Bicyclist and Pedestrian Count Data in Texas

Online Webinar Presented by:

TxDOT Bicycle and Pedestrian Program &
Texas A&M Transportation Institute (TTI)
Webinar Reminders

- All phones are muted
- Use Webex chat box to ask questions
- Webinar is being recorded
- Slides will be emailed to all registrants after webinar
1. Overview of TxDOT Bicycle and Pedestrian Program and Efforts  
   - Bonnie Sherman, TxDOT

2. “Why Should I Count Bicyclists and Pedestrians?”  
   - Michael Martin, TTI

3. Collecting Bicyclist and Pedestrian Count Data  
   - Shawn Turner, TTI

4. Summarizing, Reporting, Visualizing Your Data  
   - Phil Lasley, TTI

5. Questions and Discussion
Upcoming in-person, full-day training

1. Pharr District (Brownsville), March 6

2. San Antonio, March 25
   - Held in conjunction with Texas Trails and Active Transportation Conference

3. Dallas-Ft. Worth, April 2

4. Houston, May 1

More information will be forthcoming in these areas

Contact s-turner@tti.tamu.edu for more details
Overview of TxDOT Bicycle and Pedestrian Program

Bonnie Sherman, TxDOT
Overview

- Gap in bicycle and pedestrian datasets
- Data integration in TxDOT activities
- Tools and resources
Statewide efforts addressing bicycle & pedestrian transportation

- Texas Transportation Plan 2050
- Bikeway Design Effort
- Project Development Enhancements
- Road to Zero
- Economic Impact of Bicycling in Texas
- ADA Transition Plan Update
- Pedestrian/Bicycle Facility Inventory
- Bicycle Tourism Trails Study
TxDOT/BAC collaboratively identified project development enhancements

**NEEDS IDENTIFICATION**
- Bicyclists’ and pedestrians’ needs can be identified by members of the public, local governments, TxDOT, and other partners.
  - **Areas of Concurrency**
    - Promote collection of bike/ped data
    - Initiate District bike plans statewide

**SCOPING**
- Determining the project’s scope and addressing local, regional, state, and federal requirements.
  - **Areas of Concurrency**
    - Refine Design Summary Report or develop scoping tool to address bike/ped needs based on context
    - Continue to incorporate bicycle and pedestrian criteria into Project Safety Scoring Tool

**DESIGN CONCEPTS**
- Design criteria, roadway section, and pavement design are developed and further refined through a Preliminary Design Concept Conference (PDCC) and Design Concept Conference (DCC).
  - **Areas of Concurrency**
    - Develop informational handout to strengthen involvement of bike/ped stakeholders in PDCC and DCC

**TRAFFIC CONTROL PLANS**
- Contractors must provide temporary accommodations for roadway users during project construction.
  - **Areas of Concurrency**
    - Refine requirements to better incorporate temporary bike/ped facilities (detours) in traffic control plans

**BEST OPPORTUNITY FOR BIKE/PED INCORPORATION**

**PROJECT INITIATION AND PLANNING**

**PRELIMINARY ENGINEERING**

**FINAL DESIGN/ PLANS, SPECIFICATIONS, AND ESTIMATES (PS&E)**

**LETTING**

**CONSTRUCTION**

**CONSULTANT PROCUREMENT**
- TxDOT procures private sector partners to assist in planning, designing, and constructing projects.
  - **Areas of Concurrency**
    - Update standard contract to ensure context-appropriate bike/ped accommodation and allow for design flexibility
    - Assess bike and ped consultant qualifications separately

**COMPLIANCE WITH PLANNING AND PROGRAMMING**
- Projects are integrated with various local, regional, and statewide plans.
  - **Areas of Concurrency**
    - Create state-level clearinghouse of bike/ped transportation plans
    - Formalize bike/ped performance measures as part of department project scoring and selection processes (e.g. Decision Lens)

**PUBLIC INVOLVEMENT**
- Public meetings are required for certain environmental documents and for certain projects that impact vehicular traffic patterns.
  - Also, an annual opportunity for a public hearing is required to discuss District projects and programs related to bike use.
  - **Areas of Concurrency**
    - Refine comment response process to better document bike/ped needs
    - Develop guidance and awareness for annual District bike meeting/hearing

**GUIDANCE/TRAINING IMPROVEMENTS**
- District-level staff determine project scope, bicycle and pedestrian modal needs, and incorporate these into project designs. Design engineers refer to TxDOT’s Roadway Design Manual and AASHTO Guide to the Development of Bicycle Facilities for bikeway design standards.
  - **Areas of Concurrency**
    - Standardize bikeway design guidance so TxDOT engineers refer to one source
    - Refine existing or create new TxDOT training classes
    - Develop District-level bike/ped design engineering subject matter expertise
Better data is needed to better accommodate bicyclists & pedestrians

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Better decision-making requires good data

Safety
▪ Exposure for crash rates
▪ Behavior (contra-flow riding)

Planning
▪ Demand estimation
▪ Travel patterns

Design
▪ Facility type and design
▪ Barriers
▪ High activity areas

Performance Measurement
▪ Before and after studies
▪ Long-term trends from areawide improvements
▪ Mode shift

Understand problems
Anticipate future needs
Identify solutions
Track trends

We need to know about bicycle and pedestrian usage on our roadways.
Working to resolve the data gap for bicyclists and pedestrians...

- Texas Bicycle and Pedestrian Count Exchange
  - Planned data integration with TPP in STARS III
- Crowdsourced bicycle data (StravaMetro)
- Counter equipment loan program
- Data collection and analysis guidance
- Upcoming training in spring 2020
Thank you!

Bonnie Sherman, AICP
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Questions?
Why Should I Collect Bicyclist and Pedestrian Count Data?

Possible uses for count data:

- Measuring Facility Usage
- Monitoring Travel Patterns
  - Developing Extrapolation Factors (expand short-duration counts)
  - Evaluating User Behavior Patterns
- Evaluating Before-and-After Volumes
- Project Prioritization
- Visitor Usage
- Site Evaluation
- Multimodal Model Development
- Public Health Surveillance
- Safety Analysis
  - Quantifying Exposure
  - Identifying Before-and-After Safety Effects
  - Countermeasure evaluation
  - Safety Performance Measures
  - Network Screening, Areawide & Facility Specific
Pre- and post-construction

Corpus Christi MPO

- Pre- and post-construction bike counts for projects around the area.
- Data collection separates anecdotal information from the facts.

http://www.coastalbendinmotion.org/counts.html
North Central Texas Council of Governments (NCTCOG)

- Annual benchmarking count report
- Data about actual non-motorized travel volumes helps:
  - Inform the public and decision makers about actual usage and travel patterns
  - Evaluate the impacts of specific projects (before and after) with mobile counts
  - Analyze trends

Design Considerations

TxDOT Houston District
- New right-turn lane for property development
- Strava Metro Data shows 1,069 cyclists during 2016-2017
- Integrated bike lane treatment

Systemic Approach to Safety Improvements

TxDOT
- Risk factor evaluation of signalized intersections
- The proportion of pedestrian crashes as a function of pedestrian volume level
- As pedestrian volume increases, more pedestrian crashes occur at intersections.

![Bar chart showing the proportion of pedestrian crashes by pedestrian volume level.]

*Figure 3-16. Proportion of Pedestrian Crashes by Pedestrian Volume (Signalized Intersection)*

Source: Systemic Approach to Pedestrian Safety Improvement, TxDOT Project 58-7XXIA001, 2017
Project Selection

Houston-Galveston Area Council (HGAC)
- TxDOT Houston District response to HGAC TIP call for projects
- Selection based on the benefit-cost ratio (safety and reduction of SOV)
- Estimate of non-motorized users per project required

Alliance for Biking and Walking
- Compare areas or facilities to find over represented locations

Figure 2. Example of Pedestrian Fatality Risk in 50 Cities
Collecting Bicyclist and Pedestrian Count Data

Shawn Turner, TTI
Traffic Monitoring Fundamentals

- Can’t count everywhere all the time, so we must sample
  1. Continuous counts at permanent locations
     - Collect 365 days of data at representative locations
     - TEMPORAL COVERAGE
  2. Short-duration counts with portable equipment
     - Collect 7-14 days of data at many more locations
     - SPATIAL COVERAGE
  3. NEW: Crowdsourced / Big Data

- Data uses affect approach
  - Citywide activity
  - Before-and-after at selected sites
Continuous counts at representative locations in 3 pattern groups:

1. Commuting to work/school routes
2. Recreational/utilitarian routes
3. Hybrid/mix of commuting and recreation

FHWA TMG recommends 3-5 permanent locations in each group

Phased approach
- Not all 9-15 permanent locations at once

Use short-duration counts
- Test/confirm ideal permanent site

Plan for long-term maintenance
- E.g., batteries, cleaning, modem fees
Short-duration counts with portable equipment

- Available resources usually determine how long and how many sites

- What is short-duration?
  - Automated equipment: min. 7 days, preferred 14 days
  - Manual counts: minimum 4 hours, preferred 12 hours

- How many sites?
  - Depends mostly on data uses
  - 30 locations per traffic pattern group, but often less

- Coordinate among multiple agencies, pool resources
  - Parks & recreation
  - Utility/waterway districts
  - Commercial/business districts
  - Ped/bike counts as part of motor vehicle special counts
Short-duration site selection

- First decision – intersection vs. screenline counts
- Intersection more complicated, different collection equipment
- Based on planned data uses

- Intersection counts
  - Safety and conflicts
  - Detail of turning movements

- Screenline counts
  - Overall activity levels
  - Big picture corridor movement

Source: NCHRP Report 797
Short-duration site selection

- Typically focused on certain types of locations, not random
  - Planned improvements
  - Moderate to high activity levels (also growth potential)
  - Area and land use types
    - Commercial
    - Residential
    - Mixed use
    - Recreational
  - Bicyclist/pedestrian facility types
- Typically “more art than science”
Short-duration site selection

- Not just the highest-volume locations (unless that is your goal)
- Interplay between sites and technology – one affects the other
- Counter positioning (especially automatic counters):
  - READ THE MANUAL!
  - Where flow always moving – no pacing or waiting areas
  - Where flow likely to be single file – prevent occlusion
  - Bicyclists on sidewalks or against traffic
# Bicyclist and Pedestrian Counting Technology

## 1. What Are You Counting?

<table>
<thead>
<tr>
<th>Technology</th>
<th>Bicyclists Only</th>
<th>Pedestrians Only</th>
<th>Pedestrians &amp; Bicyclist Combined</th>
<th>Pedestrians &amp; Bicyclist Separately</th>
<th>Cost</th>
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<tbody>
<tr>
<td><strong>Permanent</strong></td>
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<tr>
<td>Inductance Loops(^1)</td>
<td>●</td>
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<td>Magnetometer(^2)</td>
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<td>Pressure Sensor(^2)</td>
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<td>Radar Sensor</td>
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<td>Seismic Sensor</td>
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<tr>
<td>Video Imaging: Automated</td>
<td>○</td>
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<tr>
<td>Infrared Sensor (Active or Passive)</td>
<td>○(^3)</td>
<td>●</td>
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<td>Pneumatic Tubes</td>
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<td>Video Imaging: Manual</td>
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<tr>
<td>Manual Observers</td>
<td>●</td>
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- ○ Indicates what is technologically possible.
- ● Indicates a common practice.
- ○ Indicates a common practice, but must be combined with another technology to classify pedestrians and bicyclists separately.
- $, $-$, $-$-$-$: Indicates relative cost per data point.

\(^1\) Typically requires a unique loop configuration separate from motor vehicle loops, especially in a traffic lane shared by bicyclists and motor vehicles.

\(^2\) Permanent installation is typical for asphalt or concrete pavements; temporary installation is possible for unpaved, natural surface trails.

\(^3\) Requires specific mounting configuration to avoid counting cars in main traffic lanes or counting pedestrians on the sidewalk.
Common pedestrian counting technology

- **Infrared**
  - Most common automated tech
  - Several vendors
  - Passive vs. active infrared
  - Occlusion (blocking) a problem, overcome with overhead mount

- **Video**
  - Also common, several vendors
  - Manual vs. automatic reduction
  - Capture pedestrian behavior and demographics

- **Manual (human observer)**
  - Clipboard or tablet computer
  - Simple and low-tech
  - Limited to short time intervals
Common bicyclist counting technology

- **Inductance loops**
  - Most common (permanent)
  - Specific loop shapes
  - Requires pavement cuts

- **Pneumatic tubes**
  - Most common (portable)
  - Specific tube size
  - Hazard issues

- **Video**
  - Common (esp. intersections)
  - Capture behavior

- **Manual**
  - Use in complex situations
  - Limited to short time intervals
Emerging video analytics

Intersection signal system analytics

Other video system analytics
Counter equipment loan program

- Portable equipment for loan:
  - 10 infrared counters
  - 8 pneumatic tube counters (bikes)

- Available for:
  - TxDOT districts
  - Local agencies
  - Others as available
Seasonal variation and adjustment

Pedestrian and Bicyclist Monthly Activity Levels in Texas (17 permanent locations)

Annual average for that month

Typical non-motorized data collection in Texas: March through October
Monthly adjustment factors

Pedestrian and Bicyclist Month-of-Year Count Adjustment Factors in Texas

Annual Average = 300 X 87% = 261

Annual Average = 200 X 109% = 218

Daily ped count of 300 in April

Daily bike count of 200 in Nov

Typical non-motorized data collection in Texas: March through October
Crowdsourced data

- Crowdsourced = location of a person walking or biking
- Strava Metro – user-prompted data collection (active)
- StreetLight Data and others – background data collection (passive)

- TxDOT licensed 4 years of statewide Strava Metro
  - 2016-2019
- Local entities have free access through sublicense
- New online analytic interface!
Expanding Strava samples to estimate total bicyclists

- Different Strava sample rates on different types of routes
  - Non-recreational routes: <1% of all bicyclists
  - Highly recreational routes: 50%+ of all bicyclists

- Estimate total bicyclists based on readily-available and most influential prediction variables:
  - Open Street map (OSM) functional road class
  - High-income households
  - 30% mean absolute error, \( R^2 = 70\% \)
For more information

- TxDOT 6927 Reports, 2018-2019

- PBIC Infobrief, 2018

  - [https://www.fhwa.dot.gov/policyinformation/tmguide/](https://www.fhwa.dot.gov/policyinformation/tmguide/)

- NCHRP Report 797, 2014
  - [http://www.trb.org/Main/Blurbs/171973.aspx](http://www.trb.org/Main/Blurbs/171973.aspx)
Summarizing, Reporting, Visualizing Your Data

Phil Lasley, TTI
The issue with collected data

- Collected data often go unused.
  - No organization of the data.
  - No validation or quality control.
  - No aggregation or analysis into usable statistics.
  - No general reporting mechanism.
  - No means to easily collect and share data to others.

_All these weaken the effort to make meaningful decisions with the data._
Now that you have data, how do you get it into a usable form?

The Texas Bicycle & Pedestrian Count Exchange (BP|CX)

- Collaborative tool maintained by TxDOT with data contributed by multiple local partners.
- Provides a publicly-viewable platform that consolidates and standardizes biking and walking count data.
- Tracks active transportation growth in Texas to justify greater infrastructure investment.
- Integrates with other TxDOT planning maps and tools (future).
- Builds a robust dataset to support research and analysis, such as exposure estimates, crowd-sourced data validation, and performance measures.
Live Demo of the BP | CX
Future improvements in the works

- In the works this year:
  - Apply and annotate factors to your data.
  - View AADNMT counts in the public view.
  - Create custom reports (we need your input!)
  - Improve system performance to speed load times.
  - On-board and train local contributors to QA/QC data.

- In the future:
  - Use AI to automate most of the QC process.
  - Improve data management tools.
  - Implement user-suggested improvements.
Why should you upload your data to the BP|CX?

- Access to data quality review tools.
- Access to data summary and visualization tools.
- Access to seasonal adjustment factors and tools (in future).
- Ability to coordinate with other local agencies for count locations.
- Ability to download datasets from peer cities to establish benchmarks.
- Ability to easily share your data with decision-makers, colleagues, and the public.
- Ability to embed interface on local webpages.
- Demonstrate increased bicycling and walking in your community to support active transportation investments.
- If desired, contributing to a statewide submission of bicycle and pedestrian count data to FHWA’s Travel Monitoring System (TMAS).
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