

Understanding Public Hurricane Evacuation Decisions and Responses to Forecast and Warning Messages

Motivation and Background

To help improve hurricane risk communication, we investigated:

- How people respond to different types of hurricane risk messages; and How audience differences, such as cultural worldviews and past hurricane experience, influence responses to approaching hurricanes.

We examined these issues in a simplified experimental context by testing hypothetical hurricane messages in a survey of at-risk members of the public.

The study design and data analysis is informed by current challenges in weather risk communication, as well as concepts and theories from the social sciences (e.g., Extended Parallel Process Model, Cultural Theory of Risk).

Research Design and Survey Measures

Data Collection

- The survey targeted residents of evacuation zones A and B in Miami-Dade County, FL (Fig. 1).
- Data collection was managed by a survey research company; participants were invited via postal mail and responded online.
- The survey was fielded Nov 2011–Jan 2012 in English and Spanish (n=255).

Survey Design

- Each respondent was shown a randomly assigned combination of test messages about the same hypothetical hurricane (Fig. 3, 4).
- Respondents were then asked questions to measure their:
- <u>Evacuation intention</u> (protective response): Likelihood of evacuating
- <u>Negative reactance</u> (emotional, defensive response): perception that the information is "overblown"
- <u>Cognitive risk perceptions</u>: perceived likelihood and severity of threat
- <u>Negative affective risk perceptions</u>: worry, fear, anxiety, dread
- Response and self efficacy: beliefs about their ability to effectively protect against the threat
- Respondents were also asked questions to measure their:
- <u>Cultural worldviews</u> (Fig. 2)
- Past hurricane experience: past evacuation, injury, damage, other financial losses, emotional impacts, overall severity of impacts
- Sociodemographic characteristics and other factors



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- *Individualism*: e.g., "The government interferes too much in our everyday lives."
- *Egalitarianism*: e.g., "The world would be a more peaceful place if its wealth were divided more equally among nations."
- Fig. 2. Two cultural worldviews examined in study, with an example measure for each

Test messages

- Respondents were informed that Julia is a Category 4 hurricane that may affect Miami within 48 hours.
- Each respondent received one of the two NHC graphics in Fig. 3.
- Along with one graphic, each respondent was also assigned to receive or not receive each of the four textual messages in Fig. 4.

55%LANDFALL: "There is a 55% chance that the eye of the hurricane will make landfall in Miami-Dade County."

or more inland."

SURGEIMPACTS: "This storm surge will be extremely violent, destructive, and deadly. If you live in an area at risk from storm surge and you stay in the area, you may die. Essential services such as food and water, electricity, transportation, communication, etc. may not be available for several weeks or longer." EVACPROTECT: "If you live in an area at risk from storm surge or flooding, evacuation is the most effective way to protect yourself and your family."

Fig. 4. Four textual messages. Respondents could receive any combination, including all or none.

Key results include:

- 4FTSURGE message: Increased evacuation intent, but not as much as SURGEIMPACTS (Fig. 5)
- SURGEIMPACTS message: Increased evacuation intent
- but also increased perceptions that message is overblown (negative reactance)





Fig. 3. Graphics: CONELINE (left) or no-CONELINE (right)

4FTSURGE: "There will be storm surge of 4 feet or higher along coastal areas, reaching as much as a mile

Individualism Fig. 7. Evacuation intent vs. individualist worldview Past hurricane experience Past hurricane evacuation experience was associated with: Higher risk perceptions and efficacy \rightarrow higher evacuation intent Past emotional impacts due to a hurricane were associated with: Higher negative affect and lower self efficacy, counteracting \rightarrow no effect on evacuation intent For more information, see: risk perception and efficacy beliefs: A mediation analysis. Submitted to *Weather, Climate, and Society*. interactions with other information of and responses to hurricane risks

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Results – Effects of Worldviews and Experience



Cultural worldviews

- Individualism had a significant effect on responses to the scenario
- Stronger individualist worldviews were associated with:
- Lower evacuation intent (Fig. 7)
- Higher negative reactance
- Lower risk perceptions (cognitive and negative affective),
- Lower response and self efficacy

Different aspects of hurricane experience were interrelated, and some reported emotional impacts despite having no tangible experiences (Fig. 8)



– Morss, R. E., J. L. Demuth, J. K. Lazo, K. Dickinson, H. Lazrus, and B. H. Morrow, 2016: Understanding public hurricane evacuation decisions and responses to forecast and warning messages. Weather and Forecasting, **31**, 395-417. Demuth, J. L., R. E. Morss, J. K. Lazo, and C. Trumbo: The effects of past hurricane experiences on evacuation intentions through

- Morss, R. E., H. Lazrus, J. L. Demuth, and A. Bostrom: Cultural worldviews and hurricane risks. In preparation.

Summary

Overall, the results indicate that: Extreme-impacts messages may help motivate protective behaviors as hurricane approaches, but can also have unintended effects Probabilistic messages can have unintended effects, e.g., through

Worldviews and experiences can significantly influence people's perceptions

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