

Identifying Barriers to Understanding Pedestrian and Bicycle Safety Laws: Best Practices Report

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Introduction

Pedestrians and bicyclists are at a disadvantage in crashes because they have no protection (e.g., a roll cage and seat belt). In 2018, the proportion of people killed outside a vehicle (e.g., pedestrians, bicyclists, motorcyclists, and other nonoccupants) increased to 34 percent nationally (National Highway Traffic Safety Administration [NHTSA], 2019). In 2018, 6,283 pedestrians and 857 bicyclists were killed in motor vehicle crashes (NHTSA, 2019). In 2018, Texas had 2,052 fatal and suspected serious injury pedestrian and bicycle crashes, comprising 13 percent of all fatal and suspected serious injury crashes (Texas A&M Transportation Institute, 2019).

To address these injuries and crashes, the Texas Transportation Code includes many statutes designed to protect bicyclists and pedestrians. However, many people are not aware of the laws. A previously conducted focus group found that many did not understand the language used in the transportation code and found the laws to be intimidating and hard to follow (Trueblood, 2019). Another challenge identified was how to find the laws that apply to them as a user of the roadway system (Trueblood, 2019).

The overall purpose of the project Identifying Barriers to Understanding Pedestrian and Bicycle Safety Laws is to better understand the existing barriers to the public's understanding of pedestrian and bicycle safety laws, to research solutions and best practices, and to develop educational materials to increase awareness of these laws in Texas for bicyclists, pedestrians, and motorists.

This document is a best practices guide on how to make education on pedestrian and bicycle safety laws accessible to the general public. This report uses the results of a survey of Texans, focus groups of stakeholders, a literature review, and other past research to provide a guide for successful and effective education on pedestrian and bicycle safety laws.

Background

Texas Laws

At the state level, the Texas Transportation Code provides the regulations on all forms of transportation, including pedestrians and bicyclists. These laws regulate behavior, signage, traffic control, and right of way, and also provide definitions, all of which form the basis for how traffic safety for all road users is enforced. This guide provides a brief overview of some of the common laws regarding pedestrian and bicycle safety, including regulations motor vehicle drivers must follow when encountering a pedestrian or bicyclist.

Definitions

First, important terms are defined. All definitions come from the Texas Transportation Code (Texas Constitution and Statutes, 2020). All statute references are available at <https://statutes.capitol.texas.gov/>. The specific section numbers are referenced in parentheses.

- **Crosswalks**, according to the Texas Transportation Code (Sec. 541.302), are defined as:

(A) the portion of a roadway, including an intersection, designated as a pedestrian crossing by surface markings, including lines; or

(B) the portion of a roadway at an intersection that is within the connections of the lateral lines of the sidewalks on opposite sides of the highway measured from the curbs or, in the absence of curbs, from the edges of the traversable roadway.

Therefore, a crosswalk exists (marked or unmarked) at an intersection—regardless of whether a paved sidewalk exists—where the lateral lines of the sidewalk extend across the roadway. This means that all four-way intersections have a crosswalk even if it is not marked with lines.

- **Right of way**, according to the Texas Transportation Code (Sec. 541.401), is defined as:

The right of one vehicle or pedestrian to proceed in a lawful manner in preference to another vehicle or pedestrian that is approaching from a direction, at a speed, and within a proximity that could cause a collision unless one grants precedence to the other.

This means that:

- To yield is to give way, letting others go first.
- Road users include motor vehicles, bicyclists, pedestrians, and others.
- Traffic control devices (e.g., signals, signs, and markings) tell the road user how to behave and indicate who has the right of way.

These definitions help lay the groundwork for understanding the rest of the laws applying to bicycle and pedestrian safety.

Pedestrians

This section discusses some common laws regarding pedestrians. Right of way at signalized intersections is dictated by a separate pedestrian signal, if equipped (Sec. 552.002). Pedestrians are required to follow the pedestrian signals and cross only on the walk signal. Pedestrians should not enter the crosswalk when it says “DON’T WALK” or “WAIT” or when the red hand is lit or flashing. If no pedestrian signals are present or in operation, pedestrians should cross a street when the traffic signal light is green in their direction of travel.

At all four-way intersections not controlled by a traffic signal, pedestrians have the right of way, even at intersections with stop control only in one direction (Sec. 552.003). However, when crossing the road at a point other than a four-way intersection or marked crosswalk, pedestrians must yield the right of way to all vehicles (Sec. 552.005). It is illegal for a pedestrian to cross a road between two adjacent intersections where traffic control signals are in use (Sec. 552.005). Pedestrians are also required to use a sidewalk if one is provided (Sec. 552.006), and if there is no sidewalk, they must walk on the left side of the road facing traffic (Sec. 552.006).

Bicyclists

Bicycles are considered vehicles under the Texas Transportation Code (Sec. 551.351). Therefore, they must obey the same rules and regulations as motor vehicle operators. This includes stopping at stop signs and red lights, signaling (with hand signals) when turning or changing lanes, riding with the flow of traffic, and riding in the main travel lane (Sec. 551.101-107). When riding at night, they are also required to have a white light in the front and a red light or reflector in the rear (Sec. 551.104).

Motorists

This section provides some common laws to keep in mind for motorists when interacting with pedestrians and/or bicyclists. Motorists must be aware of the right-of-way laws when interacting with pedestrians and bicyclists. Motorists must yield to pedestrians at a traffic signal that has a walk signal or (in the absence of pedestrian signals) are crossing with a green light in their direction of travel (Sec. 552.001-002). This also means turning motorists with a green light must yield to pedestrians that are crossing the street on their left and right, unless a green turn arrow is lit. Motorists are also required to yield to pedestrians at all four-way intersections not controlled by a traffic signal, even at intersections with stop control only in one direction, and to yield to pedestrians who are in a marked crosswalk that is not at an intersection (Sec. 552.003).

Some other important laws that affect the safety of all road users, including pedestrians and bicyclists, include distracted driving, impaired (drunk or drugged) driving, and speeding. Texas does have a statewide texting ban (Sec. 545.4251), impaired driving laws (Texas Penal Code, 49.04), and speeding laws (Sec. 545.351-365).

Other Regulations

Some cities may have additional local ordinances regarding pedestrian and bicycle safety, so check your local regulations. Common ordinances include safe passing laws indicating the distance motor vehicles must maintain between the vehicle and a bicyclist (and in some cases a pedestrian). This is usually 3 feet for passenger vehicles and 6 feet for larger commercial vehicles. Other local ordinances could include regulation of riding on sidewalks, helmet use while riding a bike, prohibition of pedestrians or bicyclists on certain roadways, and even cell phone use.

Sources of Data

This section reviews data sources that are available for city, county, and state governments, agencies, and local outreach organizations to address pedestrian and bicycle safety education and outreach in ways specific to their scope and context.

Current Project Data Sources

The current project included three tasks to better understand barriers to understanding pedestrian and bicycle safety laws, including:

- A survey.
- Focus groups.
- A literature review.

This section summarizes some of the key findings from these tasks.

Survey of Texans

The project team conducted a survey to gather information on walkers and bikers in Texas as well as to identify ways to improve their safety and knowledge of laws. Some of the more noteworthy findings are:

- 3 in 10 respondents said they “very often” or “always” cross the street at a point other than a crosswalk or intersection. This was reported more often by those that walk more frequently.
- 1 in 5 respondents reported walking after drinking. This was reported more often by younger respondents and male respondents.
- A lack of sidewalks was identified as a barrier to walking more often.
- Driver behavior and lack of/maintenance of infrastructure were obstacles to biking more often.
- Those who reported biking more often also reported following the laws more often.
- Motorists reported yielding to pedestrians less often at mid-block crosswalks than at intersections.
- Respondents thought they knew laws pertaining to pedestrian and bicycle safety, but the knowledge quiz found that this was not necessarily the case:
 - Only 31 percent correctly said that pedestrians do not always have the right of way.
 - Only 15 percent correctly answered about when a motorist is required to yield to pedestrians.

Focus Groups

The project team conducted two focus groups of pedestrian and bicycle safety stakeholders designed to identify barriers to understanding and following pedestrian and bicycle laws, and recommendations for local jurisdictions and outreach organizations to promote pedestrian and bicycle laws.

The main findings from the focus groups with stakeholders are:

- The built environment, as it pertains to pedestrians and bicyclists, is a very big concern for many stakeholders in Texas.
 - Creating a safer space to walk and ride was recommended.
 - Improving infrastructure can make it easier for all road users to follow the laws.

- There is a need for everyone to follow the rules of the road and for those laws to be enforced.
 - Education on laws is important and is sometimes done during enforcement.
 - Education needs to be relatable, accessible, and easy to understand.
- Education needs to reach people where they are.
 - Examples included using social media, leveraging existing events and outreach avenues, involving local leaders, and increasing signage/information.

Literature Review

The project team conducted a literature review designed to identify national and international educational campaigns focused on increasing awareness of pedestrian and bicycle safety laws. The review was focused on:

- Current materials that exist for promoting bicycle and pedestrian safety laws.
- Measures of effectiveness.
- Educational methods used.

There are many resources and a variety of ways to disseminate this information. Some of the mediums for sharing information include print materials, online content, video, social media, public service messages (PSAs), events, workshops, lectures, and educational curricula. There are also several examples of combining one or more of these approaches to increase efficacy.

One of the next steps is finding ways to make this information easily accessible to the general public. Currently, resources are often buried on webpages that are not easily accessible, and the materials may still be written in a way that the laws are difficult to comprehend.

Some resources are more focused on engagement with the walking or biking community than with actual education on laws or best practices, while others very specifically focus on the safety of road users and attempt to improve behavior. Many of these resources address behaviors associated with laws but do not specifically educate about laws. In addition, many of the law-specific materials simply list existing statutes but do not show how the statutes translate to behaviors. Future research and campaigns should explore designing educational materials around behaviors associated with laws. For example, campaigns could show where a motorist is required to yield to pedestrians.

While it can be hard to measure how much a message or change in behavior has impacted a specific area or group of people, most of the literature reviewed provided some measurement to help evaluate efforts. Some of these measures included easily quantifiable outcomes such as crash analyses showing a reduction in crashes or injuries, or testing showing increased knowledge in a controlled group of participants. However, sometimes surrogate measures such as observational data, community reach measured by distribution of materials, or online/social media following can tell something about the broader reach and appeal of a campaign or message.

One thing identified in the international approach (more specifically, in Europe) to pedestrian and bicycle safety is an integration of these road users into the broader traffic safety

conversation. Safety for pedestrians and bicyclists is more inherent in the culture and therefore approached in a different manner. This supports that the culture of the specific target area of a campaign should always be considered. Individuals designing and implementing campaigns should be aware of the current culture surrounding the topic area and take into consideration that the culture may vary geographically and among subpopulations. Broader safety culture changes may provide the largest safety benefit across all modes.

More Information

The findings from the survey, focus groups, and literature review provide useful information that can help with all aspects of education on pedestrian and bicycle safety laws, as well as potential target audiences. The full findings and methodology of these tasks are available from Amber Trueblood (a-trueblood@tti.tamu.edu) or Neal Johnson (neal-johnson@tti.tamu.edu).

Other Sources

Other sources of data can also help identify the specific issues that a state, county, city, or community might be dealing with when it comes to pedestrian and bicycle safety. This section provides some suggested sources of data that will help with any campaign to educate on pedestrian and bicycle safety laws.

Transportation-Related Data

Crash Data

Crash data can help determine specific locations (intersections or corridors) that have a high prevalence of pedestrian or bicycle crashes, areas that have clusters or hot spots, or places where more serious or fatal incidents are occurring. Crash data contain information reported by the investigating law enforcement officers, interpreted data assigned based on the review of the officer reports, and assigned data based on the systematic locating of crashes.

The data can be classified as:

- **Crash-level data**, related to the overall crash (e.g., time, location, roadway characteristics, weather, lighting, and crash severity).
- **Unit-level data**, related to the different units (e.g., motor vehicle, pedestrian, bicyclist, and motorized conveyance) involved in the crash (e.g., vehicle description, ownership, and contributing factors/actions related to the unit operator).
- **Person-level data**, related to the individuals involved in a crash (e.g., demographics, injury severity, impairment, and license).

Crash data are typically only collected for reportable crashes. In Texas, reportable crashes are those occurring on a public roadway that involve at least one vehicle in transport that either results in an injury or fatality, or property damage greater than \$1,000 (Texas Department of Transportation, 2019). The following briefly describes the available crash data for Texas jurisdictions and stakeholders.

Texas Department of Transportation Crash Records Information System

The Texas Department of Transportation (TxDOT) Crash Records Information System (CRIS) is available in multiple formats to meet the needs of individuals—from those with little to no data analysis experience to experienced statisticians. The simplest is the TxDOT Crash Query Tool, which allows users to run defined queries or build their own (TxDOT, 2020b). In addition to the query function, TxDOT provides crash data in spreadsheets that can be used for more in-depth analyses (TxDOT, 2020a). TxDOT has public extracts that do not include identifiable information, as well as standard extracts that include identifiable information.

More information on crash data and how to obtain crash extracts is available at <https://www.txdot.gov/government/enforcement/data-access.html>. If users have questions about the Crash Query Tool or extracts, TxDOT provides a help desk at (844) 274-7457 or support@crishlp.com. TxDOT also publishes motor vehicle crash statistics annually that can be obtained by county and city from 2003 to 2019 (TxDOT, 2020c). These reports are available at <https://www.txdot.gov/government/enforcement/annual-summary.html>.

National Highway Traffic Safety Administration

Fatality Analysis Reporting System

The NHTSA Fatality Analysis Reporting System (FARS) provides a nationwide count of fatal crashes and injuries (NHTSA, 2020b). Similar to TxDOT CRIS data, FARS data can be obtained through a query tool or through raw data extracts.

More information on how to obtain these crash data is available at <https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars>. The Fatality and Injury Reporting System Tool (FIRST) query page allows for crash data to be filtered to a specific state or NHTSA region (NHTSA, 2020c).

Crash Report Sampling System

The NHTSA Crash Report Sampling System (CRSS) is a sample of crashes across the United States (NHTSA, 2020a). CRSS data are designed to estimate overall crash patterns for the United States. CRSS data are also available on the FIRST tool or through extract files.

Information on CRSS is available at <https://www.nhtsa.gov/crash-data-systems/crash-report-sampling-system>.

Highway Statistics

The Federal Highway Administration (FHWA) provides the Highway Statistics Series, which includes information on registrations, licenses, and mileage traveled, which can be helpful to understanding roadway characteristics (FHWA, 2020a). In addition, vehicle miles traveled data can be useful when trying to calculate crash rates.

More information is available at <https://www.fhwa.dot.gov/policyinformation/statistics.cfm>. FHWA provides monthly reports that have hourly traffic count data, which can be obtained for regions or states (FHWA, 2020b). More information is available at https://www.fhwa.dot.gov/policyinformation/travel_monitoring/tvt.cfm.

Hospital/Emergency Room Data

This type of data can go beyond what crash data tell us since crash data are typically only for reportable crashes and do not tell us specific information about the type of injuries sustained. Through billing codes (ICD-10 codes) injuries involving pedestrians can be identified and used to explore injuries and their associated costs. In addition, these data allow the data user to identify pedestrian and bicycle injuries that were not reported or did not involve a motor vehicle (e.g., hit a stationary object, bicycle hit another bicycle, or pedestrian hit by a bicycle).

The Texas Department of State Health Services Texas Health Care Information Collection (THCIC) collects data on hospitals, including inpatient and outpatient hospital discharges, as well as emergency department visits (Texas Department of State Health Services, n.d.). This information is available as public data files that are readily available or as research data files that must be requested and paid for. Public data files do not include any personally identifiable information. More information on THCIC data is available at <https://dshs.texas.gov/thcic/>.

Citation Data

Citation data can identify the common types of citations in a specific jurisdiction to identify what violations are more prevalent and to track an increase or decrease in specific citations. If these data are correlated to location, they can also identify areas where specific citations have typically been issued. Linking this information to crash and injury data can also indicate specific areas where enforcement of specific laws can be emphasized.

At this time, there is no statewide citation system, but citation data can be obtained through partnerships with local law enforcement agencies or local courts. If citation data are not available for a local jurisdiction, surveying or having discussions with law enforcement officers could provide insight into leading violations that should be addressed through education efforts.

Household Travel Surveys

The National Household Travel Survey conducted by FHWA provides behavior information for all travel modes, which includes user characteristics (FHWA, n.d.).

In addition, TxDOT conducts regional travel surveys every 10 years designed to help planning organizations (TxDOT, 2020d). Texas survey reports are available at <https://www.txdot.gov/inside-txdot/division/transportation-planning/travel-survey.html>. Table 1 provides links to identified local travel surveys.

Table 1. Available Texas Travel Survey Data.

Organization	Location	Link
North Central Texas Council of Governments	Dallas-Fort Worth	https://www.nctcog.org/trans/data/info/travel-surveys/2020-transit-survey
National Renewable Energy Laboratory (NREL)	Abilene	https://www.nrel.gov/transportation/secure-transportation-data/tsdc-texas-regional-travel-surveys.html
NREL	Austin	
NREL	San Antonio	
NREL	El Paso	
NREL	Houston/Galveston	
NREL	Wichita Falls	

Behavioral Data

Behavioral data provide a look into the actual behavior of road users, not just the behaviors that people were cited for or the behavior of those that were injured or killed in a crash. Behavioral data can describe specific behaviors and/or specific road users. These data can be especially useful when the behavior being looked at is associated with a specific law. For example, how many pedestrians follow pedestrian signals, how many bicyclists are stopping at stop signs and red lights, or how many drivers are yielding to pedestrians at crosswalks?

Behavioral data are typically collected from observational studies or surveys of self-reported behavior. You can find this type of data in published research articles and reports, or by inquiring with transportation research agencies. The Texas A&M Transportation Institute has some pedestrian and bicycle behavioral data from different research projects, available from Neal Johnson (neal-johnson@tti.tamu.edu).

Population Data

It is important to understand your population, including population size and demographics. Population size can assist in calculating rates by population or vehicle miles traveled, as well as in identifying areas of concern based on where your population is located. Understanding the demographics (e.g., age, sex, education, and language spoken) in your area can also assist as you develop educational materials.

Multiple sources provide information on population size and demographics, including:

- **The Texas Demographic Center.** The Texas Demographic Center provides population estimates by county and other locations (Texas Demographic Center, 2020). More information is available at <https://demographics.texas.gov/>.
- **The U.S. Census Bureau.** The U.S. Census Bureau has a great deal of information on populations throughout the United States. Topics include education, employment, living arrangements, health, housing, income/poverty, and demographics (U.S. Census Bureau, 2020). Census data are available at multiple geographic levels, including state, county, census tract, block, school districts, and zip code tabulation areas (U.S. Census Bureau, 2020). More information is available at <https://data.census.gov/>.

Five Steps to Educating on Pedestrian and Bicycle Safety Laws

The following five steps discuss how the data resources identified can be used for educating the public on pedestrian and bicycle safety laws:

1. Define the problem.
2. Identify the target audience(s).
3. Identify and involve stakeholders.
4. Determine messaging.
5. Evaluate.

Step 1: Define the Problem: What Do the Data Say?

When developing educational materials, it is important to understand the problem in your area, as well as the populations impacted. Some important pieces of information came from the survey and focus groups that can help you define the problem in your area.

The survey of Texans showed some general areas of focus for education, such as pedestrians crossing outside a crosswalk, a lack of sidewalks in some areas, and an overall low level of knowledge of pedestrian and bicycle safety laws. The focus groups that were held with stakeholders provided some insights into this as well, such as looking at the transportation system holistically and considering the built environment that people walking and biking need to navigate. Focus group participants also suggested using a targeted approach. For example, when a city is looking at what specific pedestrian and bicycle safety laws to educate the public on, it is important to know what the issues are for that specific location. It might be helpful to conduct a survey or a focus group at the local level to find out what specific issues are needed to be addressed in your community.

In terms of other data, crash data are helpful to define the problem by showing where crashes are happening and to identify specific issues to be addressed. Hospital/emergency data can also detail the types of injuries that are being seen. The behavioral data can describe specific behaviors that may be of concern and possibly even point to specific laws that can be a focus of enforcement efforts. Enforcement can also be targeted through citation data. Population data can be a tool to understand where your population is living. These sources can often be linked to show even more information such as crash data linked to population data to show where crashes are happening in relation to where your population lives.

Once these data have been gathered and analyzed, they can help determine what bicycle and pedestrian safety laws would be most beneficial to focus on in terms of education and outreach, which can also include enforcement as a means of education.

Step 2: Identify Target Audience(s)

The next step is to determine target audience(s) for the messages and how to reach them. One of the findings from the focus groups was the need to target education on pedestrian and bicycle laws to the group(s) that will most benefit from the information.

The data sources mentioned previously can help you determine your target audience(s). Crash data can often be broken down by demographic groups and can often lead to a specific demographic that emerges as a focus (e.g., males under 30). Citation data can let you know who is receiving citations for specific offenses to further focus efforts. Behavioral data are also often broken down by demographic groups and may lead to similar target audiences or maybe even a specific subgroup (e.g., males under 30 who walk/run for exercise often).

In addition, it is also important to know how to reach your target audience. For example, education about laws delivered to a group of bicycle riders will be very different from that delivered to drivers. Reaching the under 30-year-old demographic will require different approaches than reaching those over 65. So, it is important to know the demographic you are trying to reach and how they consume their information. Surveys and focus groups are a great way to ask your target audience how you can best reach them and what mediums they prefer.

Step 3: Identify and Involve Stakeholders

When it comes to addressing pedestrian and bicycle safety, oftentimes other stakeholders are also interested or involved in efforts to promote laws to increase safety for these vulnerable users. Additionally, some groups may not currently be involved in efforts but see the collective interest in joining such a movement. Getting the involvement and endorsement of local leaders and businesses was a suggestion that came out of the focus groups.

Some common stakeholders to consider include:

- Academics or researchers.
- Bicycle and/or pedestrian advisory boards or committees.
- Bicycle and/or pedestrian advocacy organizations.
- Bicycle riding groups.
- Bicycle shops.
- Downtown business associations.
- Local chambers of commerce.
- Local community organizations.
- Local hospitals.
- Metropolitan planning organizations.
- Social media groups.
- Public health agencies.
- Tourism groups.
- Transportation departments.
- Transit agencies.
- Walking groups.

Collaboration with these stakeholders can help expand the reach of your messaging and possibly provide a direct connection to your target audience(s). Also keep in mind your target audience when choosing stakeholders. A bicycle shop is a great stakeholder to partner with for outreach to bicyclists but not if your target audience is drivers.

Step 4: Determine Messaging

Now that you know what pedestrian and bicycle safety laws you are focusing on, who you are targeting the message to, and what other stakeholders you can include in your messaging strategy, it is time to tailor the message.

In the survey, roadway signs, media campaigns, and driver's education curricula were the most common ways respondents cited they would recommend for educating Texans on pedestrian and bicycle laws. In the focus groups, participants also mentioned driver's education curricula, brochures, and social media, as well as coordinating educational efforts with other partners and making sure that any effort is consistent and ongoing.

The literature review identified several methods for educating the public on pedestrian and bicycle laws. These include PSAs, print materials, online/social media, public outreach with increased enforcement, events, workshops, lectures, and educational curricula.

Step 5: Evaluate

An important part of any educational efforts on laws is to determine if the effort was a success. Some ways to evaluate effectiveness mentioned in the literature review include reduction in crashes, observational data or other surrogate measures, surveys, focus groups, knowledge-based testing, and the amount of material or media distributed. The literature review provides more details and examples of how these evaluation methods work.

Summary

This guide provides best practices on developing and conducting educational efforts focused on pedestrian and bicycle safety laws. The ultimate goal is to make these laws accessible to the general public. Key steps include:

- Step 1: Define the problem.
- Step 2: Identify target audience(s)
- Step 3: Identify and involve stakeholders.
- Step 4: Determine messaging.
- Step 5: Evaluate.

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