THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

Evaluating Safety and Economic Impacts of Texas Travel Information Centers

Mike Murphy
Zhe Han
Nan Jiang
Darren Hazlett
Ahmed Samiel Ahsan
Austin Cooper
Carolina Baumanis
Zhanmin Zhang
Randy Machemehl
Robert Harrison

Report Version Date:	October 12, 2018
Project Title:	Evaluating Safety and Economic Impacts of Texas Travel Information Centers
Sponsoring Agency:	Texas Department of Transportation
Performing Agency:	Center for Transportation Research at The University of Texas at Austin

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Acknowledgments

The authors express appreciation to the TxDOT Travel Information Division staff that participated in the workshop and individual travel counselor interviews, and also helped the team in their visits to several Travel Information Centers.

List of Acronyms and Abbreviations

CMV	Commercial Motor Vehicle
CRIS	Crash Records Information System – a crash database maintained by TxDOT
CR-3	Crash Record – law enforcement officer crash record report filled out at the crash site. The data from CR-3 reports are used to create the CRIS database.
CTR	The University of Texas at Austin's Center for Transportation Research
SRA	Safety Rest Area
TIC	Travel Information Center
TRV	TxDOT's Travel Information Division
TxDOT	Texas Department of Transportation
VIC	Visitor Information Center
WC	Welcome Center

Table of Contents

Executive Summary 1
Study Objectives 1
Conclusions 1
Recommendations 2
Chapter 1. Background and Introduction 3
1.1. Background 3
1.2. Study Framework 4
1.3. Organization of the Report 5
Chapter 2. Literature Review 8
2.1. Definition and Scope of TICs 8
2.1.1. Drowsy Driving in Texas 9
2.2. Texas TICs 10
2.2.1. General Information 10
2.2.2. Analysis of Available Datasets Related to Texas TICs 14
2.2.3. Social Media Presence of Texas TICs 20
2.3. TICs in Other States and Countries 22
2.4. Past Literature/Study on TICs 24
2.4.1. Texas-Specific TIC Studies 24
2.4.2. TIC and SRA Research in Other States and Countries 28
2.4.3. Current TIC and SRA Research 39
2.5. Summary 46
Chapter 3. Workshop Summary 47
3.1. Workshop Purposes 47
3.2. Workshop Process 47
3.3. Workshop Major Findings 48
3.4. Summary 49
Chapter 4. TIC Employee Interviews 50
4.1. TIC Employee Experience and Training 50
4.2. Word-of-Mouth Advertising 55
4.3. TIC Employee Word-of-Mouth Safety Messages 55
4.4. TIC Media Resources Used to Provide Highway Safety Messages 65

4.5. TICs and Safety Events 74
4.6. Summary 76
Chapter 5. Analysis of Traveler Survey 78
5.1. Design of the Surveys 78
5.2. Survey Overview 79
5.2.1. Online Survey 79
5.2.2. Paper Survey 80
5.3. Survey Analyses 82
5.3.1. Questions on Shorter Version Survey 83
5.3.2. Additional Questions on CTR Survey 99
5.3.3. Additional Questions on Longer Version Survey and Online Survey 103
5.4. Travelers' Comments 112
5.4.1. Comments about TIC Employees 112
5.4.2. Comments about TIC Facilities 114
5.5. CTR Visit to TICs 115
5.6. Survey Summary 117
Chapter 6. Crash Data Analysis 119
6.1. Data Sources 119
6.1.1. Crash Data 119
6.1.2. Roadway Inventory Data 120
6.2. Data Analysis 120
6.2.1. Crash Data Analysis Procedure 120
6.2.2. Data Preparation and Preprocessing 122
6.2.3. Statistical Analysis and Results 137
6.3. Summary and Conclusions 139
Chapter 7. Comparison of TICs and SRAs 141
7.1. TICs and SRAs 141
7.2. TIC Visitor Surveys 145
7.3. Team TIC Visits 145
7.3.1. TIC Visit Observations 145
7.3.2. TIC Visit Surveys 146
7.3.3. Louisiana and Arkansas Visitor Centers 146

7.4. Comparison based on Crash Data Analysis 149
7.4.1. Data Preparation 149
7.4.2. Data Analysis and Results 160
7.5. Summary and Conclusions 163
Chapter 8. TIC Operations during Hazardous Conditions 164
8.1. Spearman's Correlation Analysis 164
8.1.1. Correlation between Disaster Occurrence and TIC Average Monthly Calls Answered 167
8.1.2. Correlation between Disaster Severity and TIC Average Monthly Calls Answered 169
8.2. Findings based on TIC Employee Interviews 171
8.3. Summary 172
Chapter 9. Economic Benefits of TICs 173
9.1. Methodology 173
9.1.1. Collection 177
9.1.2. Calculation Variables 177
9.2. Facility Costs 178
9.3. TIC Benefits 178
9.3.1. Tourism Benefits 178
9.3.2. Comfort and Convenience Benefits 178
9.3.3. Safety Benefits 179
9.3.4. Reduction in Excess Travel 180
9.4. Summary 180
Chapter 10. Conclusions and Recommendations 181
10.1. Conclusions 181
10.2. Recommendations 182
References 183
Appendix A. Supplementary Literature Review 190
Appendix B. Workshop Presentation Slides 197
Appendix C. Employee Survey 205
Appendix D. Traveler Surveys 207

List of Tables

Table 2.1. Traffic Crashes Involving Drowsy Driving from 2006 to 2009 10
Table 2.2. Summary of Texas TICs 12
Table 2.3. Scheduled TIC Events in 2018 (partial list) 20
Table 2.4. TICs in the United States 23
Table 2.5. Summary of Goals, Data Sources, Methods, and Results 41
Table 4.1. Top 12 Work Experience Types prior to Working at a TIC & the Number of Personnel with This Experience 53
Table 4.2. Top 12 Professional Training Types Received prior to Working at a TIC & the Number of Personnel Trained 53
Table 4.3. Summary of Job Activities Performed by TIC Personnel during Routine, Alert, and Emergency Situations 54
Table 4.4. Highway Safety Topics and TxDOT Sign Messages TIC Personnel Mention to Travelers Discussed during the Interviews 60
Table 4.5. TICs and Top Travel Destinations in Texas with Annual Numbers of Visitors and Shortest Distance in Miles between Each Location 63
Table 4.6. Number of Car Rentals by International Visitors to Texas (2016) 65
Table 5.1. Comparisons between TICs and SRAs based on Traveler Rating 99
Table 5.2. CTR Trips to Visit TICs 116
Table 6.1. Number of Overall Crashes along IH-20 Segment Selected for Anthony TIC Analysis 124
Table 6.2. Number of Selected Category of Crashes along IH-20 Segment Selected for Anthony TIC Analysis 125
Table 6.3. Number of Overall Crashes along US-75 Segment Selected for Denison TIC Analysis 127
Table 6.4. Number of Selected Category of Crashes along US-75 Segment Selected for Denison TIC Analysis 127
Table 6.5. Number of Overall Crashes along IH-35 Segment Selected for Gainesville TIC Analysis 129
Table 6.6. Number of Selected Crashes along IH-35 Segment Selected for Gainesville TIC Analysis 129

Table 6.7. Number of Overall Crashes along IH-35 Segment Selected for Laredo TIC Analysis 130

Table 6.8. Number of Selected Category of Crashes along IH-35 Segment Selected for Laredo TIC Analysis 131

Table 6.9. Number of Overall Crashes along IH-10 Segment Selected for Orange TIC Analysis 132

Table 6.10. Number of Selected Category of Crashes along IH-10 Segment Selected for Orange TIC Analysis 133

Table 6.11. Number of Overall Crashes along IH-30 Segment Selected for Texarkana TIC Analysis 134

Table 6.12. Number of Selected Category of Crashes along IH-30 Segment Selected for Texarkana TIC Analysis 135

Table 6.13. Number of Overall Crashes along IH-20 Segment Selected for Waskom TIC Analysis 136

Table 6.14. Number of Selected Crashes along IH-20 Segment Selected for Waskom TIC Analysis 137

Table 6.15. Mixed Model Results for Overall Crashes Analysis 139

Table 7.1. Number of Overall Crashes in the West Direction along the Two Segments of IH-10 Selected for Orange TIC and Chambers County SRA Westbound Comparison 150

Table 7.2. Number of Selected Category of Crashes in the West Direction along the Two IH-10 Segments Selected for Orange TIC and Chambers County SRA Westbound Comparison 151

Table 7.3. Number of Overall Crashes in the West and East Direction along the IH-10 Segment Selected for Orange TIC and Chambers County SRA Eastbound Comparison 152

Table 7.4. Number of Selected Category of Crashes in the West and East Direction along the IH-10 Segment Selected for Orange TIC and Chambers County SRA Eastbound Comparison 153

Table 7.5. Number of Overall Crashes in the West Direction along the Two IH-20 Segments Selected for Waskom TIC and Van Zandt County SRA Westbound Comparison 154

Table 7.6. Number of Selected Category of Crashes in the West Direction along the Two IH-20 Segments Selected for Waskom TIC and Van Zandt County SRA Westbound Comparison 155

Table 7.7. Number of Overall Crashes in the West and East Direction along the IH-20 Segment Selected for Waskom TIC and Van Zandt County SRA Eastbound Comparison 156

Table 7.8. Number of Selected Category of Crashes in the West and East Direction along the IH-20 Segment Selected for Waskom TIC and Van Zandt County SRA Eastbound Comparison 157

Table 7.9. Number of Overall Crashes in the North Direction along the Two Segments of IH-35 Selected for Laredo TIC and La Salle County SRA Northbound Comparison 159

Table 7.10. Number of Selected Category of Crashes in the North Direction along the Two Segments of IH-35 Selected for Laredo TIC and La Salle County SRA Northbound Comparison 159

Table 7.11. Mixed model results for overall crashes analysis 162

Table 8.1. Description of Hazard Severity Definitions (USDOT)..... 165

Table 8.2. List of Natural Disasters and Events Occurring in Texas from August 2010 to June 2018 and Their Severity Ratings..... 165

Table 8.3. Average Monthly Calls Answered by TICs with and without Natural Disasters 167

Table 8.4. Spearman's Rank-Order Correlation test for Natural Disaster Occurrences and Average Monthly TIC Calls 168

Table 8.5. TIC Average Monthly Calls by Disaster Severity 169

Table 8.6. Spearman's Rank-Order Correlation Test for Disaster Severity and Monthly TIC Calls 170

Table 9.1. Travel Information Center Economic Benefits..... 173

Table 9.2. TIC Survey Results 177

Table 9.3. TIC Economic Benefits Summary 180

List of Figures

Figure 1.1 Conceptual methodological framework for evaluating the safety impacts of Texas TICs 5
Figure 2.1 Location of Texas TICs 11
Figure 2.2 Total number of TIC visitors by year 14
Figure 2.3 Impact of TICs on visitor's travel behavior 15
Figure 2.4 Visitors' rating of TIC facilities 16
Figure 2.5 Visitors' rating of TIC staff 17
Figure 2.6 Visitors' rating of printed information at the TIC 17
Figure 2.7 Visitors' rating of overall TIC experience 18
Figure 2.8 Facebook page screenshot of Texas TIC at Orange 21
Figure 2.9 Facebook page screenshot of Texas TIC at Gainesville 21
Figure 2.10 Screenshot of TxDOT Amarillo Twitter 22
Figure 3.1 Workshop agenda 48
Figure 4.1 "Safe Phone Zone" sign upon entering the TIC parking lot 66
Figure 4.2 "Talk Text Crash Poster" in TIC lobby next to 'rehydration station' 66
Figure 4.3 Guest register with CTR QR code / URL poster for traveler survey 67
Figure 4.4 Wichita Falls TIC along IH 44 main traveler information area and desk 68
Figure 4.5 Comfortable seating to take a rest break, relax, and make cell calls 68
Figure 4.6 Texarkana TIC entrance and main information areas 69
Figure 4.7 Texarkana information counters with TIC personnel 69
Figure 4.8 Gainesville TIC video room 70
Figure 4.9 Waskom TIC LCD screen displaying weather information 70
Figure 4.10 Lobby area of the Gainesville TIC with a 'Look Twice for Motorcycles' banner 71
Figure 4.11 Safety poster in the Wichita Falls TIC restroom 71
Figure 4.12 Poster – 'If you see a child alone in a car take action…." 72
Figure 4.13 June – National Safety Council 2018 Safety Month 72

Figure 4.14 CTR 3” x 5” cards traveler survey QR Code and URL links to survey 73
Figure 4.15 Comfortable seating with a picture window overlook Gainesville TIC 73
Figure 4.16 Various safety advocates setting up their tables at the Safety Event 74
Figure 4.17 Some safety advocates dressed in costumes for children and photo-ops 75
Figure 4.18 Many travelers who stopped for the event ended up meeting with TIC personnel 75
Figure 4.19 The safety event also provided an opportunity for a ceremony to reopen the 600-ft-long boardwalk that had been closed for cleaning and inspection after Hurricane Harvey 76
Figure 5.1 Poster cards containing QR Codes - English version (Left) and Spanish version (Right) 79
Figure 5.2 Shorter version paper surveys overview – English (Left) and Spanish (Right) 82
Figure 5.3 Number of surveys completed at each TIC 83
Figure 5.4 Residency distribution of respondents (2,389 valid responses) 84
Figure 5.5 Gender distribution of respondents (2,144 valid responses) 85
Figure 5.6 Vehicle type distribution of respondents (2,133 valid responses) 85
Figure 5.7 Travel party size distribution (2,377 valid responses) 86
Figure 5.8 Traveler’s role prior to arriving at the TIC (2,362 valid responses) 87
Figure 5.9 Reasons for stopping at the TIC (2,350 valid responses) 88
Figure 5.10 Travelers’ trip distance prior to stopping at TICs (1,417 valid responses) 89
Figure 5.11 Travelers’ trip duration prior to stopping at TICs (1,541 valid responses) 89
Figure 5.12 Percentages of travelers who had seen highway safety messages in Texas (2,007 valid responses) 90
Figure 5.13 Highway safety messages seen in Texas (961 valid responses) 91
Figure 5.14 Percentages of travelers who had heard highway safety messages from TIC employees (1,741 valid responses) 92

Figure 5.15 Highway safety messages heard from TIC employees (591 valid responses)..... 93
Figure 5.16 Travelers' rating of TICs' effectiveness in improving highway safety (2,307 valid responses)..... 94
Figure 5.17 Travelers' opinions on TIC employee interaction (2,271 valid responses)..... 95
Figure 5.18 Travelers who stopped at an SRA (2,283 valid responses)..... 96
Figure 5.19 Travelers' rating of Texas SRAs' effectiveness in improving highway safety (1,392 travelers who had stopped)..... 97
Figure 5.20 Travelers' rating of Texas SRAs' effectiveness in improving highway safety (840 travelers who had not stopped)..... 98
Figure 5.21 Comparison between TICs and SRAs regarding effectiveness in improving highway safety (108 travelers who had stopped)..... 100
Figure 5.22 Comparison between TICs and SRAs regarding effectiveness in improving highway safety (40 travelers who had not stopped)..... 101
Figure 5.23 Comparison between TICs and SRAs regarding travelers' personal preference (108 travelers who had stopped)..... 102
Figure 5.24 Comparison between TICs and SRAs regarding travelers' personal preference (40 travelers who had not stopped) 102
Figure 5.25 Distribution of travel direction (248 valid responses)..... 104
Figure 5.26 Travelers indicating whether they'd made a stop (242 valid responses)..... 105
Figure 5.27 Distance traveled since stopping at other places (90 valid responses)..... 106
Figure 5.28 Duration traveled since stopping at other places (118 valid responses)..... 106
Figure 5.29 Percentages of travelers that planned next stop (233 valid responses)..... 107
Figure 5.30 Estimated distance to travel until next stop (114 valid responses)..... 108
Figure 5.31 Estimated duration to travel until next stop (119 valid responses)..... 108
Figure 5.32 Miles driven during entire trip (213 valid responses) 109
Figure 5.33 Percentage of travelers who'd stopped at another TIC or WC in a bordering state (220 valid responses)..... 110

Figure 5.34 “Effectiveness Score” of different highway safety message transmitting methods (201 valid responses) 111
Figure 5.35 Travelers’ opinions on having TIC Employees talk about highway safety (144 valid responses) 112
Figure 6.1 IH-10 segment selected for Anthony TIC analysis 123
Figure 6.2 Crashes mapped to IH-10 segment selected for Anthony TIC analysis 124
Figure 6.3 US-75 segment selected for Denison TIC analysis 126
Figure 6.4 IH-35 segment selected for Gainesville TIC analysis 128
Figure 6.5 IH-35 segment selected for Laredo TIC analysis 130
Figure 6.6 IH-10 segment selected for Orange TIC analysis 132
Figure 6.7 IH-30 segment selected for Texarkana TIC analysis 134
Figure 6.8 IH-20 segment selected for Waskom TIC analysis 136
Figure 6.9 Normal Distribution Fits well with the Data 138
Figure 7.1 Texas SRAs (Red-SRA, Green-TIC) 142
Figure 7.2 Hill County SRA 143
Figure 7.3 Indoor display area and vending machines in Hill County SRA 143
Figure 7.4 Waskom TIC 144
Figure 7.5 Interior, Waskom TIC 144
Figure 7.6 Travel counselors aiding travelers 145
Figure 7.7 Outside of the Louisiana Visitor’s Center 147
Figure 7.8 Inside the Louisiana Visitor’s Center 147
Figure 7.9 Outside of the Arkansas Visitor’s Center 148
Figure 7.16 Normal distribution fits well with the data 161
Figure 8.1 Average monthly TIC Calls vs. number of natural disaster occurrences 168
Figure 8.2 Monthly TIC calls vs. natural disaster severity 170
Figure 9.1 Travel Information Center Survey 176
Figure C.1 Page 1 of TIC Employee Survey 205
Figure C.2 Page 2 of TIC Employee Survey 206
Figure D.1 Page 1 of TIC Traveler Survey Long Form 207
Figure D.2 Page 2 of TIC Traveler Survey Long Form 208

Figure D.3 Page 1 of TIC Traveler Survey Long Form Spanish Version 209
Figure D.4 Page 2 of TIC Traveler Survey Long Form Spanish Version 210
Figure D.5 TIC Traveler Survey Short Form..... 211
Figure D.6 TIC Traveler Survey Short Form Spanish Version 212
Figure D.7 TIC Traveler Survey CTR Interviews 213

Executive Summary

Senate Bill 1, passed in 2017 during the 85th Legislature Regular Session, contained Rider 32. This bill requires the Texas Department of Transportation (TxDOT) to publish a report by November 1, 2018, describing the economic and safety impacts of travel information centers (TICs). TICs are believed to have positive impacts on travelers' safety. However, not all of the safety benefits have been identified or quantified in Texas. The purpose of this study is to develop a systematic approach to identify and quantify the impacts of Texas TICs on highway safety.

TxDOT's Travel Information Division (TRV) contracted with the University of Texas at Austin's Center for Transportation Research (CTR) to conduct this study.

Study Objectives

This study had the following objectives:

- Assess the impact of TICs on Texas highway safety by providing travel information and safety messages;
- Compare the safety impact of TICs and non-staffed safety rest areas;
- Analyze the economic impact of TICs in terms of promoting tourism;
- Determine whether TICs and their employees play a positive role in improving Texas highway safety;
- Make recommendations based on study findings.

The study team anticipates that this report will provide the State Legislature and the public a better understanding of TIC safety benefits.

Conclusions

The CTR team reached the following conclusions, based on an extensive literature review, traveler and TIC employee surveys, and crash data analysis.

Firstly, the literature review confirms that TICs in Texas and other states provide both economic and safety benefits. Furthermore, traveler surveys conducted at the 11 TICs located along the borders of Texas showed the following:

- The top three reasons why travelers stopped at a TIC: travel information and directions (44.4%), restroom usage (26.6%), and rest/break (25.4%);

- About 51.4% travelers have heard highway safety messages from TIC employees. The top three safety messages are about cellphone usage (text and phone) (33.7%), construction/work zones (21.3%), and driving safely/carefully/friendly (16.9%);
- According to travelers' ratings of TIC and SRA effectiveness in improving highway safety, TICs are considered more effective than SRAs;
- 73.0% of the travelers preferred TICs over SRAs primarily because of the TIC employees.

The crash data analyses did not show a significant impact of TICs on the number of crashes within the selected highway segments selected for the study. In addition, no significant difference was found between TICs and SRAs regarding their impact on the number of crashes. However, this does not mean that TICs or SRAs do not contribute to reducing crashes, as the analysis is complex and many factors cannot be easily determined.

It is significant that TIC employees, in addition to normal inquiries, answer thousands of phone calls per day during state emergency conditions. They work with all types of callers—including those frightened, anxious, or confused—and provide positive, safe advice that supports the specific emergency management goals. These skills and abilities are critical in emergencies like flooding and hurricanes, as guidance from TIC employees may save lives and enhance the effectiveness of state responses.

The same economic method is used to measure all Texas state agencies and comparison between 2017 and 2018 are reported. Overall, TRV had a benefit/cost ratio of approximately 30:1.

Recommendations

The CTR team provides this recommendation:

- Staffed TICs should continue to be funded at current levels with periodic reviews to ensure effectiveness. The CTR study shows that TICs enhance traveler safety, state tourism, and emergency strategies.

Chapter 1. Background and Introduction

This chapter describes the background rationale for this report, the general framework for the study, and the organization of the report chapters and topics.

1.1. Background

A travel information center (TIC), also known in other states as a visitor information center (VIC) or welcome center (WC), is a physical location staffed with trained professional employees that can provide travel and tourist information about the area, upcoming events and safety information. A TIC essentially serves as a "front door" for a locale. The role of the visitor center has been rapidly evolving over the past 10 years, as these facilities become more of an experience and tell the story of the place or brand they represent. Some are destinations and experiences in their own right. In addition, TICs benefit the state and traveling public especially in two aspects: safety and economy, which are identified in Section 2.1.

Texas currently has 12 TICs, 11 of which are located near Texas borders; the twelfth is located in the State Capitol Visitor Complex. These TIC services help people travel safely in various ways. The services and amenities provided by Texas TICs include restrooms, welcome gateway photo opportunities, maps, event brochures, drinking water and/or vending machines, diaper-changing stations, interpretive displays, picnic areas, accessibility features, video theater for local attractions and destination, and knowledgeable counselors that can provide professional assistance with routing, road conditions, and weather information. The amenities at TICs reduce dangerous driving behavior/maneuvers arising from lack of information, driver fatigue, distraction, or unexpected road conditions, and eliminate the need for highway shoulder stops. Both these factors decrease the number of potentially deadly highway crashes.

Senate Bill 1, which was passed in 2017 during the 85th Legislature Regular Session, contained Rider 32. This bill requires the Texas Department of Transportation (TxDOT) to publish a report by November 1, 2018, describing the economic and safety impacts of TICs. TICs are believed to have positive impacts on travelers' safety. However, not all of the safety benefits have been identified or quantified in Texas. The purpose of this study is to develop a systematic approach to identify and quantify the impacts of Texas TICs on highway safety.

TxDOT's Travel Information Division (TRV) contracted with the University of Texas at Austin's Center for Transportation Research (CTR) to conduct this study. Following were the study objectives:

- Assess the impact of TICs on Texas highway safety by providing travel information and safety messages;
- Compare the safety impact of TICs and non-staffed safety rest areas (SRAs);
- Analyze the economic impact of TICs in terms of promoting tourism;
- Determine whether TICs and their employees play a positive role in improving Texas highway safety;
- Make recommendations based on study findings.

The study team anticipates that this report will provide the State Legislature and the public a better understanding of TIC safety benefits.

1.2. Study Framework

The study team developed the conceptual framework for the analyses shown, in Figure 1.1, to guide the team's work according to the study scope.

As this framework indicates, the study starts with a comprehensive literature review. The literature review serves as the basis of the study and provided useful information to all the following steps of the study. Based on the information gathered from literature review and other sources, the study team developed a plan for public outreach and TIC field visits. The public outreach include interviewing all TIC employee, developing traveler survey and conducting workshop to gather information that can help to identify and quantify the safety impacts of Texas TICs.

With information obtained from literature review and public outreach, the study team identified important data sources that could help aid the safety analysis. The data analysis starts with collecting, examining and preparing the data. The major data sources used in this study are the statewide crash database maintained by TxDOT, the records maintained by TxDOT TRV regarding number of people visited TIC each month from 2010 to 2017 and number of phone calls answered by all TICs. These datasets are carefully analyzed using various data analysis techniques such as comparative analysis, statistical analysis etc. These data analysis results and meaningful insights gained from interviewing TIC employee and analyzing traveler survey responses formed the basis of determining the safety impact of TICs in Texas.

Finally, based on the major findings obtained from different components of this study, the study team developed the final recommendations regarding whether staffed TICs in Texas make a positive impact to highway safety.

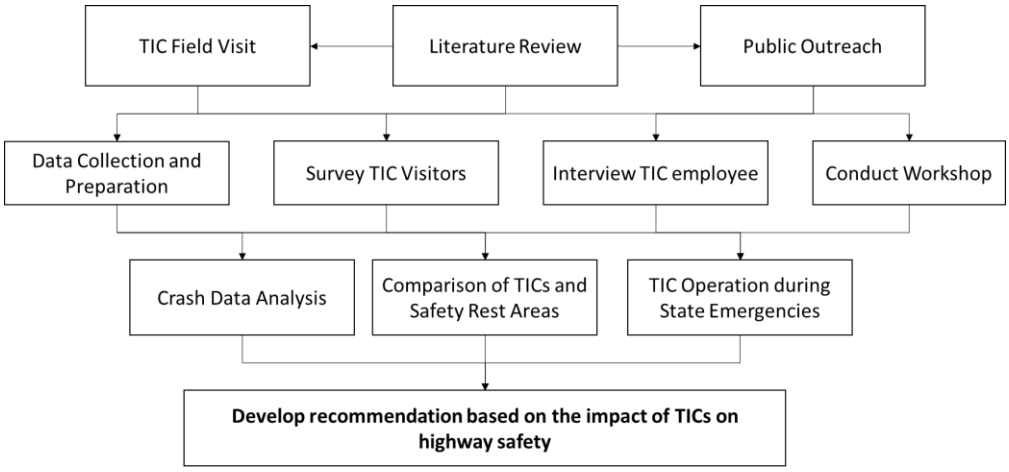

Figure 1.1 Conceptual methodological framework for evaluating the safety impacts of Texas TICs

1.3. Organization of the Report

The remainder of this report is organized into the following nine chapters:

- **Chapter 2. Literature Review**

  This chapter synthesizes a comprehensive literature review, starting with a general introduction to TICs in Section 2.1, followed by a discussion of Texas TICs in Section 2.2, including locations, amenities, statistical analysis of total visitations and current economic surveys, and social media presence. Section 2.3 discusses TIC practices in other states and countries. Section 2.4 lists and performs a thorough review of related literature. Finally, Section 2.5 provides a concise summary of the chapter.

- **Chapter 3. Workshop and Stakeholder Interview**

  This chapter summarizes the feedback and discussions gathered during the workshop held in May 2018. Section 3.1 describes the purpose for the workshop. Section 3.2 includes the presentation given during the workshop and various questions and topics on which the workshop attendees provided numerous insights. As a result, Section 3.3 lists a number of highlights and findings identified, which helped the research team learn more about how the TICs and local first responders work together to educate the public about highway safety and other safety topics; and how TICs help benefit highway safety for travelers visiting our state as well as Texas citizens, first responders, other state agencies, cities and counties. Section 3.4 serves as a summary of this chapter.

- **Chapter 4. TIC Employee Interviews**

  This chapter summarizes the TIC employee interviews. Section 4.1 summarizes the TIC employees' experience and training. Section 4.2 discusses word-of-mouth messaging and its effectiveness. Section 4.3 summarizes the word-of–mouth messaging by the TIC employees. Section 4.4 discusses the media sources used by TIC employees. Section 4.5 discusses the safety events held at TICs to promote safety. Section 4.6 provides a summary of the chapter and the most important takeaways.

- **Chapter 5. Analysis of Traveler Survey Responses**

  This chapter explores the various traveler surveys and the analysis of the responses. Section 5.1 describes the design of the surveys. Section 5.2 discusses the overview of the surveys themselves, most provided in English and Spanish. Section 5.3 is an in-depth analysis of traveler survey responses. Section 5.4 summarizes travelers' comments about TIC employees and facilities. Section 5.5 describes the CTR team's visit to TICs. Finally, Section 5.6 provides a summary of the section.

- **Chapter 6. Crash Analysis**

  This chapter presents an in-depth crash data analysis. Section 6.1 describes the data sources used. Section 6.2 is the in-depth analysis of that data for seven TICs where road segments represented people entering the state and leaving the state. Section 6.3 presents a summary and conclusions based on the analysis.

- **Chapter 7. Comparison of TIC and Safety Rest Areas**

  This chapter presents the comparison between staffed TICs and unstaffed SRAs. The comparison was performed from three aspects. Section 7.1 present the comparison based on the amenities and services provided by these two types of facilities. Section 7.2 demonstrates travelers' opinions/preferences among these two types of facilities as indicated by survey results. Section 7.3 describes the CTR team's visits to TICs and corresponding VCs in Louisiana and Arkansas. Section 7.4 shows the results of crash analysis conducted for a TICs and comparable SRAs. Finally, Section 7.5 summarizes Chapter 7.

- **Chapter 8. TIC Operations during Hazardous Conditions**

  This chapter looks at the operations of TICs during hazardous conditions and emergencies. Section 8.1 analyzes the statistics to show that TICs participate in hazardous events and help the public and travelers. Section

8.2 discusses the results of TIC employee interviews from previous hazardous events and emergency situations. Finally, Section 8.3 summarizes the chapter as a whole on the role TICs play in emergency situations.

- **Chapter 9. Economic Benefits of Travel Information Centers**

  This chapter discusses the economic benefits provided by TICs' tourism efforts. Section 9.1 presents the methodology of collecting data and determines economic benefits. Section 9.2 describes the facility costs of TICs. Section 9.3 describes the benefits of TICs not only for tourism, but also in terms of the comfort and convenience of travelers, safety, and reduction in excess travel, most of which are not quantifiable. Finally, Section 9.4 presents a summary of this chapter.

- **Chapter 10. Report Summary, Conclusions and Recommendations.**

  The last chapter summarizes the study activities and major conclusions and provides the study team's final recommendation.

Chapter 2. Literature Review

2.1. Definition and Scope of TICs

A travel information center (TIC), also known in other states or countries as visitor information center (VIC) or welcome center (WC), is a physical location staffed with trained professional employees who provide travel and tourist information about the area, upcoming events and safety information. A TIC essentially serves as a "front door" for a locale. The role of the VIC has been rapidly evolving over the past 10 years, as these facilities become more of an experience and tell the story of the place or brand they represent. Many have become destinations and experiences in their own right. TICs have these key aims:

- Provide tourism and highway condition related knowledge and information to visitors;
- Provide a safe place for drivers to rest and get refreshed;
- Market and promote access to an area;
- Enhance the visitor experience by providing information about the area;
- Substitution function: some TICs, due to their natural and/or historic setting, are attractions in their own right.

TICs benefit the state and traveling public mainly in two aspects: safety and economy. Specifically, the economic benefits of TICs include the following:

- Comfort and convenience;
- Promotion of in-state tourism;
- Enhancement of public safety;
- Reduction of excess travel to obtain services;
- Reduction of traffic congestions by providing accident information and construction zone detours;
- Savings on vehicle operation and maintenance by avoiding being congested;
- Benefits to specific business enterprise;
- Tourism benefits.

More importantly, TICs have the following safety functions:

- Reduce driver fatigue and other adverse physiological effects;

- Reduce in-vehicle driver distraction by providing a safe place to make cell phone calls or use free Wi-Fi;
- Provide a safe place to pull off the road (rather than park along a shoulder) to address vehicle mechanical problems;
- Allow parents to stop in a safe location (rather than along the shoulder) to deal with children;
- Provide a safe refuge under hazardous weather, visibility, and roadway conditions;
- Reduce roadside stops for vehicle maintenance and inspection;
- Provide safety-related information to drivers (e.g., critical safety information, updates on hazardous road and weather conditions);
- Reduce excess travel to get needed services.

Nationally, a TIC can be owned and operated either by a state entity or in partnership with businesses. The services and amenities provided by Texas TICs include restrooms, welcome gateway photo opportunities, maps, event brochures, drinking water and/or vending machines, diaper-changing stations, interpretive displays, picnic areas, accessibility features, video theater for local attractions and destinations, and knowledgeable travel counselors who can provide professional assistance with routing, road conditions, and weather information.

2.1.1. Drowsy Driving in Texas

One benefit of TICs in particular must be highlighted: their role in decreasing highway crashes related to driver fatigue. The National Institute of Occupational Safety and Health (NIOSH) pointed out that "driver fatigue has been identified as a leading contributor to roadway crashes among workers, as well as the general population" (Pratt, 2001). One report published by the National Highway Traffic Safety Administration (NHTSA) estimated that approximately 83,000 police-reported crashes occur annually because of driver fatigue, including 886 fatal crashes and 37,000 injury crashes (NHTSA, 2001). These estimates suggest that fatigue is a contributory factor in 2.2% to 2.6% of all fatal crashes in the United States on an annual basis. In 2009, nationally there were 730 fatal crashes, 30,000 injury crashes, and 72,000 total crashes involving drowsy driving. Of those, Texas had 203 fatal crashes (27.81%), 4,828 injury crashes (16.09%), and 8,080 total crashes (11.22%). Table 2.1 exhibits the figures for the motor vehicle traffic crashes and crashes involving drowsy driving from 2006 to 2009 and compares Texas to the national level (NHTSA, 2001; TxDOT, 2014).

Table 2.1. Traffic Crashes Involving Drowsy Driving from 2006 to 2009

		Fatal Crashes	Injury Crashes	Total Crashes
2006	National	995	38,000	86,000
	Texas	282 (28.34%)	6,065 (15.96%)	9,067 (10.54%)
2007	National	926	38,000	88,000
	Texas	239 (25.81%)	5,754 (15.14%)	8,845 (10.05%)
2008	National	746	36,000	79,000
	Texas	230 (30.83%)	5,236 (14.54%)	8,465 (10.72%)
2009	National	730	30,000	72,000
	Texas	203 (27.81%)	4,828 (16.09%)	8,080 (11.22%)
Total	National	3,397	142,000	325,000
	Texas	954 (28.08%)	21,883 (15.41%)	34,457 (10.60%)
Average	National	849	35,500	81,250
	Texas	239 (28.15%)	5,471 (15.41%)	8,614 (10.60%)

Table 2.1 indicates that from 2006 to 2009, Texas had a total of 954 (28.08% of national level) fatal crashes, 21,883 (15.41% of national level) injury crashes, and 34,475 (10.60% of national level) total crashes involving drowsy driving. Texas accounts for 28.15% of all drowsy driving fatal crashes in the US, indicating that drowsy driving is a serious safety issue on Texas highways. TICs provide a place for drowsy drivers to obtain enough rest to continue safely to their destinations.

2.2. Texas TICs

2.2.1. General Information

TxDOT operates and maintains 12 TICs, with one located in the Capitol Visitors Complex. Eleven of them are located near the border to serve travelers entering the state of Texas. The locations of Texas TICs are shown in Figure 2.1 (TRV, 2018). Texas TICs create a positive first impression of the Lone Star State, staffed by 58 full-time professional travel counselors who welcome visitors to Texas; help with routing; and provide information on points of interest, events, and road conditions. Generally, the operation hours of Texas TICs are daily from 8 a.m. to 5 p.m., except for major holidays (closed on Easter, Thanksgiving, Christmas Eve, Christmas, and New Year's Day). From the Friday before Memorial Day until Labor Day, the TICs are open from 8 a.m. to 6 p.m. A toll-free service at (800) 452-9292 provides travel information, professional trip-planning assistance, and highway condition information from 8 a.m. to 6 p.m. daily (until 7 p.m. during extended summer hours) and automated road condition information 24 hours a day. A detailed

summary of the 12 TICs is presented in Table 2.2 (TxDOT, 2018). This study focuses on the 11 TICs located along the Texas border. Certified professional travel counselors are on staff at all locations listed below.

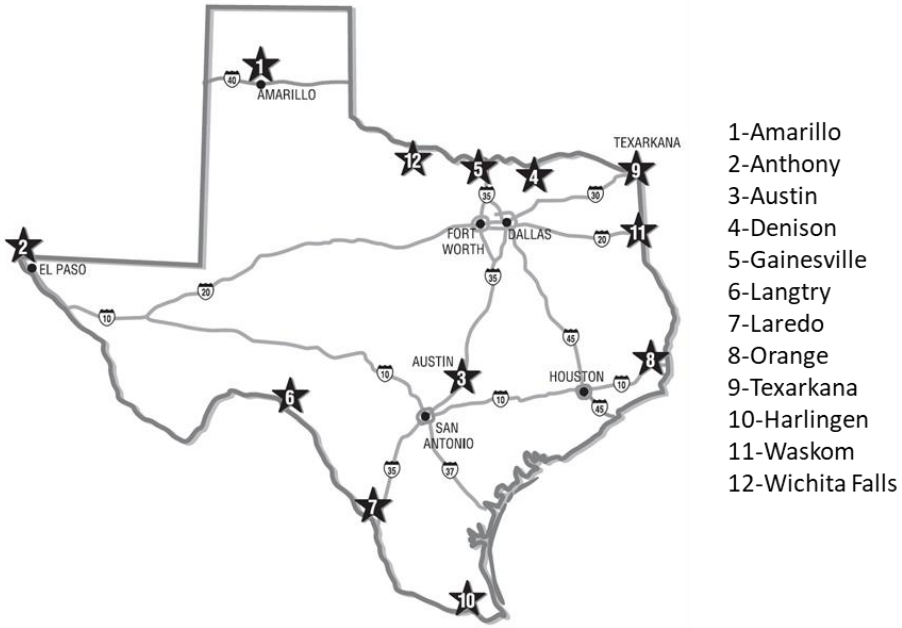

Figure 2.1 Location of Texas TICs

An extensive range of visitors, including vacation/recreational travelers, commercial motor vehicle (CMV) operators, commuters, travelers on bus tours, motorcyclists, and others, benefit from TIC amenities. In FY 2018, the centers generated an estimated $148.1 million in visitor spending, supporting 1,481 jobs and generating $9.2 million in state tax revenue. In addition, gasoline-tax dollars are generated for the highway fund, assisting with needed improvements to transportation infrastructure (TRV, 2018). Unlike unmanned SRAs, Texas TICs are staffed with employees to provide the distinct advantage of convenient and satisfactory services.

Table 2.2. Summary of Texas TICs

Location	Location	Features*	Miscellaneous	Contact
Amarillo	IH 40 - Eastbound (9700 E. I-40, Amarillo, TX 79118)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	• Located in the “Panhandle Plains” region of Texas	(806) 335-1441
Anthony	IH 10 - Eastbound (8799 S. Desert Blvd. Anthony, TX 79821)	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14	• Located in the “Big Bend” region of Texas	(915) 886-3468
Austin	11th St. and Brazos St., Austin, Texas	1, 2, 5, 7, 9, 10, 11, 12, 13	• Located in the Capitol Visitors Complex, which includes a Capitol Gift Shop with Texas and Texas State Capitol souvenirs • Located in the “Hill Country” region of Texas	(512) 463-8586
Denison	SH 69/75 - Westbound (6801 US 69/75, Denison, TX 75020)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	• Located in the “Prairies and Lakes" region of Texas	(903) 463-2860
Gainesville	IH 35 - Southbound (4901 N. I-35, Gainesville, TX 76240)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	• Located in the “Prairies and Lakes” region of Texas	(940) 665-2301
Harlingen (Rio Grande Valley)	US 77/83, serving both directions (2021 W. Harrison, Harlingen, TX 78552)	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13	• Located in the “Gulf Coast” region of Texas	(956) 428-4477
Langtry	US 90 - Westbound at State Loop 25 (US 90 W. State Loop 25 at Torres Ave., Langtry, TX 78871)	1, 2, 3, 4, 9, 10, 11, 13, 15	• Preserves the site of Judge Roy Bean’s historic “Jersey Lilly” saloon and Opera House, and includes interpretive historical exhibits and an extensive cactus garden • Located in “Big Bend” region of Texas	(432) 291-3340
Laredo	IH 35 - Northbound (15551 I-35 N. at US 83, Laredo, TX 78045)	1, 2, 3, 4, 6, 7 ,8, 9, 10, 11, 12, 13, 14	• Bilingual Staff (English and Spanish) • Located in the “South Texas Plains” region of Texas	(956) 417-4728
Orange	IH 10 - Westbound (1708 E. I-10, Orange, TX 77632)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	• Boardwalk with interpretive exhibits of Blue Elbow Swamp and scenic deck with overview of wetlands area and cypress forest • Located in the “Gulf Coast” region of Texas	(409) 883-9416
Texarkana	IH 30 - Westbound (1200 W. I-30, Texarkana, TX 75503)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14	• Located in the “Piney Woods” region of Texas	(903) 794-2114

Location	Location	Features*	Miscellaneous	Contact
Waskom	IH 20 - Westbound (1255 N. I-20 E. Waskom, TX 75692)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	• Located in the “Piney Woods” region of Texas	(903) 687-2547
Wichita Falls	IH 44 - Westbound (900 Central Freeway, Wichita Falls, TX 76306)	1, 2, 3, 4, 7, 8, 9, 10, 11, 12	• Located in the “Panhandle Plains” region of Texas	(940) 723-7931

***Key to Features:**

1. TxDOT travel literature, including the Texas State Travel Guide, Texas Official Travel Map, Texas Public Campgrounds, and Texas Events Calendar
2. Additional travel literature, including maps, weather information, pamphlets, booklets and brochures from local and statewide destinations, points of interest, special events, lodging and restaurants
3. Wireless Internet access
4. Video theater for Texas attractions and destinations
5. Security surveillance
6. 24-hour restrooms
7. “Welcome to Texas” photo opportunities
8. Covered picnic tables and group facilities
9. Accessible
10. Professional counselors provide professional assistance with routings and current information on points of interest, events, and road conditions in the state.
11. Diaper changing stations
12. Drinking water and/or vending machine
13. Interpretive displays
14. Separate truck and passenger parking
15. Walking trail

2.2.2. Analysis of Available Datasets Related to Texas TICs

2.2.2.1. Total Visitations

In order to investigate how many people are utilizing TICs, the CTR research team obtained visitation information from TxDOT. Figure 2.2 presents the total number of visitors to Texas TICs from 2011 to 2017.

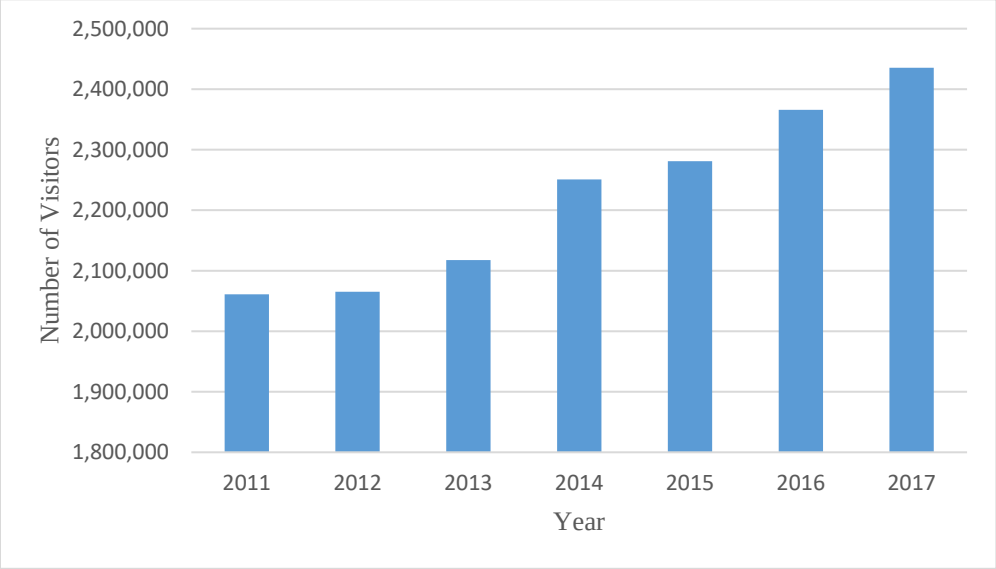

Figure 2.2 Total number of TIC visitors by year

As Figure 2.2 indicates, the number of visitors to Texas TICs has continually increased since 2011. The rise from 2,061,085 total visitors in 2011 to 2,435,467 in 2017 represents an 18% increase in 6 years. The seven-year total is 17,928,689, with an average of 2,561,241 visitors annually. This indicates that more and more travelers and tourists are visiting the TICs.

2.2.2.2. Economic Survey Results Highlights

Texas TICs conduct on-site economic surveys that are collected during a set time window. In all, 4,672 responses were collected in the FY 2018 survey. Some highlights are summarized below, illustrated in Figures 2.3 through Figure 2.7.

- When asked what they would do with the information provided at the TIC, a total of 4,468 travelers responded. Some travelers provided multiple choices. Of 4,468 respondents, 2,678 (59.94%) travelers responded that they would visit more attractions/points of interest on this trip than originally planned; 954 (21.35%) said that they would extend this trip longer than originally planned; 1,238 (27.71%) reported that there would

be no changes to this trip, but they would use the information for future trips; only 269 (6.02%) answered none of the above (no impact).

- The travel behavior of 93.98% of the visitors has been impacted due to the additional information they obtained from the TIC.

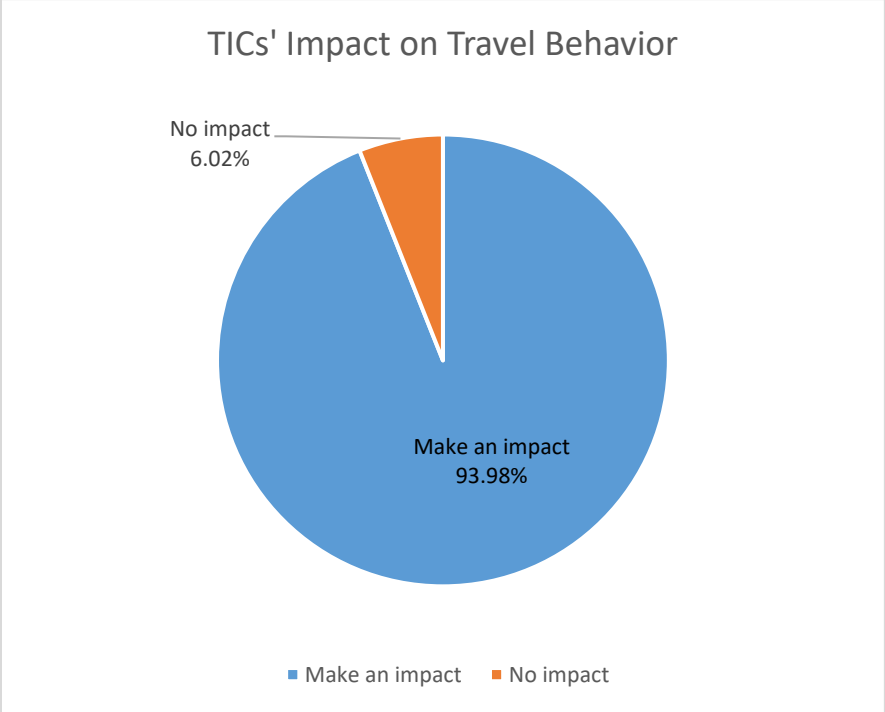

Figure 2.3 Impact of TICs on visitor's travel behavior

- Visitors rated the satisfaction level of their visit to the TIC in terms of center facility, center staff, printed information, and overall experience using a scale of *excellent*, *good*, *fair*, *neutral*, and *poor*. Following are the results:
  - **Center facility**. Of 4,542 respondents, 4,424 (97.4%) reported *excellent*, 107 (2.36%) reported *good*, 9 (0.20% reported *neutral*, and only 2 (0.04%) said the facilities were *fair*. There were no *poor* responses.
  - **Center staff**. Of 4,538 answers, 4,498 (99.12%) were *excellent*, 35 (0.77%) were *good*, 3 (0.07%) were *neutral*, and 2 (0.04%) were *fair*. There were no *poor* responses. In other words, visitors are very satisfied with the services provided by the TIC employees.
  - **Printed Information**. Of 4,527 answers, 4,389 (96.95%) answered as *excellent*, 123 (2.72%) reported *good*, 13 (0.29%) responded *neutral*, and one response each (0.02%) rated the travel literature selection as *fair* or *poor*.

- **Overall experience**. Of 4,523 respondents, 4,433 (98.01%) rated the overall experience at the TIC they visited as *excellent*, 81 (1.79%) rated it *good*, and 9 (0.20%) visitors rated it *neutral*. No visitor reported their TIC experience as *fair* or *poor*.

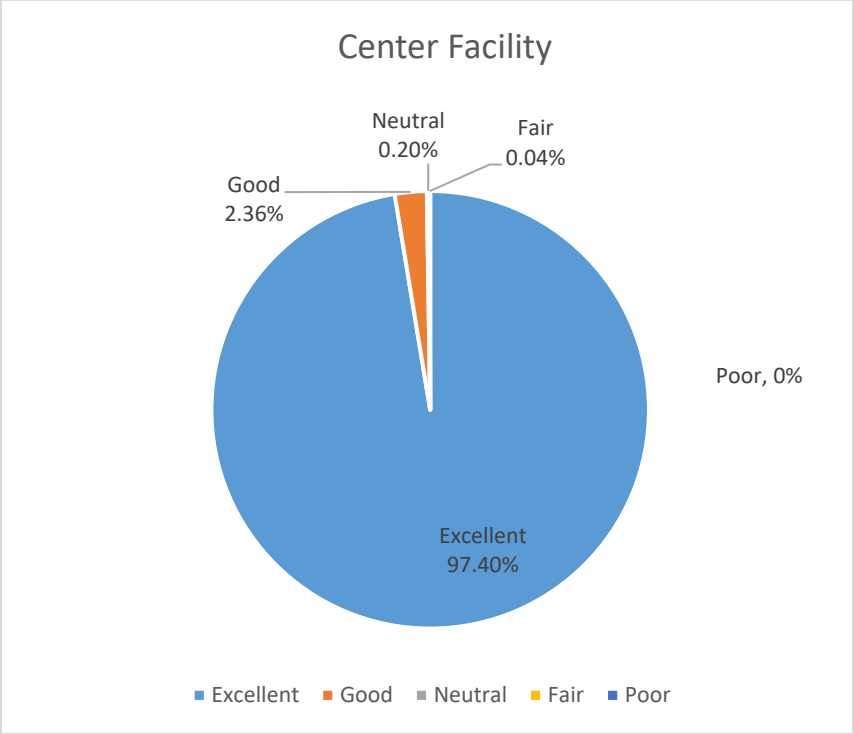

Figure 2.4 Visitors' rating of TIC facilities

Figure 2.5 Visitors' rating of TIC staff

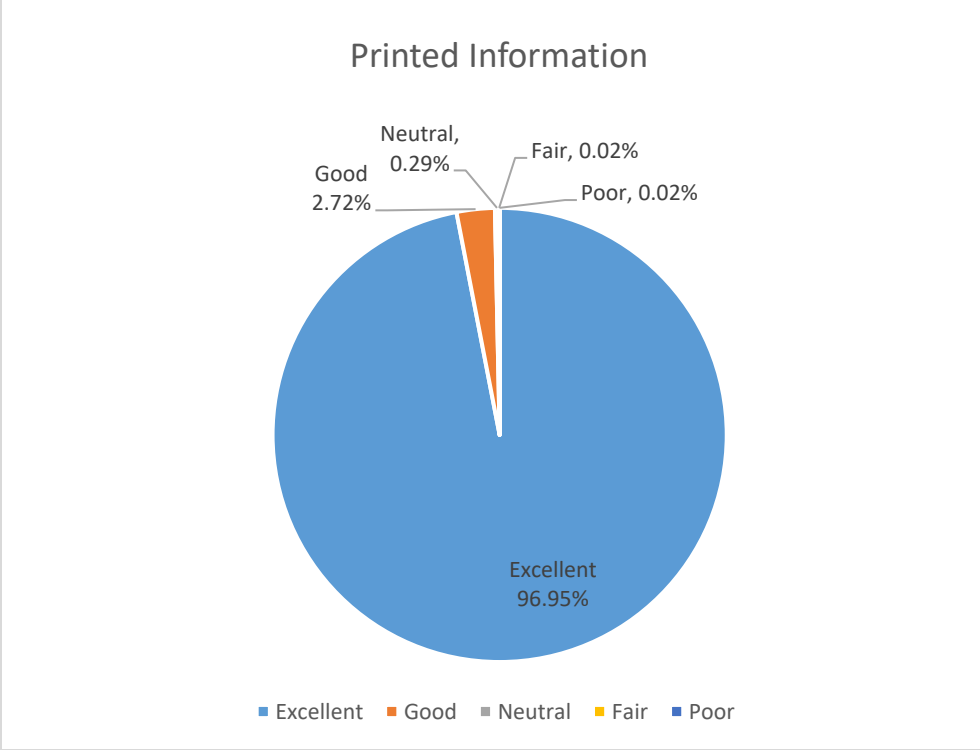

Figure 2.6 Visitors' rating of printed information at the TIC

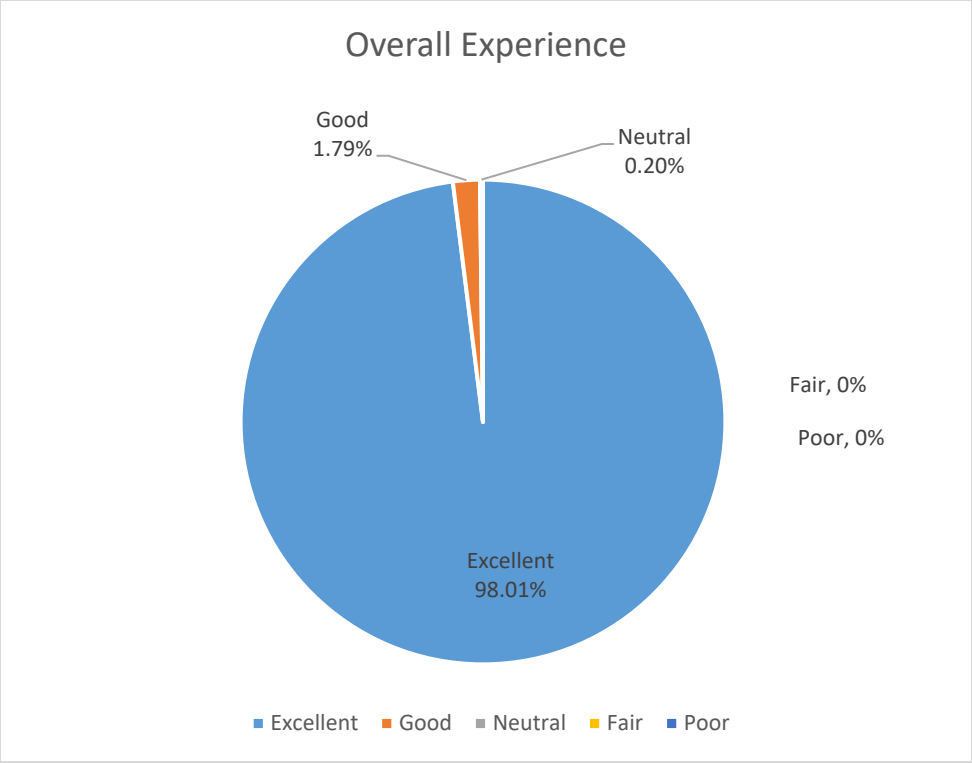

Figure 2.7 Visitors' rating of overall TIC experience

A satisfactory score was assigned to each of the category to quantify visitors' rating. Namely, 5 for *Excellent*, 4 for *Good*, 3 for *Neutral*, 2 for *Fair*, and 1 for *Poor*. The overall satisfactory score is the weighted average of all the responses. Based on the survey, the overall satisfactory scores of center facility, center staff, printed information, and overall experience are 4.97, 4.99, 4.97, and 4.98, respectively. The survey results indicate that the visitors are very satisfied with the TICs and TIC employees. It is noteworthy that the center staff has the highest overall satisfactory score of 4.99.

- Numerous positive comments were received as well, such as "I can't believe how nice it was," "Outstanding center and staff," "Awesome staff," "Pleasant staff, very helpful to our needs," "The person who helped us was the most enthusiastic & knowledgeable visitors center representative we could have found," "Friendly staff & enjoyed our stop," "A great experience, very kind & friendly staff. Keep up the good work," etc.

2.2.2.3. TIC Remote Assistance by Telephone

The Texas TICs are also staffed with professional travel counselors who answer calls received at the DriveTexas toll-free hotline (800-452-9292). According to the information received by the study team, the hotline received 201,440 phone calls

from August 1, 2017 to December 31, 2017. Of those calls, 200,120 (99.3%) were initially answered by the automated system (1,320 callers hung up the phone before their call was answered). Of the 200,120 calls, 115,003 (57.5%) initiated transfers to the TIC locations. Of those 115,005 calls, 55,562 (48%) were answered by TIC representatives. The difference of 59,441 calls is attributed to callers hanging up before being transferred out to a counselor or during peak times when the number of calls exceeds TIC staff capacity. It is noteworthy that most of the phone calls were made during the Hurricane Harvey event. More than three-fourths (77.7%) of the callers inquired about IH/US roadways; 22.3% asked about other roadway types. The representatives were able to solve the questions raised by the callers and helped them stay safe during the hurricane event.

2.2.2.4. Planned Events at Texas TICs

Every year, various themed events are held at Texas TICs to help attract travelers and distribute information. An important part of the TICs' mission is to raise safety awareness. Although some events are not safety themed, they do have safety components. Many of the TICs' safety events accompany safety campaigns funded through the Traffic Operations Division (TRF). TRF's District Safety Officers work with the TICs to put on events for safety campaigns, attend the events, and regularly supply the TICs with related posters, literature, and sometimes small giveaways.

A partial listing of events scheduled at Texas TICs is given in Table 2.3.

Table 2.3. Scheduled TIC Events in 2018 (partial list)

TIC Location	Date	Event
Amarillo	May 11, 2018	National Tourism Rally Day Event
Denison	March 14, 2018	Spring Break Event
	April 13, 2018	Work Zone Safety Event
	May 11, 2018	National Tourism Rally Day Event
	June TBD	Motorcycle Safety Event
Gainesville	March 16, 2018	Spring Wildflower Event
	April 13, 2018	Work Zone Safety Event
	May 11, 2018 (tentative)	National Tourism Rally Day Event
	May 25, 2018	Memorial Day weekend
	May 26, 2018	
	May 27, 2018	
	June 15, 2018	National Safety Month Event
Laredo	February 7, 2018	Laredo Birding Festival
Orange	May 9, 2018	National Tourism Rally Day Event
	June 1 or June 8, 2018	Orange Means Safety Event
	August 31, 2018 (tentative)	Back to School Safety Event
Texarkana	April 13, 2018	Work Zone Safety Event
Waskom	May 11, 2018	National Tourism Rally Day Event
	May 25, 2018	Welcome to Texas Rally Day

2.2.3. Social Media Presence of Texas TICs

Each of the Texas TICs has a Facebook page which provides their location, phone number, operating hours, available amenities, and other useful information. In addition, travelers can check in, post their "Welcome to Texas" photos, write a review of the TIC, invite more friends to follow the Facebook page, and obtain valuable information through the website. Followers can view major upcoming TIC events on TxDOT's main Facebook page. Figure 2.8 and Figure 2.9 present two screenshots of Facebook pages for Texas TICs in Orange and Gainesville.

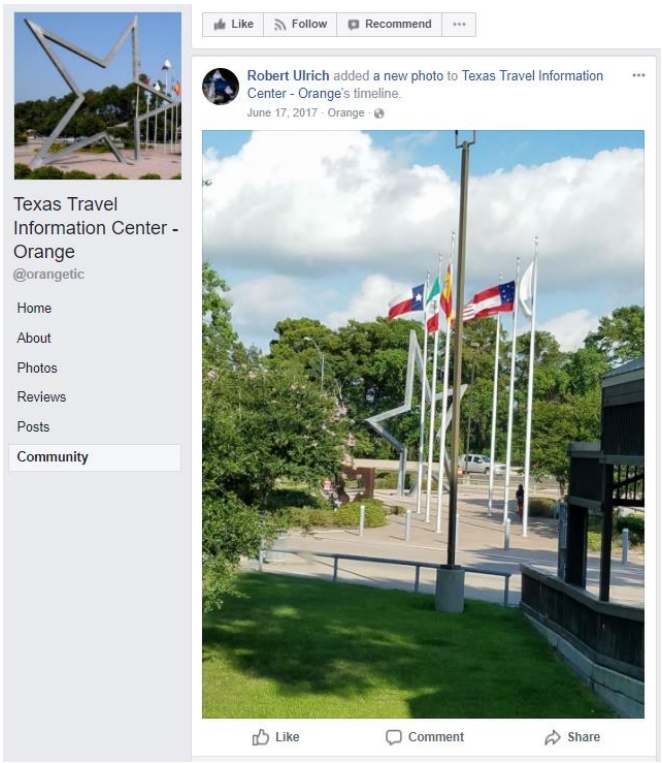

Figure 2.8 Facebook page screenshot of Texas TIC at Orange

Figure 2.9 Facebook page screenshot of Texas TIC at Gainesville

Other social media platforms, such as Twitter and Instagram, are also used for raising public awareness of the TICs. Figure 2.10 shows a screenshot of the TxDOT Amarillo District Twitter account.

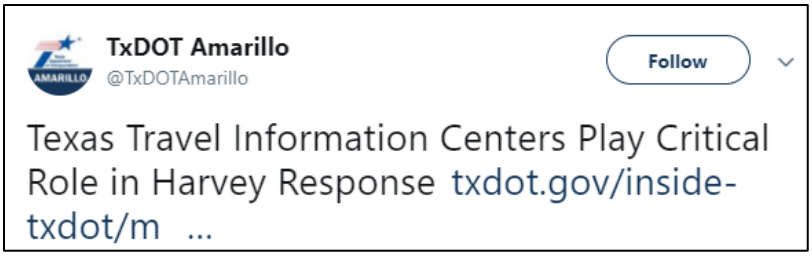

Figure 2.10 Screenshot of TxDOT Amarillo Twitter

The Internet plays an essential role in helping visitors plan and conduct their trips. Social media platforms are especially popular among younger travelers, who tend to use their smartphones and personal social media accounts extensively.

2.3. TICs in Other States and Countries

Like Texas, other US states maintain and operate their own TICs, VICs, or WCs. A variety of operational approaches are employed: state-owned and operated TICs near a state's border, state or municipal-owned and operated TICs in cities or rural areas, and service plazas on toll roads (state-owned but operated by a private company, or privately owned and operated). The centers are normally located within the first few exits into a state. The TICs and service plazas usually consist of a large building or complex with public restroom facilities; free brochures relating to nearby attractions, lodging, and dining; a free official state highway map updated at regular intervals; staffed desks where travelers can ask for assistance; and picnic areas. In addition, in front of the WC typically is a large flagpole with the state flag. Each state varies in its administration of these centers. For example, in Georgia, the Georgia Department of Transportation constructs and maintains its 12 WCs, while in Tennessee, the Tennessee Department of Tourist Development constructs and maintains Tennessee's 15 WCs. Table 2.4 lists the TICs/VICs/WCs in different US states.

Table 2.4. TICs in the United States

State	No. of Information Centers	Source
Alabama	8	Alabama Department of Transportation
Arizona	66 (including local TICs)	Arizona Office of Tourism, local authorities
Arkansas	13	Arkansas Department of Parks and Tourism
California	16	California Travel and Tourism Commission
Colorado	10	Colorado Tourism Office
Connecticut	5	Connecticut Department of Economic and Community Department, Office of Culture and Tourism
Delaware	1	Delaware Tourism Office
Florida	5	Florida Commission on Tourism/Official Florida Tourism Industry Marketing Corporation(VISITFLORIDA)
Georgia	12	Georgia Department of Transportation
Idaho	3	Idaho Department of Commerce
Illinois	13	Illinois Department of Transportation
Indiana	8	Indiana Department of Transportation
Iowa	4	Iowa Economic Department Authority
Kansas	2	Kansas Department of Wildlife, Parks, and Tourism, Tourism Division
Kentucky	7	Kentucky Department of Travel
Louisiana	13	Louisiana Department of Culture, Recreation, and Tourism
Maine	7	Maine Tourism Association
Maryland	12	Maryland Office of Tourism Department, Maryland Department of Transportation, and Maryland Transportation Authority
Massachusetts	10	Massachusetts Department of Transportation
Michigan	14	Michigan Department of Transportation
Minnesota	12	Minnesota Tourism Council
Mississippi	13	Mississippi Department Authority, Tourism Division
Missouri	8	Missouri Department of Transportation
Montana	2	Montana Department of Transportation
Nebraska	2	Nebraska Department of Economic Department, Tourism Division
Nevada	5	Nevada Department of Transportation
New Hampshire	4	New Hampshire Department of Resources and Economic Department
New Jersey	13	New Jersey Department of State, Division of Travel and Tourism
New Mexico	4	New Mexico Tourism Department
New York	14	New York Department of Economic Development
North Carolina	9	North Carolina Department of Commerce, Division of Tourism, Film, and Sports Department
North Dakota	9	North Dakota Department of Transportation
Ohio	10	Ohio Department of Transportation
Oklahoma	9	Oklahoma Tourism and Recreation Department

State	No. of Information Centers	Source
Oregon	8	Oregon Tourism Commission
Pennsylvania	14	Pennsylvania Department of Transportation
Rhode Island	8	Rhode Island Tourism Division
South Carolina	9	South Carolina Department of Parks and Tourism
South Dakota	11	South Dakota Department of Tourism
Tennessee	15	Tennessee Department of Tourist Department
Texas	12	Texas Department of Transportation
Utah	6	Utah Office of Tourism
Vermont	17	Vermont Information Centers Division
Virginia	13	Virginia Tourism Corporations
Washington	19	Washington State Department of Transportation
West Virginia	8	West Virginia Department of Commerce
Wisconsin	5	Wisconsin Department of Tourism
Wyoming	4	Wyoming Office of Tourism

These centers are staffed with professional travel counselors to provide weather information, road condition advisories, and trip advice, as well as answer any other questions raised by the visitors.

2.4. Past Literature/Study on TICs

This section reviews past literature/study on TICs. Particularly, studies on Texas TICs will be discussed first in Section 2.4.1. The next section lists and examines the research on TICs and SRAs in the US and other countries. Finally, this section summarizes current TIC and SRA in terms of the data used, methodology employed, and the research findings.

2.4.1. Texas-Specific TIC Studies

Researchers have quantified the economic and safety impacts of Texas TICs over multiple studies. Following is a summary of three representative studies.

Sharif, Hatim, Jose Weissmann, and Samer Dessouky. Safety Impact of Texas Travel Information Centers: An Update. No. 0-6821. 2016.

Sharif et al. developed a methodology to quantify the safety impacts of Texas TIC staff and services on the travelers on Texas roadways. They conducted person-to-person surveys (at five TICs: Harlingen, Orange, Amarillo, Gainesville, and Waskom) to gather sufficient data that can be applied to the analytical tools. More specifically, they established a four-tiered approach to provide evidentiary data supporting the safety impact of Texas TICs: 1) Review existing research projects and literature focusing on the safety benefits (e.g., drowsy/fatigue driving, larger trucks); 2) Analyze crash data, which indicates a notable reduction in crash rates for roadway segments immediately downstream of TIC facilities; 3) Collect and analyze on-site visitor surveys at selected TICs; 4) Analyze toll-free TIC hotlines answered by TIC employees during emergency or extreme weather events affecting roadways (e.g., ice, hurricane, flood). Valuable safety information is distributed to the callers during such events by TIC employees.

The report confirms that TICs contribute to the reduction of crashes caused by driver fatigue, shoulder parking, driver distraction, hazardous road and weather conditions, and vehicle malfunction. TICs have a positive safety impact on the travelers in a variety of ways. The study performed in 2016 selected three TICs (Gainesville, Orange, and Amarillo) to investigate the crash rates along the highway segments. The results showed a statistically significant reduction in crash rates due to the existence of the TIC at Orange and Gainesville. In addition, there was a reduction in the number of crashes for all three TICs studied. The researchers also developed a safety index based on the visitor responses to estimate how the center users perceive the impact of the usage on the safety of their travel experience. The results also suggest that the TICs have substantial and positive safety impacts on the travelers.

The report also contains an economic analysis of the TICs, which showed that all TIC facilities are considered economically viable. It was estimated that the economic benefit/cost ratio of Texas TICs may be well above 10:1.

In all, the research suggested that the Texas TICs are not only safety-beneficial to the traveling public, but also economically beneficial to the state of Texas with a very high benefit/cost ratio. The study also leaves topics for future research, including quantification of additional benefits associated with crash reduction and availability of travel information for safety purposes, such as weather information and road closures, which will demonstrate more safety impact of TICs.

Sharif, H., Weissmann, J., & Dessouky, S. (2014). Safety and Economic Impact of Texas Travel Information Centers: Technical Report. Texas Department of Transportation.

The objective of this research was to develop a methodology and gather sufficient data to quantify the impact of Texas TIC staff and services on the safety of travelers.

Data Sources:

- Two years of on-site data collection via surveys at Rio Grande Valley, Orange, Amarillo, and Gainesville.
- TIC users survey.
- Crash records provided by Crash Records Information Systems (CRIS).

Methods:

- Analysis of peaks in DriveTexas – call volume answered by TIC staff during emergency and extreme weather conditions.
- Computation of the overall safety index determined through the travelers' responses to the survey instrument.
- Use of paired t-test and ANOVA – to test the statistical significance of the differences in average crash rates in two opposing directions of a highway, compare the significance of the differences in average crash rates for segments that benefitted from a TIC's presence (given that a driver could potentially stop there to rest and relax) with the average crash rates of drivers in the opposite direction (who may have been driving for an extended period of time). This method allows the researchers to determine the associated effects on crash probability caused by drivers' fatigue.

Results:

- Several safety benefits were found, such as reduction of driver fatigue, transmission of critical information of safety and hazardous road and weather conditions, reduction of driver discomfort and distraction, reduction of highway shoulder stops, and reduction of excess travel to get services.
- The crash data analysis showed the positive effects of TICs.
- TICs' positive economic benefits include comfort and convenience, promotion of in-state tourism, enhancement of public safety, reduction of excess travel to obtain services, savings on vehicle operation and maintenance, benefits to specific business enterprises, and reduction of traffic diversion into communities.

Limitations:

- Many of the benefits were unquantifiable, such as comfort and convenience.

- The relationship between crash reduction rate and distance from a center was not delineated properly.

Carson, J., V. Pezoldt, Nicholas Koncz, and Kwaku Obeng-Boampong. "Benefits of public roadside safety rest areas in Texas: Technical report." Texas Dept. of Transportation, Austin, TX (2011). Report 0-6267-2.

The report defines a series of potential safety rest area benefit and cost components from the perspective of highway users, highway and other public agencies, and external entities. These benefit components include safety, comfort and convenience, reduction of excess travel and diversion, CMV scheduling and staging, direct monetary revenue, highway operation and maintenance, economic development and tourism, specific business enterprise, and traffic diversion into communities. The cost components include safety (potentially adverse safety effects attributable to additional merging and lane changing near the facility's entrances and exits), direct monetary costs, environmental impacts, socially undesirable behavior, and traffic diversion from communities. Subsequently, the report lists the methodologies and data sources that could be used to analyze and calculate each of the benefit and cost components, such as before after analysis, direct measurement, and other equations developed; the supporting data sources implied by the report are CRIS, the Design and Construction Information System (DCIS), and the Financial Information Management System (FIMS). The benefit/cost ratio is calculated based on the benefit components and cost components defined.

Three corridors were selected as demonstration sites: US 287 corridor between Ft. Worth and Amarillo (approximately 341 miles), IH 45 corridor between Houston and Dallas (approximately 240 miles), and IH 10 corridor between San Antonio and Anthony (approximately 574 miles). The results show the applicability of the proposed methodology.

The report then discusses the detailed strategies that serve as alternative opportunities to support SRA construction, operation, and maintenance, including commercialization/public-private partnerships, non-traditional funding sources, joint public development, and targeted cost savings. Examples from peer states are summarized, such as California, Iowa, Massachusetts, Idaho, Utah, Washington, Oregon, New York, Ohio, Arizona, Montana, Virginia, Minnesota, and North Carolina. The report summarizes the implications for these investigations on Texas.

The proposed methodology has its strengths and shortcomings for future research.

Strengths:

- The method utilizes data and national/aggregate unit values that are more timely and relevant than those used in prior comprehensive SRA studies, which were conducted more than 20 years ago;
- Researchers were careful to document specific sources for each of the individual national/aggregate unit values used in this investigation to ensure defensibility and repeatability of the benefit/cost ratios estimated for Texas;
- Researchers framed required assumptions to produce the most conservative estimates of SRA benefits and costs.

Shortcomings:

- The methodology is heavily assumption-based. Minor changes to any of these assumed values will influence the resultant benefit/cost ratios, and it is unclear to what extent these ratios would change;
- The quality and accessibility of supporting data: both data quality and accessibility proved challenging;
- The transferability of the results.

At the end, the report gives some recommendations on alternative SRA development opportunities in Texas.

2.4.2. TIC and SRA Research in Other States and Countries

Although most states maintain and operate TICs, not all of them have researched and published studies about their TICs. The study team collected and reviewed related literature published by eleven states (in addition to Texas); some of the studies address TICs specifically while others are about unmanned rest areas.

2.4.2.1. California

Banerjee, Ipsita, June ho Lee, Kitae Jang, Swati Pande, and David R. Ragland. Rest Areas: Reducing Accidents Involving Driver Fatigue. UC Berkeley Traffic Safety Center, 2009.

Collisions in the vicinity of rest areas were investigated using two different approaches:

1. 10-miles up/downstream of rest areas
2. Distance traveled from rest areas

Sample t-tests analysis were statistically significant when evaluating decreases in collisions involving fatigued and non-fatigued drivers. Specifically, collisions due

to fatigue tended to decrease immediately downstream of rest areas, then climbed after about 30 miles from rest areas, while non-fatigue collisions remained the same. Binomial tests confirmed that the percentage of fatigue collisions further than 30 miles from rest areas was significantly higher.

The study also compared ramps at rest areas to other ramps and found that trucks were the primary vehicle type involved in rest area ramp collisions. The comparison revealed that some rest areas had too few parking spots

Their study also explored the growth of informal rest areas: shoulders frequented by truck drivers when other safe stopping opportunities do not exist. The study analyzed collision rates at informal rest area ramps and determined that on average the rates were higher than at other ramps. Analysis of fatigue-related collisions adjacent to informal rest areas provided mixed results regarding the efficacy of informal rest areas in reducing highway collisions. However, the higher incidence of fatigue-related collisions at these locations supports the need for additional rest areas.

Ramey, Joe, David Dornbusch, and Jim Kniss. Final Task 5 Report: Strategic Recommendations-Safety Roadside Rest Area Master Plan. No. CA2011-2049. 2011.

This report recommends strategies to enhance the safety roadside rest area (SRRA) system while assessing the use/parking needs of existing rest areas and the locations where new rest area services are most needed. It was found that on average 74% of vehicles entering SRRAs are autos and 26% are trucks and buses. It is estimated that over the next 20 years, 52 of the 87 SRRAs (or 60% of all SRRAs) will require some level of additional parking to meet forecasted parking demand. Projected 20-year SRRA parking deficiencies range between 1 and 76 spaces, with an average parking deficiency of 20 spaces.

The report also points out that federal and state laws continue to prohibit the provision of commercial services at SRRAs located within the right-of-way of federally funded highways. It is recommended that Caltrans seek to implement public/private SRRA partnerships that offer commercial services exclusively at off-line locations, outside the highway right-of-way.

2.4.2.2. Connecticut

Connecticut Department of Transportation. CT Statewide Rest Area and Service Plaza Study. CONN DOT Project No. 170-2533. September 2008.

The report points out that WCs can provide travelers access to organized information about attractions, events, and accommodations throughout the state, thus increasing economic activity. A strong network of WCs can also provide travelers the opportunity for assistance from trained and knowledgeable staff, and, along with appropriate training and materials, is an effective way to promote

tourism in a state. Studies from several states have shown that WCs are able to bring financial benefits to the local economy.

Walking trails and pet exercise areas are standard at WCs located in less densely populated areas where space constraints are not as severe. Survey respondents indicated that the best floor layout for a WC locates information, exhibits, and restrooms so that travelers only intending to use the restrooms would pass through or adjacent to tourist promotion/information areas. The report identifies several major issues, such as truck parking deficiencies, undersized facilities, gaps in service, etc. The report also identifies needs for future development—for example, more and better WCs that feature tourist information and are well-staffed with knowledgeable workers. They believe that tourism can be better addressed in Connecticut's roadside traveler facilities as evidenced by limited number and scope of WCs, gateway locations, and understaffed WCs.

2.4.2.3. Florida

Florida Department of Transportation. Statewide Rest Area Long Range Plan. Prepared by Jacobs. FPID: 190258-1-32-37.

Florida has five WCs (one is located at the west entrance of the State Capitol Building). Each center is staffed by personnel who have undergone rigorous training to receive national Information Specialist certification. WC visitors learn about the state's diverse destinations along with in-person information. Each of the four highway WCs has a designated area for visitors traveling with children, a feature appreciated by visitors traveling with small children. The Visit Florida Kid's Corner offers a play area to educate and entertain the children while the parents get the travel information they need from the WC staff. The highway WCs offer clean, well-maintained restroom facilities and all are handicapped accessible. Vending machines and pay phones are on-site. Designated areas in each parking lot accommodate large bus, RV, and truck parking.

The report also mentioned that visitors are able to generally find a clean facility, which offers access to restrooms and other services, although older facilities do not meet the full needs of the traveling public. More than 560 rest area consumers were interviewed during the study; the results yielded important data about the opinions of respondents and the services provided. Of the respondents 85% rated the rest area as very important to the traveling public and 89% rated the rest area facilities as being "very safe." The primary-reasons-to-stop question generated the following responses: 57% stopped to use the restrooms, 18% stopped to rest, and 9% stopped to get water or a snack.

Potential future trends for WCs/rest areas have been identified, such as the availability of Wi-Fi (or next generation of wireless internet technology) services in public places and in retail establishments, and the inclusion of family restrooms. Other specific trends include truck and RV long-term parking needs; ITS applications for information on truck parking, weather, rest area services, traffic,

incident management, and area visitor information; the next generation of vehicle information technology (e.g., in-vehicle real-time information, vehicle-to-vehicle communications, and satellite applications); and electric/hydrogen vehicle hook-ups for recharge.

Safety considerations involve ramp parking, truck driver fatigue, and social/environmental concerns.

1) Truck parking on rest area ramps and in undesignated areas within rest areas occurs and is a growing safety concern, which includes sight and lateral obstructions for motorists entering and exiting the ramps, particularly at night.

2) Relieving driver fatigue is a primary purpose for WCs/SRAs. Given their long, daily hours of driving, truck drivers are especially susceptible to fatigue.

3) Social/environmental concerns related to overnight truck parking at rest areas include truck drivers being approached by criminal interests, the lack of proper hygiene facilities such as showers, and general safety concerns for drivers. Environmental concerns at WC/rest areas include issues related to wastewater effluent, solid waste, and other typical rest area characteristics.

2.4.2.4. Illinois

Fesenmaier, Daniel R. "Traveler use of visitor information centers: Implications for development in Illinois." Journal of Travel Research 33, no. 1 (1994): 44-50.

This study was based upon on-site personal interviews of visitors to five of Illinois' 14 highway WCs using two separate surveys. The results indicate the large majority of respondents stopped to use restrooms, stretch and exercise, and obtain refreshments. Of the respondents, 32% indicated they stopped to pick up travel and tourist information. Ease of access, availability of restrooms, and convenience were the most common reasons for stopping at the tourist information center rather than leaving the interstate. At least 52% of the respondents appear willing to consider alternative off-interstate tourist information locations. The service setting is the single most important aspect affecting respondents' decisions concerning off-interstate locations; access (being located on a frontage road next to the interstate) is the second most important element. The findings indicate the tourist information center acts as one of the most important communication channels with which to attract and educate travelers about the benefits of visiting the state. The results also provide encouraging support for locating and developing an alternative system for meeting the information needs of visitors to the state.

2.4.2.5. Kentucky

Wallace, Candice Y., Jennifer R. Walton, and Joseph D. Crabtree. "Best practices for providing traveler information services to motorists at rest areas and welcome centers." (2009). Research Report: KTC-09-13/SPR387-08-1F

Wallace et al. conducted a study for the Kentucky Transportation Cabinet. They gathered information through literature review, Internet searches, and telephone survey with public officials in other states. The research focused on the current practice of wireless Internet availability at rest areas and weigh stations. The use of kiosks to provide traveler information in rest areas and WCs was also investigated. The results indicate that recreational travelers are the most likely to use Wi-Fi service at rest areas and/or WCs; kiosks are an effective, reliable, and affordable solution for providing traveler information to motorists at rest areas and/or WCs. Moreover, static kiosks are more preferred than interactive kiosks due to maintenance and reliability issues.

2.4.2.6. Maryland

Maryland Office of Tourism Development, online reference, available at: http://www.visitmaryland.org/list/maryland-welcome-centers. Accessed on February 20, 2018.

Maryland provides 12 WCs throughout the state, including several along non-interstate highways. The Office of Tourism Development operates these centers and is proud that Maryland is one of the few states to fully staff its WCs with travel counselors who are nationally certified by the Travel Industry Association of America. Maryland views its WCs/rest areas as important components for promoting and expanding tourism. Based on the discussions with WC staffs, they believe that a traveler extends their visitation to the state as a direct correlation to the fact that they stop and use the WC. The WCs provide the traveler with restrooms, vending, a playground, travel information, and community meeting/museum space. In addition, Maryland is installing Wi-Fi internet services at many locations.

2.4.2.7. Michigan

Gates, Timothy, Peter Savolainen, Tapan Datta, and Ryan Todd. "Economic Assessment of Public Rest Areas and Traveler Information Centers on Limited-Access Freeways." Transportation Research Record: Journal of the Transportation Research Board 2346 (2013): 63-71.

Gates et al. developed a benefit/cost analysis methodology for public rest areas and traveler information centers located on limited access freeways. The methodology considered a broad range of benefits associated with public rest areas/TICs, including travel diversion savings, comfort and convenience benefits, and crash

reductions. Increased tourism spending was also considered for traveler information centers. The costs were almost exclusively related to those incurred by the agency, which included construction, operation, rehabilitation, and routine maintenance. The methodology was demonstrated using data provided by the Michigan Department of Transportation. The benefit/cost ratio for the nine traveler information centers ranged from 1.10 to 7.02 with an average of 4.00. The benefit/cost ratio for the 58 Michigan public rest areas on limited access freeways ranged from 1.24 to 5.89 with an average of 3.36. Convenience for travelers and reduction of fatigue related crashes make the major contribution to the overall benefits. More specifically, it was estimated that slightly greater than two crashes can be reduced per facility per year. Additional wages, benefits, and tax revenue resulting from increased tourism spending comprised a large portion of the benefits estimated for traveler information centers. As the estimated benefits were strongly correlated with annual utilization of the facility, the facilities with the highest benefit/cost ratios included heavily utilized facilities located on the primary freeway routes. Those with the lowest benefit/cost ratios were underutilized facilities with high operation and/or maintenance costs.

Taylor, W., Nakmoon Sung, and A. Jawad. "A Study of Highway Rest Areas and Fatigue Related Truck Crashes." In 78th Transportation Research Board Annual Meeting, Washington, DC. 1999.

The authors analyzed the relationship between SRA spacing on Michigan interstate highways and vehicle crashes and found a positive relationship between SRA spacing and fatigue-related single-vehicle truck crashes. Specifically, they found that freeway segments 30 miles or more beyond an SRA experienced disproportionately more single vehicle truck crashes than segments less than 30 miles from an SRA. The paper also indicated that the majority of single-vehicle truck collisions occur between midnight and 8:00 a.m.

Lenneman, John K., Richard W. Backs, Nicholas Cassavaugh, Alex Bos, and Noah VanBergen. Improving driver safety with behavioral countermeasures. No. RC-1561. Michigan Department of Transportation. Office of Research and Best Practices, 2011.

In the report published by Michigan Department of Transportation (MDOT), drowsy driving is identified as a significant problem. In a telephone survey conducted by the AAA Foundation for Traffic Safety, respondents were asked "if they had ever fallen asleep or nodded off, even just for a second or two, while driving." Of the respondents, 41% reported that they had fallen asleep or nodded off while driving. In another survey conducted by the National Sleep Foundation (NSF), 51% to 60% reported that they had previously driven while considering themselves drowsy, with 17% saying that they had fallen asleep at the wheel in the previous year. On one separate survey, NSF found that 1% to 2% of the respondents reported that they had a crash that they felt was caused by drowsy driving. NHTSA estimated that in 2009 drowsy driving resulted in approximately 72,000 crashes involving property damage, an injury, or a fatality, representing 1.3% of all vehicle

crashes. Drowsy driving related crashes led to 832 fatalities. The report also indicates that most drowsy-related crashes occur overnight (between midnight and 6 a.m.) and middle afternoon (between noon and 5 p.m.). MDOT proposes several countermeasures for drowsy driving, including communications and outreach programs, employer programs, centerline and shoulder rumble strips, drowsy driver laws, and medical conditions (medications). A TIC can provide a place for the drivers to rest with effective campaign. In addition, the employee working at the information center can verbally communicate with the drivers to let them be aware of the fatigue.

McArthur, Adam, Jonathan Kay, Peter Savolainen, and Timothy Gates. "Effects of public rest areas on fatigue-related crashes." Transportation Research Record: Journal of the Transportation Research Board 2386 (2013): 16-25.

The researchers performed a spatial analysis that investigates how a road segment's proximity to a rest area affects the frequency of fatigue-related crashes. Negative binomial and Poisson models are applied to estimate the effects of proximity of freeways and two-lane highways, while controlling for other relevant factors, such as traffic volume. The results indicate that the proximity of a road segment to the nearest rest area significantly influences crash frequencies on both freeways and two-lane highways (traffic volumes tended to have similar effects) with the fact that the effects of proximity were slightly more pronounced on two-lane highways. The study results suggest that roadside rest areas provide a safety benefit, and the crash prediction models are developed as a part of the research to provide a starting point for quantifying these impacts.

2.4.2.8. Minnesota

SRF Consulting Group, Inc. Interstate Highway Safety Study: Analysis of Vehicle Crashes Related to Safety Rest Area Spacing. Prepared for Minnesota Department of Transportation, Office of Technical Support. July 2007.

The study was based on Minnesota's accident record database provided by Minnesota Department of Public Safety as well as additional data, including average annual daily traffic, heavy commercial average daily traffic, hourly traffic volumes, and nighttime SRA CMV parking demand data for the 10-year period of 1995 to 2004. Researchers summarized and displayed the data in data plots to identify trends and patterns, and they performed statistical tests to identify cases where these trends illustrated statistically significant results. Normalization was also used to compute crash rates, which allowed the study team to compare crash characteristics on roadways with different traffic volumes or exposure levels. Their study revealed that, for single-vehicle truck crashes, being asleep was listed as a contributing factor at a rate almost three times greater than and almost five times more often than for multi-vehicle truck crashes.

The study identified a relationship between SRA spacing and single vehicle truck crashes during all times of the day: the greater the distance between SRAs, the higher the number of downstream crashes. The researchers also indicated that there is a relationship between high SRA nighttime vehicle percentage of parking capacity filled and high downstream nighttime single-vehicle truck crashes: the greater the percentage filled, the higher the number of crashes. Statistical tests showed that the nighttime percentage of parking capacity filled for SRAs had good predictive capabilities for nighttime single-vehicle truck crashes.

2.4.2.9. Missouri

Dee Ann McKinney. Missouri Tourism: The Impact of Welcome Centers. June, 2016.

The state of Missouri conducted a survey to study the impact of WCs. Of 2477 responses, 38% reported that they visited the WC to use the restrooms, followed by needing directions (19%), getting general tourism information (14%), and needing info about specific Missouri destinations (11%) and specific Missouri attractions (9%). In terms of the reasons people do not stop at the WC, the top reason is that travelers feel they can obtain the same information on the Internet (60%). The next-largest segment of respondents have never stopped at one before (43%), or they wanted to stop somewhere with food or other features (33%). The report highlights that the center staff was the biggest source of inspiration of new places to visit. The Missouri WCs have an overall satisfaction level of 99%. Visitors are most pleased with the ability to communicate directly and in person with staff, and they appreciate the friendliness and knowledge of the staff. The WC not only impacts activities on travelers' current trips, but also on their future trips as well.

2.4.2.10. South Carolina

Carolyn Childs, Best Practice in Visitor Information Center: A Tale of Two Perspectives. Presented at TTRA International Conference. June 2016.

The State of South Carolina operates 9 WCs, which have 37 full-time staff members and 20 to 30 part-time employees. More than 3.5 million guests visit the WC every year and about 2 million visitors receive personal one-on-one assistance from a South Carolina travel counselor. South Carolina WCs create 20,000 to 30,000 reservations and distribute an average of 4 million brochures annually. Over $2 million in direct revenue is generated by accommodations and attractions booking. According to an online survey conducted in fall 2012, 67% of 1144 respondents indicate that they use WCs at least occasionally. The major reason that travelers stop at WCs is to use the restroom (93%), followed by obtaining maps, brochures, or other printed information (52%), picking up hotel or activity coupon/discount booklets (29%), using vending machines (24%), walking a pet (18%), getting the latest information on traffic and weather (14%), obtaining staff assistance with directions and travel advice (12%), using picnic tables (11%), using Wi-Fi to check emails (10%), and shopping for local goods (6%). The reasons why they do not stop

are that they feel that there is no need to stop (29%), they are in a hurry to get to their destination (22%), they planned in advance/already know what they need (13%), the facility is overcrowded or dirty (6%), they have security concerns (unsafe/fear of crime) (6%), they stop only if bathroom break is needed (4%), they like to combine stops for food, gas, and bathroom (4%), or no gas is sold at the rest stop (3%). It also suggests that openness, brightness, and cleanliness of the space had the most impact. New furniture, free Wi-Fi, weather reports, charging stations, coupons, and deals were preferred. The improvements most compelling to visitors include more and better signage, more food options, enhanced security and safety, addition of children's amenities, and strong curb appeal.

2.4.2.11. South Dakota

Department of Tourism and Transportation. South Dakota Interstate Rest Area Revitalization Plan. May 12, 2016.

The report investigates and analyzes current conditions and use of the interstate rest areas and information centers. The information centers/WCs in South Dakota are staffed by seasonally employed travel counselors who offer additional traveler information about South Dakota's tourism offerings. There are a total of 21 rest areas along the interstate corridors with 13 operating as staffed information centers during South Dakota's main summer tourism season. The original basic function of the rest areas/information centers, when constructed with the interstate, were to provide a safe resting place for travelers with services such as restrooms, picnic areas, and parking. Current services available at the tourist information centers include business and attraction brochures, seasonal travel counselors who welcome visitors, state travel maps, storage areas or sheds for caretakers and tourism staff, short-term visitor and truck parking, and pay phones. Three of the information centers have SD promotional T-shirts and one (in Chamberlain) has culture displays providing local educational value.

The South Dakota information centers are staffed with over 70 seasonal part-time employees from mid-May through mid-September. Three of the information centers (Chamberlain, Valley Springs, and Homestead) remain open through October. Information center staff members are hired by the Missouri River Tourism Association as outlined in a consulting contract between South Dakota DOT and the Missouri River Tourism Association. Staff are hired and supervised by Tourism and the cost of staff wages is shared equally between Tourism and DOT in accordance with the contract.

The research team found that TIC and rest area research have been conducted by other researchers and authorities around the world. Based on available literature, the study team selected Australia and Ireland as representative countries.

2.4.2.12. Australia

Australia initiated an innovative program to address driver fatigue several years ago that involved an extensive public ad campaign about sleep deprivation, a condition labeled “micro sleep” in the campaign. This condition occurs when a driver enters the sleep mode for seconds or fractions of a second. It might be considered nodding off, when a driver catches himself and tries to stimulate himself back awake. Methods such as rolling the window down, turning the radio up, and other measures are applied to try to improve attention to stay awake.

The Australian program featured a doctor explaining the “micro sleep” condition, and the ads focused on the distance a car can travel within a few seconds and the ineffectiveness of the staying awake efforts. Statistics collected over a period of time supported the conclusion that the program was effective at reducing sleep-related accidents in the specific region of the country where it was focused.

Campbell, Shane. "The economic evaluation of heavy vehicle rest areas-a new technique?" Road & Transport Research: A Journal of Australian and New Zealand Research and Practice 23, no. 1 (2014): 69.

The overall impact of fatigue on Australian roads is significant and has serious consequences, especially for heavy vehicle crashes. Around 5% to 20% of all crashes in Australia are fatigue related, contributing to around 20% to 30% of all deaths on the road being as much a contributor as speeding or drink driving. The role of fatigue in accidents is highly underestimated. The paper reports that the provision of well-planned heavy vehicle rest areas is fundamental to the efficient and safe operation of interstate freight routes. The author developed an approach based on safety, accident history, and severity to identify and measure the safety benefits of heavy vehicle rest area. The paper presented a case study of three new rest areas. The results of benefit/cost analysis range from 1.98 to 10.09, indicating that the construction of new rest areas are considered viable. The paper also pointed out that the connections and causal relationship between crash reduction and the construction of well-planned/located rest areas is one area in need of future research.

Adam Pekol Consulting. Nationally Consistent Rest Area Data Definition Framework. Published by Austroads. Project No. FS1698. Publication No. AP-R443-13

The report defines the data attributes required to ensure a consistent national (data) description of heavy vehicle rest areas (HVRAs), within the context of all rest area types. Based on the type of providers, HVRAs can be categorized into two general types: companies to facilitate their commercial success; and state road agencies or local governments to facilitate their obligations. The attributes and services provided by a HVRA includes appropriate location for drivers to efficiently manage fatigue, advance warning facilities so that drivers can plan ahead, sufficient parking lots, appropriate parking dimensions for oversized trucks, climatic suitability, basic facilities (such as seats, shelter, and bins), restrooms, and easy access.

Ballantyne, Roy, and Karen Hughes. "E-learning in Queensland Visitor Information Centers: Barriers, Facilitators and Communities of Practice" November 2004.

VICs are staffed with professional counselors to provide visitors with travel advice; interpret the local region; make accommodation, tour and transport bookings; and collect visitor data. The report examined how VICs access tourist information, documented the type of information that would facilitate the delivery of visitor information, and explore the potential of e-learning and the development of Community of Practice to enhance the delivery and sharing of information and ideas. The study also conducted survey managers of nine VICs in North and Outback Queensland. The results indicate that both volunteer and paid staff strongly supported the introduction of e-learning, which was delivered in a blended format that enabled them to access materials outside work hours and/or at home. It recommends that all staffs should be trained comprehensively, not only on local tourism products, but also in areas such as customer service, computer skills itinerary planning, and online tourist information retrieval.

Ballantyne, Roy, Karen Hughes, and Brent W. Ritchie. "Meeting the needs of tourists: the role and function of Australian visitor information centers." Journal of Travel & Tourism Marketing 26, no. 8 (2009): 778-794.

Kerstetter, D., & Cho, M. (2004). Prior knowledge, credibility and information search. Annals of Tourism Research, 31(4), 961-985.

Ballantyne et al. (2009) studied the importance of visitor information facilities and services that are expected to meet the needs and interests of the traveling public. They used 18 Australian VICs located in Queensland, Northern Territory, Western Australia, and Victoria to explore tourists' use and perceptions during mid-year school holidays. Four Plus model was applied to investigate the functions of centers, identifies features that tourists regard as important, and provides an insight into the information needs and travel planning practices of those who use VICs.

The research found that people stop at VICs to obtain general as well as specific information. Based on the response, 64% of the visitors said they use information from the Internet to plan trips, followed by word-of-mouth (61%), travel guidebooks (46%), magazines (32%), television (22%), and travel agent (20%). A preference for local information was evident across all types of information—general information, specific information about activities and/or attractions, and information about accommodation. The study suggests that visitors expect all centers to provide local information, maps, brochures, and personal advice (Ballantyne et al., 2009). In addition, access to friendly and knowledgeable staff was also considered important. Results indicate that visitors value being able to access personal, current, and accurate tourist information from staff. They also suggest that travel advice provided by staff is perceived to be credible—a quality

that has been found to increase the likelihood of tourists using that particular source of information (Kersteller and Cho, 2004).

Major findings of the research include the following: 1) the majority of respondents stopped at VICs to obtain maps of the local town or region, especially for the first-time visitors; 2) information centers should endeavor to provide information and resources that have a local flavor; 3) since professional and knowledgeable staff members are a key attraction for visitors, information centers should prioritize staff training about local tourism products and customer service. Center management should also consider staff training to help transfer tacit knowledge into explicit knowledge (Ballantyne et al., 2009).

2.4.2.13. Ireland

Healy, Noel, Carena J. van Riper, and Stephen W. Boyd. "Low versus high intensity approaches to interpretive tourism planning: The case of the Cliffs of Moher, Ireland." Tourism Management 52 (2016): 574-583.

A VIC provides interpretive displays that facilitate interact between travelers and local attractions. Those facilities provide information and services that encourage reflection and learning among tourists, while attracting visitor spending and the development of ancillary services, which are particularly helpful in areas of economic or social decline. Healy et al. (2016) examined visitor's preference for the intensity of interpretive facilities, evaluated and compared low-tech and high-tech visitor facilities. They performed semi-structured interviews, onsite surveys, and participant observations. The research selects the Cliffs of Moher visitor center as a case study. The results showed that low-intensity interpretation was preferred to technologically driven displays. In addition, the study suggests that visitors need greater recognition as stakeholders in tourism planning.

More detailed information obtained from the survey is that 85% of the visitors indicate that they use VICs. About 44% of them spend less than 15 minutes and 65% stay less than 30 minutes. The main reason for not using the VIC is lack of interest (40%), followed by limited time (22%), not knowing an interpretive area existed (19%), and cost (16%). Visitors who entered the interpretive area spent about 12 minutes there on average. About 38% reported that they use at least some of the facilities and 11% responded that they did not use any displays. The experience of the interactions between visitors and the facilities resulted in satisfaction and positive about the importance of interpretive areas. In all, 75% of the travelers believed that the displays were very useful.

2.4.3. Current TIC and SRA Research

Most of the literature the study team reviewed on visitor centers revolved around their effectiveness, quantifying their service, and proposing ways to improve them. However, traveler decision-making depends on emotional satisfaction and

psychology. The varying range of objectives throughout the literature review is given below:

- Measure performance & success, and figure out their ingredients for success (McKinney, 2016, Tierney, 1993).
- Develop a benefit/cost analysis methodology for SRAs, demonstrating its applications (Carson et al., 2009).
- Evaluate the best practice and propose design methodology (Childs, 2016, Pearce, 2004, US Department of the Interior Bureau of Reclamation, 2007).
- Identify the reasons tourists use tourist information centers, identify the extent to which these visitors obtain travel information, as well as assess its perceived usefulness for trip, and assess the efficiency of alternative locations and forms of tourist information centers in meeting the information needs of visitors (Deery et al., [n.d.], Fesenmaier, 1994).
- Measure consumer preference (Perdue, 1995).
- Develop a methodology and gather sufficient data to quantify the impact of Texas TIC staff and services on the safety of travelers on Texas roadways (Sharif, 2014).
- Investigate the factors determining the service setting that enhance customers' emotional reactions and lead to psychological states and behaviors.
- Describes the economic impacts of travel to and through Texas and the state's metropolitan areas, tourism regions, counties, and selected cities and places.
- Meta-analysis of more than 100 surveys of US public opinion toward billboards, covering almost eight decades of findings from more than 100,000 participants.
- Investigation of how political economy influences its local modes of tourism governance.

Researchers used a wide range of data to perform experiments and analysis to reach their goals. The data were obtained from a variety of sources. A wide range of methods and analysis were used to evaluate the goals and reach a proper conclusion. However, not all of the methods were without their limitations. Table 2.5 lists types of data, their sources, and the goals, methods, and results achieved by using those data.

Table 2.5. Summary of Goals, Data Sources, Methods, and Results

Researcher	Goals	Data type	Data source	Methods	Results
Industry Innovation Team, Tourism Queensland (2012)	To evaluate the role of 11 VICs, measure their performance & success, and figure out their ingredients for success	Current and historical VIC data	Observation, generation data.	Information gathering and summary.	Building positive relationships with tourism industry, civic leaders, providing appropriate training, engaging with the local community, pursuing funding opportunities, taking advantage of location.
Carolyn Childs (2016)	To investigate the mission of the WCs and how consumers related to them	Survey data.	Online survey.	Statistical analysis and interpretation of the survey results.	Renovations are appreciated, better stop signs, food, children amenities are effective in getting travelers to stop.
Carson et al. (2009)	Benefit/cost analysis	Crash data, economic data, vehicle classification counts, statistical data, visitor profile.	TxDOT's SRA website and database, CRIS, National Safety Council, survey data, literature review, Bureau of Labor Statistics, Texas Department of Assistive/Rehabilitation Services, Business Enterprises of Texas Program, Texas 2008 Visitor Profile.	Benefit/cost analysis along three corridors in Texas.	High level of variability in aggregate benefit/cost ratio estimated along the corridors, suggesting limited transferability of results.
Childs (2016)	To evaluate the best practice.	Statistical data.	Customer/stakeholder survey, expert consultation, staff workshops.	Three tier (e.g., funding efficiency, model optimization, value creation) segmentation model.	Proposed an ecosystem to attract, engage, and inform visitors.

Researcher	Goals	Data type	Data source	Methods	Results
Deery et al. (n.d.)	To look into the role played by VIC in enhancing tourism yield.	Demographic information, trip details.	Field survey.	Estimation of frequency, mean, standard deviation, and percentage of traveler visits, visitor planning, and tourism yield.	Purchase of local, regional food and wine products are important in creating memorable experiences, greater attention should be paid to the promotion and sale of local products that are unique to the region, friendliness of staff is important.
Fesenmaier (1994)	To investigate usage of VIC, extent to which visitors obtain information, and assess efficacy of alternative locations of VIC.	Interview data	On-site personal interview.	Identifying attributes, demographic characteristics analysis, comparison of data, assessments of the importance of the travel information, logit regression.	Tourist information center acts as one of the most important communication channels, tourism information centers address travelers' safety needs by providing easily accessible and relatively safe places of rest.
Gates et al. (2013)	To present a benefit/cost analysis methodology.	Fifty-eight Michigan public rest areas and nine traveler information center	Michigan Department of Transportation.	Benefit/cost analysis	Most benefits originated from a combination of comfort/convenience and a reduction of crashes; wages, benefits, and tax revenue comprised a large portion of the benefits estimated; estimated benefits were strongly correlated with annual utilization of the facility.
McKinney (2016)	To measure the impact, satisfaction of WCs	Traveler information.	Personal survey.	Statistical analysis and interpretation of the survey results.	WCs are likely to be "brand promoter," impact a person's future trips, staffs are the biggest source of inspiration to visit new places.
Pearce (2004)	To extend the work with the newly entitled "Four Plus" model of visitor center functioning.	Information gathering from various literature	Published literature	Analyzed several functions (e.g., multiple overlapping, promotion) of visitor centers.	Proposed a four-state design phase to improve visitor centers.

Researcher	Goals	Data type	Data source	Methods	Results
Perdue (1995)	To measure consumer preferences for visitor center attributes, to examine the importance of these, and to determine the best location for VIC.	Location, facilities, services data.	Interview with TDA authorities, open-ended survey.	Identification of attributes; using regression coefficients. Estimates of visitation at each of the proposed sites were calculated.	Distance from the state border and location were not important to travelers, visitation estimates as a function of traffic flow and center attractiveness.
Sharif et al. (2014, 2016)	To develop a methodology and gather sufficient data to quantify the impact of Texas TIC staff and services on the safety of travelers on Texas roadways.	Crash records, demographic records.	On-site data collection, CRIS.	Analysis of peaks (call volumes), paired t-test and ANOVA.	Several safety benefits were found; crash data analysis showed positive effects of TIC; TICs have positive economic benefits; TICs are economically viable.
Tierney (1993)	To determine the influence of traveler information centers.	Interview data.	Personal interview.	A nonprobability sampling procedure; Univariate chi-square and t-tests; ANCOVA.	Nonresident automobile-based tourists have a flexible itinerary; nearly half of all respondents' decisions were made after their arrival; centers are attracting and influencing a very different group of visitors than targeted; centers play an important role in trip planning; centers have a significant impact on travel decision making; centers positively influenced expenditures; the ability to interact with the centers' friendly knowledgeable staff was critical, and displays and brochures without the human touch were not enough.

Researcher	Goals	Data type	Data source	Methods	Results
Brunner-Sperdin (2012)	To investigate the factors determining the service setting that enhance customers' emotional reactions and lead to psychological states and behaviors.	Activity/service consumption, satisfaction, and situational variables	On-site questionnaire.	Research model explaining the relationship between different components of service settings influencing emotional states and satisfaction, a statistical analysis with a five-point Likert scale.	Experience, hardware, and human ware significantly influence emotional states of customers in high-quality hotels.
Franke & Taylor (2017)	A meta-analysis of more than 100 surveys of US public opinion toward billboards, covering almost eight decades of findings from more than 100,000 participants.	Data on billboards, outdoor advertising, and highway beautification acts, together with attitude, poll, and public opinion	Surveys.	Survey coding process involves iterative examination of the surveys to identify common categories of questions that are relevant to the research hypotheses, random-effects meta-analysis was implemented using SAS PROC MIXED.	Consumers view billboards positively; a strong majority do not support billboard bans; the public subscribes to the idea of billboards that provoke thoughts.

Researcher	Goals	Data type	Data source	Methods	Results
Penny Wan & Bramwell (2015)	To investigates how Hong Kong's political economy influences its local modes of tourism governance and development planning; and also explore how a destination can exhibit a hybrid mode of tourism governance, and also how that emerged in Hong Kong.	Crash data, historical statistics	Academic articles, archival materials, newspapers, government documents on planning laws, procedures and policies, as well as government planning studies, reports and statistics	Examines continuities and changes in Hong Kong's political economy from the colony's birth to the present; analysis of these evolving governance relationships draws on the previously identified typology of governance modes, and also on the four analytical dimensions of modes of governance.	Hong Kong's present mode of tourism governance combines pro-growth and pluralist elements; it is affected by the need for capital accumulation and political legitimacy and by the relative influence of government and civil society.
Wansink & Ittersum (2004)	To propose and examine a stopping-decision framework through three studies.	Trip diary, panel data.	Focus group interviews, questionnaire survey.	Identifies multiple concurrent needs; uses a national panel survey to identify the traveler and trip-related characteristics, uses a series of exit surveys to further examine the characteristics that influence travelers' perceptions of travel plazas by conjoint study.	Travelers stop at travel facilities to satisfy multiple concurrent needs; the proposed framework can help operators of travel facilities gain a better understanding of travel interruptions, facility of visitation, activity, and attraction; the insights can be used to determine optimal locations for travel facilities and trade-offs to develop facilities that attract travelers.

Some of the literature listed in Table 2.5 has already been summarized and presented in Section 2.4. Additional information regarding the literature in Table 2.5 but was not discussed in Section 2.4 is provided as Appendix A.

2.5. Summary

This chapter synthesizes a comprehensive literature review, starting with a general introduction to TICs, followed by a discussion of Texas TICs, including locations, amenities, statistical analysis of total visitations and current economic surveys, and social media presence. Section 2.3 discusses TICs practice in other states and countries. Section 2.4 lists and performs thorough review of related literature. Following are some notable findings presented in this chapter:

- Past research and statistical analysis indicate that Texas TICs provide both economic and safety benefits;
- Surveys taken at the Texas TICs show that almost all the visitors are satisfied with the TIC experience (satisfactory score 4.98), especially in terms of the centers' staff (99.12% of the respondents rated them as excellent with a satisfactory score of 4.99);
- TIC staffers are essential for providing in-person, one-on-one sources for roadway conditions, weather information, travel guidance and suggestions, and for answering questions;
- TICs effectively mitigate drowsy driving, preventing fatigue-related crashes;
- TICs play a significant role for travelers during natural disasters, such as hurricanes and tornadoes;
- TICs positively impact tourism and usually extend the trips travelers had planned;
- Different data sets and methodologies have been applied by researchers to study and quantify the safety impact of TICs.

Chapter 3. Workshop Summary

3.1. Workshop Purposes

On May 15, 2018, the research team held a workshop from 9:00 AM to 12:00 PM at DalTrans Traffic Management Center, Arnold Oliver Conference Room, in Dallas, Texas. The main purposes of the workshop were to learn more about how the TICs and local first responders work together to educate the public about highway safety and other safety topics. In addition, the research team would like to identify how TICs help benefit highway safety for travelers visiting our state as well as Texas citizens, first responders, other state agencies, cities and counties. This will provide a basis for discussions with local police, fire department, EMS, DPS and other agencies which work together with the TICs to help improve highway safety in Texas.

WebEx attendance was made an option to increase participation. Attendees could participate either in-person or through the WebEx meeting service. In total, 28 people (12 in person and 16 by WebEx) attended this workshop, including CTR researchers, TRV headquarters staff, TIC supervisors and travel counselors, and TxDOT traffic safety specialists.

A scanned copy of the sign-in sheet is available upon request.

3.2. Workshop Process

The workshop was broken up into two components, a presentation by CTR and open discussion by the group. The presentation was given by Dr. Mike Murphy from CTR. The workshop attendees were welcomed to ask questions and/or make comments during the presentation. The open discussion was the more interactive in which several topics associated with TICs and highway safety were discussed.

The workshop went well and followed the agenda shown in Figure 3.1.

DalTrans Traffic Management Center
Arnold Oliver Conference Room
4625 US-80, Mesquite, TX 75150

May 15, 2018
9:00 AM – 12:00 PM

Agenda

I. Introductions – goals and objectives of the workshop
II. Summary of highway safety benefits learned from TIC employees
III. Benefits of the TIC for first responder operations – open discussion
    a. Local police
    b. Fire Department
    c. EMS
    d. DPS
    e. TxDOT – Maintenance employees (traffic control)
IV. Highway Safety Benefits of the TIC to TxDOT Districts
V. Highway Safety Benefits of the TIC to other States
    a. TIC employees monitor weather and road conditions along routes outside Texas – provide reroute information to Travelers – Route 66
    b. How can we determine the benefits of reduced crashes, fatalities and injuries in other states due to improved information obtained from Texas TICs.
    c. Conversely, several other states have eliminated manned Travel Centers. How can we determine the impacts of reduced safety information to travelers entering Texas?
VI. Open Discussion

Figure 3.1 Workshop agenda

The presentation given by Dr. Mike Murphy is attached as Appendix B.

3.3. Workshop Major Findings

During the workshop, a wide variety of topics and questions were discussed. Following are the major highlights and findings from the workshop:

- Every year, a variety of safety events are held in each TIC, such as child car seat installments, Click it or Ticket, etc. These events allow people (especially those from other states) to know Texas safety standards;
- TICs serve many senior travelers (who may not use smart phones for navigation);
- TIC helps sharpen older drivers' attention by providing a place to rest and get travel information;
- TICs provide valuable TxDOT services, with clean facilities, beautiful scenery, and friendly employees;

- TICs are beneficial to the Texas economy. If they were unstaffed, this benefit would be reduced;
- TICs are clean and safe places with a large volume of traffic, so TxDOT District Safety Officers sometimes use the TICs for social media safety campaigns;
- TICs are the first facilities for a traveler to see when they enter Texas – first impression is very important;
- It is beneficial to quantify the benefit to reputation TICs yield for TxDOT;
- TICs are good place for maintenance workers to cool off during hot summer shifts;
- TICs have a large number of repeat customers;
- Visitors traveling alone receive additional benefit from social interaction with a travel counselor over and above merely resting;
- TIC employees are experienced in providing friendly services and refreshing tired travelers;
- TICs are beneficial to teenage safety education - school groups come to the center to learn about transportation safety;
- TICs have environmental benefits as well. For example, they provide anti-litter messages;
- TICs play a significant role during bad weather, such as hurricanes, ice and snow, flooding, etc. They may go into extended hours or 24-hours during weather emergencies. Callers to the DriveTexas Travel Information Line can receive personal assistance from TIC staff;
- TICs have a very good relationship with local residents, fire departments, and DPS, who visit the TICs frequently.

3.4. Summary

This chapter summarizes the feedback and discussions gathered during the workshop held on May 15, 2018. The workshop attendees provided insight into a variety of questions and topics raised by the presentation. As a result, a number of highlights and findings were identified, which help the research team learn more about how the TICs and local first responders work together to educate the public about highway safety and other safety topics; and how TICs help benefit highway safety for travelers visiting our state as well as Texas citizens, first responders, and other state agencies, cities, and counties.

Chapter 4. TIC Employee Interviews

TRV established TICs to provide travel and tourist information to the public, including Texas drivers and visitors from other states and countries. Tourist information about Texas is provided by certified professional travel counselors and other travel counselors who are very knowledgeable about Texas attractions and the Texas highway system. In addition, the TIC facilities provide a place for a traveler to stop and rest, use the restroom, obtain maps and brochures, and buy refreshments from vending machines. TIC facilities and TIC personnel also provide an important and beneficial way to convey highway safety messages to travelers. In order to document the methods used to convey highway safety messages, the CTR team conducted 52 telephone interviews with TIC personnel from the 11 TICs along the Texas state borders. A copy of the interview questionnaire is contained in Appendix C.

The interviews were conducted during April and May 2018 from CTR using a teleconference line. Typically, one CTR team member conducted the interview with two to three team members taking notes of the discussion with the TIC supervisor or employee. The interviews were scheduled for 1 hour and typically were conducted over a 20-minute to 1-hour period.

In addition, CTR team members visited five TICs—Orange, Wichita Falls, Gainesville, Texarkana, and Waskom—to conduct in-person traveler surveys and to observe interactions between travelers, the TIC facilities and TIC employees.

The following sections discuss the TIC employee interview responses in detail especially with regard to TIC employees' use of word-of-mouth marketing of highway safety messages to travelers. In addition, TIC personnel discussed the various insights gained regarding best practices for conveying highway safety messages and other methods of communication such as posters, printed materials, the video room and LCD screens discussed in later sections.

4.1. TIC Employee Experience and Training

The CTR team documented the work experience and training that TIC supervisors and employees (hereafter personnel) have which relate directly or indirectly to their many and various duties. It is important to summarize the types of activities that TIC employees support to better understand how their knowledge, skills and abilities are applied to enhance traveler highway safety.

On average TIC personnel have 9 years of experience working at a TIC, ranging from 1 month to 31 years for the 52 TIC personnel who were interviewed during this study. Prior work experience ranges from 6 months to 40 years for an average of 16 years for the TIC personnel interviewed. Thus, the employees interviewed have an average of 19 years' total work experience. Table 4.1 summarizes the variety of prior work experience types mentioned by the 52 TIC employees interviewed.

Table 4.2 summarizes prior professional training that TIC personnel obtained in their previous careers. It is noted that four TIC personnel owned and operated their own businesses. TIC personnel also gained management, supervisory and leadership training through the military, law enforcement, various retail or hospitality businesses, the US or local government agencies, and the public school system.

TIC supervisors and employees provide information and guidance to Texans at their place of residence in addition to domestic, out-of-state, and international travelers. TIC personnel speak with individuals both in person and by phone on a routine basis and during alert and emergency conditions. During statewide weather emergencies such as hurricanes, winter storms, and other severe weather, TxDOT's DriveTexas Travel Information Line acts as a statewide emergency information line. The line provides automated information around the clock and the option to speak with a travel counselor during TIC hours of operation. During emergencies, TICs may go into extended or even 24-hour operations to provide this emergency assistance. The calls are automatically rotated among the TICs such that TIC staff at any location may be responding to a caller in Houston who is trapped by flood waters. Conversely, during a severe winter storm that has closed roads due to ice and snow, TIC personnel in south or far west Texas may be answering calls from travelers from their place of residence or in their vehicle along various routes near Amarillo, Wichita Falls, Dallas, and Ft. Worth. The ability to respond to callers who need assistance during these extreme conditions requires TIC personnel to be experienced about dealing with frightened, confused or angry callers, while providing reassurance to calm the caller down in order to assess the situation and take next steps. Responding to these types of situations also requires TIC personnel to be very knowledgeable about different regions of the state and to provide guidance about existing highway conditions and other emergency and evacuation resources using:

1. DriveTexas.org
2. Updated information from Austin Emergency Management which is distributed through email messages
3. Information bulletins from TxDOT Public Information Officers

4. Information from other TICs' personnel within the affected region

These severe conditions disrupt normal highway operations and may create threatening situations that can result in injury or death if proper actions are not taken by the traveler. Many callers have stated they are thankful to have been able to talk to a real person rather than hearing only an automated message. Hearing a human voice and talking to a person who is knowledgeable and can provide up to date information is considered to be an extremely valuable service by a frightened caller. Table 4.3 summarizes the types of activities that TIC supervisors and employees perform. Additional information is discussed in Chapter 8 about TIC personnel performance during statewide emergency situations.

Table 4.1. Top 12 Work Experience Types prior to Working at a TIC & the Number of Personnel with This Experience

	TIC Personnel Prior Work Experience Types					
Experience Type	Customer / Hospitality Services	Retail Sales	Government	Public School	Medical / Dental / Optician	Travel Agent
Number of TIC employees	37	18	10	9	7	4
Experience Type	Transportation	Owned Business	Banking	Trainer for Business	Auditor / Inventory Control	Journalist
Number of TIC employees	4	4	3	3	3	2

Table 4.2. Top 12 Professional Training Types Received prior to Working at a TIC & the Number of Personnel Trained

	Types of Professional Training Received Prior to TIC employment					
Training Type	Customer Service	Management / Supervision	Conflict Resolution	Understanding Personality Types	Certified Travel Councilor - Includes Traveler Safety Module	Leadership
Number of TIC personnel	16	8	7	6	5	4
Training Type	First Aid	Customer Service over the phone	Computers / IT	Tourism	Crisis Management Training	Children - Teaching and/or Special education
Number of TIC personnel	4	4	4	3	3	3

Table 4.3. Summary of Job Activities Performed by TIC Personnel during Routine, Alert, and Emergency Situations

TIC Supervisor and Employee Job Activities - Local and Statewide Assistance and Communications	
Routine Activities	**Alert and Emergency Conditions**
Provide / Discuss general Travel / Tourist information / brochures	**Travel Advisories and Alerts**
Provide first-hand information about places to visit in Texas	Caution travelers who plan to cross into Mexico of US Travel Alerts
Answer Travelers Questions / suggest maps and other information	Advise travelers of accidents on their route - reroute when requested
Convey highway safety messages to travelers by word-of-mouth / phone	Caution travelers of severe weather alerts - reroute when requested
Discuss road conditions - work zones / work zone safety / stalled traffic	Caution travelers of Tornado Alerts / Warnings within Texas or adjoining state
Provide re-routing to travelers on request	Caution Travelers of high wind advisories for 18-wheelers / RVs
Interact with tired / sleepy travelers - suggest resting / spending the night	Assist travelers in making motel reservations when travel is discouraged
Redirect lost travelers (in person / by phone)	Support travelers who have sought shelter at the TIC (various reasons)
Advise of weather conditions anywhere in the state / out of state	Lead older travelers in person to local services / motels as necessary
Caution travelers to plan ahead - remote routes / lack of services	Explain the meaning of ITS Messages (Amber / Silver Alert)
Caution travelers to watch speeds / Work -School zones / small towns	Explain the meaning of DMS sign messages along travel routes
Caution travelers about wildlife activity along certain routes	**Working with Angry / Frustrated Travelers**
Caution Travelers about RV travel capabilities along routes w/ steep grades	Assess emotional state and the problem / talk with traveler until calmed
Advise out-of-state motorcyclists of Texas Helmet law and insurance rq'mts	Encourage angry or frustrated travelers to rest before driving further
Redirect in person and out of state traveler calls about Texas gun laws	**Emergency Conditions & Road Closures**
Redirect out of state trucker calls about permits / bridge clearances	Caution callers of winter driving conditions
Provide special services to international travelers	Identify route closures due to ice / snow
Converse in Spanish to provide directions, suggest tourist locations	Advise travelers not to closely follow snow plows
Convert distances and speed from KPH / kilometers to MPH / miles / time	**1-800 calls / Hurricane evacuation**
Explain the meaning of Texas highway signs and safety messages	Help Travelers who are in areas with flooding and risk of drowning
Explain Texas traffic laws to out-of-state / international travelers	Redirect callers to emergency services
Help coordinate and participate in Safety Events	Help guide callers to Safety using DriveTexas.org
Work with district Safety coordinator to distribute / discuss safety materials	Help callers assess their situation
Meet with student drivers and their instructor - provide / explain TIC services	Help calm frightened callers and suggest options / next steps
Coordinate with 1st responders during plannig / training exercises	**Advise police - illegal activities at TIC**
Provide wifi other services to law enforcement due to equipment malfunction	Kidnapped person seeking help
Attend school & civic functions - distribute -discuss safety / tourist materials	Advise of possible human trafficking

4.2. Word-of-Mouth Advertising

A number of studies and articles have documented the value of word-of-mouth communications, marketing or advertising and face-to-face meetings for improving communications since this allows reading body language. In addition, word-of-mouth has been shown to be more effective in influencing a behavioral change in customer purchasing, personal health choices and other applications (Bughin, J. et al. 2010) (Chee, C & Ang, A. 2013) (Chang, M. 2015).

Though there is little information available about word-of-mouth marketing and highway safety messages, it is notable that the Louisiana DOT State Highway Safety Plan – Communications and Marketing Plan recognizes "Earned Media" as a type of free marketing that relies on conveying safety messages at public events to create a "buzz" about highway safety. Grassroots marketing employs several methods to get the message out by working through small groups. The messages are communicated by a) power of personal relationships, b) word of mouth and c) the internet (LaSHSP 2017). This type of advertising of highway safety messages is somewhat similar to District Highway Safety Events which are held at TICs which will be discussed in a later section.

Cronin and Hightower evaluated the types of marketing used to advertise public transit organizations (Cronin & Hightower 2004). Based on survey responses, word of mouth was the most commonly used (83%) type of advertising by transit agencies while direct mail (71%) and newspaper advertising (62%) were second and third place. The most commonly used media employed by transit agencies included television, radio, newspapers, brochures, billboards, direct mail, word of mouth, and public service announcements.

The Minnesota Safe Ride Program Report discusses the impact of encouraging impaired individuals to call, or have someone call for a Safe Rides Van or the police to ensure they get home safely. In Cleveland, Minnesota, the Cleveland Police received between 80 and 100 calls per year and transported 145 people in 2009. The Cleveland police indicated that the Safe Ride Program was communicated within the town completely by word of mouth marketing (Sprattler Group 2010).

4.3. TIC Employee Word-of-Mouth Safety Messages

TIC personnel have gained insights about best practices in conveying highway safety messages to travelers at the TIC and on the phone during routine calls for information. The following excerpts are comments from TIC personnel about conveying highway safety messages which were learned through experience:

"People first ask about places to visit and then ask about road conditions and construction."

"We talk about highway safety as part of a normal conversation with the traveler."

"People stop at the TIC because they want to know the best route."

"We don't necessarily quote the exact safety slogan on the bill board - like Click it or Ticket - we would probably say remember to fasten your seat belt.'"

"The Safety Message Depends on the route the traveler will be taking and their Destination."

"The (Safety) message depends on the weather, accidents and construction along the route."

"Talking to a traveler about highway safety is a case by case basis - you determine what is important for them to hear based on what they are asking for."

"(We) May not see it (the safety benefit) right away, but you are planting that seed for (the) future. The information might be subliminal – the traveler might not aware of the message but later, when they see the information along the roadway, they recall because the TIC employee had a conversation with the traveler earlier. "

"(Safety Messages) Save traveler's time, money, and life. Some people think they are invincible……"

In addition, TIC personnel have learned that travelers are more receptive to highway safety messages based on the following insights:

"Keep safety messages short."

"Make the conversation personal."

"Engage in conversation, ask the traveler if they saw a certain sign (and) have a question."

Further, TIC personnel sometimes will recognize that a traveler is frustrated or angry. TIC personnel work to defuse these situations:

"A TIC is a Safe Zone - We will listen to your problem. We are your helper, your ally."

Finally, TIC personnel services help traveler safety in other ways that might not first come to mind:

"(TIC personnel) Help travelers who are lost find the way back to the correct route."

"Knowing where you are going (correct route, directions) is helpful to safety."

"Visitors often underestimate the distance to major cities in Texas when entering the state. We explain the time and distance to various destinations in Texas."

"Some people think that a destination is 'x' distance, but miscalculate the number of driving hours - we point out the speed limit - it will take more time than they think."

During the TIC personnel telephone interviews CTR asked each person which safety messages they typically share with travelers and callers. Table 4.4 provides a summary of the most commonly shared highway safety messages including the number of times TIC personnel mentioned a particular safety message. Table 4.4 is sorted in terms of the greatest number of times and percentage of times (in relation to the total number of all safety messages) TIC personnel mentioned during the interviews. Information is also provided regarding numbers of times a specific highway safety (sign) slogan was mentioned during the interviews. In addition, the number of fatal crashes (red text) and/or number of fatalities (blue text) are listed in relation to the highway safety message based on TxDOT 2016 Crash Cause or Contributing Factor crash statistics (TxDOT 2018a) (TxDOT 2018b) (TxDOT 2018c) (TxDOT 2018d).

Though Table 4.4 lists the most commonly shared messages, there are other safety insights, safety messages or travel advice that are unique to a specific TIC or region of the state. The following list summarizes quotes from TIC personnel about these safety messages or actions. Again, it is important to remember that since travel calls are rotated among TICs, TIC personnel may be responding to a request for information or addressing a problem several hundreds of miles from their location. This requires TIC personnel to work as an integrated team and to become very familiar with all parts of the state through annual meetings, and regional trips to become familiar with various traveler destinations. For this reason, TRV holds annual meetings in different parts of the state to allow TIC personnel to have the widest, personal knowledge of local terrain, climate, towns, and highway routes possible.

"We advise RV drivers about the (highway) grades (at) destinations they plan to visit – for example, if they are traveling to Big Bend – we ask if they are towing a smaller vehicle such as a car or SUV. This is because the roadway grades within the park are sometimes very steep and an RV is not able to climb the grade – thus, the traveler might change their plans after learning about this."

"There are long distances between towns in our region – it could be 60 or more miles to the next gas station. We try to get travelers to think ahead and plan – when you're driving a long distance you can get tunnel vision, there is no cell phone service in our area so people need to think."

"Mexico's roads usually have lower speed limits than US roads because of condition. Mexico maintains highways that are tolled. Regular free highways don't have a shoulder."

"TICs give Mexican citizens a good first impression of Texas and the US – they can talk to us and we can give them an overall better understanding of different messages. For example, we have been asked what 'Don't Mess with Texas' means…..they have heard this message but the meaning can be confusing. We also explain that once you get off the Interstate – you may be driving on local streets which have different speed limits and other rules. We keep our messages short and sweet – that is what works best."

"(The) speed limit - is 75mph in Texas and 85mph on toll roads – people from other states or countries may not know the laws in Texas – they are surprised that we have speed limits this high."

"Don't use cruise control during rain – you might end up hydroplaning and running off the road."

"We try to find an alternative route when people are stuck (in) traffic (e.g., mom with kids stuck in traffic for 2 hours, no water etc.), people maybe not familiar with the alternative routes, and scared of getting off the main road, I will stay on the phone with them …… to guide them to the alternative route."

"(During a Safety Event) A Care Flight helicopter came and landed in the parking lot, this attracted a lot of people and they had the chance to talk with the helicopter crew about safety and what could happen if you had a crash."

TIC personnel are also involved in educating drivers about Texas Traffic Laws and explaining to student driver's the types of information and services provided by TICs and TIC personnel.

"For young student drivers, we tell them do not drive and text, put on your seat belt."

"During the summer the Drivers Ed teachers will stop at the TIC with 2 or 3 students and come into the center to get information – road conditions and other information. We give each student a package of information about Texas tourism and highway safety. We also tell them about our [DriveTexas] 1-800 number which they can call if they need information."

"(A Lieutenant with the local) Police department is a Customer safety specialist – (he's) really (a) good person (to have) doing the safety promotion, we have a good relationship. He worked for the Sheriff's Dept. and then DPS for 40 years."

"(Safety Messages) Helps keep the Travelers aware and keeps them conscious of their surroundings. Knowing about Texas laws and local construction zones helps reduce distracted driving and the person doesn't get a ticket – they're not asking themselves when they are driving along 'Am I doing something wrong?'"

Thus, it is apparent from these comments that TIC personnel use a combination of customer service / hospitality, tourist marketing and inter-personal skills to identify travelers who are open to hearing the message and those who are not.

Table 4.4. Highway Safety Topics and TxDOT Sign Messages TIC Personnel Mention to Travelers Discussed during the Interviews

Highway Safety Topics that were discussed by TIC personnel during the CTR Interview							
Highway Safety Topic	**Do Not Drive Drowsy**	**Obey Speed Limit - Slow Down**	**Look Twice for Motorcycles**	**Cell Phone - Talking**	**Work / Construction Zones**	**Turn Around - Don't Drown**	**Cell Phone Texting -**
Total number of times this highway safety topic was mentioned	46	38	31	29	28	17	12
Total number of times a TxDOT Sign message for this highway safety topic was mentioned	2	1	3	2	0	7	0
Percentage of all safety messages (237)	19.4%	16.0%	13.1%	12.2%	11.8%	7.2%	5.1%
Percentage of all safety signs mentioned (23)	8.7%	4.3%	13.0%	8.7%	0.0%	30.4%	0.0%
Statewide number of fatal **crashes** (**fatalities**)	**161**	**501**	**484**	**17**	**162** / **181**	**Unknown**	**15**
Motorcyclist fatalities (helmet worn)			**219**				
Motorcyclist fatalities (helmet not worn)			**265**				

Highway Safety Topic	**Do Not Drive Distracted**	**Explain Texas Traffic Laws**	**Fasten Seat Belts**	**Do Not Drink and Drive**	**Watch for School Zones**	**Watch for Railroad Crossings**	**Watch for Wildlife**
Total number of times this highway safety topic was mentioned	11	7	6	4	3	3	2
Total number of times a TxDOT Sign message for this highway safety topic was mentioned	1	0	2	2	2	1	0
Percentage of all safety messages (237)	4.6%	3.0%	2.5%	1.7%	1.3%	1.3%	0.8%
Percentage of all safety signs mentioned (23)	4.3%	0.0%	8.7%	8.7%	8.7%	4.3%	0.0%
Statewide number of fatal **crashes** (**fatalities**)	**417** / **460**	**10***	**1,088**	**944**	**Unknown**	**6**	**20**
Vehicle Fatalities (wore seat belt)			**1,288**				
Vehicle Fatalities (did not wear seat belt)			**1,088**				

*Note: The crash cause used for this safety topic is 'Failed to Obey Warning Signs'.

Referring to the top listed highway safety message from Table 4.4 ‘Do Not Drive Drowsy’, TIC personnel used more different methods to describe how they recognize a traveler who may be too tired to drive safely:

“Ask (the) Traveler how many hours they have been driving – take a rest break”
“Providing travel information allows people to rest.”
“(We) encourage a motorist who is obviously tired to stop and rest at the TIC.”
“Encourage Drivers to rest and take a break in our video room.”
“Take a Break (and walk down our 600' long board walk). Stretch your legs.”
“If you are tired, please rest.” “Take a Break from the road.”
“You can rest here at night”

An important point to emphasize is that a TIC and a highway SRA both provide travelers with a place to stop and rest. However, SRAs are unmanned; TIC personnel are able to interact directly with travelers, assess their level of fatigue and encourage tired drivers to rest at the TIC before driving further, or stopping at a nearby motel for the rest of the day. When visiting an SRA, the fatigued driver is left to their own discretion whether to rest at the SRA or ‘push on’ further toward their final destination. TIC personnel thus provide a significant safety benefit by assessing a driver’s physical appearance, communicating with them to determine the number of hours or miles they have been driving and then encouraging tired drivers to rest. Under certain circumstances, TIC personnel may also help a tired traveler who is unfamiliar with local accommodations, to make motel reservations. Since TIC employees maintain good working relationships with hotel and motel contacts, they are able to quickly determine which motels are full and which still have available rooms, especially under severe weather conditions. In some cases, TIC personnel have led older, fatigued travelers to a local motel as an extra safety precaution.

Notably, one TIC supervisor mentioned during the interview that an older driver returned months later to the TIC and thanked him personally for helping him make accommodations for the night and then leading him to the hotel. In a separate event, the Supervisor indicated he had received a thank-you letter from a State Representative for helping two constituents by providing a slower, scenic re-route around Dallas since they did not want to drive through Dallas.

Table 4.5 provides the distance in miles from each TIC to another TIC and to the top tourist destinations in Texas. Note in the bottom half, the table lists travel distances and destinations that can be safely reached in 1-day, 2-days and 3-days based on the (limited) safe driving distance / time information currently available.

The Boy Scouts of America Transportation Guide has established 10 hours as the maximum number of traveling hours for passenger vehicles, SUVs and vans, transporting scouts, regardless of the number of drivers. The 10 hour period is to include frequent rest and recreation breaks and is intended to reduce the risk of fatigued driver crashes (BSA 2018).

The University of New South Wales's University Occupational Health and Safety Program provides guidelines regarding the maximum number of hours an employee may drive depending on different factors (NSW OH&S 2011), including:

1. Solo or multiple drivers; not more than 10 hours driving in a day
2. Driving during daylight or night time hours
3. Combined work and driving time in the same day
4. Take frequent rest breaks; at least 20 minutes every 2 hours
5. Consider driver age, drivers over 50 years old are more likely to fall asleep than younger drivers
6. Consider vehicle type, terrain and weather conditions

TIC personnel may ask travelers the number of hours they've been driving. As will be discussed in Chapter 5 regarding the Traveler Survey, travelers were asked how many miles and how many hours they had been driving before stopping at the TIC. Clearly, TIC staff interactions with fatigued drivers can help reduce the number of fatigued driving crashes in Texas involving Texas residents and either out of state and international travelers.

Closely associated with the distance or number of hours a traveler has driven before arriving at the TIC or plans to drive after leaving the TIC is the speed limit along their chosen route. As indicated during the interviews, TIC personnel were asked about or indicated the speed limit along the planned route and recommended that travelers obey the speed limit and slow down. Once TIC personnel know the planned route, they are able to check speeds, presence of active work zones, lane closures or Traffic Alerts due to crashes or other incidents. TIC personnel can then advise the traveler of these conditions and may be requested to reroute the traveler to avoid long traffic queues, or to avoid traveling through construction zones.

Table 4.5. TICs and Top Travel Destinations in Texas with Annual Numbers of Visitors and Shortest Distance in Miles between Each Location

Table of TIC and Top Travel Destinations in Texas with annual number of visitors and shortest distance in Miles between each Location												
TIC Location, Major Cities and Tourist Destinations	**Visitors per Year**	**Amarillo**	**Anthony**	**Denison**	**Gainesville**	**Harlingen - Valley**	**Langtry**	**Laredo**	**Orange**	**Texarkana**	**Waskom**	**Wichita Falls**
Amarillo TIC	136,599	0	446	343	302	764	457	611	666	486	521	245
Anthony	108,694	446	0	726	690	821	387	608	876	831	822	603
Denison TIC	246,727	343	726	0	51	598	537	490	347	162	213	128
Gainesville TIC	277,715	302	690	51	0	568	484	477	387	192	234	88
Harlingen - Rio Grande Valley TIC	74,132	764	821	598	568	0	417	196	440	621	555	589
Langtry TIC	45,065	457	387	537	484	417	0	222	520	642	592	444
Laredo TIC	283,598	611	608	490	477	196	222	0	432	583	515	477
Orange TIC	288,651	666	876	347	387	440	520	432	0	262	192	449
Texarkana TIC	329,018	486	831	162	192	621	642	583	262	0	96	271
Waskom TIC	391,828	521	822	213	234	555	592	515	192	96	0	306
Wichita Falls TIC	163,095	245	603	128	88	589	423	477	449	271	306	0
Dallas - Ft. Worth	25,000,000	370	655	79	75	502	444	411	312	177	167	140
Austin	25,610,000	477	597	274	257	306	294	217	273	354	291	286
San Antonio	31,000,000	512	572	353	336	249	215	138	308	433	370	339
Houston	21,800,000	595	756	316	314	329	409	322	113	292	233	376
El Paso	8,990,000	422	21	706	666	783	365	588	857	811	802	557
Corpus Christi	8,100,000	672	716	472	452	135	325	150	321	499	440	481
Galveston	6,500,000	641	804	366	364	371	459	382	104	340	282	426
Lubbock	5,500,000	128	360	334	291	637	322	484	642	477	513	210
South Padre Island	4,300,000	810	847	644	610	47	460	257	486	665	606	634
Waco	2,500,000	418	632	174	157	408	382	318	271	271	214	204
Big Bend National Park	440,276	450	313	606	551	571	155	376	674	712	689	483
Guadalupe Mountains National Park	225,257	364	126	563	523	691	275	495	756	685	676	440
Palo Duro Canyon National Park	72,562	30	417	365	325	748	441	595	683	508	543	238

Note: The US Air Force has established the following maximum driving distance regulations for airmen on leave. The Air Force considers 350 miles per day to be the standard travel distance. If the travel distance between the origin and destination is between 350 and 700 miles, airmen are allocated 2 travel days to permit 8 hours of sleep during the trip. This same relationship has been used to determine when 3 travel days should be planned. Cells in white (39.9% of origin/destination pairs) show distances <= 350 miles or 1 day travel distance; yellow cells (51% of origin/destination pairs) show distances from 351 to 700 miles or 2 days travel distance. Blue cells (9.1% of origin/destination pairs) are 701 to 800 or more miles or 3-days travel distance.

TIC personnel are particularly alert to travelers who will be traveling within construction work zones, school zones and when traveling through small towns.

TIC personnel also emphasized that many travelers have been surprised by the high speed limits along Texas highways and toll roads; high speed limits on the approach to route segments with lower posted speeds requires special vigilance by the traveler. Certain interview comments by TIC personnel bear repeating:

> "The Safety Message depends on the route the traveler will be taking and their destination."
>
> "The (Safety) message depends on the weather, accidents and construction along the route."
>
> "(The) speed limit is 75mph in Texas and 85mph on toll roads – people from other states or countries may not know the laws in Texas – they are surprised that we have speed limits this high."
>
> "Mexico's roads usually have lower speed limits than US roads because of condition. Mexico maintains highways that are tolled. Regular free highways don't have a shoulder."

These last two comments should be considered within the context of the number of tourists that visit Texas each year from Mexico and other countries. Based on information provided by the Office of the Governor – Texas Tourism, approximately 8 million tourists from Mexico visit Texas each year. An additional 1.8 million tourists from the India, the UK, Japan, China and many other countries also choose Texas as their tourist destination.

It should be noted that the 8 million tourists from Mexico are among the over 34 million passenger vehicles and 67 million passengers who crossed over from Mexico to Texas at 11 border crossings in 2017 (BTS 2018). It is further noted, that of the 8 million tourists from Mexico, 619,000 arrived in Texas by air while the remaining 7.3 million tourists arrived by land. It has been further estimated that of the 1.8 million international tourists who visited Texas from Canada, Europe, Asia, South America, India, and other countries approximately 409,600 (31%) rented a car (Canadian car rental data was not available) (Travel Texas 2017a) (Travel Texas 2017b) (Travel Texas 2018). Table 4.6 summarizes the number of car rentals made by international travelers who drove in Texas. International travelers typically visit as least two states while in the US. Thus, a traveler might arrive in another state, visit that state, then visit a TIC on their journey to a destination in Texas. Else, a traveler might arrive in Texas at Dallas or Houston, rent a car, travel to destinations

in Texas, then possibly visit one of the border TICs as they leave the state. During visits to the Orange, Wichita Falls, and Gainesville TICs, CTR personnel who were conducting survey interviews interacted with two individuals from England, five individuals from South Africa, one individual from Mexico (non-English speaker), and one US citizen traveling with one Vietnamese citizen (non-English speaker). In addition, travelers from many other states were also interviewed.

During traveler surveys conducted by TIC and CTR personnel in person and an online survey in both English and Spanish, a total of 158 international visitors were interviewed from 28 different countries. The top five countries of origin were Mexico (58), Canada (47), England (8), Germany (6) and France (6). Additional travelers were from Western and Eastern Europe, Africa, Asia, Australia and the Middle East.

Table 4.6. Number of Car Rentals by International Visitors to Texas (2016)

Country of Origin	India	UK	Central America	China	Australia	Germany	Middle East	South Korea
Number of Visitors	158,000	135,000	128,000	124,000	107,000	93,000	64,000	63,000
% Rented a Car	15.3%	33.4%	28.9%	22.7%	43.1%	50.8%	31.0%	33.0%
Number of Car Rentals	24,174	45,090	36,992	28,148	46,117	47,244	19,840	20,790

Country of Origin	Columbia	Nordic	Italy	Brazil	Japan	Netherlands	France	Taiwan
Number of Visitors	55,000	51,000	47,000	46,000	41,000	41,000	40,000	20,000
% Rented a Car	31.4%	48.3%	46.8%	34.9%	30.7%	47.0%	43.9%	57.5%
Number of Car Rentals	17,270	24,633	21,996	16,054	12,587	19,270	17,560	11,500

4.4. TIC Media Resources Used to Provide Highway Safety Messages

TIC facilities incorporate various media sources that are used to present tourist and safety information to travelers (Figures 4.1 through 4.3). Upon arrival at a TIC the traveler is greeted by information regarding highway safety, including signs and information that the TIC is a "Safe Phone Zone." TxDOT has partnered with GEICO Insurance ™ to provide a safe area for travelers to pull off the road to make calls or read text messages. All of the TICs offer free wi-fi for public use.

Figure 4.1 "Safe Phone Zone" sign upon entering the TIC parking lot

Figure 4.2 "Talk Text Crash Poster" in TIC lobby next to 'rehydration station'

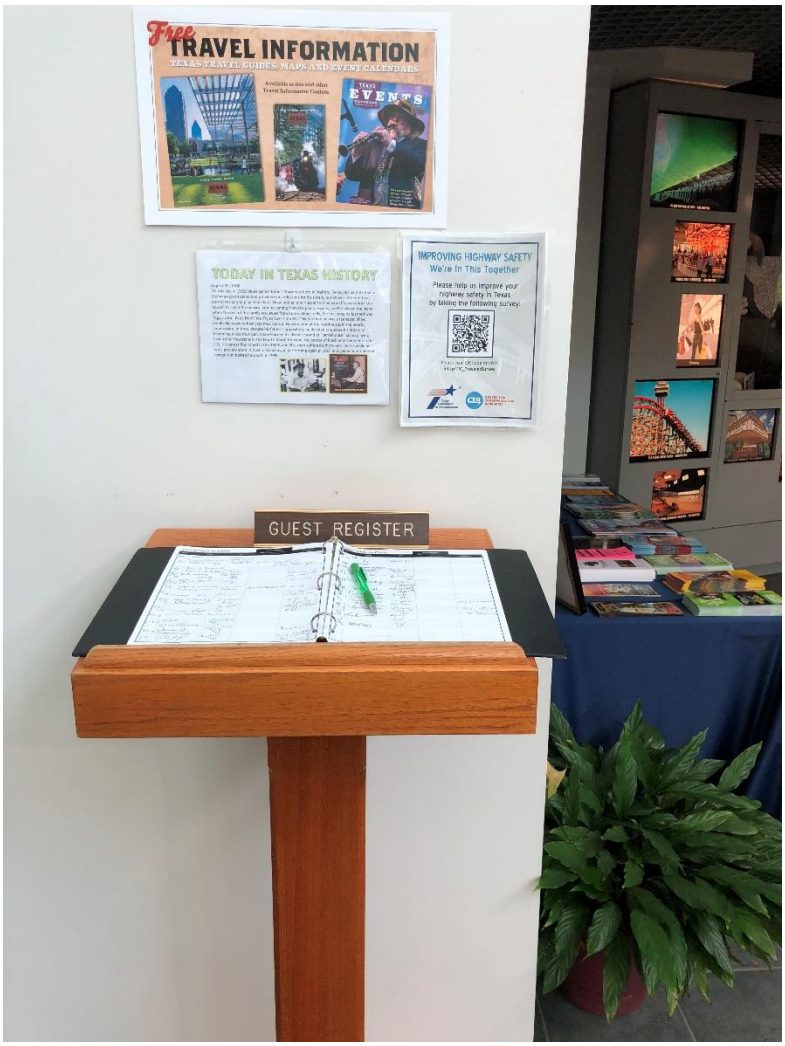

Figure 4.3 Guest register with CTR QR code / URL poster for traveler survey

One of the methods used to collect traveler information was through a traveler survey that could be accessed by using a cell phone to read the Quick Response (QR) Code or input the URL listed on the CTR travel survey poster.

Upon entering a TIC the traveler is greeted by a very well-organized, clean, well-lighted, and friendly environment (Figures 4.4 through 4.7).

Figure 4.4 Wichita Falls TIC along IH 44 main traveler information area and desk

Figure 4.5 Comfortable seating to take a rest break, relax, and make cell calls

Figure 4.6 Texarkana TIC entrance and main information areas

Figure 4.7 Texarkana information counters with TIC personnel

Each TIC has a video room which provides travelers with a comfortable place to sit and watch videos of their selection on a range of topics (Figure 4.8).

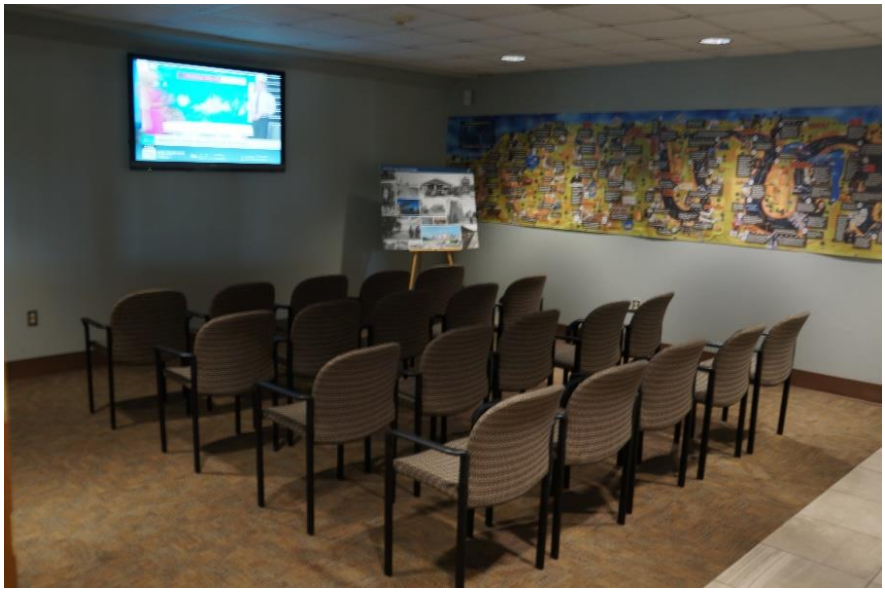

Figure 4.8 Gainesville TIC video room

In addition, some TICs have a large LCD screen near the entrance or within the TIC that displays live TV coverage of weather and other information (Figure 4.9).

Figure 4.9 Waskom TIC LCD screen displaying weather information

In addition, each TIC has banners or posters prominently displayed in the central area of the TIC adjacent to traveler brochures, maps and other information. These banners and posters often result in travelers asking TIC personnel questions about the safety message (Figure 4.10 shows one such safety message).

Figure 4.10 Lobby area of the Gainesville TIC with a 'Look Twice for Motorcycles' banner

TIC personnel have also learned that travelers often notice highway safety posters or information when visiting the restroom facilities (Figures 4.11 through 4.14).

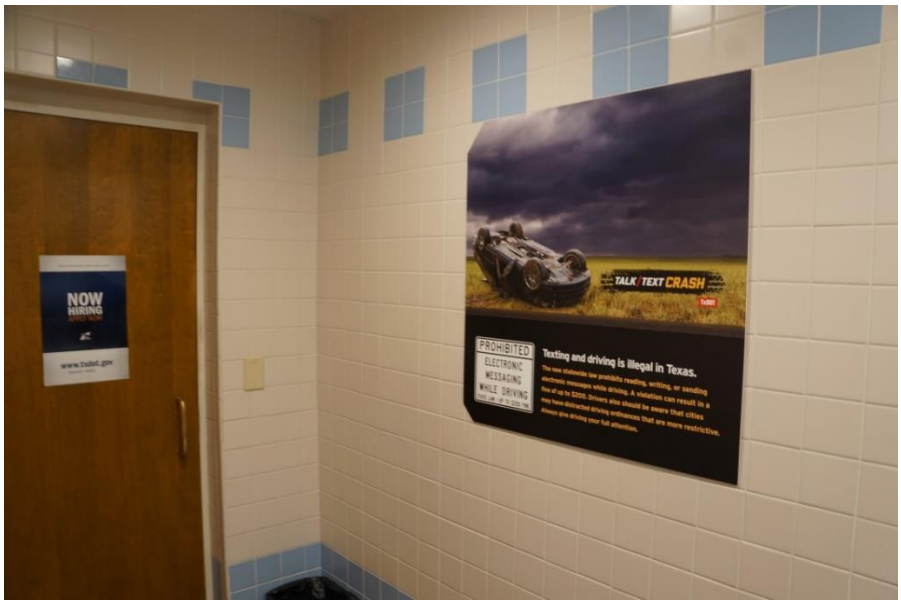

Figure 4.11 Safety poster in the Wichita Falls TIC restroom

Figure 4.12 Poster – 'If you see a child alone in a car take action…."

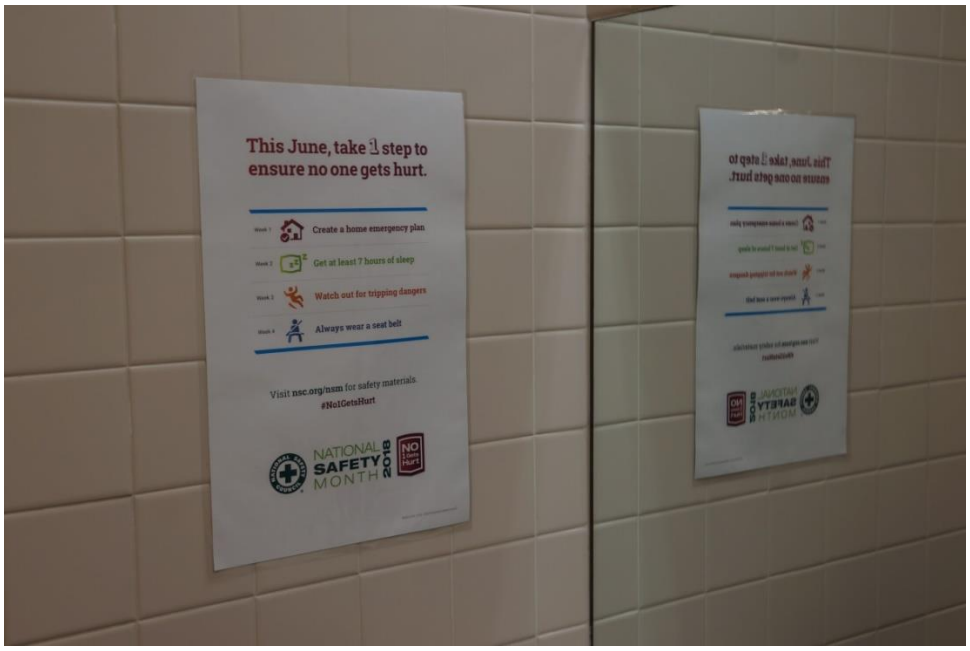

Figure 4.13 June – National Safety Council 2018 Safety Month

Figure 4.14 CTR 3" x 5" cards traveler survey QR Code and URL links to survey

Figure 4.15 provides an example of TIC amenities available to travelers.

Figure 4.15 Comfortable seating with a picture window overlook Gainesville TIC

4.5. TICs and Safety Events

TIC personnel work closely with the district safety coordinator to host one or more safety events at the TIC. The TIC provides an opportunity for representatives from law enforcement, various citizen safety advocacy groups, and local government to display many types of safety information. Figures 4.16 through 4.19 were taken at a highway safety event held at the Orange TIC.

Figure 4.16 Various safety advocates setting up their tables at the Safety Event

Figure 4.17 Some safety advocates dressed in costumes for children and photo-ops

Figure 4.18 Many travelers who stopped for the event ended up meeting with TIC personnel

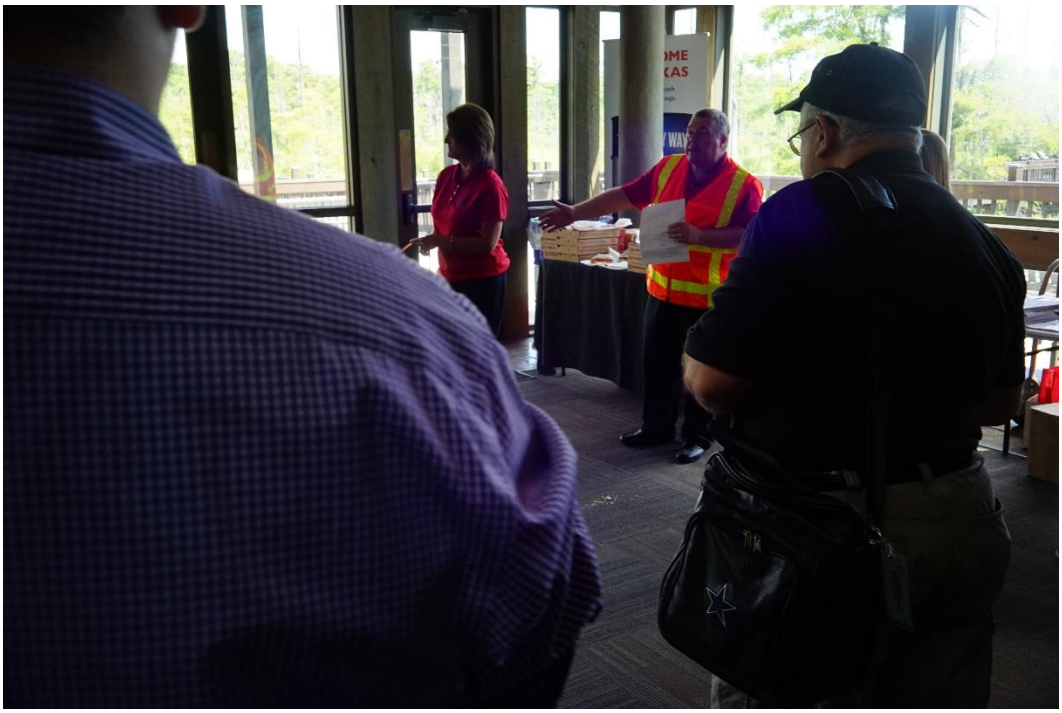

Figure 4.19 The safety event also provided an opportunity for a ceremony to reopen the 600-ft-long boardwalk that had been closed for cleaning and inspection after Hurricane Harvey

The Orange TIC safety event was visited by hundreds of travelers who asked for brochures and travel information and also received safety information from dozens of safety advocacy groups who attended. Safety events typically have a specific theme depending on the safety campaign TxDOT is emphasizing. Many different safety advocates also discuss information on safety topics related to highway safety and other outdoor safety activities typical for vacationers.

4.6. Summary

In summary, the TIC personnel interviews provided a wealth of information about methods used to convey highway safety messages to travelers in person and by phone on a day to day basis. In addition TIC personnel are experienced and knowledgeable about providing accurate and up-to-date information to travelers during travel alerts and statewide emergency conditions. The following key points were learned during the surveys:

1. TIC personnel use word-of-mouth safety messages to inform travelers of information specific to their travel route and destination.

2. TIC personnel make an extra effort to recognize tired, sleepy travelers and take steps to encourage them to rest before traveling further.

3. TIC personnel interact with out-of-state and international travelers who may not understand Texas traffic laws; may not understand Texas highway safety messages, and are unfamiliar with the higher speed limits and other operational considerations more familiar to Texas residents.

4. TIC personnel use other types of media such as banners, posters, videos, and brochures to convey a wide range of highway safety messages to travelers.

5. The TIC facilities are well designed, organized, friendly, and inviting places for travelers to stop and rest, obtain tourist and safety information, and prepare for the next portion of their journey.

6. TIC personnel have excellent connections with local first responders, motels, and other businesses that are important resources to travelers.

7. TIC personnel work as a statewide team to convey safety information during emergency events and may go into extended hours answering the phones and reassuring stranded travelers who have sought shelter at the TIC.

Chapter 5. Analysis of Traveler Survey

TICs offer a wide variety of accessible services between 8 a.m. and 5 p.m. (6 p.m. in summer), including travel information, free wireless internet access, video theater for Texas attractions and destinations, 24-hour restrooms, 24-hour security surveillance, "Welcome to Texas" photo opportunities, group facilities, and several hosted safety events throughout the year. It is obvious that people would choose to stop at a TIC to combat driving fatigue and rest. However, TICs offer much more than just a place to counteract fatigue. CTR developed both online and in-person surveys to unveil the safety impacts of TICs. By surveying the public, the Chapter captures and analyzes travelers' opinions on TIC employees and the safety impact of TICs.

5.1. Design of the Surveys

CTR research team developed both an online and paper survey to collect travelers' opinions on the safety impact of TICs. Both revealed-preference questions and stated-preference questions were included in both survey approaches. With a revealed-preference question, travelers are asked to report actual behaviors. Stated-preference questions ask travelers to identify choices they would make under various scenarios. Specifically, the survey mainly collects information on a traveler's residency, gender, whether they are driving a CMV or not, travel party size, the reasons for stopping at a TIC, number of miles (or hours) driven since the last stop, whether the traveler has planned the next stop, highway safety messages seen in Texas, highway safety messages heard from TIC employees, rating on effectiveness of different methods in transmitting highway safety messages, rating on safety impact of TICs, opinions on having a TIC employee to talk with or ask questions, whether the traveler has stopped at a Texas highway SRA or not, and traveler's rating on safety impact of SRAs.

Considering that a portion of travelers in Texas speak only Spanish, online and paper surveys were developed in both English and Spanish. CTR has prepared 3-inch by 5-inch cards with a QR Code to the online survey. TIC employees helped distribute the cards to the travelers so that they can scan the QR Code and conduct the survey online via smartphone. Most of the in-person surveys were conducted with the help of at least one TIC employee during the traveler's visit. The 11 TICs mailed the completed surveys to CTR research team for analysis on regular basis. CTR also traveled to five TICs to participate in one safety event, observe the

facility, talk with travelers, and conduct the survey with travelers. The CTR team complied, integrated, and analyzed all the surveys received, which contained valuable information from travelers on determining safety benefits of TICs.

5.2. Survey Overview

5.2.1. Online Survey

CTR developed an online survey to provide information regarding travelers' experience and opinions about the TIC employees and safety impact of TICs. UT is licensed to use Qualtrics™ online survey and data analysis tools. A QR Code was created, which can be scanned by traveler's cellphone and directly takes the traveler to the survey. A 3-inch by 5-inch poster card containing the QR Code was developed and mailed to the 11 TICs for distribution purposes. The design of the poster card is presented in Figure 5.1.

Figure 5.1 Poster cards containing QR Codes - English version (Left) and Spanish version (Right)

The poster cards were mailed to the 11 TICs so that the TIC employees could print them out and put them around sign-in sheet, restroom, and/or other notable places in the TIC. Travelers could complete the survey during their visit or take the card with them to scan the QR code and complete the survey when convenient. The

online survey was originally developed to capture as much information as possible. Therefore, it contained 34 questions, but its length resulted in a relatively low response rate.

Since there are certain TICs with Spanish-only speakers, CTR developed a "Spanish" drop-down option on the right top corner of the online survey; when selected, Qualtrics automatically translates the survey into Spanish.

The online survey was made available to public on April 6, 2018. There were in total 134 online surveys received. Of those 134 surveys, 72 surveys (54%) were 100% completed, while the other 62 surveys (46%) had at least one question not answered by the traveler. Seventy-four of the online surveys (55.2%) were conducted by scanning the QR Code, while the remaining sixty surveys (44.8%) were completed using an online link. One hundred and thirty-two of the surveys (98.5%) were completed in English, while only two surveys (1.5%) were completed in Spanish. The English and Spanish online survey can be accessed at: https://utexas.qualtrics.com/jfe/form/SV_5dn2UMktrO0LDqR, respectively. The findings of the online survey are integrated and analyzed in Section 5.3.

5.2.2. Paper Survey

Paper surveys were developed to conduct an in-person survey at TICs. Travelers were invited to take the survey while walking around the lobby after a restroom break and/or after consulting questions. In-person surveys have much higher response rates than online surveys, which can help ensure a cross-sectional representation of the population because people are less likely to decline a survey when personally invited by a travel counselor. At least one TIC employee was required to assist the travelers to complete the survey. The employee answered any questions associated with the survey and/or helped the traveler to fill it out. The completed surveys were mailed to CTR on a regular basis through FedEx or USPS. CTR processed those received surveys and developed a database to store the information.

Similar to the online survey, the first (longer) version of paper survey was developed with the goal of capturing as much information as possible. The initial survey had 19 questions on 3 pages. Although the total number of questions was different for the paper survey and the online survey, the questions themselves were the same. The online survey broke several questions down into sub-questions to get more in-depth information. The first paper survey was emailed to each TIC on April, 6, 2018, and was conducted for one week to collect comments or

recommendations for future improvement. According to feedback from TICs, the first version survey contained too many questions and the travelers were not willing to complete it. Therefore, CTR revised the survey and removed some of the questions in order to increase the response rate. The second (shorter) version had 11 questions on one page. The shorter version survey was emailed to each TIC on April 13, 2018. The shorter version was less time-consuming to complete and increased the response rate significantly. In an attempt to collect a statistically representative sample of survey responses, the shorter survey was conducted from April 14, 2018 to August 31, 2018. A Spanish version was also developed and provided in TICs where Spanish is the primary language spoken, such as Laredo TIC.

To summarize, there were 170 longer version surveys and 1,978 shorter version surveys received from the 11 TICs, respectively. Out of those 2,148 paper surveys assisted by TIC employees, 2,041 surveys (95.0%) were in English, while the other 107 surveys (5.0%) were in Spanish. It is noteworthy that most of the Spanish surveys came from Laredo TIC. A total of 1,371 surveys (63.8%) were 100% completed, which indicates that the remaining 777 surveys (36.2%) had at least one question left unanswered. The longer and shorter versions of the survey are attached in Appendix D, respectively. The overview of shorter version surveys is presented in Figure 5.2. The detailed shorter surveys are attached in Appendix D as well.

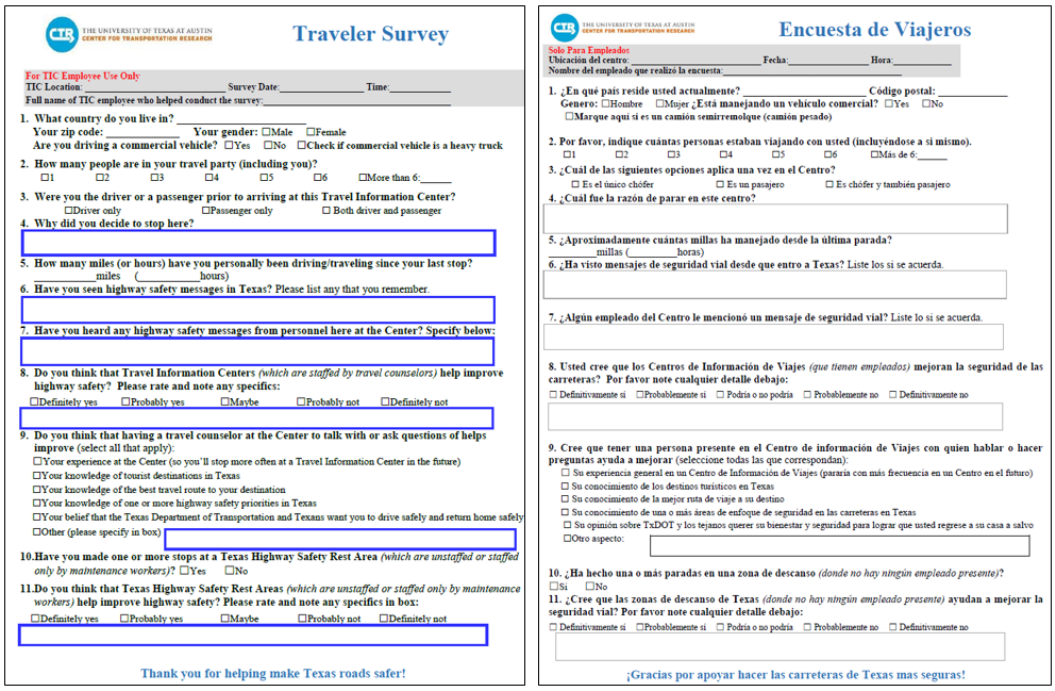

Figure 5.2 Shorter version paper surveys overview – English (Left) and Spanish (Right)

In addition, CTR conducted three trips to visit five TICs (in Orange, Waskom, Wichita Falls, Texarkana, and Gainesville) in order to attend scheduled TIC safety events (at the Orange TIC), gain more insights on TIC operation, talk with travelers, and further investigate the safety impact of a TIC. CTR team members brought surveys and conducted traveler surveys in person. The survey contained 13 questions, with the first 11 questions exactly the same as shorter version survey (as shown in Figure 5.2). The two additional questions directly compared a TIC with an SRA regarding their safety impact and the traveler's personal preference. CTR research team collected 161 surveys during 3 trips. The survey is in English and is attached in Appendix D.

The analysis and findings of the paper surveys are presented in Section 5.3.

5.3. Survey Analyses

Since there are various versions of surveys and some of the questions are not answered by the travelers, different questions have different number of valid responses. In total, there are 134 online surveys and 2,309 paper surveys completed. Responses to each question were reviewed and invalid responses (e.g. unreasonable responses or blank responses) were removed by the research team before conducting analysis. The total number of surveys (online and paper surveys)

completed at all 11 TICs was 2,443. 2,418 surveys (99.0%) indicated the TIC location where the surveys were conducted. The breakdown for each TIC is presented in Figure 5.3.

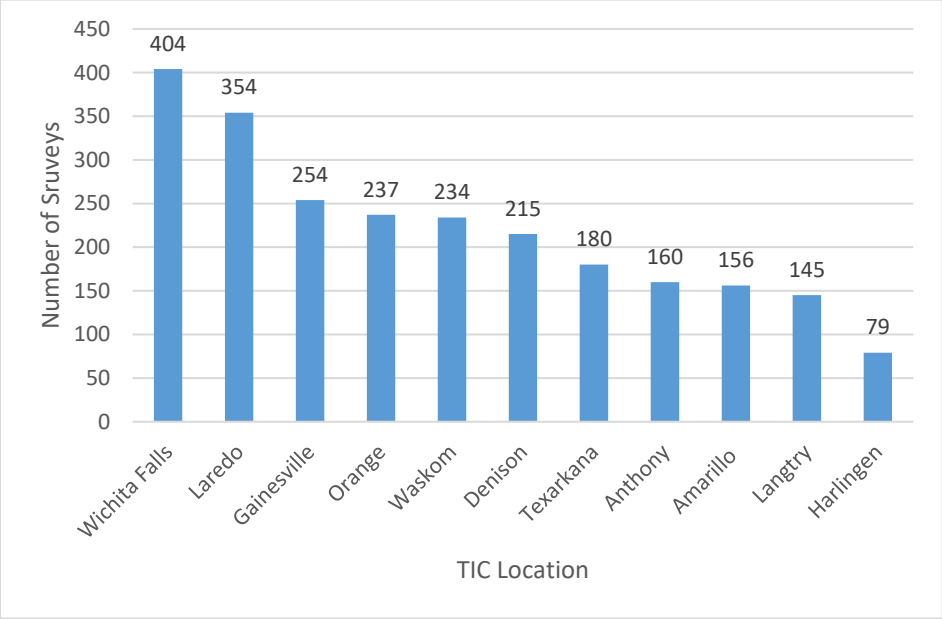

Figure 5.3 Number of surveys completed at each TIC

5.3.1. Questions on Shorter Version Survey

Most of the traveler surveys were conducted using the shorter version survey. This section analyzes the questions on that survey. Please note that since the longer version survey and online survey also contain the same questions, the numbers and statistics shown in this section combine all the survey results from all versions for the same questions. Additional questions that are not in the shorter version will be discussed separately in subsequent sections.

The survey first collected travelers' basic information, such as residency, gender, and whether they are driving a CMV. Based on the 2,389 valid responses, 92.5% of the travelers presently reside in United States, and the other 7.5% come from other countries, including Mexico, Canada, Australia, Argentina, Chile, China, Costa Rica, Japan, and European countries, such as England, Germany, France, Belgium, Netherlands, etc. Most of them come from Mexico and Canada. It is significant that TIC employees provide safety messages to international travelers with limited knowledge about Texas traffic laws which might be different from those of their countries.

A total of 2,144 respondents provided their gender, of which 1,018 (47.5%) are male and 1,126 (52.5%) are female. There are 2,133 valid results indicating types of vehicles that a traveler drives. 1,945 (91.2%) respondents said that they were driving a regular passenger vehicle, while the other 188 (8.8%) mentioned that they were driving a CMV. 43 (2.0%) stated that the CMV is a heavy truck. The pie charts for residency, gender, and vehicle type are shown in Figure 5.4, Figure 5.5, and Figure 5.6, respectively.

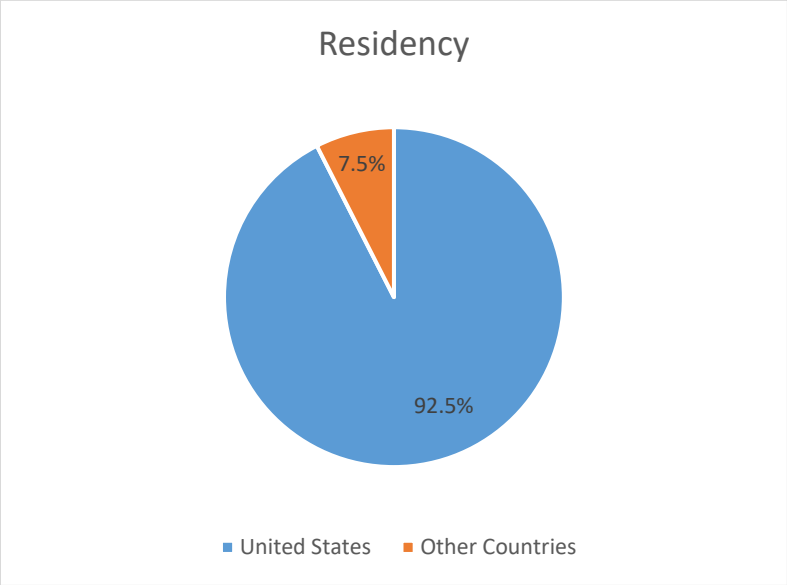

Figure 5.4 Residency distribution of respondents (2,389 valid responses)

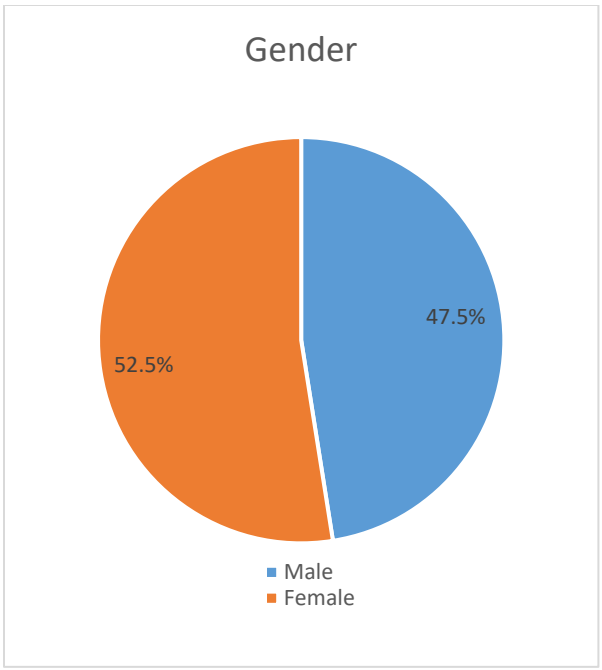

Figure 5.5 Gender distribution of respondents (2,144 valid responses)

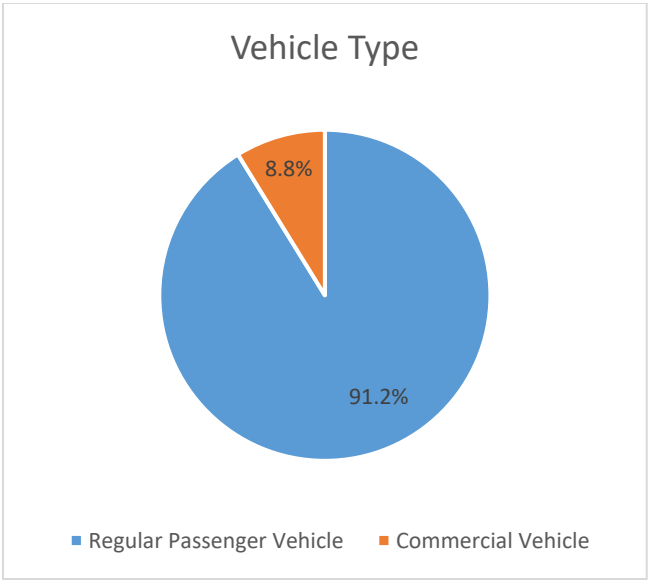

Figure 5.6 Vehicle type distribution of respondents (2,133 valid responses)

Travelers were asked about the travel party size (including the survey taker). Based on 2,377 valid responses, most of the travel party size is 2 (1,043 responses, 43.9%), followed by travel party size of 3 (421 responses, 17.7%), 1 (339 responses, 14.3%), 4 (316 responses, 13.3%), 5 (125 responses, 5.3%), more than 6 (86 responses, 3.6%), and 6 (47 responses, 2.0%). In addition, the travelers were asked to provide

the detailed number of travel party size if it is more than six. Overall, the average travel party size is three. Figure 5.7 presented the distribution of the travel party size.

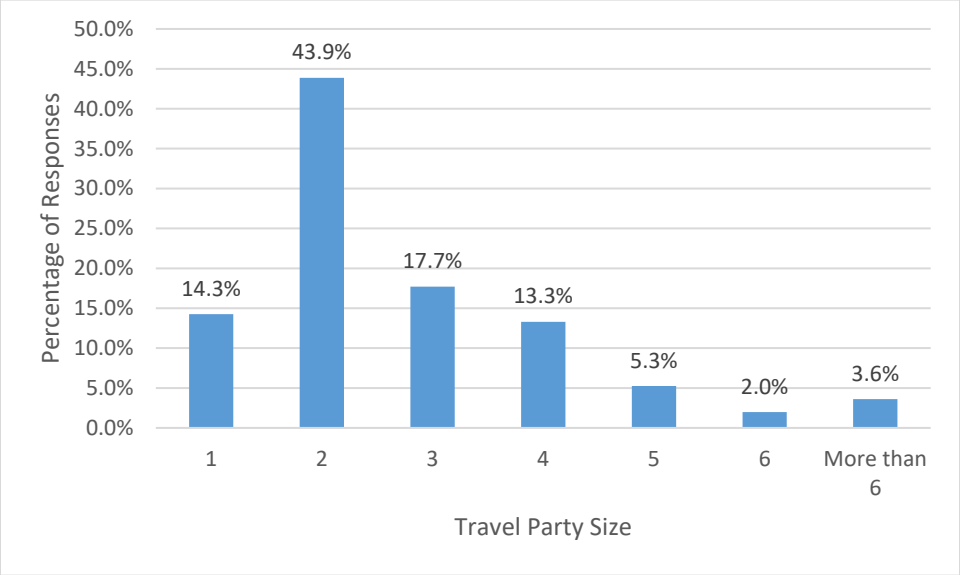

Figure 5.7 Travel party size distribution (2,377 valid responses)

The survey then asked the traveler's role prior to arriving at the TIC. According to 2,362 valid responses, 1,062 (45.0%) were driver only, 536 (22.7%) were passenger only, and 764 (32.3%) were both driver and passenger. Most of the travelers are driver only, which indicates that they may need a place to take a break and/or take turns to drive in order to avoid fatigue. The distribution of travelers' roles prior to arriving at the TIC is shown in Figure 5.8.

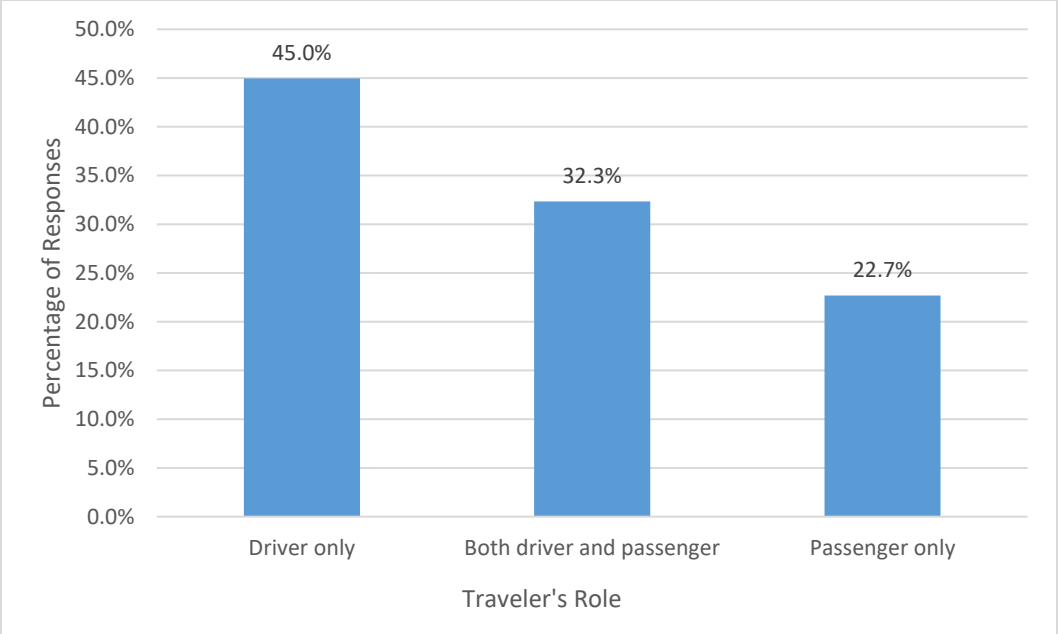

Figure 5.8 Traveler's role prior to arriving at the TIC (2,362 valid responses)

The CTR researchers asked travelers why they chose to stop at a TIC. A wide variety of reasons were given. Based on 2,350 valid responses, the top three reasons were information/direction (e.g., maps, guides, directions, brochures, etc.), restroom, and stop to take a break with 1,044 responses (44.4%), 624 responses (26.6%), and 597 responses (25.4%), respectively. Figure 5.9 listed more detailed reasons why travelers stopped at a TIC. "Others" includes Wi-Fi and cellphone use, children relief, walk pets, food or drink supply, etc.

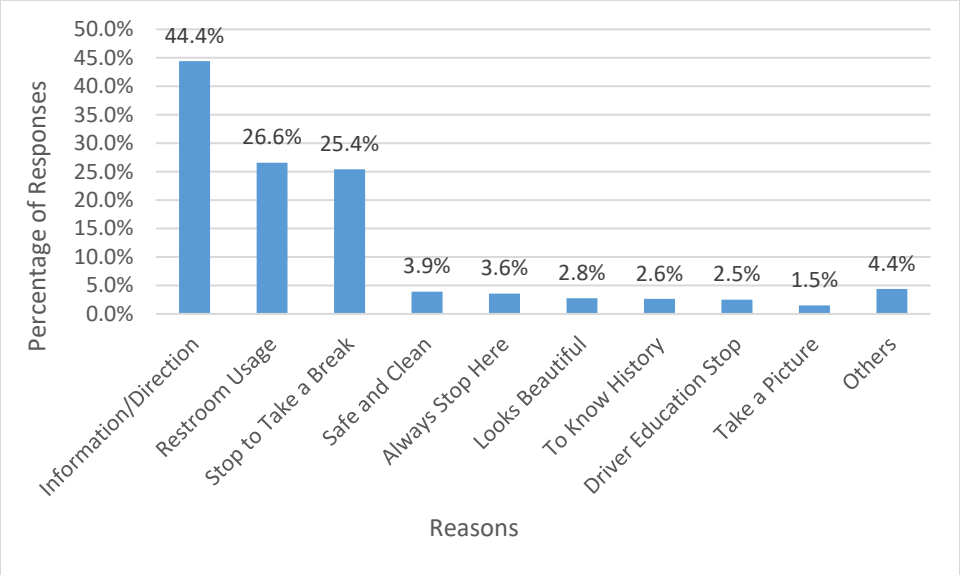

Figure 5.9 Reasons for stopping at the TIC (2,350 valid responses)

Most of the respondents (44.4%) stopped at the center to ask for travel information and directions. CTR research team noticed that restroom usage only received a 26.6% response rate. This may due to the way how the survey was conducted. In order not to disturb travelers, TIC employees were asked to wait until travelers had used the amenities before asking them to take the survey. However, during our visit to TICs, we observed that many travelers leave right after using the restroom without taking the survey, leading to an artificially low restroom usage response rate.

A TIC is preferred by 3.9% of the travelers because they feel that it is safe (24-hour security surveillance) and clean. About 3.6% of the respondents made TICs a regular stop location. The appearance, opportunity to know more history (especially at Langtry TIC where people want to know more about Judge Roy Bean), and driver education are the next three reasons that attract travelers to stop at a TIC. In addition, a TIC is regarded as a symbol of Texas by many travelers as it is the first facility they come across after entering Texas. Many travelers stopped at a TIC just to take some pictures of the TIC facilities and/or "Welcome to Texas" signs. "Others" includes Wi-Fi and cellphone use, children relief, walk pets, food or drink supply, etc.

Travelers were asked questions regarding their trip distance or duration prior to their stop at the TICs. Number of miles or hours traveled was provided by the travelers. A total of 1,417 travelers gave valid responses in miles traveled and 1,541 travelers provided valid responses in hours traveled. Figure 5.10 and Figure 5.11

presented the distributions of distance and duration that respondents traveled prior to stopping at the TICs, respectively.

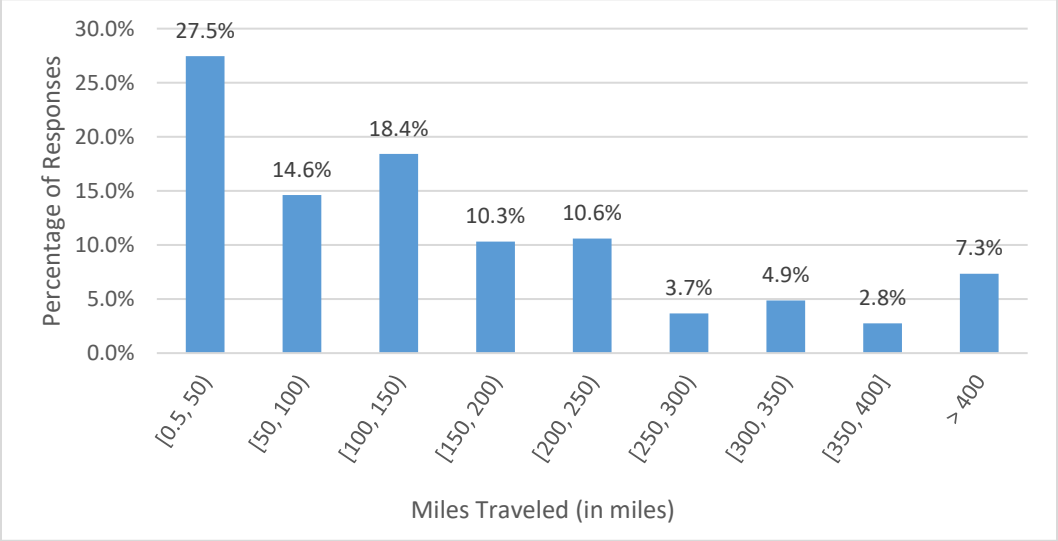

Figure 5.10 Travelers' trip distance prior to stopping at TICs (1,417 valid responses)

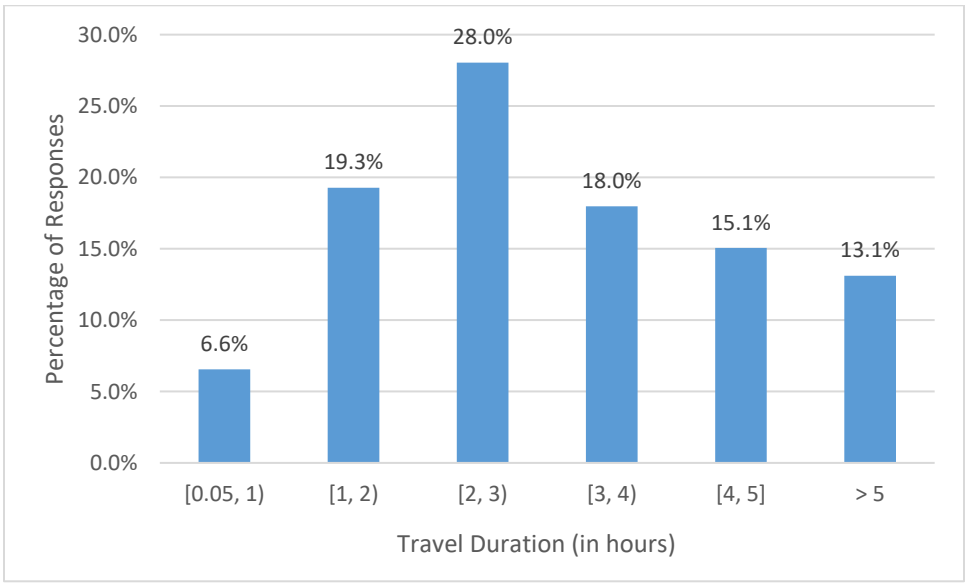

Figure 5.11 Travelers' trip duration prior to stopping at TICs (1,541 valid responses)

As can be seen from Figure 5.10, 27.5% of the respondents traveled less than 50 miles before they stopped at the TICs. A total of 81.4% traveled less than 250 miles. It needs to be pointed out that 7.3% of the travelers indicated that they traveled more than 400 miles prior to stopping at the TICs. In terms of the trip duration, most of the travelers (28.0%) traveled between 2 to 3 hours before they made the stops. In addition, 74.1% of the respondents traveled more than 2 hours with 13.1%

traveling more than 5 hours. The average distance traveled prior to stopping at the TICs is 186 miles, and the average trip duration is 3.3 hours. The TICs are great places that provide clean facilities and safe spaces for travelers to take restroom breaks, stretch their legs, get re-energized, and/or obtain travel information.

CTR researchers attempted to know if travelers had seen highway safety signs in Texas when they are traveling along the highways. If they had seen any, the researchers would like to know what safety messages they were. Since this is a write-in question, the response rate is a little lower – 2,007 valid responses were collected. 1,463 travelers (72.9%) mentioned that they had seen at least one safety messages in Texas, while the other 544 (27.1%) said they did not pay attention or did not see any safety messages, which is shown in Figure 5.12. The reasons why they had not seen any safety message are "just entered Texas", "have been sleeping", and "didn't really pay attention".

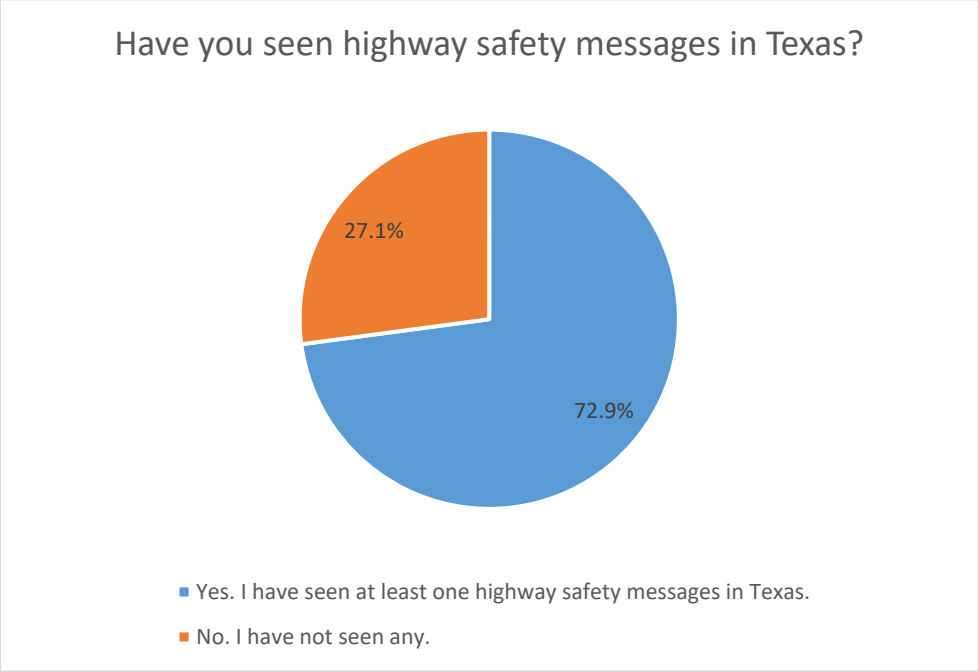

Figure 5.12 Percentages of travelers who had seen highway safety messages in Texas (2,007 valid responses)

Of those 1,463 travelers who said they had seen highway safety messages in Texas, 961 travelers listed the safety messages they had seen. The other 502 travelers just answered "yes" without listing detailed message, or they said "yes, but I do not remember." Figure 5.13 presents the highway safety messages in Texas seen by the travelers.

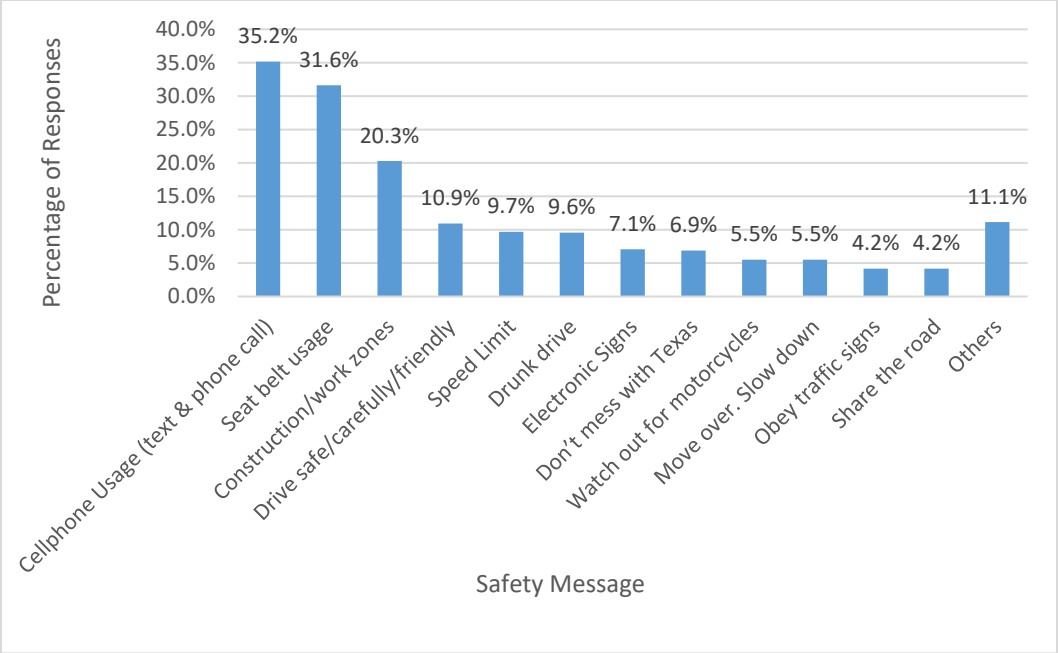

Figure 5.13 Highway safety messages seen in Texas (961 valid responses)

As can be seen from Figure 5.13, cellphone usage is the most common safety massage that the travelers saw (35.2%), which includes slogans like "Don't drive and text," "No texting while driving," "Talk, text, crash," etc. Other notable safety messages are seat belt usage (e.g., "Click it or Ticket," "Buckle up," etc.) (31.6%), construction/work zones (20.3%), drive safe/carefully/friendly (10.9%), speed limit (9.7%), don't drink and drive (9.6%), electronic signs showing number of deaths (7.1%), Don't mess with Texas (6.9%), watch out for motorcycles (5.5%), move over and slow down (5.5%),obey traffic signs (4.2%), and share the road (4.2%). Other safety messages (11.1%) include left lane for passing only, amber alerts, turn around – don't drown, detour and lane closure, high winds, etc. Although "Don't mess with Texas" is TxDOT's anti-litter campaign, it is considered to be a safety message by many travelers because they believed that the debris and certain trash on highways could cause crashes.

Subsequently, the travelers were asked if they had heard any safety messages from a TIC employee. If yes, they were asked to write down the safety messages if possible. Since part of the travelers were less likely (might not have enough time) to write down their answers, the research team noticed that several questions were left blank. Therefore, the valid responses are smaller – 1,741 valid responses. Of the 1,741 valid surveys, 846 travelers (48.6%) said that they had not heard any highway safety messages from a TIC employee, while the other 895 travelers

(51.4%) confirmed that they had heard at least one safety messages from the TIC employee, as shown in Figure 5.14.

Figure 5.14 Percentages of travelers who had heard highway safety messages from TIC employees (1,741 valid responses)

According to Figure 5.14, TIC employees did a great job in conveying safety messages as the majority of travelers (51.4%) indicated that they received highway safety messages from TIC employees. The main reasons why 48.6% of the travelers had not heard any safety messages are "just arrived the TIC," "have not talked with an employee," "I did not stay to listen," and "I did not ask for the safety message."

Of those 895 travelers who said they had received highway safety messages from a TIC employee, 591 travelers listed the safety messages they had heard about. The other 304 travelers just answered "yes" without listing detailed message, or they said "yes, but I did not pay attention." Figure 5.15 presents the highway safety messages heard from TIC employees.

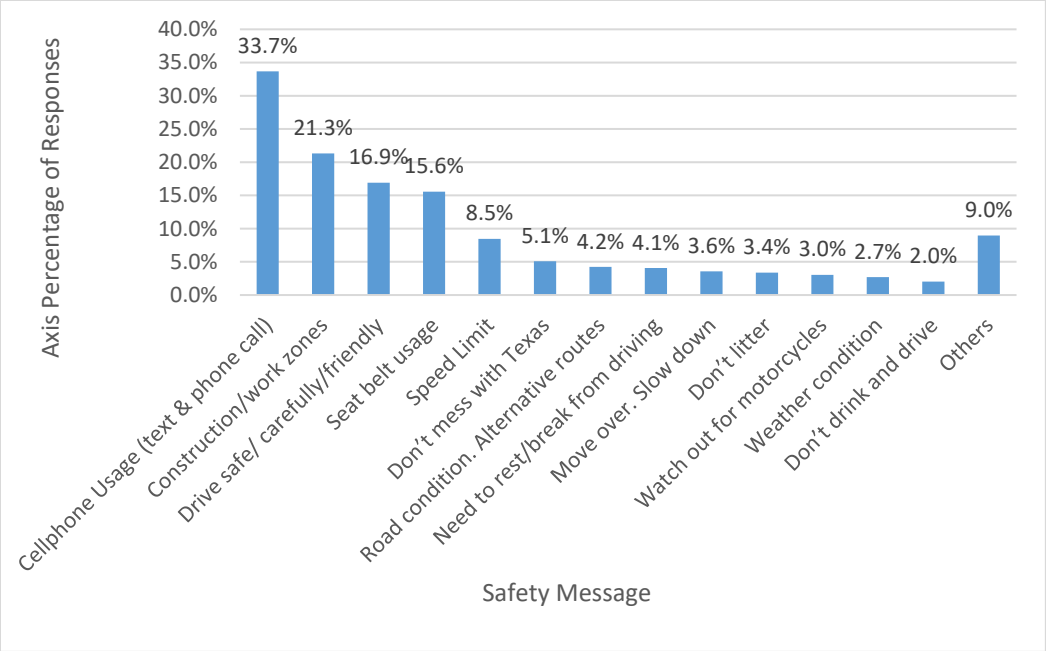

Figure 5.15 Highway safety messages heard from TIC employees (591 valid responses)

According to Figure 5.15, cellphone usage is still the most common (33.7%) safety message that the travelers remembered hearing from TIC employees. The second most safety message is "construction/work zones" (21.3%) because the TIC employees are very knowledgeable about the construction in their area and they can also obtain real-time information from DriveTexas.org. The other safety messages heard from TIC employees include drive safe/drive carefully/drive friendly (16.9%), seat belt usage (15.6%), speed limit (5.8%), don't mess with Texas (5.1%), and road condition (4.2%). The TIC employees also emphasized the importance of taking a break from long-distance driving (4.1%). Other safety messages (9.0%) include general traffic laws, obey traffic signs, don't drive distracted, turn around/don't drown, etc. The TIC employees did a great job of reminding travelers about those safety messages. Travelers would be kept aware of these safety messages, which helps improve highway safety.

The next question asked the travelers to give their rating on a TIC's effectiveness in improving highway safety. The travelers can select one of the five options provided: definitely yes (highly effective), probably yes (effective), maybe (neutral), probably not (ineffective), and definitely not (highly ineffective). 2,328 valid responses were received and the distribution of each rating is shown in Figure 5.16.

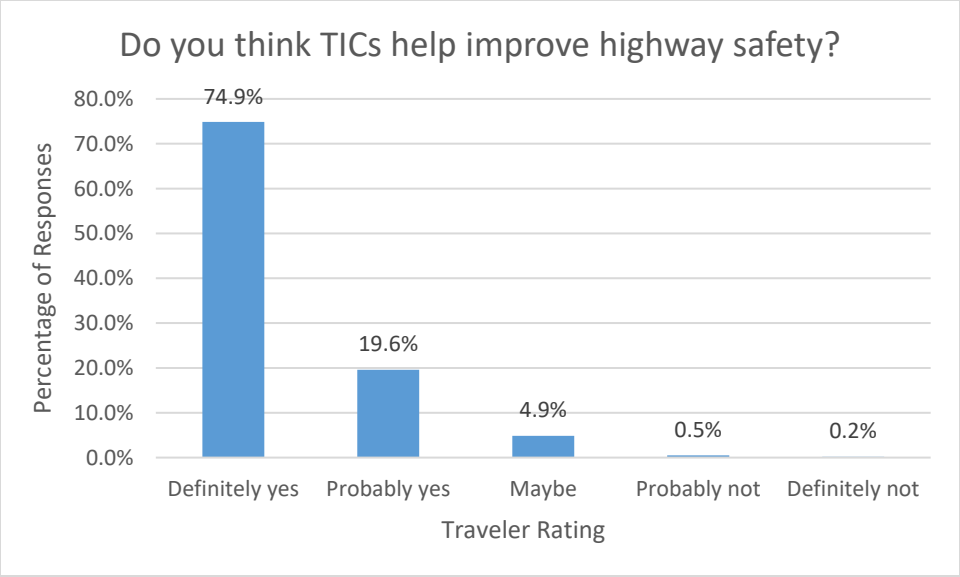

Figure 5.16 Travelers' rating of TICs' effectiveness in improving highway safety (2,307 valid responses)

Figure 5.16 shows that 74.9% of the travelers (1,743 out of 2,307 travelers) believe TICs definitely help improve highway safety and 19.6% (456 travelers) think they probably help improve highway safety, which indicates that a total of 94.5% travelers (2,199 travelers) believe TICs benefit highway safety. Only 0.5% of the travelers (12 travelers) think TICs probably don't help improve highway safety, and 0.2% (4 travelers) said they are definitely not helping improve highway safety.

In order to quantify the results, a "safety score" was developed by the researchers. More specifically, a score was assigned to each of the ratings: 5 – definitely yes, 4 – probably yes, 3 – maybe, 2 – probably not, and 1 – definitely not. This means that if a traveler rated "definitely yes", then the score for this answer is 5. The "safety score" of TICs' effectiveness in improving highway safety is the weighted average of all the travelers' responses, namely:

$$Safety\ \ Score = \frac{5\times n_1 + 4\times n_2 + 3\times n_3 + 2\times n_2 + 1\times n_5}{N} \qquad (5.1)$$

where n_1, n_2, n_3, n_4, and n_5 are the number of responses for definitely yes, probably yes, maybe, probably not, and definitely not, respectively; N is the total number of valid responses.

In this way, the travelers' ratings are quantified into a "safety score." A "safety score" of 5 indicates that the travelers believe TICs are completely effective in improving highway safety and a score of 1 means that totally ineffective. Based on

the number of responses received, the "safety score" is calculated using Equation 5.1. The overall "safety score" is as high as 4.7, which indicates that TICs are very effective in improving highway safety in travelers' opinions.

The survey then attempts to capture travelers' opinions on TIC employees, which asks the traveler to select the impact of having a travel counselor (employee) at the TIC. Five options were provided, including "help improve experience at the center (will stop more often at a TIC in the future)," "help improve my knowledge of tourist destinations in Texas," "help improve my knowledge of the best travel route to my destination," "help improve my knowledge of one or more highway safety priorities in Texas," and "help improve my belief that TxDOT and Texans want me to drive safely and return home safely." The travelers could select all that apply. In addition, the travelers were encouraged to write down any other comments they had, which is categorized as "other." A total of 2,271 valid responses were collected and the statistics are presented in Figure 5.17.

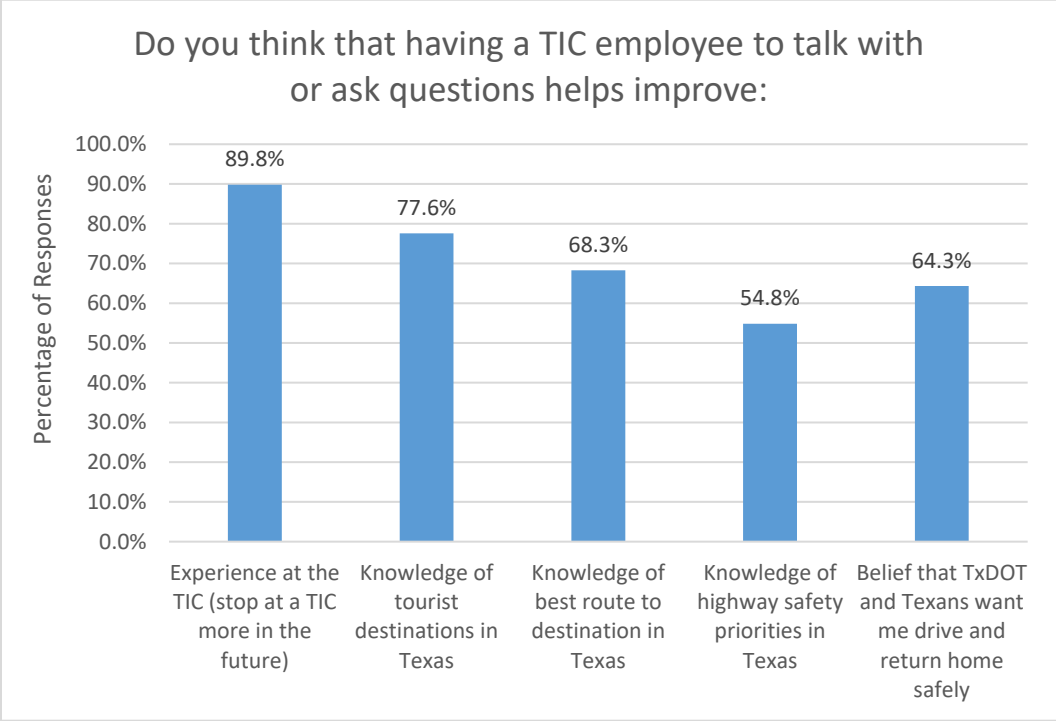

Figure 5.17 Travelers' opinions on TIC employee interaction (2,271 valid responses)

Figure 5.17 indicates that the TIC employees did an excellent job in improving the traveler's experience at the TIC by talking with them and answering their questions. 89.8% of the travelers said that they would stop more often at a TIC in future trips. In addition, many TIC employees are certified travel counselors, who are very

knowledgeable about tourist destinations and the best route to destinations in Texas. 77.6% of the travelers thought they gained more information about tourist destinations in Texas and 68.3% of the travelers mentioned that the employees helped them to know the best route to their destination. 54.8% of the travelers recognized that they knew more about safety messages and safety priorities in Texas. Finally, 64.3% of the travelers said that the TIC and the employees made them believe that TxDOT and Texans want them to drive and return home safely. The researchers also received various comments made by the travelers in "other" category. Selected comments will be presented and discussed in Section 5.4.

For comparison purposes, the research team also requested travelers' opinions on Texas SRAs. Travelers were asked about whether they had stopped at one or more SRAs in Texas. 2,283 valid responses were collected. 1,402 travelers (61.4%) indicated that they had stopped at an SRA in Texas, and the other 881 travelers (38.6%) said that they had not. The pie chart is presented in Figure 5.18.

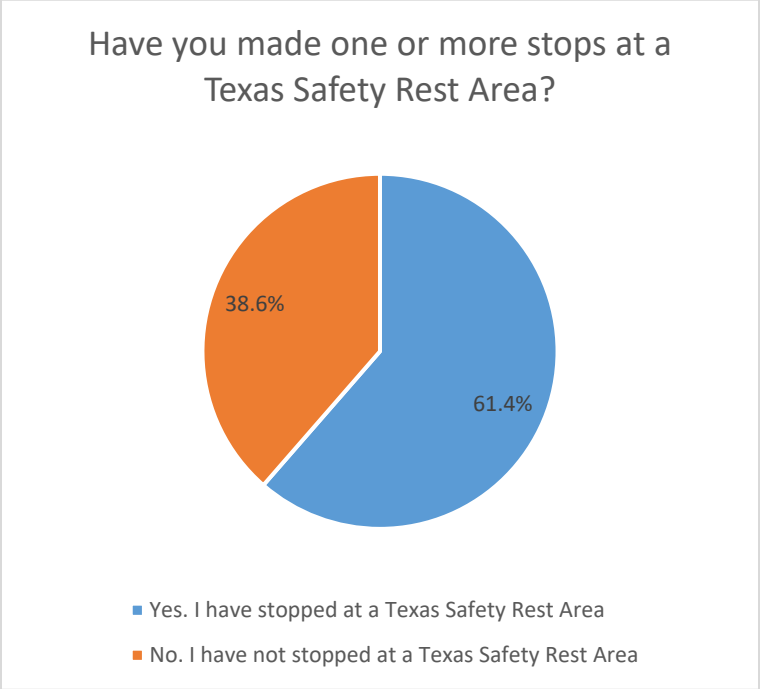

Figure 5.18 Travelers who stopped at an SRA (2,283 valid responses)

It should be pointed out that many travelers indicated that this was their first time in Texas and they just entered the state. Therefore, they had not stopped at a Texas SRA before.

The last question asks the travelers if they think an SRA helps improve highway safety based on their experience and personal opinion. Similarly, travelers can select one of the five options provided: definitely yes (highly effective), probably yes (effective), maybe (neutral), probably not (ineffective), and definitely not (highly ineffective). In this question, responses from travelers who had stopped at a Texas SRA before are considered first by the research team because they had used and experienced the SRA facilities and environment. Of those 1,402 travelers who had stopped at a Texas SRA before, 1,392 travelers provided their response to this question. The distribution of each rating is shown in Figure 5.19.

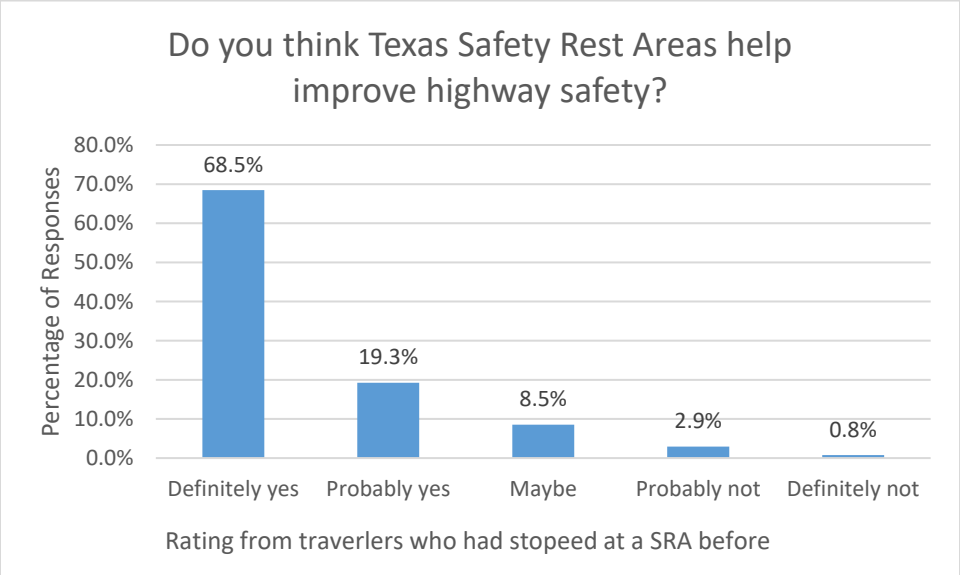

Figure 5.19 Travelers' rating of Texas SRAs' effectiveness in improving highway safety (1,392 travelers who had stopped)

For those travelers who had stopped at a Texas SRA before, Figure 5.19 shows that 68.5% of the travelers (953 out of 1,392 travelers) believe SRAs definitely help improve highway safety and 19.3% (268 travelers) think they probably help improve highway safety, which indicates that a total of 87.8% travelers (1,221 travelers) believe SRAs benefit highway safety. 2.9% of the travelers (41 travelers) think SRAs probably don't help improve highway safety, and 0.8% (11 travelers) said they are definitely not helping improve highway safety.

The research team also noticed that many travelers said that they had not stopped at an SRA before but responded to this question anyway. Of those 881 travelers who had not stopped at a Texas SRA before, 840 travelers provided their responses to this question. The distribution of each rating is shown in Figure 5.20.

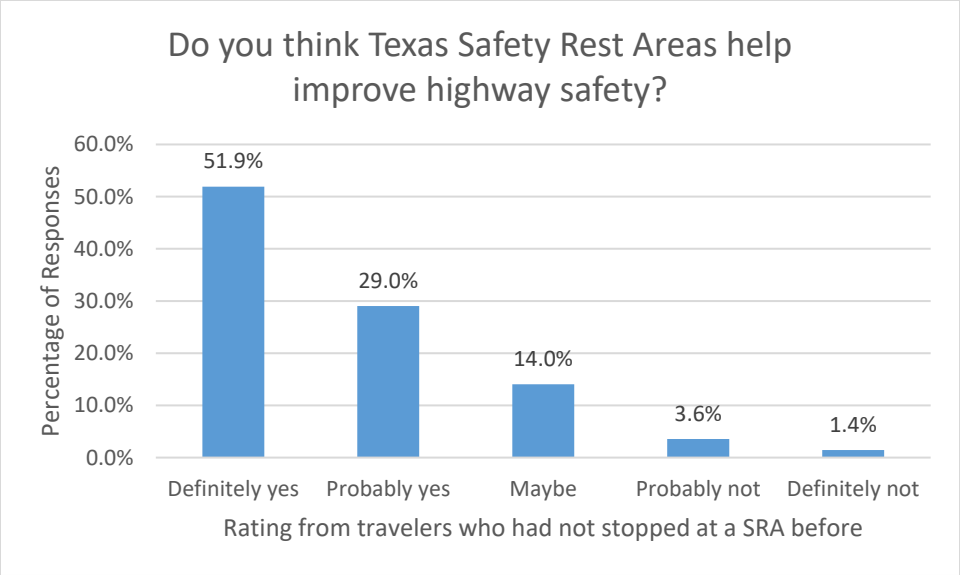

Figure 5.20 Travelers' rating of Texas SRAs' effectiveness in improving highway safety (840 travelers who had not stopped)

For those travelers who had not stopped at a Texas SRA before, Figure 5.20 shows that 51.9% of the travelers (436 out of 840 travelers) believe SRAs definitely help improve highway safety and 29.0% (244 travelers) think they probably help improve highway safety, which indicates that a total of 80.9% travelers (680 travelers) believe SRAs benefit highway safety. 3.6% of the travelers (30 travelers) think SRAs probably don't help improve highway safety, and 1.4% (11 travelers) said they are definitely not helping improve highway safety.

Similar to the analysis of TIC, the "safety score" was calculated to evaluate the effectiveness of an SRA in improving highway safety based on traveler's ratings. The score for each rating was assigned this scale: 5 – definitely yes, 4 – probably yes, 3 – maybe, 2 – probably not, and 1 – definitely not. Again, this means that if a traveler rated "definitely yes", then the score for this answer is 5. The "safety score" of SRAs' effectiveness in improving highway safety is the weighted average of all the travelers' responses. By using Equation 5.1, the overall "safety score" of an SRA based on traveler who had stopped before is 4.5, and the "safety score" of an SRA based on travelers who had not stopped before is 4.3, which indicates that SRAs are effective in improving highway safety in travelers' opinions. However, it needs to be pointed out that the "safety score" of an SRA is a lower than that of a TIC (4.7). Table 5.1 listed the comparison between TICs and SRAs in terms of traveler's ratings.

Table 5.1. Comparisons between TICs and SRAs based on Traveler Rating

	Percentage of Responses					Safety Score
	Definitely yes	Probably yes	Maybe	Probably not	Definitely not	
TICs	74.9%	19.6%	4.9%	0.5%	0.2%	4.7
[1]SRAs	68.5%	19.3%	8.5%	2.9%	0.8%	4.5
[2]SRAs	51.9%	29.0%	14.0%	3.6%	1.4%	4.3

Note: [1]SRAs: SRA rating based on travelers who had stopped at SRAs before
[2]SRAs: SRA rating based on travelers who had not stopped at SRAs before

It can be seen from Table 5.1 that in traveler's opinion, both TICs and SRAs are effective in improving highway safety because both of them provide a place for people to rest and refresh themselves. Larger portions of travelers rated TICs as "definitely yes" and "probably yes," which leads to the case that TICs have a higher "safety score" than SRAs. For travelers who had not stopped at an SRA, the percentages of "probably yes" and "Maybe" is evidently higher than those of TICs (even for SRAs from travelers who stopped previously), indicating that they might believe the SRAs' impact on highway safety is not so significant as TICs. This can also be verified that there is a substantial drop in responses "definitely yes," and the percentage increases in "probably not" and "definitely not." Therefore, based on survey results, TICs are considered more effective than SRAs by travelers in improving highway safety.

5.3.2. Additional Questions on CTR Survey

As mentioned in Section 5.2.2, CTR research team traveled to 5 TICs and conducted 161 traveler surveys during the study. Besides the same questions in shorter version survey, there are two additional questions which ask the travelers to directly compare a staffed TIC and an unstaffed SRA. The first question asks the travelers which they think is more effective in improving highway safety, a TIC or an SRA. The second question asks the travelers' overall personal preference between a TIC and an SRA. Three options were provided to choose: TIC, SRA, or the same. The research team members would describe the conditions of an SRA and explain the differences between a TIC and an SRA to travelers who had not stopped at a Texas SRA before.

Of all the 161 surveys, 148 travelers provided their opinions on the first question (comparing effectiveness in improving highway safety). More specifically, of all the 148 valid responses, 108 travelers (73.0%) indicated that they had stopped at an SRA before; while the other 40 travelers (27.0%) had not visited an SRA. The

statistics of responses from travelers who had stopped at an SRA is presented in Figure 5.21.

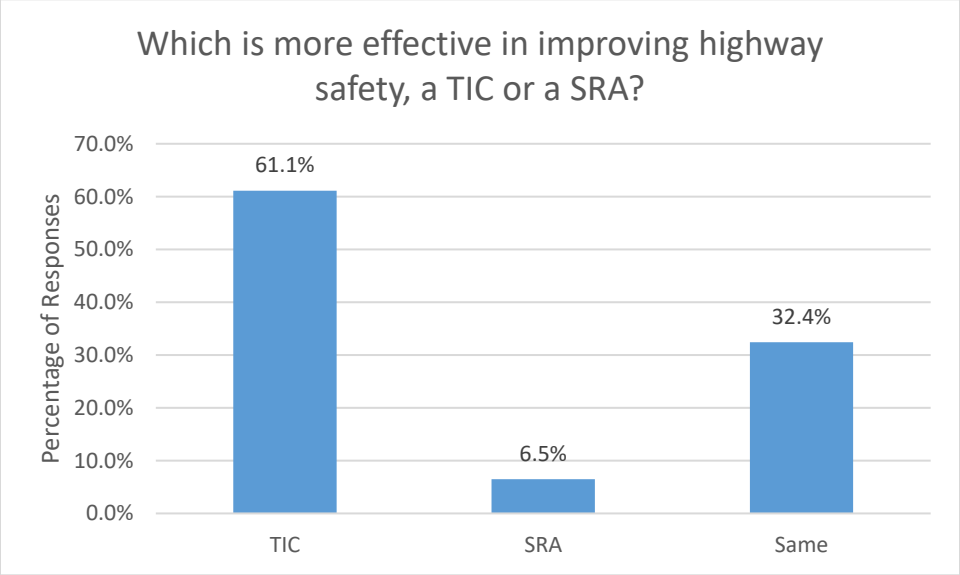

Figure 5.21 Comparison between TICs and SRAs regarding effectiveness in improving highway safety (108 travelers who had stopped)

Figure 5.21 shows that for those travelers who had stopped at an SRA before, 61.1% of them think that TICs are more effective in improving highway safety based on their experience. Only 6.5% of the responses said the SRAs are more effective. The other 32.4% feel that they have same effectiveness.

The statistics of responses from travelers who had not stopped at an SRA but provided their opinions is presented in Figure 5.22.

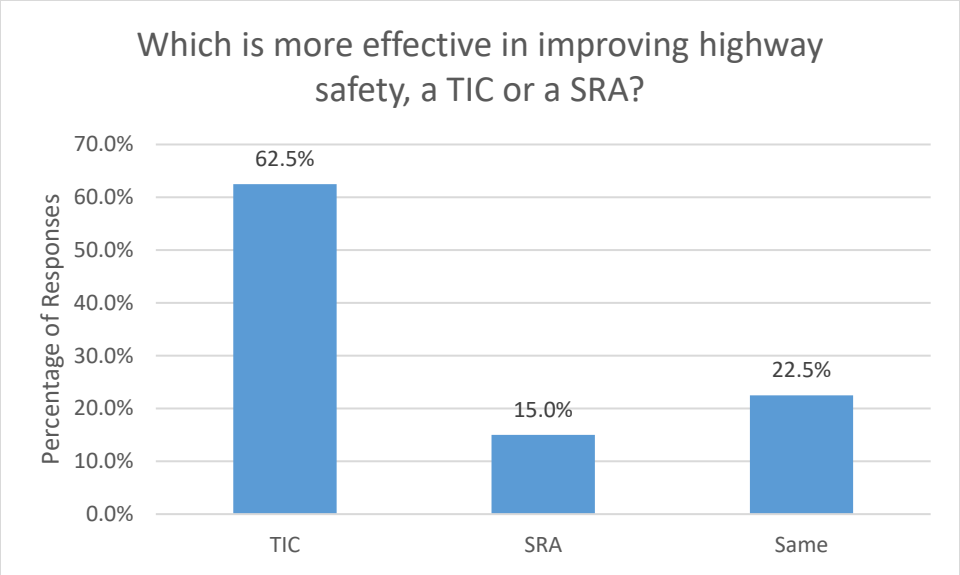

Figure 5.22 Comparison between TICs and SRAs regarding effectiveness in improving highway safety (40 travelers who had not stopped)

Even though some travelers had never stopped at a Texas SRA, they still knew what an SRA was based on their knowledge and they had their opinions on the effectiveness in improving highway safety. Figure 5.22 shows that for those travelers who had not stopped at an SRA before, 62.5% of them think that TICs are more effective in improving highway safety based on their knowledge and understanding. 15.0% of the responses said the SRAs are more effective. The other 22.5% feel that they have same effectiveness.

Regardless of whether they had stopped at an SRA or not, the majority of the travelers believe that TICs are more effective than SRAs in terms of improving highway safety. Overall, of the 148 valid responses, 91 travelers (61.5%) said TICs are more effective. Only 13 travelers (8.8%) indicated SRAs are more effective.

The second question attempts to capture traveler's overall personal preference between a TIC and an SRA. A total of 148 valid responses were received for this question. In addition, 108 travelers (73.0%) indicated that they had stopped at an SRA before, while the other 40 travelers (27.0%) had not visited an SRA. The statistics of responses from travelers who had stopped at an SRA is presented in Figure 5.23.

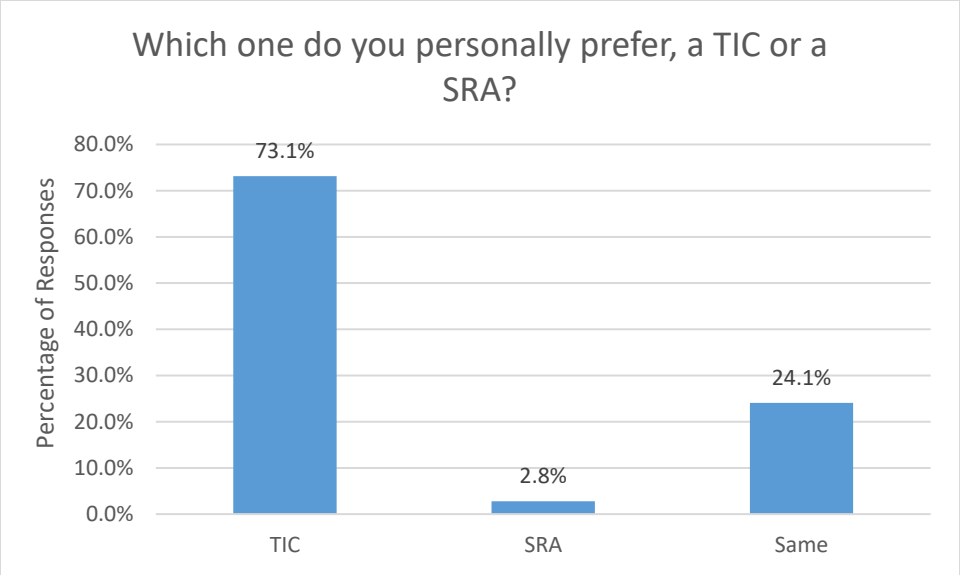

Figure 5.23 Comparison between TICs and SRAs regarding travelers' personal preference (108 travelers who had stopped)

Figure 5.23 shows that for those travelers who had stopped at an SRA before, 73.1% of them prefer TICs than SRAs based on their experience. Only 2.8% of the responses prefer SRAs. The other 24.1% feel that TICs and SRAs are the same to them.

The statistics of responses from travelers who had not stopped at an SRA but provided their preferences is presented in Figure 5.24.

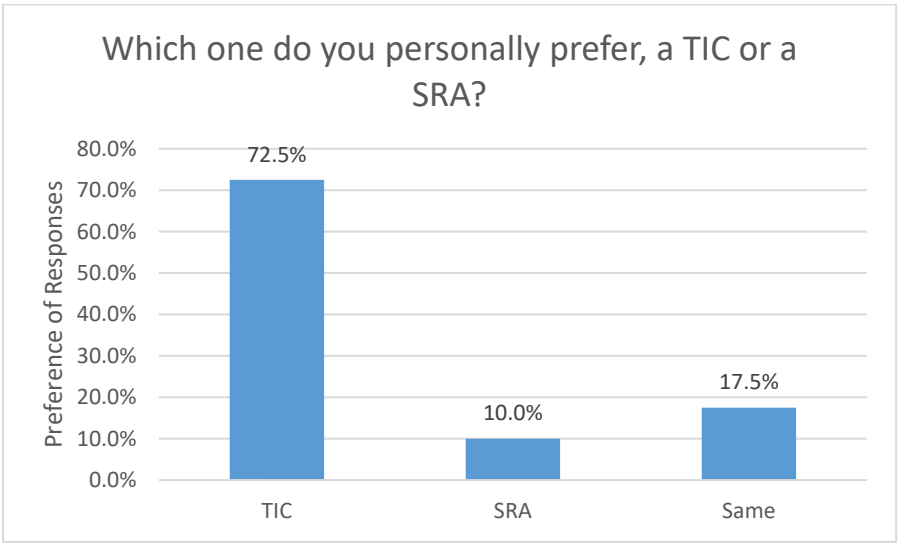

Figure 5.24 Comparison between TICs and SRAs regarding travelers' personal preference (40 travelers who had not stopped)

Figure 5.24 shows that for those travelers who had not stopped at an SRA before, 72.5% of them prefer TICs over SRAs based on their knowledge and understanding, while 10.0% preferred SRAs. The other 17.5% perceive TICs and SRAs as the same. Overall, of the 148 valid responses, 108 travelers (73.0%) said they personally preferred TICs. Only seven travelers (4.7%) indicated they like SRAs better.

Based on the survey results of these two questions and Figure 5.21 to Figure 5.24, TICs are believed to be more effective in improving highway safety than SRAs, and travelers prefer TICs to SRAs whether or not they have stopped at an SRA before. One of the reasons is that travelers can talk with TIC employees and ask any questions they may have. This makes the travelers feel much more welcome, comfortable, and secure.

5.3.3. Additional Questions on Longer Version Survey and Online Survey

Again, as mentioned in Section 5.2.2, a longer version survey was used for about one week before the research team reduced the number of questions in order to increase response rate. Therefore, there are some additional questions in the longer survey (as well as the online survey) that are not in the shorter survey and are not analyzed in Section 5.3.1. Though the sample size (valid responses) is much smaller for these questions, the research team believes that the answers from travelers still contribute to the study. This section summarizes and analyzes these additional questions only on the longer and online surveys.

The research team is interested in the travel direction of travelers stopping at the TIC. The travelers were asked if they were entering Texas, leaving Texas, or traveling within Texas. A total of 248 valid responses were collected. More than half of the travelers (134 travelers, 54.0%) indicated that they were entering Texas. Only 24 travelers (9.7%) were leaving Texas and 90 travelers (36.3%) were traveling within Texas. Figure 5.25 presented the distribution of the travel direction.

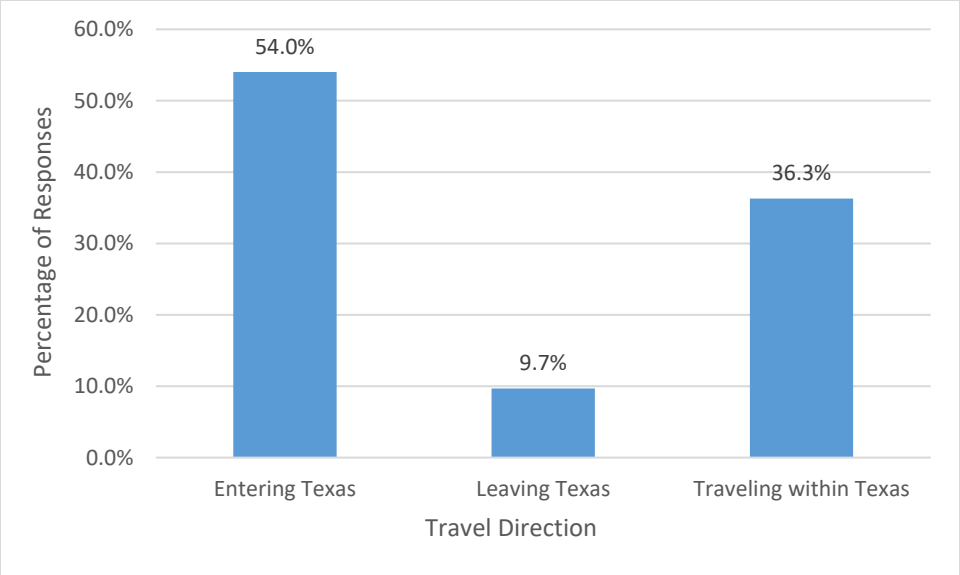

Figure 5.25 Distribution of travel direction (248 valid responses)

Most of the travelers were entering Texas and many of them indicated that the Texas TIC was the first facility they saw in Texas, indicating they felt welcomed by using the amenities and talking with TIC employees.

The next question asks travelers if they had made a stop at a gas station, restaurant, or convenience store prior to arriving at the TIC. If yes, then the traveler was asked approximately how many miles (or hours) ago he/she made the stop. A total of 242 valid responses were received. 63.6% of them (154 responses) said that they had made a stop while the other 36.4% said they had not. Most of the travelers indicated that they stopped at a gas station, convenience store, and/or rest area. The pie chart is presented in Figure 5.26.

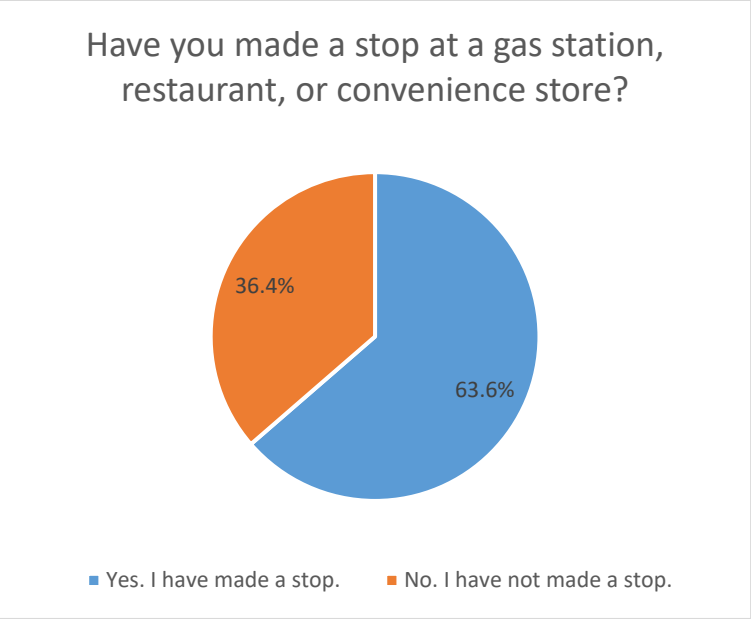

Figure 5.26 Travelers indicating whether they'd made a stop (242 valid responses)

In terms of the distance and duration since they made the stop, some travelers provided only number of miles, some provided number of hours, and some provided both. Of all the 154 travelers who had stopped, 90 travelers gave mileage since their stop at the gas station, convenience store, restaurant, etc. 118 travelers provided the corresponding information in hours. The histograms of distance and duration since the travelers stopped at a gas station (or convenience store, restaurant, etc.) are shown in Figure 5.27 and Figure 5.28, respectively.

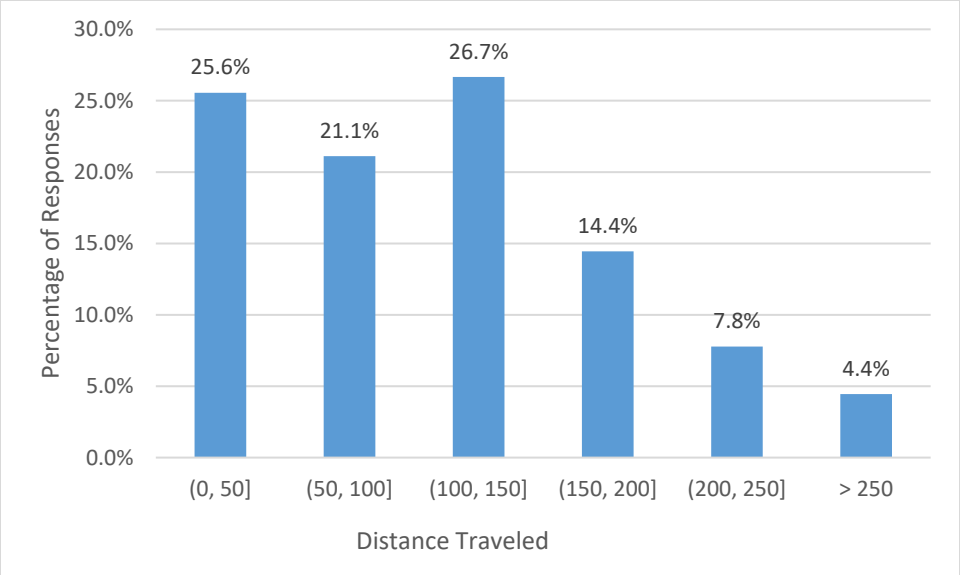

Figure 5.27 Distance traveled since stopping at other places (90 valid responses)

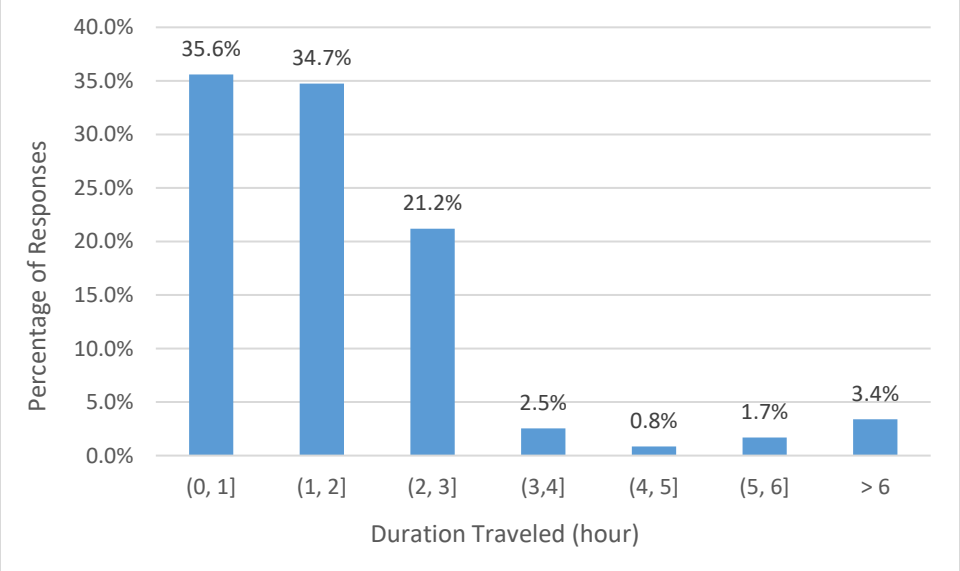

Figure 5.28 Duration traveled since stopping at other places (118 valid responses)

Note that this question only collects responses from travelers who stopped at a gas station, convenience store, restaurant, etc. Figure 5.27 indicates that 73.3% of the visitors traveled less than 150 miles since they stopped last time. The average distance traveled is 115 miles, which is lower than the analysis of similar question in Section 5.3.1. Figure 5.28 shows that most of the travelers (70.3%) traveled within 2 hours before they stopped at the TIC. The percentages of travelers who

had traveled more than 3 hours is 8.5%, which is low. The average travel duration is 2 hours.

The next question asks the travelers if they have made any plans to stop after they leave TICs. If travelers plan to stop, the survey further asks the travelers to estimate how many miles or hours until their next stop. 233 travelers gave valid responses for this question. 171 travelers (73.4%) said that they had planned their next stop while the other 62 travelers (26.6%) indicated that they had not made any plan regarding next stop, which is shown in Figure 5.29. Most of the planned next stops are hotels, home, gas stations, restaurants, and/or convenience stores.

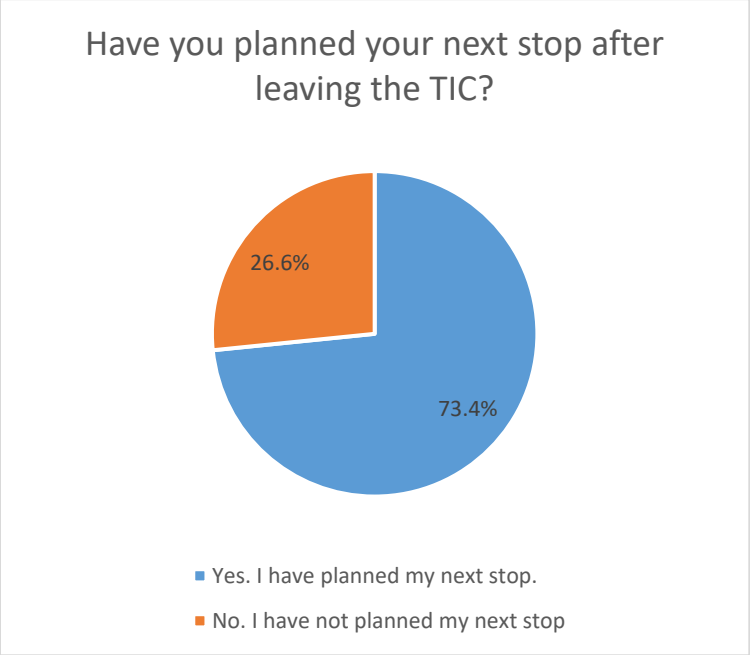

Figure 5.29 Percentages of travelers that planned next stop (233 valid responses)

If a traveler said he/she had planned the next stop after leaving the TIC, then he/she would be asked to estimate the distance and duration to the next stop in miles and/or hours. Some travelers provided only number of miles, some provided number of hours, and some provided both. Of those 171 travelers who had made stop plans, 114 travelers gave mileage until next stop. 119 travelers provided the corresponding information in hours. The histograms of estimated distance and duration until the travelers make their next stops are presented in Figure 5.30 and Figure 5.31, respectively.

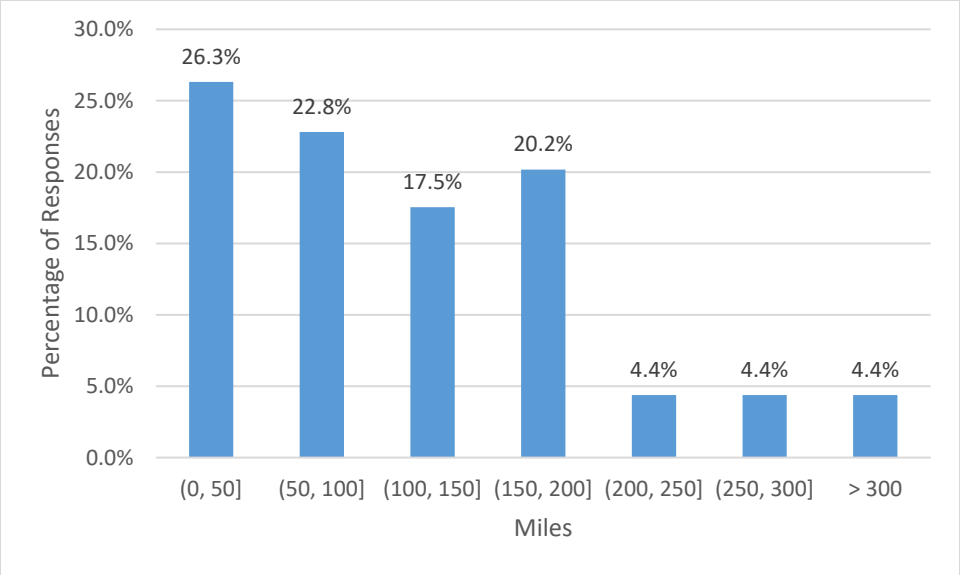

Figure 5.30 Estimated distance to travel until next stop (114 valid responses)

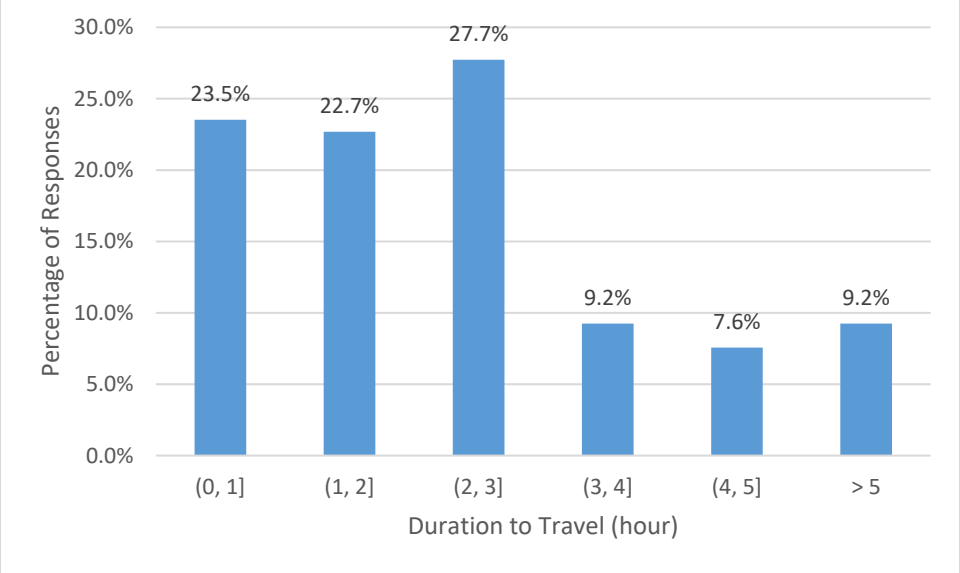

Figure 5.31 Estimated duration to travel until next stop (119 valid responses)

Figure 5.30 and Figure 5.31 show that some travelers still need to travel a long distance (or time) until they reach their next stop. Based on these valid responses, the average distance to travel until next stop is 124 miles, while the average duration to travel is 4 hours. Considering that these travelers had been traveling for miles and hours, the TICs provide the travelers a great place to use the facilities, stretch their legs, take a break, and refresh themselves before continuing their trips. This is a very effective way to reduce driving fatigue.

In order to estimate levels of fatigue, the researcher asked travelers the total number of miles they had driven during the entire trip. In all, 213 valid responses were collected and the histogram of the miles driven during the entire trip is presented in Figure 5.32.

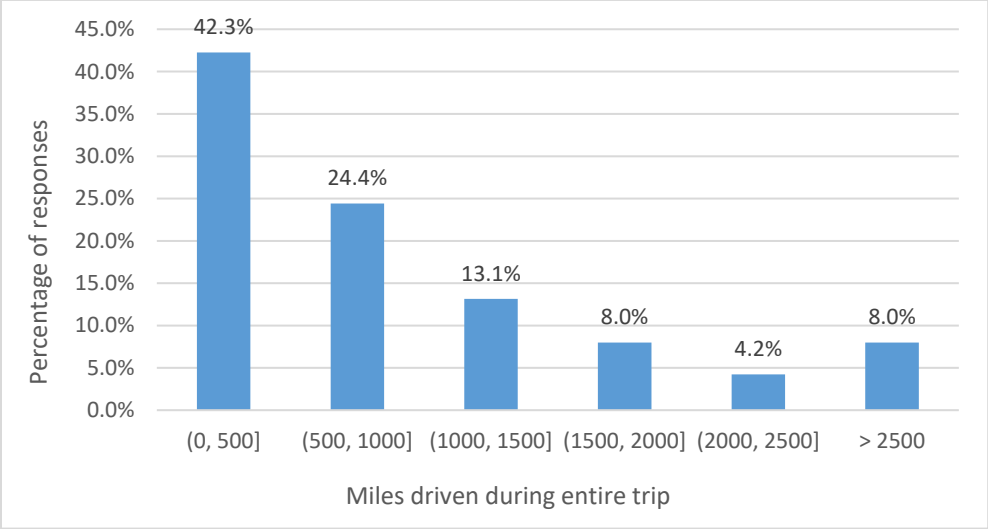

Figure 5.32 Miles driven during entire trip (213 valid responses)

As can be seen from Figure 5.32, 42.3% of the travelers (90 travelers) had driven less than 500 miles during entire trip before they stopped at the TIC. On the other hand, 17 travelers (8.0%) indicated that they had driven more than 2,500 miles. Overall, the average mileage that a traveler had driven during the entire trip is 1,048 miles. Drivers should recognize fatigue and stop to rest before resuming driving. Since many travelers had just entered Texas, the average mileage traveled in Texas is 419 miles. Again, TICs provide excellent opportunities for them to walk around, take a break, and talk with a travel counselor to re-energize.

The survey also asked travelers if they had stopped at another TIC or WC in a bordering state. A total of 220 valid responses were received. Most of the travelers (199 travelers, 90.5%) said that this was the only TIC that they visited. The other 21 travelers (9.5%) had stopped at another TIC or WC in New Mexico, Arkansas, Louisiana, Oklahoma, or Missouri. The pie chart is presented in Figure 5.33.

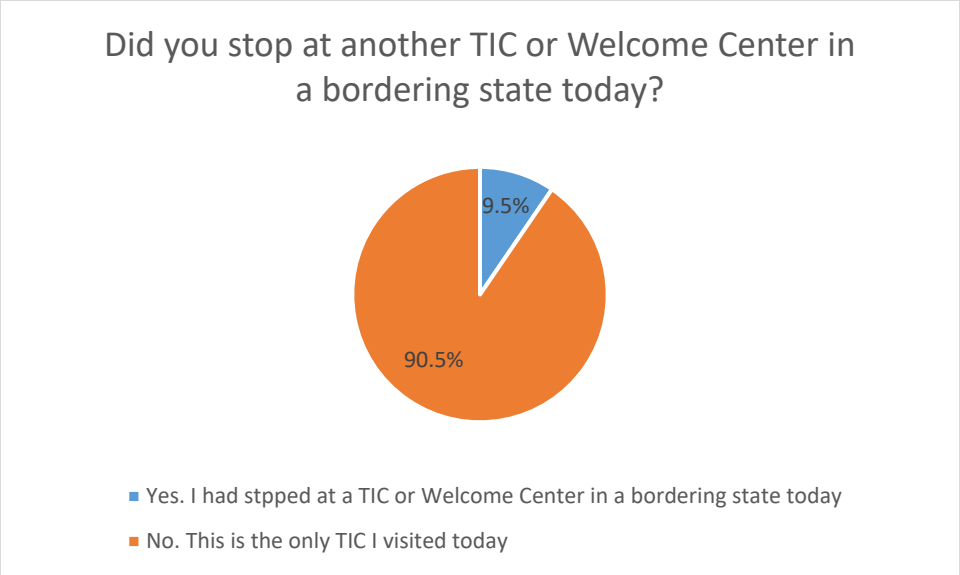

Figure 5.33 Percentage of travelers who'd stopped at another TIC or WC in a bordering state (220 valid responses)

Travelers receive highway safety messages in various ways. The next question evaluates the effectiveness of several methods in transmitting highway safety messages, including billboard, changeable message board sign, heard from TIC employees, heard from a family member, heard from a friend, saw on official vehicles (e.g., police car), radio, TV, Internet, and video. Some of the methods are word-of-mouth (e.g., heard from TIV employees, family members, and friends) and some are regular ways to convey safety messages (e.g., TV, radio, billboards, etc.). The travelers were asked to rate each method as "totally effective," "effective," "neutral," "ineffective," or "totally ineffective." 201 travelers provided their ratings for each of the methods.

Similar to the "safety score" developed in Section 5.3.1, an "effectiveness score" was developed for this section: 5 for "totally effective," 4 for "effective," 3 for "neutral," 2 for "ineffective," and 1 for "totally ineffective." The higher the "effectiveness score" is, the more effective the method is in conveying a safety message. The overall "effectiveness score" of each method is the weighted average of each traveler's rating.

$$Effectiveness\ \ Score = \frac{5 \times n_1 + 4 \times n_2 + 3 \times n_3 + 2 \times n_2 + 1 \times n_5}{N} \qquad (5.2)$$

Where n_1, n_2, n_3, n_4, and n_5 are the number of responses for "totally effective," "effective," "neutral," "ineffective," and "totally ineffective," respectively; N is the total number of valid responses for each rating.

Based on 201 valid responses, the "effectiveness score" of each method was calculated using Equation 5.2. The results are presented in Figure 5.34.

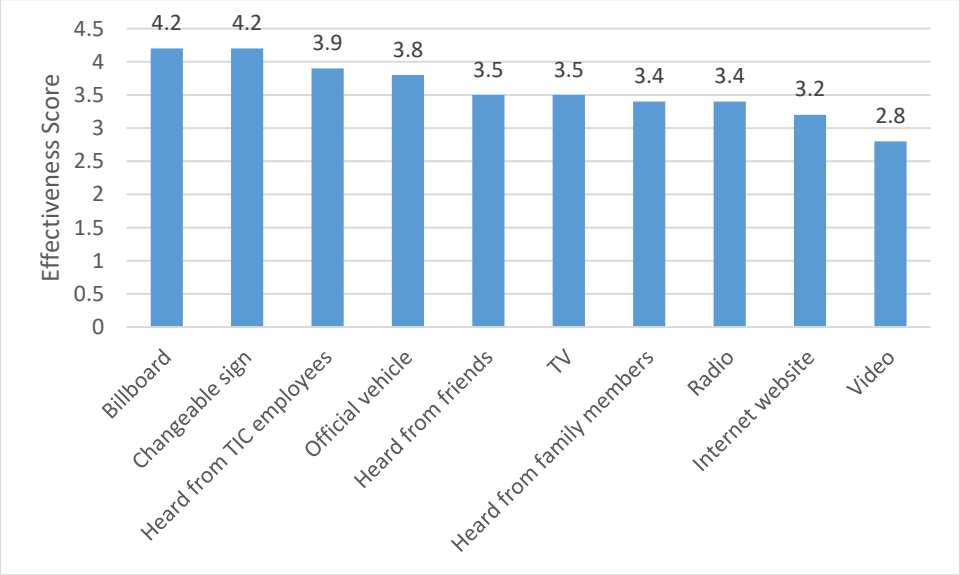

Figure 5.34 "Effectiveness Score" of different highway safety message transmitting methods (201 valid responses)

As can be seen from Figure 5.34, the top three most effective ways in conveying highway safety messages are billboard (4.2), changeable sign (4.2), and heard from TIC employees (3.9). Social media like Internet website (3.2) and video (2.8) are not as effective as others. This figure also underlines the importance of having TIC employees to convey highway safety messages to travelers, which is found to be effective and accepted by travelers.

The last question on the longer and online survey asks the travelers to write comments on whether they liked or didn't like having TIC employees talk about highway safety messages. A wide variety of comments were received and 144 valid responses were analyzed. Ninety-four travelers (65.3%) responded that they liked and appreciated it very much. Five people (3.5%) said it was a waste of time and they did not like it. Twelve travelers (8.3%) provided neutral comments. The other 33 travelers (22.9%) said they didn't remember a TIC employee talking to them about highway safety. The distribution is presented in Figure 5.35.

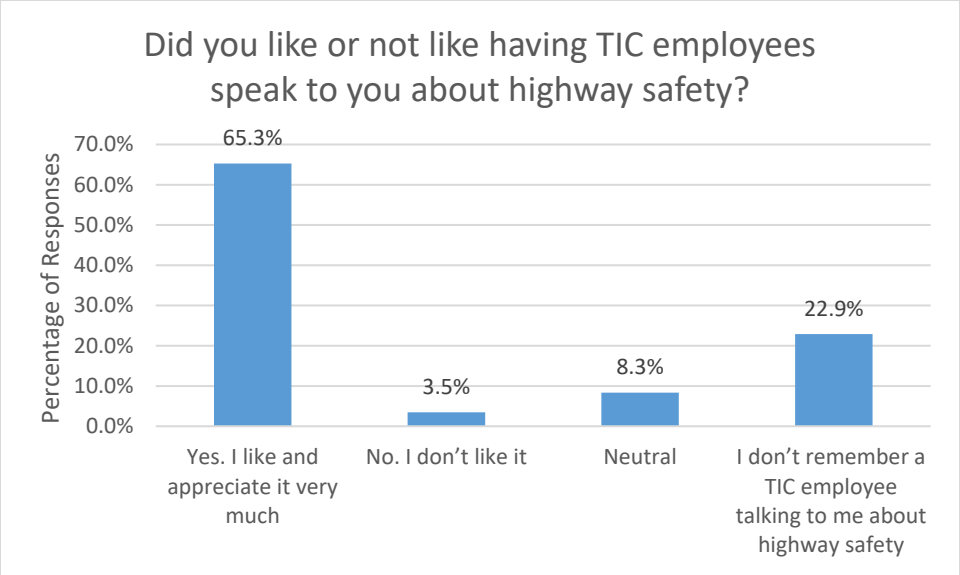

Figure 5.35 Travelers' opinions on having TIC Employees talk about highway safety (144 valid responses)

It can be obviously seen from Figure 5.35 that most of the travelers (65.3%) thought having TIC employees talk about highway safety is good and helpful, which makes the travelers feel that their safety is being concerned and they keep aware of those highway safety messages. Comments received will be discussed in detail in Section 5.4.

5.4. Travelers' Comments

During the survey, travelers were encouraged to provide their comments on TIC operation, TIC employees, and highway safety. A wide variety of comments were received, most of which expressed their appreciation to TIC employees for welcoming them and answering their questions. Many travelers also said they were aware of more highway safety messages after the conversation with TIC employees. Selected comments were presented in this section.

5.4.1. Comments about TIC Employees

Based on the comments, travelers think that TIC employees are very friendly and helpful, which makes them feel comfortable and is greatly appreciated. Below are comments received.

"I think that the info they provide is priceless."

"TIC employees are very helpful, pleasant great ambassador for Texas."

"Great conversations on safety."

"Nice and helpful people."

"They (TIC employees) encourage tired drivers to stop."

"It is always nice to sit with knowledgeable fellow Texans!"

"Staff is very helpful,"

"Love when there is someone to speak with."

"Staff are friendly, helpful, and knowledgeable."

"Love the friendly counselors."

"I only stop at staffed centers,"

"It is always good to speak with someone."

"Very friendly and full of information."

"Love them – feel safer."

"Great personnel info, routes, avoiding awful construction (accidents)."

"They are knowledgeable & friendly."

"Makes it easier to stop if you have a nice facility friendly staff."

"Texas friendly, helpful - they make you feel glad you're here."

"They give us maps and safety tips."

"Great service and knowledgeable."

"They provide information/ideas that I wasn't thinking about."

"Staffs are extremely friendly."

"People working here are extremely helpful."

"Staffs are well informed and are a great asset."

"Awesome staffs!!"

"We like coming here because it is so welcoming."

"They have up to date info that can't be found on radio or social media."

"The staffs help give information. They know about the weather and construction. The staffs are very friendly with the travelers."

"Very attentive staff. They offered a lot of help with our trip."

"Much better to deal with a human being."

"Love hearing staffs to give information."

"The staffs are great - hospitable, made me feel welcome."

"Someone to talk to help with directions or freshen your mind."

"My job as a professional driver would be difficult without them."

Many other similar comments were received as well.

5.4.2. Comments about TIC Facilities

Some travelers provided their comments on the TIC facilities and operations. They feel that the TIC is a safe place for them to rest. Below are some detailed comments on TIC facilities:

"Provide safe, non-commercial place to take a break."

"Allow us to rest and not drive drowsy."

"Would like to see more like this TIC everywhere."

"Have all kinds of driver safety tips and give people and place to stop and get out of car for a while."

"Safe place to rest."

"Here to stop, get help, take break in safe clean place."

"Texas Welcome Centers are the best in the USA."

"Great place to take a break from road."

"Great source of information."

"A place to find out about construction and detours."

"Safe, clean, friendly location to take a break so don't drive while drowsy."

"Comfortable and clean."

"We slept here for 4 hours - freshened up got a map and directions for a safer site."

"Offer opportunity for travelers to stop and review local laws."

"Gives you a good excuse to stop."

"Safe place to stop, especially for families and single travelers."

Some travelers also provided their comments on the difference between a TIC and an SRA:

"A SRA is a safe place when rest is needed, but people (staffs) are always better."

"It is better if there are staffs who can help us."

"An employee or security would be vital."

"Both TIC and safety rest area do their part, taking breaks is important."

"Feel that it is safer in TIC as a female, where I can also get information and ask questions."

"TICs are more effective than safety rest areas because you can ask questions to TIC employees."

However, there are also some travelers saying that it would not help them by talking with the TIC employees or other negative comments.

"I know my visit to this center will not make me a safer driver."

"It won't help unless you have staffs 24 hours a day."

"I already drive safely and didn't need to hear the message."

"I would rather not be approached unless I have a question"

"They were wasting my time, I was in a hurry."

Overall, the travelers gave overwhelmingly good and positive comments on TIC facilities and TIC employees. They believe that it is necessary for a driver to take a break from driving. TICs provide a clean and safe place for them to rest. In addition, the TIC employees are very friendly, helpful, and knowledgeable. They (especially for international travelers with limited knowledge on Texas traffic laws) can talk with the travelers, answer questions, and provide information. The travelers enjoy interacting with TIC employees a lot and they feel safe and welcomed.

5.5. CTR Visit to TICs

In order to participate in safety events, observe and photo the facility, talk with travelers, and conduct surveys, the CTR research team organized three trips to visit five TICs, as listed in Table 5.2.

Table 5.2. CTR Trips to Visit TICs

Trip Number	Number of CTR Team Members	Date	TIC Location
1	4	June 8, 2018	Orange
2	2	August 9, 2018	Wichita Falls
2	2	August 10, 2018	Gainesville
3	3	August 9, 2018	Waskom
3	3	August 10, 2018	Texarkana

The research team members attended the annual "Orange Means Safety" event at the Orange TIC. The team members took several photos during our trip and conducted 161 traveler surveys. More importantly, these trips provided us a very good opportunity to see what is going on in the TICs, observe and talk with a traveler to gain more insights on their opinions. The photos of selected TICs can be found in Chapter 4 (Section 4.4 and Section 4.5) and Chapter 7 where TICs are compared with SRAs. Other highlights based on our trip to TICs are:

- Safety events always attract much more travelers to visit a TIC, which is a good opportunity to propagate safety slogans and convey safety messages to traveling public;
- Many other stakeholders would attend the safety events, including fire department, Texas Parks and Wildlife Department, Coast Guard, etc. They select TICs as a perfect place to get access to the traveling public;
- The research team observed that many travelers came into the TIC, used the restroom, and left without walking into the lobby and talking with the TIC employees;
- The research team found that some travelers did not list "use restroom" as one of their stop reasons even though they just had just visited the restroom – this might contribute to the low response rate for "restroom usage" response rate mentioned in Section 5.3.1;
- TIC employees did a great job in greeting every traveler who walked into the lobby and answering their questions;
- Different travelers had different understandings of what "safety messages" were. For example, we interviewed and invited one traveler after his talking with TIC employees at Orange TIC. We clearly heard the TIC employee said "Travel safe. Watch the speed" during their conversation. However, when the traveler took the survey, he wrote "No. I have not heard any safety message from TIC employee";

- The research team found that many travelers did not fully recognize the difference between a TIC and an SRA;
- During the survey, the team members met two visibly extremely fatigued travelers. One traveler from Wichita Falls stated that he had been driving for 19 hours and he felt very tired. He felt that the Wichita Falls TIC was a very safe place for him to rest. The other traveler was interviewed at Waskom TIC. He had been driving for 18 hours before he stopped at the TIC. He indicated that he would rest at the TIC for a while until he felt much more energetic.

Based on our conversation with the travelers while we were at the TICs, most of the travelers preferred the staffed TIC. They feel that TIC employees are very helpful and make them feel safe, which is consistent with the traveler survey findings.

5.6. Survey Summary

This chapter thoroughly analyzes the traveler surveys conducted at the 11 TICs located along the borders of Texas. Surveys were conducted from April 6, 2018 to August 31, 2018. A statistically representative sample of survey responses were collected. Following are some notable findings of the traveler survey:

- 92.5% of the travelers presently reside in United States and 7.5% of the travelers live in other countries, which indicates that about 7.5% of the traveler have limited knowledge about Texas traffic laws.
- The top three reasons why travelers stopped at a TIC are travel information and directions (44.4%), restroom usage (26.6%), and take a rest/break (25.4%).
- The average distance traveled prior to stopping at the TICs is 186 miles, and the average trip duration is 3.3 hours—the point at which a break would be needed.
- About 72.9% travelers have seen highway safety messages along highways. The top three safety messages seen are about cellphone usage (text and phone) (35.2%), seat belt usage (31.6%), and construction/work zones (20.3%).
- About 51.4% travelers have heard highway safety messages from TIC employees. The top three safety messages heard are: cellphone usage (text and phone) (33.7%), construction/work zones (21.3%), and drive safe/carefully/friendly (16.9%).

- About 61.4% of the travelers indicated that they had stopped at a Texas SRA.
- According to the travelers' ratings of TIC and SRA effectiveness in improving highway safety, TICs are considered more effective than SRAs. The "safety score" of TICs is higher than that of SRAs. This is also verified by the questions on CTR survey only—about 61.5% of the travelers believe that TICs are more effective than SRAs in improving highway safety.
- Based on traveler's personal preference, TICs are more preferred by 73.0% of the travelers.
- Billboard, changeable signs, and TIC employees are the top three most effective methods in transmitting safety messages.
- Most of the travelers like the TICs because TICs provide very clean and safe place for them to rest. The TIC employees are found to be very friendly, helpful, and knowledgeable. They feel more safe and comfortable at a TIC. They can ask questions and talk with TIC employees, which they appreciate very much.

Chapter 6. Crash Data Analysis

To quantify the safety impact of TICs, the study team performed statistical analysis using Texas crash data. This chapter presents the analysis results.

6.1. Data Sources

6.1.1. Crash Data

The study team obtained 2010–2017 crash records for the entire state of Texas from TxDOT's CRIS using the Crash Query Tool[1]. These crash records include important information about every reportable crash, including every vehicle and person involved in each crash, which is extracted from the law enforcement officers' crash reports (CR-3 report). Important data elements include, but are not limited to, the following:

- Crash location (latitude, longitude)
- Crash severity
- Contributing factors
- Vehicle type (passenger vehicle, CMV [such as truck, bus, etc.], motorcycle)
- Vehicle travel direction
- Highway system
- Highway number
- Reference marker number
- Reference marker offset distance
- Roadway surface condition
- Person type (driver, passenger, pedestrian)
- Weather condition
- First harmful event

[1] https://cris.dot.state.tx.us/public/Query/app/public/welcome

The data field “Commercial Motor Vehicle Flag” was used to distinguish passenger vehicles and CMVs.

6.1.2. Roadway Inventory Data

To perform the spatial analysis of crash data, the study team used the 2016 TxDOT Roadway Inventory Data. Important information used in this study include the GIS linework and following attributes of each roadway segment:

- Section Length
- Traffic volume
- Starting and ending reference marker
- Starting and ending reference marker displacement

6.2. Data Analysis

In this section, the study team presents how the data analysis was conducted and what are the major findings from analyzing the data sets discussed above.

6.2.1. Crash Data Analysis Procedure

The crash data analysis was conducted for selected TICs located at Texas border by comparing the vehicles traveling at different directions on the roadway segment downstream of TIC. These TICs are selected for the analysis because majority of their visitors are coming into Texas. For example, according to an interview with TIC supervisors, more than 90% of visitors stopped at following TICs are traveling into Texas:

- Anthony
- Denison
- Gainesville
- Laredo
- Orange
- Texarkana
- Waskom

This directional distribution of TIC visitors forms the basis of the analysis. The study team carried out the following procedure to compare the number of crashes along the roadway segment downstream of the TIC in different directions:

Step 1. Identify target roadway segment

The roadway segments immediately downstream of the TIC is selected. This is done by selecting the relevant roadway sections in the Road Inventory Data Linework GIS shape file. Only the segment of the major highway on which the TIC is situated is selected. For example, an IH-35 segment was selected for Gainesville TIC analysis and IH-10 segment was selected for Orange TIC analysis. The length of the segment is not a fixed number but the segment generally stops before it passing through a major city or urbanized area considering the significant impact of these areas on crashes or stops at an SRA.

Step 2. Extract crashes from CRIS database

After determining the target roadway segment, crashes happened on this roadway segment from 2010 to 2017 are extracted from CRIS database. This is done by mapping crashes in GIS based on their latitude and longitude and then select all those crashes falling into the range of the target highway segment.

The crash data downloaded from the CRIS query system contains multiple records for each crash. One record for each person involved in the crash. Using vehicle travel direction information, the crash data can be first separated into crashes happened on different directions of the roadway, then only one record is kept for each crash by removing duplicate records based on crash ID.

Step 3. Conduct statistical analysis

After obtain the number of crashes for opposite directions of the selected roadway segment for all seven TICs located at Texas border, a statistical analysis is conducted to evaluate if significant differences exist between the direction leading into Texas (impacted direction) and the opposite direction (not impacted direction). If the impacted direction has significantly less number of crashes, it may conclude that TIC help reduce the number of crashes.

This procedure is possible to help identify the safety impact of TICs in terms of reducing number of crashes if all other conditions/variables of both directions are the same except the existence of the TIC. However, this is hardly true and many factors can potentially contribute or impact the occurrence of traffic crashes. Therefore, the crash analysis results cannot definitively determine the safety impact of TICs.

6.2.2. Data Preparation and Preprocessing

To enhance the study, the research team not only looked at the overall crashes, but also subset of crashes. By interviewing TIC employees, the research team learned the types of safety messages often conveyed by TIC employees to travelers. These safety messages remind travelers to drive safe overall as well as noting that travelers should watch for specific elements such as work zones, motorcycles, speed limits, wild animals, etc. In addition to receiving these safety messages from TIC employees, travelers get to rest at the TIC, make phone calls, check their emails, tend to their crying children, etc. These services offered by TICs are believed to reduce the possibility of crashes that may occur in work zones and school zones as well as crashes due to the following causes (phrases are from crash reports or citations):

- Animal On Road – Wild (specific to Langtry and other rural locations)
- Cell/Mobile Phone Use
- Cell/Mobile Device Use – Talking/Texting/Other/Unknown
- Disregarding Warning Sign at Construction Zone
- Distraction in Vehicle
- Driver Inattention
- Failed to Control Speed/Speeding (Overlimit)/Unsafe Speed
- Fatigued or Asleep
- Followed Too Closely
- Road Rage
- Taking Medication
- Wrong Side – Not Passing

The study team extracted crashes contributed by the factors listed above and conducted analysis with these crashes (referred as “subset” hereafter).

Besides the overall crashes and this subset of crashes, the study team also separately calculated the number of crashes related to following three aspects with the consideration that the TIC's impact might have more significant impact on these crashes.

- Fatigued or Asleep
- Person not using restraint
- Failed to Control Speed/Speeding (Overlimit)/Unsafe Speed

Next, the crash data extracted and prepared for statistical analysis are presented for each of the seven TICs selected for the analysis.

6.2.2.1. Anthony TIC

Anthony TIC is located at the border of Texas and New Mexico on IH-10. The roadway segment selected for Anthony TIC analysis is the IH-10 from Anthony TIC to the El Paso County SRA as shown in Figure 6.1. The total length of this segment is 49 miles.

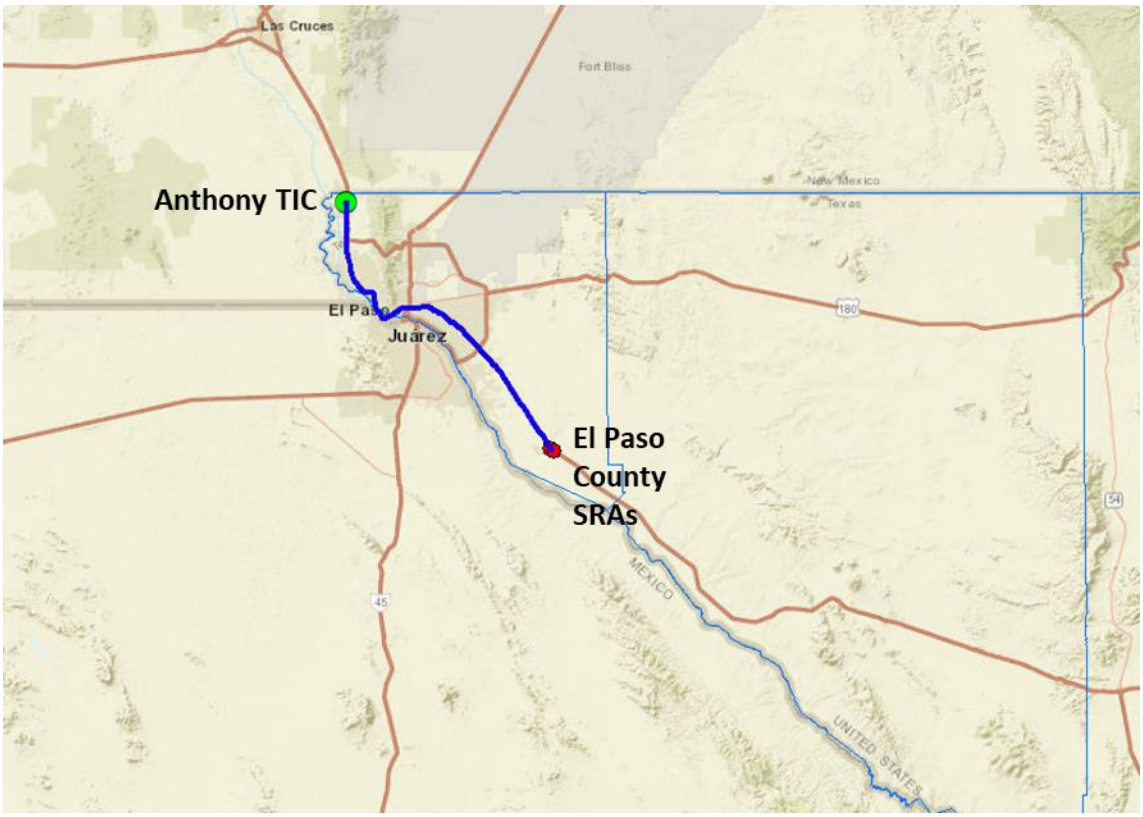

Figure 6.1 IH-10 segment selected for Anthony TIC analysis

The crash data used for Anthony TIC analysis were extracted by filtering all the crashes on this selected segment of IH 20 (see Figure 6.2).

Figure 6.2 Crashes mapped to IH-10 segment selected for Anthony TIC analysis

Tables 6.1 and 6.2 show the 2010–2017 crashes along this segment of IH 20.

Table 6.1. Number of Overall Crashes along IH-20 Segment Selected for Anthony TIC Analysis

Year	East or South	West or North
2010	1217	1057
2011	1032	962
2012	1082	1054
2013	974	851
2014	1035	1098
2015	1506	1452
2016	1513	1364
2017	1555	1459
Total	**9914**	**9297**

Table 6.2. Number of Selected Category of Crashes along IH-20 Segment Selected for Anthony TIC Analysis

	Subset		Caused by Fatigued or Sleepy		Caused by Speeding		Person didn't use restraint	
Year	East or South	West or North	East or South	West or North	East or South	West or North	East or South	West or North
2010	601	460	2	8	344	293	17	22
2011	450	420	4	6	241	258	15	13
2012	445	470	5	6	283	313	14	22
2013	374	331	6	9	247	226	17	12
2014	375	460	3	7	250	284	10	13
2015	596	629	5	10	445	446	13	13
2016	605	587	3	8	478	428	12	12
2017	637	545	6	8	477	356	16	7
Total	**4083**	**3902**	**34**	**62**	**2765**	**2604**	**114**	**114**

Overall, the number of crashes in the west or north direction (not impacted direction) is less than the impacted direction. However, the number of crashes due to fatigued or sleepy in the impacted direction is about only half of that in the not impacted direction. Also important to mention is that the El Paso County SRAs are located on both sides of the highway, meaning travelers traveling in the west or north direction could have benefited from stopping and resting at the SRA.

6.2.2.2. Denison TIC

The Denison TIC is located at the border of Texas and Oklahoma on US 69/75. The roadway segment selected for Denison TIC analysis is the US 75 from the TIC to the intersection of US 75 and FM 121 (Sam Rayburn Hwy) as shown in Figure 6.3. The total length of this segment is 41 miles. Most visitors are traveling through this segment and heading south to Dallas.

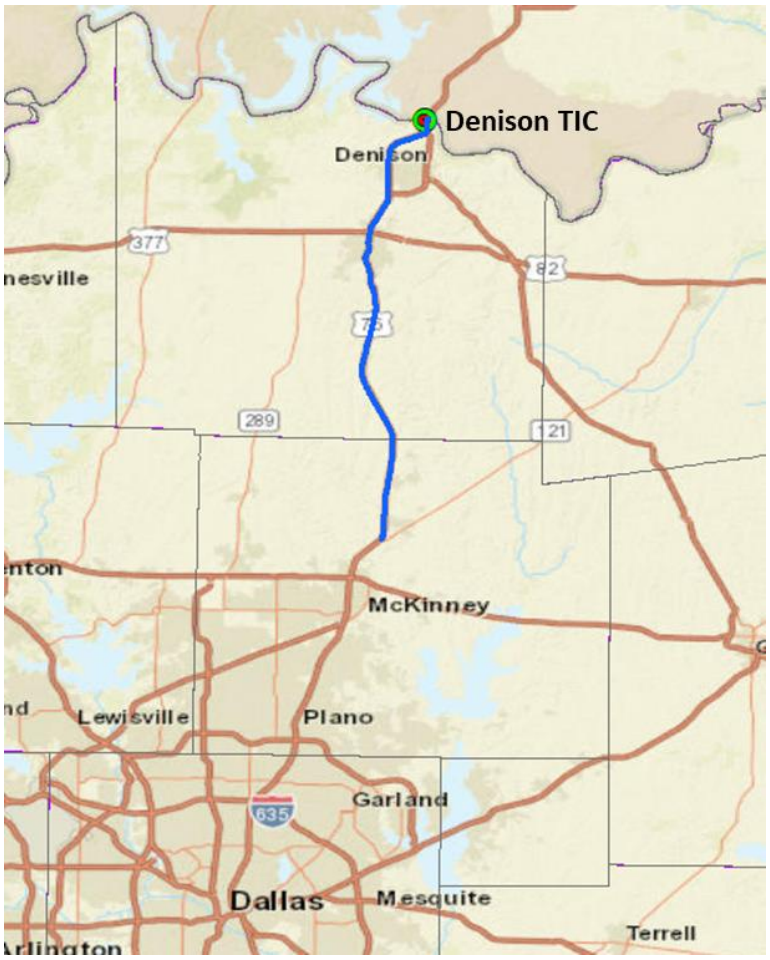

Figure 6.3 US-75 segment selected for Denison TIC analysis

The number of crashes in the north and south direction along this segment of US 75 from 2010-2017 are shown in Table 6.3 and Table 6.4.

Table 6.3. Number of Overall Crashes along US-75 Segment Selected for Denison TIC Analysis

Year	North	South
2010	243	235
2011	286	272
2012	247	261
2013	305	283
2014	304	279
2015	271	295
2016	229	254
2017	267	232
Total	**2152**	**2111**

Table 6.4. Number of Selected Category of Crashes along US-75 Segment Selected for Denison TIC Analysis

	Subset		Caused by Fatigued or Sleepy		Caused by Speeding		Person didn't use restraint	
Year	North	South	North	South	North	South	North	South
2010	128	115	2	3	73	65	10	7
2011	115	131	2	3	69	65	6	5
2012	110	118	9	5	64	50	8	8
2013	154	146	7	7	77	74	6	4
2014	127	136	2	7	74	78	10	2
2015	128	143	5	8	79	70	6	8
2016	106	114	6	6	40	63	5	6
2017	118	92	7	6	51	43	11	4
Total	**986**	**995**	**40**	**45**	**527**	**508**	**62**	**44**

The overall number of crashes in both directions are similar. The south direction (impacted direction) has less number of crashes contributed by speeding or crashes related to no restraint use, but it has slightly more crashes due to fatigued or sleepy.

6.2.2.3. Gainesville TIC

The Gainesville TIC is located at the border of Texas and Oklahoma on IH 35. The roadway segment selected for Gainesville TIC analysis is the IH 35 from the TIC to the intersection of IH 35 and FM 3163 (Milam RD E) as shown in Figure 6.4.

The total length of this segment is 30 miles. Most visitors are traveling through this segment and heading south to the Dallas-Fort Worth area.

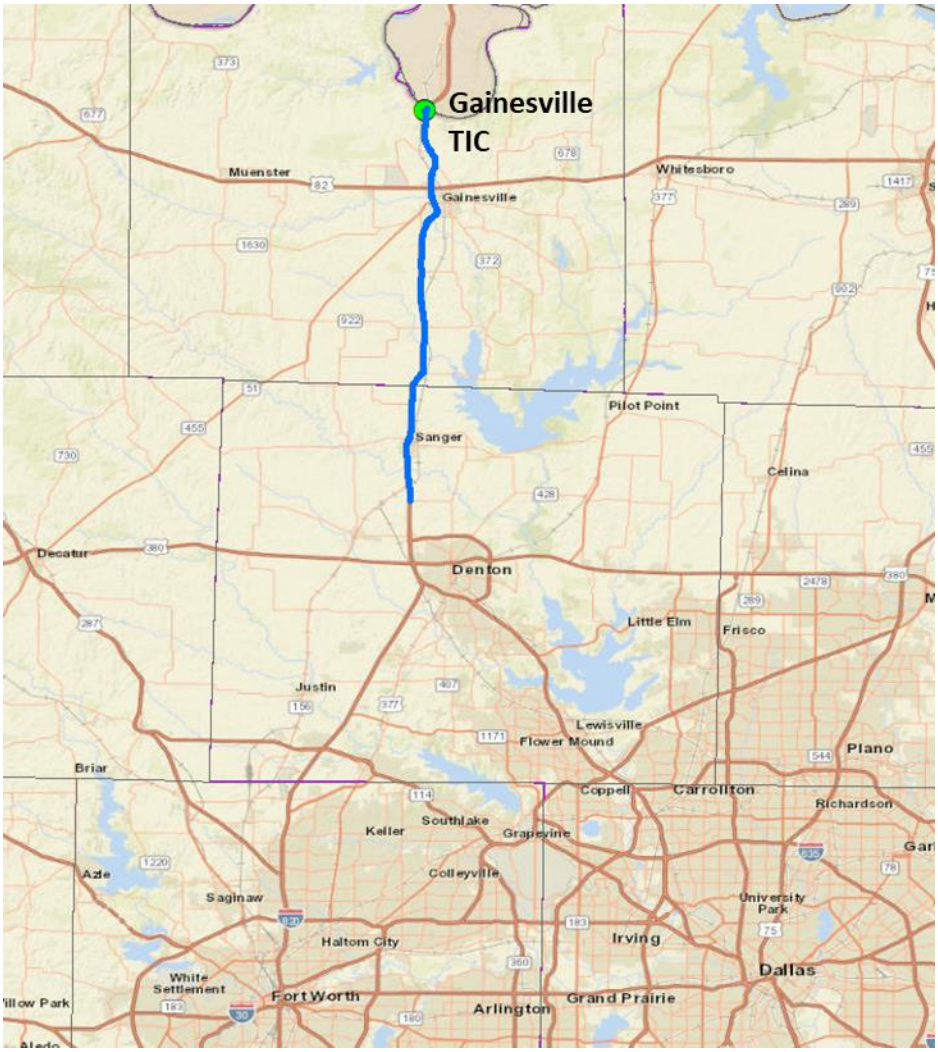

Figure 6.4 IH-35 segment selected for Gainesville TIC analysis

The overall and selected number of crashes in the north and south direction along this segment of IH 35 from 2010 to 2017 are shown in Table 6.5 and Table 6.6.

Table 6.5. Number of Overall Crashes along IH-35 Segment Selected for Gainesville TIC Analysis

Year	North	South
2010	129	120
2011	119	93
2012	115	93
2013	117	106
2014	127	114
2015	141	115
2016	164	138
2017	131	141
Total	**1043**	**920**

Table 6.6. Number of Selected Crashes along IH-35 Segment Selected for Gainesville TIC Analysis

	Subset		Caused by Fatigued or Sleepy		Caused by Speeding		Person didn't use restraint	
Year	North	South	North	South	North	South	North	South
2010	53	46	4	6	29	29	4	4
2011	57	33	6	4	41	16	7	0
2012	44	33	4	4	26	14	4	2
2013	50	54	5	8	25	29	5	2
2014	60	43	6	4	41	30	2	3
2015	56	56	4	2	40	44	4	4
2016	76	53	3	5	56	37	5	9
2017	59	54	8	4	35	37	2	5
Total	**455**	**372**	**40**	**37**	**293**	**236**	**33**	**29**

6.2.2.4. Laredo TIC

The Laredo TIC is located at the Texas and Mexico border on IH 35. The roadway segment selected for Laredo TIC analysis is on IH 35 from the TIC to La Salle County SRA as shown in Figure 6.5. The total length of this segment is 41 miles. Most visitors are traveling through this segment and heading north to San Antonio.

Figure 6.5 IH-35 segment selected for Laredo TIC analysis

The number of overall and selected crashes in the north and south directions along this segment of IH 35 from 2010 to 2017 are shown in Table 6.7 and Table 6.8.

Table 6.7. Number of Overall Crashes along IH-35 Segment Selected for Laredo TIC Analysis

Year	North	South
2010	20	30
2011	35	34
2012	38	46
2013	39	51
2014	60	50
2015	49	58
2016	45	24
2017	38	32
Total	**324**	**325**

Table 6.8. Number of Selected Category of Crashes along IH-35 Segment Selected for Laredo TIC Analysis

	Subset		Caused by Fatigued or Sleepy		Caused by Speeding		Person didn't use restraint	
Year	North	South	North	South	North	South	North	South
2010	11	11	2	2	5	4	1	1
2011	20	17	3	3	13	11	5	2
2012	20	15	2	5	12	5	1	3
2013	25	28	3	5	18	16	1	3
2014	34	22	2	5	24	11	3	4
2015	22	34	5	7	12	24	3	3
2016	22	11	1	3	16	4	3	1
2017	19	15	2	2	12	5	2	2
Total	**173**	**153**	**20**	**32**	**112**	**80**	**19**	**19**

Overall, the south direction has less number of crashes than the north direction (impacted direction). The north direction has more fatigued and sleepy related crashes, but less speeding related crashes. Similar to Anthony TIC, because of the existence of La Salle County SRA, vehicles traveling in the south direction could be benefited from stopping and resting at the SRA.

6.2.2.5. Orange TIC

The Orange TIC is located at the Texas and Louisiana border on IH 10. The roadway segment selected for Laredo TIC analysis is on IH 10 from the TIC to Neches River as shown in Figure 6.6. The study team didn't extend this segment to pass through the city of Beaumont considering that big cities usually have significant impact on the number of crashes happened there. The total length of this segment is 24 miles. Most visitors are traveling through this segment and heading west to Houston.

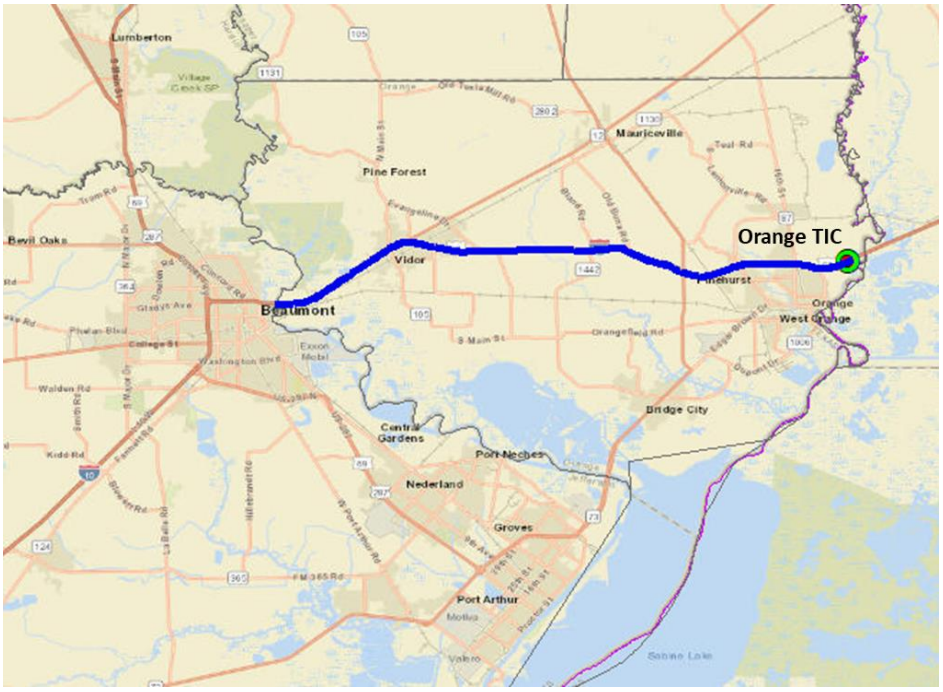

Figure 6.6 IH-10 segment selected for Orange TIC analysis

The number of overall and selected crashes in the east and west directions along this segment of IH 10 from 2010 to 2017 are shown in Table 6.9 and Table 6.10.

Table 6.9. Number of Overall Crashes along IH-10 Segment Selected for Orange TIC Analysis

Year	West	East
2010	215	192
2011	179	174
2012	176	163
2013	164	156
2014	184	158
2015	261	191
2016	317	227
2017	362	258
Total	**1858**	**1519**

Table 6.10. Number of Selected Category of Crashes along IH-10 Segment Selected for Orange TIC Analysis

	Subset		Caused by Fatigued or Sleepy		Caused by Speeding		Person didn't use restraint	
Year	West	East	West	East	West	East	West	East
2010	91	69	3	1	81	64	7	1
2011	55	60	0	0	53	59	9	2
2012	74	49	4	0	67	44	2	4
2013	65	55	0	1	60	51	2	3
2014	82	64	3	1	76	61	3	3
2015	93	55	3	2	86	49	11	1
2016	141	92	4	0	131	91	5	5
2017	135	109	2	2	127	102	12	8
Total	**736**	**553**	**19**	**7**	**681**	**521**	**51**	**27**

The east side of this stretch of highway (not impacted direction) has less number of crashes overall or in selected category.

6.2.2.6. Texarkana

The Texarkana TIC is located at the Texas and Arkansas border on IH 30. The roadway segment selected for Texarkana TIC analysis is the IH 30 from the TIC to US 259 S. The total length of this segment is 45 miles. Most visitors are traveling through this segment and heading west to the Dallas-Fort Worth area.

Figure 6.7 IH-30 segment selected for Texarkana TIC analysis

The number of overall and selected crashes in the east and west directions along this segment of IH 30 from 2010 to 2017 are shown in Table 6.11 and Table 6.12.

Table 6.11. Number of Overall Crashes along IH-30 Segment Selected for Texarkana TIC Analysis

Year	West	East
2010	104	105
2011	103	120
2012	93	96
2013	118	135
2014	88	133
2015	115	148
2016	133	121
2017	100	128
Total	**854**	**986**

Table 6.12. Number of Selected Category of Crashes along IH-30 Segment Selected for Texarkana TIC Analysis

	Subset		Caused by Fatigued or Sleepy		Caused by Speeding		Person didn't use restraint	
Year	West	East	West	East	West	East	West	East
2010	43	48	2	3	31	37	4	9
2011	49	53	1	6	41	35	1	11
2012	39	47	3	5	24	36	4	2
2013	49	79	10	10	34	50	2	12
2014	33	61	6	13	19	39	5	6
2015	50	69	4	8	39	45	7	4
2016	58	56	6	9	36	37	9	8
2017	42	62	9	8	29	44	7	3
Total	**363**	**475**	**41**	**62**	**253**	**323**	**39**	**55**

The west side of this stretch of highway (impacted direction) has less number of crashes overall or in selected category.

6.2.2.7. Waskom TIC

Waskom TIC is located at the Texas and Louisiana border on IH 20. The roadway segment selected for Waskom TIC analysis is on IH 20 from the TIC to the intersection of IH 20 and TX 281 Loop as shown in Figure 6.8. The total length of this segment is about 37 miles. Most visitors are traveling through this segment and heading west to the Dallas-Fort Worth area.

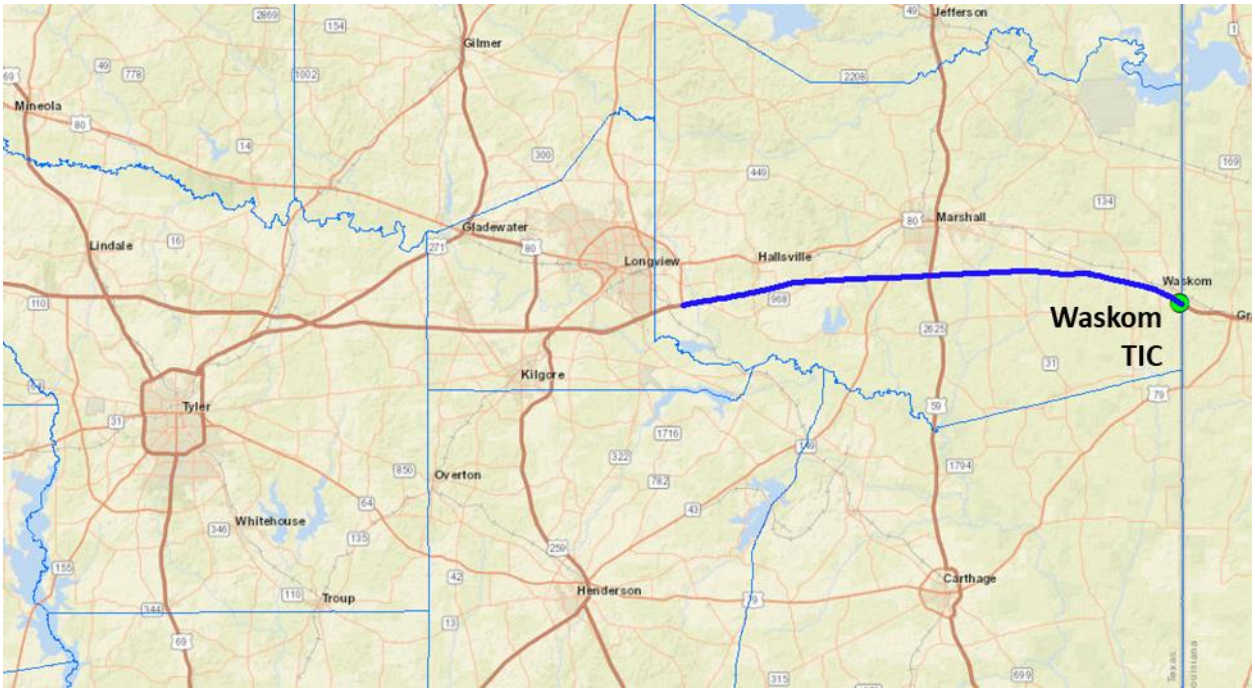

Figure 6.8 IH-20 segment selected for Waskom TIC analysis

The number of overall and selected crashes in the east and west directions along this segment of IH 20 from 2010 to 2017 are shown in Table 6.13 and Table 6.14.

Table 6.13. Number of Overall Crashes along IH-20 Segment Selected for Waskom TIC Analysis

Year	West	East
2010	132	112
2011	124	81
2012	155	85
2013	96	95
2014	124	113
2015	128	124
2016	127	159
2017	150	102
Total	**1036**	**871**

Table 6.14. Number of Selected Crashes along IH-20 Segment Selected for Waskom TIC Analysis

	Subset		Caused by Fatigued or Sleepy		Caused by Speeding		Person didn't use restraint	
Year	West	East	West	East	West	East	West	East
2010	59	48	6	9	40	32	7	7
2011	73	42	7	2	51	32	4	3
2012	89	43	3	4	72	28	3	2
2013	47	44	1	2	38	35	5	9
2014	77	61	6	4	61	45	4	3
2015	81	65	4	2	70	52	2	4
2016	80	89	4	6	62	69	1	6
2017	76	52	3	3	59	43	2	2
Total	**582**	**444**	**34**	**32**	**453**	**336**	**28**	**36**

The west side of this stretch of highway (impacted direction) has more number of crashes overall and most selected category except crashes with person didn't use restraint.

6.2.3. Statistical Analysis and Results

The 8 years of data for the impacted direction (e.g., south direction for Gainesville TIC, west direction for Orange TIC, north direction for Laredo TIC) and the not-impacted direction are combined for the statistical analysis. To account for the correlation within each stretch of the highway, a mixed model was developed to exam the random effects of year and highway segment. The input data is a table with four columns representing respectively:

- TIC
- Year
- Number of crashes in the impacted direction
- Number of crashes in the not-impacted direction

The table contains 56 rows of data. The analysis was conducted using programming language R. The study team did the analysis for the number of overall crashes and selected category of crashes. The results of the analysis are discussed below.

After normalization within each TIC, the data fit well with a normal distribution as shown by Figure 6.9. Therefore, a linear mixed model was conducted with TIC and year as two crossed random effect and direction with/without impact as the fixed effect. The model results are shown in Table 6.15. As we can see the random effect of year and TIC accounts for variation of normalized crash metric by 0.0038 and 0.0071 respectively, comparing to the residual variation of 0.0168. Inspecting the results for the fixed effect (direction with/without impact), the difference on normalized metric caused by impacted direction has estimated coefficient as 0.0101, standard error as 0.0245 and p-value by chi-squared test as 0.68. With the 0.05 type I error acceptance rate, we conclude that the effect on tested crash metric caused by impacted direction is not significant.

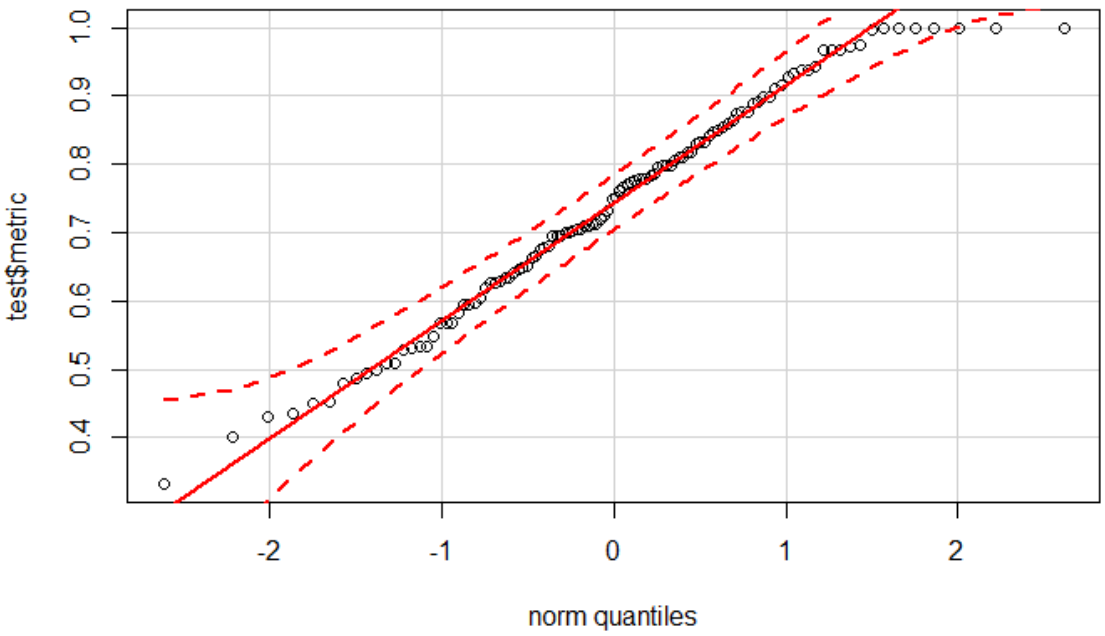

Figure 6.9 Normal Distribution Fits well with the Data

Table 6.15. Mixed Model Results for Overall Crashes Analysis

```
Linear mixed model fit by REML ['lmerMod']
Formula: metric ~ impact + (1 | yr) + (1 | tic)
   Data: test

REML criterion at convergence: -106.9

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.60881 -0.67740 -0.05818  0.54919  2.65814

Random effects:
 Groups   Name        Variance Std.Dev.
 yr       (Intercept) 0.003828 0.06187
 tic      (Intercept) 0.007136 0.08447
 Residual             0.016805 0.12964
Number of obs: 112, groups:  yr, 8; tic, 7

Fixed effects:
            Estimate Std. Error t value
(Intercept)   0.7348     0.0424  17.329
impactexp     0.0101     0.0245   0.412

Correlation of Fixed Effects:
          (Intr)
impactexp -0.289
Analysis of Deviance Table (Type II Wald chisquare tests)

Response: metric
        Chisq Df Pr(>Chisq)
impact 0.1701  1       0.68
```

Similar analysis was conducted with percentage of the subset of crashes among all crashes, the percentage of crashes caused by fatigued and sleepy among all crashes, percentage of crashes caused by speeding among all crashes and crashes involving person not using restraint among all crashes. The analyses all show effect on the tested metrics caused by the impacted direction is not significant.

Considering the not-impacted direction of both Anthony TIC and Laredo TIC are actually impacted by the SRA located at the other end of the segment, the study team performed the statistical tests for only the other five TICs. Again, no significant difference between the impacted and not-impacted direction is identified in terms of overall crashes or the selected category of crashes.

6.3. Summary and Conclusions

The study team analyzed the crash data in the downstream highway segments of the seven TICs located at the border of the state. The team examined the number of overall crashes, a subset of crashes that more closely related to the function of TIC and the safety messaged passed by TIC employee to travelers, crashes that are

specifically contributed by fatigued or sleepy drivers, crashes caused by speeding, and crashes with occupants not using restraint.

The statistical test didn't show significant difference in the number of overall crashes or percentage of selected category of crashes among all crashes between the impacted and not-impacted direction. This does not mean, however, that the TICs don't have positive impact on reducing crashes. The occurrence of crashes is impacted by various factors, without knowing which people stopped at the center and which didn't and without control of many other factors such as traffic volume in opposite direction[2], number and location of other similar type of facilities (e.g., coffee shop, gas station, restaurant) along the roadway, it is very difficult to quantify the safety impact of TICs from this type of crash analysis.

[2] Previous studies used crash rate instead of number of crashes trying to capture the impact of traffic volume. However, they assume the traffic volumes in the opposite directions are the same. The study team has duplicated the test conducted in previous study but didn't arrive at the same conclusion.

Chapter 7. Comparison of TICs and SRAs

In this chapter, the CTR team describes TICs and SRAs, traveler surveys conducted by TIC staff, and visits conducted by the team

7.1. TICs and SRAs

TxDOT maintains a series of 12 TICs and 78 SRAs in Texas to serve drivers, both commercial and the traveling public, and fulfil its mission of "Through collaboration and leadership, we deliver a safe, reliable, and integrated transportation system that enables the movement of people and goods."

SRAs feature regional designs, modern 24-hour rest rooms, covered picnic areas, and separate parking areas for cars and trucks. TICs have these same amenities plus free wireless internet access and Travel Counselors available to provide information on travel routes, traffic congestion, road condition, weather, and advice and brochures on points of state and local interest. In emergencies, travel counselors provide emergency information, directions, and support for travelers and the public.

The location of SRAs and TICs are shown in Figure 7.1. SRAs are shown as red dots. The green dots are TICs. SRAs usually have two facilities located on both sides of the highway.

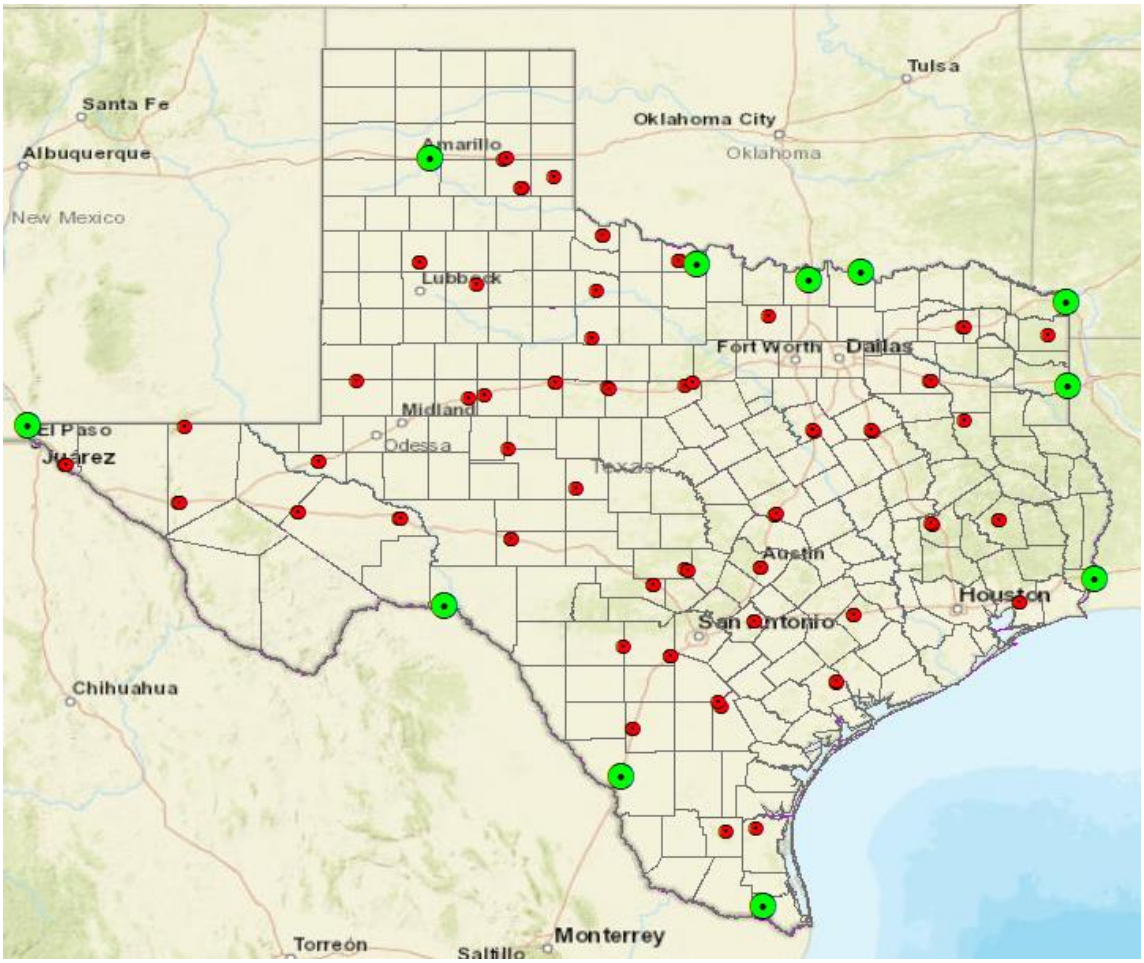

Figure 7.1 Texas SRAs (Red-SRA, Green-TIC)

The CTR team chose to highlight one TIC and one SRA to compare facilities and amenities. The TIC chosen was the Waskom TIC located on IH 20 in Waskom Texas at the Texas-Louisiana border. The SRA chosen was the Hill County SRA on IH 35. Both of these facilities are on interstate highways and both have both car and truck parking areas.

Figure 7.2 shows the TxDOT SRA in Hill County on southbound IH 35. This facility has a main building with restrooms, vending machines with a regional display shown in Figure 7.3 and outbuildings with restrooms for after-hours operation.

Figure 7.2 Hill County SRA

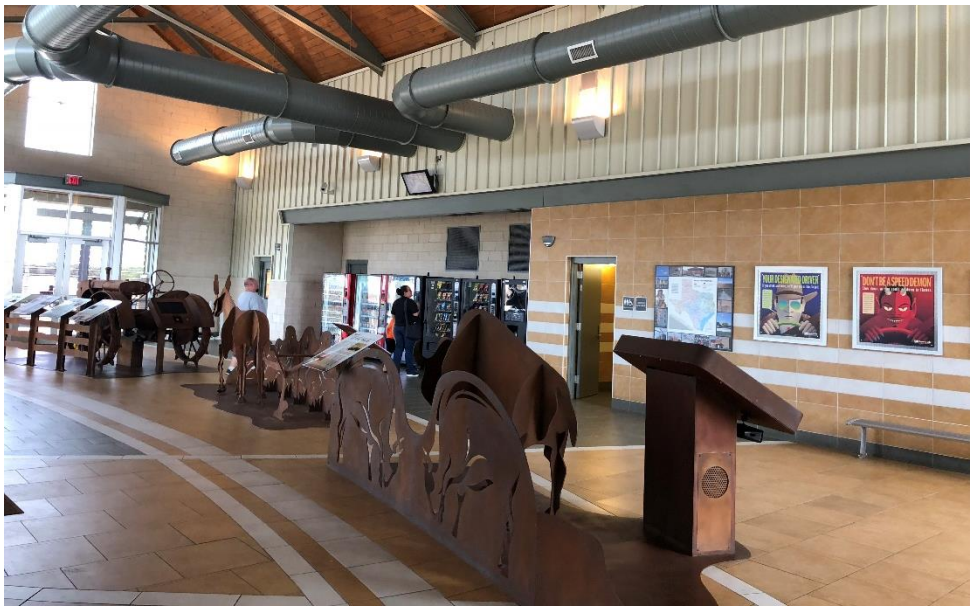

Figure 7.3 Indoor display area and vending machines in Hill County SRA

Figure 7.4 shows the TIC in Waskom, Texas. This facility has indoor restrooms, outside accessible restrooms for 24-hour use, and a display and consultation area where travelers can talk to travel counselors to get information on state and local travel and points of interest, as well as advice on travel, road conditions, and weather.

Figure 7.4 Waskom TIC

Figures 7.5 and 7.6 show the interior of the TIC in Waskom. On display are brochures on points of state and local interest, and visitors meeting with travel counselors.

Figure 7.5 Interior, Waskom TIC

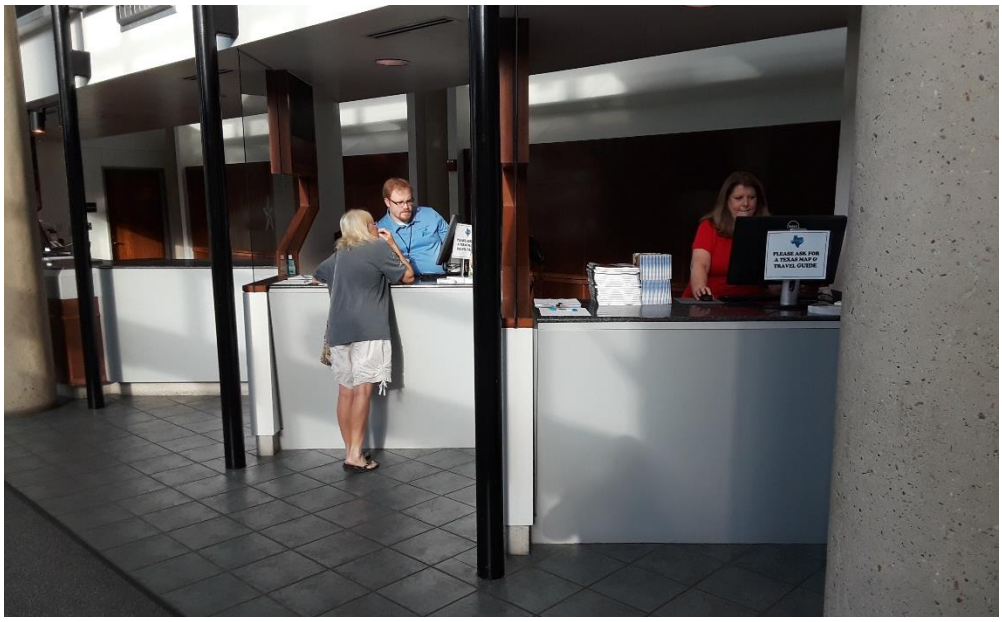

Figure 7.6 Travel counselors aiding travelers

7.2. TIC Visitor Surveys

The CTR team asked staff at all TICs to conduct visitor surveys from May to August 2018. The survey is shown in Appendix D. These surveys were designed to determine the geographical area the visitor was from, their purpose for stopping, the distance/time they traveled before stopping, impressions about TICs, and impressions about SRAs. There is a general preference for TICs over SRAs. The complete description and analysis is in Chapter 5.

7.3. Team TIC Visits

To understand the clientele of the TICs, the CTR team visited five TICs: Orange, Waskom, Texarkana, Wichita Falls, and Gainesville. On these visits, the team conducted visitor interviews, observed TIC operations, and monitored visitor activities.

7.3.1. TIC Visit Observations

General observations included:

- TICs are staffed for visitor consultation between 8am and 6pm during the summer months,
- TICs are clean and well maintained,

- Grounds and janitorial services are provided by third-party contracts,
- Some visitors only enter the building to use the restroom and then leave.
- Visitors that enter the information room are greeted by travel counselors and any questions answered.
- Travel counselors are knowledgeable about statewide travel and local attractions,
- Weather information is provided, with specific information available from travel counselors.
- Many commercial drivers use the TIC as a stopping point and some park overnight.

7.3.2. TIC Visit Surveys

The CTR team conducted personal visitor surveys for approximately 4 hours each at each location visited. This allowed the team to see how visitors arrived and how they interacted with the staff. The visitors were asked the same survey questions as the TIC staff used. CTR personal traveler surveys showed a substantial majority of travelers preferred TICs over SRAs. The complete description and analysis is shown in Chapter 5.

7.3.3. Louisiana and Arkansas Visitor Centers

During visits to the Waskom and Texarkana TICs, the CTR team drove across the state border to Louisiana and Arkansas respectively to visit the corresponding visitor center. The team found the visitor centers in Louisiana and Arkansas to be similar in design and function to those in Texas. Generally, building designs were based on regional themes. In Louisiana, the center had a plantation theme. In Arkansas, the center had a log cabin theme. Both were staffed, provided traveler information and brochures on state and local points of interest. They both had restrooms and separate parking for cars and trucks. In both cases, these centers were able to provide free coffee to visitors.

Figures 7.7 and 7.8 show the outside and inside of the Louisiana Visitor's Center.

Figure 7.7 Outside of the Louisiana Visitor's Center

Figure 7.8 Inside the Louisiana Visitor's Center

Figures 7.9 and 7.10 show the outside and inside of the Arkansas Visitor's Center.

Figure 7.9 Outside of the Arkansas Visitor's Center

Figure 7.10 Inside the Arkansas Visitor's Center.

This chapter compared the TIC and SRA in terms of the facilities and amenities, preferences from surveys, and TICs from Louisiana and Arkansas.

7.4. Comparison based on Crash Data Analysis

To see if there is significant difference between the impact of TICs and SRAs on crashes, the study team conducted crash data analysis similar to what was described in Chapter 6. The difference is that, in this section, instead of comparing the impacted direction and the not-impacted direction, the study team compared the segment/stretch of highway that would potentially impacted by TIC and the segment impacted by SRA.

The comparison was conducted either for the same direction of different segments or for the opposite direction of the same segment (when the segment starts/ends at a TIC and an SRA). When different segments are selected, they have same length and relatively similar surrounding condition (e.g., don't have one section pass through a major city while the other section pass through rural areas).

Next, the study team will introduce the pairs of highway segment and crash data used for this comparison analysis.

7.4.1. Data Preparation

7.4.1.1. Orange TIC and Chambers County SRA Westbound

The stretch of IH 10 west of the Chambers County SRA was selected to compare with the stretch of IH 10 west of Orange TIC (see Figure 7.11). Both stretch of highways is 24 miles. The crashes involving vehicles travelling in the west direction are compared since this is the "impacted" direction.

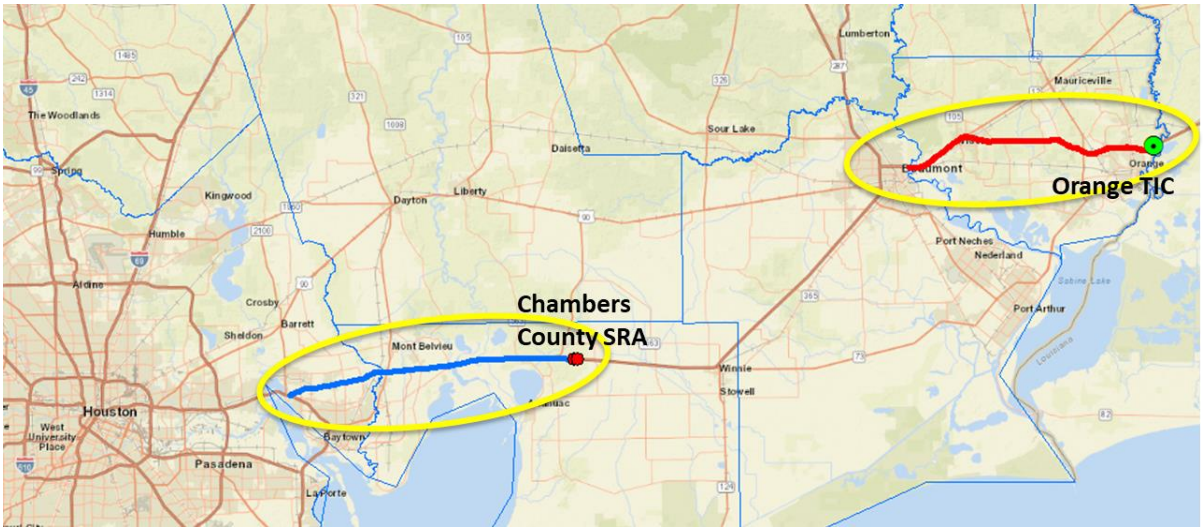

Figure 7.11 IH-10 segments selected for Orange TIC and Chambers County SRA westbound comparison

The number of overall and selected category crashes in the west directions along these two segments of IH 10 from 2010 to 2017 are shown in Tables 7.1 and 7.2.

Table 7.1. Number of Overall Crashes in the West Direction along the Two Segments of IH-10 Selected for Orange TIC and Chambers County SRA Westbound Comparison

Year	Orange TIC Segment	Chamber County SRA Segment
2010	215	209
2011	179	178
2012	176	188
2013	164	225
2014	184	277
2015	261	346
2016	317	351
2017	362	376
Total	**1858**	**2150**

Table 7.2. Number of Selected Category of Crashes in the West Direction along the Two IH-10 Segments Selected for Orange TIC and Chambers County SRA Westbound Comparison

	Subset		Caused by Fatigued or Sleepy		Caused by Speeding		Person didn't use restraint	
Year	Orange TIC Segment	Chamber County SRA Segment	Orange TIC Segment	Chamber County SRA Segment	Orange TIC Segment	Chamber County SRA Segment	Orange TIC Segment	Chamber County SRA Segment
2010	91	86	3	7	81	59	7	9
2011	55	60	0	5	53	40	9	9
2012	74	56	4	6	67	32	2	3
2013	65	77	0	11	60	47	2	4
2014	82	106	3	11	76	69	3	6
2015	93	137	3	10	86	90	11	10
2016	141	161	4	13	131	99	5	12
2017	135	148	2	12	127	101	12	6
Total	**736**	**831**	**19**	**75**	**681**	**537**	**51**	**59**

It can be seen that overall and in most category of crashes, the TIC segment has less number of crashes than the SRA segment. However, the TIC segment has more crashes caused by speeding.

7.4.1.2. Orange TIC and Chambers County SRA Eastbound

The comparison between Orange TIC and Chambers County SRA Eastbound can be conducted by selecting the IH-10 segment from Orange TIC to Chamber County SRA (see Figure 7.12) and comparing the crashes in the east and west direction along this segment. The west direction is impacted by Orange TIC and the east direction is impacted by the Chamber County SRA Eastbound. This segment is 67 miles long.

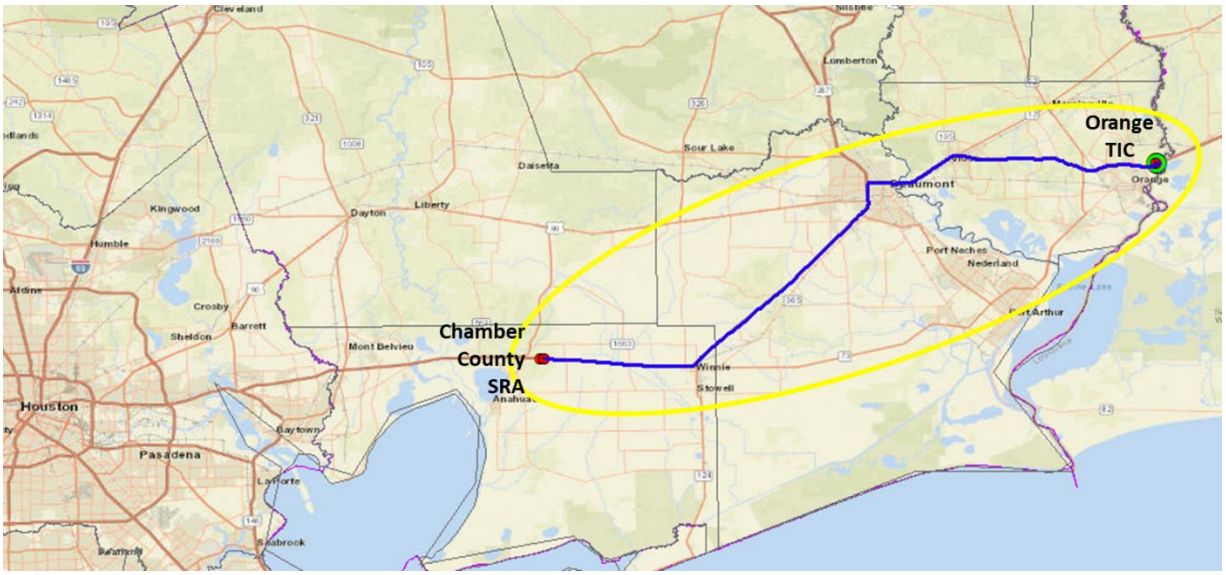

Figure 7.12 The IH-10 segment selected for Orange TIC and Chamber County SRA eastbound comparison

The number of overall and selected category of crashes in the west and east directions along this segment of IH 10 from 2010 to 2017 are shown in Tables 7.3 and 7.4.

Table 7.3. Number of Overall Crashes in the West and East Direction along the IH-10 Segment Selected for Orange TIC and Chambers County SRA Eastbound Comparison

Year	West	East
2010	409	444
2011	364	370
2012	426	417
2013	399	454
2014	423	501
2015	518	538
2016	655	576
2017	641	552
Total	**3835**	**3852**

Table 7.4. Number of Selected Category of Crashes in the West and East Direction along the IH-10 Segment Selected for Orange TIC and Chambers County SRA Eastbound Comparison

	Subset		Caused by Fatigued or Sleepy		Caused by Speeding		Person didn't use restraint	
Year	**West**	**East**	**West**	**East**	**West**	**East**	**West**	**East**
2010	160	161	10	7	137	138	13	10
2011	131	126	6	7	120	113	11	4
2012	164	140	11	5	137	121	10	8
2013	146	178	6	6	124	157	9	9
2014	158	215	10	15	137	182	7	9
2015	177	196	7	15	154	166	12	10
2016	251	214	9	7	229	202	13	12
2017	221	207	6	4	203	196	16	15
Total	**1408**	**1437**	**65**	**66**	**1241**	**1275**	**91**	**77**

It can be seen that overall and in most category of crashes, the west direction (impacted by TIC) has slightly less number of crashes than the east direction (impacted by SRA). However, the east direction has slightly less crashes involving person not using restraint.

7.4.1.3. Waskom TIC and Van Zandt County SRA Westbound

The stretch of IH 20 west of Van Zandt County SRA was selected to compare with the stretch of IH 20 west of Waskom TIC (see Figure 7.13). Both stretches of highway is 37 miles. The crashes involving vehicles travelling in the west direction are compared.

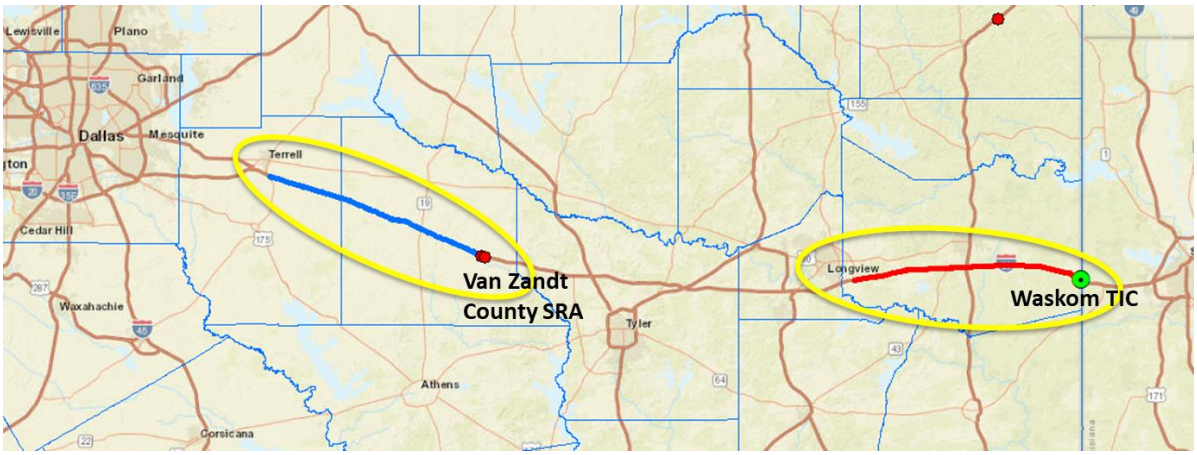

Figure 7.13 IH-20 segments selected for Waskom TIC and Van Zandt County SRA westbound comparison

The number of overall and selected category of crashes in the west directions along these two segments of IH 20 from 2010 to 2017 are shown in Tables 7.5 and 7.6.

Table 7.5. Number of Overall Crashes in the West Direction along the Two IH-20 Segments Selected for Waskom TIC and Van Zandt County SRA Westbound Comparison

Year	Waskom TIC Segment	Van Zandt County SRA Segment
2010	132	104
2011	124	88
2012	155	71
2013	96	94
2014	124	108
2015	128	135
2016	127	134
2017	150	158
Total	**1036**	**892**

Table 7.6. Number of Selected Category of Crashes in the West Direction along the Two IH-20 Segments Selected for Waskom TIC and Van Zandt County SRA Westbound Comparison

	Subset		Caused by Fatigued or Sleepy		Caused by Speeding		Person didn't use restraint	
Year	Waskom TIC Segment	Van Zandt County SRA Segment	Waskom TIC Segment	Van Zandt County SRA Segment	Waskom TIC Segment	Van Zandt County SRA Segment	Waskom TIC Segment	Van Zandt County SRA Segment
2010	59	54	6	4	40	46	7	4
2011	73	32	7	3	51	24	4	7
2012	89	20	3	5	72	10	3	2
2013	47	42	1	2	38	33	5	2
2014	77	61	6	5	61	42	4	5
2015	81	75	4	1	70	53	2	4
2016	80	73	4	8	62	52	1	7
2017	76	65	3	10	59	47	2	5
Total	**582**	**422**	**34**	**38**	**453**	**307**	**28**	**36**

It can be seen that overall and in most category of crashes, the SRA segment has less number of crashes than the TIC segment. However, the TIC segment has less crashes caused by fatigued or sleepy and crashes involving person not using restraint.

7.4.1.4. Waskom TIC and Van Zandt County SRA Eastbound

The comparison between Waskom TIC and Van Zandt County SRA Eastbound can also be conducted by selecting the IH-20 segment from Waskom TIC to Zandt County SRA (see Figure 7.14) and comparing the crashes in the east and west direction along this segment. The west direction is impacted by Waskom TIC and the east direction is impacted by the Van Zandt County SRA Eastbound. This segment is 97 miles long.

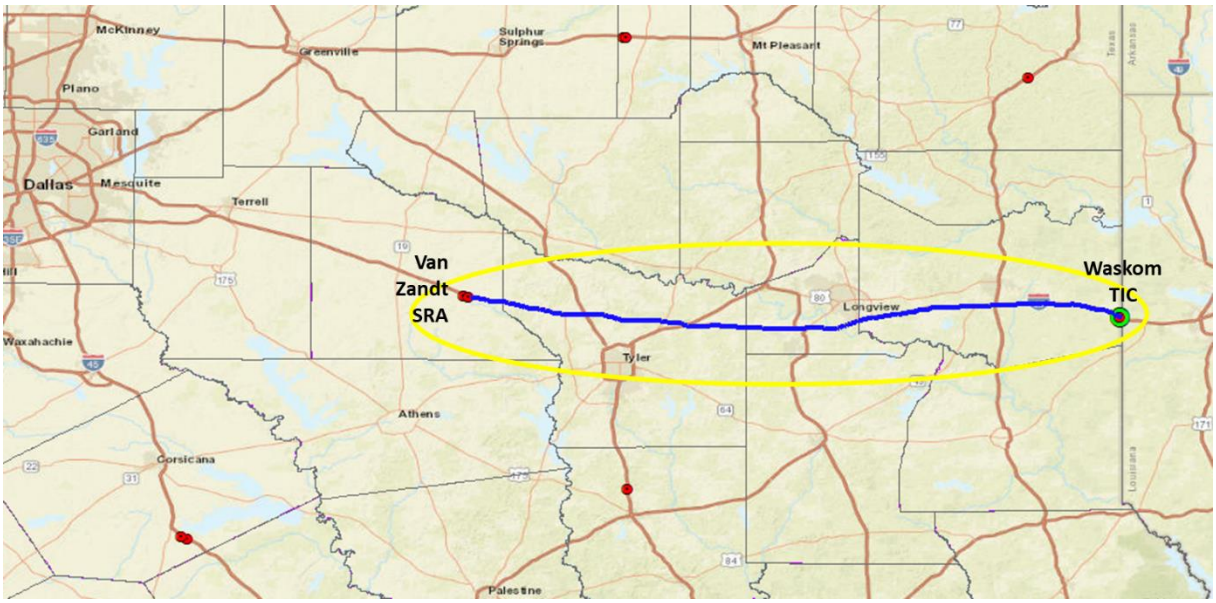

Figure 7.14 The IH-20 segment selected for Waskom TIC and Van Zandt County SRA eastbound comparison

The number of overall and selected category of crashes in the west and east directions along this segment of IH 20 from 2010 to 2017 are shown in Tables 7.7 and 7.8.

Table 7.7. Number of Overall Crashes in the West and East Direction along the IH-20 Segment Selected for Waskom TIC and Van Zandt County SRA Eastbound Comparison

Year	West	East
2010	410	402
2011	387	317
2012	403	374
2013	375	374
2014	386	449
2015	481	450
2016	422	490
2017	496	425
Total	**3360**	**3281**

Table 7.8. Number of Selected Category of Crashes in the West and East Direction along the IH-20 Segment Selected for Waskom TIC and Van Zandt County SRA Eastbound Comparison

	Subset		Caused by Fatigued or Sleepy		Caused by Speeding		Person didn't use restraint	
Year	**West**	**East**	**West**	**East**	**West**	**East**	**West**	**East**
2010	234	227	14	15	196	189	14	20
2011	229	185	11	7	191	152	12	14
2012	242	218	9	12	204	177	8	13
2013	189	207	6	11	162	169	19	20
2014	215	260	10	9	182	216	10	19
2015	298	259	17	7	250	225	14	13
2016	251	283	12	10	211	230	12	14
2017	284	222	13	6	229	192	13	13
Total	**1942**	**1861**	**92**	**77**	**1625**	**1550**	**102**	**126**

It can be seen that overall and in most category of crashes, the east direction (impacted by SRA) has less number of crashes than the west direction (impacted by TIC). However, the west direction has slightly less crashes involving person not using restraint.

7.4.1.5. Laredo TIC and La Salle County SRA Northbound

The stretch of IH 30 north of La Salle County SRA was selected to compare with the stretch of IH 35 north of Laredo TIC (see Figure 7.15). Both stretches of highway is 41 miles. The crashes involving vehicles travelling in the north direction are compared.

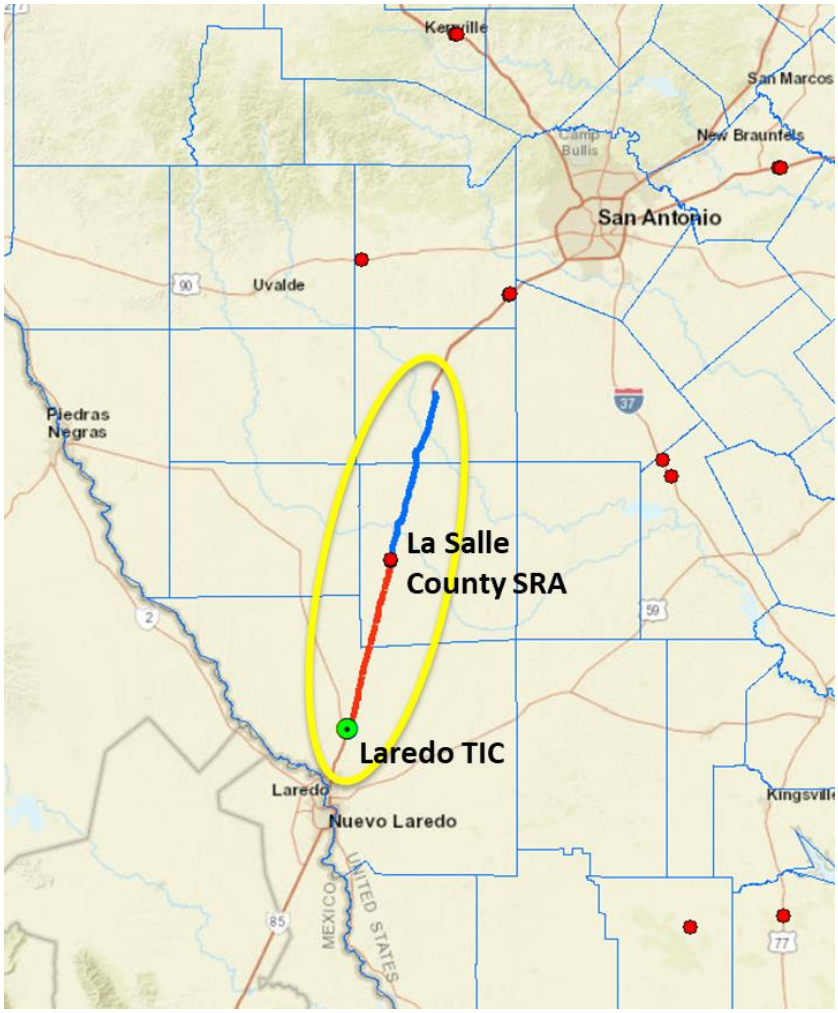

Figure 7.15 IH-35 segments selected for Laredo TIC and La Salle County SRA northbound comparison

The number of overall and selected category of crashes in the north directions along these two segments of IH 35 from 2010-2017 are shown in Tables 7.9 and 7.10.

Table 7.9. Number of Overall Crashes in the North Direction along the Two Segments of IH-35 Selected for Laredo TIC and La Salle County SRA Northbound Comparison

Year	Laredo TIC Segment	La Salle County SRA Segment
2010	20	20
2011	35	27
2012	38	63
2013	39	49
2014	60	37
2015	49	42
2016	45	33
2017	38	37
Total	**324**	**308**

Table 7.10. Number of Selected Category of Crashes in the North Direction along the Two Segments of IH-35 Selected for Laredo TIC and La Salle County SRA Northbound Comparison

	Subset		Caused by Fatigued or Sleepy		Caused by Speeding		Person didn't use restraint	
Year	Laredo TIC Segment	La Salle County SRA Segment	Laredo TIC Segment	La Salle County SRA Segment	Laredo TIC Segment	La Salle County SRA Segment	Laredo TIC Segment	La Salle County SRA Segment
2010	11	10	2	2	5	5	1	0
2011	20	9	3	2	13	4	5	4
2012	20	23	2	1	12	15	1	1
2013	25	21	3	2	18	13	1	3
2014	34	13	2	0	24	11	3	3
2015	22	16	5	1	12	12	3	4
2016	22	13	1	1	16	6	3	3
2017	19	15	2	3	12	10	2	4
Total	**173**	**120**	**20**	**12**	**112**	**76**	**19**	**22**

It can be seen that overall and in most category of crashes, the SRA segment has less number of crashes than the TIC segment. However, the TIC segment has slightly less number of crashes involving person not using restraint.

7.4.1.6. Laredo TIC and La Salle County SRA Southbound

As mentioned in Section 6.2.2.4, the IH-35 segment selected for Laredo TIC study is located between the TIC and the La Salle County TIC, so the south direction of this segment is potentially impacted by the SRA Southbound. A comparison between the north and south direction can also be used for the comparison of the impact of the Laredo TIC and the La Salle County SRA Southbound. The data of these two directions can be found in Section 6.2.2.4.

7.4.1.7. Anthony TIC and El Paso County SRA Westbound

Similarly, the IH-10 segment selected for Anthony TIC study is located between the TIC and the El Paso County TIC, so the west direction of this segment is potentially impacted by the SRA. A comparison between the south or east direction and north or west direction can also be used for the comparison of the impact of the Anthony TIC and the El Paso County SRA westbound. The data of these two directions can be found in Section 6.2.2.1.

A segment of IH 10 east of El Paso County SRA eastbound was not chosen for this comparison considering the TIC section passes through the city of El Paso while the segment of IH 10 east of El Paso SRA eastbound is located mainly in rural areas. These two segments would be hardly comparable.

7.4.2. Data Analysis and Results

Similar to the data analysis conducted in Section 6.2.3.1, after normalization within each TIC, the data fit well with a normal distribution as shown by Figure 7.16. Therefore, a linear mixed model was conducted with TIC-SRA pair and year as two crossed random effect and segment/direction with TIC/SRA impact as the fixed effect. The model results are shown in Table 7.11. As we can see the random effect of year and TIC-SRA pair accounts for variation of normalized crash metric by 0.0099 and 0.0041 respectively, comparing to the residual variation of 0.0182. Inspecting the results for the fixed effect (segment/direction with TIC/SRA impact), the difference on normalized metric caused by segment/direction with TIC impact has estimated coefficient as 0.0161, standard error as 0.0255 and p-value by chi-squared test as 0.53. With the 0.05 type I error acceptance rate, we conclude that compared with segment/direction with SRA impact, the effect on tested crash metric caused by segment/direction with TIC impact is not significant.

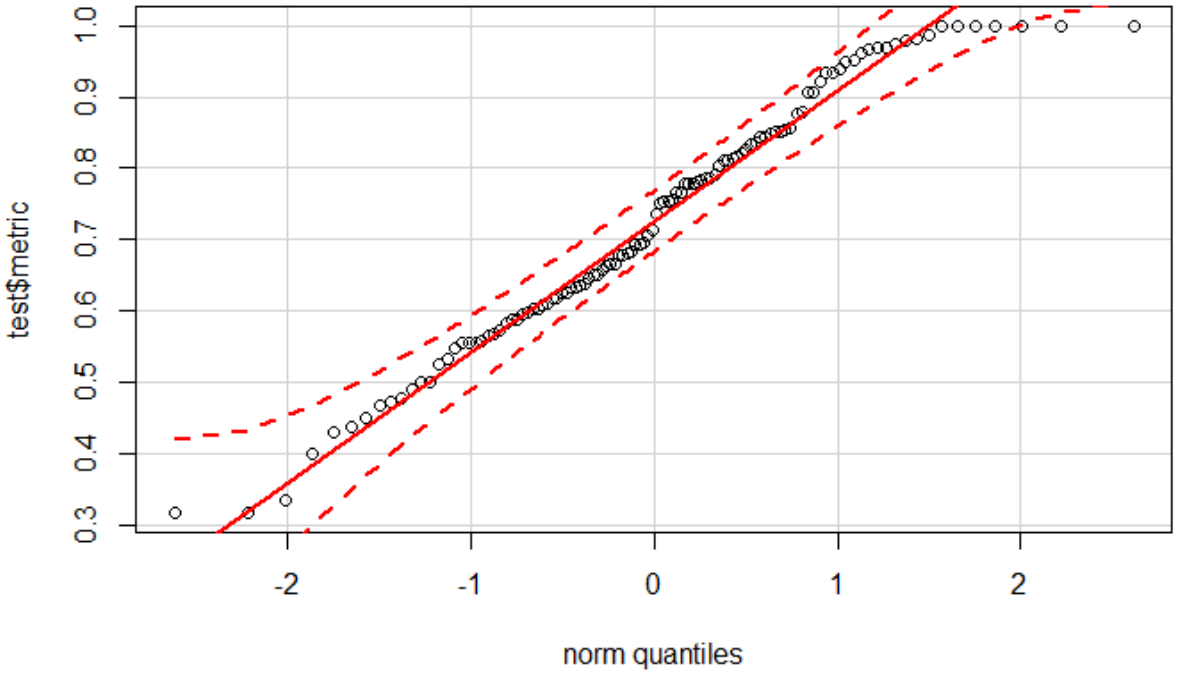

Figure 7.16 Normal distribution fits well with the data

Table 7.11. Mixed model results for overall crashes analysis

```
Linear mixed model fit by REML ['lmerMod']
Formula: metric ~ impact + (1 | yr) + (1 | tic)
   Data: test

REML criterion at convergence: -96.2

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.6443 -0.5378 -0.0370  0.5724  2.9129

Random effects:
 Groups   Name        Variance Std.Dev.
 yr       (Intercept) 0.009957 0.09979
 tic      (Intercept) 0.004143 0.06436
 Residual             0.018187 0.13486
Number of obs: 112, groups:  yr, 8; tic, 7

Fixed effects:
            Estimate Std. Error t value
(Intercept)  0.71685    0.04649  15.420
impactexp    0.01611    0.02549   0.632

Correlation of Fixed Effects:
          (Intr)
impactexp -0.274
Analysis of Deviance Table (Type II Wald chisquare tests)

Response: metric
        Chisq Df Pr(>Chisq)
impact 0.3996  1     0.5273
```

Similar analysis was conducted with percentage of the subset of crashes among all crashes, the percentage of crashes caused by fatigued and sleepy among all crashes, percentage of crashes caused by speeding among all crashes and crashes involving person not using restraint among all crashes. The analyses show that:

- The effect of TIC on the percentage of crashes involving person not using restraint is not significant compared with SRA.
- The percentage of the subset of crashes among all crashes and the percentage of crashes caused by speeding is significantly higher on the TIC impacted segment than the SRA impacted segment.
- The percentage of crashes caused by fatigued and sleepy among all crashes is significantly lower on the TIC impacted segment than the SRA impacted segment.

7.5. Summary and Conclusions

In this chapter, the study team compared TICs and SRAs from different aspects. TICs provide more services than SRAs. Many travelers expressed their preference of TICs over SRAs due the presence of TIC employee.

However, the crash data analysis didn't show significant difference between them in reducing total number of crashes and indicated mixed results in terms of those selected category of crashes. As mentioned before, the occurrence of crashes can be impacted by many random factors. Without knowing which travelers stopped at a TIC or SRA and without a good control of many other impacting factors, the crash data analysis cannot produce reliable results for comparing the safety impact of TICs and SRAs.

Chapter 8. TIC Operations during Hazardous Conditions

As individuals face countless difficulties during hazardous and disastrous situations (e.g., transportation and communication obstacles, power outages, etc.), they need to contact a variety of organizations for a range of assistance that will help them solve those difficulties. TICs are one of such organizations. The objective of this chapter is to evaluate the importance of TICs during natural disasters and hazardous conditions.

8.1. Spearman's Correlation Analysis

One way that a TIC can help the public during hazardous disaster conditions is by answering phone calls from all over the state. The TIC employee provides the caller the most accurate and real-time guidance on the correct route to his destination, rest areas, possible tourism sites, etc. Weather and roadway conditions are also provided to the callers to secure their safety. Each TIC has its own telephone number. Besides that, TxDOT has an interactive voice recognition (IVR) system (800-452-9292) on existing road conditions, weather updates, evacuation routes, road closures, etc. If the caller opts to speak to a representative, the system transfers the call to one of the TICs. The volume of calls increases significantly during natural disasters (e.g., hurricane, flooding, etc.). The more serious the disaster is, the more callers there will be.

CTR obtained monthly data from TxDOT regarding the number of calls that were made to the IVR system (800-452-9292) and the number of calls that were transferred to Texas TICs. The data covers each month from August 2010 to June 2018. The research team also obtained a timeline of major disasters and hazards that occurred in Texas during the same time span. These occurrences were given a severity rating outlined by the US Department of Transportation (USDOT) on a Likert scale of 1 to 5. A hazard/disaster was given a severity level of one if its impact was minimum, and a severity level of five if its impact was catastrophic. Table 8.1 lists the detailed description of each severity level.

Table 8.1. Description of Hazard Severity Definitions (USDOT)

Severity Level	Description
Minimal - 1	Negligible safety effect
Minor - 2	Physical discomfort to persons; Slight damage to aircraft/ vehicle
Major - 3	Physical distress or injuries to persons; Substantial damage to aircraft/vehicle
Hazardous - 4	Multiple serious injuries; fatal injury to a relatively small number of persons; a hull loss without fatalities
Catastrophic - 5	Multiple fatalities (or fatality to all on board) usually with the loss of aircraft/vehicle

Table 8.2 lists all the recorded natural disasters and events occurring in Texas during August 2010 to June 2018 and their severity ratings.

Table 8.2. List of Natural Disasters and Events Occurring in Texas from August 2010 to June 2018 and Their Severity Ratings

Hazards / Disasters	Months Affected	Severity Rating
Texas Hurricane Alex (DR-1931)	Aug 2010	5
South Texas Ice Storm	Feb 2011	2
Texas Wildfires (DR-1999)	April–Aug 2011	1
Texas Wildfires (DR-4029)	Aug–Dec 2011	1
Snowfall & Severe Weather	Dec 2012	2
Severe Blizzard	Feb 2013	2
Texas Severe Storms and Flooding (DR-4159)	Oct 2013	2
N. American Storm	Nov 2013	2
Cleon	Dec 2013	2
South Texas Icing	Jan 2014	2
Winter Storm	Feb 2014	2
Frona, Winter Storm, Lola	Jan 2015	2
Winter Strom	Feb 2015	2

Hazards / Disasters	Months Affected	Severity Rating
Texas Severe Storms, Tornadoes, Straight-line Winds, and Flooding (DR-4223)	May–June 2015	4
Texas Severe Storms, Tornadoes, Straight-line Winds, and Flooding (DR-4245)	Oct 2015	4
Texas Severe Winter Storms, Tornadoes, Straight-line Winds, and Flooding (DR-4255)	Dec 2015–Jan 2016	4
Texas Severe Storms, Tornadoes, and Flooding (DR-4266)	Mar 2016	4
Texas Severe Storms and Flooding (DR-4269)	Apr 2016	4
Texas Severe Storms and Flooding (DR-4272)	May–June 2016	2
North and Central Texas Storms	Jan 2017	2
Texas Hurricane Harvey (DR-4332)	Aug–Sep 2017	5
Severe Weather & Tornadoes	Jan 2018	4
Texas Severe Storms And Flooding (DR-4377)	June 2018	2

As can be seen from Table 8.2, two natural disasters occurred in Texas from August 2010 to June 2018, namely Hurricane Alex in August 2010 and Hurricane Harvey in August 2017 to early September 2017. Six natural disasters were categorized as hazardous events with severity level 4.

With the number of calls answered by TICs information obtained, the research team performed Spearman's rank-order correlation analysis to quantify the relationship between the natural disasters and number of calls answered by TIC employees. Note that the number of phone calls TIC answered are those received through the DriveTexas Travel Information Line.

Spearman's rank-order correlation is a method of measuring the statistical dependence between two variables (one dependent and one independent). The advantage with this analysis is that the technique is versatile, doesn't assume normal distribution of the data, and is more resilient to outliers. Spearman's Correlation coefficients range from -1 to +1. A correlation coefficient of -1 indicates that two variable have a negative correlation and if the change in one variable will inversely affect the other one. On the other hand, a correlation coefficient of +1 suggests the exact opposite. Moreover, a correlation coefficient of

+0.9 suggests that the variables are positively correlated and 90% of the dependent variable in based on the independent variable. The null hypothesis for the test was "there was no significant correlation between the two variables", and the alternative hypothesis was "there was significant correlation between the two variables". If two confidence intervals of 95% and 99% were taken for two particular tests, then p-values of less than 0.05 and 0.01 respectively would reject the null hypothesis and accept the alternative one. Moreover, if the alternative hypothesis was accepted, then correlation coefficient became valid for that particular test. The exact opposite would have happened if the null hypothesis was accepted.

8.1.1. Correlation between Disaster Occurrence and TIC Average Monthly Calls Answered

Based on the monthly call information from August 2010 to June 2018 and the natural disaster occurrence information from Table 8.2, the average monthly phone calls answered for months without disasters and with disasters are calculated, respectively. The results are presented in Table 8.3.

Table 8.3. Average Monthly Calls Answered by TICs with and without Natural Disasters

	Number of Months	Average Monthly Calls Answered by TICs
Months without disasters	61	2,929
Months with disasters	34	8,520

It can be seen from Table 8.3 that the average monthly calls answered by TICs during disaster months (8,520/month) are significantly higher than that of months without disasters (2929/month).

The IVR system was launched on August 2, 2010. In the years following, the DriveTexas Travel Information Line received gradually increasing public visibility. In addition, the data set for 2018 only contains 6 months. Therefore, the research team applied 2011 to 2017 data (7 years) to conduct the Spearman's rank-order correlation analysis. The analysis result is presented in Figure 8.1 and Table 8.4.

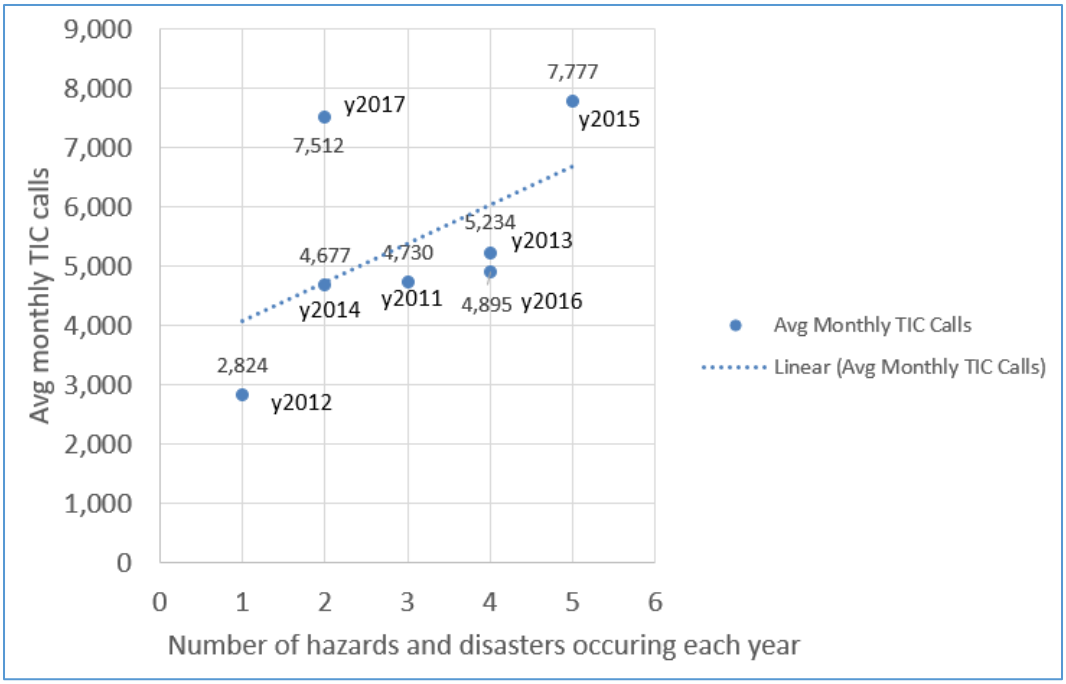

Figure 8.1 Average monthly TIC Calls vs. number of natural disaster occurrences

In Figure 8.1, the x-axis is the number of natural disasters occurred each year and the y-axis is the average monthly TIC calls answered. For example, 2013 had four natural disasters, according to Table 8.2 (severe blizzard, Texas severe storms and flooding, North American storm, and Cleon), and the average number of monthly phone calls for 2013 is 5,234. According to Figure 8.1, the average number of monthly calls to a TIC increased if a greater number of hazards or disasters occurred that year.

Table 8.4. Spearman's Rank-Order Correlation test for Natural Disaster Occurrences and Average Monthly TIC Calls

Number of avg. monthly TIC calls per year	
Correlation coefficient	+0.709
Significance	0.037
Data count	7

As Table 8.4 indicates, it was even more evident when the correlation between the data was analyzed. After performing the Spearman's Correlation with a 95% confidence interval, it was found that the number of hazardous and disastrous events occurring in a year and the number of average monthly TIC calls of that year

had correlation coefficient of +0.709. The test had a p-value of 0.037, which is statistically significant and the alternative hypothesis "there was significant correlation between the two variables" is accepted. In addition, the correlation coefficient suggested that about 71% of the dependent variable (average monthly TIC phone calls) was based on the independent variable (occurrence of natural disasters). This implies that if hazardous and disastrous events occur more frequently, the number of TIC calls will also increase accordingly.

During a natural disaster condition, travelers often face transportation difficulties. They seek expert opinions about the safest route to a particular destination, to evacuate a dangerous area, or even about the closest shelter. This results in a significant increase of calls being transferred to TIC personnel from IVR during a hazardous or disastrous event. TIC employees will do their best to help each caller during the emergency conditions.

8.1.2. Correlation between Disaster Severity and TIC Average Monthly Calls Answered

The research team investigated the relationship between disaster severity and TIC average monthly calls answered. The statistics of TIC average monthly calls by severity is listed in Table 8.5.

Table 8.5. TIC Average Monthly Calls by Disaster Severity

	Number of Months	Average Monthly Calls Answered by TICs
Months without disasters	61	2,929
Months with disasters severity 1	9	3,495
Months with disasters severity 2	14	9,230
Months with disasters severity 4	8	9,747
Months with disasters severity 5	3	16,884

It is noteworthy that some disasters last more than one month. It can be seen from Table 8.4 that as disaster severity increases, the average monthly calls answered by TICs also increases. Specifically, the average monthly calls answered by TICs for

natural disaster with severity 5 is 16,884, which indicates that TICs play an important role in assisting the public during disasters.

In Figure 8.2, the x-axis is the severity of the natural disasters for each month. A "0" indicates that no major natural disaster occurred that month. The y-axis is the number of monthly TIC calls. Even though there are only two disasters (Hurricane Alex and Hurricane Harvey) with level-five severity, Hurricane Harvey impacted two months. Therefore, there are three data points under severity level-five disasters. The results of Spearman's Rank-Order Correlation test for disaster severity and monthly TIC calls is presented in Table 8.5.

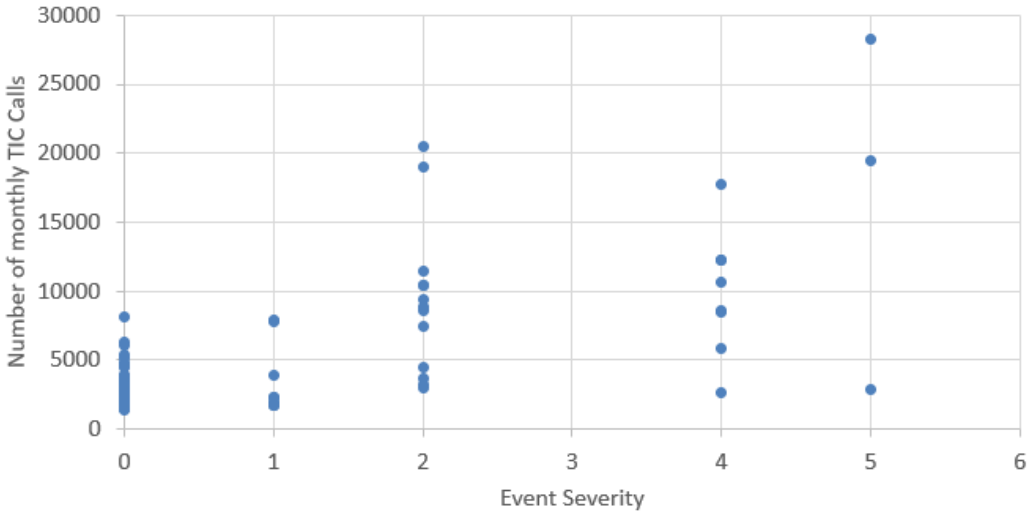

Figure 8.2 Monthly TIC calls vs. natural disaster severity

Table 8.6. Spearman's Rank-Order Correlation Test for Disaster Severity and Monthly TIC Calls

Number of monthly TIC calls	
Correlation coefficient	+0.562
Significance	1.57E-9
Data count	95

As can be seen from Table 8.6, it was found that the severity of disastrous events occurring in a month and the number of monthly TIC calls of that year had correlation coefficient of +0.562. The test had a p-value of 1.57E-9, which is statistically significant with 99% confidence interval and the alternative hypothesis "there was significant correlation between the two variables" is accepted. In addition, the correlation coefficient suggested that about 56% of the dependent

variable (average monthly TIC phone calls) was based on the independent variable (severity of natural disasters). This implies that the more serious a disaster event is, the more number of calls a TIC will receive.

This is reasonable because the more severe an event, the more complication it induces. For example, hurricane Harvey had a severity level of 5. It is the second most costly hurricane to hit the US mainland since 1900. It damaged and destroyed nearly 135,000 homes, and caused historic flooding. Therefore, it is evident that it induced a lot of transportation difficulties for travelers and local residents. These affected individuals wanted guidance from personnel who have the most accurate information on safest routes and safest places for rest. A total of 47,754 phone calls were answered by TIC representatives during Hurricane Harvey. Since catastrophic climate events can change drastically, automated replies will not live up to the expectation of the callers. Therefore, it will result in a greater number of TIC calls where callers will be able to get direct and precise guidance from personnel.

8.2. Findings based on TIC Employee Interviews

During the TIC interview process, TIC employees shared their experience with major natural disasters. Most of them talked about Hurricane Harvey, which occurred in August 2017. During Hurricane Harvey, many TIC employees pointed out that their phone kept ringing non-stop. They were extremely busy answering the phone to help the public. One TIC employee said that "we answered over 600 calls per day at our TIC during Hurricane Harvey." Some people were panicked and TIC employees helped them to calm down. Typical questions were, "how can I get to my destination," "what time will the hurricane hit my area," "when will the flooding hit my area," "is it safe to travel to my destination now," and whether various roads were closed.

TIC employees offered their help to the callers in various ways during a major hazardous event. More specifically:

- TIC employees assisted the callers with routing out of a flooded area
- TIC employees reminded many callers not to drive into water over the road
- TIC employees calmed panicked callers and advised them to shelter in place until later because in many cases, there was no safe way out
- When a caller had an immediate need, TIC employees got their information to the TRV staff in Austin to coordinate rescue efforts

For other disasters with lower severity, such as bad weather, the TIC employees would tell the callers turn around – don't drown. Watch out for the ice. Try to encourage callers who are stuck in their trip and may advise parents whose kids are planning to travel back to their college whether certain routes are safe or not.

TIC employees do an excellent job in helping and answering phone calls during major natural disasters, which may save many lives. Those employees play a significant role in calming down the callers and providing accurate information.

8.3. Summary

This chapter evaluates the role of TICs during natural disasters and emergency conditions. The monthly phone call answered by TIC employees was obtained. The Spearman's rank-order correlation test was conducted. Following are some findings of note:

- The occurrence of natural disasters and average number of TIC phone calls are positively correlated. The more disasters occur, the more phone calls a TIC receives.
- The severity of natural disasters and number of TIC monthly phone calls are positively correlated. The number of TIC monthly phone call increases as the severity of the disaster increase.
- TIC employees answer lots of phone calls during hazardous conditions. They are experienced at helping the callers by answering their questions, providing useful information, calming them down, and telling them what to do and not to do.
- TIC employees make significant contribution during hazardous conditions—they may save many lives by providing valuable services.

Chapter 9. Economic Benefits of TICs

TRV began exploring ways to calculate the economic impact of the twelve TICs in 2010. For internal reference, TxDOT applied visitor behavior results from an Iowa WC survey to Texas TIC visitor numbers and average daily per-person spending figures from D.K. Shifflet & Associates, Ltd., for the travel research office of the Office of the Governor – Economic Development and Tourism (EDT).

Preliminary results from these studies were not officially reported, but recognizing the valuable information that could be derived from primary research, TxDOT and EDT began working together to develop a survey tool for the collection and analysis of Texas visitor behavior, to be administered directly at the TICs. The methodology listed below was formulated jointly by these two agencies, with final approval of the completed survey tool and methodology given by EDT. TxDOT began reporting the results of this study at the beginning of FY 2013. The year-end results for FY 2017 and FY 2018 are given in Table 9.1.

Table 9.1. Travel Information Center Economic Benefits

Fiscal Year	FY 2017	FY 2018
Direct Visitor Spending Generated by Centers	$152.3 million	$148.1 million
Jobs Supported by Centers	1,523	1,481
State Tax Revenue Generated by Centers	$9.5 million	$9.2 million

9.1. Methodology

Surveys are collected from each center in proportion to its visitation.

- Three per day:
  - Denison
  - Gainesville
  - Orange
  - Texarkana
  - Rio Grande Valley (Harlingen)
  - Waskom
  - Wichita Falls

- One per day:
  - Amarillo
  - Anthony (El Paso)
  - Capitol Visitor Center (Austin)
  - Judge Roy Bean Visitor Center (Langtry)
  - Laredo
- Surveys are collected during set time windows. If no visitors come in during the set window, no survey will be collected until the next time window.
- The travel party size used to calculate total spending is set according to travel party size results from this survey.
- The daily per-person spending figure from the most recently released D.K. Shifflet report available through EDT at the beginning of the fiscal year is used throughout the fiscal year.
- Reports are generated quarterly. At the end of the fiscal year, the quarterly totals are added to arrive at the yearly total.
- Economic impact is calculated based on two types of responses:
  - Visitors who respond that they will extend this trip longer than originally planned:
    - 2 hours and ½ day — Calculated at ½ daily spending
    - One day — Calculated at 1x daily spending
    - Two days — Calculated at 2x daily spending
    - Three or more days — Calculated at 3x daily spending
  - Visitors who respond that they will visit more attractions/points of interest in Texas on this trip than originally planned (without spending additional time):
- Calculated at ½ daily spending
  - Visitor response "No changes to this trip, but will use the information for future trips" has an uncalculated/unreported economic impact.
  - Visitor response "None of the above" estimated to have no economic impact.

- Counselors hand out paper survey forms to visitors. Completed surveys are entered into an online database tool whose contents are maintained by TRV.

The survey tool collects additional data for internal use and analysis by TxDOT, including visitor origin and destination, purpose of travel, and customer satisfaction. Demographic information is not collected to avoid redundancy with the research done by EDT. The survey form is shown as Figure 9.1.

Texas Travel Information Center Survey – Center Name

Today's Date: _____

A trip is traveling 50 miles or more from home.

1a. In what country do you presently reside? _____

1b. If "United States," what state? _____ What ZIP code? _____

2a. What state or country is (or was) your destination on this trip?
(If you are on your way home, please tell us where you went.)

_____

2b. If "Texas" is (or was) your destination, what city or region?

_____

3. How many trips will you take in Texas this year? _____

4. How many are in your traveling party (including you)?

1☐ 2☐ 3☐ 4☐ 5☐ More than 5☐

5a. Which of the following are you most likely to do because of information provided at the Travel Information Center?
(Please check only one.)

☐ Extend this trip longer than originally planned

☐ Visit more attractions/points of interest in Texas on this trip than originally planned (without spending additional time)

☐ No changes to this trip, but will use the information for future trips

☐ None of the above

5b. If extending this trip, about how much longer?

☐ 2 hours ☐ 2 days

☐ ½ day ☐ 3 or more days

☐ One day

6. What activities will you/did you take part in on this visit? *(Please check all that apply.)*

☐ Visiting Friends / Relatives ☐ Historic Sites ☐ General Vacation

☐ Dining / Shopping ☐ Theme Parks / Amusement Parks ☐ Business Activities / Work Trip

☐ Museums / Art Exhibits ☐ Hiking / Camping / Outdoor Activities ☐ Special Event _____

☐ Other _____

7. Please rate your satisfaction with the following:

	Poor		*Neutral*		*Excellent*
a. Center facility	1	2	3	4	5
b. Center staff	1	2	3	4	5
c. Printed information	1	2	3	4	5
d. Overall / general	1	2	3	4	5

Comments: _____

_____

Thank you for your visit!

Office Use Only
Survey Administered by:

Figure 9.1 Travel Information Center Survey

9.1.1. Collection

In FY 2017, 6,326 visitor surveys were collected at the TICs. In FY 2018, there were 4,670 visitor surveys collected.

9.1.2. Calculation Variables

The variables listed in Table 9.2 were used to calculate TIC economic impact for FY 2017 and FY 2018. Unless otherwise specified, figures given are drawn from the TIC Visitor Survey results.

Table 9.2. TIC Survey Results

	FY 2017	FY 2018
Daily per person spending	$119.50*	$125.80**
Number of travel parties who received a travel counseling session at a TIC	780,226	723,438
Average travel party size	2.52	2.6
% of survey respondents extending their trip longer than originally planned	20.72%	21.45%
% of survey respondents visiting more attractions/points of interest in Texas on their trip than originally planned (without spending additional time)	61.1%	60.01%

*D.K. Shifflet & Associates Ltd., *2015 Texas Visitor Profile*
**D.K. Shifflet & Associates Ltd., *2016 Texas Visitor Profile*

9.1.2.1. Jobs Supported and State Tax Revenue Generated

In addition to the calculations of direct visitor spending based on the methodology above, EDT calculates that every $100,000 in direct visitor spending supports one job. Spending also yields state tax revenue; calculated at 6.24% for both FY 2017 and FY 2018.

9.1.2.2. Customer Satisfaction

The TICs' customer satisfaction rating results are consistently very high. The TICs received a rating of 4.97 out of 5 for overall customer satisfaction with the facility, staff, and travel literature available in FY 2017 and 4.98 in FY 2018.

9.2. Facility Costs

In FY 2017, operating costs for the TICs were $4,405,281 with maintenance costs of $2,587,175. In FY 2018, operating and maintenance costs were $3,832,568 and $2,186,881, respectively. (Note: The FY 2018 budget will not be closed out until December 2018. Operating and maintenance costs listed are correct as of October 2018. The final figures may be slightly different.)

9.3. TIC Benefits

TICs benefit Texas and travelers in promoting tourism, comfort and convenience of travelers, increased safety, and reducing excess travel.

9.3.1. Tourism Benefits

TRV's mission is to promote travel to and within Texas. The TICs work to fulfill this mission by offering professional travel counseling services and providing routing and highway condition information. The centers are open 360 days a year, closing only on New Year's Day, Easter Sunday, Thanksgiving Day, Christmas Eve, and Christmas Day. These services are provided free of charge to the public.

In conjunction, the centers provide free services to Texas tourism organizations and attractions via a partnership model. Travel counselors are extensively trained to be knowledgeable about current tourism opportunities within the state, and participate in a state and national professional certification program. Regional, city, and private sector tourism partners underwrite educational familiarization tours and training for these counselors throughout the calendar year, thus providing extensive staff training at minimal expense to TxDOT. The centers also provide free literature display and distribution to promote cities, regions, and attractions throughout the state.

9.3.2. Comfort and Convenience Benefits

Texas TICs are conveniently located at all major points of entry to the state, as well as in the Capitol Visitors complex in Austin and the historic Judge Roy Bean Visitor Center in Langtry. Continuing the tradition that began when the first centers were founded in 1936 to assist travelers coming to Texas for its Centennial celebrations, each center's design uniquely reflects the geography and history of its region. The centers are designed to be aesthetically pleasing as well as convenient, and feature such amenities as clean restrooms, landscaped grounds, shaded picnic arbors, free

wireless internet access, “Welcome to Texas” photo ops, and viewing rooms featuring videos on Texas tourism destinations. The attractive facilities and extensive, park-like grounds promote safety by enticing travelers to stop and take a break from the road. These benefits have an additional, unquantified economic impact.

9.3.3. Safety Benefits

Texas TICs perform three important safety functions for the benefit of the traveling public:

1. TICs are an integral component of TxDOT’s DriveTexas Highway Conditions service. Current information on highway closures, construction, accidents, and weather-related travel conditions are displayed on an interactive map at www.DriveTexas.org and provided via TxDOT’s toll-free Travel Information line at 1-800-452-9292. This line provides automated highway conditions information as well as an option to speak with a travel counselor at one of the centers to receive personal, professional assistance.
2. During emergency events, this toll-free information line serves as an emergency information conduit for the traveling public. In case of evacuations, hurricanes, winter storms, or other emergency conditions, TIC staff are activated as a state emergency resource and dispense information on a variety of subjects including emergency shelter information, fuel availability, food and water availability, emergency medical resources, and more. TICs may go into extended hours or 24-hour operations, depending on the nature of the emergency. In the event that an emergency evacuation route includes a TIC, the center may serve as an emergency staging location and provide personal assistance to evacuees.
3. Throughout the year, TICs partner with TxDOT District Safety Officers, the Texas Department of Public Safety, local law enforcement, and other organizations to host safety awareness events for the public. These events tie in with such public safety campaigns as *Click It or Ticket*, impaired and distracted driving awareness campaigns, child car seat safety campaigns, and work zone driving safety campaigns. These events feature educational games and activities, promotional materials, presentations, demonstrations, and entertainment, and are well-attended by local community members as well as passing travelers.

By reducing crashes, property damage, injuries and lost time, these safety benefits have an additional unquantified economic benefit to the State of Texas.

9.3.4. Reduction in Excess Travel

Finally, TICs provide the additional, unquantified economic benefit of reducing excess travel time by providing expert directional information, taking into account both the most efficient route and any delays or detours resulting from highway conditions along that route.

9.4. Summary

In FY 2017 and FY 2018, the TICs demonstrated significant economic value as shown in Table 9.3. In addition, customer satisfaction ratings continue to be very high, with the centers rated 4.96 out of 5 both years.

Table 9.3. TIC Economic Benefits Summary

TIC Economic Benefits	FY 2017	FY 2018
Direct Visitor Spending Generated by Centers	$152.3 million	$148.1 million
Jobs Supported by Centers	1,523	1,481
State Tax Revenue Generated by Centers	$9.5 million	$9.2 million
TIC Costs	**FY 2017**	**FY 2018***
Center Operating Costs (Staffing, Consumables)	$4,405,281	$3,832,568
Center Maintenance Costs (Facilities)	$2,587,175	$2,186,881
Total	$6,992,456	$6,019,449

The TICs are highly valued by their customers, and play an active role in the Texas travel and tourism industry. The Texas Travel Industry Association member organizations underwrite training costs to keep operating costs low and the staff educated and up-to-date. The state tax revenues that the TICs generate further offset these costs. These estimated economic benefits can be considered conservative, as they do not take into account the additional unquantified economic benefits of comfort and convenience, safety impact, and reducing excess travel. The centers clearly provide a significant economic benefit to Texas.

*The FY 2018 budget will not be closed out until December 2018. Operating and maintenance costs listed are correct as of October 2018. The final figures may be slightly different.

Chapter 10. Conclusions and Recommendations

10.1. Conclusions

The CTR team provides the following conclusions. Past research and statistical analysis indicate that Texas TICs provide both economic and safety benefits. The study team learned from the workshop and TIC employee surveys that TICs provide many safety benefits to the traveler that are hard to quantify in terms of dollars, but are real benefits nonetheless, such as:

- hosting safety events to promote all-around safety;
- providing a clean, safe place to stop and rest;
- having a friendly staff to answer questions and reinforce safety messages specific to travel route and destination;
- interacting with out of state and international travelers who may not understand Texas traffic laws; may not understand Texas highway safety messages and are unfamiliar with the higher speed limits and other operational considerations more familiar to Texas residents; and
- using word-of-mouth safety messages, which have proven to be the most effective method for encouraging positive personal behavioral changes.

Traveler surveys conducted at the 11 TICs located along the borders of Texas showed the following:

- The top three reasons why travelers stopped at a TIC are to obtain travel information and directions (44.4%), use restrooms (26.6%), and take a rest/break (25.4%);
- About 51.4% travelers have heard highway safety messages from TIC employees. The top three safety messages involve cellphone usage (text and phone) (33.7%), construction/work zones (21.3%), and driving safely/carefully/friendly (16.9%);
- Based on travelers' ratings of TICs and SRAs' effectiveness in improving highway safety, TICs are considered more effective than SRAs; and
- 73.0% of the travelers prefer staffed TICs over unstaffed SRAs.

The crash data analyses didn't show a significant impact of TICs on the number of crashes within the selected highway segments. In addition, no significant difference was found between TICs and SRAs regarding their impact on the number of crashes. However, this does not mean that either TICs or SRAs don't have positive impact on reducing crashes. The occurrence of crashes is complex and can be impacted by many factors. Following are some of the factors impacting the analysis:

- not knowing which people stopped at the center and which didn't,
- difference in traffic volumes in the two travel directions, and
- number and location of other types of facilities (e.g., coffee shop, gas station, restaurant) along the roadway.

Without accurate information about these factors, it is not possible to differentiate the impact of TICs or SRAs from other impacting factors.

TIC employees answer thousands of phone calls per day during hazardous conditions; the more severe the conditions, the more calls they receive. They are experienced in working with frightened or confused callers who may believe their life is threatened, calming these callers by:

- reassuring them that help will be available,
- answering their questions,
- helping them assess their situation, and then
- providing callers with information to take positive action.

Travel counselors possess skills and abilities uniquely helpful to the travelers they assist. Through their actions in emergencies they may save many lives.

TICs demonstrated significant economic and cost effective value for TxDOT and travelers in Texas with a benefit/cost ratio of approximately 30:1.

10.2. Recommendations

Based on our findings, the CTR team recommends the following:

> Staffed TICs should continue to be funded at current levels with periodic reviews to ensure effectiveness. This study shows that TICs enhance traveler safety, state tourism, and emergency strategies.

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Appendix A. Supplementary Literature Review

This section provides additional detailed information regarding the literature listed in Table 2.5 but was not discussed in Section 2.4.

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The objective was to evaluate the role of 11 VICs, measure their performance and success, and determine their ingredients for success through observation and general data analysis.

Findings:
Several ingredients for success were observed in the VICs under consideration:

- Building positive working relationships with the tourism industry, civic leaders and the wider community to increase understanding of the economic and community benefits generated through investment in the Center.
- Providing staff and volunteers with the appropriate training needed to maintain a high level of customer service.
- Engaging with the local community through school visits, sporting groups, education programs and attendance at local events.
- Establishing a comprehensive distribution channel to market the facility.
- Pursuing funding opportunities through external grants.
- Providing products that is available all year as feasible for a remote location.
- Taking advantage of the location.
- Delivering value-added services beyond traditional responsibilities.
- Attracting the right mix of volunteers and train them to the required level.
- Ensuring communication with the community.

- Managing the requirements to maintain a regular staff presence at community and industry events.
- Not ignoring traditional marketing techniques.
- Ensuring personal engagement (a critical component).
- Being realistic about how digital technology can be applied in the VIC environment.
- Working with Council and other stakeholders to develop strategies and actions that will maximize response efforts across the region.

Deery, M., Jago, L., Daugherty, S., Carson, D., & Adams, K. (n.d.). Investigating Potential Tourism Yield from Visitor Information Centers. Sustainable Tourism Pty Ltd.

The objective was to look into the role played by VICs in enhancing tourism yield within regional Australia and provide recommendations for increasing the tourism yield.

Data sources:

- Field survey on demographic information, details on the planned trip, perceptions of the VIC and VIC staff, and the potential influence of the VIC on visitor behavior, followed by a telephone interview.
- It was designed as a two-phased method to avoid difficulty in obtaining information:
  - From visitors who were keen to proceed with their holiday.
  - Relating to recent influences on behavior.
- The questionnaire was refined to take two minutes of the visitor's time.

Methods:

- Estimation of frequency, mean, standard deviation, and percentage of traveler visits, visitor planning, and tourism yield.

Results:

- The purchase of local, regional food and wine products are important in creating memorable experiences.
- Greater attention should be paid to the promotion and sale of local products that are unique to the region.
- Friendliness of staff is important.

Pearce, P. L. (May, 2004). The Functions and Planning of Visitor Centers in Regional Tourism. The Journal of Tourism Studies, 15(1).

The objective of this paper was to extend the work with the newly entitled "Four Plus" model of visitor center functioning. The extended model was inspired from the work of Fallon and Kriwoken (2003) and Simpson (2001), who emphasized the community functions and acceptance of the visitor center.

The author analyzed several functions of visitor centers:

- Multiple overlapping functions – promotion of the area, orientation to and enhancement of the area's attractions, control and filtering of visitor flows and substitution for on-site visits.
- The promotion function – active promotion of the city, area, or region.
- Orientation and enhancement function – concentration on the quality of the experience for the visitor, attempting to provide displays, suggesting new locations and generally inform visitors about features of the region to promote responsible behavior.
- Control and filtering function – suggesting times of the day to visit set locations, alternative locations for less crowded experiences and the partial use of the center in conjunction with other activities such as guided tours or films to concentrate visitor numbers away from fragile sites or viewing areas.
- The substitution function – the visitor centers themselves become spots of attraction.
- The plus functions – visitor centers can act as community facilities for a range of local cultural and social events, particularly where the space contains a theatre or meeting room. Further, it can be argued that the more symbolic function of a visitor center to signal the importance and significance of a town or site for tourism is a major reason for the existence of many centers.

The author later proposed a four-stage design scheme for the implementation of visitor centers: planning the building design and construction, interpretive and interior display design, management and maintenance.

Perdue, R. R. (1995). Traveler Preferences for Information Center Attributes and Services. Journal of Travel Research, 2-7.

The objective was to measure consumer preferences for different VIC attributes, to examine the importance of these attributes for travelers as compared to center managers, and to determine the best location for a proposed new VIC in Colorado.

Data Sources:

- Interviews with several tourism development authorities (TDAs) indicated that traffic flow on interstates or highways.

- An open-ended survey on location, access and facilities, and services.

Methods:

- Step 1: Identify the attributes or characteristics of VICs with the potential to significantly influence visitation at the proposed sites.
    - State policies concerning VIC design and operation were identified and a preliminary list of center attributes of particular interest to the Tourism Board was developed.
    - Identify design and location attributes of importance to travelers and TDAs.
    - An open-ended survey instrument was developed asking respondents to identify information center attributes that determine visitation levels.
    - A complete listing of the attributes identified by the above procedures was developed and formatted into a Likert-type survey instrument.
    - Any differences in their locational characteristics was identified through visitation.
    - A set of proposed access attributes was developed for more extensive evaluation.
- Step 2: Six information center attributes were identified for more extensive evaluation by analyzing if they varied between two sites or not.
    - An orthogonal, fractional, factorial research design was developed identifying eight hypothetical VICs that systematically varied on these six attributes.
    - A conjoint measurement instrument was developed asking respondents to rate each hypothetical information center. The results were evaluated using OLS regression with respondents' center rating and hypothetical VIC attributes as the dependent and independent variables respectively.
- Step 3: Visitor center visitation as a function of traffic flow and attractiveness was estimated. Specifically, visitation to the existing Colorado VICs was projected on the basis of traffic flow and estimates of center attractiveness derived from the conjoint experiment results. Using the resulting regression coefficients, estimates of visitation at each of the proposed sites were calculated.

Results:

- Distance from the state border and location were not important to travelers.
- Visitation estimates as a function of traffic flow and center attractiveness.

Tierney, P. T. (1993). The Influence of State Traveler Information Centers on Tourist Length of Stay and Expenditures. Journal of Travel Research, 28-32.

The objective was to determine the influence of traveler information centers, if any, on visitor length of stay and expenditures.

Data Sources:

- Personal interview of nonresident tourist parties entering the state, who stopped at one of the three Colorado WCs located along the state border.
- Personal interview at rest areas near roadside serving as control sites for comparable analysis.
- The end result of the survey was a 48-page booklet with space for recording a description of purchases, the price, location of purchase, travel party characteristics, actual trip characteristics, and actual influence of the stop at a WC.

Methods:

- A nonprobability sampling procedure was used because of budget limitations, the large distances between survey sites, and the difficulty in randomly sampling TIC and control site users.
- Univariate chi-square and t-tests were conducted to determine which variables were most related to total expenditures.
- Analysis of covariance was performed with the dependent variables being the log of total trip expenditures and the independent variables being education, income, and interview site. Covariates were group size and length of stay in Colorado.
- A check for nonresponse bias was made by comparing estimated length of stay in Colorado, derived from personal interviews, between groups who returned a diary, groups who returned a follow-up questionnaire, and groups who did not respond.

Results and findings:

- Nonresident automobile-based tourists in this sample have a relatively flexible itinerary.
- Nearly half of all their decisions to visit an attraction were made by respondents after they arrived in the state.
- Only a small percentage of TIC users had seen a CTB TV or radio ad about the state or had previously contacted the CTB to receive the state official vacation planning guide.

- WCs are attracting and influencing a very different group of visitors than are influenced by CTB advertising and other promotions.
- The vast majority of nonresident tourists in this study stopped at Colorado TICs primarily to get information.
- WCs play an important role in trip planning by serving as a source of information on new areas, attractions, and special events, for first-time as well as repeat visitors to the state.
- Tourist travel beyond those destinations and attractions in Colorado with national reputations.
- Colorado WCs have a significant impact on travel decision making, which in turn influences tourist length of stay and expenditures.
- There were significant differences in spending between groups that stopped at two of the three TICs and those who did not.
- WCs positively influenced expenditures.
- Simply operating a TIC does not guarantee that a large number of tourists will be influenced.
- A WC must have easy access, clear signage, adequate room, and a trained staff.
- The ability to interact with the centers' friendly knowledgeable staff was critical, and displays and brochures without the human touch were not enough.
- TIC influence on trip expenditures was found to be significant but limited to persons from middle and high income households.

Bunn, T. L., Slavova, S., & Rock, P. J. (2017). Association between commercial vehicle driver at-fault crashes involving sleepiness/fatigue and proximity to rest areas and truck stops. Accident Analysis and Prevention.

The objective of the study was to determine the association between the occurrence of sleepiness/fatigue-related cases & all other human factor-related CMV driver at-fault crashes (controls) and map the rest areas, weigh stations with rest havens, & truck stops.

Data Sources:

- Kentucky CMV driver crash data for years 2005–2014 from the Kentucky Collision Report Analysis for Safer Highways (CRASH) system which is maintained by the Kentucky State Police.

Methods:

- A case-control design that is effective when relatively rare outcomes and their determinants are studied.
- The outcome of interest was the human factor (e.g., sleepiness/fatigue and any other human factor) contributing to a motor vehicle crash among at-fault CMV drivers involved in crashes.
- A multiple logistic regression model was used to obtain an adjusted odds ratio as an effect measure for the association between the outcome of interest (sleepiness/fatigue vs other human factor(s) for at-fault CMV collisions) and the exposure of interest (distance between the crash site and a rest area, weigh station, or truck stop) while accounting for other covariates (e.g., relevant exposures, possible confounders, and effect modifiers).
- Chi-square tests were performed on the data to test for a bivariate association between driver, collision, roadway, and CMV risk factors; proximity to nearest rest area, weigh station, or truck stop; and the outcome of a sleepiness/fatigue-related at-fault CMV crash.
- Three separate multiple logistic regression models were built.
    - The first model tested for the association between the outcome of interest and the exposure variable "distance from crash location to nearest rest area/truck stop/weigh station with rest haven.
    - The second model identified the specific roads that were associated with higher odds for sleepiness/fatigue-related at-fault driver crash.
    - The third regression model tested the hypothesis for association between the outcome of interest and the type of road (interstate vs parkway).

Results:

- CMV driver at-fault crashes involving sleepiness/fatigue were more likely to occur on roadways where the nearest rest areas/weigh stations with rest havens/truck stops were located 20 miles or more from the CMV crash site compared to commercial vehicle at-fault driver crashes with human factors other than sleepiness/fatigue cited in crash reports.
- CMV driver at-fault crashes involving sleepiness/fatigue also were more likely to occur on parkways compared to interstates, during nighttime hours, and on dry pavement.

Appendix B. Workshop Presentation Slides

THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

HIGHWAY SAFETY BENEFITS OF TEXAS TRAVEL INFORMATION CENTERS

WORKSHOP AND WebEX

DalTRANS Traffic Management Center
May 15, 2018
9AM - noon

AGENDA

I. Introductions – Workshop Purpose and Goals

II. First Responders

III. TxDOT Districts

IV. The Traveling Public

V. TIC Supervisors and employees

VI. Statewide Road Conditions and Emergency Response

AGENDA

I. Introductions – Workshop Purpose and Goals

TxDOT Travel Information Division (TRV)

Martha Martin, Special Projects and Campaigns Section Director
Elizabeth Watson, Special Projects Coordinator
Bryan Watson, Special Projects Coordinator
Ben Watson, Special Projects Coordinator
Michelle Lee, Supervisor, Wichita Falls TIC
Jan Autry, Travel Counselor, Gainesville TIC
Valerie Eaves, Supervisor, Texarkana TIC
Christy Gentry, Lead Travel Counselor, Waskom TIC
Laura Allen, Lead Travel Counselor, Orange TIC

AGENDA

I. Introductions – Workshop Purpose and Goals

Center for Transportation Research

Mike Murphy, PhD., P.E. – Deputy Director – CTR
Zhe Han, PhD. Research Fellow
Ahmed Ahsan, PhD, Graduate Research Assistant

Dr. Randy Machemehl – Senior Professor Transportation
Dr. Zhanmin Zhang - Professor Transportation
Dr. Nan Jiang, P.E. - Associate Researcher
Mr. Robert Harrison - Senior Economist
Carolina Baumanis - PhD Graduate Research Assistant (U.F.)

Roll Call - Those Attending by WebEX

AGENDA

I. Introductions – Workshop Purpose and Goals

a) The State Legislature is requiring a Report from TRV documenting the economic & highway safety benefits of Travel Information Centers (TICs).

b) CTR is working with TIC Supervisors and employees to conduct surveys.

c) We want to hear ideas from First Responders, TxDOT District employees, highway users and industry trade groups regarding TICs and Highway Safety benefits.

AGENDA

I. Introductions – Workshop Purpose and Goals

II. First Responders

III. TxDOT Districts

IV. The Traveling Public

V. TIC Supervisors and employees

VI. Statewide Road Conditions and Emergency Response

AGENDA

Questions:

1. Based on your experience, do you think that certain types of crashes are reduced due to the services provided by the TIC and its employees?
2. Based on your experience do you think certain types of traffic citations are reduced within a given distance (miles) from a TIC?
3. Does your agency attend Safety Events at TICs? If so, why do you think this is important?

AGENDA

Questions:

4. Do you think travelers from other states and countries are at any higher (or lower) risk of a crash than Texas residents? Why?
5. Do you benefit from services provided by a TIC? If so, can you describe how these services help your personal safety?
6. Does your agency consider using the TIC facility when planning emergency operations? Why?

AGENDA

Questions:

7. If you named one thing the TIC and its employees contributes as part of your Community's highway safety education program, what would it be?
8. If you named one thing the TIC and its employees contributes as part of the State's highway safety education program, what would it be?
9. Can you suggest how the TIC and its employees can better serve the traveling public's safety?

AGENDA

Questions:

10. Do you think there is a difference in Highway Safety benefits comparing a TIC and an unmanned safety rest area?
11. Has a TIC employee mentioned any highway safety messages to you? Do you recall the message?
12. When you left the TIC to go back out on the highway, did you feel more refreshed and alert? Why?

AGENDA

I. Introductions – Workshop Purpose and Goals

II. First Responders

III. TxDOT Districts

IV. The Traveling Public

V. TIC Supervisors and employees

VI. Statewide Road Conditions and Emergency Response

AGENDA

Questions:

1. Why do you schedule Safety Events at the TIC? Does the TIC allow you to reach a different audience than safety events at other locations?
2. Do you also hold safety events at the district or another location? Why is the venue changed?
3. Do you think travelers from out of state or from another country are at any higher risk of a crash than Texas drivers? Why or why not?

AGENDA

Questions:

4. As the District Safety Officer – which Divisions do you work with to promote highway safety? How?
5. As the District Safety Officer – which State Agencies do you work with to promote highway safety? How?
6. Of all the different types of workers in the district, who do you think benefits most from the TIC and its employees? Why?

AGENDA

I. Introductions – Workshop Purpose and Goals

II. First Responders

III. TxDOT Districts

IV. The Traveling Public

V. TIC Supervisors and employees

VI. Statewide Road Conditions and Emergency Response

AGENDA

Questions:

1. TIC calls are always answered by a person; not an automated message system. The TIC employee does research if necessary; the caller is given the correct contact number(s)

   - Truck size and weight limits, permits
   - Concealed weapons / handgun laws
   - Driver's license requirements
   - Vehicle Registration
   - Bridge heights

AGENDA

Questions:

- Why am I stuck in traffic? What's happening?
- Is it safe for me to drive to Dallas with ice on the road?
- Our daughter is scared and crying – she can't find a road that is not flooded – can you help her?
- Do I have to wear a motorcycle helmet in Texas?

AGENDA

Questions:

- What are the laws in Texas about texting and driving?
- What are the laws in Texas about talking on a cell phone and driving?
- What are the laws in Texas about children wearing a seat belt if they are in the back seat?
- What are the laws in Texas about children needing to be in a child safety seat?

AGENDA

Questions:

- My car only has Kilometers per hour on the speedometer – can you translate this to miles per hour for me?
- I am from Mexico, Germany, France, Bulgaria – what does 'Click it or Ticket' mean?
- What does 'Don't mess with Texas' mean?
- How far is it to Houston? 100 miles? – so about 1 hour, right?
- How far above the speed limit can I drive and still not get a ticket?

AGENDA

Questions:

- There's a mattress lying in the middle of the road, who should I call?
- I've been kidnapped and dropped off at your Center…….
- I've been kidnapped and the man who did it is unconscious in his car after taking drugs…..
- Caller: My daughter is having a baby and our neighborhood is flooded, how can we get help?

AGENDA

I. Introductions – Workshop Purpose and Goals

II. First Responders

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VI. Statewide Road Conditions and Emergency Response

AGENDA

Questions:

1. Some TIC employees weren't aware until interviewed that they communicate many highway safety messages to travelers daily.

2. Travelers receive many highway safety messages from TIC supervisors and employees; though some travelers might not realize it. Does this matter?

Is the traveler's highway safety benefited anyway?

AGENDA

VI. Statewide Road Conditions and Emergency Response

- (1-800 452-9292) TxDOT TIC call center
- (1-800-525-5555 DPS – Stranded Motorists (back of DL)
- **Customers of wireless companies, ALLTEL, Nextel, AT&T/Cingular, Verizon, Sprint, US Cellular, and T-Mobile, can also dial *DPS (*377) (DPS website)**
- **911 – Emergency Calls (Fire, Police, DPS, EMT)**
  - **Evacuations / Rescues only**
  - **75,000 calls first 24 hours; 21,000 calls next 24**

AGENDA

VI. Statewide Road Conditions and Emergency Response

511 – Designated as a National transportation and traffic information number in July, 2000 by FCC. Based on research conducted at University of North Dakota #SAFE. Actively used in:

Florida	Tennessee
Georgia	Virginia
Kentucky	West Virginia
New Hampshire	Wyoming
New York	Canada
Pennsylvania	

AGENDA

VI. Statewide Road Conditions and Emergency Response

HERO PROGRAM – Roadside assistance Central Texas Regional Mobility Authority (CTRMA)

- 10/16/17 to 4/13/2018 9,692 motorist responses on various routes (now 10 routes) in the Austin Area.
  - Disabled vehicle – 5,366
  - Vehicle first - 44
  - Road debris - 529
  - Abandoned Vehicle


THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH
AGENDA
Open Discussion
Other Ideas
10/11/2018
COLLABORATE. INNOVATE. EDUCATE.

Appendix C. Employee Survey

THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

Employee Survey

Name and Location of the TIC:_____. **Survey Date:**_____. **Time**_____

Gender: ☐Male ☐Female TIC Employee number _____

1. How long have you worked for TxDOT? _____years _____months. ☐ Full time. ☐ Part time.

2. Prior to working for TxDOT as a TIC travel professional in what business did you work?

3. On average, how many travelers do you personally meet/greet on a typical day?

☐1-10	☐ 11- 20	☐ 21-30	☐31-40	☐41-50	☐ 51-60	☐ 61-70
☐ 71-80	☐ 81-90	☐ 91-100	☐ 101- 150	☐ 151- 200	☐ > 200	

How many travelers do you personally meet/greet on high volume travel days (holidays)?

☐ 11- 20	☐ 21-30	☐31-40	☐41-50	☐ 51-60	☐ 61-70	☐ 71-80
☐ 81-90	☐ 91-100	☐ 101- 150	☐ 151- 200	☐ 201-250	☐ > 250	

4. Have you received any professional training from institutions/organizations other than TxDOT for your job at TIC? ☐Yes ☐No

If yes, please specify the institution/organization and what kind of training (any certifications):

5. Do you discuss or mention any of the TxDOT Highway Safety Messages during a traveler's visit? (Not including Special Safety Events) **Your wording does not have to exactly match Safety slogans**

☐Yes ☐ Occasionally, if a traveler asks for information ☐Rarely, or Never

If yes, which messages have you mentioned? (Select all that apply)

☐Click-it or Ticket (fasten your seat belt)	☐Do not use your cellphone while driving	☐Welcome to Texas – Please Drive Safely
☐Do not Drive Distracted	☐Drink, Drive, Go to Jail	☐Railroad Crossing Safety
☐Do not Drive Drowsy	☐Look Twice for Motorcycles	☐Turn around – don't drown
☐Do not Drive and Text	☐Obey traffic signs - it's the law	☐Work Zones – Give us a Brake
☐Do not speed	☐Pedestrian Safety	☐Others

If others, please specify: **Your wording does not have to exactly match Safety slogans**

6. Can you recall, in most cases, what the traveler's response was when you talked about these Safety Programs?

☐Appreciative	☐Seemed receptive	☐Appeared non-receptive	☐ Negatively receptive

7. Do you think that talking to a traveler about Highway Safety is part of your job?

☐Yes	☐No	☐Unsure

8. Do you think that talking to travelers about Highway Safety can have an impact on their Safety and result in better highway safety in Texas?

☐Yes	☐No	☐Unsure

If yes, in what ways? If no, why is this the case?

9. Have you ever started to talk to a traveler about Highway Safety, but the traveler said they did not have time, or did not want to hear the message?

☐Yes	☐No	☐I have never talked to a traveler about Highway Safety

1

Figure C.1 Page 1 of TIC Employee Survey

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CENTER FOR TRANSPORTATION RESEARCH

Employee Survey

10. Do you think that TxDOT TICs help improve Highway Safety?

☐Yes	☐No	☐Unsure

If yes, in what ways? If no, why is this the case?

11. Have you been involved in a Highway Safety Event while working for this (or another) TIC?

☐Yes ☐No

If yes, please name the event and describe your interactions with the public:

12. Do you think that this TIC provides a benefit to local residents, police, EMS, DPS, TxDOT employees that can help improve their Safety?

☐Yes ☐No

If yes, how?

13. Have you ever provided Highway Safety information over the phone to a TIC caller?

☐Yes, **I have done this for** ☐1-20 ☐21-40 ☐41-60 ☐61-80 ☐80-100 ☐Over 100 **times per day**

☐Rarely ☐No, I have never done this before

If yes, please describe examples of the Highway Safety Message(s) that you gave:

14. During disaster conditions, e.g. hurricane, how many emergency phone call have you answered?

☐less than 50	☐51-70	☐71-90	☐91-110	☐101-130	☐over 130

☐No, I have never done this before

15. Has a traveler ever asked you about Texas traffic laws?

☐Yes ☐No

If yes, what topics do travelers ask about? Please select all that apply.

☐Drive while on a cell phone

☐Not wearing a seat belt

☐ If Texas police or DPS allows some 'lee way' in speed limits (for example. "Is it ok to drive 5 mph over posted speed?"

☐How should a child car safety seat be installed?

☐Others

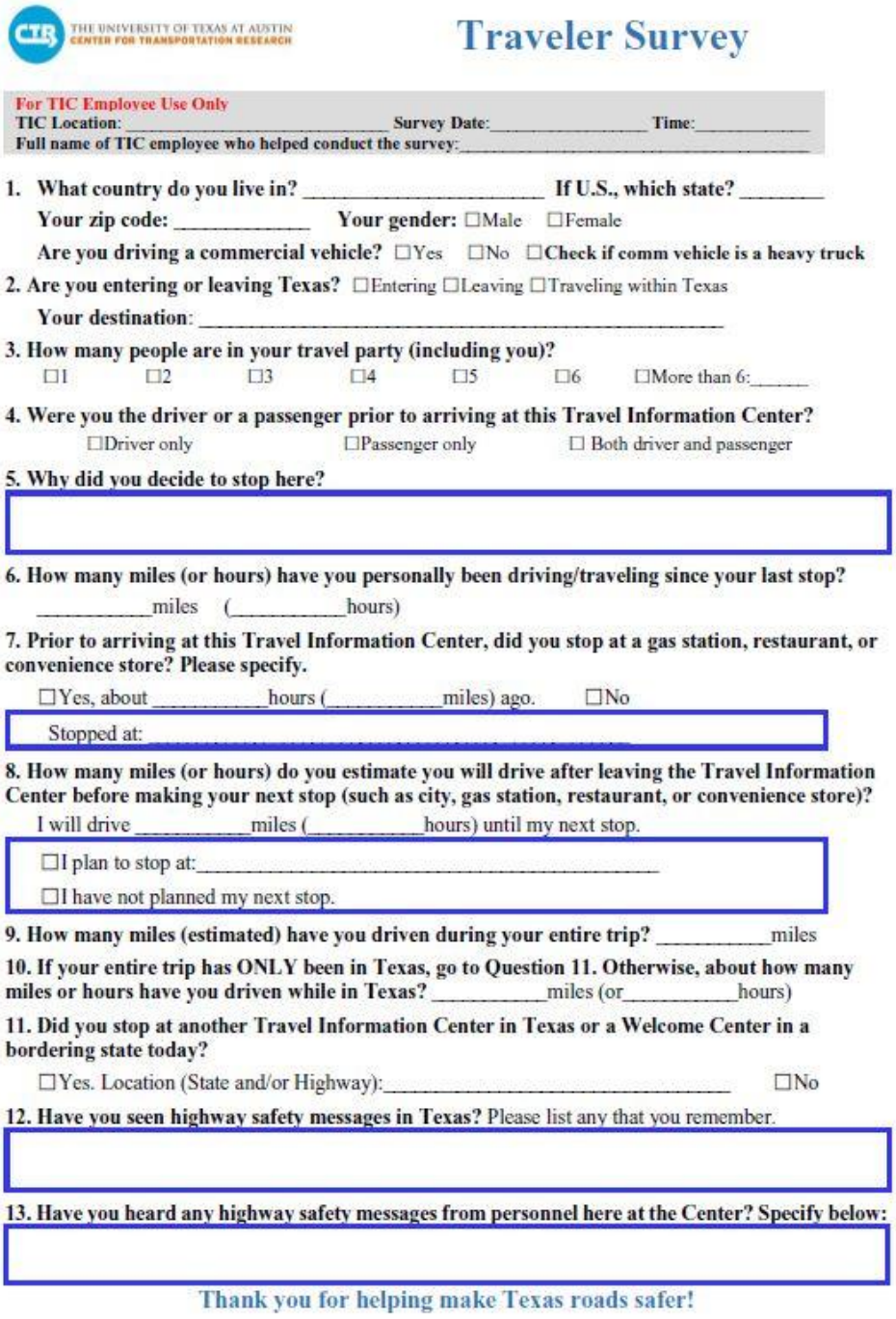
If others, please specify:

16. Have you ever discussed with other TIC employees how to communicate Highway Safety Messages to Travelers? (Not including Scheduled Safety Events)

☐Yes	☐No	☐Unsure

Figure C.2 Page 2 of TIC Employee Survey

Appendix D. Traveler Surveys



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Traveler Survey

For TIC Employee Use Only
TIC Location: _____ Survey Date: _____ Time: _____
Full name of TIC employee who helped conduct the survey: _____

1. What country do you live in? _____ If U.S., which state? _____
   Your zip code: _____ Your gender: ☐Male ☐Female
   Are you driving a commercial vehicle? ☐Yes ☐No ☐Check if comm vehicle is a heavy truck
2. Are you entering or leaving Texas? ☐Entering ☐Leaving ☐Traveling within Texas
   Your destination: _____
3. How many people are in your travel party (including you)?
   ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐More than 6:_____
4. Were you the driver or a passenger prior to arriving at this Travel Information Center?
   ☐Driver only ☐Passenger only ☐ Both driver and passenger
5. Why did you decide to stop here?

6. How many miles (or hours) have you personally been driving/traveling since your last stop?
   _____miles (_____hours)
7. Prior to arriving at this Travel Information Center, did you stop at a gas station, restaurant, or convenience store? Please specify.
   ☐Yes, about _____hours (_____miles) ago. ☐No
   Stopped at: _____
8. How many miles (or hours) do you estimate you will drive after leaving the Travel Information Center before making your next stop (such as city, gas station, restaurant, or convenience store)?
   I will drive _____miles (_____hours) until my next stop.
   ☐I plan to stop at: _____
   ☐I have not planned my next stop.
9. How many miles (estimated) have you driven during your entire trip? _____miles
10. If your entire trip has ONLY been in Texas, go to Question 11. Otherwise, about how many miles or hours have you driven while in Texas? _____miles (or_____hours)
11. Did you stop at another Travel Information Center in Texas or a Welcome Center in a bordering state today?
    ☐Yes. Location (State and/or Highway): _____ ☐No
12. Have you seen highway safety messages in Texas? Please list any that you remember.

13. Have you heard any highway safety messages from personnel here at the Center? Specify below:

Thank you for helping make Texas roads safer!

Figure D.1 Page 1 of TIC Traveler Survey Long Form

THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

Traveler Survey

14. On a scale from 1 to 5, please rate the effectiveness of the following methods in transmitting highway safety messages.

Method	Totally Ineffective		Neutral		Totally Effective
Billboard	1	2	3	4	5
Changeable message board sign	1	2	3	4	5
Heard a highway safety message from a travel information center employee	1	2	3	4	5
Heard a highway safety message from a family member	1	2	3	4	5
Heard a highway safety message from a friend	1	2	3	4	5
Highway safety sign on an official vehicle, bus, or police car	1	2	3	4	5
Radio	1	2	3	4	5
TV	1	2	3	4	5
Website	1	2	3	4	5
YouTube video	1	2	3	4	5

15. What did you like or not like about having Center personnel speak to you about highway safety?

16. Do you think that Travel Information Centers *(which are staffed by travel counselors)* **help improve highway safety? Please rate and note any specifics:**

☐Definitely yes ☐Probably yes ☐Maybe ☐Probably not ☐Definitely not

17. Do you think that having a travel counselor at the Center to talk with or ask questions of helps improve (select all that apply):

☐Your experience at the Center (so you'll stop more often at a Travel Information Center in the future)
☐Your knowledge of tourist destinations in Texas
☐Your knowledge of the best travel route to your destination
☐Your knowledge of one or more highway safety priorities in Texas
☐Your belief that the Texas Department of Transportation and Texans want you to drive safely and return home safely
☐Other (please specify in box below)

18. Have you made one or more stops at a Texas Highway Safety Rest Area *(which are unstaffed or staffed only by maintenance workers)***?** ☐Yes ☐No

19. Do you think that Texas Highway Safety Rest Areas *(which are unstaffed or staffed only by maintenance workers)* **help improve highway safety? Please rate and note any specifics in box:**

☐Definitely yes ☐Probably yes ☐Maybe ☐Probably not ☐Definitely not

Thank you for helping make Texas roads safer!

Figure D.2 Page 2 of TIC Traveler Survey Long Form

THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

Encuesta de Viajeros

Solo Para Empleados
Ubicación del centro: _____ **Fecha:**_____ **Hora:**_____
Nombre del empleado que realizó la encuesta:_____

1. ¿En qué país reside usted actualmente? _____ **Si vive en los EE.UU, ¿en que estado vive?**_____ **Código postal:** _____ **Genero:** ☐Hombre ☐Mujer

¿Está manejando un vehículo comercial? ☐Yes ☐No

☐**Marque aquí si es un camión semirremolque (camión pesado)**

2. ¿Cuándo visitó el Centro estaba ☐Entrando a Texas ☐Saliendo de Texas ☐Viajando dentro de Texas**?**

Su destino final: _____

3. Por favor, indique cuántas personas estaban viajando con usted (incluyéndose a si mismo).

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐Más de 6:_____

4. ¿Cuál de las siguientes opciones aplica una vez en el Centro?

☐ Es el único chófer ☐ Es un pasajero ☐ Es chófer y también pasajero

5. ¿Porque decidió parar en este Centro?

6. ¿Aproximadamente cuántas millas ha manejado desde la última parada?

_____millas (_____horas)

7. ¿Dónde fue su previa parada: restaurante, tienda de bienes, hotel/motel, centro de bienvenida en un estado limítrofe, zona de descanso, u otro lugar?

☐Mi previa parada fue en:_____ hace _____millas (_____horas). ☐No aplica

8. ¿Cuántas millas (u horas) calcula que manejara hasta su próxima parada?

Yo manejare aproximadamente _____millas (_____horas) hasta la próxima parada.

☐La próxima parada será en:_____

☐ No se, todavía no he pensado en eso.

9. ¿Cuántas millas calcula que ha manejado durante todo su viaje? _____millas

10. Si su viaje ha sido SOLAMENTE dentro de Texas, siga a la pregunta número 11. Si no, ¿cuántas millas (u horas) calcula que ha manejado solamente dentro de Texas? _____

11. ¿Paró en otro Centro de Información de Viajes de Texas o en un centro de bienvenida de un estado limítrofe durante este viaje?

☐¿En qué centro(s) paró?:_____ ☐No

12. ¿Ha visto mensajes de seguridad vial desde que entro a Texas? ¿Puede recordar lo visto?

13. ¿Ha escuchado mensajes de seguridad vial desde que entro a Texas? ¿Puede recordar lo escuchado?

14. De 1 a 5, indique cuan efectivo cree que las siguientes formas de recibir un mensaje de seguridad vial son:

¡Gracias por ayudar a hacer las carreteras de Texas más seguras!

Figure D.3 Page 1 of TIC Traveler Survey Long Form Spanish Version

THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

Encuesta de Viajeros

Formas	Muy efectivo	Eficaz	Neutral	Ineficaz	Altamente ineficaz
Verlo en una cartelera	1	2	3	4	5
Verlo en un letrero de mensajes cambiables	1	2	3	4	5
Escucharlo de un empleado del Centro de Información de Viajes	1	2	3	4	5
Escucharlo de un miembro de su familia	1	2	3	4	5
Escucharlo de un amigo	1	2	3	4	5
Verlo puesto en un vehículo, autobús, o vehículo de la policía	1	2	3	4	5
Escucharlo a través la radio	1	2	3	4	5
Escucharlo a través de la TV	1	2	3	4	5
Verlo en una página de internet	1	2	3	4	5
Verlo en YouTube	1	2	3	4	5

15. ¿Qué opina si un empleado del Centro de Información de Viajes se toma la iniciativa de informarle sobre cómo mantener la seguridad en las carreteras? Por favor note cualquier detalle debajo:

☐ Me gusta ☐ No me gusta

16. Usted cree que los Centros de Información de Viajes *(que tienen empleados)* **mejoran la seguridad de las carreteras? Por favor note cualquier detalle debajo:**

☐ Definitivamente sí ☐Probablemente sí ☐ Podría o no podría ☐ Probablemente no ☐ Definitivamente no

17. Cree que tener una persona presente en el Centro de información de Viajes con quien hablar o hacer preguntas ayuda a mejorar (seleccione todas las que correspondan):

☐ Su experiencia general en un Centro de Información de Viajes (pararía con más frecuencia en un centro de información de rutas en el futuro)
☐ Su conocimiento de los destinos turísticos en Texas
☐ Su conocimiento de la mejor ruta de viaje a su destino
☐ Su conocimiento de una o más áreas de enfoque de seguridad en las carreteras en Texas
☐ Su opinión sobre TxDOT y los tejanos querer su bienestar y seguridad para lograr que usted regrese a su casa a salvo
☐Otro aspecto:

18. ¿Ha hecho una o más paradas en una zona de descanso *(donde no hay ningún empleado presente)***?**

☐Sí ☐No

19. ¿Cree que las zonas de descanso vial en Texas *(donde no hay ningún empleado presente)* **ayudan a mejorar la seguridad de las carreteras? Por favor note cualquier detalle debajo:**

☐ Definitivamente sí ☐Probablemente sí ☐ Podría o no podría ☐ Probablemente no ☐ Definitivamente no

¡Gracias por ayudar a hacer las carreteras de Texas más seguras!

Figure D.4 Page 2 of TIC Traveler Survey Long Form Spanish Version

Traveler Survey

For TIC Employee Use Only
TIC Location: _____ **Survey Date:**_____ **Time:**_____
Full name of TIC employee who helped conduct the survey:_____

1. **What country do you live in?** _____
   Your zip code: _____ **Your gender:** ☐Male ☐Female
   Are you driving a commercial vehicle? ☐Yes ☐No ☐**Check if commercial vehicle is a heavy truck**
2. **How many people are in your travel party (including you)?**
   ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐More than 6:_____
3. **Were you the driver or a passenger prior to arriving at this Travel Information Center?**
   ☐Driver only ☐Passenger only ☐ Both driver and passenger
4. **Why did you decide to stop here?**
5. **How many miles (or hours) have you personally been driving/traveling since your last stop?**
   _____miles (_____hours)
6. **Have you seen highway safety messages in Texas?** Please list any that you remember.
7. **Have you heard any highway safety messages from personnel here at the Center? Specify below:**
8. **Do you think that Travel Information Centers** *(which are staffed by travel counselors)* **help improve highway safety? Please rate and note any specifics:**
   ☐Definitely yes ☐Probably yes ☐Maybe ☐Probably not ☐Definitely not
9. **Do you think that having a travel counselor at the Center to talk with or ask questions of helps improve** (select all that apply):
   ☐Your experience at the Center (so you'll stop more often at a Travel Information Center in the future)
   ☐Your knowledge of tourist destinations in Texas
   ☐Your knowledge of the best travel route to your destination
   ☐Your knowledge of one or more highway safety priorities in Texas
   ☐Your belief that the Texas Department of Transportation and Texans want you to drive safely and return home safely
   ☐Other (please specify in box)
10. **Have you made one or more stops at a Texas Highway Safety Rest Area** *(which are unstaffed or staffed only by maintenance workers)***?** ☐Yes ☐No
11. **Do you think that Texas Highway Safety Rest Areas** *(which are unstaffed or staffed only by maintenance workers)* **help improve highway safety? Please rate and note any specifics in box:**
    ☐Definitely yes ☐Probably yes ☐Maybe ☐Probably not ☐Definitely not

Thank you for helping make Texas roads safer!

Figure D.5 TIC Traveler Survey Short Form

THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

Encuesta de Viajeros

Solo Para Empleados
Ubicación del centro: _____ **Fecha:**_____ **Hora:**_____
Nombre del empleado que realizó la encuesta:_____

1. ¿En qué país reside usted actualmente? _____ **Código postal:** _____
Genero: ☐Hombre ☐Mujer **¿Está manejando un vehículo comercial?** ☐Yes ☐No
☐**Marque aquí si es un camión semirremolque (camión pesado)**

2. Por favor, indique cuántas personas estaban viajando con usted (incluyéndose a si mismo).
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐Más de 6:_____

3. ¿Cuál de las siguientes opciones aplica una vez en el Centro?
☐ Es el único chófer ☐ Es un pasajero ☐ Es chófer y también pasajero

4. ¿Cuál fue la razón de parar en este centro?

5. ¿Aproximadamente cuántas millas ha manejado desde la última parada?
_____millas (_____horas)

6. ¿Ha visto mensajes de seguridad vial desde que entro a Texas? Liste los si se acuerda.

7. ¿Algún empleado del Centro le mencionó un mensaje de seguridad vial? Liste lo si se acuerda.

8. Usted cree que los Centros de Información de Viajes *(que tienen empleados)* **mejoran la seguridad de las carreteras? Por favor note cualquier detalle debajo:**
☐ Definitivamente sí ☐Probablemente sí ☐ Podría o no podría ☐ Probablemente no ☐ Definitivamente no

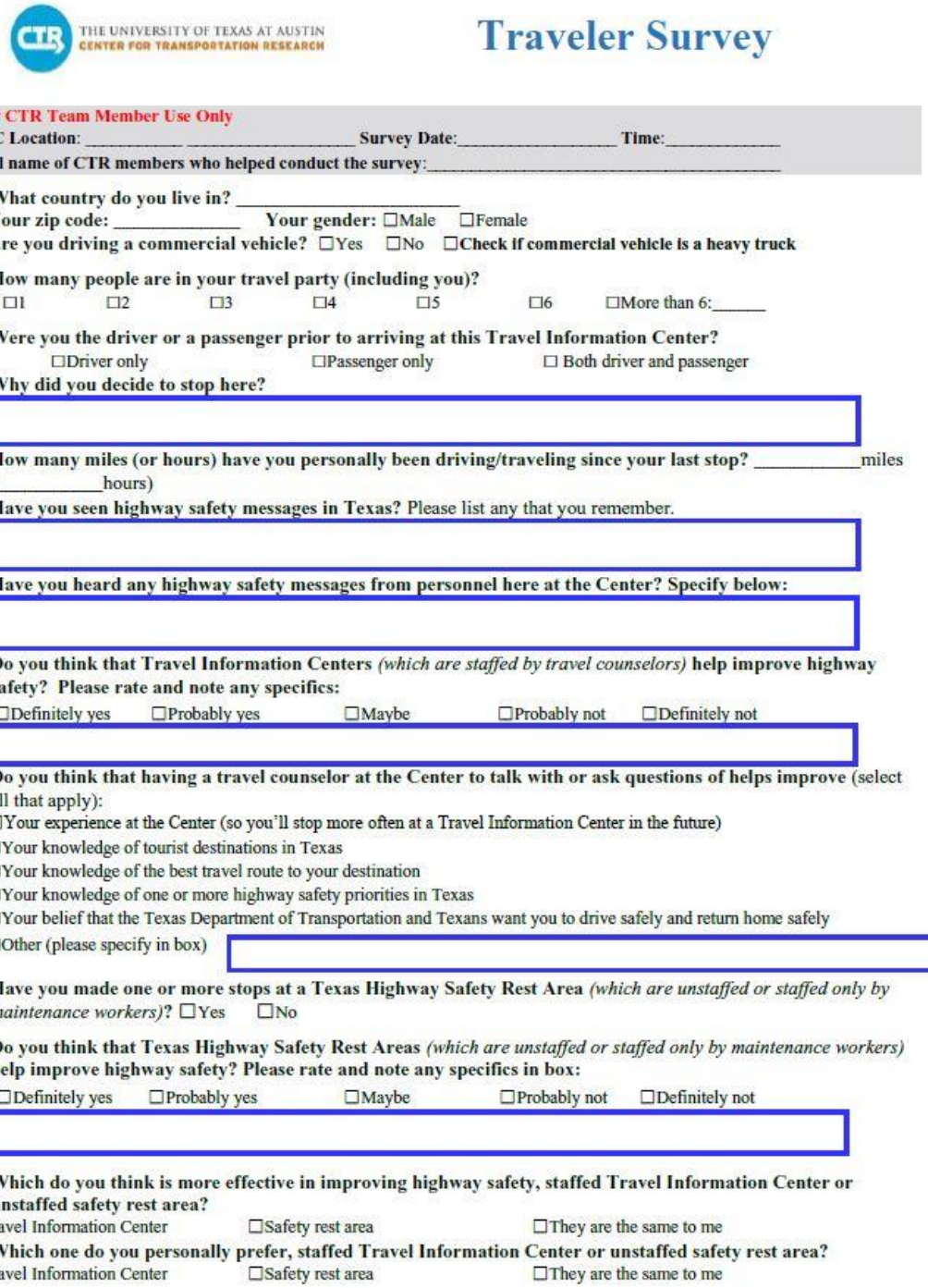
9. Cree que tener una persona presente en el Centro de información de Viajes con quien hablar o hacer preguntas ayuda a mejorar (seleccione todas las que correspondan):
☐ Su experiencia general en un Centro de Información de Viajes (pararía con más frecuencia en un Centro en el futuro)
☐ Su conocimiento de los destinos turísticos en Texas
☐ Su conocimiento de la mejor ruta de viaje a su destino
☐ Su conocimiento de una o más áreas de enfoque de seguridad en las carreteras en Texas
☐ Su opinión sobre TxDOT y los tejanos querer su bienestar y seguridad para lograr que usted regrese a su casa a salvo
☐Otro aspecto:

10. ¿Ha hecho una o más paradas en una zona de descanso *(donde no hay ningún empleado presente)***?**
☐Si ☐No

11. ¿Cree que las zonas de descanso de Texas *(donde no hay ningún empleado presente)* **ayudan a mejorar la seguridad vial? Por favor note cualquier detalle debajo:**
☐ Definitivamente sí ☐Probablemente sí ☐ Podría o no podría ☐ Probablemente no ☐ Definitivamente no

¡Gracias por apoyar hacer las carreteras de Texas mas seguras!

Figure D.6 TIC Traveler Survey Short Form Spanish Version



THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

Traveler Survey

For CTR Team Member Use Only
TIC Location: _____ _____ **Survey Date:**_____ **Time:**_____
Full name of CTR members who helped conduct the survey:_____

1. **What country do you live in?** _____
   Your zip code: _____ **Your gender:** ☐Male ☐Female
   Are you driving a commercial vehicle? ☐Yes ☐No ☐**Check if commercial vehicle is a heavy truck**
2. **How many people are in your travel party (including you)?**
   ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐More than 6:_____
3. **Were you the driver or a passenger prior to arriving at this Travel Information Center?**
   ☐Driver only ☐Passenger only ☐ Both driver and passenger
4. **Why did you decide to stop here?**
5. **How many miles (or hours) have you personally been driving/traveling since your last stop?** _____miles (_____hours)
6. **Have you seen highway safety messages in Texas?** Please list any that you remember.
7. **Have you heard any highway safety messages from personnel here at the Center? Specify below:**
8. **Do you think that Travel Information Centers** *(which are staffed by travel counselors)* **help improve highway safety? Please rate and note any specifics:**
   ☐Definitely yes ☐Probably yes ☐Maybe ☐Probably not ☐Definitely not
9. **Do you think that having a travel counselor at the Center to talk with or ask questions of helps improve** (select all that apply):
   ☐Your experience at the Center (so you'll stop more often at a Travel Information Center in the future)
   ☐Your knowledge of tourist destinations in Texas
   ☐Your knowledge of the best travel route to your destination
   ☐Your knowledge of one or more highway safety priorities in Texas
   ☐Your belief that the Texas Department of Transportation and Texans want you to drive safely and return home safely
   ☐Other (please specify in box)
10. **Have you made one or more stops at a Texas Highway Safety Rest Area** *(which are unstaffed or staffed only by maintenance workers)***?** ☐Yes ☐No
11. **Do you think that Texas Highway Safety Rest Areas** *(which are unstaffed or staffed only by maintenance workers)* **help improve highway safety? Please rate and note any specifics in box:**
    ☐Definitely yes ☐Probably yes ☐Maybe ☐Probably not ☐Definitely not
12. **Which do you think is more effective in improving highway safety, staffed Travel Information Center or unstaffed safety rest area?**
    ☐Travel Information Center ☐Safety rest area ☐They are the same to me
13. **Which one do you personally prefer, staffed Travel Information Center or unstaffed safety rest area?**
    ☐Travel Information Center ☐Safety rest area ☐They are the same to me

Figure D.7 TIC Traveler Survey CTR Interviews