Webinar #2
Effective Weather Messaging

April 16, 2018 | 12:30 – 1:30 EST
Speakers

Paul Pisano, FHWA
Road Weather and Work Zone Management Team Leader

Randy Graham, NWS Central Region
Deputy Chief of the Science and Technology Infusion Division

Jeff Williams, UDOT
Weather Operations and RWIS Manager
Weather-Savvy Roads Initiatives

Road weather management strategies that help agencies manage road systems and inform travelers ahead of and during adverse road weather conditions.

FHWA’s EDC Weather-Savvy Roads (WSR) Initiative

Pathfinder

Integrating Mobile Observations (IMO)
What is Pathfinder?

• **Collaboration** between the National Weather Service (NWS), State DOTs, and support contractors to share and translate forecasts into consistent public transportation impact statements

• Disseminates road weather information that is:
  • clear,
  • concise,
  • impact-based, and
  • consistent

**Intended Outcome** - Drivers are well informed and able to make safe and efficient travel decisions
What is Integrating Mobile Observations (IMO)?

Weather and road condition data collection from fleet vehicles for a more comprehensive view of network conditions

Advanced, vehicle-based technologies are deployed to collect, transmit, and use weather, road condition, and related vehicle data

Intended Outcome – Utilizing enhanced data for more informed system management (maintenance, traffic, asset, performance)
Winter Weather Events, Crashes and Traffic Impacts: Applying Environmental Communication Strategies to Winter Weather Messaging

Randy Graham
National Weather Service Central Region
NWS/UDOT Partnership

• Forecast Collaboration
  – UDOT participation in NWSChat
  – Coordinate threats and impact wording
  – **Consistent message in UDOT and NWS products** as well as on VMS signs
  – Winter weather
  – High wind events (I-80, I-15, US-50)
  – Dense fog around the Great Salt Lake
  – Wildfires

• Forecasts from NWS grids available on
  – UDOT Commuterlink site (xml from NWS)
  – UDOT 511 telephone system
  – Internal UDOT webpage for each mile post
Project Goals

• Quantify travel impacts associated with snowfall events
  • Crash rates, travel times, varied impacts based on time of day, day of week, snowfall intensity & road temperatures
  • Create crash & traffic climatology

• Leverage risk communication strategies to create improved NWS/UDOT messaging based on impacts
Weather & Travel – Why do we care?

• Nearly 23% of all auto accidents associated with winter weather events

• Annually, weather-related accidents result in:
  – 6,253 deaths, 480K+ injured & involve 1M people
  – Est costs = $5.7B in property damage, $3.1B for medical care & $8.2B for lost productivity

• Non-recurring traffic delays & congestion result in annual cost of $450 million in Salt Lake City

• Vast majority of high impact travel days in SLC are associated with inclement weather (UDOT)
Driver Awareness and Response to Winter Storms

• Two events were surveyed
  – Heavy snow event during PM commute
  – Freezing rain event during AM commute

• Phone surveys led by PEGUS Research

• 400 surveys completed per event
  – Awareness of weather forecast
  – Sources of weather and road information
  – Modification of travel plans
  – Perception of storm impacts & severity
Winter Storm Message Sources

- Queried about 11 possible sources of weather info
  - Personal (friends, social media)
  - Media (TV, radio)
  - Government (UDOT, NWS)

- Most heavily utilized sources
  - Personal observation – 59%
  - Local TV – 57%
  - Local radio – 43%
  - Government sources – 27%
Many indicated that they modified their travel plans.

<table>
<thead>
<tr>
<th>Type of Change</th>
<th>Percent</th>
</tr>
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<tbody>
<tr>
<td>Changed schedule</td>
<td>62%</td>
</tr>
<tr>
<td>Changed route</td>
<td>26%</td>
</tr>
<tr>
<td>Did not travel</td>
<td>13%</td>
</tr>
<tr>
<td>Used mass transit</td>
<td>6%</td>
</tr>
</tbody>
</table>
Actual Behavior Change

- Commute shifted by 2 hours
- Significant volume decrease
  - 43% less at typical peak
- Supports reported behavior
  - Peak before it began snowing!
- Predictor of behavior change
  - Government & personal sources
Data Analysis

• Cool seasons of 2013-14 through 2015-16

• Drew correlations between a variety of data sets
  – Weather data (visibility, current weather)
  – Road condition info (road temperature)
  – Traffic data from UDOT PeMS (flow, VMT)
  – Crash data

• Identified differences in crash frequency, commute times, delays for:
  – Storm versus non-storm days
  – Storms at different times of day
  – Storms on different days of the week
Results of Weather, Road, Traffic and Crash Data

- Weekdays were divided into 4 distinct travel periods
- Emphasis on AM and PM commute windows
- Saturdays showed a broad peak from 10 AM to 6 PM
  - VMT > than PM commutes
Crash Climatology for Snowfall Events

- Utilized visibility as proxy for snowfall intensity
  - Less than ~2 miles defined as ‘moderate’ snow by Transportation Canada and FAA

- With 2+ hours of Vsby < 2 miles
  - AM commute crashes ↑ by 8x
  - PM commute crashes ↑ by 3-4x
  - Commutes took 1.5-2x as long
  - Saturday crashes ↑ by 2x

- Need to have skillful forecasts!
Messaging Strategies

• Forecasts derive value from helping individuals, businesses & government make the best decision possible & change behavior when needed
  – *Forecasts “acquire value through their ability to influence the decisions made by users of the forecasts”* – Allan Murphy

• Current forecast messaging does not take advantage of risk messaging research
  • “A strong winter storm will result in significantly impaired travel conditions...”

• Extensive research available on a variety of approaches
Odds Ratios

• Presenting the likelihood of an event relative to the historical likelihood (i.e., 10x more likely to occur)

• People respond more to odds ratios than probabilities
  – Lipkus noted that risk of getting lung cancer from smoking is rather small, but it is much higher than for nonsmokers

• Expressing the increase in odds over climatology leads to better decisions for extreme & rare events

• Data analysis results utilized to create odds ratio messages
Normative Messaging

• Communication that activates social norms can be effective in producing beneficial conduct
  - People more likely to litter in a littered environment

• Communication must align descriptive norms (what people do) with injunctive norms (what people find un/acceptable)
  - Individuals tend to do what is approved by society & popular
  - Should avoid messaging that highlights common offenses
  - Message must be present when desired behavior is expected

• Utilized this strategy to reference positive behavior change such as many changing their commute
Threat Appeals

• Threat messages are “persuasive messages that arouse fear” with the intention of motivating behavior change

• Mixed results from this strategy
  – Some research shows that these can paralyze individuals
  – Others have shown that they play role in individual response

• Key seems to be related to self efficacy

• Explored mild threat appeals using words & imagery
  – Tried to emphasize self-efficacy
Visual Priming

• Imagery can “prime” an individual to take action when paired with an effective message

• Those with experience with an event (tornadoes, winter storms) are less likely to take action than those with no experience

• When visually primed with damage imagery both all are more likely to take protective action

• Implications for winter weather travel appeals
  – Accident imagery
  – Traffic backup imagery
  – Avoid strong threat imagery
UDOT Communication Platforms

• UDOT Messaging Platforms
  – Variable Message Signs (VMS)
  – Social Media
  – Website and 511 phone service

• Created messaging examples for each platform for consideration

• Allowed for different approaches which leveraged the strengths of the medium used

• Messages assessed by 3 communication experts
  – Dr. Jen Henderson
  – Dr. Susan Jasko
  – Dr. Julie Demuth
Variable Message Signs

• Variable Message Signs (VMS)
  – Need to be simple
  – Need to capture attention
  – UDOT has history of using humor
  – Research found that majority indicated messages are useful
  – Communicate ahead of impacts
  – Assertive messages most effective (fines, fatalities)

- Your really important message goes here!
- Ice to meet you! Snowy AM commute = 8x as many crashes
- Like to sleep in? Great idea. Avoid AM commute
Website and 511 Phone Service

- Allow for a bit more verbose messages
  - Normative appeals
  - Odds ratios

It’s going to be a snowy commute tomorrow morning. Join thousands of other savvy commuters in shifting your commute time, taking mass transit, or staying home. You’ve got options.
Social Media Messages

Like your car? Good thing.

Snowy commutes can take 2x as long

Change your commute, save your time
Potential Social Media Examples

*Where would you rather be?*

Here?

or here?

Join thousands of others in choosing safety for themselves and their neighbors. Avoid the snowy AM commute.
Crash risk is 8x greater during a snowy AM commute!
• Noted increase in crash risk & travel times associated with winter weather events that occur during weekday commutes & Saturday peak travel window

• Risk communication messages can be crafted for specific dissemination platforms utilizing travel & crash information & proven risk communication techniques

• Review of preliminary messages by risk communication experts supported the idea that this approach has the potential to improve driver response
Utah President’s Day Storm 2018

Utah Pathfinder Partners
Utah Department of Transportation
Weathernet
National Weather Service – Salt Lake City
President’s Day - Utah Traffic Patterns

7 Major Ski Resorts
- All within 40 minutes of SLC airport
- 2nd Busiest Ski Holiday
- Estimated 50% increase compared to normal ski weekends

St. George, Utah
- 3-4 hour drive from Salt Lake
- Las Vegas Climate
2017 vs. 2018 President’s Day Weather

2017

Unorganized and mild winter storm
- High mountain road snow impacts, valley rain showers
- St. George weekend weather: Highs 50s with rain showers

2018

Large winter storm from late Sun through Tue morning
- Up to 25” of snow ski resorts and valley benches
- St. George weekend weather: Highs 60s, sunny and dry
Friday-Saturday “Vehicle Miles Traveled”  
Wasatch Front Metro to St. George

President’s Day Weekend 2017 vs. 2018  
Friday and Saturday Southbound Travel  
I-15 SB MP 250 (Scipio) - MP 0 (St. George)

VMT stands for Vehicle Miles Traveled. It is a sum of the total miles that were driven in a certain area.
3:15 PM
In-TOC Weather Briefing

3:30 PM
Plan of Action made with UDOT managers

PEAK ROAD WEATHER IMPACTS
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- **5:00 AM**: "Fatality Friday" VMS messages posted
- **12:00 PM**: SLC NWS WFO Conference Call
- **1:00 PM**: Pre-storm VMS messages posted
- **1:30 PM**: Weathernet issues Road Weather Alert
- **3:29 PM**: SLC NWS issues Winter Storm Watch
- **2:30 PM**: UDOT Weather Brief posted

**ZERO FATALITIES**
THE ONLY ACCEPTABLE GOAL

**20 FATALITIES ON UTAH ROADS IN 2018**

WEATHERNET
Pre-Storm VMS Signs Posted

- **Region 1**: WINTER STORM SUN PM - MON AM PLAN TRAVEL
  - Expires: Sunday 9:00 AM
- **Region 2**: WINTER STORM SUN PM THRU MON PLAN TRAVEL
  - Expires (for R2): Sunday 12:00 PM
  - Expires (for R3): Sunday 3:00 PM
- **Region 3**: WINTER STORM MONDAY PLAN TRAVEL
  - Expires: Sunday 6:00 PM

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U.S. DOT
Keeping Utah Moving
3:29 AM
SLC NWS updates Winter Storm Watch

12:00 PM
SLC NWS WFO Conference Call

3:00 PM
In-TOC Weather Briefing

3:53 PM
SLC NWS issues Winter Storm Warning

PEAK ROAD WEATHER IMPACTS
PEAK ROAD WEATHER IMPACTS

- Cold front enters far northern Utah in the late morning
- Rain/snow, mostly wet roads until at least sunset
- Increasing impacts along the Wasatch Front as the night progressed
PEAK ROAD WEATHER IMPACTS

- Cold front progresses through the state
- Moist orographic-driven snowfall begins in areas behind the front
- Lake effect off the Great Salt Lake begins in the evening
- Cold front has exited the state
- Early morning lake effect off the Great Salt Lake and Utah Lake slows the morning commute
- Pockets of snowfall across the state in the A.M. in mostly moist orographic flow.
- Most snowfall ends by late morning
Sunday – Tuesday “Vehicle Miles Traveled”
St. George to Wasatch Front Metro

President’s Day Weekend 2017 vs. 2018
Sunday-Tuesday Northbound Travel
I-15 NB MP 0 (St. George) - 250 (Scipio)

Sunday +50.1%
Monday (holiday) -5.4%
Tuesday +61.8%
Questions?

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WSR Resources

Checkout our latest fact sheets and case studies!

- IMO Materials ([https://go.usa.gov/xn58V](https://go.usa.gov/xn58V))
  - Getting Data into the Weather Data Environment
  - Leveraging Communication Systems – Nevada DOT Case Study
  - Using the National Architecture for Implementing WSR
  - WSR Benefits and Costs
- Pathfinder Materials ([https://go.usa.gov/xnS8m](https://go.usa.gov/xnS8m))
  - Pathfinder Overview
  - Colorado’s Pathfinder Process
  - Managing the Total Solar Eclipse – Wyoming DOT Case Study
  - WSR Benefits and Costs

Mark your calendars for these upcoming events!

- Pathfinder Summit - Salt Lake City, UT (June 26 – 27, 2018)

Interested in hosting or participating in an in-person or virtual workshop or peer exchange?

Contact Paul.Pisano@dot.gov

More materials and events coming soon – continue to check out the WSR toolkit for the latest information.
WSR Toolkit

Access the toolkit from FHWA’s Road Weather Management Exchange Website!

https://go.usa.gov/xnSqw
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