Impact of Warnings on Severe Weather Preparedness:

Kimberly Riek and Ethan Wilkinson

Introduction

- **Severe weather warnings are critical items issued by the National Weather Service as an alert method for hazardous conditions/situations.**
- **Effective warnings can help to improve public preparedness.**
- **Public interpretation of how warnings are communicated and trust of the forecast plays a big role in the effectiveness of warnings.**
- **Someone's experiences with severe weather impacts how they respond to future weather warnings/alerts.**

Questions Posed:

Science Questions:

- **Are parameters set for severe storm classifications well understood by the public?**
- **Have improved technologies, such as Numerica Weather Prediction models, made any impact on increasing warning lead times?**

Impacts Questions:

- **How does the use of impact-based warnings versus strictly hazard-based criteria affect public response?**
- **How does past experiences with severe weather impact response to weather alerts/warnings?**

Impacts Results:

- **Past Experiences – Beneficial vs. Harmful:**
  - **Constant exposure to outcomes contribute to a better familiarity with the hazards; people may feel that they are more competent, take more risks, and are hesitant to respond to warnings.**
  - **Experiences with false alarm/near-miss (Fig. 3) weather evacuations appear to not affect perception of risk; many stated that they would make few changes to their future evacuation plans.**
- **Boosted Public Understanding:**
  - **Impact based warnings help describe what the physical hazard is and how it will impact you, the people.**
  - **Providing context about impacts themselves can increase likelihood of people taking better protective measures.**
- **Mixed Results:**
  - **Little change compared to traditional hazards-based warnings. Effectiveness is likely based on how message of warning is communicated. (Fig. 4)**

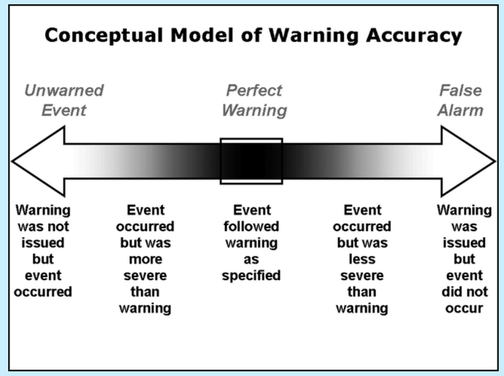

Figure 3: Conceptual Model of Warning Accuracy

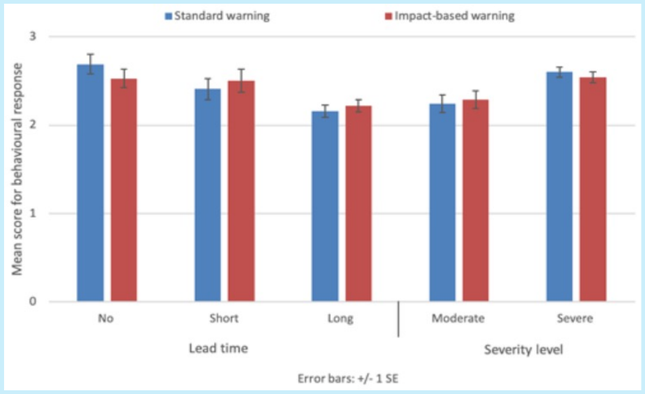

Figure 4: Comparison of Standard Warning vs. Impact Based Warning with difference in lead time

Science Results:

- **Great Confusion on Meaning of Warning:**
  - **Study from The University of Nebraska-Lincoln shows 50% of people surveyed in Mid-South could not accurately describe what a Tornado Warning entailed.**
  - **Uncertainty is high between Watch vs. Warning.**
- **National Weather Service Posts for Understanding Categories: (Fig. 1)**
- **Increased Lead Times With "New" Forecasting Methods:**
  - **Warn On Forecast used NWP models to predict storms earlier and allow for increased lead time.**
- **Watch to Warning Gap:**
  - **Typically a 15 minute lead time – relying on current radar and observations.**
  - **With Warn On Forecast NWP results – over 1 hour lead time, increasing time for preparedness decision making. (Fig. 2)**

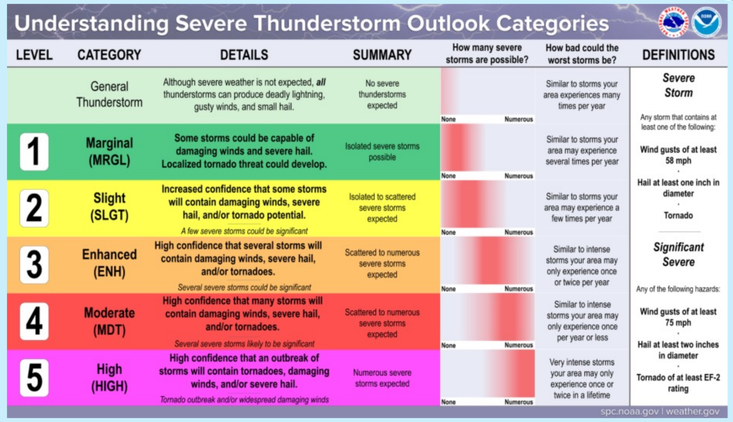

Figure 1: Understanding Severe Thunderstorm Outlook Categories, NWS

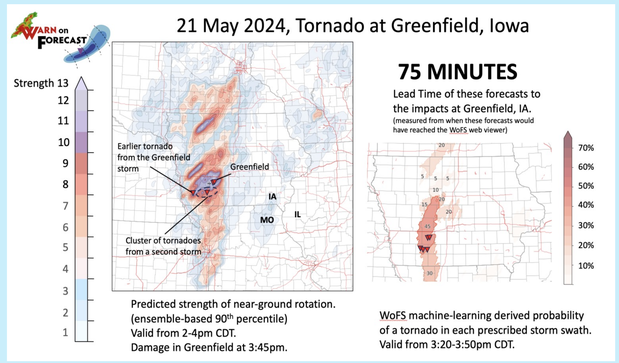

Figure 2: Warn On Forecast Lead Time Project NSSL Simulation Results

Conclusions

- **Confusion found within the general public over watch vs. warning.**
- **Continued efforts to revamp forecasting methods to increase lead time for severe thunderstorms and tornadoes.**
- **Impacts Based Warnings can help better explain hazards but have not been as effective as initially intended.**
- **An increased tendency to follow future warnings are affected by both an increase in information and an increase in understanding of one's vulnerability of the hazard.**

References

(1) Barnes, L. R., Gruntfest, E. C., Hayden, M. H., Schultz, D. M., & Benight, C. (2007). False Alarms and Close Calls: A Conceptual Model of Warning Accuracy. *Weather and Forecasting*, *22*(5), 1140–1147

(2) Kox, T., & Thieken, A. H. (2017). To Act or Not To Act? Factors Influencing the General Public's Decision about Whether to Take Protective Action against Severe Weather. *Weather, Climate, and Society*, *9*(2), 299–315

(3) Lussenden, H. B. (2014, July). *GEOGRAPHIC DIFFERENCES IN EMERGENCY MANAGEMENT DECISION-MAKING: A CASE STUDY OF SEVERE WEATHER IN THE MIDWEST.*

(4) NOAA. (2024, May 29). *THE WARN-ON-FORECAST SYSTEM: A Weather Forecasting Moonshot – NSSL News*. Noaa.gov

(5) Potter, S., Harrison, S., & Kreft, P. (2021). The benefits and challenges of implementing impact-based severe weather warning systems: Perspectives of weather, flood, and emergency management personnel. *Weather, Climate, and Society*, *13*(2)

(6) University of Nebraska-Lincoln. (2024, May 9). *Take cover! Survey shows tornado warnings widely misunderstood.* ScienceDaily.