Effectiveness of Safety and Public Service Announcement Messages on Dynamic Message Signs

U.S. Department of Transportation
Federal Highway Administration

Foreword

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16. Abstract

The report assesses the usefulness and effectiveness of safety and public service announcement (PSA) messages through surveys conducted in four urban areas in the United States: Chicago, IL; Houston, TX; Orlando, FL; and Philadelphia, PA. The surveys were designed to specifically address the types of safety and PSA messages for each respective city. A total of 2,088 survey responses were received and analyzed. The report further captures findings and recommendations based on the analysis of the survey responses.

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EXECUTIVE SUMMARY

The number of transportation agencies that use dynamic message signs (DMS) to provide traffic information to motorists has increased dramatically over the past four decades. This growing trend of DMS deployment is a reflection of the public interest in more information about travel conditions and the importance of traveler information for transportation system operations.

There has been extensive research conducted on traffic-related messages. However, policies regarding the display and type of non-traffic-related messages vary greatly among states. Thus, it is unclear how effective these non-traffic-related messages are in modifying driver or travel behavior. It is also unclear whether these messages are acceptable to motorists and whether they have a positive or negative impact on their driving behavior.

The purpose of this study was to identify how safety and public service announcement (PSA) messages influence driver behavior and to ultimately assist the U.S. Department of Transportation (USDOT), transportation management centers (TMCs), state agencies, and local transportation partners in optimizing the utility of safety and PSA messages on DMS. Four urban areas in the United States were selected as study sites—Chicago, IL; Houston, TX; Orlando, FL; and Philadelphia, PA. Surveys were designed to specifically address the types of safety and PSA messages for each respective city. The goal was to collect approximately 500 survey responses per city. In total, 2,088 responses were received.

The data from each survey was summarized by city and analyzed in terms of usefulness and effectiveness. That is, summary statistics were compiled for the survey questions, and inferential statistics were used to examine the usefulness and effectiveness of safety and PSA messages. Usefulness was defined as the practical and functional application of PSAs on DMS, and examined within each city. For this study, effectiveness was defined as the ability of DMS to positively impact driver behavior by displaying safety and PSA messages. Usefulness and effectiveness are clearly subjective measures since they are based on individual perceptions. For the inferential model, only those variables that were shown to have a significant impact on the respective outcome (usefulness or effectiveness) for DMS remained in the final model. If a variable was not included, there was no significant impact on the usefulness or effectiveness of having safety and PSA messages on DMS.

Most respondents reported that they do see safety and PSA messages on DMS while driving, at least sometimes. The majority also noted that safety and PSA messages on DMS are useful, with some even noting that those messages are more effective on DMS as compared to other media (such as television). Respondents in each location were also asked to interpret the meanings of several common safety and PSA messages (e.g., “Don’t drive impaired” and “Eyes on road, hands on wheel”). In general, most respondents had a fairly good understanding of these messages.

Furthermore, the survey asked about safety and PSA messages that have a more threatening connotation. The majority of respondents indicated that such messages like “Click it or ticket or

get $100 fine" or "100 deaths this year on Texas road," would impact their driving behavior. In Chicago, respondents indicated that they would change their driving behavior for messages that relate to slowing down for emergency vehicles and in construction zones. Houston respondents indicated that messages that would most affect their driving are those with more assertive language (e.g., "Drunk driving, over the limit, under arrest"). Orlando motorists were most likely to change their driving behaviors for all safety and PSA messages; while, Philadelphia motorists were neutral on the effects of safety and PSA messages on their driving.

In addition, the perceived usefulness of safety and PSA messages was examined in a binary logit model. The model showed that the messages were considered useful if the driver encountered them often. Respondents also thought that those messages could be effective in changing behavior. Hence, greater exposure to such messages impacts the perceptions of the messages.

In three of the locations, drivers that considered driving under the influence (DUI) messages (Philadelphia, Chicago, Houston) and speeding messages (Orlando, Chicago, Houston) important also found safety and PSA messages to be useful. In two of the locations, individuals younger than 30 years old did not think that safety and PSA messages were useful. More factors that affect perceived usefulness were also mentioned, but they were on an individual city basis and are further discussed in CHAPTER 6: Findings and Recommendations/Guidance.

Similarly, the perceived effectiveness was analyzed in a binary logit model, where all responses were aggregated together, ignoring locational factors. Safety and PSA messages were considered more effective when they were encountered often. They were considered useful for respondents older than 60 years old and respondents who had some graduate school or a post-graduate degree. Males with an income less than $25,000 per year and individuals younger than 30 years old did not perceive safety and PSA messages on DMS to be effective.

There are limitations associated with this study as there are always sampling biases with surveys. To minimize such biases, a pilot test was conducted, a representative sample of the driving population was captured, and surveys were collected via face-to-face communication. A website was also set up to offer another mechanism for participants to answer the survey. Possible differences were also examined between those who lived in the general area of the city and those who did not.

The general recommendation based on the surveys was that safety and PSA messages need to be considered useful and effective to maximize their influence on driver behaviors. Certain socioeconomic characteristics influence drivers' perceptions of these messages. For instance, younger respondents were less likely to consider the messages effective, and future efforts should be focused on promoting awareness targeted toward this group. Respondents also indicated that they took assertive safety and PSA messages seriously, but further examination should consider the magnitude of this impact.

Finally, drivers' stated preferences usually differ from their revealed preferences. Thus, an on-road impact assessment of safety and PSA messages on DMS is needed to confirm the findings of this survey-based perceptional study.

CHAPTER 1. INTRODUCTION

The number of transportation agencies that use DMS to provide traffic information to motorists has increased dramatically over the past four decades. According to the USDOT's 2010 deployment survey, almost 90 percent of freeway agencies and approximately 20 percent of arterial agencies reported using DMS to disseminate traveler information. This growing trend of DMS deployment is a reflection of the public interest in more information about travel conditions and the importance of traveler information for transportation system operations.

Although extensive research has been conducted on traffic-related messages (see Dudek 1992; 1997; and 2006 for examples),[1] policies regarding the display and type of non-traffic-related messages vary greatly among states and, in some cases, are nonexistent. Therefore, it is unclear how effective these non-traffic-related messages are in modifying driver or travel behavior. It is also unclear whether these messages are acceptable to motorists and whether they have a positive or negative impact on their driving behavior (Tay and deBarros, 2010).[2]

The purpose of this study is to identify how safety and PSA messages influence driver behavior. The findings from the study will help the USDOT, Transportation Management Centers Pooled Fund Study (TMC PFS) members, and state agencies and local transportation partners identify and implement the necessary improvements and changes to DMS technologies and safety and PSA messaging strategies in order to better support the public's travel and safety needs.

The effectiveness of the messages is based on two primary factors:

- Usefulness of the information disseminated.
- Motorists' ability to understand and willingness to use the information.

The survey distributed to respondents did not define the terms "usefulness" or "effectiveness." However, the survey was built under the assumption that most respondents spoke English and had an 8th grade education level. Therefore, it was assumed that a common interpretation in this context would be implied by all participants. *Usefulness* encompasses the practical and functional application of PSAs on DMS. *Effectiveness* is the perception that DMS would deliver safety and PSA messages such that a driver's behavior would be positively impacted.

Four urban areas in the United States were selected as study sites—Chicago, IL; Houston, TX; Orlando, FL; and Philadelphia, PA. Surveys were designed to specifically address the types of

1 Dudek C.: *Effective Message Design for DMS*, TxDOT/FHWA 2006

2 Tay R., deBarros A.: "Effectiveness of Road Safety Messages on Variable Message Signs," *Journal of Transportation Systems Engineering and Information Technology* 01/201

safety and PSA messages for each respective city. The goal was to collect approximately 500 survey responses per city. In total, 2,088 responses were received.

CHAPTER 2. ORGANIZATIONAL AND INSTITUTIONAL FRAMEWORKS FOR SAFETY AND PSA MESSAGES IN THE FOUR URBAN AREAS

This chapter identifies the organizational and institutional frameworks that govern the display of safety and PSA messages on DMS in each of the four urban areas—Chicago, Houston, Orlando, and Philadelphia.

CHICAGO

In Illinois, jurisdiction over the creation and display of safety and PSA messages lies at the state and local levels. Typically, safety messages and PSAs will originate at the state level, while travel times, incident notifications, and construction notices will be generated at the local level.

The Illinois Department of Transportation's (DOT's) Division of Traffic Safety, the State Secretary of Transportation, and the State Police all contribute to generating safety messages for display on DMS. The Secretary has insisted that the DMS show a count of highway-related deaths at all times, in addition to any travel times, incident notifications, construction notices, safety messages, and PSAs. The State Police and Division of Traffic Safety collaborate to create a list of safety messages and PSAs for display, usually corresponding to events of local or national significance. These messages are reviewed for conformance to the Manual on Uniform Traffic Control Devices (MUTCD).

Over time, the usage of DMS has grown from solely displaying travel times to posting safety messages around holidays or other events associated with high traffic volumes, to now showing PSA and safety messages, travel times, and a count of highway-related deaths. This three-phase message set is displayed continuously.

Moreover, the messages are displayed on all DMS in the Chicago area. There is no targeted demographic group; rather, the safety and PSA messages are aimed at the general traveling public.

During an interview with an Illinois DOT representative, it was not specified how the capital, operation, and maintenance costs of Chicago's DMS are funded. Presumably, these costs are covered through a combination of state and local funding.

HOUSTON

In general, safety messages are developed at the state level and then provided to regional TMCs for local dissemination at their discretion, based on traffic and other conditions. The development of the messages is based on Federal Highway Administration (FHWA) and state guidelines, and in part on national safety campaigns, while the localities have some feedback and input on which messages should be displayed.

Specific standards and guidance on DMS usage in the state of Texas can be found in Chapter 2I of the Texas MUTCD, 2011 version. Topics include applications, legibility and visibility, design characteristics, message length and units of information, and installation of permanent DMS. In general, the messages must be clear, concise, and easily understood by the public.

Furthermore, the Texas Department of Transportation (TxDOT) primarily uses DMS for managing travel, controlling and diverting traffic, and identifying current and anticipated roadway conditions. Changes in roadway conditions include those due to traffic incidents, weather, and construction. Normally, TxDOT does not display messages that are basic traffic laws or could be considered "rules of the road."

Travel times, construction notifications, emergency messages, and incident alerts have higher display priority than safety messages. During rush hours, only travel times are displayed, except for about 30 DMS on non-peak flow lanes that display safety messages. Outside of these times, and barring any incidents or construction, safety messages and PSAs are displayed continuously on all DMS in the Houston area. Usually, DMS are located sufficiently upstream of known bottlenecks, high crash locations, and major diversion decision points.

Also, non-incident, traffic safety messages are displayed on a limited basis and must be associated with a specific targeted safety campaign. Non-traffic-related safety messages such as "Click it or ticket" and "Don't drink and drive" are displayed in conjunction with a media campaign. TxDOT has developed media tools for its traffic safety messages for use in television, radio, print ads, or news releases. These can also be part of national safety initiatives with support from the USDOT such as "Click it or ticket," work zone awareness, and "No phone zone." Through discussions with TxDOT, it was not clear how the construction, operation, and maintenance of DMS are funded, nor if the messages are targeted toward certain demographics.

ORLANDO

The display of safety messages is largely controlled at the state level, with some coordination with national safety campaigns. All messages displayed are for traffic information dissemination purposes. Due to a large number of requests, the state has developed guidance on safety and PSA message display.

The default display on DMS is travel times, but this can be preempted by other messages conveying information on emergency events, traffic incidents, law enforcement alerts, or special events. In the absence of accurate or useful travel time information, and when not preempted by other messages, the DMS will display a safety message or PSA.

As a compromise, safety messages are now shown in a limited fashion—presuming they have a positive effect on highway safety and congestion and the message is supplemental to a national or statewide highway safety media campaign. The total duration of any such campaign is limited to 2 hours per day during off-peak hours for a maximum duration of 2 weeks. Only six such events are allowed per year. The safety messages are posted to a select group of DMS deemed

acceptable by the Florida Department of Transportation (FDOT). There are 18 DMS throughout the Orlando area, and local discretion is allowed for determining when to run the messages outside of peak hours.

Funding for construction, operation, and maintenance of the DMS in Florida is provided by the state, with no federal contributions.

PHILADELPHIA

Control of the development and broadcast of safety messages occurs at the federal, state, and local levels in Pennsylvania. The state has issued formal guidance on this topic, *Dynamic Message Sign Operating Standards*, published in December 2013. The stated intent of the document is "to create uniformity in DMS messaging across Pennsylvania, yet provide flexibility for local needs." Districts are encouraged to adopt these standards into their TMC's standard operating procedures and develop pre-planned DMS response plans based on recurring events.

Numerous sources were used by the Pennsylvania Department of Transportation (PennDOT) to develop the standards, including the national MUTCD, other state DMS guidelines, FHWA reports and directives, user comments, and the TMC PFS *Changeable Message Sign Operation and Messaging Handbook*.

PennDOT's engineering district offices have the ultimate responsibility for the operation and dissemination of messages via DMS on roadways within their jurisdictions.

The state recommends prioritizing messages in the following order:

1. Full road closure.
2. Roadway restriction.
3. Emergency destination guidance.
4. AMBER alerts.
5. Congestion.
6. Weather/road conditions.
7. Automated intelligent transportation system (ITS) messages.
8. Special events.
9. Future/planned events.
10. Scheduled safety messages.
11. Travel plaza messages.
12. Sign testing.

Travel times may be displayed in a two-panel fashion with any of the other types of message priorities listed.

Furthermore, particular guidance is provided for scheduled safety messages. The display of such messages may only be for a limited basis, is prohibited during peak traffic times (weekdays from 6am to 9am and 3pm to 6pm), and can only be on DMS under the direct operation of district TMCs. All safety messages must be posted in accordance with the Scheduled Safety Message Calendar developed by PennDOT Central Office. Unless a DMS is being used to display a higher priority message, safety messages must be displayed on at least 50 percent of DMS. If the need arises, a District Traffic Engineer (DTE) can request an exemption to run a customized Local Safety Message in conjunction with the safety message calendar.

Approved safety messages and a schedule for display are generated and distributed to the district TMCs each January. The four categories of safety messages include:

1. Messages for a statewide safety campaign.
2. Messages particular to a locality or region, which require DTE and Central Office approval.
3. Messages in support of a new or existing traffic law, which must be vetted by the State Press Office.
4. Messages on weather-related traffic laws.

Also, the display of general PSAs is prohibited on DMS, along with messages related to advertising, routine congestion, contact information, and chronological information.

Moreover, the interview with DOT staff in Philadelphia revealed that scheduled safety messages are displayed continuously at strategic locations during safety messaging operations campaign periods. Such locations may be after entry points with high traffic volumes.

Funding and targeted demographics were not discussed during the interview with the PennDOT staff.

CHAPTER 3. SURVEY DESIGN AND EXECUTION PLAN

To successfully administer the surveys in all four locations and produce reliable and credible results, the project team developed a detailed survey design and execution plan that highlights the process for:

- Identifying key safety and PSA messages for further evaluation.
- Developing a clear, succinct, and customized survey questionnaire for each of the four urban areas.
- Identifying the target population.
- Calculating the sample size.
- Collecting and analyzing the data.

The remainder of this chapter further describes the survey design and execution plan in the four selected locations, as well as the pilot study.

SURVEY DESIGN

This section describes the approach to identifying key safety and PSA priority messages in each of the four test locations, the survey format, and the survey content.

Priority Messages

The project team researched and identified the type and content of safety and PSA messages that have been posted on DMS in the study areas (Chicago, Houston, Orlando, and Philadelphia). The team coordinated with the four state transportation agencies to gain information on the agencies' policies, guidelines, and rules for displaying these safety and PSA messages on DMS. The team compiled:

- A comprehensive list of safety and PSA messages that have been used by each state traffic management center, with an additional column indicating the frequency of use over the past year.
- A recommended list of messages to use in the survey and the justification for the proposed messages. Based on input from stakeholders, proposed messages were suggested for further evaluation and inclusion in the survey. In addition, message consistency across the four regions was considered to provide a solid framework for comparison on the national scale.

Chicago

Table 1 shows the final list of recommended priority messages for Chicago, based on conversations with the Illinois DOT.

Table 1. Recommended messages for Chicago, IL.

Priority Messages for Chicago, IL
Click It or Ticket
Don't Drink and Drive
Move Over, Slow Down for Emergency Vehicles
Slow Down and Obey the Posted Speed Limit
Don't Be a Distracted Driver
XXX Deaths This Year
Seat Belts Save Lives, Buckle Up
Don't Text and Drive
Slow Down in Work Zones, Give 'em a Brake
Start Seeing Motorcycles
Construction Season Is Approaching – Give 'em a Brake

Houston

Priority messages for Houston were generated through interviews with TxDOT staff and the local Houston DOT/Transtar office. Table 2 presents the final list of recommended priority messages for Houston.

Table 2. Recommended messages for Houston, TX.

Priority Messages for Houston, TX
Click It or Ticket
Drive Safely, at or under the Speed Limit
Move Over or Slow Down, It's the Law
Watch for Motorcycles, Drive Safely
Drive Safely, Text Later, It Can Wait
XXX Deaths This Year on Texas Road
Drive Safely, Arrive Alive
Use Caution in Work Zones
If Water on Road, Turn Around, Don't Drown
Drink, Drive, Go to Jail

Orlando

Table 3 presents the final list of recommended priority messages for Orlando. The messages were identified based on communications with FDOT staff.

Table 3. Recommended messages for Orlando, FL.

Priority Messages for Orlando, FL
Click It or Ticket
Prevent a Tragedy, Don't Drink and Drive
Move Over for Emergency Vehicle, It's the Law
Keep Safe Distance, Stay Safe
Drive Safely, Look Twice for Motorcycles
Don't Barrel Through Work Zones
Slow Down, Save a Life
Don't Be a Distracted Driver
Report Impaired Drivers, Dial *347

Philadelphia

Based on discussions with PennDOT staff in Philadelphia, a list of priority messages for Philadelphia was identified. Table 4 presents the final list of recommended priority messages for Philadelphia.

Table 4. Recommended messages for Philadelphia, PA.

Priority Messages for Philadelphia, PA
Click It or Ticket
Steer Clear of Emergency Responders, It's the Law
Stay Right, Pass Left, It's the Law
Slow Down, Save a Life
Eyes on Road, Hands on Wheel
Drive Sober or Get Pulled Over
Watch for Motorcycles, Drive Safely
Avoid Aggressive Driving
Stay Safe, Don't Drive Impaired

Survey Format

The surveys included demographic information (e.g., age, gender, income) as well as questions on behavior, acceptance, and comprehension. Paper and online surveys were used for enhanced outreach:

- The four-page, tri-fold paper-based survey had an imprinted postage-paid address so it could be easily returned by mail. This ensured that the survey could be completed and returned easily and quickly. In addition, the paper-based survey included a link to a web-based survey for those participants wishing to complete the questionnaire online.
- The web-based survey had questions that were identical to the paper-based survey and accessible through any Internet connection. Respondents were given an opportunity to preview, go backwards, and change answers. Once completed and submitted, respondents received a confirmation.

Both surveys allowed respondents to skip questions that they did not feel comfortable answering.

Survey Questionnaire/Content

The survey design was based on the priority safety and PSA messages that were identified based on suggestions from state agencies in each of the four studied urban areas and that were reviewed by the PFS members. The surveys attempted to accurately depict the weaknesses and strengths of the system and any areas of improvement by gathering input from system users that have been exposed to those safety and PSA messages on DMS.

The survey questions were clear, succinct, simple to answer, and able to be completed in 15 minutes or less. Appendix A: Survey Questionnaires provides a complete set of the administered survey questionnaires.

To achieve a 95-percent confidence level, 500 surveys needed to be returned per site. In total, 2,088 responses were received.

SURVEY EXECUTION

This section describes the approach for administering the survey in all four sites. This includes the recruitment of potential respondents and locations for face-to-face delivery of the surveys.

Subject Recruitment

For the purposes of this study, the project team targeted drivers who may have encountered DMS with safety and PSA messages. Drivers included local residents and out-of-town travelers. The following survey administration techniques were considered:

1. Utilization of vehicle registration/licensing information.
2. In-person delivery of survey questionnaire.
3. Posting the surveys online.

Despite the anticipated effectiveness of Technique 1: *Utilization of Vehicle Registration/Licensing Information*, it raises privacy and technical concerns for some agencies (such as the Florida, Illinois, and Pennsylvania DOTs). Therefore, a combination of Techniques 2 and 3 was used to obtain the largest sample size in the most cost-effective and timely manner. Appendix B: Sample Size Calculation provides details on the sample size calculation.

Survey Locations for In-Person Interviews

The team selected 18 potential survey locations across the four selected cities (Philadelphia, Houston, Orlando, and Chicago) for distribution of the surveys.

Appendix C: Potential Survey Locations by City provides a list of these potential locations.

Prior to selecting the potential survey locations, the team conducted research to locate all DMS locations for each city. In most cases, these DMS locations are available online via local or state DOT websites. In cases where DMS locations were not available online, the project team reached out to the state DOT for a list of these locations. The lists were then used to map all of the DMS locations across the four cities.

In most cases, DMS are located along freeway and arterial routes in all four cities. Using the DMS map that was created, the team began to look for suitable locations to conduct the survey. Survey locations were selected based on type of facility. Emphasis was placed on finding facilities that would contain a high rate of commuter traffic that would have potentially passed a DMS sign en route to the location. For this reason, facilities such as park-n-ride lots, transit stations, rest stops, gas stations, and shopping centers were considered ideal locations due to their expected rate of commuter traffic and high turnover, which is thought to provide a larger audience for survey distribution. Facilities were then narrowed down based on their proximity to a DMS. Only those facilities that had at least one DMS within a 2-mile radius of the site were considered for a potential survey location.

Once suitable facilities were found, the team then catalogued the facilities based on the number of parking spaces, where applicable, and the average daily traffic (ADT) of the freeway/arterial closest to the facility in an effort to illustrate the potential audience capture for the survey at each location.

PILOT STUDY

The project team conducted a live, face-to-face pilot in Philadelphia and developed web-based surveys for Chicago, Houston, and Orlando to test the survey instrument in advance of the final survey implementation. The purpose of the pilot testing was to validate the survey and ensure that the sampled population would understand the wording, order of questions, and template. The pilot study included administering the survey to a small sample, coding the data, and performing descriptive analyses of the data. Some preliminary statistics were needed to examine the variability across several of the key dependent variables, as the initial goal of the pilot survey was to assess statistical proportions and variations since they can vary greatly depending on the specific behavior (or driver/travel characteristic) being considered (e.g., proportion that will change seat belt usage, change route, or slow down).

Live In-Person Survey

The live pilot survey was conducted in the Philadelphia area on Thursday, March 7, 2013, from 2:00 pm to 4:00 pm at the I-95 Pennsylvania Welcome Center.

The I-95 Pennsylvania Welcome Center was selected due to its known proximity to a DMS location, with the closest DMS approximately 0.5 mile south of the Welcome Center on I-95

Northbound, as shown in **Error! Reference source not found.**. The Welcome Center is a limited-access facility, with the only access to the site from I-95 Northbound where the DMS was located. This guaranteed that all traffic arriving at the Welcome Center had passed the DMS immediately before arriving. The team selected a 2-hour afternoon slot in an effort to capture travelers prior to the evening rush hour, when traffic flow may impede access to the Welcome Center and thereby potentially decrease the survey audience.

The project team coordinated with the Welcome Center staff in this city to set up a table inside the Welcome Center for the survey. This table was staffed near the entrance to the building, where travelers were approached to fill out the survey as they entered. Twenty-five surveys were completed during the pilot survey time period.

Figure 1. Photo. Pilot survey location.

Survey Results

The survey was given to 25 participants, with an age range from 23 to 84 years old, and a mean age of 47 years old (S.D. = 18.45 years). Thirty-two percent of the participants shared a household with one or more persons. Only 2 out of the 25 participants have children under the age of 6. Forty-four percent of the participants own their own a home. Twenty-four percent of the participants have high school as their highest education; 28 percent of the participants have graduate or post-graduate degrees (Table 5). The median household income is between $25,000 and $50,000 per year (Table 6).

Table 5. Educational level of study participants.

Highest Level of Education	%
Some Schooling	8
High School	24
Associate Degree	8
Undergraduate	8
Graduate	12
Postgraduate	16

Table 6. Household income in $/year of study participants.

Household Income	%
Less than $25,000	12
$25,001 to $50,000	32
$50,001 to $75,000	12
$75,001 to $100,000	8
$100,001 to $125,000	8
Greater than $125,000	3

The survey showed that some messages on the highway are more recognized than others. Sixty percent or more of the participants recognized the followings PSAs: “Buckle up, seat belts save lives,” “Click it or ticket,” “Live free, ride alive,” and “Steer clear of emergency responders, it’s the law.” Other messages did not get as much attention and were recognized within a range of 20 to 40 percent. Further answers to questions indicated that, in general, most survey participants have encountered DMS on the highway in the past (**Error! Reference source not found.**). Only 4 out of 25 participants stated that they have rarely or never seen one.

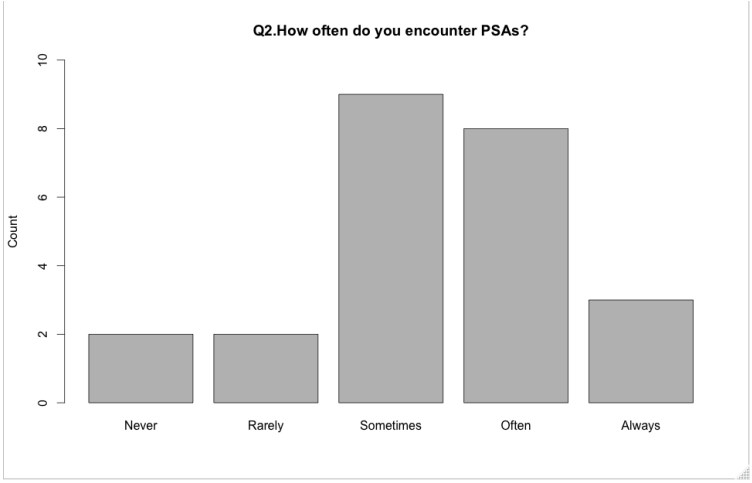


Figure 2. Chart. Recognition of PSA messages.

Forty percent of the participants strongly agree that there is a high level of police enforcement in all categories including seat belt use, speeding in a work zone/construction area, speeding over the posted speed limit, DUI, texting or using a mobile device while driving, tailgating (or following too close to another vehicle), and using the left lane for regular driving (not passing). No participant disagrees or strongly disagrees with that statement (Table 7).

Table 7. Level of enforcement.

Activity	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Seat belt use	16	6	0	0	0
Speeding in a work zone/construction area	10	11	0	0	0
Speeding over the posted speed limit	12	10	0	0	0
DUI	17	5	0	0	0
Texting or using a mobile device while driving	13	9	0	0	0
Tailgating (or following too close to another vehicle)	18	4	0	0	0
Using the left lane for regular driving (not passing)	16	6	0	0	0
Other general reckless behaviors not already described in A to G	16	5	0	0	0

Forty percent of the participants always respond to the dynamic messages they see. The most recognized DUI warning message is "Drive sober or get pulled over," with 12 out of 25 participants always responding to this message (Table 8).

Table 8. Would you change your driving behavior when you see the listed PSAs?

Activity	Never	Rarely	Sometimes	Often	Always
Buckle your seatbelt if it was not buckled …for "Click it or ticket"	1	1	8	2	10
Remember to stay at or below the speed limit …for "Slow down, save a life"	1	3	6	5	6
Put away your mobile phone while driving …for "Don't drive distracted"	1	2	8	3	7
Slow down …for "Steer clear of emergency responders, it's the law"	1	2	4	5	10
Not drink or do drugs …for "Drive sober or get pulled over"	0	2	6	2	12
Be more aware of motorcycles …for "Watch for motorcycles, drive	0	1	7	5	9

Activity	Never	Rarely	Sometimes	Often	Always
safely"					

Only 8 percent of the participants strongly disagree to change their driving patterns or habits based on the listed PSA messages. On the other hand, the majority of the participants responded that they would "agree" or "strongly agree" to change their driving behavior. Most participants agreed with the message "Click it or ticket" (48 percent) and would change their driving patterns based on that message (Table 9).

Table 9. Whether to change driving patterns or habits based on the following PSAs.

Message	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Click it or ticket	12	5	1	0	2
Steer clear of emergency responders, it's the law	10	7	1	0	2
Stay right, pass left, it's the law	9	8	1	0	2
Slow down, save a life	9	7	1	0	2
Eyes on road, hands on wheel	8	10	1	0	2
Drive sober or get pulled over	9	8	1	0	2
Watch for motorcycles, drive safely	7	11	1	0	1
Stay safe, don't drive impaired	9	8	1	0	2

Seventy-six percent of the participants "strongly agree" or "agree" that PSAs that show a fine will impact their driving behavior. At the same time, 48 percent of the participants "agree" or "strongly agree" that they are uncomfortable reading threatening messages while driving.

Two participants out of 25 have been involved in a collision that was reported to the police in the past 5 years, and four have received one ticket for a moving violation (Figure 3). This proportion helped in verifying that the pilot study captured a realistic and representative sample of the population.

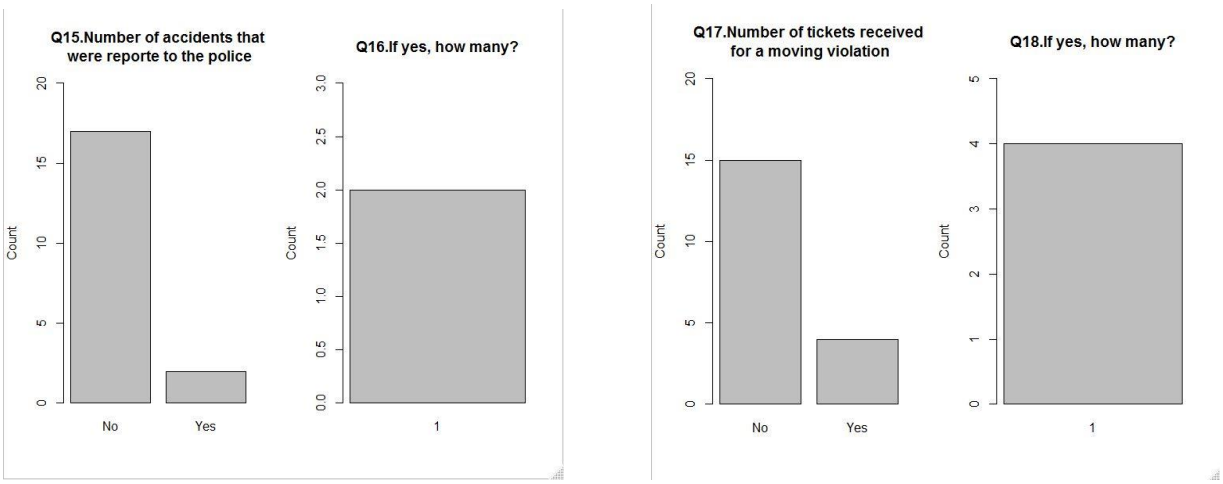


Figure 3. Chart. Number of collisions and number of ticket instances in the past 5 years.

LESSONS LEARNED FROM THE PILOT SURVEY

The pilot study resulted in several key lessons learned in relation to the survey administration and execution plan:

- The pilot survey was conducted without incentive, and the response rate was 95 percent for all persons approached. However, several comments were made about the survey length—even at a rest stop, many people were not willing to spend 10 minutes to complete the full survey and left some pages or questions blank. An incentive such as printed coupons was worth providing to ensure high participation in the final survey.
- A highway rest stop was found to capture an audience primarily of travelers, not locals. Efforts were made to select multiple locations for the final survey to spread contact over all traveler populations.
- Coordinating with local officials (such as local DOTs, operators of facilities, etc.) prior to conducting surveys is crucial to ensure that all jurisdictions are aware of the team's operations for a successful survey experience. This also helps in marketing the survey—during the pilot survey, the rest stop personnel were helpful in marketing the survey to all groups that came into the parking lot, before they entered the building.
- There was a segment of the pilot survey population that had never seen a DMS, had never seen some of the PSA messages, or did not understand the meaning of several of the messages, and asked the survey administrator for explanations. It is helpful to have additional literature or a web link available to provide more information.

CHAPTER 4. ADJUSTMENTS TO THE SURVEY EXECUTION PLAN

This chapter captures the adjustments to the survey execution plan that were made based on the lessons learned during the pilot study. It provides the final execution plan for the administration of the full surveys in the four target urban areas.

FINAL DATA COLLECTION LOGISTICS

The project team conducted in-person surveys in the four cities chosen for this study (Houston, Philadelphia, Orlando, and Chicago) from September 2013 through November 2013. Potential survey sites were selected for each city prior to travel based on a variety of factors including proximity to DMS locations, high rate of pedestrian and vehicle traffic to target for surveys, FHWA and the PFS recommendations, and success rates of similar types of studies in prior cities. A survey team of three staff members was deployed to each city for 3 days; multiple sites were visited and multiple administration techniques were tested. Based on the sample size calculations conducted prior to survey administration, a goal was set to achieve at least 500 survey responses in each city to meet a 95-percent confidence interval. This section details the evolution of site selection across the four cities.

Houston

Houston was selected as the first city to survey between September 18 and September 21, 2013. Table 10 lists the original survey locations selected for Houston by the project team. These original locations were presented to the FHWA and TMC PFS members for review. The project team revised the potential survey locations (see Table 11) based on the comments received.

Table 12 details the locations ultimately visited by the survey team on the first trip to Houston, including the date and time of each site visit. During the first visit, the survey team focused largely on surveying shopping malls, universities, and public gathering spaces. Surveys were distributed for immediate response as well as for mail-back response via a postage-paid printed survey. At the end of the 3-day study period, the survey team returned with 140 completed surveys.

Houston was visited a second time between November 14 and November 16, 2013, to increase the number of survey responses. Table 13 details the locations visited during the second visit. The second visit resulted in 430 survey responses, bringing the total survey responses to 570 for Houston.

Table 10. Original Houston survey locations.

Location	Address	Type of Facility
Northwest Transit Center	7373 Old Katy Rd.	Park-n-Ride for Houston Metro Bus
Eastex Park-n-Ride	14400 Old Humble Rd.	Park-n-Ride for Houston Metro Bus
Fannin South Park-n-Ride	1604 West Bellfort Rd.	Park-n-Ride for Houston Metro Bus and Metro Rail
Fuqua Park-n-Ride	11755 Sabo Rd.	Park-n-Ride for Houston Metro Bus
Gulfgate Transit Center	7400 South Loop East	Park-n-Ride for Houston Metro Bus

Table 11. Updated Houston survey locations based on state DOT feedback.

Location	Address	Type of Facility
Willowbrook Mall	2000 Willowbrook Mall Rd.	Shopping Mall
The Galleria	5085 Westheimer Rd.	Shopping Mall
University of Houston	4800 Calhoun Rd.	University
Northwest Transit Center	7373 Old Katy Rd.	Park-n-Ride for Houston Metro Bus
Gulfgate Transit Center	7400 South Loop East	Park-n-Ride for Houston Metro Bus

Table 12. Survey locations visited in Houston during first visit.

Location	Address	Type of Facility	Date Visited	Time Visited
University of Houston	4800 Calhoun Rd.	University	09/18/13	11:00am-2:00pm
Hermann Park	6201 Hermann Park Dr.	Outdoor Park/Central Gathering Area	09/18/13	4:00pm-7:00pm
Rice University	6100 Main St.	University	09/19/13	11:00am-2:00pm
The Galleria	5085 Westheimer Rd.	Shopping Mall	09/19/13	3:00pm-7:00pm
South Shore Harbour Conference Center/Hotel	2500 South Shore Blvd.	Hotel / Conference Center	09/20/13	9:00am-11:00am
Willowbrook Mall	2000 Willowbrook Mall Rd.	Shopping Mall	09/20/13	12:00pm-3:00pm
Kemah Boardwalk	215 Kipp Ave.	Shopping/Dining	09/20/13	4:00pm-7:00pm
Houston Hobby Airport	7800 Airport Blvd.	Airport	09/21/13	9:00am-2:00pm

Table 13. Survey locations visited in Houston during second visit.

Location	Address	Type of Facility	Date Visited	Time Visited
Bush Intercontinental Airport (IAH) Cell Phone Waiting Lot 1	JFK Blvd.	Airport Waiting Lot	11/14/13 – 11/15/13	11:00am-5:00pm
IAH Cell Phone Waiting Lot 2	Will Clayton Parkway	Airport Waiting Lot	11/14/13 – 11/15/13	11:00am-5:00pm
Kuykendahl Park-n-Ride	12920 Kuykendahl Rd.	Park-n-Ride for Houston Metro Bus	11/15/13	6:00am-9:00am
Houston Community College Northeast	555 Community College Dr.	Community College	11/16/13	10:00am-2:00pm

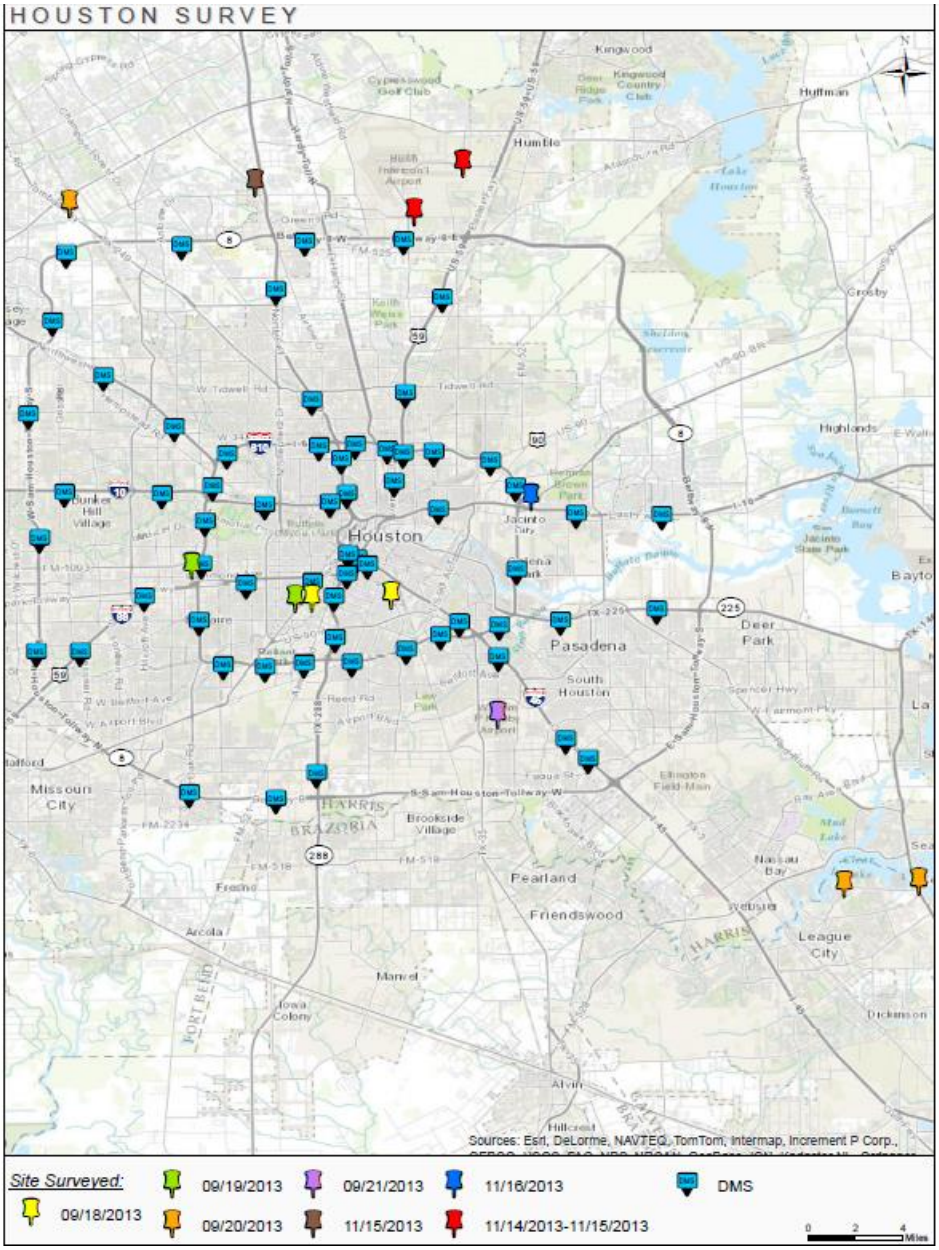


Figure 4. Photo. Houston survey sites.

Philadelphia

Philadelphia was selected as the second city to survey between October 10 and October 12, 2013. Using lessons learned from Houston, the survey team updated selected survey locations to those that would be more successful for gathering immediate responses from participants. Table

14 through Table 16 detail the progression of site selection for Philadelphia. At the end of the 3-day study period, the survey team returned with 504 completed surveys.

Table 14. Original Philadelphia survey locations.

Location	Address	Type of Facility
I-95 PA Welcome Center	½ mile from PA/DE Border on I-95	Highway Rest Stop
30th St Station	93 N. 30th St. and Market St.	Parking Lot for Multiple Regional Rail Lines, Amtrak, NJ Transit Bus Routes
Penn's Landing Parking Lot	Intersection of Columbus Blvd at South St.	Parking Lot for SEPTA Bus Routes
Wissahocken SEPTA Station	5099 Ridge Avenue and Osborn St.	Parking Lot for SEPTA Station

Table 15. Updated Philadelphia survey locations based on state DOT feedback.

Location	Address	Type of Facility
I-95 PA Welcome Center	½ mile from PA/DE Border on I-95	Highway Rest Stop
30th St Station	93 N. 30th St. and Market St.	Parking Lot for Multiple Regional Rail Lines, Amtrak, NJ Transit Bus Routes
King of Prussia Mall	160 N. Gulph Rd.	Shopping Mall
Cornwell Heights SEPTA Station	700 Station Ave.	SEPTA Station / Park-n-Ride Lot
Franklin Mills Mall	1455 Franklin Mills Circle	Shopping Mall

Table 16. Survey locations visited in Philadelphia.

Location	Address	Type of Facility	Date Visited	Time Visited
30th St Station	93 N. 30th St. and Market St.	Parking Lot for Multiple Regional Rail Lines, Amtrak, NJ Transit Bus Routes	10/10/13 – 10/11/13	9:00am-11:00am and 2:00pm-5:00pm
Drexel University	3141 Chestnut St.	University	10/10/13	11:00am-2:00pm
University of Pennsylvania	3451 Walnut St.	University	10/11/13	11:00am-2:00pm
Columbus St DMV	1530 S. Columbus Blvd.	Department of Motor Vehicles	10/11/13	9:00am-10:00am
Reading Terminal Market	51 N. 12th St.	Shopping/Dining	10/12/13	11:00am-4:00pm

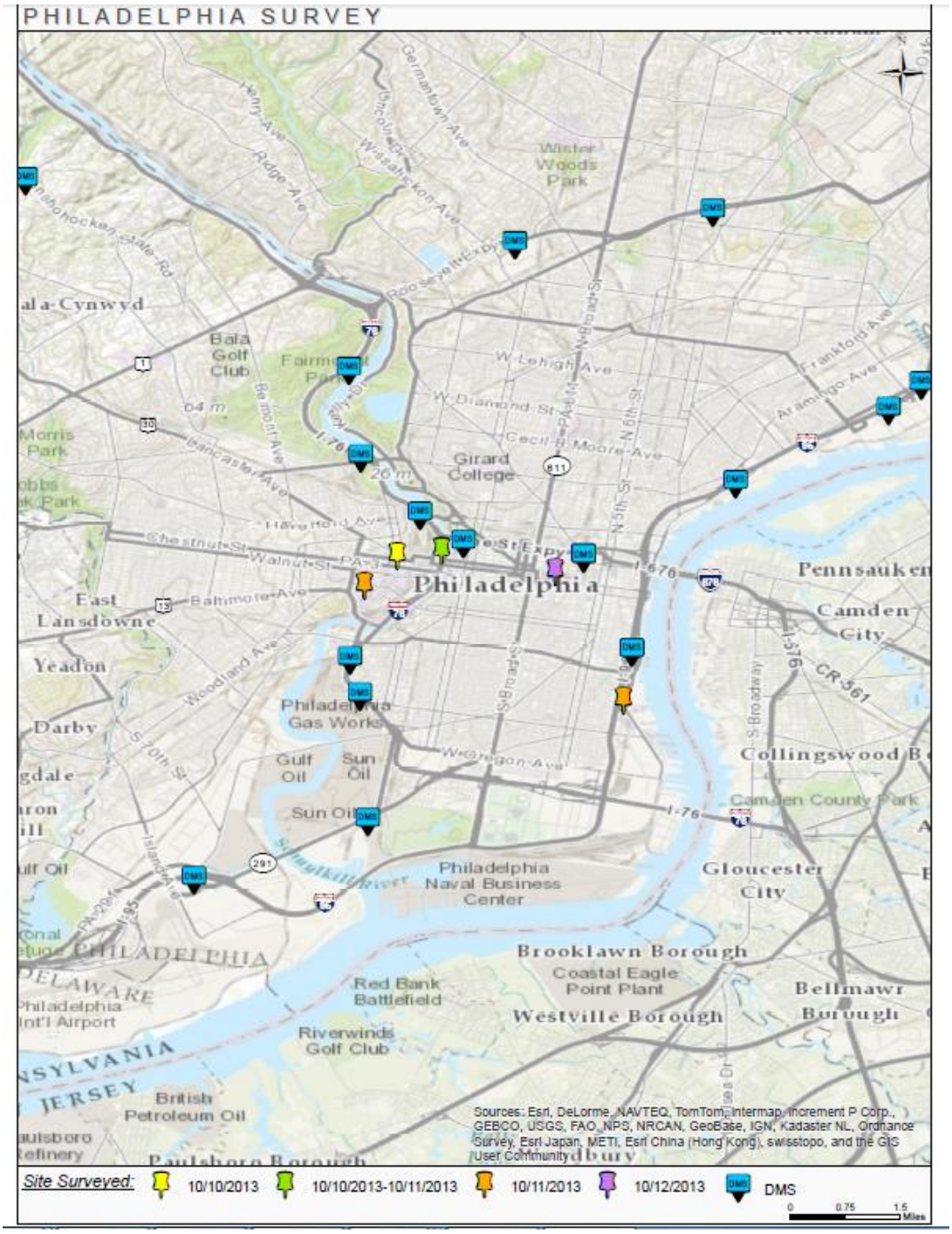


Figure 5. Photo. Philadelphia survey sites.

Orlando

Orlando was selected as the third city to survey between October 17 and October 19, 2013. Table 17 through Table 19 detail the progression of site selection. At the end of the 3-day study period, the survey team returned with 500 completed surveys.

Table 17. Original Orlando survey locations.

Location	Address	Type of Facility
Turkey Lake Service Plaza	Mile Post 263 - Florida Turnpike	Highway Rest Stop
Orange County Convention Center	9400 Universal Blvd.	Convention Center – would focus on intercepting in parking lots
Orlando Amtrak Station	1400 Sligh Blvd.	Train Station
Econlockhatchee Park-n-Ride	9555 East Colonial Dr.	Park-n-Ride Lot

Table 18. Updated Orlando survey locations based on state DOT feedback.

Location	Address	Type of Facility
Turkey Lake Service Plaza	Mile Post 263 - Florida Turnpike	Highway Rest Stop
Orange County Convention Center	9400 Universal Blvd.	Convention Center
Florida Mall	8001 S Orange Blossom Trail	Shopping Mall
The Mall at Millenia	4200 Conroy Rd.	Shopping Mall
University of Central Florida	4000 Central Florida Blvd.	University

Table 19. Survey locations visited in Orlando.

Location	Address	Type of Facility	Date Visited	Time Visited
Turkey Lake Service Plaza	Mile Post 263 - Florida Turnpike	Highway Rest Stop	10/17/13 - 10/18/13	8:00am-11:00am
University of Central Florida	4000 Central Florida Blvd.	University	10/17/13 – 10/18/13	11:00am-2:00pm
Orange County Convention Center	9400 Universal Blvd.	Convention Center	10/18/13	2:00pm-5:00pm
Universal City Walk	6000 Universal Blvd.	Shopping/Dining	10/18/13	6:00pm-9:00pm
Orlando International Airport	1 Jeff Fuqua Blvd.	Airport	10/19/13	9:00am-1:00pm

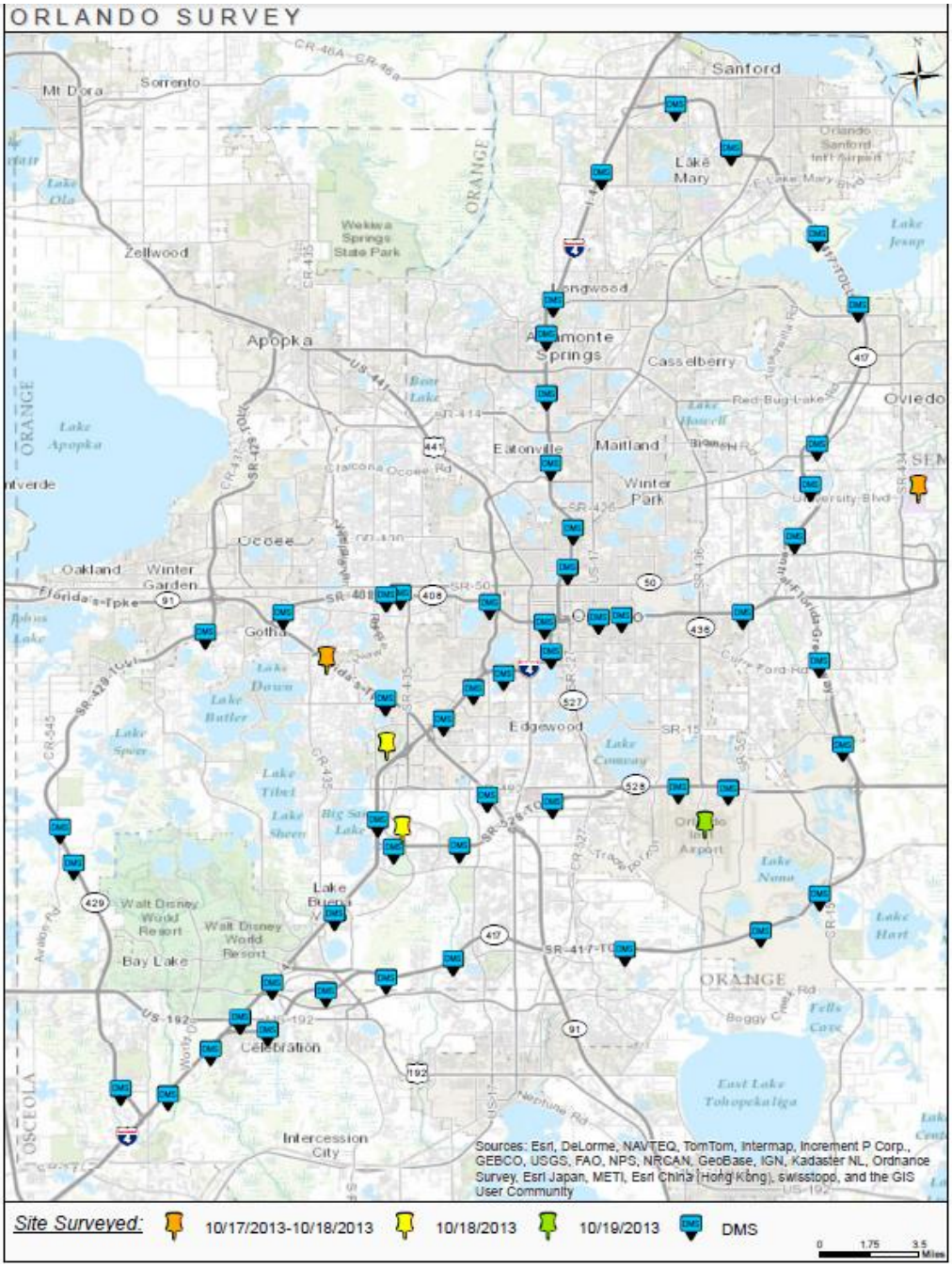


Figure 6. Photo. Orlando survey sites.

Chicago

Chicago was selected as the fourth city to survey between November 6 and November 9, 2013. Table 20 through Table 22 detail the progression of site selection. At the end of the 3-day study period, the survey team returned with 584 completed surveys.

Table 20. Original Chicago survey locations.

Location	Address	Type of Facility
Cumberland Park-n-Ride	5800 N. Cumberland Ave.	Park-n-Ride Lot for "L" Train Blue Line Train and CTA Buses
LaSalle St Station	121 W. Van Buren St.	Parking Lots for Several "L" Train Lines (Brown, Orange, Pink, and Purple Lines)
Garfield Red Line Station	220 W. Garfield Blvd.	Parking Lot for "L" Train Red Line and CTA Buses
Shell / BP Gas Station	Intersection of W. Touhy Ave. and N. Cicero Ave.	Gas Station
Target Shopping Center	Intersection of Harrison St. and S. Manheim Rd.	Shopping Center

Table 21. Updated Chicago survey locations based on state DOT feedback.

Location	Address	Type of Facility
Garfield Red Line Station	220 W. Garfield Blvd.	Parking Lot for "L" Train Red Line and CTA Buses
Shell / BP Gas Station	Intersection of W. Touhy Ave and N. Cicero Ave.	Gas Station
Target Shopping Center	Intersection of Harrison St. and S. Manheim Rd.	Shopping Center
Gurnee Mills Mall	6170 W. Grand Ave.	Shopping Mall
Woodfield Mall	5 Woodfield Mall Rd.	Shopping Mall
Millenium Park	S. Columbus Dr.	Outdoor Park/Central Gathering Area

Table 22. Survey locations visited in Chicago.

Location	Address	Type of Facility	Date Visited	Time Visited
Chicago Union Station	Canal St.	Central Station for Amtrak and Metra	11/06/13 - 11/07/13	8:00am-2:00pm
University of Chicago	5555 S Ellis Ave.	University	11/08/13	11:00am-2:00pm
Chicago Central DMV	100 W. Randolph St.	DMV	11/07/13	2:00pm-5:00pm
Millennium Park	S. Columbus Dr.	Outdoor Park/Central Gathering Area	11/09/13	9:00am-1:00pm
O'Hare International Airport	1000 West O'Hare Ave.	Airport	11/09/13	3:00pm-6:00pm

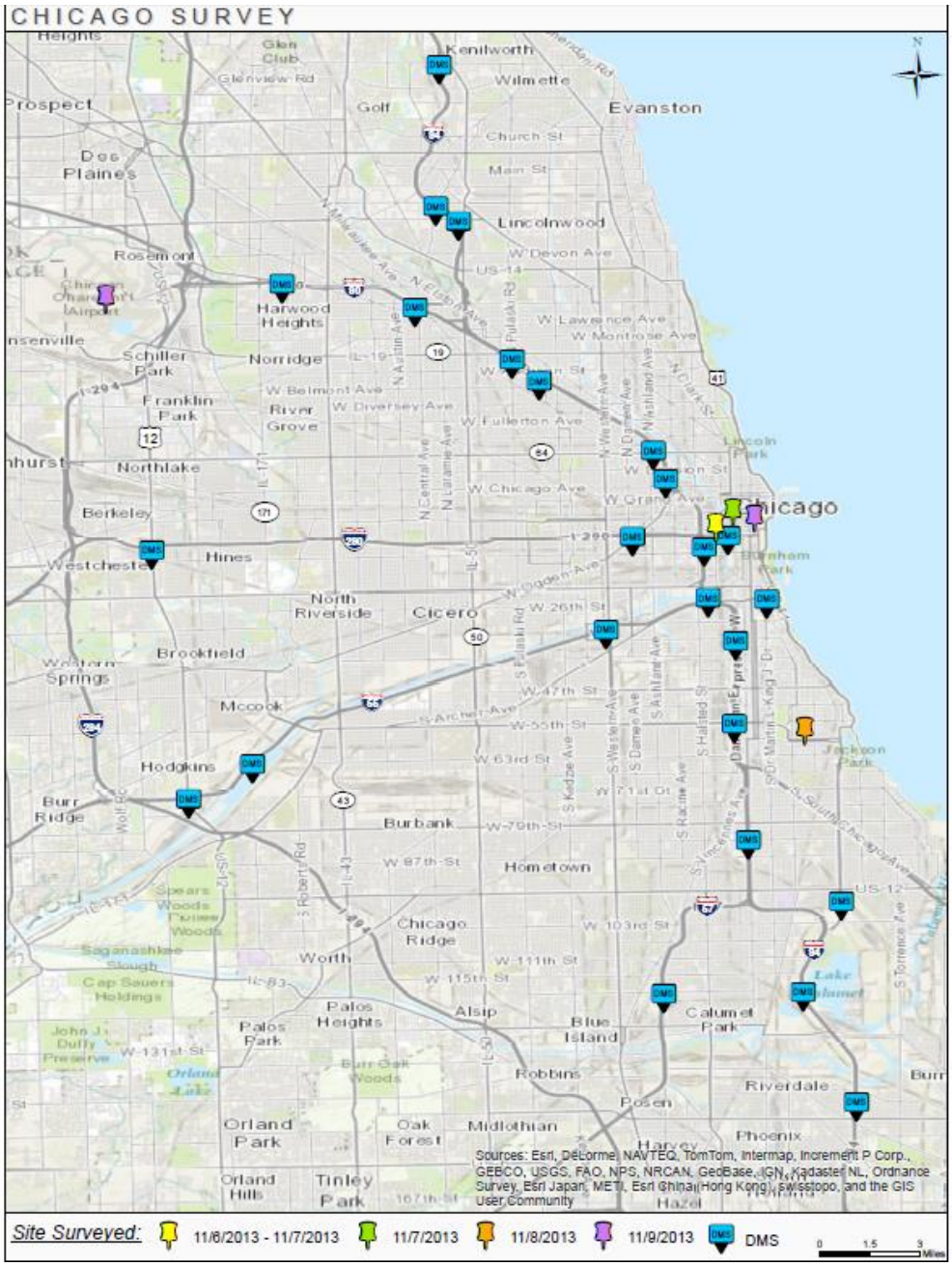


Figure 7. Photo. Chicago survey sites.

CHAPTER 5. RESULTS AND ANALYSIS

DESCRIPTIVE STATISTICS

After incomplete surveys were removed, there were 497 usable surveys from Philadelphia, 500 from Orlando, 584 from Chicago, and 507 from Houston. This chapter includes descriptive statistics in numerical (i.e., means, standard deviations, min, max) and graphical forms (i.e., box plots, histograms, scatter plots) of these surveys. The specific display depends on the response type for the question being analyzed (i.e., continuous, categorical, or ordinal). Table 23 presents a breakdown of the demographics for individual respondents.

Table 23. Demographics by survey city.

	Philadelphia (n=497)	Orlando (n=500)	Chicago (n=584)	Houston (n=507)
Gender				
Female	260	217	274	244
Male	202	223	269	233
Age (years)				
Range	17-85	16-91	16-82	17-85
Mean (SD)	30.18 (15.0)	29.04 (13.01)	36.83 (15.9)	32.18 (15.4)
Marital Status				
Single	274	266	258	216
Significant Other	59	53	59	30
Married	106	83	166	196
Divorced	21	26	48	28
Highest Education				
Some Schooling	9	37	14	33
High School Diploma	160	171	159	187
Associate Degree	47	98	86	76
Undergrad Degree	148	68	151	96
Some Grad School	34	23	44	32
Post Grad Degree	55	16	76	34
English as Primary Language				
Yes	407	258	489	83
No	49	142	43	385

There was roughly an equal number of males and females at each site, as well as a similar distribution in ages across locations. Most of the respondents were primarily English speakers. Table 24 summarizes the self-reported information about the subjects' driving experiences. These results are highly representative of normal driving populations, where most respondents have not

been involved in a collision or received a moving violation within the past 5 years. From the drivers who had been involved in a collision or moving violation, the average was two or less respective instances, observed at each city.

Table 24. Driving experience by survey city.

	Philadelphia (n=497)	Orlando (n=500)	Chicago (n=584)	Houston (n=507)
Collision (within 5 years)				
No	371	361	433	395
Yes	90	64	103	74
If Yes, How Many				
Mean (SD)	1.22 (0.29)	1.66 (0.96)	1.12 (0.36)	1.19 (0.48)
Moving Violation (within 5 years)				
No	367	353	393	379
Yes	92	60	147	96
If Yes, How Many				
Mean (SD)	1.64 (1.54)	1.61 (0.93)	1.71 (1.35)	2.06 (1.78)

Table 25 provides information on household demographics. The majority of participants lived within the greater area of the respective survey's city. Each city had a similar range and mean in household size. The distribution of household incomes across all cities was also very similar. Drivers who own and rent their living space are each well represented in all cities.

Table 25. Socioeconomic characteristics of the survey respondents.

	Philadelphia (n=497)	Orlando (n=500)	Chicago (n=584)	Houston (n=507)
Live within Greater Area				
Yes	308	248	317	356
No	153	159	218	113
People in House				
Range	1-20	1-20	1-20	1-26
Mean (SD)	3.3 (2.18)	3.2 (1.69)	3.2 (1.88)	3.5 (2.17)
Children under 6 in Household				
Count	39	108	91	101
Range (if yes)	1-6	1-5	1-4	1-15
Current Living Space				
Rent	220	211	203	152
Own	136	100	220	215
Neither	101	106	109	106
Household Income				
< 25k	109	149	101	82
25k - 50k	85	125	124	112
50k - 75k	83	82	117	88
75k - 100k	73	37	58	57
100k - 125k	27	15	51	28
> 125k	55	10	50	59

Interpretations of PSAs

Each city was asked to interpret three potential PSAs that were relevant to their city with some overlapping questions for comparison. Not all messages were used in all four cities; however, for consistency, exactly three interpretation questions were asked in each city (Q4, Q5, and Q6). For Philadelphia, Orlando, and Chicago, the respondents were asked for their interpretation of the PSA: "Ride safely, sober, live free, ride alive." This information was not solicited for Houston, because there was no similar PSA message on DMS in the city at the time the survey was administered (the questions used in the survey were discussed and approved at an earlier stakeholders meeting). With respect to the PSA, "Ride safely, sober, live free, ride alive," there was a generally shared interpretation across the three cities sampled that this message meant, "Don't drink and drive," as shown in Figure 8 (a) (b) and (c).

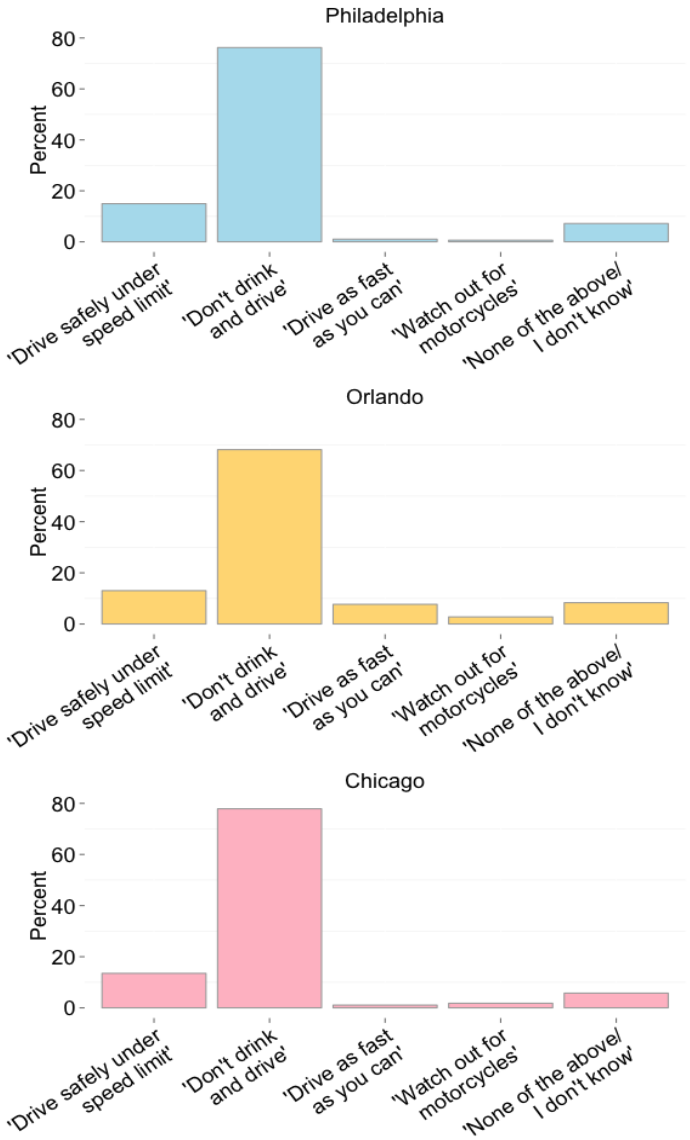


Figure 8 (a) (b) (c). Chart. PSA "ride safely, sober, live free, ride alive."

These same three cities were also surveyed on their interpretation of the PSA: "Eyes on road, hands on wheel." A comparison of these results is provided in Figure 9 (a) (b) and (c). There was a split in the understanding of this PSA message between "Stay alert" and "Don't drive distracted," observed in all three cities.

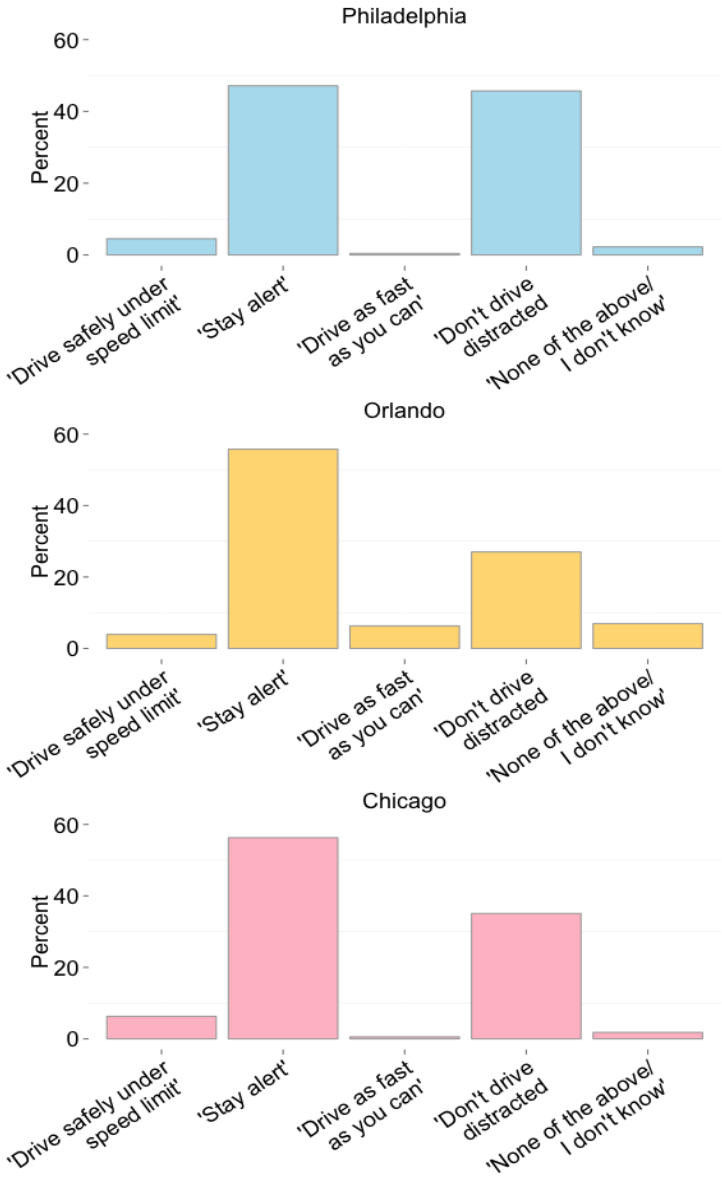
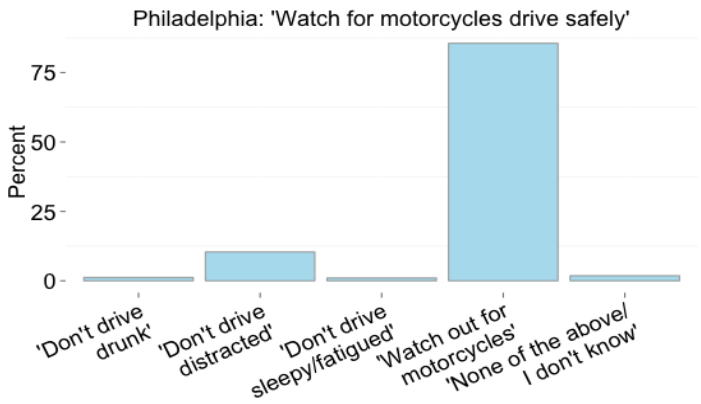
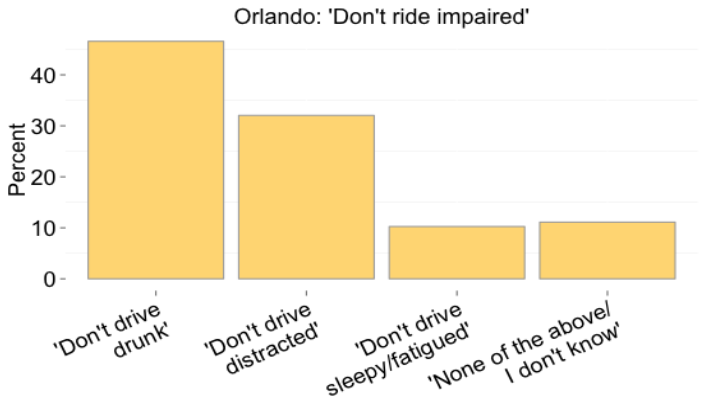
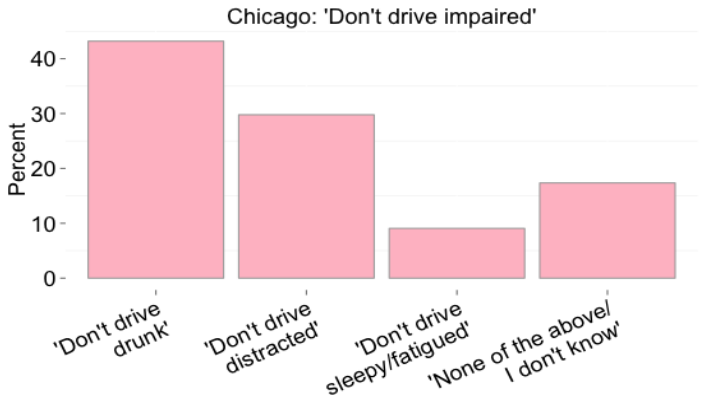


Figure 9 (a) (b) (c). Chart. PSA "eyes on road, hands on wheel."

All four cities were surveyed on an individual PSA commonly viewed in their area, which was also comparable across all cities. The overall message for this PSA was safety, with variations in focus highlighting motorcycle and impairment awareness. For Philadelphia and Houston, the term "motorcycle safety" was included; in Houston, Chicago, and Orlando, the term "impairment" was used; and in Orlando and Houston, "ride" was included to allude to motorcycle drivers. Figure 10 (a) (b) (c) and (d) illustrate the comparison of interpretations based on these word choices.


Philadelphia: 'Watch for motorcycles drive safely'
Percent
75
50
25
0
'Don't drive drunk'
'Don't drive distracted'
'Don't drive sleepy/fatigued'
'Watch out for motorcycles'
'None of the above/ I don't know'


Orlando: 'Don't ride impaired'
Percent
40
30
20
10
0
'Don't drive drunk'
'Don't drive distracted'
'Don't drive sleepy/fatigued'
'None of the above/ I don't know'


Chicago: 'Don't drive impaired'
Percent
40
30
20
10
0
'Don't drive drunk'
'Don't drive distracted'
'Don't drive sleepy/fatigued'
'None of the above/ I don't know'

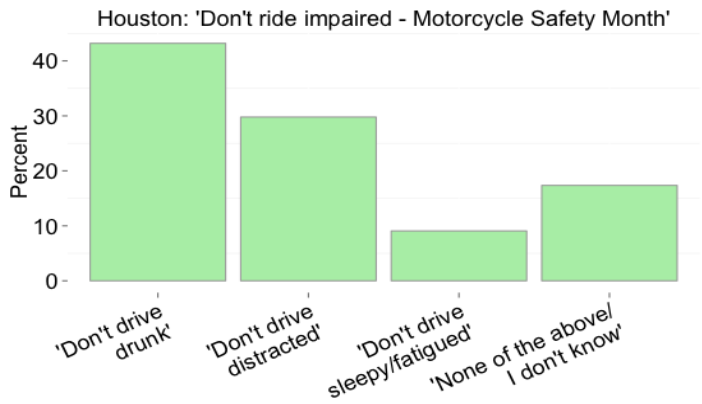
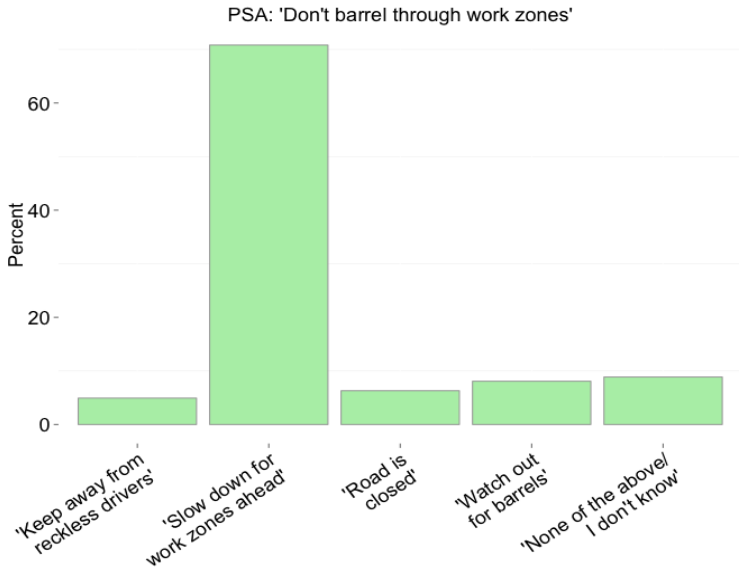


Figure 10 (a) (b) (c) (d). Chart. Comparable PSA messages by city.

Houston was also surveyed on two additional PSA messages: "Don't barrel through work zones" and "Avoid aggressive driving." The interpretations of these messages can be viewed in Figure 11 (a) and (b). For the most part, participants agreed on the meanings of these messages.



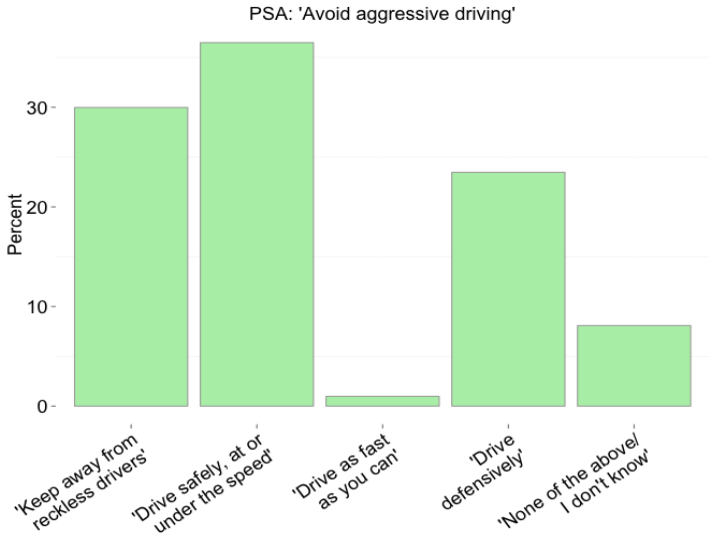
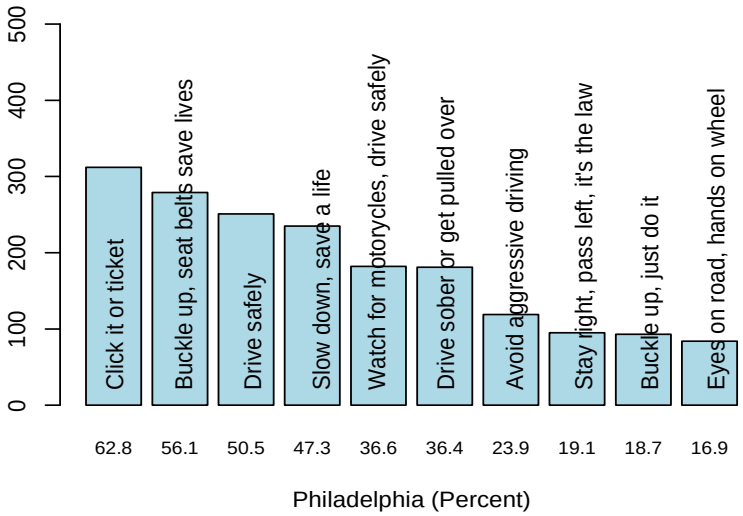
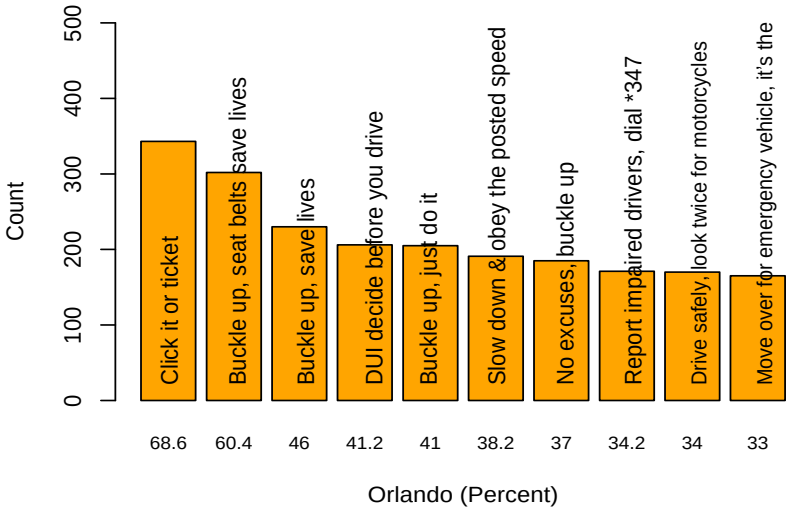
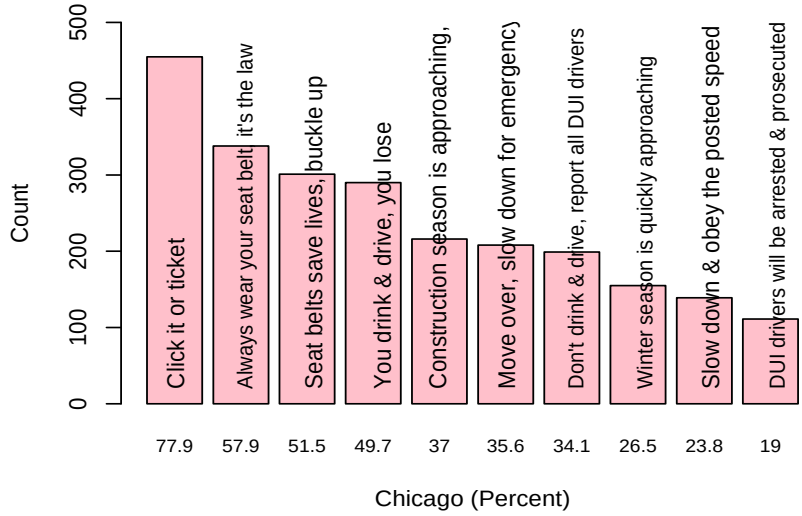


Figure 11 (a) (b). Chart. Additional PSA messages in Houston.

Each city was also given a list of approximately 15 of the most commonly posted PSA messages for their area, and participants were asked to select all messages that they recognized. Figure 12 (a) (b) (c) and (d) show the top 10 most recognized PSAs for each city. Seatbelt campaigns were most widely recognized across all four areas.




Count
0
100
200
300
400
500
Click it or ticket
Buckle up, seat belts save lives
Buckle up, save lives
DUI decide before you drive
Buckle up, just do it
Slow down & obey the posted speed
No excuses, buckle up
Report impaired drivers, dial *347
Drive safely, look twice for motorcycles
Move over for emergency vehicle, it's the
68.6
60.4
46
41.2
41
38.2
37
34.2
34
33
Orlando (Percent)


Count
0
100
200
300
400
500
Click it or ticket
Always wear your seat belt it's the law
Seat belts save lives, buckle up
You drink & drive, you lose
Construction season is approaching,
Move over, slow down for emergenc)
Don't drink & drive, report all DUI drivers
Winter season is quickly approaching
Slow down & obey the posted speed
DUI drivers will be arrested & prosecuted
77.9
57.9
51.5
49.7
37
35.6
34.1
26.5
23.8
19
Chicago (Percent)

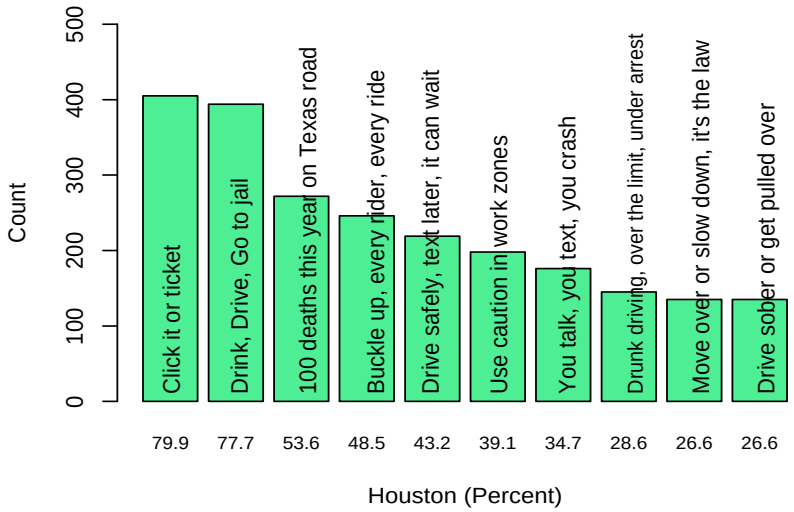


Figure 12 (a) (b) (c) (d). Chart. Top 10 most recognized PSAs by city.

A possible correlation between these top 10 most recognized messages by respondents and the actual count/duration of message displays in each urban area was examined. However, limited data was available from each jurisdiction, and a robust correlation could not be identified.

Data was obtained from the TxDOT for these top 10 messages in Houston for the 3 months leading up to the study and the study month itself. “Drink, drive, go to jail” was displayed 167 times in each of the 3 months prior to the survey. “XX deaths this year on Texas roads” was displayed 165 times in each of the 4 months. “Buckle up, every rider, every ride” was displayed 165 times in the month of collection. “Move over or slow down, it’s the law” was displayed 167 times in one of the three preceding months and “Drive sober or get pulled over” twice in two of the preceding months.

Chicago reported displaying death count messages 24/7, alternated with one PSA message. The alternative messages were: “Cell phone use while driving must be hands free,” “Don’t drink and drive,” “Don’t text and drive,” “Save a life, buckle up,” and “Stay off the phone in work zones.”

Philadelphia did not display any of the top 10 recognized messages in the 4 months of interest. However, this is based on exact wording, and it is unclear whether a similar variation of a message was displayed. Data on the Orlando PSA display schedule for the time of this study was unable to be linked with any significance.

All four cities were asked general questions about their experiences and opinions regarding posting PSAs on DMS. Table 26 provides a summary of responses on frequency, usefulness, and effectiveness of these messages.

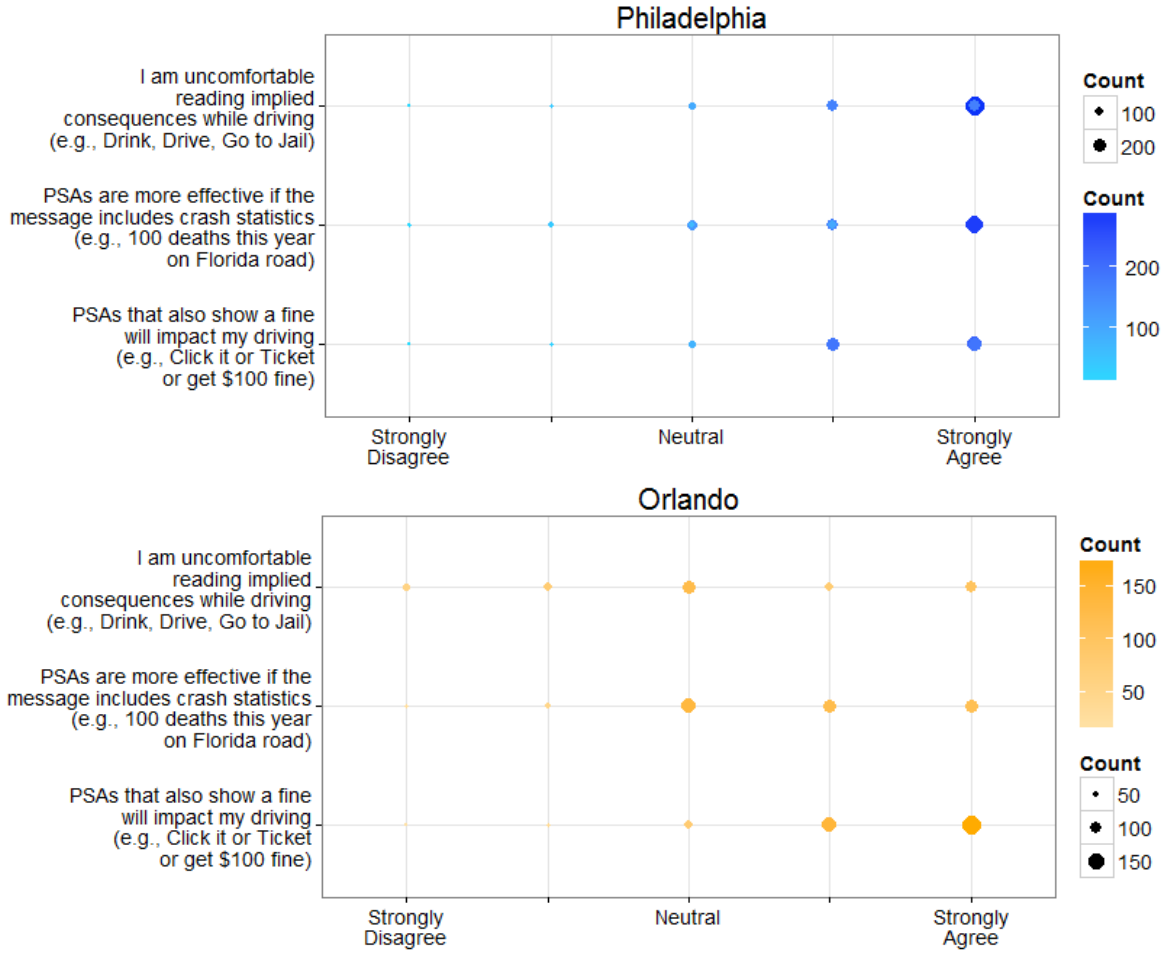
Table 26. General opinions of PSAs on DMS.

	Philadelphia (n=497)	Orlando (n=500)	Chicago (n=584)	Houston (n=507)
"How often do you see PSAs on dynamic message signs while driving?"				
Never	12 (2.4%)	14 (2.8%)	15 (2.9%)	8 (1.6%)
Rarely	70 (14.0%)	53 (10.7%)	2 (0.4%)	43 (8.5%)
Sometimes	224 (44.7%)	108 (21.7%)	248 (47.1%)	125 (24.8%)
Often	159 (31.7%)	120 (24.1%)	186 (35.4%)	186 (36.8%)
Always	36 (7.2%)	202 (40.6%)	75 (14.3%)	143 (28.3%)
"How useful is it to have PSAs on dynamic message signs for drivers?"				
Never	23 (4.6%)	9 (1.8%)	12 (2.1%)	5 (1.0%)
Rarely	93 (18.6%)	46 (9.3%)	94 (16.2%)	63 (12.5%)
Sometimes	117 (23.4%)	111 (22.3%)	113 (19.5%)	104 (20.6%)
Often	173 (34.5%)	171 (34.4%)	173 (29.9%)	155 (30.8%)
Always	95 (19.0%)	160 (32.2%)	187 (32.3%)	177 (35.1%)
"Do you think PSAs on DMSs are more effective compared to other media?"				
Never	17 (3.4%)	15 (3.1%)	7 (1.2%)	9 (1.8%)
Rarely	69 (13.8%)	67 (13.7%)	54 (9.4%)	49 (9.7%)
Sometimes	167 (33.5%)	145 (29.6%)	183 (31.8%)	179 (35.4%)
Often	187 (37.5%)	141 (28.8%)	247 (43%)	175 (34.7%)
Always	59 (11.8%)	122 (24.9%)	84 (14.6%)	93 (18.4%)

Most responses in all cities were in the "sometimes" and "often" category for all three of these questions, indicating a somewhat positive opinion on using PSAs on DMS.

These questions are ***not*** specific to capturing recognition of the message itself. For example, the first question listed in Table 26 is "How often do you see PSAs on dynamic message signs while driving?" Approximately 84 percent of respondents selected "sometimes," "often," or "always" in Philadelphia. Although, only 39 percent reported "often" and "always," again the question was not targeted toward recognition, but how often the respondents see these messages ***specifically*** on DMS ***while*** driving. Also, respondents may view similar messages on other media such as billboards or TV, and it may not be as easy for individuals to recall whether the message was from DMS or another media form.

All four cities were also surveyed on their opinions of reinforcement messages on the DMS. These questions ranged from posting consequences (e.g., “Drink, drive, go to jail”) to including crash statistics (e.g., “100 deaths this year on Texas road”) to showing a specific fine (e.g., “Click it or ticket or get $100 fine”). The results for these questions can be viewed in Figure 13 (a) (b) (c) and (d). In all cities, participants agreed that they were neutral about to somewhat comfortable with reading consequences; somewhat agreeing that PSAs with crash statistics are more effective and their driving would be strongly impacted by signs that showed a fine.



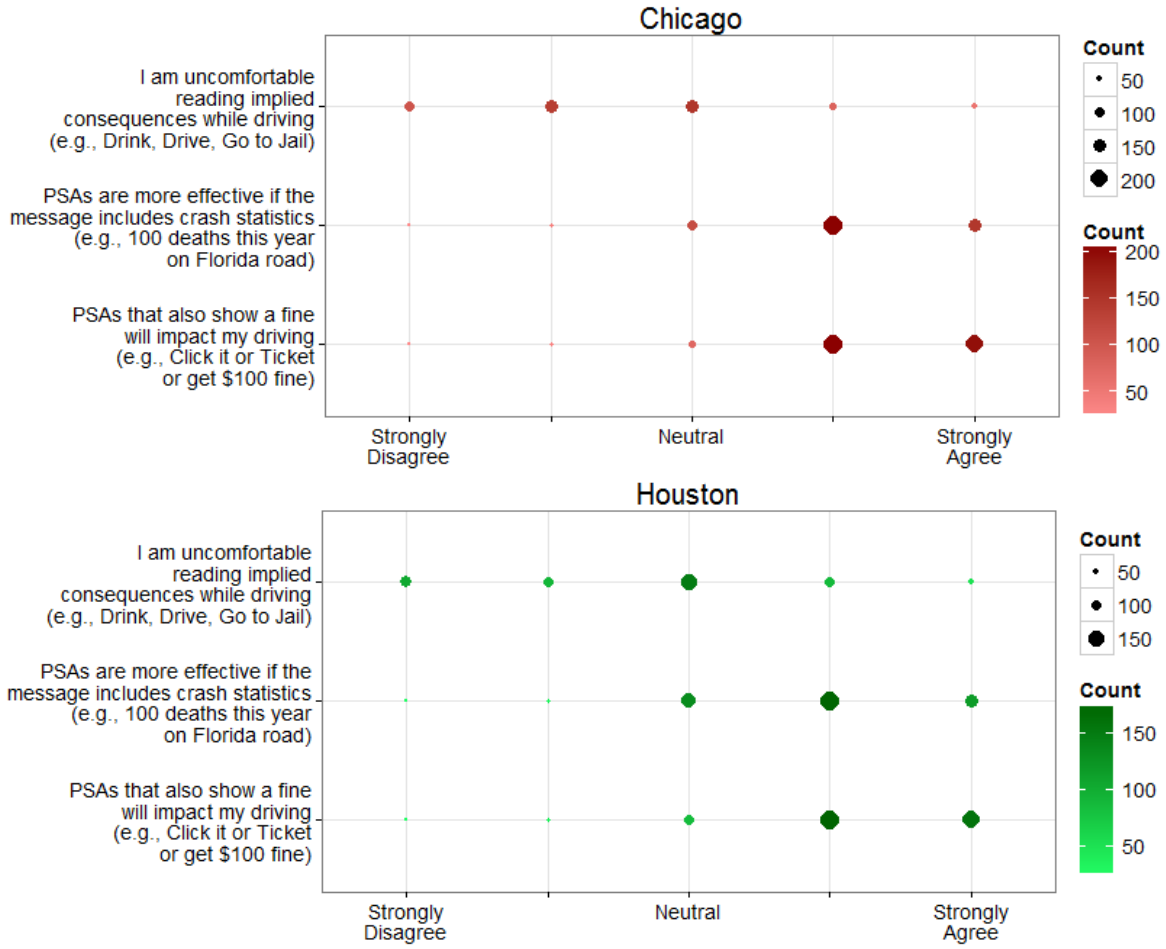
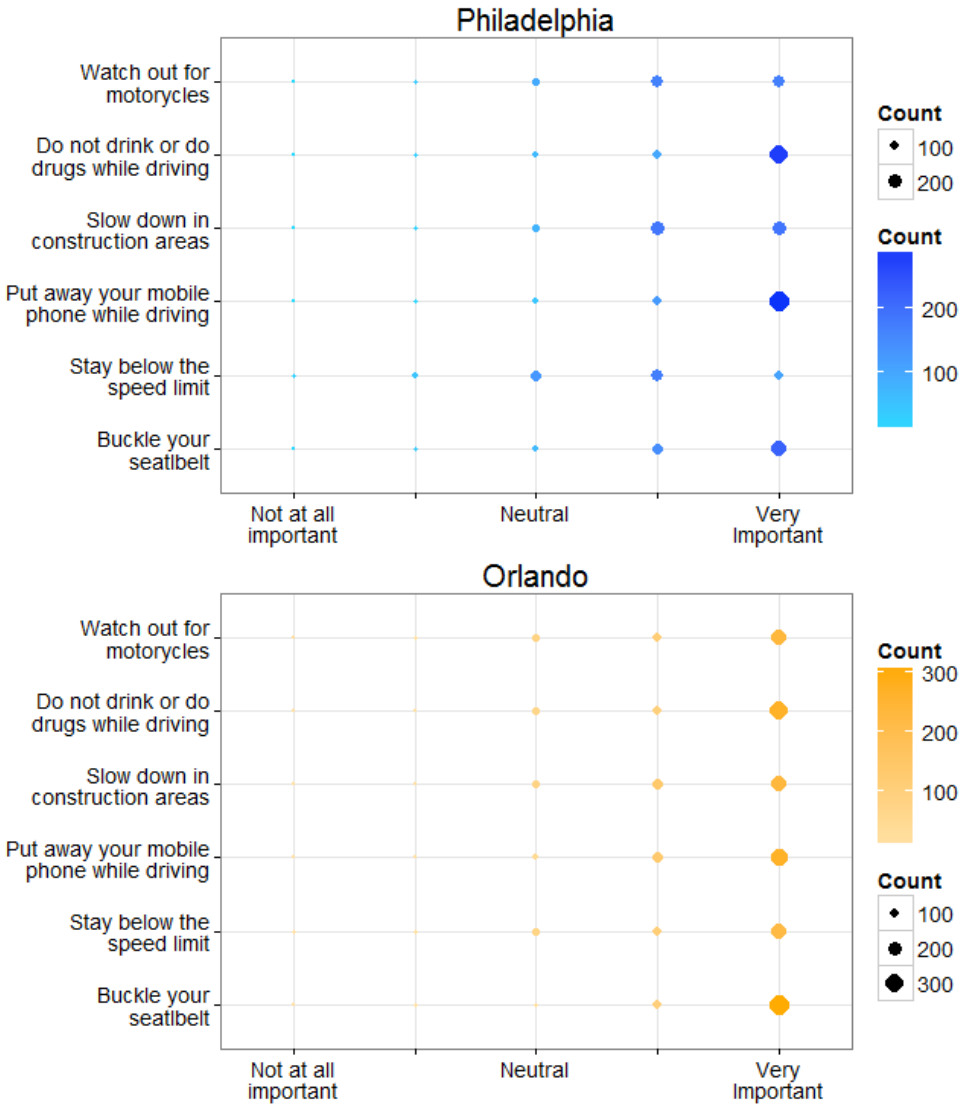


Figure 13 (a) (b) (c) (d). Chart. "How much do you agree or disagree with the following statements…"

Furthermore, each city was asked the same set of questions with regards to the importance of providing information to drivers on six common safety issues—motorcycle awareness, driving impaired, work zone safety, distracted driving, speeding, and seatbelt usage. These results are portrayed in Figure 14 (a) (b) (c) and (d). On average, people thought it was very important to provide information to drivers on all six of these concerns, with less emphasis on staying below the posted speed limit.


Philadelphia
Watch out for motorcycles
Do not drink or do drugs while driving
Slow down in construction areas
Put away your mobile phone while driving
Stay below the speed limit
Buckle your seatlbelt
Not at all important
Neutral
Very Important
Count
100
200
Count
200
100
Orlando
Watch out for motorcycles
Do not drink or do drugs while driving
Slow down in construction areas
Put away your mobile phone while driving
Stay below the speed limit
Buckle your seatlbelt
Not at all important
Neutral
Very Important
Count
300
200
100
Count
100
200
300

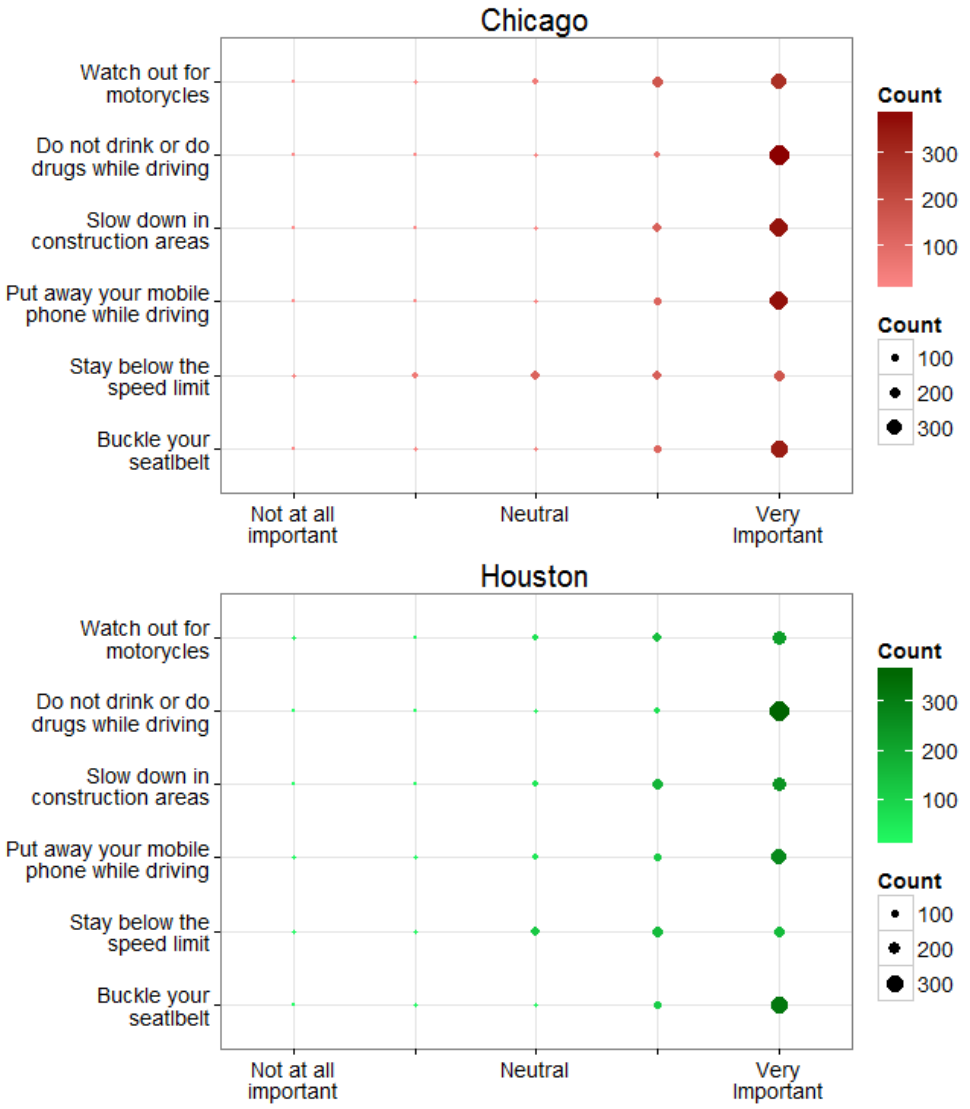
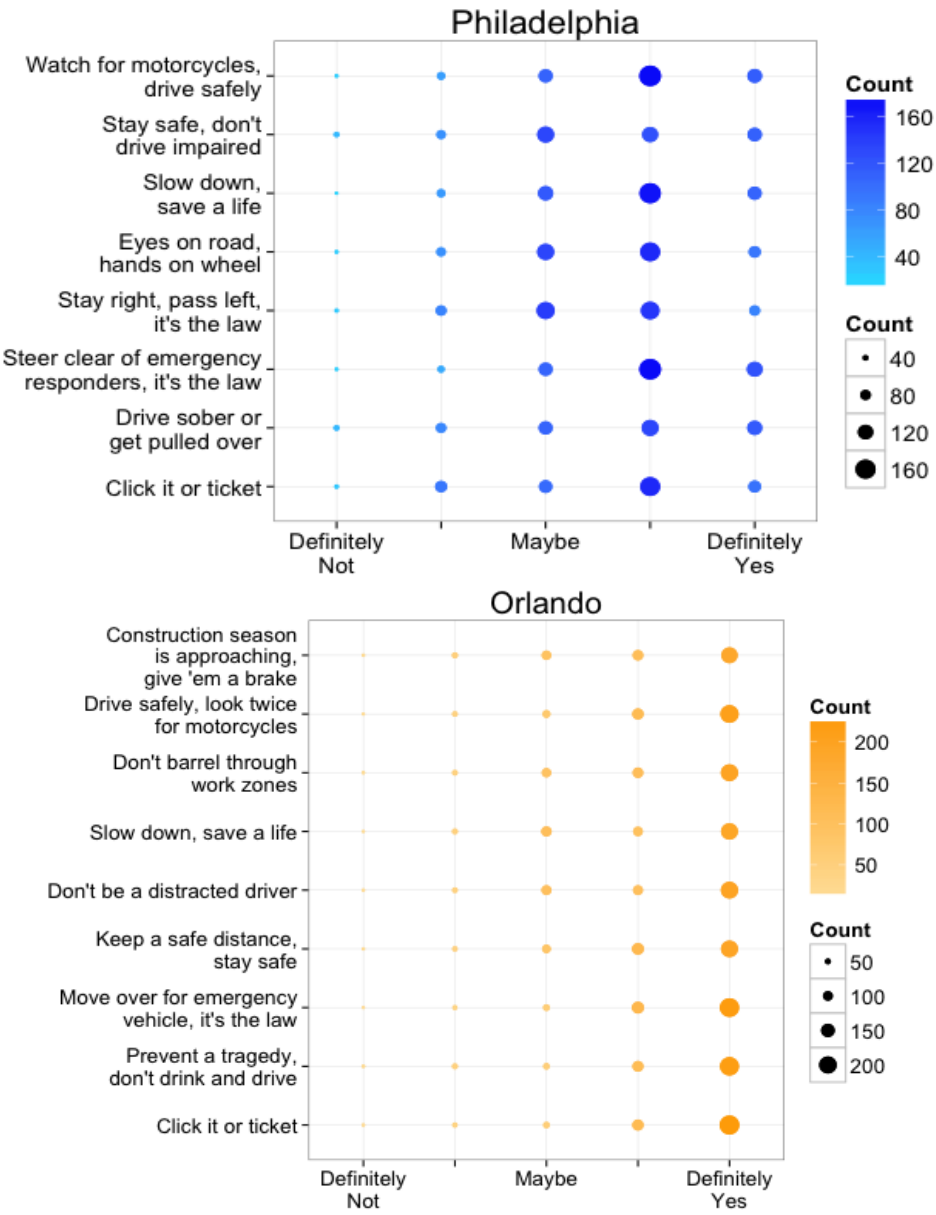


Figure 14 (a) (b) (c) (d). Chart. "How important is it to provide information to drivers on the following…"

Similarly, actual messages displayed in each of these cities that correspond to the six safety issues were assessed for their impact on driver behavior. Survey respondents were asked "if they would change their driving behavior or habits if they saw the following PSA on DMS while driving?" The possible responses ranged from "definitely not" to "definitely yes." Orlando had the strongest responses toward "definitely yes" on all messages. Chicago responded strongly with "definitely yes" for messages relating to slowing down for emergency vehicles and in construction zones, with a majority of mixed responses between "probably" and "definitely yes" for the other messages. Philadelphia respondents were more neutral, with most responses in the "maybe" and "probably yes" behavior responses. Houston responses were the most scattered; the

only two messages with a strong majority correspond to the two messages with more assertive language ("100 deaths this year on Texas road" and "Drunk driving, over the limit, under arrest"). Figure 15 (a), (b), (c), and (d) further depict these responses in behavioral changes linked to specific PSAs.



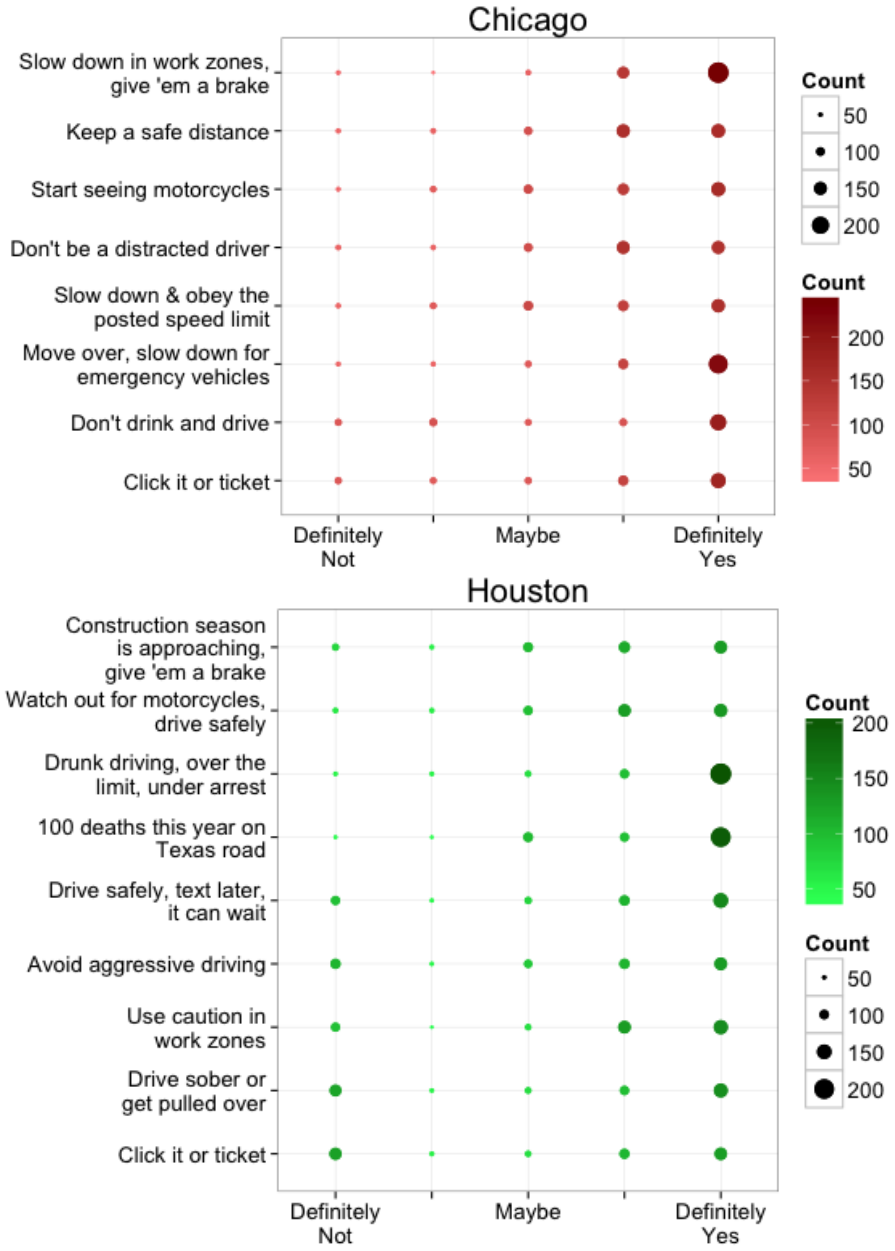


Figure 15 (a) (b) (c) (d). Chart. "Would you change your driving behavior or habits when you see the following PSA on DMS while driving…"

INFERENTIAL STATISTICS

A chi-square test was conducted on the responses for opinions relating to posting consequences, crash statistics, and fines on PSAs to determine how the results differed based on city. All chi-square values were less than 0.05, indicating that PSA opinions significantly differ based on city.

A binary logit model was developed for each city to predict the perceived *usefulness* of PSAs on DMS given various explanatory variables that include behavioral correlates and socioeconomic characteristics. The outcome was based on recoding the 5-point Likert scale so that those who indicated "Neutral" to "Less than useful" are coded 0 (not useful), and "Always useful" to "somewhat useful" are coded 1 (or useful).

In all four cities, individuals were more likely to agree that PSAs on DMS were useful if they encountered them more frequently. If the user felt that posting PSAs on DMS would be highly effective, then they would also feel that PSAs were more useful. In Philadelphia, males considered PSAs more useful, while in Orlando, females considered PSAs more useful. Only in Chicago was income a factor, where lower income individuals were more likely to regard PSAs to be useful when compared to those with higher incomes. In three cities (Philadelphia, Chicago, and Houston), there was a higher likelihood of reporting that PSAs were useful if the surveyed subjects also considered conveying information on impaired driving to be important. Table 27 provides a more in-depth summary on this model.

Table 27. Binary logit model for predicting perceived usefulness.

	Odds Ratio		Confidence Interval	
	estimate	**p-value**	**lower**	**upper**
Philadelphia				
Frequency	1.56	0.002	1.18	2.01
Effective	2.84	<0.001	2.18	3.78
Seatbelt	2.11	0.017	1.15	3.92
DUI	1.99	0.042	1.03	3.90
Speeding	-	ns	-	-
Lives in Area	-	ns	-	-
Male	1.48	0.098	0.93	2.36
Younger	-	ns	-	-
Older	-	ns	-	-
High School	-	ns	-	-
Grad School	-	ns	-	-
Lower Income	-	ns	-	-
Crash	-	ns	-	-
Tickets	-	ns	-	-
Null Deviance = 575.64				
Residual Deviance = 458.13				

	Odds Ratio		Confidence Interval	
	estimate	p-value	lower	upper
Orlando				
Frequency	1.68	<0.001	1.31	2.17
Effective	1.94	<0.001	1.48	2.58
Seatbelt	-	ns	-	-
DUI	-	ns	-	-
Speeding	2.56	<0.001	1.48	4.41
Lives in Area	-	ns	-	-
Male*	0.60*	0.046*	0.36	0.99
Younger	-	ns	-	-
Older	-	ns	-	-
High School	-	ns	-	-
Grad School	-	ns	-	-
Lower Income	-	ns	-	-
Crash	-	ns	-	-
Tickets*	0.47*	0.028*	0.24	0.92
Null Deviance = 485.44				
Residual Deviance = 369.04				

* Odds ratio estimate is less than 1.

	Odds Ratio		Confidence Interval	
	estimate	p-value	lower	upper
Chicago				
Frequency	1.46	0.007	1.11	1.94
Effective	3.50	<0.001	2.57	4.87
Seatbelt	-	ns	-	-
DUI	4.00	<0.001	1.93	8.52
Speeding	1.84	0.013	1.14	2.97
Lives in Area*	0.65*	0.086*	0.40	1.06
Male	-	ns	-	-
Younger*	0.67*	0.111*	0.41	1.10
Older*	0.48*	0.074*	0.22	1.08
High School	-	ns	-	-
Grad School	-	ns	-	-
Lower Income	2.16	0.014	1.18	4.08
Crash*	0.61*	0.079*	0.35	1.06
Tickets	-	ns	-	-
Null Deviance = 573.19				
Residual Deviance = 439.46				

* Odds ratio estimate is less than 1.

	Odds Ratio		Confidence Interval	
	estimate	p-value	lower	upper
Houston				
Frequency	1.60	<0.001	1.24	2.08
Effective	2.11	<0.001	1.61	2.81
Seatbelt	-	ns	-	-
DUI	2.54	0.014	1.21	5.39
Speeding	1.73	0.028	1.06	2.84
Lives in Area	-	ns	-	-
Male	-	ns	-	-
Younger*	0.53*	0.019*	0.31	0.90
Older	-	ns	-	-
High School*	0.62*	0.080*	0.36	1.06
Grad School*	0.41*	0.019*	0.19	0.87
Lower Income	-	ns	-	-
Crash	-	ns	-	-
Tickets	-	ns	-	-
Null Deviance = 495.67				
Residual Deviance = 414.44				

* Odds ratio estimate is less than 1.

Notes:

- *Frequency = encounter PSAs always or sometimes*
- *Effective = consider PSAs on DMS more effective/much more effective compared to other media means*
- *Seatbelt/DUI/Speeding = consider important/very important to provide information on topic to drivers*
- *Younger = less than 30 years old*
- *Note 5: Older = older than 60 years old*
- *Note 6: High School = some high school or high school diploma*
- *Note 7: Grad School = some graduate school or postgraduate degree*
- *Note 8: Lower Income = less than $25,000 per year*
- *Note 9: Crash/Tickets = has been in at least one crash/received ticket within past 5 years*

A second binary logit model was developed to predict the perceived *effectiveness* of PSAs on DMS given variables that were identical across all four cities. Rather than four separate models for each city, this model is aggregated across all survey locations. Similar to the first model, survey questions based on the 5-point Likert scale were recoded such that "Neutral" to "Less than effective" are coded as 0 (for not effective), and "Always effective" to "somewhat effective" are coded as 1 (or effective).

Table 28 provides the model summary for the aggregated data across all cities. Individuals were 1.74 times more likely to consider PSAs effective on DMS when they *encountered PSAs frequently* and were 3.29 times more likely if they also consider *PSAs to be useful*. These outcomes echo the findings at the individual city level. In addition, individuals who had some

graduate schooling or a postgraduate degree were 1.34 times more likely to find these messages effective.

Based on the aggregation across all cities, the team was also able to examine interaction effects. Specifically, lower income males were less likely to find these DMS effective. Older respondents (older than 60) were more likely to consider PSAs effective, while younger respondents (less than 30) were less likely to consider them effective. As a reference, 10 percent of the dataset included lower-income males, 8 percent were in the older category, 57 percent were younger, and 17 percent were represented by the graduate school variable.

Table 28. Binary logit model for predicting perceived effectiveness when compared to other media.

	Odds Ratio		Confidence Interval	
	estimate	p-value	lower	upper
Frequency	1.74	<0.001	1.41	2.15
Useful	3.29	<0.001	2.64	4.10
Low Income Male*	0.73*	0.081*	0.52	1.04
Younger*	0.76*	0.017*	0.60	0.95
Older	1.55	0.051	1.00	2.42
Grad School	1.34	0.048	1.00	1.79
Null Deviance = 2249.5				
Residual Deviance = 2039.6				
Observations = 1620				

* Odds ratio estimate is less than 1.

Notes:

- *Frequency = encounter PSAs always or sometimes*
- *Useful = consider PSAs on DMS useful or very useful*
- *Low Income Male = males with an annual income less than $25,000*
- *Younger = less than 30 years old*
- *Older = older than 60 years old*
- *Grad School = some graduate school or postgraduate degree*

CHAPTER 6. FINDINGS AND RECOMMENDATIONS/GUIDANCE

Summary data showed that respondents do take assertive PSAs quite seriously (e.g., monetary fine and number of deaths). In Philadelphia, respondents appeared to be more uncomfortable with messages that include direct consequences (e.g., drink and you will go to jail), when compared to Chicago and Houston. This could be due to the fact that those that drive in Chicago and Houston are more accustomed to seeing these message displays as compared to Philadelphia. Respondents in all four cities indicated that PSAs that show a monetary fine would impact their driving, as would data displayed on number of crashes.

There were two inferential models developed. Table 29 summarizes the findings from the four models developed to assess the usefulness of PSAs on DMS; an up arrow corresponds to "perceived as more useful," a down arrow corresponds to "perceived as less useful," and 'ns' corresponds to "not a significant variable within that location." Four models were developed to observe the differences within each city. All factors in Philadelphia had an increasing effect on perceived usefulness; however, this was not observed in any other city. It is important to note that encountering PSAs often and considering PSAs effective increased perceived usefulness at all locations. In addition, two locations observed respondents younger than 30 year old to consider PSAs not useful.

Table 29. Perceived usefulness of PSAs on DMS summary.

Perceived Usefulness	Location			
	Philadelphia	Orlando	Chicago	Houston
Encounters PSAs often	↑	↑	↑	↑
PSAs on DMS are effective	↑	↑	↑	↑
PSAs on seatbelts are important	↑	ns	ns	ns
PSAs on DUI are important	↑	ns	↑	↑
PSAs on speeding are important	ns	↑	↑	↑
Lives within greater area	ns	ns	↓	ns
Male	↑	↓	ns	ns
Younger than 30 years old	ns	ns	↓	↓
Older than 60 years old	ns	ns	↓	ns
Some high school or high school diploma	ns	ns	ns	↓
Some graduate school or postgraduate degree	ns	ns	ns	↓
Income less than $25,000 per year	ns	ns	↑	ns
Has been in at least 1 crash within 5 years	ns	ns	↓	ns
Has received at least 1 ticket within 5 years	ns	↓	ns	ns

Another model was designed to examine the effectiveness of PSAs when compared to other media types (e.g., radio, billboard, TV), and this model was based on data pooled from all four cities. In this latter model, a smaller subset of data was used. More specifically, this model captured only data that was identical in all four cities. This summary is provided in Table 30, where up arrows indicate factors that increased perceived effectiveness and down arrows represent factors that decrease perceived effectiveness. Insignificant variables are not included in this summary.

Table 30. Perceived effectiveness of PSAs on DMS summary.

Perceived Effectiveness	Effect
Encounters PSAs often	↑
PSAs on DMS are useful	↑
Male with income less than $25,000 per year	↓
Younger than 30 years old	↓
Older than 60 years old	↑
Some graduate school or postgraduate degree	↑

Respondents were provided with specific PSAs commonly displayed on DMS in their city and asked whether they would change their driving behaviors when they saw those messages.

- In Orlando, the largest proportion of responses stipulated that drivers would definitely change their driving behaviors when they saw all nine example messages.
- In Chicago, the majority of responses were that all eight messages would probably or definitely change their driving behaviors. The messages with the largest impact on driving were about slowing down for work zones and emergency vehicles.
- The eight example messages in Philadelphia had the largest number of responses in the "maybe" to "probably" changing driving behaviors.
- Houston respondents reported the least amount of consistency in behavioral changes from their nine example messages. The only two messages with a majority response were "Drunk driving, over the limit, under arrest" and "100 deaths this year on Texas road," based upon which drivers would definitely change their behaviors. It is to be noted that these were the only two messages with assertive language.

The assumption is that most survey respondents spoke English and had an 8^{th} grade education level. Considering the population of survey respondents, this assumption appears to hold true as the majority did indicate English as their primary language, and the majority did indicate that they had some high school education or higher. Hence, many of the words used in the survey were not defined (e.g., distraction, safety, consequence). Based on earlier meetings with the state transportation agencies, it was deemed important to separate usefulness from effectiveness. Although the survey did not define usefulness or effectiveness to the survey respondents, the goal was to consider usefulness as a practical and functional application of PSAs on DMS. Effectiveness captured the perception that DMS were the most successful medium to deliver PSAs in a way that would impact driver behavior.

In general, most respondents across the four cities indicated that PSAs on DMS appear useful. Respondents with an income lower than $25,000 annually did not find these messages to be useful, but this effect was observed in Houston only. Respondents who have been in a crash or had received a ticket in the past 5 years were less likely to find PSAs to be useful.

When aggregated across all four cities, producing a larger sample size, young males with lower incomes tend not to find these messages effective. Older drivers and drivers with a higher education found safety and PSA messages on DMS to be effective, while younger drivers did not.

Traditionally, DMS are used to provide useful travel information to drivers so that they know whether they need to change routes, reduce speed, or change lanes. This study showed that there could be some possibility of changing driver behavior if safety and PSA messages were also posted on DMS. For example, those drivers who reported that certain safety issues are important to disseminate (e.g., driving under the influence or staying below the speed limits) also found PSAs to be both useful and effective. However, it would be very important to ensure that PSAs

that are placed on DMS are both useful and effective. Hence, more testing and studies would be needed to validate whether the perceptions noted in the surveys translate to real-world driving. Often, drivers' stated preferences differ from their revealed preferences. Another concern that should be tested on-road is whether the inclusion of additional PSAs would be more distracting to travelers, impacting their overall safety. Lastly, there is a cost associated with operating DMS in terms of maintenance and use. Again, these issues would need to be examined in the real world. Table 31 provides some overall recommendations based on the study's key findings.

Table 31. PSAs on DMS – recommendations and guidance.

Findings	Recommendations/Guidance
Assertive PSAs (e.g., monetary fine and number of deaths) are taken seriously	Assertive PSAs need to be examined more carefully to identify the impact on driver behavior.
PSAs that show a monetary fine impact driving	It is uncertain whether including monetary fines has a good or bad impact on driving. Hence, PSAs that show monetary fines need to be examined on-road.
PSAs that include data on crash statistics impact driving	It is uncertain whether including crash statistics will have a good or bad impact on driving. Hence, PSAs that show crash statistics need to be examined on-road before further implementation.
There is an association between the frequency of observation of PSAs on DMS and the perceived usefulness	More studies need to be done to pinpoint the appropriate number and frequency of PSAs on DMS to avoid the introduction of an unnecessary number of messages.
Younger respondents (less than 30) are less likely to consider PSAs on DMS effective	Promote awareness on (and familiarity with) PSAs among the younger groups of population.

APPENDIX A: SURVEY QUESTIONNAIRES

CHICAGO

W Safety and Public Service Announcements (PSAs) on Dynamic Messages Signs for the Chicago area

The goal of this survey is to understand the value of having safety and public service messages on the dynamic message signs you see on our highways. These messages are used to raise awareness of social and safety issues. This survey is completely voluntary and all responses are anonymous and cannot be connected back to any individual. You can also fill this survey out online at:

https://catalyst.uw.edu/webq/survey/millerik/207614

Thank you for taking time to be part of this important study.

Q1 (Check only one): How often do you see PSAs on dynamic message signs while driving?

Never — Rarely — Sometimes — Often — Always

Q2 (Check only one): How useful is it to have PSAs on dynamic message signs for drivers?

Not useful — Somewhat useful — Neutral — More useful — Very useful

Q3 (Check only one): Do you think PSAs on dynamic message signs are effective compared to other media (radio, billboard, TV)?

Much less effective — Less effective — Neutral — More effective — Much more effective

Q4 (Check only one): What does "Ride Safely, Sober, Live free, Ride alive" mean to you?

- ☐ Drive safely under speed limit
- ☐ Don't drink and drive
- ☐ Drive as fast as you can
- ☐ Watch out for motorcycles
- ☐ None of the above/I do not know

Q5 (Check only one): What does "Don't drive impaired" mean to you?

- ☐ Don't drive drunk
- ☐ Don't drive distracted
- ☐ Don't drive sleepy/fatigued
- ☐ None of the above/I do not know

Q6 (Check only one): What does "Eyes on road, hands on wheel" mean to you?

- ☐ Drive safely under speed limit
- ☐ Stay alert
- ☐ Drive as fast as you can
- ☐ Don't drive distracted
- ☐ None of the above/I do not know

Q7 (Check all that apply): How many of the following PSAs on dynamic message signs have you seen while driving?

- ☐ Always wear your seat belt, it's the law
- ☐ Click it or ticket
- ☐ Seat belts save lives, buckle up
- ☐ 55 means 55, slow down
- ☐ Don't be a distracted driver
- ☐ Keep a safe distance
- ☐ Don't driver impaired
- ☐ Don't drink & drive, report all DUI drivers
- ☐ DUI drivers will be arrested & prosecuted
- ☐ Slow down & obey the posted speed limit
- ☐ Move over, slow down for emergency vehicles
- ☐ Construction season is approaching, give 'em a brake
- ☐ You drink & drive, you lose
- ☐ Watch for motorcycles, drive safely
- ☐ Winterize your vehicle
- ☐ Winter season is quickly approaching

Q8 (Check only one for each row): How important is it to provide information to drivers on the following?

	Not at all important	Somewhat important	Neutral	Important	Very important
a. Buckle your seatbelt	○	○	○	○	○
b. Stay below the speed limit	○	○	○	○	○
c. Put away your mobile phone while driving	○	○	○	○	○
d. Slow down in construction areas	○	○	○	○	○
e. Do not drink or do drugs while driving	○	○	○	○	○
f. Watch out for motorcycles	○	○	○	○	○

Q9 (Check only one for each row): In Chicago, do you agree that there is a HIGH LEVEL OF ENFORCEMENT for:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Seat belt use	○	○	○	○	○
b. Speeding in a work zone/construction area	○	○	○	○	○
c. Speeding over the posted speed limit	○	○	○	○	○
d. Driving under the influence (DUI)	○	○	○	○	○
e. Texting or using a mobile device while driving	○	○	○	○	○
f. Tailgating (or following too close to another vehicle)	○	○	○	○	○
g. Using the left lane for regular driving (not passing)	○	○	○	○	○
h. Other reckless behaviors not described in a to g.	○	○	○	○	○

Q10 (Check only one for each row): Would you do something different while driving if you saw the following PSA (even if you have not seen it before):

	Definitely not	Probaby not	Maybe	Probably yes	Definitely yes
a. Click it or ticket	○	○	○	○	○
b. Don't drink and drive	○	○	○	○	○
c. Move over, slow down for emergency vehicles	○	○	○	○	○
d. Slow down & obey the posted speed limit	○	○	○	○	○
e. Don't be a distracted driver	○	○	○	○	○
f. Start seeing motorcycles	○	○	○	○	○
g. Keep a safe distance	○	○	○	○	○
h. Slow down in work zones, give 'em a brake	○	○	○	○	○

Q11 (Check only one for each row): Please state how much you agree or disagree with the following statements:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. PSAs that also show a fine will impact my driving (e.g., Click it or Ticket or get $100 fine)	○	○	○	○	○
b. PSAs are more effective if the message includes crash statistics (e.g., 100 deaths this year on Illinois road)	○	○	○	○	○
c. I am uncomfortable reading implied consequences while driving (e.g., Drink, Drive, Go to Jail)	○	○	○	○	○

About Yourself

Q12. Are you?

☐ Male
☐ Female

Q13. How old are you?

_____ years old

Q14. Do you live in the Greater Chicago Area?

☐ No
☐ Yes

Q15. How many people live in your household (including yourself)?

_____

Q16. How many children under the age of 6 live in your household?

_____

Q17. During the past 5 years, have you been involved in a collision that was reported to the police?

☐ No
☐ Yes
→ **Q17a. If yes, how many?** _____

Q18. Are you...

☐ Married
☐ Single
☐ Divorced
☐ Have a significant other

Q19. During the past 5 years, have you received a ticket for a moving violation?

☐ No
☐ Yes
→ **Q19a: If yes, how many?** _____

Q20. Do you rent or own your current living space?

☐ Rent
☐ Own
☐ Neither, I live with others who pay

Q21. What is your highest level of education?

☐ Some schooling
☐ High school diploma
☐ Associate degree
☐ Undergraduate degree
☐ Some graduate school
☐ Postgraduate degree

Q22. What is your approximate household income?

☐ Less than $25,000
☐ $25,001 - $50,000
☐ $50,001 - $75,000
☐ $75,001 - $100,000
☐ $100,001 - $125,000
☐ Greater than $125,000

Q23. Is English your primary language?

☐ No
☐ Yes

If you have any questions or concerns regarding this survey, do not hesitate to contact us:

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Graduate Research Assistant
Erika Miller, millerik@uw.edu

Associate Professor
Linda Ng Boyle, linda@uw.edu

Thank you again, and if you have additional comments, please feel free to write them here.

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HOUSTON

Safety and Public Service Announcements (PSAs) on Dynamic Messages Signs for the Houston area

The goal of this survey is to understand the value of having safety and public service messages on the dynamic message signs you see on our highways. These messages are used to raise awareness of social and safety issues. This survey is completely voluntary and all responses are anonymous and cannot be connected back to any individual. You can also fill this survey out online at:

https://catalyst.uw.edu/webq/survey/millerik/207616

Thank you for taking time to be part of this important study.

Q1 (Check only one): How often do you see PSAs on dynamic message signs while driving?

Never — Rarely — Sometimes — Often — Always

Q2 (Check only one): How useful is it to have PSAs on dynamic message signs for drivers?

Not useful — Somewhat useful — Neutral — More useful — Very useful

Q3 (Check only one): Do you think PSAs on dynamic message signs are effective compared to other media (radio, billboard, TV)?

Much less effective — Less effective — Neutral — More effective — Much more effective

Q4 (Check only one): What does "Don't barrel through work zones" mean to you?

- ☐ Keep away from reckless drivers
- ☐ Slow down for work zones ahead
- ☐ Road is closed
- ☐ Watch out for barrels
- ☐ None of the above/I do not know

Q5 (Check only one): What does "Don't ride impaired – Motorcycle safety month" mean to you?

- ☐ Don't drive drunk
- ☐ Don't drive distracted
- ☐ Don't drive sleepy/fatigued
- ☐ None of the above/I do not know

Q6 (Check only one): What does "Avoid aggressive driving" mean to you?

- ☐ Keep away from reckless drivers
- ☐ Drive safely, at or under the speed limit
- ☐ Drive as fast as you can
- ☐ Drive defensively
- ☐ None of the above/I do not know

Q7 (Check all that apply): How many of the following PSAs on dynamic message signs have you seen while driving?

- ☐ Avoid aggressive driving
- ☐ Buckle up, every rider, every ride
- ☐ Click it or ticket
- ☐ Construction season is approaching, give em a brake
- ☐ Don't barrel through work zones
- ☐ Drunk driving, over the limit, under arrest
- ☐ Move over or slow down, it's the law
- ☐ Drink, Drive, Go to jail
- ☐ If water on road, turn around, don't drown
- ☐ Drive safely, arrive alive
- ☐ 100 deaths this year on Texas road
- ☐ Drive safely, text later, it can wait
- ☐ Drive sober or get pulled over
- ☐ Watch for motorcycles, drive safely
- ☐ Work zone awareness week
- ☐ You talk, you text, you crash
- ☐ Use caution in work zones

Q8 (Check only one for each row): How important is it to provide information to drivers on the following?

	Not at all important	Somewhat important	Neutral	Important	Very important
a. Buckle your seatbelt	○	○	○	○	○
b. Stay below the speed limit	○	○	○	○	○
c. Put away your mobile phone while driving	○	○	○	○	○
d. Slow down in construction areas	○	○	○	○	○
e. Do not drink or do drugs while driving	○	○	○	○	○
f. Watch out for motorcycles	○	○	○	○	○

Q9 (Check only one for each row): In Houston, do you agree that there is a HIGH LEVEL OF ENFORCEMENT for:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Seat belt use	○	○	○	○	○
b. Speeding in a work zone/construction area	○	○	○	○	○
c. Speeding over the posted speed limit	○	○	○	○	○
d. Driving under the influence (DUI)	○	○	○	○	○
e. Texting or using a mobile device while driving	○	○	○	○	○
f. Tailgating (or following too close to another vehicle)	○	○	○	○	○
g. Using the left lane for regular driving (not passing)	○	○	○	○	○
h. Other reckless behaviors not described in a to g.	○	○	○	○	○

Q10 (Check only one for each row): Would you do something different while driving if you saw the following PSA (even if you have not seen it before):

	Definitely no	Probaby not	Maybe	Probably yes	Definitely yes
a. Click it or ticket	○	○	○	○	○
b. Drive sober or get pulled over	○	○	○	○	○
c. Use caution in work zones	○	○	○	○	○
d. Avoid aggressive driving	○	○	○	○	○
e. Drive safely, text later, it can wait	○	○	○	○	○
f. 100 deaths this year on Texas road	○	○	○	○	○
g. Drunk driving, over the limit, under arrest	○	○	○	○	○
h. Watch out for motorcycles, drive safely	○	○	○	○	○
i. Construction season is approaching, give 'em a brake	○	○	○	○	○

Q11 (Check only one for each row) : Please state how much you agree or disagree with the

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. PSAs that also show a fine will impact my driving (e.g., Click it or Ticket or get $100 fine)	○	○	○	○	○
b. PSAs are more effective if the message includes crash statistics (e.g., 100 deaths this year on Texas road)	○	○	○	○	○
c. I am uncomfortable reading implied consequences while driving (e.g., Drink, Drive, Go to Jail)	○	○	○	○	○

About Yourself

Q12. Are you?

☐ Male
☐ Female

Q13. How old are you?

_____ years old.

Q14. Do you live in the Greater Houston area?

☐ No
☐ Yes

Q15. How many people live in your household (including yourself)?

_____

Q16. How many children under the age of 6 live in your household?

_____

Q17. During the past 5 years, have you been involved in a collision that was reported to the police?

☐ No
☐ Yes
→ **Q17a. If yes, how many?** _____

Q18. Are you…

☐ Married
☐ Single
☐ Divorced
☐ Have a significant other

Q19. During the past 5 years, have you received a ticket for a moving violation?

☐ No
☐ Yes
→ **Q19a: If yes, how many?** _____

Q20. Do you rent or own your current living space?

☐ Rent
☐ Own
☐ Neither, I live with others who pay

Q21. What is your highest level of education?

☐ Some schooling
☐ High school diploma
☐ Associate degree
☐ Undergraduate degree
☐ Some graduate school
☐ Postgraduate degree

Q22. What is your approximate household income?

☐ Less than $25,000
☐ $25,001 - $50,000
☐ $50,001 - $75,000
☐ $75,001 - $100,000
☐ $100,001 - $125,000
☐ Greater than $125,000

Q23. Is English your primary language?

☐ No
☐ Yes

If you have any questions or concerns regarding this survey, do not hesitate to contact us:

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Erika Miller, millerik@uw.edu

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Thank you again, and if you have additional comments, please feel free to write them here.

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ORLANDO

W Safety and Public Service Announcements (PSAs) on Dynamic Messages Signs for the Orlando area

The goal of this survey is to understand the value of having safety and public service messages on the dynamic message signs you see on our highways. These messages are used to raise awareness of social and safety issues. This survey is completely voluntary and all responses are anonymous and cannot be connected back to any individual. You can also fill this survey out online at:

https://catalyst.uw.edu/webq/survey/millerik/207615

hank you for taking time to be part of this important study.

Q1 (Check only one): How often do you see PSAs on dynamic message signs while driving?

Never — Rarely — Sometimes — Often — Always

Q2 (Check only one): How useful is it to have PSAs on dynamic message signs for drivers?

Not useful — Somewhat useful — Neutral — More useful — Very useful

Q3 (Check only one): Do you think PSAs on dynamic message signs are effective compared to other media (radio, billboard, TV)?

Much less effective — Less effective — Neutral — More effective — Much more effective

Q4 (Check only one): What does "Ride Safely, Sober, Live free, Ride alive" mean to you?

- ☐ Drive safely under speed limit
- ☐ Don't drink and drive
- ☐ Drive as fast as you can
- ☐ Watch out for motorcycles
- ☐ None of the above/I do not know

Q5 (Check only one): What does "Don't ride impaired" mean to you?

- ☐ Don't drive drunk
- ☐ Don't drive distracted
- ☐ Don't drive sleepy/fatigued
- ☐ None of the above/I do not know

Q6 (Check only one): What does "Eyes on road, hands on wheel" mean to you?

- ☐ Drive safely under speed limit
- ☐ Stay alert
- ☐ Drive as fast as you can
- ☐ Don't drive distracted
- ☐ None of the above/I do not know

Q7 (Check all that apply): How many of the following PSAs on dynamic message signs have you seen while driving?

- ☐ Avoid aggressive driving
- ☐ An alert driver can avoid a crash
- ☐ Buckle up, seat belts save lives
- ☐ Click it or ticket
- ☐ Construction season is approaching, give 'em a brake
- ☐ DUI decide before you drive
- ☐ Drive safely, look twice for motorcycles
- ☐ No excuses, buckle up
- ☐ Buckle up, save lives
- ☐ Buckle up, just do it
- ☐ Slow down, save a life
- ☐ Don't be a distracted driver
- ☐ Don't barrel through work zones
- ☐ Move over for emergency vehicle, it's the law
- ☐ Prevent a tragedy, don't drink and drive
- ☐ Report impaired drivers, dial *347
- ☐ Report reckless drivers, dial *347
- ☐ Keep a safe distance, stay safe
- ☐ Slow down & obey the posted speed limit
- ☐ Watch for motorcycles, drive safely

Q8 (Check only one for each row): How important is it to provide information to drivers on the following?

	Not at all important	Somewhat important	Neutral	Important	Very important
a. Buckle your seatbelt	○	○	○	○	○
b. Stay below the speed limit	○	○	○	○	○
c. Put away your mobile phone while driving	○	○	○	○	○
d. Slow down in construction areas	○	○	○	○	○
e. Do not drink or do drugs while driving	○	○	○	○	○
f. Watch out for motorcycles	○	○	○	○	○

Q9 (Check only one for each row): In Orlando, do you agree that there is a HIGH LEVEL OF ENFORCEMENT for:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Seat belt use	○	○	○	○	○
b. Speeding in a work zone/construction area	○	○	○	○	○
c. Speeding over the posted speed limit	○	○	○	○	○
d. Driving under the influence (DUI)	○	○	○	○	○
e. Texting or using a mobile device while driving	○	○	○	○	○
f. Tailgating (or following too close to another vehicle)	○	○	○	○	○
g. Using the left lane for regular driving (not passing)	○	○	○	○	○
h. Other reckless behaviors not described in a to g.	○	○	○	○	○

Q10 (Check only one for each row): Would you do something different while driving if you saw the following PSA (even if you have not seen it before):

	Definitely not	Probaby not	Maybe	Probably yes	Definitely yes
a. Click it or ticket	○	○	○	○	○
b. Prevent a tragedy, don't drink and drive	○	○	○	○	○
c. Move over for emergency vehicle, it's the law	○	○	○	○	○
d. Keep a safe distance, stay safe	○	○	○	○	○
e. Don't be a distracted driver	○	○	○	○	○
f. Slow down, save a life	○	○	○	○	○
g. Don't barrel through work zones	○	○	○	○	○
h. Drive safely, look twice for motorcycles	○	○	○	○	○
I. Construction season is approaching, give 'em a brake	○	○	○	○	○

Q11 (Check only one for each row): Please state how much you agree or disagree with the following statements:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. PSAs that also show a fine will impact my driving (e.g., Click it or Ticket or get $100 fine)	○	○	○	○	○
b. PSAs are more effective if the message includes crash statistics (e.g., 100 deaths this year on Florida road)	○	○	○	○	○
c. I am uncomfortable reading implied consequences while driving (e.g., Drink, Drive, Go to Jail)	○	○	○	○	○

About Yourself

Q12. Are you?

☐ Male
☐ Female

Q13. How old are you?

_____ years old.

Q14. Do you live in the Greater Orlando area?

☐ No
☐ Yes

Q15. How many people live in your household (including yourself)?

_____

Q16. How many children under the age of 6 live in your household?

_____

Q17. During the past 5 years, have you been involved in a collision that was reported to the police?

☐ No
☐ Yes
→ **Q17a. If yes, how many?** _____

Q18. Are you…

☐ Married
☐ Single
☐ Divorced
☐ Have a significant other

Q19. During the past 5 years, have you received a ticket for a moving violation?

☐ No
☐ Yes
→ **Q19a: If yes, how many?** _____

Q20. Do you rent or own your current living space?

☐ Rent
☐ Own
☐ Neither, I live with others who pay

Q21. What is your highest level of education?

☐ Some schooling
☐ High school diploma
☐ Associate degree
☐ Undergraduate degree
☐ Some graduate school
☐ Postgraduate degree

Q22. What is your approximate household income?

☐ Less than $25,000
☐ $25,001 - $50,000
☐ $50,001 - $75,000
☐ $75,001 - $100,000
☐ $100,001 - $125,000
☐ Greater than $125,000

Q23. Is English your primary language?

☐ No
☐ Yes

If you have any questions or concerns regarding this survey, do not hesitate to contact us:

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PHILADELPHIA

W Safety and Public Service Announcements (PSAs) on Dynamic Messages Signs for the Philadelphia area

The goal of this survey is to understand the value of having safety and public service messages on the dynamic message signs you see on our highways. These messages are used to raise awareness of social and safety issues. This survey is completely voluntary and all responses are anonymous and cannot be connected back to any individual. You can also fill this survey out online at:

https://catalyst.uw.edu/webq/survey/millerik/207591

Thank you for taking time to be part of this important study.

Q1 (Check only one): How often do you see PSAs on dynamic message signs while driving?

Never — Rarely — Sometimes — Often — Always

Q2 (Check only one): How useful is it to have PSAs on dynamic message signs for drivers?

Not useful — Somewhat useful — Neutral — More useful — Very useful

Q3 (Check only one): Do you think PSAs on dynamic message signs are effective compared to other media (radio, billboard, TV)?

Much less effective — Less effective — Neutral — More effective — Much more effective

Q4 (Check only one): What does "Ride Safely, Sober, Live free, Ride alive" mean to you?

- ☐ Drive safely under speed limit
- ☐ Don't drink and drive
- ☐ Drive as fast as you can
- ☐ Watch out for motorcycles
- ☐ None of the above/I do not know

Q5 (Check only one): What does "Watch for motorcycles drive safely" mean to you?

- ☐ Don't drive drunk
- ☐ Don't drive distracted
- ☐ Don't drive sleepy/fatigued
- ☐ Watch out for motorcycles
- ☐ None of the above/I do not know

Q6 (Check only one): What does "Eyes on road, hands on wheel" mean to you?

- ☐ Drive safely under speed limit
- ☐ Stay alert
- ☐ Drive as fast as you can
- ☐ Don't drive distracted
- ☐ None of the above/I do not know

Q7 (Check all that apply): How many of the following PSAs have you seen on dynamic message signs while driving?

- ☐ Avoid aggressive driving
- ☐ Buckle up, seat belts save lives
- ☐ Buckle up, just do it
- ☐ Click it or ticket
- ☐ Don't ride impaired
- ☐ Drive safely
- ☐ Drive sober or get pulled over
- ☐ Eyes on road, hands on wheel
- ☐ Report impaired drivers, dial *347
- ☐ Stay safe, don't drive impaired
- ☐ Slow down, save a life
- ☐ Stay right, pass left, it's the law
- ☐ Steer clear of emergency responders, it's the law
- ☐ Watch for motorcycles, drive safely

Q8 (Check only one for each row): How important is it to provide information to drivers on the following?

	Not at all important	Somewhat important	Neutral	Important	Very important
a. Buckle your seatbelt	○	○	○	○	○
b. Stay below the speed limit	○	○	○	○	○
c. Put away your mobile phone while driving	○	○	○	○	○
d. Slow down in construction areas	○	○	○	○	○
e. Do not drink or do drugs while driving	○	○	○	○	○
f. Watch out for motorcycles	○	○	○	○	○

Q9 (Check only one for each row): In Philadelphia, do you agree that there is a HIGH LEVEL OF ENFORCEMENT for:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Seat belt use	○	○	○	○	○
b. Speeding in a work zone/construction area	○	○	○	○	○
c. Speeding over the posted speed limit	○	○	○	○	○
d. Driving under the influence (DUI)	○	○	○	○	○
e. Texting or using a mobile device while driving	○	○	○	○	○
f. Tailgating (or following too close to another vehicle)	○	○	○	○	○
g. Using the left lane for regular driving (not passing)	○	○	○	○	○
h. Other reckless behaviors not described in a to g.	○	○	○	○	○

Q10 (Check only one for each row): Would you change your driving behavior or habits when you see the following PSA on DMS while driving? (even if you have not seen it before):

	Definitely not	Probaby not	Maybe	Probably yes	Definitely yes
a. Click it or ticket	○	○	○	○	○
b. Drive sober or get pulled over	○	○	○	○	○
c. Steer clear of emergency responders, it's the law	○	○	○	○	○
d. Stay right, pass left, it's the law	○	○	○	○	○
e. Eyes on road, hands on wheel	○	○	○	○	○
f. Slow down, save a life	○	○	○	○	○
g. Stay safe, don't drive impaired	○	○	○	○	○
h. Watch for motorcycles, drive safely	○	○	○	○	○

Q11 (Check only one for each row): Please state how much you agree or disagree with the following statements:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. PSAs that also show a fine will impact my driving (e.g., Click it or Ticket or get $100 fine)	○	○	○	○	○
b. PSAs are more effective if the message includes crash statistics (e.g., 100 deaths this year on Pennsylvania road)	○	○	○	○	○
c. I am uncomfortable reading implied consequences while driving (e.g., Drink, Drive, Go to Jail)	○	○	○	○	○

About Yourself

Q12. Are you?

☐ Male
☐ Female

Q13. How old are you?

_____ years old.

Q14. Do you live in the Greater Philadelphia area?

☐ No
☐ Yes

Q15. How many people live in your household (including yourself)?

_____

Q16. How many children under the age of 6 live in your household?

_____

Q17. During the past 5 years, have you been involved in a collision that was reported to the police?

☐ No
☐ Yes
→ **Q17a. If yes, how many?** _____

Q18. Are you...

☐ Married
☐ Single
☐ Divorced
☐ Have a significant other

Q19. During the past 5 years, have you received a ticket for a moving violation?

☐ No
☐ Yes
→ **Q19a: If yes, how many?** _____

Q20. Do you rent or own your current living space?

☐ Rent
☐ Own
☐ Neither, I live with others who pay

Q21. What is your highest level of education?

☐ Some schooling
☐ High school diploma
☐ Associate degree
☐ Undergraduate degree
☐ Some graduate school
☐ Postgraduate degree

Q22. What is your approximate household income?

☐ Less than $25,000
☐ $25,001 - $50,000
☐ $50,001 - $75,000
☐ $75,001 - $100,000
☐ $100,001 - $125,000
☐ Greater than $125,000

Q23. Is English your primary language?

☐ No
☐ Yes

If you have any questions or concerns regarding this survey, do not hesitate to contact us:

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Thank you again, and if you have additional comments, please feel free to write them here.

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APPENDIX B: SAMPLE SIZE CALCULATION

Observational studies such as the one in this task order differ from controlled studies, and any statistical models developed need to include potential covariates and interaction effects. The greater the number of covariates, the greater the sample size needed to ensure sufficient power to minimize Type II errors. There is a need to be sufficiently confident that any insignificant findings observed are not due to large variations in too small a sample and that any impacts from outliers are minimized.

In the absence of subject compensation, and based on past studies, a **25- to 30-percent survey response** rate is anticipated.

Simple random sampling is used to compute the needed sample size. The necessary sample size is calculated such that:

$\Pr[|\ p-P\ |> d]= 0.05$ **Equation 1**

Where:

- *p* is the estimated proportion of people who will engage in a certain behavior (for example, wear seat belt)
- *P* is the true proportion of people in the target population that will engage in a certain behavior
- *d* is the margin of error -- it specifies the desired level of precision in the sample estimate, p, to be with respect to P.

Equation 1 above states that the sample size is calculated such that there is only 5-percent chance (or with a 95-percent confidence level) that the sample estimate p will deviate from the true population parameter *P* by more than *d*. Derived from equation 1, the formula to calculate the number of survey responses needed *n* becomes:

$$n = \frac{zP(1-P)}{d^2}$$ **Equation 2**

Where:

- z is equal to 1.96 at a 95-percent confidence level

To calculate *n*, both *p* and *d* need to be specified and *n* varies as *p* and *d* change. The larger the sample size, the smaller is the margin of error. *P* (See Table 32 for examples) will be estimated from the pilot survey (it can also be obtained from the existing literature, i.e., based on experience).

Table 32. Needed number of responses *n* as a function of *P* and *d*.

d\P	0.1	0.2	0.3	0.4	0.5
0.05	71	125	165	188	384
0.075	31	56	73	84	87
0.1	18	31	41	47	49
0.15	8	14	18	21	22

n refers to the number of responses. Thus, assuming a 10-percent response rate, the final sample size needed should be 10*n.

If the sample estimate *p* is 0.5 and the margin of error is *d* is 0.05, then a sample size of N=384 is reasonable.

It is important to note that this is the number of surveys that need to be returned and not the number distributed, which will need to be much higher. The response rates for each survey conducted in past studies have varied (from 10 percent to 35 percent), which creates sampling biases that also need to be accounted for statistically.

Given these estimates, 500 surveys need to be returned per site. Thus, with four sites, **2000 total surveys** should be sufficient to achieve a 95-percent confidence interval.

APPENDIX C: POTENTIAL SURVEY LOCATIONS BY CITY

Table 33. Potential survey locations—Houston, TX.

Location	Address	Type of Facility	Major Access Roads	App.# Parking Spaces	# of DMS within 2-Mile Radius (Approx)	ADT
Northwest Transit Center	7373 Old Katy Rd. Houston, TX 77024	Park-n-Ride for Houston Metro Bus	At interchange of I-10 (Katy Fwy) and Route 610 (W. Loop Fwy)	180	5	
Eastex Park-n-Ride	14400 Old Humble Rd. Houston, TX 77396	Park-n-Ride for Houston Metro Bus	Near Interchange of Route 69 (Eastex Fwy) and Route 8 (North Sam Houston Pkwy)	1000	2	
Fannin South Park-n-Ride	1604 West Bellfort Houston, TX 77054	Park-n-Ride for Houston Metro Bus and Metro Rail	Off of Route 610 (S. Loop Fwy)	1500	4	
Fuqua Park-n-Ride	11755 Sabo Rd. Houston, TX 77089	Park-n-Ride for Houston Metro Bus	Off of Route 45 (Gulf Fwy)	700	2	
Gulfgate Transit Center	7400 South Loop East Houston, TX 77087	Park-n-Ride for Houston Metro Bus	At interchange of Off of Route 610 (S. Loop Fwy) and Route 45 (Gulf Fwy)	200	4	

Table 34. Potential survey locations—Chicago, IL.

Location	Address	Type of Facility	Major Access Roads	App.# Parking Spaces	# of DMS within 2-Mile Radius (Approx)	ADT
Cumberland Park-n-Ride	5800 N. Cumberland Ave., Chicago, IL 60631	Park-n-Ride Lot for "L" Train Blue Line Train and CTA Buses	Off of Route 90 (Kennedy Expy)	1600 (Parking garage)	1	Route 90: 200,000
LaSalle St Station (Chicago Stock Exchange)	121 W. Van Buren St., Chicago, IL 60605	Parking Lots for Several "L" Train Lines (Brown, Orange, Pink, and Purple Lines)	Off of Route 290 (Dwight D. Eisenhower Expy) in downtown	170	2	Route 290: 228,000
Garfield Red Line Station	220 W. Garfield Blvd., Chicago, IL 60609	Parking Lot for "L" Train Red Line and CTA Buses	Off of I-90 (Dan Ryan Expy)	350	1	Not Avail.
Shell / BP Gas Station	Intersection of W Touhy Ave. and N. Cicero Ave.	Gas Station	Off of Route 94 (Eden Expy)	N/A	2	Route 94: 164,000
Target Shopping Center	Intersection of Harrison St. and S. Manheim Rd.	Shopping Center	Off of Route 290 (Dwight D. Eisenhower Expy)	1000	1	Route 290: 189,000

Table 35. Potential survey locations—Orlando, FL.

Location	Address	Type of Facility	Major Access Roads	App.# Parking Spaces	# of DMS within 2-Mile Radius (Approx)	ADT
Turkey Lake Service Plaza	Mile Post 263 Florida Turnpike	Highway Rest Stop	Florida Turnpike	350 plus truck parking	2	71,000
Orange County Convention Center	9400 Universal Blvd. Orlando, FL 32819	Convention Center – would focus on intercepting in parking lots	At interchange of Route 528 (Martin Anderson Bee Line Expy) and I-4	2000	3	Route 528: 77,800 I-4: 132,000
Orlando Amtrak Station	1400 Sligh Blvd. Orlando, FL 32806	Train Station	Near interchange of I-4 and Route 408 (Spessard Holland East-West Expy)	80	5	I-4: 132,000 Route 408: 64,000
Econlockhatchee Park-n-Ride	9555 East Colonial Dr. Orlando, FL 32817	Park-n-Ride Lot	Off of Route 417 (Eastern Beltway)	41	2	Route 417: 57,000

Table 36. Potential survey locations -- Philadelphia, PA.

Location	Address	Type of Facility	Major Access Roads	App.# Parking Spaces	# of DMS within 2-Mile Radius (Approx)	ADT
I-95 PA Welcome Center	½ mile from PA/DE Border on I-95	Highway Rest Stop	I-95 NB	80 plus truck parking	1	I-95: 80,000 (NB only)
30th St Station	93 N. 30th St. and Market St. Philadelphia PA 19104	Parking Lot for Multiple Regional Rail Lines, Amtrak, NJ Transit Bus Routes	Off of Route 76 (Schuykill Expy)	1,000 (incl. surface lots and parking garage)		Route 76: 72,000
Penn's Landing Parking Lot	Intersection of Columbus Blvd. at South St.	Parking Lot for SEPTA Bus Routes and Tourists to Penn's Landing	I-95	240		I-95: 80,000
Wissahocken SEPTA Station	5099 Ridge Ave. and Osborn St. Philadelphia, PA 19128	Parking Lot for SEPTA Station	Off of Route 76 (Schuykill Expy)	206		Route 76: 68,000

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