>THRULNS</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Number of Through Lanes on Main St</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>SPEED</td>
<td>42</td>
</tr>
<tr>
<td>12</td>
<td>85th Percentile Speed on Main St</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>MAINADT</td>
<td>22000</td>
</tr>
<tr>
<td>14</td>
<td>Main Street ADT</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>COMM</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>Commercial Area (1=yes, 0=no)</td>
<td></td>
</tr>
</tbody>
</table>

**Safety Index value =** 2.7
Pedestrian Example
Pedestrian Example

- Signalized intersection
- Four through lanes on the main road (two in each direction)
- 85th percentile speed on the main road is 42 mph
- Main road ADT is 22,000 vehicles per day
- Surrounding area is residential
Pedestrian Example

⇒ Ped ISI = 2.372 – 1.867 Signal – 1.807 Stop + 0.335 Thrulns + 0.018 Speed + 0.006 (MainAdt * Signal) = 0.238 Comm

⇒ Ped ISI = 2.372 – 1.867 * 1 – 1.807 * 0 + 0.335 * 4 + 0.018 * 42 + 0.006 (22 * 1) = 0.238 * 0

⇒ Ped ISI = 2.7
# Pedestrian Example

<table>
<thead>
<tr>
<th>Main Rd Thru Lns</th>
<th>1 Through Lane</th>
<th>2 Through Lanes</th>
<th>3 Through Lanes</th>
<th>4 Through Lanes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Rd Speed</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>1000</td>
<td>1.3</td>
<td>1.4</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>5000</td>
<td>1.3</td>
<td>1.4</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>10000</td>
<td>1.4</td>
<td>1.4</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>15000</td>
<td>1.4</td>
<td>1.5</td>
<td>1.6</td>
<td>1.7</td>
</tr>
<tr>
<td>20000</td>
<td>1.4</td>
<td>1.5</td>
<td>1.6</td>
<td>1.7</td>
</tr>
<tr>
<td>25000</td>
<td>1.4</td>
<td>1.5</td>
<td>1.6</td>
<td>1.7</td>
</tr>
<tr>
<td>30000</td>
<td>1.5</td>
<td>1.6</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>35000</td>
<td>1.5</td>
<td>1.6</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>40000</td>
<td>1.5</td>
<td>1.6</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>45000</td>
<td>1.6</td>
<td>1.7</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>50000</td>
<td>1.6</td>
<td>1.7</td>
<td>1.8</td>
<td>1.9</td>
</tr>
</tbody>
</table>
Web Links


How to Develop a Pedestrian Safety Action Plan

The Federal Highway Administration's (FHWA) Safety Office hired the Pedestrian and Bicycle Information Center (PBIC) to develop a comprehensive guide to provide a framework for state and local agencies to develop and implement a pedestrian safety action plan tailored to their specific problems and needs.

**New Tool for Safety Professionals:**

The Pedestrian Safety Guide and

**Exemplary Pedestrian Plans**

Planning so that pedestrians and motorists

**Data Collection and Analysis for Communities**

This report describes how communities can collect

[www.walkinginfo.org](http://www.walkinginfo.org)
Example Pedestrian Plans

[City of Cambridge Pedestrian Plan]

COMMUNITY DEVELOPMENT DEPARTMENT
FHWA Resident’s Guide

Resident Guide Features

➡ Developed user-friendly Guide

➡ Focuses on community activities

➡ Builds vocabulary for working with locals

➡ Increases efficiency and communication
Designing for Pedestrian Safety Workshop
Learning Objectives

You should be able to:

- Describe HOW to analyze and integrate the data to develop and implement your Pedestrian Safety Action Plan.
Questions?

Contact Info:

Charlie Zegeer
PBIC Director
Charlie_zegeer@unc.edu
(919) 962-7801
www.walkinginfo.org