Data Collection and Research
This module will review some of the methods and reasons behind conducting research on bicycle and pedestrian planning.
Research on bicycle and pedestrian planning helps answer questions about behavior, needs, and will help set benchmarks to determine the progress and success of a program. From answering questions about users to facilities, these are general categories for why we need to do research in our planning process. This research can improve the outcomes of a bicycle or pedestrian facility and network.

Answer questions about pedestrians and bicyclists
• What types of people walk or bicycle?
• When and where do they walk or ride?
• What types of facilities do they prefer?
This research can get at important information about facilities. This could be research on where there are facilities—or gaps—the relative quality of the facility, number of people who use them, or their safety and performance.

Research can also make the case for a new type of facility based on these results. It may be an opportunity to investigate the facilities return on investment, a metric more and more decision makers are looking for.

In San Jose, California they began collecting data on trail usage in 2007 and have found this research to be essential in grant applications. Since 2007 they have been able to accomplish the following:

• Secured grant from the State of California for $700,000 awarded for construction of the Guadalupe River Trail (Woz Way to Virginia Street). State representatives reported that the Trail Count Fact Sheet influenced the grant panel’s decision to award the grant.
• In discussing a $350,000 grant application, State of California (Caltrans) staff said that the Trail Count Fact Sheet data about commuting was impressive and wished other agencies gathered similar data.
• The City received a $150,000 grant from the Bay Area Ridge Trail for Penitencia Creek Trail and $123,000 from the State of California for Guadalupe River Trail enhancements. Both applications included the Trail Count Fact Sheet.
• The City coordinated with sponsors of the San Jose Grand Prix to minimize impacts from event closures along the Guadalupe River Trail. The Trail Count Fact Sheet helped to document the negative impact of such closures to bicycle commuting.
Research can provide input for decision makers and planners on the types of facilities that would be best for a community. It can also determine what improvements are needed within the system or the community’s preference for one type of facility over another.
Good research can also provide benchmarks to measure the use of a facility or progress of a project. These benchmarks can be important for fundraising, grants, and getting buy in from decision makers for future projects.

Benchmarks can also help redirect efforts if projects are not meeting objectives. It might provide information for how the project got derailed and give insight to improve the plan in the future.

The National Bicycle and Pedestrian Documentation Project is attempting to overcome one of the greatest challenges facing the bicycle and pedestrian field—the lack of documentation on usage and demand. Without accurate and consistent demand and usage figures, it is difficult to measure the positive benefits of investments in these modes, especially when compared to the other transportation modes such as the private automobile. The website http://bikepeddocumentation.org/ may help measure and evaluate bicycle and pedestrian data in your community while supporting an effort to have standardized, national information on active transportation modes.
Conducting and Using Research

Conducting Research:
- Practitioners at all levels
- University researchers
- Advocates
- Citizens

Used for:
- Educate policy makers
- Inform advocates & citizens
- Inform best practices

Who uses research? Everyone! Practitioners in local, state and federal government may need it for program funding and planning facilities. These practitioners may collaborate with University researchers, or enlist advocate and citizens to help conduct the research. (e.g. counting)

This research can be used to inform policy makers. They may need data in order to convince them of the need for facilities, to make better policies and decisions and to turn them into cheerleaders.

Academics
- growing interest in faculty to conduct research on bicycle facilities and travel behavior

Advocates
- use the data – they can help with data collection

Citizens
- Participate in counts, other research
There are numerous places that provide data that could be used for planning bike and pedestrian facilities. Specific databases for the area of safety and crash data and other data sources that get more at users, travel behaviors, and change over time for geographic areas.

Safety and Crashes
- NHTSA Traffic Safety Facts
- Fatal Accident Reporting System (FARS)
- Highway Safety Information System (HSIS)
- State Police Crash Databases
- Hospital Emergency Room Records
- US Census
- American Community Survey
- Regional household travel surveys
- Local counts

Other Data Sources
- US Census
- American Community Survey
- Regional household travel surveys
- Local counts (National Documentation Project)
However, there are some problems with using existing safety and crash data. While it is not perfect, it may be the best information we have available.

• Only **56% of pedestrians** and **48% bicyclists** linked to reported motor vehicle cases

Most Shared-Use Path incidents go unreported
  • Only **3 of 48** incidents were reported
  • **Bicyclists had 3x** more incidents than pedestrians

• Only **56% of pedestrians** and **48% of bicyclists** were successfully linked to cases reported on their respective state motor vehicle crash files (Stutts & Hunter, 1998)

• Most shared-use path incidents were unreported (Aultman-Hall & LaMondia, 2005)
  • Only 3 of 48 incidents were reported to police
  • Bicyclists had 3 times more incidents than pedestrians
  • Falls were much more common than collisions
  • Highest-volume paths had highest incident rates
There are a variety of methods to conduct research on bicycle and pedestrian travel. Typical methods range from counts, to travel diaries, or utilizing GPS technology to track travel behavior.
When beginning field observations, certain considerations should be taken. For example, how much time do you want to dedicate to the sample? < one hour, 1-2 hours, peak hour(s), 12 hours. What will different locations tell us about the usage? How many sites should be selected.

It’s also important to realize that it may be difficult to collect all the information you want in a count, so you should know ahead of time what you want to count, gender, race, age, direction, group size, helmet, etc.
Counting is easy. Counting accurately & consistently is the challenge

Uses for counts:
• Are we achieving our goals?
• Collect baseline data for future projects
• Project usage - provide inputs to models
• Tell a story – make walking & bicycling more visible
• Make the case
Manual Counts can be completed by staff or volunteers, and require a substantial time commitment. Accuracy of the information can be an issue due to human error, however these counts can obtain more in depth information on the user, such as their turning movements, gender, use of helmets or other safety gear, and age.

Electronic Counts are utilized by placing counters in the field. There is no information about the user that can be gathered, and accuracy can be compromised by how it is placed or obstacles in the field. There are several types of electronic counters available.
Methods

Pneumatic Tubes

- Can be semi-permanent or mobile
- Can be bicycle-specific
- Can detect riders side by side
- Does not count pedestrians

For more info see: http://www.eco-compteur.com/TUBES.html?wpid=15040
This tool holds 3 months of data that can be imported into Excel
Electronic Counts: Infrared

- Detects each trail user as infrared beam is broken
- Data reported as a stream of dates and time

Can be imported to Excel as space-delimited text file with a maximum of 16,000 entries

These sensors (eg: http://www.eco-compteur.com/Pyroelectric-Sensor.html?wpid=15036) can detect different user groups such as pedestrians, cyclists, etc. These also direct direction of movement.
• Detects trail users’ infrared heat signatures
• Differentiates direction (i.e. left-to-right vs. right-to-left) and types of users
• Holds one year of data
• Data imported in Excel in 15-minute increments

See previous slide for link to additional examples
**So when should these be used?** Work done in Minneapolis did a side by side comparison of these count methods.

**Minneapolis Example:**

**Methods of Counting**

<table>
<thead>
<tr>
<th>Method of observation</th>
<th>Manual</th>
<th>Magnetic Loop Detector</th>
<th>Active Infrared Counters (beam/sensors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic observed</td>
<td>Cyclists (bi-directional) Cyclists (bi-directional) Cyclists only (bi-directional, potentially) Cyclists &amp; Peds combined (no directional)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>Choice of time units 15 minute blocks Time of event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locations for deployment</td>
<td>On and off-street facilities &amp; no facilities Off-street facilities Depends on counter type and facility characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of observations</td>
<td>Based on staff availability (often two-hour blocks) Continuous: 24 hours Continuous: 24 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sources of error</td>
<td>Distractions Misses riders on edge of trail. Misses users passing simultaneously</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data recorded</td>
<td>5 – 60 minute time intervals 15 minute counts Time of “event”; can be aggregated to any time period</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other considerations</td>
<td>Can record groups, some user characteristics Can’t measure user characteristics Can’t measure user characteristics</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Here is output from different count methods that investigate patterns in trail use over time.
Here is that information on trail use over the months
Data from Midtown Greenway in Minneapolis MN
Surveys can be used to determine mode shares, predict participant behavior, gauge people’s opinions and preferences for facility types, and analyze the performance of a facility. There are different approaches to using surveys we will cover next, each with its own sets of drawbacks and benefits.
There are numerous types of surveys that can get at the information you are hoping to gather. Choosing which method depends upon the relevant benefits and drawbacks of each, and the context of the project.

Mail Surveys

Pros:
- Allows follow up
- Control

Cons:
- Expensive
- Less accurate
- Not representative of the population (self selection of respondents)
There are numerous types of surveys that can get at the information you are hoping to gather. Choosing which method depends upon the relevant benefits and drawbacks of each, and the context of the project.

Web surveys
Pros:
  - Inexpensive
  - low barrier to entry
  - young people (more likely to be online)
Cons:
  - lowest level of accuracy
  - cannot target invitations
  - excludes those who are not online
Phone surveys

Pros:
- Accurate

Cons:
- Very, very expensive
cell phones (many people do not have land lines, randomized numbers only
  use land lines)
Intercept Survey

Pros

- Detailed information
- Ability to clarify content
- Expensive
- Time-intensive

Cons

- Expensive
- Only obtain information from users/participants
- Don’t get info from those who do not/will not use facility (one-sided)
Participant Surveys

- Measures knowledge, attitudes, and behavior change
- Can’t measure impact on total population

Pros:
- Inexpensive to administer

Cons:
- Cannot measure impact on total population
- Usually don’t know demographic characteristics of participants
Interviews can provide in-depth information on a topic from the perspective of different community members. Depending on how interviews are structured and who is contacted to give interviews, they may or may not provide representative information. These interviews can be time consuming but are relatively inexpensive to administer.
Participants maintain a diary of trips, mode, purpose etc over a given period of time. This gives the researcher detailed information on both the mode choice and purpose of the trip. This is a time consuming method for both researchers and participants.
Using GPS is a relatively new method to gather information on routes. The participants will carry a GPS device over a certain length of time to track the routes they choose. This tracking gives great, detailed information on route choice and preferences for types of facilities. They are often coupled with travel diaries to get more information about purpose of the trip.

There is some self-selection bias for who is willing to participate.

It is important to evaluate facilities in order to see what is working within the community and how the facilities are being used. This can provide valuable information about which facilities should be implemented in the future.

Evaluations can measure the use of and behaviors of various users at facilities. Generally, the evaluations look at crossings, intersections, new facility types e.g. bike boxes, cycle tracks etc. They work best if evaluations are done pre and post facility construction and with controls. Evaluations can measure economic and other benefits.
In order to do evaluation, there are certain methods that tend to work well. We will look at each of these in a little more detail.

Methods:
1. Video pre and post
2. Survey users
3. Manual counts, analysis, and observations
Methods for Facilities evaluation

Collect video in the pre- and post-periods
Collecting video of how users use the space pre and post construction can be informative.
To survey users of a facility it is best to do an intercept survey. It can either be a survey they complete at the location, or they are given the survey to take later and mail back (or complete online). This will get information on how users of the facility, and those impacted by its presence, feel about the change.
Manual counts can assist facility evaluation. Counts will allow analysis for changes over time in the number of users or how people are using the facility.

Observations in the field will assist with the evaluation and analysis of the facility. This will depend on what needs to be analyzed or the goal of the facility.
Discussion