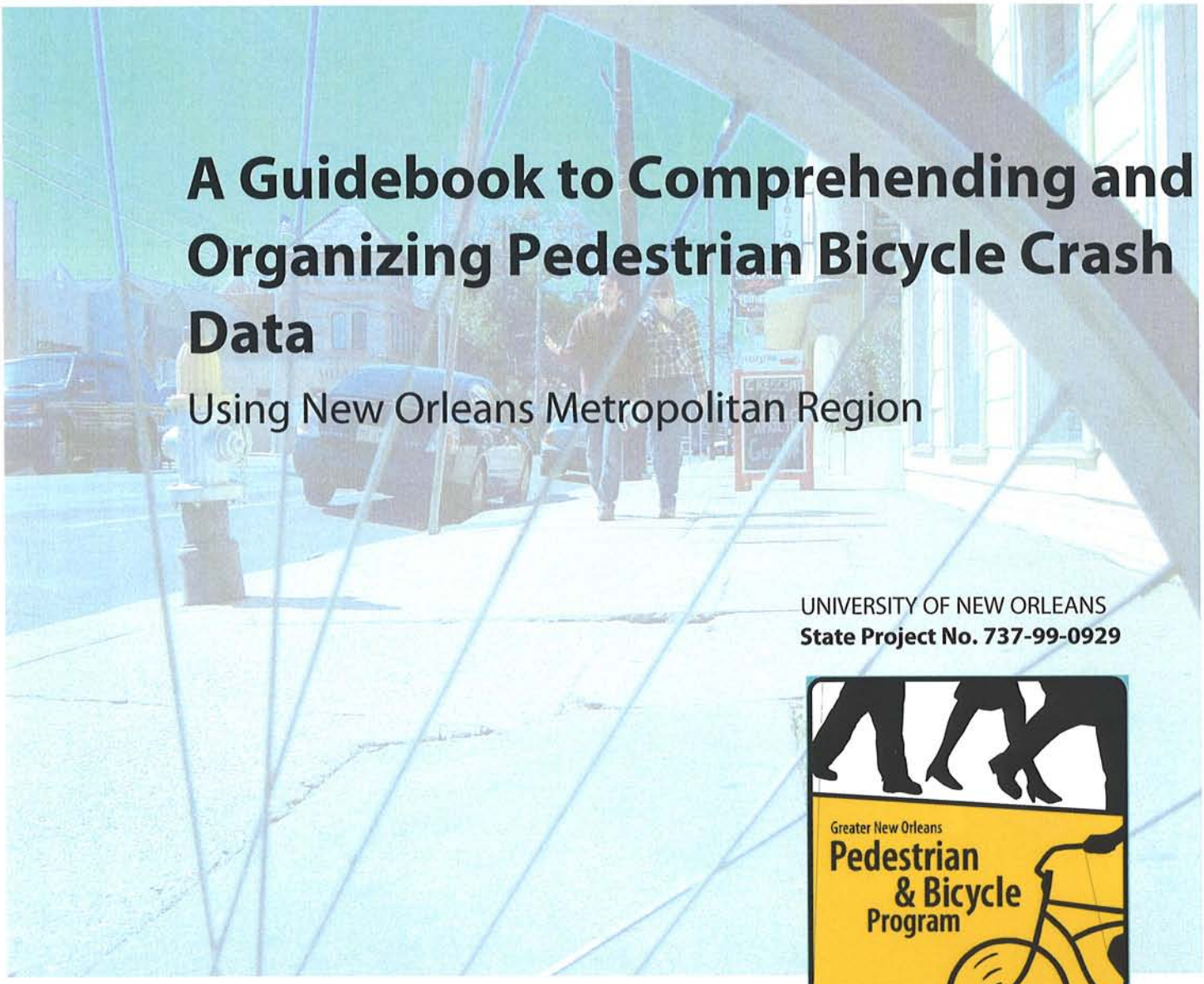
A Guidebook to Comprehending and Organizing Pedestrian Bicycle Crash Data

Using New Orleans Metropolitan Region



UNIVERSITY OF NEW ORLEANS

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Greater New Orleans Pedestrian & Bicycle Program

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LOUISIANA'S ON THE MOVE... DOTD BUILDS THE WAY

REGIONAL PLANNING COMMISSION

PBRI PEDESTRIAN BICYCLE RESOURCE INITIATIVE

A Project of the
Regional Planning Commission and the Louisiana Department of Transportation and Development

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1. INTRODUCTION

The Pedestrian Bicycle Resource Initiative (PBRI) has assumed the task of sorting and archiving all available Metropolitan New Orleans pedestrian-bicycle crash data for the years of 1999 through 2006. These data were originally collected as crash reports by police agencies in the region, and are stored in the New Orleans Regional Planning Commission's files in two separate formats:

- All data between the years of 1999 and 2002 are available as Microsoft Office spreadsheets. The extension for these files is '.xls'.
- All data between the years of 2003 and 2006 were saved as Microsoft Access **tables**, or spreadsheets, which were aggregated into databases for each year. The databases are saved in Microsoft Access format as 'crash[year]_plus_dotd.' These extension for these files is '.mdb'.

This guidebook will instruct readers how to interpret and analyze this data using Microsoft Access and ESRI ArcMap Geographic Information System (GIS) software.

2. MICROSOFT ACCESS

Each Microsoft Access database (those from the years 2003-2006) contains only three tables that are relevant to pedestrian/bicycle related crash incidents. Those are:

- **Crash_tb (Crash Table)**
  This table contains general data on all crashes reported in that year.
- **Vehic_tb (Vehicle Table)**
  This table contains data on every vehicle involved in a reported crash for that year. The number of **records**, or rows in the table, should be about double that listed in the crash table, since the overwhelming number of crashes reported involve a collision between two vehicles, and a record is present for both. In the 'VEH_TYPE_CD" (Vehicle type) column, bicycles are coded as 'F.'
- **Pedes_tb (Pedestrian Table)**
  This table contains data on any pedestrians involved in an crash. The number of record listed in this table shouldn't be small compared to those listed in the crash and vehicle tables.

In order to view these tables, launch Microsoft Access. The program will automatically prompt you to open an existing Microsoft Database (.mdb) file. Navigate to where the crash data is stored on your hard drive and open a database file.

The screen similar to the following should appear:

The column to the left contains two features that are relevant to our purpose: 'tables' and 'queries.'

Tables, as defined previously, are simply spreadsheets containing collected data. In order to view a table, click on the 'table' button in the windows sidebar (if not already selected) and double click on any of the entries symbolized by a square with three columns. A spreadsheet should open containing the data for that table.

A **query** can be thought of as a composite of data from various tables. Querying is a feature that will be covered in more detail later, but first one must understand how to create **relationships**.

In order to illustrate how to conduct these processes, the following tutorial will instruct the user how to create several Microsoft Excel spreadsheets from the available Access data, as well as how to perform necessary Access procedures.

Note: When saving any changes, it's a good idea to save it separate from the original Access database, that way an original copy is preserved.

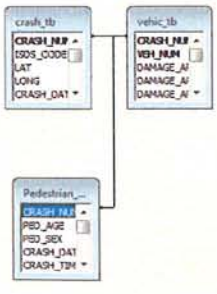
2.1 CREATING RELATIONSHIPS

Relationships can be created between tables that share common features. Every crash incident contains its own unique **crash number**, which should be located in the first column of each table. This number can be used to link the three relevant tables (crash, bicycle, and pedestrian) together by creating relationships.

In order to create relationships in Access between the three relevant bicycle/pedestrian crash data tables, one must:

a. Open a crash database in Microsoft Access.
b. Click the 'Tools' dropdown menu from the taskbar.
c. Click 'Relationships...'
d. The Relationships screen will open up. The screen should be blank at this point. Right click on the blank screen and choose 'Show Table...'
e. Highlight the crash table (Crash_tb) and choose 'Add,' followed by the vehicle (vehic_tb) and pedestrian (pedes_tb) tables.
f. Find the 'Crash Number' in the 'Crash_tb' list that appears and drag it to the 'Crash Number' in the next list over. When you release the mouse button, a line should appear between the two lists. This symbolizes relationship between the two tables, meaning that Access will now relate them by their common attribute (the crash number). Repeat this step between the crash table and the pedestrian table.
g. When complete, save your progress. Remember to save changed Access databases separately from the originals.

The relationship screen should appear similar to this, with the related tables' common fields connected by lines.



2.2 QUERYING DATA

Querying is one of the most important features for organizing the crash data. It brings together fields from various tables into a single location based on a common field (thus the necessity of building a relationship between tables before they can be queried).

The purpose of querying the crash data is to join information from the Vehicle and Pedestrian tables together with information in the Crash table. For example, while the Vehicle table contains demographic information about drivers involved in a collision, it does not contain the date or time of the collision. By running a query, the user may bring this separate information into one single location that can then be converted to a table or exported as a spreadsheet.

There are two methods for querying data: using the 'design view,' or the 'wizard.' While it is simpler to use the wizard feature, we will use the design view instead, as this method makes *filtering*, a step covered later in the guide, easier to complete.

We will now outline the steps necessary to create a single table containing relevant vehicle and crash data.

a. Open the crash database in Microsoft Access where you performed the relationship exercise; this progress should have been saved in order to complete the following exercise.
b. Click the 'Queries' selection from the table of contents menu on the left.
c. Double click the 'Create Queries in Design View' feature listed at the top of the right-hand window. Two screens should appear: the query screen in background and the 'Show Table' screen in the foreground.
d. In the 'Show Table' screen, double click **crash_tb** and **vehicle_tb**. You may now close out the 'Show table' screen. The tables you selected should appear in the query screen with a line between them, indicating that they are connected. The boxes representing each table list only the fields contained within the tables. Once the query is complete, it will produce a query table with the data for each selected field.
e. To select fields for the new query, double click each field that you wish to include. The field titles are fairly self-explanatory. **Include the crash number from one of the tables as well as 'VEHIC_TYPE_CD' (vehicle type code, located in the vehicle table)**, in addition to any other data you desire.
f. Once you've added the vehicle type code as a field, go to the bottom half of the query screen and type 'F' into the 'criteria' row, in the 'VEHIC_TYPE_CD' column. Remember that F represents bicycles. This is one of two ways of filtering data; when the table is created, it will only include records of bicycle crash incidents.
g. Once you've added all necessary fields, click the X to close the Query screen. You will be prompted to save the changes to the query. Save it as 'Bicycle_Crash_Data_[year]_v1.'

Your query will now appear listed in the query section. Open it up and check to make sure that all data is present, and that only bicycles are listed under 'vehicle type.'

2.3 CONVERTING A QUERY TO AN ACCESS TABLE

While a query may appear as a table, Access does not treat it as one. In order to create relationships between queries and tables, you must turn the query into a table.

a. Open Microsoft Access; open the database in which you conducted exercise 2.2.
b. Click on the 'Query' tab, and right click on the 'Bicycle_Crash_Data' file that you created in the last exercise. Click on 'Design View.'
c. Once in design view, click the Query drop-down menu from the main Access window; click 'make table query.'
d. A screen will prompt you to name the table that will be created. Title it 'Bicycle_Crash_Table_[year]_v1' and click OK.
e. Close the Query Design table. Save changes when prompted.
f. A table-creation query should be listed in the Query section with the name 'Bicycle_Crash_Table_[year]_v1'; double click it; click 'Yes.'

The table should now be available in the Table section. Check to ensure that all data is present.

2.4 SEPARATING VEHICLE TYPES

This section will instruct the reader how to create a query with vehicle crash data **only for motor vehicles involved in a collision with a bicycle**. Therefore, two separate spreadsheets may be created: one for bicycles involved in a collision, and one for motor vehicles involved in that same collision.

In order to do this, you'll apply what you learned in section 2.2 to conduct a new query that will bring together data from the 'Bicycle_Crash_Table_[year]_v1' table and the vehicle table.

a. Open Microsoft Access; open the database in which you conducted exercise 2.3.
b. Follow the steps from exercise 2.2 to run the following query:
c. Select all of the fields from the 'Bicycle_Crash_Table_[year]_v1' table except for vehicle type (Vehic_Type_cd).
d. Select the vehicle type field from the vehicle table (vehic_tb).
e. In the criteria for this field, type "not F."
f. Run the query. When prompted to save your changes, title it 'Vehicles_that_collided_with_bicycles_[year]_v1.'

By using the crash number field of the bicycle crash table that we created in the previous lesson to run the query, and then proceeding to filter out all bicycle entries, you have created a query that contains only data for vehicles that collided with bicycles.

2.5 EXPORTING QUERIES AND TABLES AS MICROSOFT EXCEL DOCUMENTS.

Exporting data is a simple process. For both tables and queries:

a. Right click on title.
b. Click 'export.'

c. Export the query/table as a Microsoft Excel 1997-2000 document.
d. Save the document in a desired location.

2.6 FILTERING DATA IN MICROSOFT ACCESS

While one method of filtering was covered in section 2.2, there is a second method. In order to filter the data for bicycle related incidents alone outside of the Query Design View, one must:

a. Open Microsoft Access; open one of the pedestrian/bicycle crash databases.
b. Open the vehicle table.
c. Click on the 'Records' dropdown menu from the taskbar.
d. Point to 'Filter' and choose to 'Filter by form.'
e. The 'Filter by form' menu will appear. Scroll over to the 'Vehicle Type' (VEHIC_TYPE_CD) column and click on the blank entry below it. Type 'F' (the code for bicycles).
f. Click on the 'Filter' dropdown menu and click 'Apply Filter/Sort.' This will leave only a fraction of the original records in the table.

3. ArcMAP

3.1 JOINING DATA

In order to join data in ArcMap to connect tables:

a. Open ArcMap; click on the 'Add data' [] button, navigate to the Crash Data databases, and add the Vehicle, Pedestrian, and Crash tables. (If you click the 'Source' tab at the bottom of the table of contents menu, these tables will be listed. To view their contents, right click on the title of the table you wish to view in the table of contents menu and click 'Open.')
b. Right click on one of the tables you wish to join, point to 'Joins and relates,' and click 'Join.'
c. Where it asks which field you wish to base the join upon, choose 'Crash Number.' On the second selection, choose which table you wish to join the other to (for example, you may wish to join the Crash table to the Vehicle table). Last, choose the common field between them (Crash number).
d. Click 'OK.'

The two tables will now merge together. If you right click on one and choose 'Open,' you'll see that the table now contains all the data from the two original tables.

3.2 GEOCODING CRASH DATA

There are two ways to import the geographic attributes of the crash data. The first way is to use the field labeled "lat/lon" that is designed to provide GPS coordinates of the crash location. This field, in theory, could be imported directly into ArcGIS providing geographic coordinates for each crash. This file is often, however, left blank. As more police begin to carry GPS receivers,

this situation should improve. At the present time, however, the "lat/lon" column is not adequately populated to be useful for a successful geographic analysis.

The second method for importing geographic attributes of the file is to **geocode**, or geographically represent, the crash data. This will require some preparation.

STEP ONE: CONCATINATING

Aside from the lat/lon field, there is no single field that specifies a crash location. The best alternative to the lat/lon field in this database is the designation of the closest intersection to the crash location. This can be determined by combining the primary road column (prim_road_name) with the intersecting road column (inter_road). These two columns must be combined (or **concatenated**) and then saved as either a csv or dbf file to move into ArcGIS in a readable format. This task can be completed in Excel.

a. Open a spreadsheet containing the bicycle crash data in Excel.
b. Create a new column by clicking "Insert" on the task bar. Scroll down and click "column." This will be the column where we will combine primary and intersecting road columns. Name it "INTERSECT."
c. An example of the basic formula that can be used to concatenate the columns is: =F2&"@""&E2" where F2 represents the primary road and E2 represents the intersecting road.
d. Click "File," "Save as...," and in the "Save as type" drop down menu, select DBF IV. This file is easiest to use in ArcGIS software, and will be imported into ArcMAP in the following step.

STEP TWO: CREATING AN ADDRESS LOCATOR

Several important features should be noted about geocoding the bikeped crash data. First, because of the distance between primary and intersecting roads, this methodology is not recommended for country roads with few cross streets. This is especially important in outlying parishes. Because of this limitation, spatial statistical techniques have only been employed in the core, urbanized parts of the New Orleans region. Second, a good knowledge of local roads is required to effectively geocode the files. Many streets in the New Orleans area have both locally known street names as well as state road number designations. The crash files provided by the state most often use the state road designations, but the ArcGIS files often have the local road designations. This makes local knowledge imperative for accurate geocoding. Finally, there are many spelling mistakes in the crash database files. Setting the spelling tolerance fairly low and then manually evaluating the results is necessary to ensure good return rates.

a. Open ArcMap.
b. Click on 'View' from the main menu, point to 'Toolbars' and click on 'Tools.'
c. Expand the 'Geocoding Tools' selection from the Tools menu that appears.
d. In the 'Address Locator Style' choose the 'U.S. Streets' selection.

e. For 'reference data,' select the Orleans Parish Streets shapefile. This shapefile is available through the City of New Orleans GIS Data Portal. (http://gisweb.cityofno.com/cnogis/)
f. Align the correspondent data in the Field Map screen.
g. Select a place on your hard drive to save your address locator. Assign it a recognizable name, such as "New Orleans Streets."

STEP THREE: GEOCODING ADDRESSES

a. Open the Tools taskbar and expand the 'Geocoding Tools' selection. Double click on 'Geocode Addresses.'
b. In the 'Input Table' selection screen of the window that appears, browse for the database format (DBF IV) spreadsheet that you created in Step One of this section. Select it.
c. In the 'Address Locator' selection screen, browse for the Address Locator that you created in Step Two of this section. Select it.
d. In the right column of the 'Input Address Field' screen, click the blank cell to the right of the "Streets" cell. In the drop-down menu, choose the "INTERSECT" selection.
e. Choose an area on your hard drive to export the resultant shapefile and click "OK."

The geocoded shapefile will be added to your work session.