

Unlocking the socioeconomic benefits of improved weather forecasts

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Overview



- **Why societal and economic research and applications (SERA) for high impact weather forecasts?**
- **Unlocking the benefits of forecasts through improved communication of information**
 - ▣ Applications and research, informing each other
- **More vulnerable populations**
- **Example research questions and projects**
- **Next steps**

Why High Impact Weather forecasts?

- **“A new paradigm for the coming decades is for end-users and scientists (both physical and social scientists) to work together toward also providing improved, explicit impact forecasts.”**

(U.S. National Research Council report, *When Weather Matters*, 2010)

- **“Communicating *the science* of hurricane threats is not the same as communicating *what people need to know* to effectively respond to hurricane risks.”**

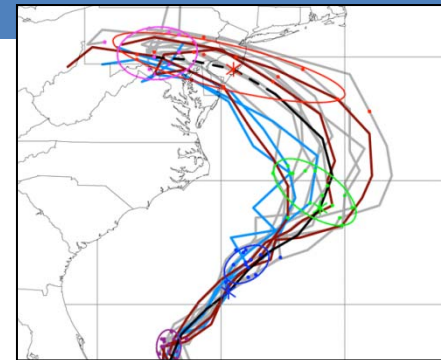
(Demuth, Morss, Morrow, Lazo, *BAMS*, 2012)



Why High Impact Weather forecasts?

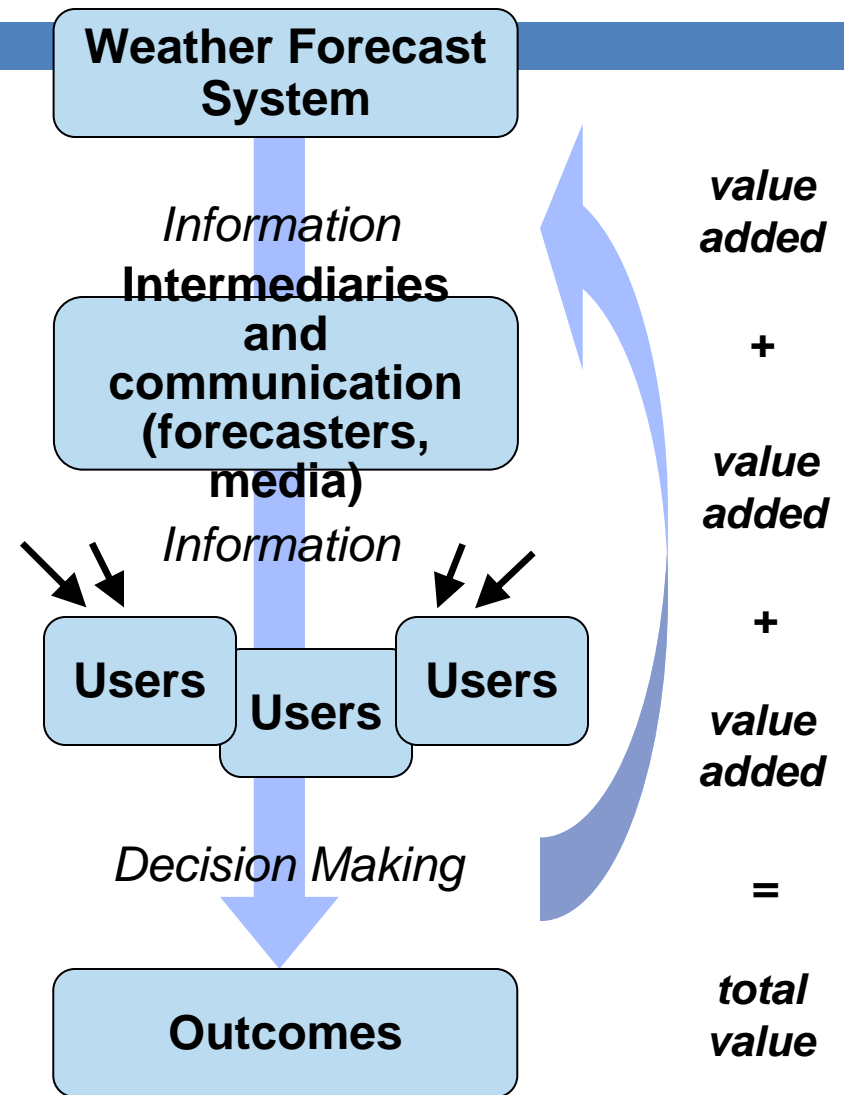
- “[People] want to know three things: what does it mean to them, what does it mean to their family, and what do they need to do right now. And so don’t speak like a meteorologist. Tell me what we need to know.”

(U.S. television meteorologist interviewee in Demuth et al., *BAMS*, 2012)



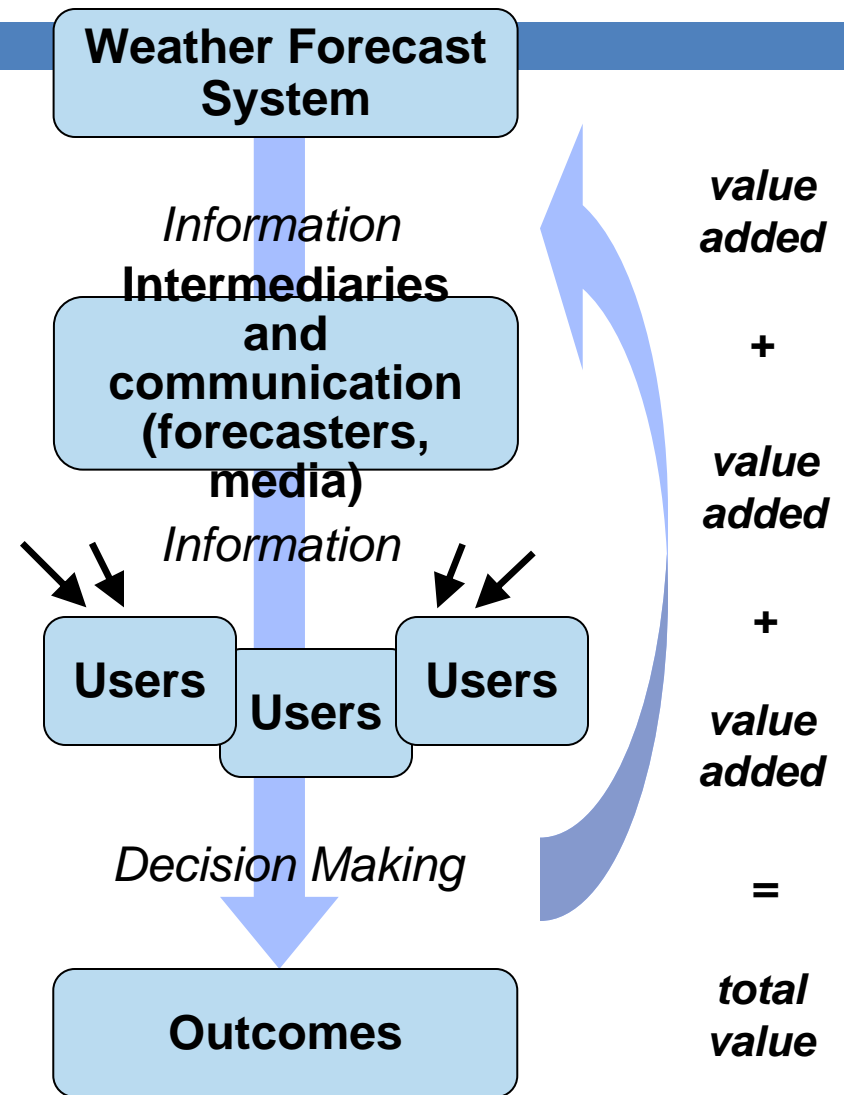
Unlocking the benefits of forecasts

- **Weather forecast information (usually) has value through being used in decisions**
 - ▣ By users — in specific application sectors, in civic protection, and by *members of the public*



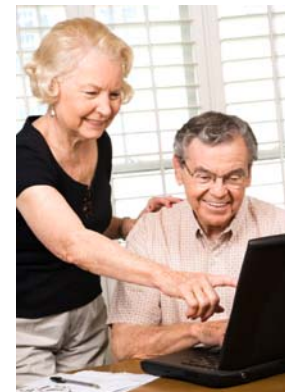
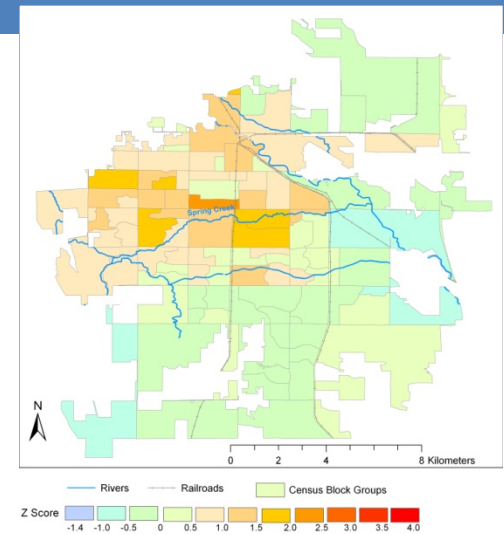
Unlocking the benefits of forecasts

- To enhance benefits of (current and improved) weather forecasts
 - ▣ Understand and improve generation, communication, interpretation, and use of forecasts
 - ▣ Includes assessing socioeconomic value, as part of an iterative process



Diversity of users: Vulnerable populations

- **Vulnerability:** Susceptibility to harm
 - ▣ **Exposure:** Conditions of the natural and built environment that influence severity of harm
 - ▣ **Sensitivity:** The degree to which people are affected
 - ▣ **Adaptive/coping capacity:** The ability of people to modify their behaviors to better manage high-impact weather (e.g., by proactively responding to approaching weather)
- Dynamic, complex, varies widely
 - ▣ Vulnerability to different aspects of weather
 - ▣ Adaptive/coping capacity → agency, *resilience*
 - ▣ Who is left behind?



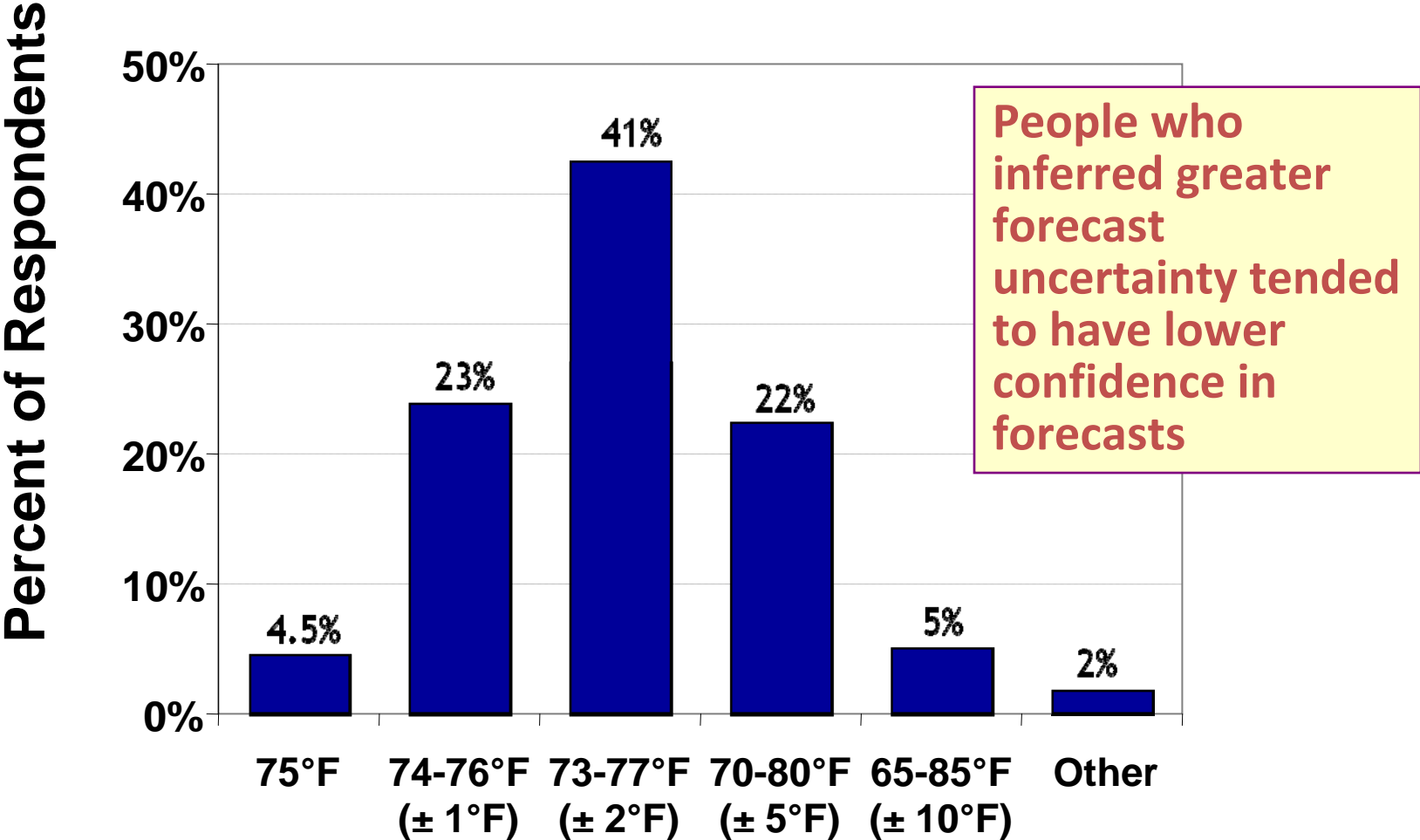
Morss, Wilhelmi, Meehl, Dilling (*Annual Review of Environment and Resources*, 2011)
Lazrus, Morrow, Morss, Lazo (*Weather, Climate, and Society*, 2012)

Example questions

- What is the value of (improved) forecasts?
- How do people perceive and interpret forecast information?
 - ▣ What do they (not) like, want, prefer? What do they think is understandable, useful, appealing, etc.? What do they think a forecast means?
- How do people use forecast information?
 - ▣ How does information influence their decision outcomes and process? (intended / self-reported and actual)
- Integrate meteorology and social sciences
 - ▣ Many (inter)disciplinary perspectives, theories, approaches, methods, etc. (qualitative and quantitative)

Suppose the forecast high temperature for tomorrow for your area is 75°F.

What do you think the actual high temperature will be?

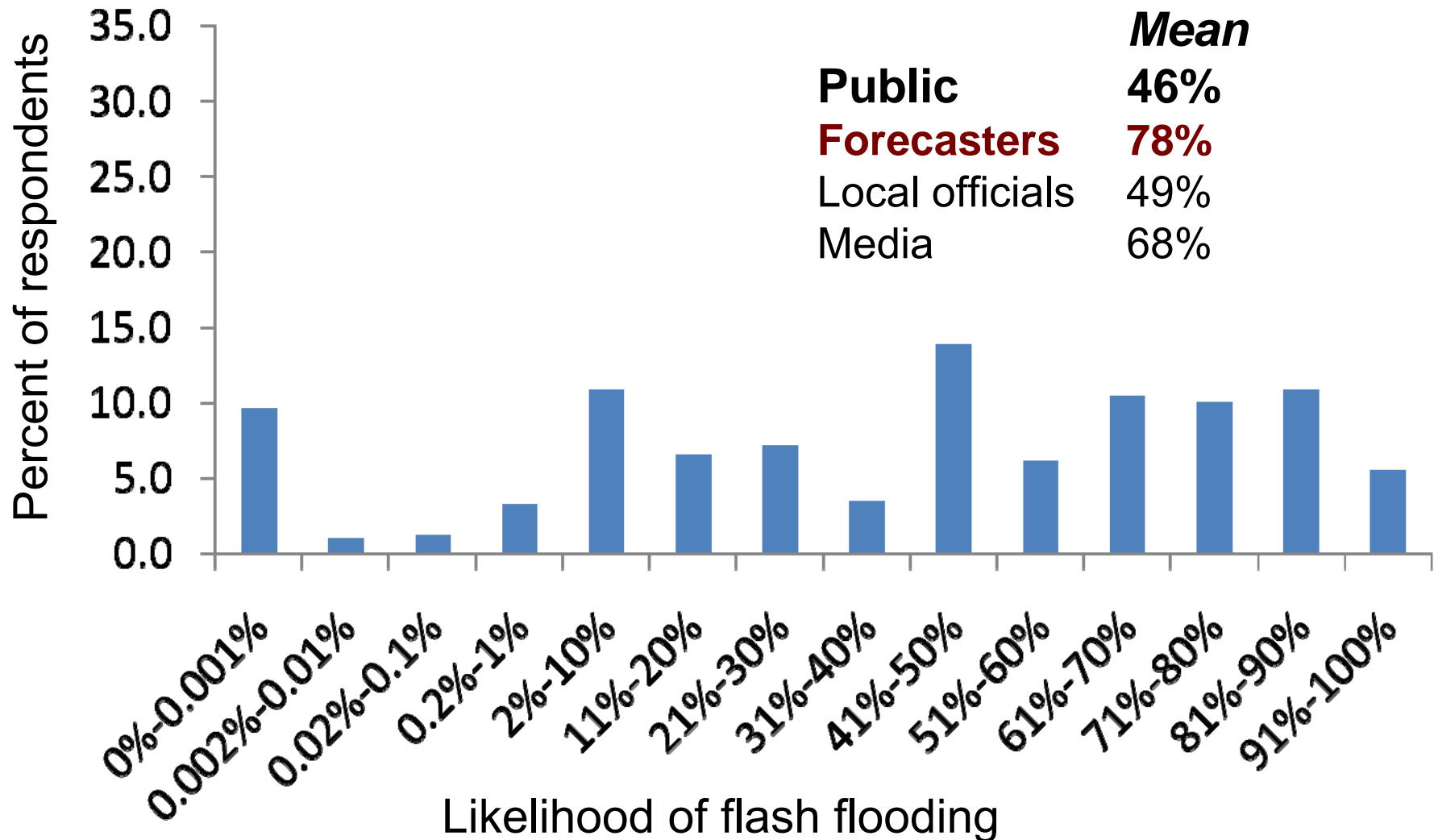


Morss, Demuth, Lazo (*Weather and Forecasting*, 2008)

If a warning is issued, how likely is flash flooding in the next 24 hours?

	<i>Mean</i>
Public	46%
Forecasters	78%
Local officials	49%
Media	68%

If a warning is issued, how likely is flash flooding in the next 24 hours?

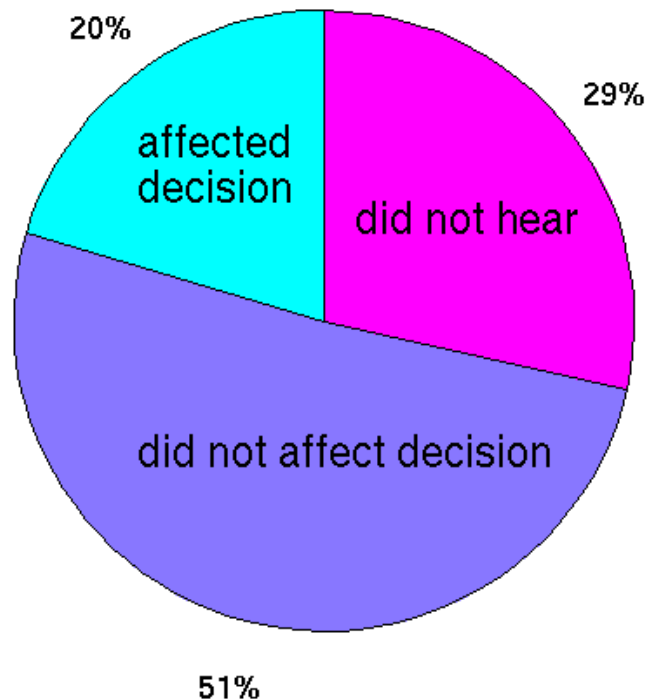


Hurricane Ike: 20+ foot storm surge predicted

Local National Weather Service: “Persons not heeding evacuation orders ... will [may] face certain death.”

If heard statement prior to Ike:

- ▣ Did it affect your decision to prepare or evacuate? How?



- ▣ What was your opinion of this statement?

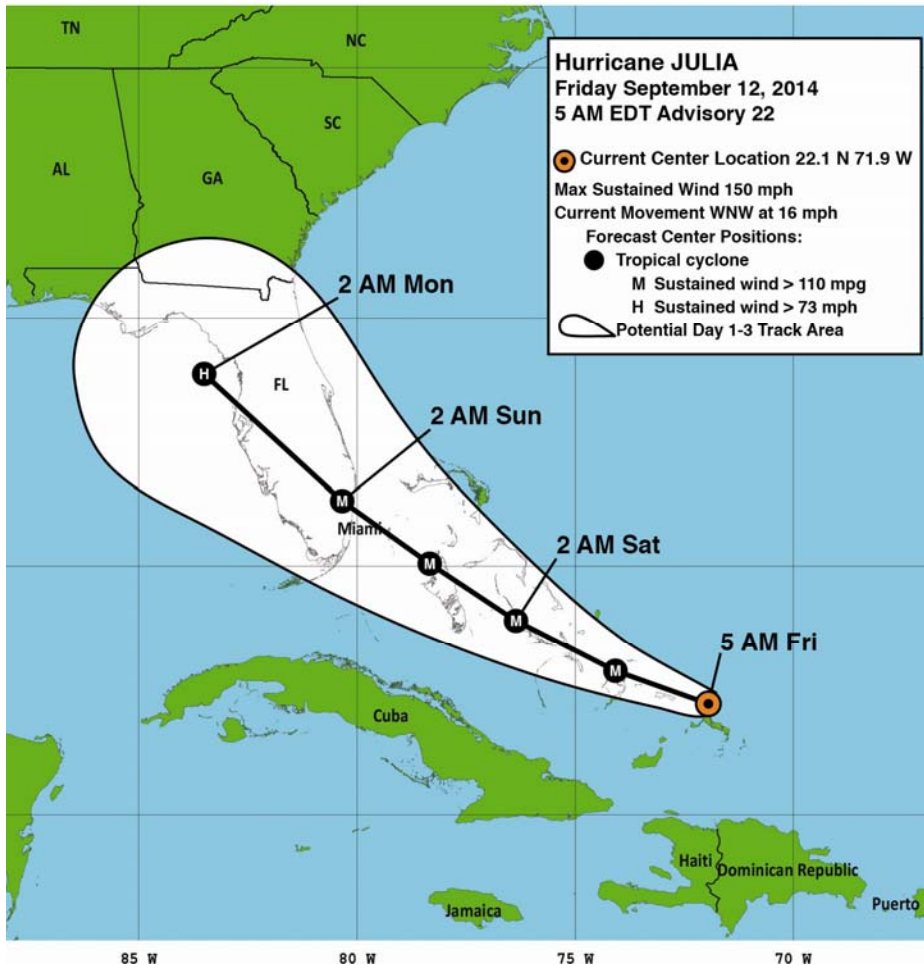
- ~40% positive: “scared you to death”
- ~40% negative: “overblown”, “rude”

- ▣ Many didn't adequately prepare for flooding

- “I never dreamed of 7 feet of water”

Testing Experimental Hurricane Forecast Messages

All respondents received “cone of uncertainty”, *with or without center line*

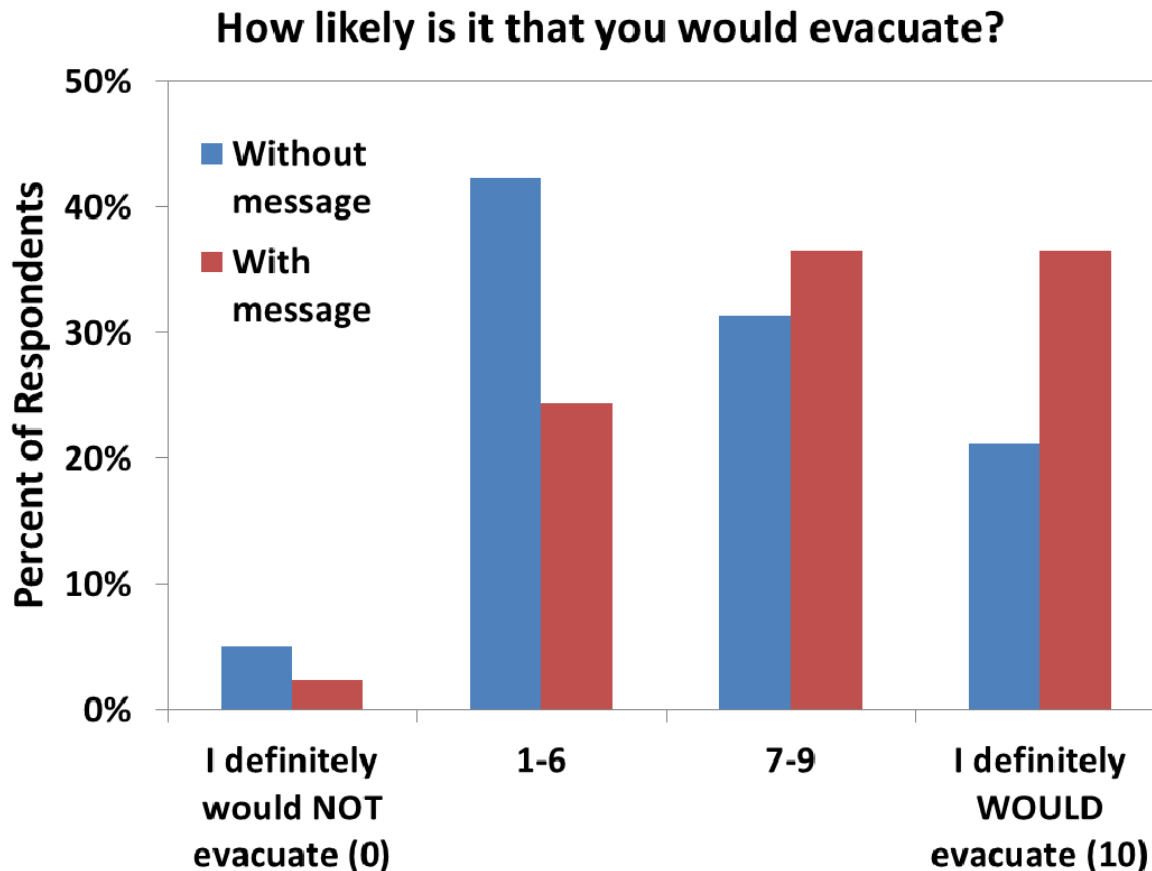


Some respondents also received:

- There is a *55% chance that the eye of the hurricane will make landfall in Miami-Dade County.*
- There will be *storm surge of 4 feet or higher* along coastal areas, reaching as much as a mile or more inland.
- *This storm surge will be extremely violent, destructive, and deadly. If ... you stay in the area, you may die. Essential services ... may not be available for several weeks or longer.*
- 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.*

Testing Experimental Hurricane Forecast Messages

Message: This storm surge will be extremely violent, destructive, and deadly. If ... you stay in the area, you may die. Essential services ... may not be available for several weeks or longer.



- Likelihood of evacuation: 7.4 → 8.6
- Damages will be devastating: 4.9 → 5.4
- Information is overblown: 2.4 → 2.8
- Source is reliable: 5.9 → 5.5

(all significant at <5% level)

Next steps

- Integrate relevant societal / social sciences expertise early
- Studies examining high impact weather – society problems in multiple countries
 - ▣ Focusing on different types of high impact weather, problems, users
 - ▣ Applying different approaches, disciplines, methods, etc.
- Develop and demonstrate methods to track changes through forecasts → communication → uses → outcomes
- Funding, in collaboration with meteorology

