

Crash Analysis – Uses and Approaches

PANEL

Ruth Steiner – University of Florida
David Henderson – Miami-Dade County, FL
Tom Huber and Michael Amsden – Wisconsin
DOT
Libby Thomas – Univ. of North Carolina, Highway
Safety Research Center



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Dr. Ruth Steiner, of the University of Florida conducts research in transportation policy and transportation and land use interactions, as well as bicycle and pedestrian facility design and other areas.

David Henderson is the bicycle pedestrian specialist for Miami-Dade County.

Tom Huber is the Bicycle and Pedestrian Coordinator for Wisconsin DOT and Michael Amsden was a senior research analyst with WISDOT when he performed this study.

Libby Thomas is research associate focusing on bicycle and pedestrian issues, and crash and human factors analyses, with UNC Highway Safety Research Center.



PBCAT Crash Analysis and BIKESAFE and PEDSAFE Countermeasure Selection Tools


Libby Thomas
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Workshop #24

Presentation Topics

- Origins of Crash Typing
- PBCAT Version 2.0 Features
- Countermeasure selection: PEDSAFE and BIKESAFE
- Applications of PBCAT Version 1.0

Why Crash Typing?

- Traditional Electronic Crash Data
 - When (date, time of day, day of week)
 - Where (city, street, roadway class, intersection)
 - Who (age, gender, severity)
 - Typing
 - Pre-crash maneuvers
 - Details on location
- Better Countermeasures**
- 

Data contained in traditional crash systems can tell us

- when the crash occurred,
- where the crash occurred,
- and provide information on the persons involved.

But there is limited information about the circumstances surrounding the collision. Crash Typing provides us with information on the pre-crash maneuvers of the parties involved and more details about the location of the crash.

With this improved level of detail, we can hopefully develop and apply better countermeasures.

Crash Typing Origins

- Manual Typing Methodologies (NHTSA)
 - Pedestrian (Snyder and Knoblauch, 1971)
 - Bicycle (Cross and Fisher, 1977)
- Crash Types of the Early 1990s (FHWA)
 - 5000 ped crashes and 3000 bike crashes (Hunter, Stutts, Pein, and Cox, 1996)

Crash Typing originated in the 1970's at the National Highway Traffic Safety Administration.

Both the pedestrian and bicyclist methods were manual – i.e., you used a set of forms and worked your way through a series of questions to determine the crash type.

In the 1990's, this manual method was applied to more than 5000 ped and 3000 bike crashes as part of an FHWA study.

First Release

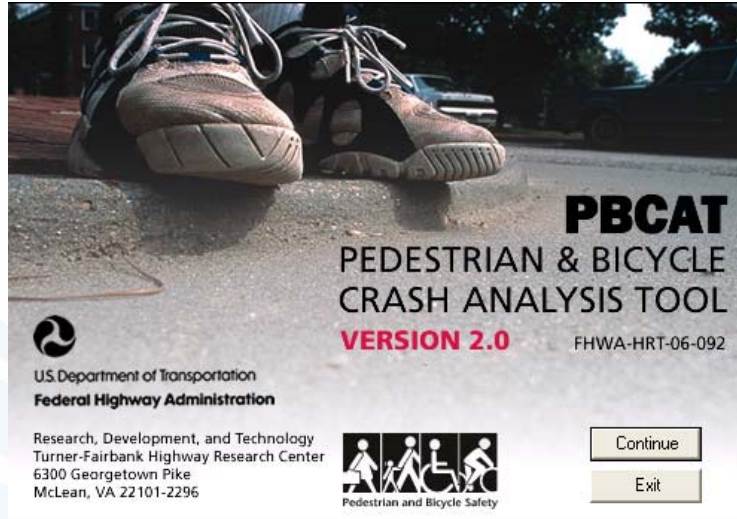
- Version 1.0 – released 1999
- 600+ registered users in all 50 states and 28 countries



It was the 1990's study that led to the decision to produce a software product that could be used for typing crashes and creating a database of pedestrian and bicycle crashes.

Version 1.0 of PBCAT was released in 1999. More than 600 users in all 50 states and 28 countries have requested the software.

PBCAT version 2.0



David Harkey, HSRC, lead the development team which included Lendis Corp. and other HSRC researchers for both version 1 and the updated version 2.

Version 2.0 Improvements

- Enhanced navigation in a more familiar user interface
- More user options and greater customization
- Better reporting capabilities
- Options for 'group' crash typing
- Option for location detail for pedestrian intersection crashes
- Greatly enhanced countermeasure information
- "Advertised" product support

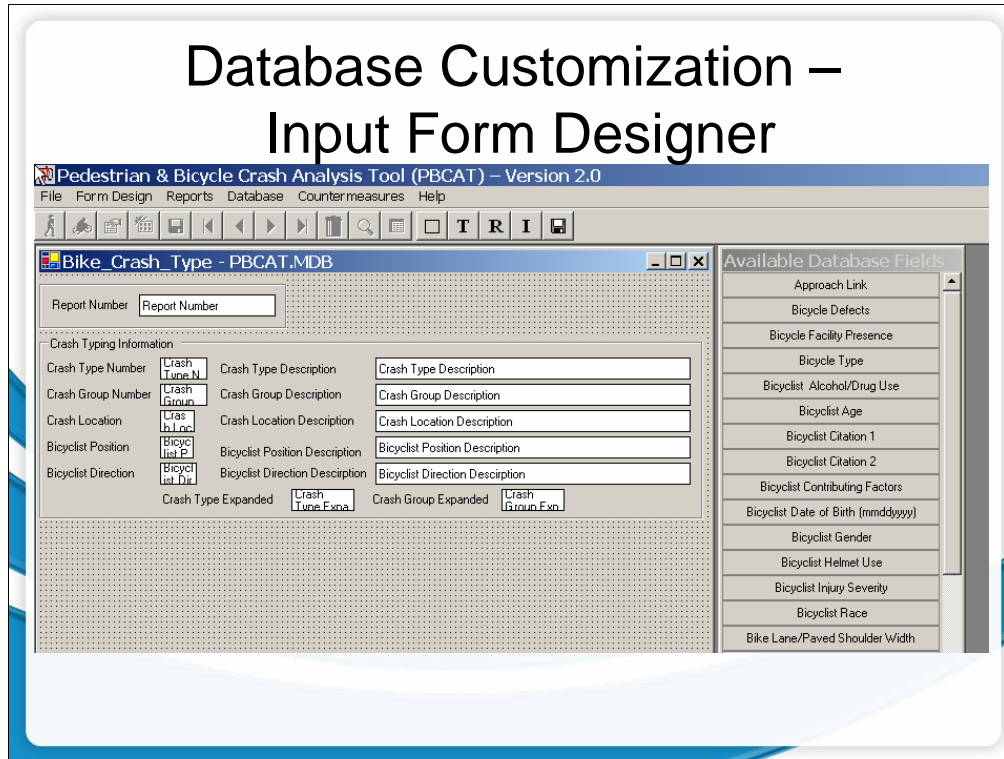
The first step in designing the next version of PBCAT was to survey the users to determine what improvements needed to be made. These are a few of the major items that were requested, which discussed in more detail in the next few slides.



Version 1.0 was very rigid in terms of the software design and navigation, primarily because it was designed to be compatible with Windows 3.X operating systems.

Those constraints no longer exist.

Database Customization – Input Form Designer



Customization was a MAJOR request. Database fields utilized, alias names, variable level values, and data entry forms are all highly customizable.

Users can now add an infinite number of fields to the Access database, customize the field data entry type, field length, etc.

For example, the user can select between data entry type dynamic list (a lookup list is created from the entries – reduces multiple spellings, etc.), single-line and multi-line edit, dropdown list box for data entry to control the values entered.

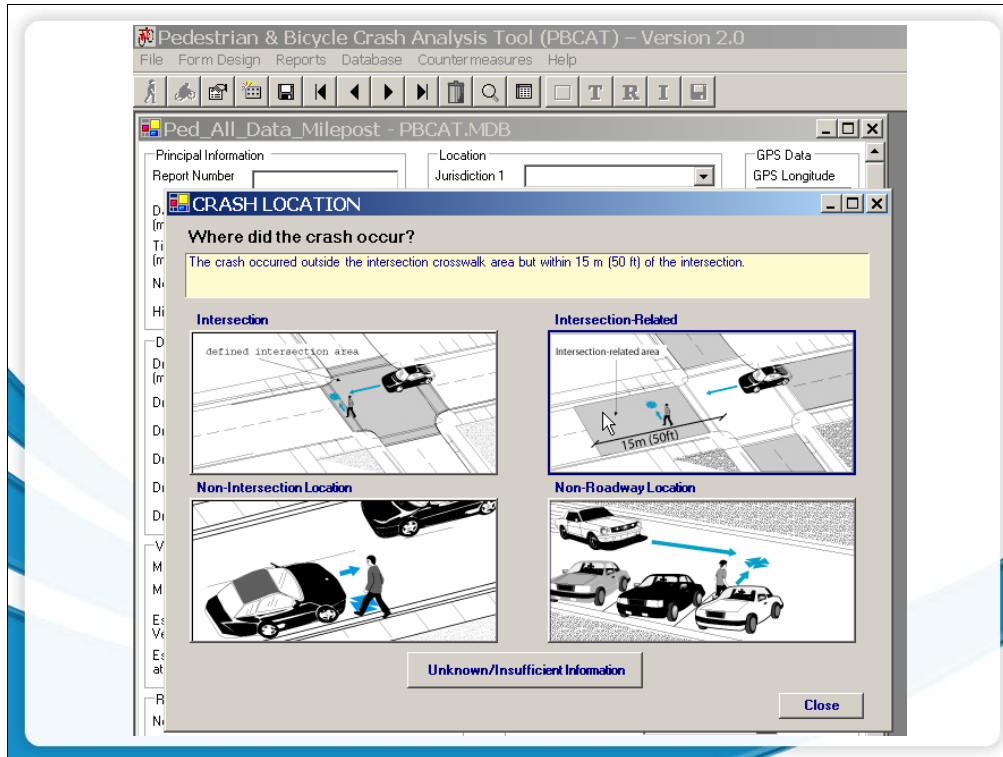
They can also create their own data entry forms. The screen shown here is the edit form for editing an existing form. Available fields, shown on the right, can be dragged and dropped onto the form. The fields can be ordered in any fashion and box sizes can be changed as one wishes.

With all desired fields on the form, the user can index the fields to set the order for data entry.

A form such as the one shown, which captures only the crash report number and the data fields entered through crash typing, might be used if one wanted to merge the crash typing data with pre-existing data from crash databases.

The principal reason for this customization request was so users could design a data entry form that matches the crash report form used in a particular state or jurisdiction or otherwise match whatever data elements that they desired to enter into their database.

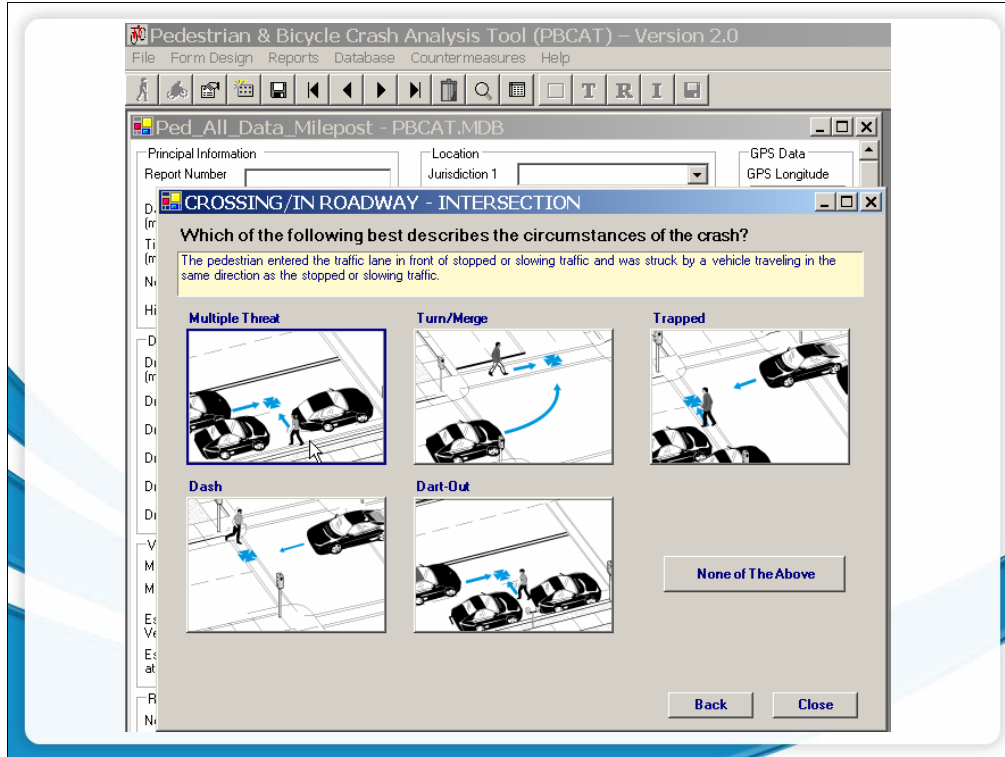
This form was designed to match the crash report form used in NC.



Crash typing begins with a click on the crash typing icon. The user answers a series of questions about the location of the crash and the circumstances surrounding the crash.

The first question, shown here, asks about the location of the crash. As the user moves the cursor over each graphic, the definition of that location (or that maneuver or crash circumstance) is provided in the narration box – the key to accurate crash typing. The images are to provide a general guide or hint at potential crash situations covered.

In this example, the cursor is on Intersection-Related, and the definition reads...(from slide)



Some of the screens ask about specific circumstances of the crash. Here, the cursor is over Multiple Threat, which is defined as ... (from slide).

A click on this graphic will result in the end of questions, as the crash will be typed as a multiple threat crash. The same would be true for Dash, Dart-Out, and Trapped. However, a click on Turn/Merge or None of the Above would produce additional screens.

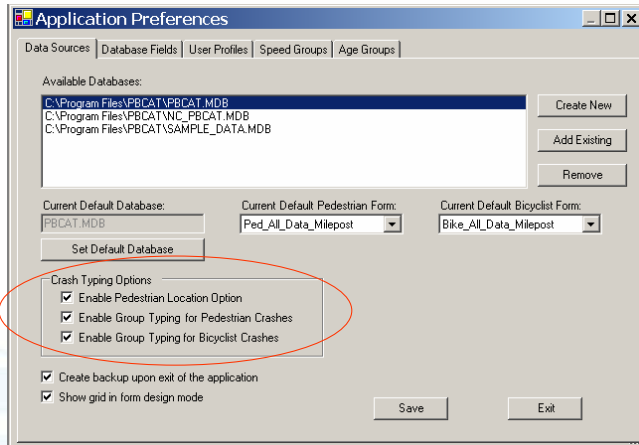
Group Typing

- Too many crash types?

- 56 ped crash types
- 79 bike crash types

- Crash Groups

- 16 ped
- 20 bike

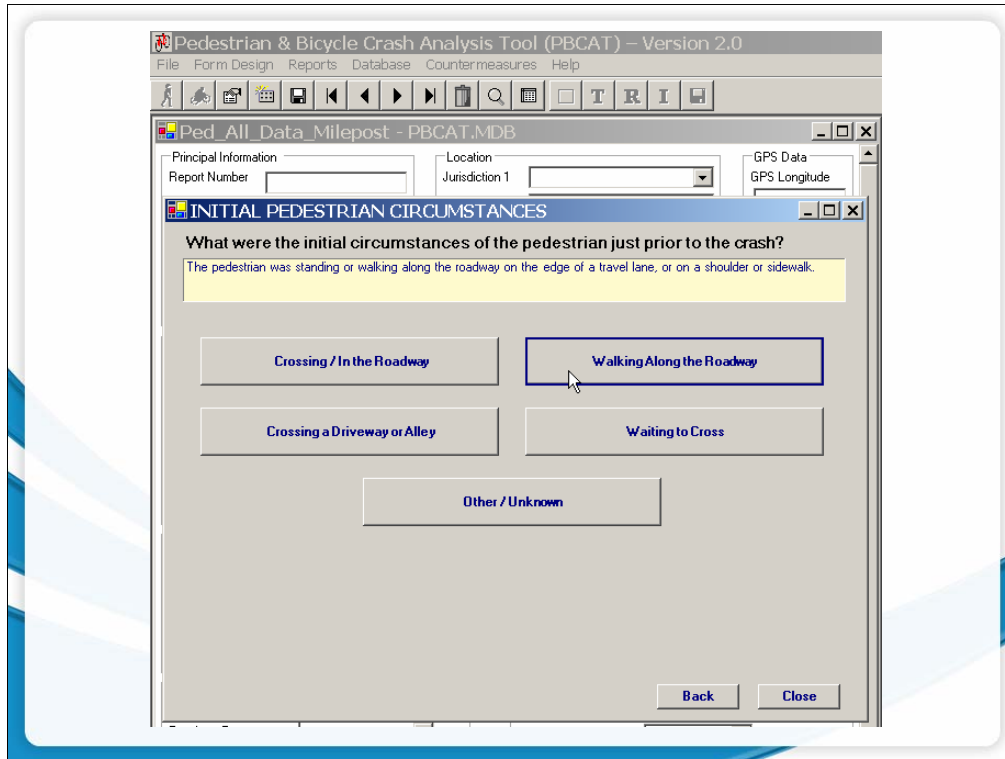


Another request was for an alternate form of crash typing that had fewer screens and questions.

The standard crash typing includes 56 pedestrian and 79 bike types. Each of these types is also assigned to one of the 16 ped or 20 bike groups.

The Group Typing option, does include fewer screens and questions and assigns crashes to the groups only.

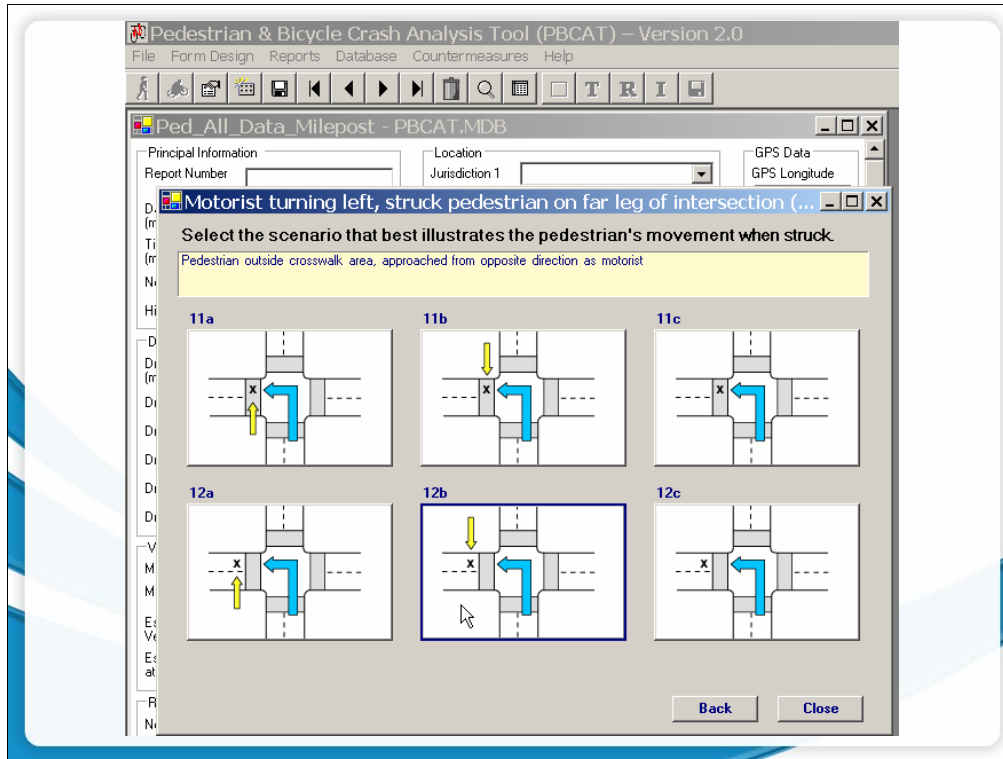
This option, as well as the location option, is turned on and off by the user in the program preferences.



This is an example of a screen from the group typing logic. There are no graphic illustrations.

On this screen, the selection of Walking Along the Roadway will result in the crash being typed as such.

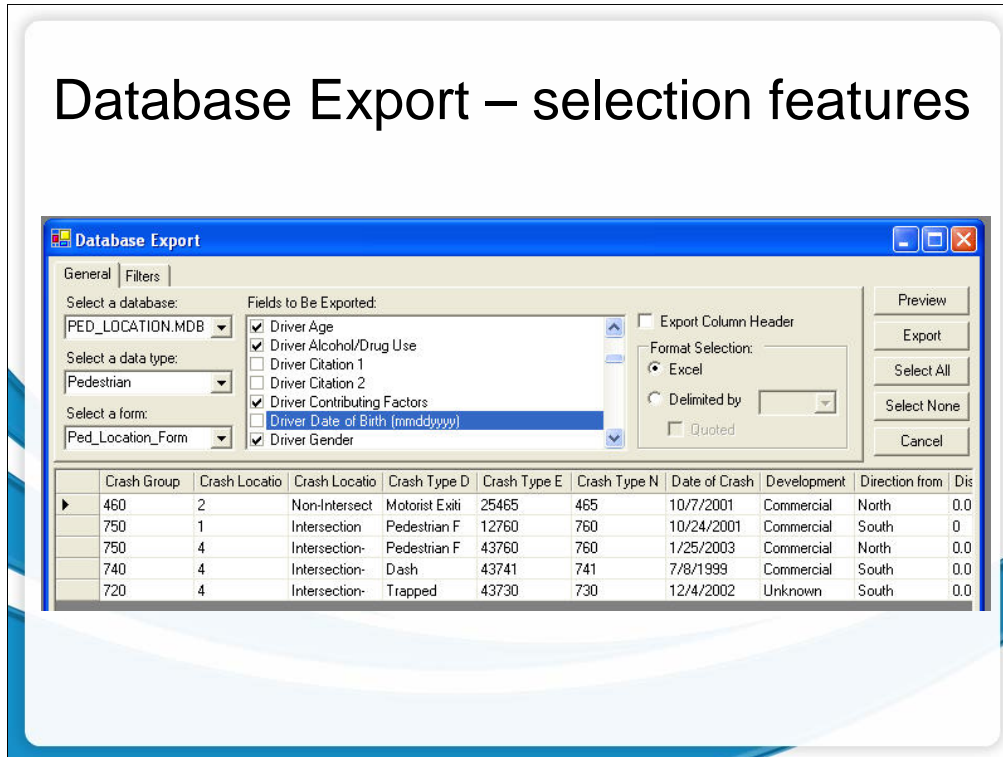
In the standard typing option, a click on this option results in an additional screen that allows the user to choose among five options for walking along roadway crashes that provides more detail about whether the ped was walking with or against traffic and was struck from the front or rear.



Another of the requests made was to add more detail about the location of pedestrian intersection crashes and travel directions of the parties involved. This is an optional element in Version 2.0 that can be used to record this extra level of detail.

The user answers additional questions about the maneuver of the motorist, whether the crash occurred on the nearside or farside of the intersection, whether the pedestrian was in or out of the crosswalk, and the travel direction of the pedestrian.

Database Export – selection features



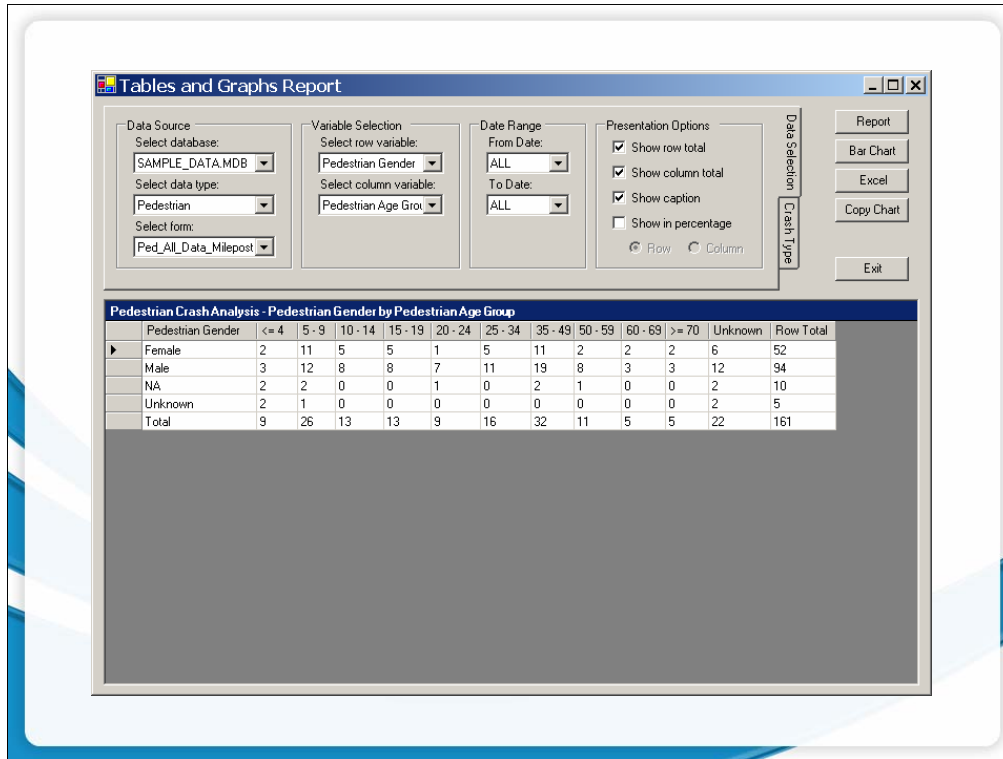
Utilizing the database export feature (also customizable), the user can export those variables of interest to Excel® or other database format, to produce site-specific crash location reports, [next slide]

Example Pedestrian Location Report

Route/Street Name	Reference Street	Direction from Reference Street	Distance from Reference Street	Scenario	Crash Location Description	Crash Type Description	Date of Crash (mm/dd/yyyy)	Time of Day (military - hhmm)	Driver Age	Driver Alcohol/Drug Use	Driver Contributing Factors	Hit and Run	Leg Intersection	Light Conditions	Marked Crosswalk	Motorist Direction
Airport Rd	Hillsborough	S	0	3a	Intersection	Pedestrian Failed to Yield	Wednesday, October 24, 2001	1943	45	No	Unk	No	Far	Dark, Street Lights	Yes	S
Airport Rd	Hillsborough	N	0.0114		Non-Intersection	Motorist Exiting Driveway or Alley	Sunday, October 07, 2001	1504	21	Unk	Failure to Yield	No		Daylight	N/A	W
Airport Rd	Hillsborough	N	0.0095	4a	Intersection-Related	Pedestrian Failed to Yield	Saturday, January 25, 2003	1758		Unk	Unk	No	Far	Dawn/Dusk	No	N
Airport Rd	Hillsborough	S	0.0095	4a	Intersection-Related	Dash	Thursday, July 08, 1999	1346	19	No	Other	No	Far	Daylight	Yes	S
Airport Rd	Hillsborough	S	0.0057	4b	Intersection-Related	Trapped	Wednesday, December 04, 2002	545		Unk	Unk	No	Far	Dark, Street Lights	Yes	S

which could be taken into the field for site-specific assessments or otherwise used for further analysis.

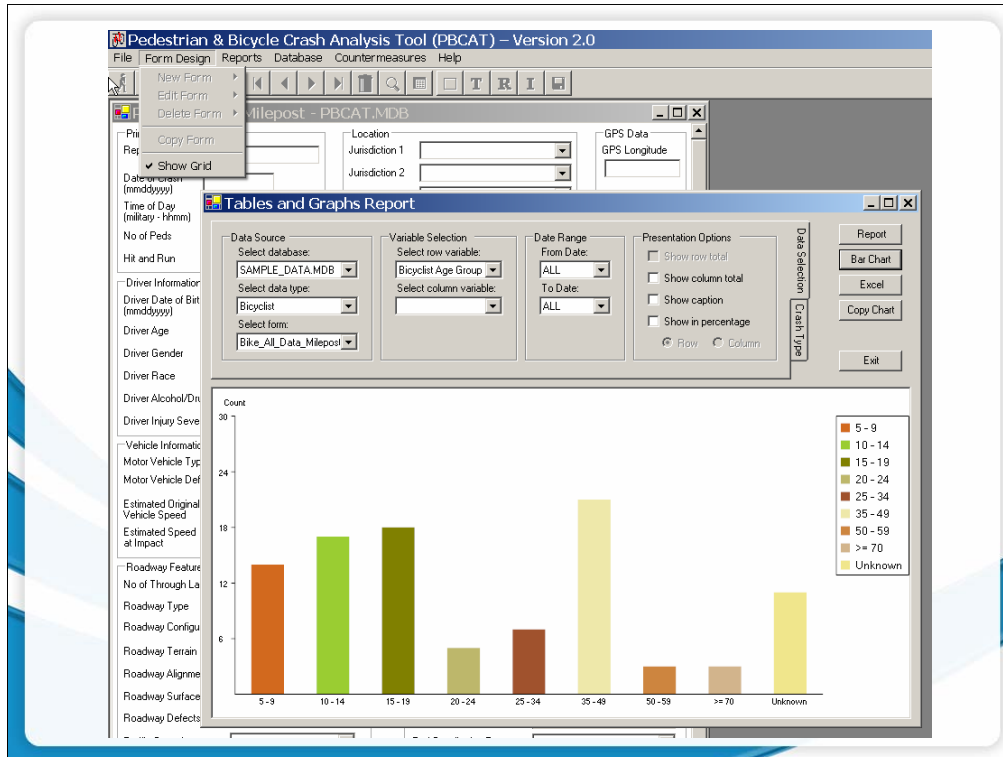
This report was created in Excel.



The options for creating reports within Version 2.0 of PBCAT are also more robust.

The user can create one-way and two-way tables for any of the databases created. The one shown here is for pedestrian gender by pedestrian age group and includes column and row totals and a caption.

A major enhancement also is the ability to export this table directly to Excel for further manipulation, charting, or printing.



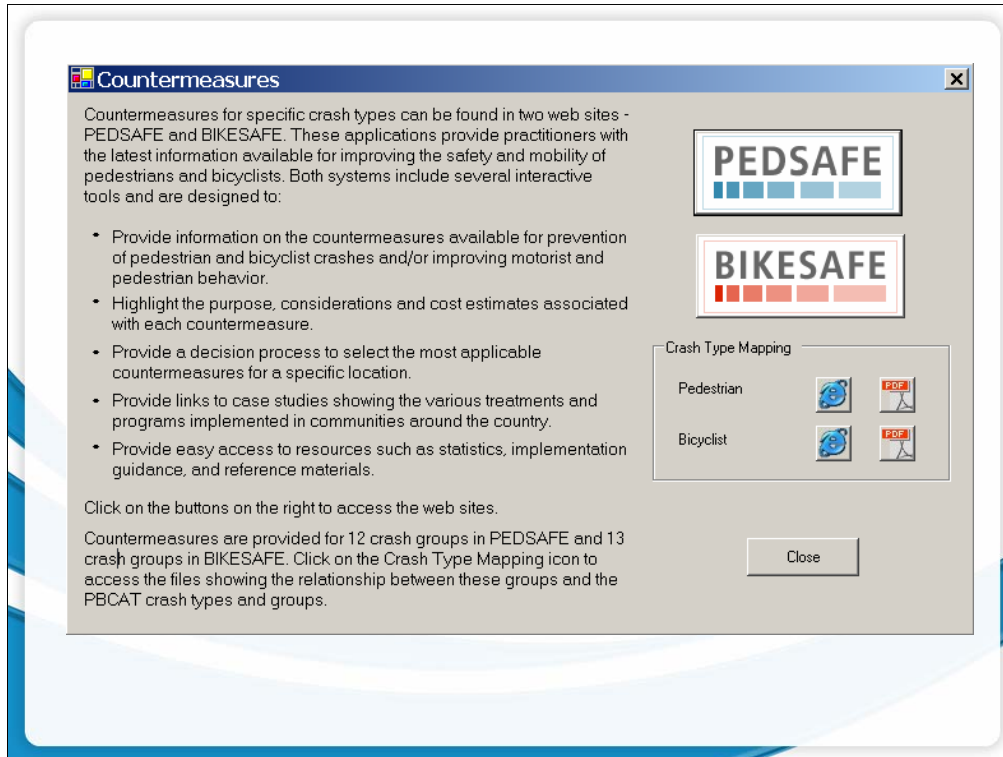
Single-variable charts can also be produced within the software. Again, for more extensive analyses, data may be easily exported to Excel or other database format.

Version 2.0 has a look and feel that is common to all Windows-based software. There are toolbars and dropdown menus for navigation. Multiple windows may be opened simultaneously and moved and adjusted with a click of the mouse.

Crash Types Reports

Count	Crash Type Number	Crash Type Description
13	724	Left Turn - Opposite Direction
10	723	Left Turn - Same Direction
10	770	Motorist Failed to Yield
9	741	Dash
6	690	Other - intersection
5	721	Right Turn - Same Direction
4	769	Pedestrian Failed to Yield - other
3	620	Other - walking in the roadway
2	722	Right Turn - Opposite Direction
2	729	Turn/Merge - direction unknown
1	140	Vehicle-Vehicle/Object
1	742	Dart-Out
1	763	Pedestrian Failed to Yield - step-out
1	341	Commercial Bus-Related
1	320	Exiting/Entering Parked Vehicle
1	311	Working in Roadway
1	190	Other - unusual
1	710	Multiple Threat

Crash type reports are easily created for all locations or the location type of interest. For example, here we've created a table of crash type frequencies for intersection and intersection-related locations (excluding mid-block and non-roadway crashes).



Once you've identified the predominant crash types (and other crash characteristics) - Another significant improvement in Version 2.0 is the access to detailed countermeasure information related to many of the crash types.

FHWA has funded two additional projects in the past couple of years that have resulted in more extensive descriptions of countermeasures that are available for improving pedestrian and bike safety. These are known as PEDSAFE and BIKESAFE.

PBCAT takes advantage of these products by linking directly to the web sites for those products.

Links to printable tables mapping the PBCAT crash types and groups to the BikeSafe and PedSafe crash groups are also provided on this page.

PEDSAFE Pedestrian Safety Guide and Countermeasure Selection System

The Pedestrian Safety Guide and Countermeasure Selection System is intended to provide practitioners with the latest information available for improving the safety and mobility of those who walk. The online tools provide the user with a list of possible engineering, education, or enforcement treatments to improve pedestrian safety and/or mobility based on user input about a specific location. [\[read more\]](#)

Resources:

- Background** – understand what is needed to create a viable pedestrian system.
- Crash Statistics** – learn about the factors related to the pedestrian crash problem.
- Crash Analysis** – learn how crash typing can lead to the selection of the most appropriate countermeasures.
- Objectives** – learn how selected treatments may address many requested improvements to the pedestrian environment.
- Implementation** – read about the necessary components for implementing pedestrian treatments.
- More Info** – access additional information through a variety of resources.
- Downloads** – access print versions of the guide and other relevant materials.

Available Tools:

- Selection Tool** – find appropriate countermeasures on the basis of desired objectives and specific location information.
- Interactive Matrices** – view the countermeasures associated with crash types and performance objectives.
- Countermeasures** – read descriptions of the 49 engineering, education, and enforcement treatments.
- Case Studies** – review real-world examples of implemented treatments.

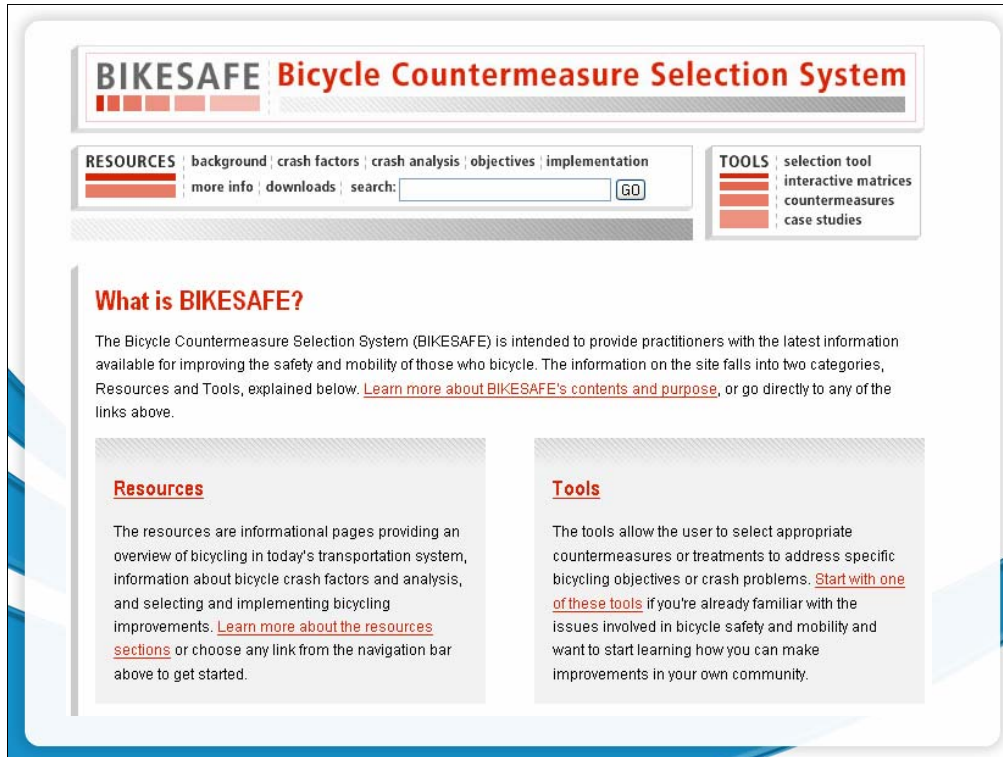
Project sponsored by:
 U.S. Department of Transportation
 Federal Highway Administration

This leads to the second set of tools that I want to discuss today – PEDSAFE and BIKESAFE, but I will show you examples from:

BIKESAFE since it is more recently released.

PEDSAFE includes an abundance of resource information on the pedestrian safety and mobility problem, crash statistics, crash analysis, and implementation.

PEDSAFE also includes several tools, including countermeasure descriptions, case studies describing the implementation of these countermeasures, and a couple tools that can be used to select countermeasures.



This is the first page of BikeSafe.

- BikeSafe has wealth of Resources and Background information available, including crash factors and analysis and other reference materials that are available through links at the top left and the
- Interactive Tools (with links on top right), including
Selection Tool
Interactive Matrices
Countermeasures and
Case Studies describing how countermeasures have been implemented in communities across the country.

Countermeasures

A total of 50 engineering, education, and enforcement countermeasures are discussed in this section. The treatments and programs selected for inclusion in this application are those that have been in place for an extended period of time and/or have been proven effective at the time the material for this product was being compiled. Since that time, new countermeasures continue to be developed, implemented, and evaluated. Thus, practitioners should not necessarily limit their choices to those included here; this material is a starting point. More information on the latest treatments and programs can be found through many of the Web sites and resources included in this section and the [More Info](#) section.



Shared Roadway:

The goal of an appropriately designed roadway should be to safely and efficiently accommodate all modes of travel, from bicyclists to pedestrians to motorists.



Trails/Shared-Use Paths:

Bike paths or shared-use trails are complementary to the road network and serve recreational, child, and even commuter bicyclists.



On-Road Bike Facilities:

Various kinds of on-road facilities, such as bike lanes, paved shoulders, and wide curb lanes, make bicyclists more comfortable.



Markings, Signs, Signals:

Traffic engineers have an arsenal of pavement markings, signs, and signals that can be used to inform, regulate, and warn both motorists and bicyclists.



Intersection Treatments:

Nearly half of all bicycle-motor vehicle crashes occur at intersections or other junctions.



Education and Enforcement:

Education and enforcement are key strategies in increasing bicyclist and motorist awareness and behavior.



Maintenance:

Maintenance of all kinds of bicycle facilities must be planned for and done routinely.



Support Facilities and Programs:

The simple promotion of bicycling is a way to increase the amount of riding in a community.



Traffic Calming:

Traffic calming is a way to design streets, using physical measures, to encourage people to drive more slowly.

BikeSafe includes descriptions of 50 countermeasures organized into 9 categories. PedSafe has a very similar format, with 49 countermeasures organized into 7 categories.

Interactive Matrices

Click on one of the matrices below to see the relationship between the seven countermeasure groups and the 13 crash types (on the right) or the eight performance objectives (on the left). Select any bullet in either matrix to view the specific countermeasures that are applicable to each crash type or performance objective.

Objectives Matrix click to enlarge

Objective	Shared Facilities	On-Road Bike Facilities	Intersection Treatments	Driveways	Public Carriage	Workplaces or Public Buildings	Trails, Paths, Leases, Licenses, Easements and Encroachments
1. Provide safe on-street facilities for bicycles.	*	*	*	*	*	*	*
2. Provide off-road paths or trails for bicycles.	*	*	*	*	*	*	*
3. Provide and maintain quality surfaces for bicycles.	*	*	*	*	*	*	*
4. Provide safe intersections for bicycles.	*	*	*	*	*	*	*
5. Improve motorists' behavioral compliance with traffic laws.	*	*	*	*	*	*	*
6. Improve bicyclist behavior' compliance with traffic laws.	*	*	*	*	*	*	*
7. Encourage and promote bicycling.	*	*	*	*	*	*	*


Crash Matrix click to enlarge

Crash Group	Shared Facilities	On-Road Bike Facilities	Intersection Treatments	Driveways	Public Carriage	Workplaces or Public Buildings	Trails, Paths, Leases, Licenses, Easements and Encroachments
1. Motorist failed to yield - signalized intersection.	*	*	*	*	*	*	*
2. Motorist failed to yield - non-signalized intersection.	*	*	*	*	*	*	*
3. Bicyclist failed to yield - signalized intersection.	*	*	*	*	*	*	*
4. Bicyclist failed to yield - non-signalized intersection.	*	*	*	*	*	*	*
5. Motorist drove into - midblock.	*	*	*	*	*	*	*
6. Bicyclist rode out - midblock.	*	*	*	*	*	*	*
7. Motorist turned or merged left into path of bicyclist.	*	*	*	*	*	*	*
8. Motorist turned or merged right into path of bicyclist.	*	*	*	*	*	*	*
9. Bicyclist turned or merged left into path of motorist.	*	*	*	*	*	*	*
10. Bicyclist turned or merged right into path of motorist.	*	*	*	*	*	*	*
11. Motorist overtaking bicyclist.	*	*	*	*	*	*	*
12. Bicyclist overtaking motorist.	*	*	*	*	*	*	*
13. Non-motor vehicle crashes.	*	*	*	*	*	*	*

A Crash Group matrix with 13 crash groups

And a Performance Objectives matrix may be explored interactively to generally identify countermeasures that may be appropriate to address those concerns.

Crash Matrix

Crash Group	Countermeasure Group							
	Shared Roadway	On-Road Bike Facilities	Intersection Treatments	Maintenance	Traffic Calming	Trails/Shared-Use Paths	Markings, Signs, Signals	Education and Enforcement
1. Motorist failed to yield – signalized intersection	•	•	•	•	•	•	•	•
2. Motorist failed to yield – non-signalized intersection	•	•	•	•	•	•	•	•
3. Bicyclist failed to yield – signalized intersection	•	•	•	•	•	•	•	•
4. Bicyclist failed to yield – non-signalized intersection	•	•	•	•	•	•	•	•
5. Motorist drove out – midblock	•	•	•	•	•	•	•	•
6. Bicyclist rode out – midblock	•	•	•	•	•	•	•	•
7. Motorist turned or merged left into path of bicyclist	•	•		•	•	•	•	•
8. Motorist turned or merged right into path of bicyclist	•	•	•	•	•	•	•	•

For example, you may have identified a high proportion of motorist left turn in front of bicyclist crashes and want to explore what intersection treatments may help address that type of crash. Clicking on the button will take you to a list of possible treatments, which you can then click on and read about.

Selection Tool

How the Tool Works

The selection tool is designed to receive input on several variables from the user in three steps.

1 Choose the Location

First, enter the location of the site in question. This allows the user to create reports for several different sites and keep the results separated by location. It is used for reporting purposes only and is not stored permanently by the operators of this web site.

2 Select the Goal of the Treatment

Second, one must decide on the goal of the treatment. It may either be to achieve a specific performance objective, such as reduce traffic volumes, or to mitigate a specific type of pedestrian-motor vehicle collision.

3 Describe the Site

Once a specific goal has been selected, the third step is to provide answers to a series of questions related to the geometric and operational characteristics of the site in question. The answers to these questions are used to narrow the list of appropriate countermeasures for a specific goal. For example, if the location of interest were a segment of roadway, or midblock location, then the treatments associated with intersection improvements would not be applicable and thus, would not be included in the results as possible countermeasures.

For any question where the information is not known, an entry of "unknown" will simply retain the countermeasures relevant to the question, and the range of treatments will not be reduced.

Use the Selection Tool

[Start Here](#)

The other tool that is available is the Selection Tool, in which the user can enter details about the location, the desired goal (outcome) of a treatment, and additional information about the site itself.

Selection Tool

Step One: Choose the Location

For the roadway location being addressed, please enter a description.

Location:

Proceed to Step 2

Selection Tool

Step Two: Select the Goal of the Treatment

For the roadway location being addressed, the goal of the bicycling treatment is intended to improve bicyclist safety and access by either achieving one of the following performance objectives OR mitigating one of the following crash types.

Therefore, you must choose one of the following to begin:

Performance Objectives

- Provide safe on-street facilities/space for bicyclists
- Provide off-road paths or trails for bicyclists
- Provide and maintain quality surfaces for bicyclists
- Provide safe intersections for bicyclists
- Improve motorist behavior/compliance with traffic laws
- Improve bicyclist behavior/compliance with traffic laws
- Encourage and promote bicycling

Crash Types

- Motorist failed to yield - signalized intersection
- Motorist failed to yield - non-signalized intersection
- Bicyclist failed to yield - signalized intersection
- Bicyclist failed to yield - non-signalized intersection
- Motorist drove out - midblock
- Bicyclist rode out - midblock
- Motorist turned or merged left into path of bicyclist
- Motorist turned or merged right into path of bicyclist
- Bicyclist turned or merged left into path of motorist
- Bicyclist turned or merged

Your Input:

Roadway Location:

Next Steps:

[Proceed to Step 3](#)

Step Three: Describe the Site

Please answer the following questions.

1. Is the problem location on an off-road multi-use path (not at an intersection with a roadway) or on a roadway (or roadway/path intersection)?
 - Roadway
 - Path
 - Not Applicable/Unknown
2. In what type of area is the roadway located?
 - Urban CBD
 - Urban - Other
 - Suburban
 - Rural
 - Not Applicable/Unknown
3. What is the functional class of the roadway?
 - Local
 - Collector & Minor Arterial
5. Is vehicle volume low, medium, or high?
 - Low (<10,000 ADT)
 - Medium (10 - 25,000 ADT)
 - High (>25,000 ADT)
 - Not Applicable/Unknown
6. Is vehicle prevailing speed low, medium, or high?
 - Low (<= 30 mph)
 - Med (31 - 44 mph)
 - High (>45mph)
 - Not Applicable/Unknown
7. What is the number of through lanes?
 - <=2
 - 3 or 4
 - 5 or more
 - Not Applicable/Unknown
8. Is a traffic signal present, being considered, or not an option?

Your Input:

Roadway Location:

Your Performance Objective:

**Provide safe on-street facilities/
space for bicyclists.**

Next Steps:

Edit:

[Change Your Performance
Objective](#)

[Start Over](#)

[Get Results](#)

Applicable Countermeasures

Based upon your input, the following countermeasures were found:

- Shared Roadway
 - [Lighting Improvements](#)
 - [Parking Treatments](#)
 - [Median/Crossing Island](#)
 - [Driveway Improvements](#)
 - [Access Management](#)
 - [Reduce Lane Number](#)
- On-Road Bike Facilities
 - [Bike Lanes](#)
 - [Paved Shoulders](#)
 - [Combination Lanes](#)
- Intersection Treatments
 - [Curb Radii Revisions](#)
 - [Intersection Markings](#)
 - [Sight Distance Improvements](#)
 - [Turning Restrictions](#)
 - [Merge and Weave Area Redesign](#)
- Traffic Calming
 - [Raised Intersection](#)
- Trails/Shared-Use Paths
 - [Path Intersection Treatments](#)
 - [Intersection Warning Treatments](#)
- Markings, Signs, Signals
 - [Install Signal/Optimize Timing](#)

Your Input:

Roadway Location:

Your Crash Type:

Motorist turned or merged left into path of bicyclist

Your answers to the previous questions:

Roadway or Path: Roadway

Location: Urban - Other

Functional Class: Principal

Arterial

Intersection or Midblock:

Intersection

Volume: High (>25,000) ADT

Speed: Med (31 - 44 mph)

Lanes: 5 or more

Signal: Present (removal not an option)

Bike Facilities: Wide Curb Lane

Next Steps:

Edit:

One of the applicable countermeasures is Access Management, so then you can follow the link to that countermeasure.

Applicable Countermeasures

View Other Applicable Countermeasures ▾

Access Management

Every driveway and street connection is a potential conflict point among motorists, bicyclists and pedestrians. Therefore, managing the number, spacing, access, directional flow, and other aspects of driveway and side street connections protects those traveling along the corridor from conflicts with those entering or leaving the corridor. Access management strategies such as providing raised/non-traversable medians and limiting driveway access may be useful in promoting safe bicycle travel, particularly on arterial or major collector streets, since they help reduce the number of potential conflict points.

The principles of access management incorporate providing specialized roadways appropriate to their intended use. The trade-off is between providing direct access and promoting through movement. For example, the main purpose of freeways and arterials is to move through traffic, and access should be restricted to necessary interchanges. Local streets should generally serve all destinations and access should not be limited.

- ▣ [view purpose](#)
- ▣ [view considerations](#)
- ▣ [view estimated cost](#)



Raised medians and driveway consolidation are two access management tools that reduce the number of conflict points.

Photo by Dan Burden

Each countermeasure includes a description and images of the countermeasure (we're only seeing a portion on this slide)

The chief purposes

Considerations for implementation

And estimated cost information

You can also follow links to relevant case studies from the countermeasure page.

(Unfortunately, and here comes the solicitation, we were unable to obtain a good case study on the use of access management to treat a bicycle crash or conflict problem. So, if you know of a good example, please let me know, and perhaps we can get it included in version 2.)

print page x close window

#29 – Bikeway Speed Humps

PORTLAND, OREGON

Scott Batson,
Management

#8 – Bike Lane Safety Evaluation


PHOENIX, ARIZONA

Michael J. Cynecki, P.E., Traffic Engineering Supervisor, City of Phoenix Street Transportation Department

Background
Portland's Bike Speed humps Clinton Street continued to be marked with the 1990

Background
Phoenix, AZ, is the sixth largest city in the United States with a population of 1.32 million and an ideal climate for cycling. In the mid-1980s Phoenix had a very small system of bike facilities, consisting of only 75 miles, including off-street paths, signed bike routes, and a few miles of on-street bike lanes.

Countermeasures
In 1987, the City Council approved an aggressive bicycle system of 700 miles of bike lanes, bike paths, and signed bike routes to be installed over the years. The plan included providing many new miles of bike facilities as well as upgrades to existing facilities. Funding for new bike facilities increased from \$300,000 per year to \$500,000 per year in fiscal year 2000–2001. By 2000, Phoenix had developed over 450 miles of bike facilities, including over 222 miles of on-street bike lanes. While many of the on-street bike lanes have been installed on collector streets, bike lanes are also provided on arterial streets. Furthermore, the standard cross-section for new arterial streets built in Phoenix was modified to include on-street bike lanes.



Open House

Evaluation and Results

A couple of the many excellent case studies we did receive.

Bikeway Speed Humps – an example where traffic calming measures were used to slow traffic along a segment of a bike route where the right-of-way was too narrow to stripe bike lanes – from Portland, OR.

Bike Lane Safety Evaluation – an analysis was performed on where motor vehicle - bike crashes were occurring including what facility types (on road only), and types of bike crashes and ages of riders involved – from Phoenix, AZ.

Recent Applications

- Statewide crash analyses
 - Wisconsin
 - North Carolina
(<http://www.pedbikeinfo.org/pbcats/>)
- Pedestrian ITS & Safety Engineering Countermeasures Demo Project (FHWA)
 - Miami Dade County and others
 - Determine high crash locations
 - Identify specific *types* of pedestrian crashes
 - Implement *appropriate* countermeasures

Other communities including Orlando, Las Vegas, and San Francisco have used location and PBCAT identification of crash types for pedestrian crashes in Miami-Dade, Las Vegas, and San Francisco as part of an FHWA Demo project. This information was used to identify and implement the most appropriate countermeasures.

NC Ped/Bike Crash Data Web site

- 8 years of data
 - 18,500 ped crashes
 - 7,900 bike crashes
- Annual Crash Facts
- Annual Crash Types
- On-line Query Function
- Summary Reports



www.pedbikeinfo.org/pbcats

Slides 38 – 42 – I did not cover these slides during the PWPB session, but left them in here as additional examples of ways PBCAT has been used in some recent North Carolina efforts.

The development of a statewide online database that contains all pedestrian and bicycle crashes in NC over the past 8 years. The system can be accessed by local practitioners and the general public to acquire information about ped and bike crashes in their communities, county-wide, region-wide, or state-wide.

NC PBCAT Web site Data Queries

Division of Bicycle & Pedestrian Transportation

Bicycle Crash Data Pedestrian Crash Data

home : bicycle crash data : pedestrian crash data

Two-Way Data Query

step 1 : mode
▼ Bicycle

step 2 : location
▼ Chapel Hill, City

step 3 : year
▼ 2000,2001,2002,2003,2004

Please select a Bicycle level variable to populate the ROWS in your query.

- Driver Alcohol Use
- Driver Injury
- Driver Vehicle Type
- Driver Estimated Speed
- Alcohol Involved Crashes
- Ambulance Requested
- City Name
- Crash In Workzone
- Crash Severity
- Crash Type
- Crash Type (Grouped)
- Day of Week

Please select a Bicycle level variable to populate the COLUMNS in your query.

- Excessive Speed Indicated
- Fault
- Hit And Run
- Light Condition
- Locality
- Month
- Number Of Through Lanes
- Number Of Units
- Road Characteristic
- Road Condition
- Road Configuration
- Road Defects

run two-way query

When a two-way cross-tab. Is performed, all data years are combined.
With a one-way analysis, the data are shown separately by year.

Factors Contributing to Pedestrian and Bicycle Crashes on Rural Highways

Final Report



Submitted to Federal Highway Administration by

UNC Highway Safety Research Center

The NC PBCAT data have also been used in a study of rural pedestrian and bicyclist crashes with motor vehicles sponsored by FHWA through Highway Safety Information System (HSIS) (Daniel Carter, lead author). This study linked HSIS roadway inventory data from NC with PBCAT crash type data for the years 1997 to 2002 (six years).

Since HSIS predominantly contains data only for urban and medium-to-high volume rural roads, only a subset of PBCAT rural crashes were contained in the HSIS database (1849 out of 6037 bicycle crashes; 3598 out of 13508 pedestrian crashes). This subset of rural crashes was the primary focus of this study.

The urban crashes from the PBCAT database were also extracted and linked with the HSIS roadway data to form a dataset to use in general comparison. Note that these “urban” crashes would be those that occur on state routes through urban areas. These are most likely to be major arterial roadways, and would not include residential streets or other non-major urban roads.

Description of Crash Data

The final crash dataset used in this study spans the years 1997 to 2002. The data comprise 1849 total bicycle-vehicle crashes, of which 956 (52%) are rural and 893 (48%) are urban, and 3598 pedestrian-vehicle crashes, of which 1947 (54%) are rural and 1651 (46%) are urban. These rural-urban designations were given in the PBCAT database, which defines crashes occurring within municipal limits as urban and those outside municipal limits as rural. The data consist of crashes on state-maintained roads. In North Carolina, approximately 78,000 miles of roadway are owned by the state, but only 39,385 miles are included in the HSIS database – those road segments to which crashes can be “mileposted.” As discussed above, these are the urban and medium-to-high volume rural roads. Low volume rural roads are not included in this study, nor are residential streets in urban areas.

Rural Bicycle Crashes

Table 1. General Comparison - Types of Bicycle Crashes

	Rural	Urban	1996 Study
Bicyclist Turn/Merge Into Path of Motorist	31%	10%	7%
Motorist Overtaking	25%	8%	9%
Motorist Failed to Yield	7%	26%	22%
Bicyclist Failed to Yield, Midblock	10%	13%	12%
Motorist Turn/Merge Into Path of Bicyclist	7%	12%	12%
Bicyclist Failed to Yield, Intersection	7%	12%	17%
Intersection Crash	2%	8%	3%
Unknown/Insufficient	4%	4%	2%
Wrong Way Operator	3%	2%	3%
Specific Circumstances	2%	1%	7%
Operator Lost Control	1%	1%	2%
Bicyclist Did Not Clear Intersection	0%	2%	1%
Bicyclist Turning Error	0%	1%	1%
Motorist Turning Error	1%	0%	1%
Bicyclist Overtaking	0%	0%	3%

Some differences between rural and urban bicycle crashes in NC are the higher number of bicyclist turn/merge into path of motorist crashes (involving a higher proportion of younger bicyclists than average) in rural areas, and a higher proportion of motorist overtaking crashes involving a higher proportion of adults than average. Most of these crashes were on rural 2-lane roadways, 87% of which lack paved shoulders (80% of all the crashes were on this type of road)

Of course speeds and fatality rates were higher for both pedestrian and bicyclist rural crashes as opposed to urban, and alcohol use was higher in rural ped and bike crashes.

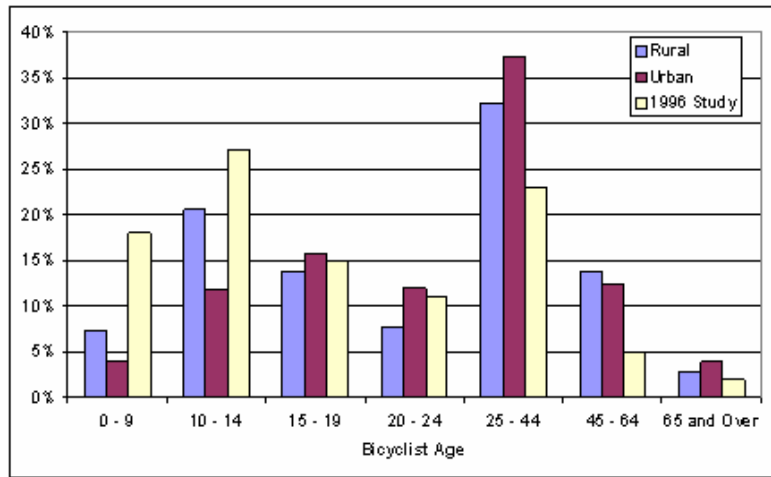


Figure 1. General Comparison - Bicyclist Age

A higher proportion bicyclists being struck in rural areas are young (aged 10 – 14) – We don't know whether this is totally a function of exposure - they may ride more than their urban counterparts – or in part due to lacking safe places to ride OR not knowing how to ride on high speed, rural roadways.

Product Access

- PEDSAFE
 - www.walkinginfo.org/pedsafe/
- BIKESAFE
 - www.bicyclinginfo.org/bikesafe/
- PBCAT
 - www.bicyclinginfo.org/bc/pbcats.htm
 - www.walkinginfo.org/pc/pbcats.htm



Both of these products are available at the web sites shown here.

PBCAT can be downloaded from the site shown and installed on your local machine.

PEDSAFE and BIKESAFE are web sites that only require a browser. There are pdfs (downloads) of the entire PEDSAFE and BIKESAFE documents on this site as well.