Winter Weather Events, Crashes and Traffic Impacts: Applying Environmental Communication Strategies to Winter Weather Messaging

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2018 Pathfinder Summit
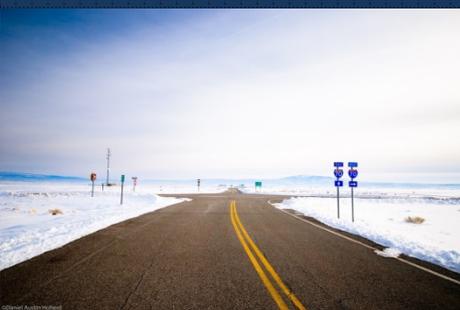
Project Goals

- 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)

UDOT Flow Data - 27 Feb 2017
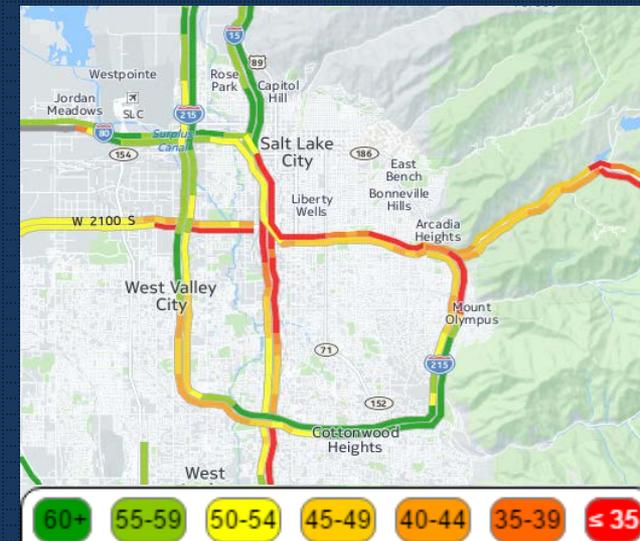
Driver Awareness and Response to Winter Storms

- 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
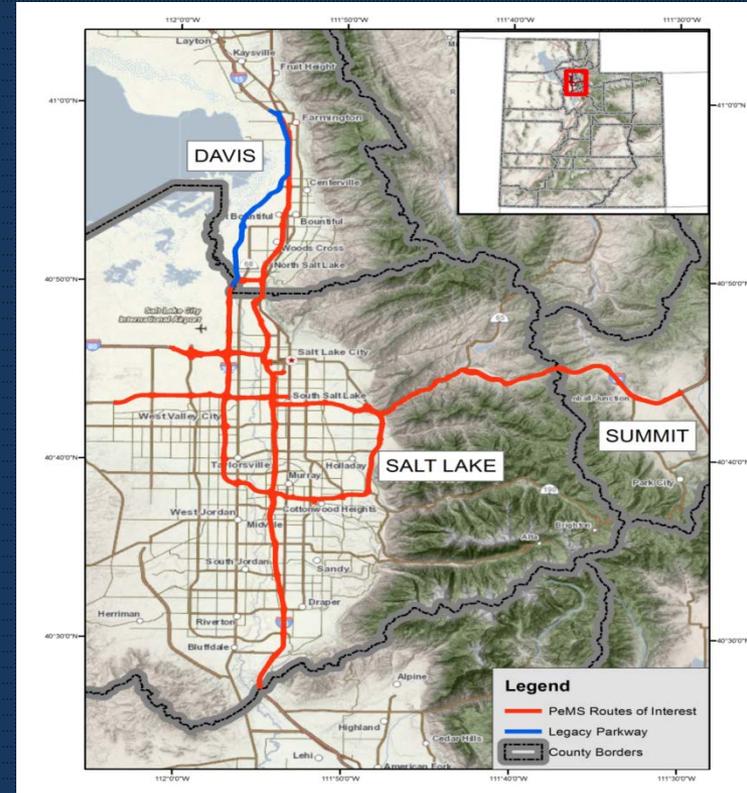
Winter Storm Message Sources

- 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%

Check the Source!

Self-reported Behavior Change

Many indicated that they modified their travel plans

Type of Change	Percent
Changed schedule	62%
Changed route	26%
Did not travel	13%
Used mass transit	6%

Actual Behavior Change

PeMS Data across Salt Lake City Metro Area

Aggregate Vehicle Miles Traveled
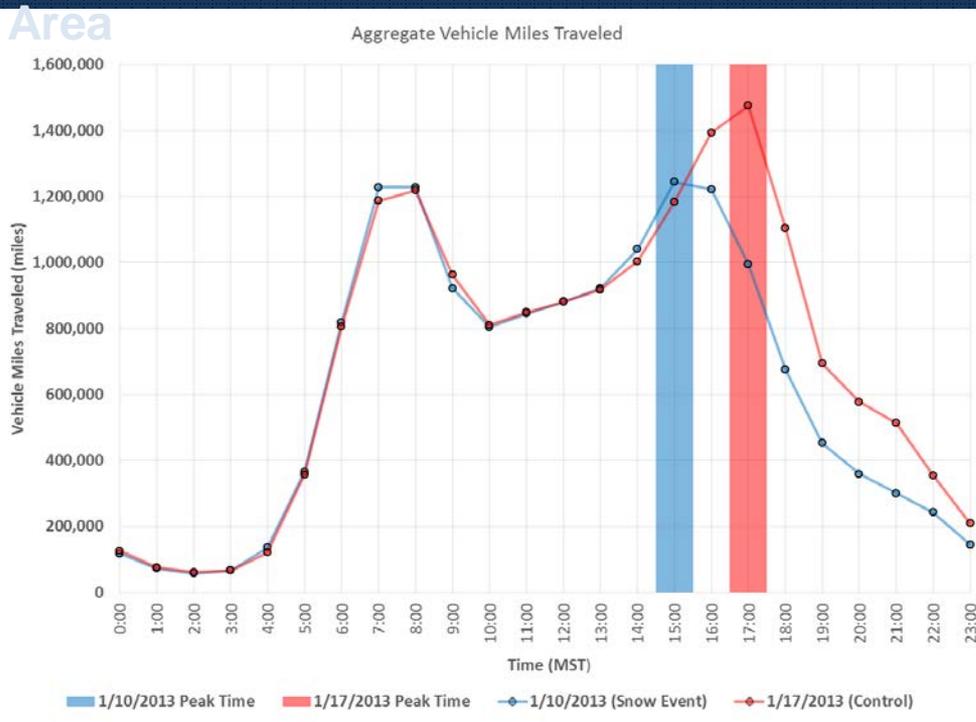
- Commute shifted by 2 hours

- 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

Vehicle Miles Traveled by Time of Day
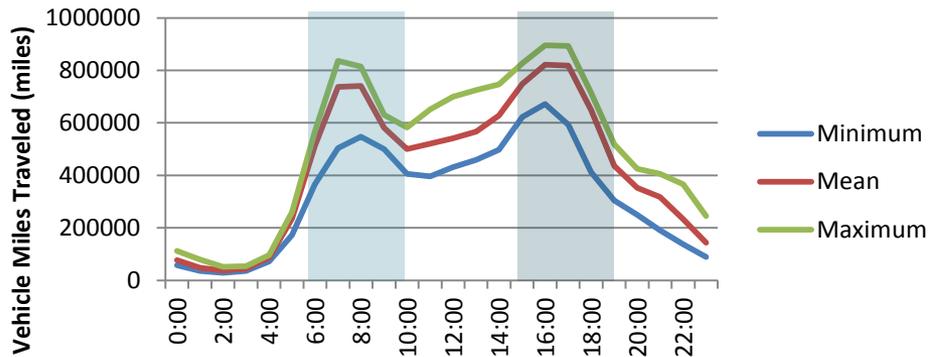
Average Vehicle Miles Traveled - Saturday's

- 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!

Average Crashes - Time of Day vs Hours with Visibility < 2 miles

Chart: Crashes per day (y-axis, 0 to 120) vs Length of time with visibility < 2 miles (x-axis: Zero (dry day), Any length, 2+ hours, 4+ hours). Legend: 5-11 AM (blue), 3-9 PM (red).

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

KEEP CALM AND THE ODDS BE EVER IN YOUR FAVOR

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

Terrie, 51
North Carolina

Before it's too late. wwf.org
WWF

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

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

- Variable Message Signs (VMS)
  - Limited number of characters
  - Need to capture attention
  - UDOT has history of using humor
  - Research found that majority indicated messages are useful
  - Assertive messages most effective (fines, fatalities)

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.

Briefing 1_9_2013 1200.jpg
TRAVEL WEATHER HIGHLIGHTS
UDOT / Northwest Weathernet
Forecast Period: 2 A.M. Thu. - Noon Fri.   Updated: 11 P.M. Tue., 1/9/13

Road Snow, Blowing Snow and Reduced Visibilities Thursday Afternoon Through Friday

Peak Road Snow Along the I-15 Corridor 5 P.M – 11 P.M Thursday

Road Snow, Blowing Snow and Reduced Visibilities Thursday Night Through Friday

Low Caution – Minimal to no weather related travel concerns

Moderate Caution – Minor/Intermittent weather related travel concerns

High Caution – Impaired Travel Expected

Statewide Road Snow Event Thursday and Friday

Social Media Messages

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!

3
Things

- 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