Public Perception of Safety Messages and Public Service Announcements on Dynamic Message Signs in Rural Areas

Name of Meeting/Conference/Location of Presentation
Date of Presentation

Name of presenter(s)
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Robert Krile, Battelle, Statistician
Agenda

• Project Objectives
• Survey Plan – Overview and Questionnaire
• Statistical Sampling Methodology
• Field Data Collection
• Statistical Analysis
• Results
• Recommendations
Project Objectives (1 of 2)

- Evaluate effectiveness/benefits of posting PSA and safety messages in rural areas
- Provide rural comparison to prior research on PSA and safety messages
Project Objectives (2 of 2)

- Conduct surveys on four rural corridors to gather feedback on PSA and safety messages
  - Nevada I-80, Minnesota/Wisconsin I-94, Kansas I-70, Missouri I-44
  - Various message campaigns
  - Include frequent travelers (≥ 1/month), infrequent travelers (< 1/month), and truckers
## Survey Plan Overview

<table>
<thead>
<tr>
<th>Questionnaire Design and Testing</th>
<th>Statistical Sampling Methodology</th>
<th>Data Collection Field Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Based upon study hypotheses and evaluation measures</td>
<td>• Population is all corridor drivers</td>
<td>• “Downstream” from DMS sign</td>
</tr>
<tr>
<td>• Focus group/testing in Columbus, Ohio</td>
<td>• Intercept surveys at roadside locations</td>
<td>• 2-person interview teams, each with a tablet</td>
</tr>
<tr>
<td>• 2-Step Approach: screening questionnaire and full survey</td>
<td>• Planned for ~480 completed surveys in each corridor for statistical power</td>
<td>• Responses recorded electronically (tablet)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 10 sampling periods across the 4 corridors in May-November 2015</td>
</tr>
</tbody>
</table>
## Questionnaire Design and Testing: Screener Response Log

<table>
<thead>
<tr>
<th>Screener Responses</th>
<th>Date:</th>
<th>Hours:</th>
<th>Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>~16-25</td>
<td>~26-65</td>
<td>~66+</td>
</tr>
<tr>
<td>Refused before M determining eligibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eligible and Refused</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ineligible (did not see message sign)</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ineligible (did not travel on corridor)</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other barrier M = Spanish L = other language</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Questionnaire Design and Testing:
### Full Questionnaire (Nevada example) (1 of 2)

<table>
<thead>
<tr>
<th>Topic Area</th>
<th>Questions</th>
</tr>
</thead>
</table>
| **Awareness**               | - Did you observe one of these safety-related Dynamic Message Signs on I-80?  
- How often do you see safety campaign messages on these Dynamic Message Signs? |
| **Understanding**           | - What does <insert upstream DMS message here, e.g., "Don't Drive Impaired"> mean to you?  
- Have you ever slowed down or been slowed down by other traffic in order to read these messages signs?  
- Indicate your level of agreement with the following statement pertaining to <insert upstream DMS message>: The message was understandable <insert Likert scale 1-5 here> |
| **Opinion/ Perceived Benefits** | - Do you believe the message <insert upstream DMS message> was appropriate? <insert Likert scale 1-5 here>  
- Do you believe the message <insert upstream DMS message> raised your awareness of the issue? <insert Likert scale 1-5 here>  
- Besides seeing these types of messages <insert pictures> on message signs on the roadway, have you ever seen or heard of these messages elsewhere <select all that apply>: Heard it on the Radio; Saw it on the TV; Saw it in the newspaper, magazine, or other print media; I never saw it anywhere else |
# Questionnaire Design and Testing: Full Questionnaire (Nevada example) (2 of 2)

<table>
<thead>
<tr>
<th>Topic Area</th>
<th>Questions</th>
</tr>
</thead>
</table>
| Behavior Change  | ▪ Have these Dynamic Message Signs ever <select all that apply>: Slow down; Put on your seat belts; Ask your passengers to put on a seat belt; Decide not to drive after drinking; Be more attentive when driving or change your driving behavior (such as moving over for emergency vehicles); Become distracted from driving; Be in an accident  
▪ After seeing the message(s) did you do anything differently? Yes/No  
  ▪ (if yes) What did you do? e.g., For "seat belt" type of message: Slowed down; Be more attentive when driving; Checked to see that I was wearing a seat belt; Told my passenger to put on their seatbelt; Change my driving behavior; Other.  
  ▪ (if no) Why not? I was already driving safely; I did not understand the message; Message like this do not influence my decisions; I have not seen police pulling people over in this area; I don’t know. |
| Demographic      | ▪ Age category  
▪ How often do you travel on I-80?  
▪ Gender  
▪ Are you a commercial vehicle operator? |
Questionnaire Design and Testing: Survey Instrument

- QuickTap Survey
  - Touchscreen application for iPads
  - Electronically records responses and generates Excel tables
  - Offline survey administration and storage capabilities
Statistical Sampling Methodology (1 of 2)

• Four rural corridors studied:
  ▪ Different safety campaigns on all four corridors allowed for recent “recall” questions
    − Questions about 3 messages of other corridor safety campaigns included
  ▪ This enabled:
    − Statistical cross-corridor comparisons
    − Analysis of public response to PSA and safety messages in general, rather than a focus on one type of campaign
Statistical Sampling Methodology (2 of 2)

• Results naturally weighted by selection probability at intercept locations - no post-survey weighting adjustments available

• Rest area survey locations used most in each corridor
  - Relatively good mix of traveler types (i.e., frequent, infrequent, truckers)
  - Higher levels of eligible travelers
  - Higher-volume locations than other sites in the rural corridors
  - Potential for bias excluding other stopping locations and missing travelers who do not stop at all

• Multiple rounds of surveys in each corridor in aggregate covered May-November to provide some protection against seasonality bias

• Intercepts were during daytime hours and on non-holiday week days
Data Collection: Field Procedures

• Coordinated survey schedule with state safety campaigns
• Survey locations selected in relevant (i.e., downstream) locations

• Intercept survey was 6-step process with 2-person team:
  1. Intercept – expanded from planned every 5th individual to all due to low volume
  2. Determining eligibility – must recall seeing a DMS in the corridor
  3. Recruitment – consent, commitment
  4. Completion of the main questionnaire,
  5. On-site data quality procedures – assure completion to limit non-response
  6. Distribution of incentives
**Data Collection: Survey Schedule** (1 of 2)

<table>
<thead>
<tr>
<th>State, Corridor</th>
<th>Survey Round, 2015 Dates</th>
<th>Safety Campaign Message Content*</th>
<th>Information Type</th>
</tr>
</thead>
</table>
| Nevada, I-80           | R1: 5/4-5/7  
R2: 10/5-10/7 | OUR GOAL IS ZERO FATALITIES ON NEVADA ROADS  
DRIVE SAFELY MAKE IT ZERO FATALITIES | General Safety                  |
| Minnesota/Wisconsin, I-94 | R1: 5/26-5/28 | EXTRA SEAT BELT PATROLS NOW, CLICK IT OR TICKET  
BUCKLE UP, ___ TRAFFIC DEATHS THIS YEAR | Seatbelt                        |
|                        | R2: 9/15-9/17;  
R3: 10/26-10/29 | WI REMINDS YOU TO MOVE OVER FOR EMERGENCY VEHICLES  
BUCKLE UP, ___ TRAFFIC DEATHS THIS YEAR  
JUST DRIVE, TEXTING CAN WAIT  
PLAN AHEAD DESIGNATE A SOBER DRIVER | Mixed: Seatbelt, Distracted Driving, DUI, EMS |

* Messages that were asked to be interpreted during surveys are shown in bold.
<table>
<thead>
<tr>
<th>State, Corridor</th>
<th>Survey Round, 2015 Dates</th>
<th>Safety Campaign Message Content*</th>
<th>Information Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kansas, I-70</td>
<td>R1: 7/6-7/9</td>
<td>MOVE OVER FOR HIGHWAY WORKERS</td>
<td>Work zone/ EMS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MOVE OVER FOR EMERGENCY VEHICLES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R2: 9/8-9/11</td>
<td>DON’T DRIVE DRUNK, ALCOHOL LAWS ENFORCED</td>
<td>DUI and EMS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MOVE OVER FOR EMERGENCY VEHICLES</td>
<td></td>
</tr>
<tr>
<td>Missouri**, I-44</td>
<td>R1: 7/13-7/15</td>
<td>It’s a Passing Lane...Not a Cruising Lane</td>
<td>Safe driving and Seatbelt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Passing on Left, Drive on Right</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changing Lanes? Show Me Your Blinker</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Turn Signals… The Original Instant Message</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unbuckled? Seriously?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Buckle Up, Windshields Hurt</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R2: 10/14-10/15</td>
<td>It’s No Trick, Seatbelts Are a Treat</td>
<td>Seatbelt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Buckle Up, Have a Nice Day</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>That Seat Belt Looks Good On You</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R3: 11/2-11/5</td>
<td>All Buckled, All Seats, All the Time</td>
<td>Seatbelt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>That Seat Belt Looks Good on You</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Buckle Up, Windshields Hurt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Give Thanks, Buckle Up, Drive Safely</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thanks for Wearing Your Seat Belt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thanks for Buckling Kids in Car Seats</td>
<td></td>
</tr>
</tbody>
</table>

* Messages that were asked to be interpreted during surveys are shown in bold.
** Missouri posts PSAs and safety messages in Title Case and not in ALL CAPS.
Statistical Analysis (1 of 2)

• Used SAS™ software for statistical analysis, with:
  ▪ Means/proportions as responses for survey questions
    − 5-point Leikert (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree)
    − Multiple choice (multiple responses allowed for some)
    − Yes/No
  ▪ Graphical summaries (histograms, bar charts)
  ▪ Separate reporting by corridor and survey round
Statistical Analysis (2 of 2)

• Analysis of Variance (ANOVA) modeling:
  ▪ Binary logistic model with odds ratios to determine likelihood of being in one response category (e.g., “Yes” or aggregate of “Strongly Agree” and “Agree”) compared to the other
  ▪ Separate models for each of the four corridors
  ▪ Included covariates for traveler type (infrequent, frequent, trucker), age (under 55 vs 55 and older), gender, survey round, and reported frequency of seeing DMS

• Repeatability of patterns across corridors provides evidence of universality
## Travelers Encountered and Survey Participants (1 of 2)

<table>
<thead>
<tr>
<th>State, Survey Round</th>
<th>Screener Results (Did not take survey)</th>
<th>Survey Responses</th>
<th>Total Travelers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Refused before determining eligibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eligible and Refused</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ineligible (did not see DMS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ineligible (did not travel on corridor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other barrier, e.g., language</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NV</td>
<td>R1 153</td>
<td>345</td>
<td>549</td>
</tr>
<tr>
<td></td>
<td>R2 23</td>
<td>125</td>
<td>93</td>
</tr>
<tr>
<td>MN/WI</td>
<td>R1 141</td>
<td>430</td>
<td>590</td>
</tr>
<tr>
<td></td>
<td>R2 53</td>
<td>194</td>
<td>233</td>
</tr>
<tr>
<td></td>
<td>R3 352</td>
<td>621</td>
<td>910</td>
</tr>
<tr>
<td>KS</td>
<td>R1 80</td>
<td>325</td>
<td>502</td>
</tr>
<tr>
<td></td>
<td>R2 30</td>
<td>128</td>
<td>216</td>
</tr>
<tr>
<td>MO</td>
<td>R1 141</td>
<td>322</td>
<td>503</td>
</tr>
<tr>
<td></td>
<td>R2 34</td>
<td>138</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>R3 304</td>
<td>773</td>
<td>1055</td>
</tr>
<tr>
<td>Total</td>
<td>1311</td>
<td>3401</td>
<td>5338</td>
</tr>
</tbody>
</table>
Travelers Encountered and Survey Participants (2 of 2)

![Bar chart showing traveler type percentages by site]

- **NV**: 41% Infrequent, 28% Frequent, 31% Truckers
- **MN/WI**: 40% Infrequent, 33% Frequent, 27% Truckers
- **KS**: 50% Infrequent, 29% Frequent, 22% Truckers
- **MO**: 50% Infrequent, 20% Frequent, 30% Truckers
Results – Frequency of Seeing Safety Campaign Messages

![Bar chart showing frequency of seeing safety campaign messages on DMSs for NV, MN/WI, KS, and MO. The chart indicates the percentage of people who see messages less than 1 time per month, 1-3 times per month, 1-3 times per week, and more than 3 times per week.]

- Nevada (NV): 36% (0-1 time per month), 28% (1-3 times per month), 23% (1-3 times per week), 13% (more than 3 times per week)
- Minnesota/Wisconsin (MN/WI): 26% (0-1 time per month), 34% (1-3 times per month), 25% (1-3 times per week), 15% (more than 3 times per week)
- Kansas (KS): 37% (0-1 time per month), 27% (1-3 times per month), 22% (1-3 times per week), 14% (more than 3 times per week)
- Missouri (MO): 38% (0-1 time per month), 26% (1-3 times per month), 22% (1-3 times per week), 13% (more than 3 times per week)
Results – Evaluation of Awareness

• Hypothesis: A significant percentage of travelers are aware that safety and PSA messages are included on DMS. (Supported)
  ▪ 77% of travelers encountered by the survey team had seen a DMS.

• Hypothesis: A significant percentage of travelers can correctly identify the actual safety or PSA message on the DMS in their corridor. (Supported)
  ▪ 79% of travelers from the four sites reported observing at least one of the safety-related messages, and not the “false” message.
  ▪ For 3 sites, infrequent travelers had the highest level of awareness, followed by frequent travelers and then truckers. In MO, order was frequent>truckers>infrequent.
Results – Evaluation of Understanding

- Hypothesis: Drivers can understand the messages on the DMS. *(Supported)*
  - 92% of travelers agreed or strongly agreed that the message was understandable.
  - 79% of travelers interpreted the message correctly.
    - Varies by state and message from high of 95% in MN/WI for “Click it or ticket” to low of 65% in MN/WI for “Move over for emergency vehicles”
    - Repeatable pattern across all corridors that more frequent DMS observation resulted in higher understanding rate
Results – Evaluation of Behavior Changes (1 of 2)

• Hypothesis: The display of a safety or PSA message on a DMS does not cause traffic to slow down or other congestion. **(Supported)**
  - 18% of travelers thought that they “slow down” or are slowed down by other traffic because of these DMS messages.
    - Ranged by corridor and survey round within corridor from 13% to 26%
Results – Evaluation of Behavior Changes (2 of 2)

- Hypothesis: The contents of a safety or PSA message cause a change in behavior of travelers (e.g., more aware, looking for license plates, etc.). *(Supported)*
  - 23% of travelers indicated that they changed their behavior after seeing the current campaign messages.
  - 54% of travelers indicated that seeing safety campaign messages on DMSs caused them to change their driving, in general.
    - On average, significantly less likely for infrequent travelers vs frequent travelers in all four corridors, significantly less so in all but MO
    - Though not significantly more in any corridor, frequent travelers in all four corridors more likely than truckers
  - Given high compliance rates (e.g., seat belt usage) the percentage of travelers changing behavior as a result of seeing a safety message is expected to be lower.
Results – Evaluation of Opinions (1 of 6)

• Hypothesis: Travelers believe that DMS for safety and PSA messages are appropriate. (Supported)
  
  - 90% of travelers agreed or strongly agreed that the specified safety message at each site was appropriate.
    - Travelers over age 55 were significantly more likely to consider the messages to be appropriate than younger travelers in Kansas, Minnesota/ Wisconsin and Missouri, while the opposite was found in Nevada (OUR GOAL IS ZERO FATALITIES ON NEVADA ROADS).
Results – Evaluation of Opinions (2 of 6)

• Hypothesis: Travelers believe that DMS should only be used for traffic-related messages. *(Not Supported)*

  ▪ 6% of travelers thought that only transportation-related messages should be displayed on DMSs.
    – Impact by traveler type was not statistically significant but in all states infrequent travelers and truckers were more likely to agree with this assertion than frequent travelers
    – Travelers 55 and under were more likely to think the DMS should only display traffic messages, significantly more so in Kansas and Missouri.
Results – Evaluation of Opinions (3 of 6)

- Hypothesis: Travelers believe that it would be more effective and/or less distracting to motorists to disseminate safety and PSA messages via other means. (Not Supported)
  - 73% of travelers indicated that DMSs are the “best” way of communicating safety-related information.
    - Other options included Online advertising/Email (2%), Printed advertising (1%), Radio/TV advertising (5%), and Static Signs (19%)
Results – Evaluation of Opinions (4 of 6)

• Hypothesis: Travelers perceive a value of safety and PSA messages on DMSs. *(Supported)*

  - 71% of travelers agreed or strongly agreed that the specified DMS raised their awareness of the issue.
    - MOVE OVER FOR EMERGENCY VEHICLES in MN/WI produced significantly higher awareness (80-84%) than CLICK IT OR TICKET (65%).
    - MOVE OVER FOR HIGHWAY WORKERS in KS produced significantly higher awareness (76%) than DON’T DRIVE DRUNK, ALCOHOL LAWS ENFORCED (66%).
Results – Evaluation of Opinions (5 of 6)

• Overall, only 24.7 percent agreed or strongly agreed that they were more likely to stop reading DMS after seeing the specified safety campaign message multiple times. By survey round at each location:
Results – Evaluation of Opinions (6 of 6)

• Overall, responses on what message types should be displayed on DMS:
  - Traffic messages (e.g., congestion, travel time to a destination, accident), 89%;
  - Safety-related messages (e.g., seat belts, distracted driving, work zone safety), 73%;
  - Weather messages (e.g., severe storms, icy conditions, windy conditions), 85%;
  - Missing person messages (e.g., AMBER alert, silver alert), 68%; and
  - Other messages (e.g., call 511, special event notice, ozone action day), 33%.
Recommendations (1 of 3)

- Results generally validate current practices for displaying public service announcements and safety messages on DMS in rural areas.
  - 73% of surveyed travelers support the use of DMS to display PSAs and safety-related information.
  - 73% of surveyed travelers think that DMS are the best way to communicate that information.
    - A few respondents indicated that they thought the specified PSAs and safety-related information were displayed too often.
  - For rural corridors with higher volumes, agencies may want to examine potential mobility and safety impacts caused by travelers slowing down to read DMS messages.
    - 18% of respondents reported this occurring.
Recommendations (2 of 3)

• Research findings suggest that displaying safety messages and PSAs more frequently would not be detrimental.
  ▪ About 23% of respondents indicated behavior changes after reading the safety message on the DMS.
  ▪ About 54% had changed their behavior in the past.
  ▪ Given high compliance rates with seatbelt use for example, this result is promising, and even a small percentage of travelers changing their behavior could result in a positive influence on highway safety.
  ▪ Many travelers who indicated that they did not change their behavior, anecdotally indicated that reading the safety message made them more conscious of driving in a safe manner.
Recommendations (3 of 3)

- More research is needed to examine the benefits of displaying catchy messages versus traditional messages.
  - Catchy messages (e.g., Unbuckled? Seriously?, etc.) were displayed in only one of the four survey corridors (MO), so could not separate findings for these type of messages from the MO-specific findings to conclude possible benefits or negative impacts.
  - Anecdotally, catchy messages were commented on by travelers surveyed in other states displaying traditional messages; most remembered those messages in a positive manner.
  - Catchy messages could also influence the negative comments about DMS being a distraction, however.
Point of Contact

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