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Social Science and Severe Weather: Evaluating a New Tornado Risk Communication Tool

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More tornadoes occur in the U.S. than any other country. One of the most recent and dramatic was the tornado that struck Joplin, Mo., on May 22, 2011, when 159 people were killed and more than 1,000 injured. The extraordinary number of casualties resulting from the tornado in spite of multiple and early warnings was puzzling. The National Weather Service (NWS) determined the need for improved communication after the disaster, including the creation of a new set of warnings based on the predicted severity of a future storm in the hopes

of prompting more people to take immediate action. As a result, the NWS developed the impact-based warning (IBW) system to enhance traditional tornado watch and warning information and support the decision-making needs of NWS partners, namely emergency managers and broadcast reporters.

Sea Grant's Great Lakes Social Science Network evaluated the IBW product throughout the NWS Central Region in 2013. The study revealed the product's effectiveness throughout the NWS Central Region, which includes 14 states and 38 weather forecast offices. The evaluation data were collected using focus groups, interviews and surveys of NWS weather forecasters, emergency managers and broadcast reporters. Analysis of the data revealed factors that both limit and contribute to the product's effectiveness and modifications needed for improvement.

Overall, emergency managers and broadcast reporters were more satisfied with the IBW product than were weather forecasters. Surveys asked respondents to rate their satisfaction with the ability of the IBW product to convey information about items such as magnitude, timing, history and duration of the storm. The satisfaction items are listed in *Table 1*. *Figure 1* displays the relative satisfaction among emergency managers, broadcast reporters and weather forecasters for each item. Satisfaction was rated on a scale of 1-5 where 1 is not at all satisfied and 5 is extremely satisfied. The items are listed in order of satisfaction. The three user groups were least satisfied with the IBW product's ability to convey storm duration, forecaster confidence and storm history, and most satisfied with its ability to convey relative storm severity, location and timing.

Effective elements of Impact-Based Warnings (IBW):

- Differentiation between severity levels
- Efficiency of impact statements to communicate a threat
- Source of severe weather information (e.g., storm spotter, radar)
- Language that is simple, concise and attention-grabbing

Modifications suggested:

- In-person impact-based warning (IBW) product trainings for weather forecasters
- Greater emphasis on damage threat tags and other important information within the warning product by placing that information first
- Improved relevancy of impact statements for diverse regions, including rural areas and places with smaller, short-lived tornadoes



Figure 1. Satisfaction with IBW product by emergency managers, broadcast media and weather forecasters
 Weather forecasters were least satisfied with the IBW product. They expressed concern about their accountability to provide accurate information. They were also concerned about a systematic decision-making framework, the need for trained spotter reports and in-person training to use the product.

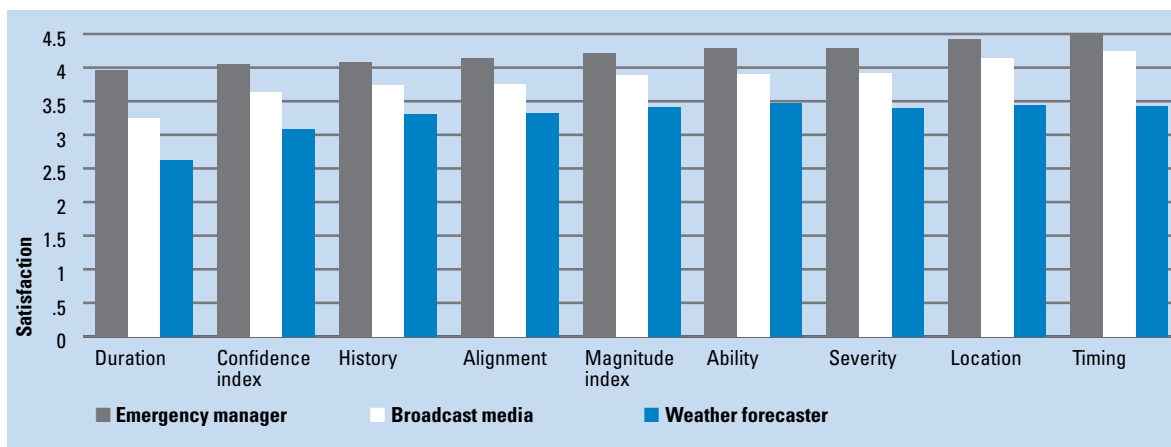


Table 1: IBW Satisfaction items

IBW satisfaction item	IBW survey item
Duration	Ability of NWS impact statement to convey duration (how long storm will last)
Confidence	Ability of NWS impact statement to convey confidence (how confident is the NWS forecaster)
History	Ability of NWS impact statement to convey storm history (what damage/impacts has the storm had so far)
Alignment	Alignment of NWS impact statement with tornado damage threat tag
Magnitude	Ability of NWS impact statement to convey magnitude (potential size)
Ability	The ability of NWS threat tags and impact statements to convey needed information about thunderstorm and tornado impacts
Severity	The addition of the words “CONSIDERABLE” and “CATASTROPHIC” to convey increased severity of impacts during a NWS tornado warning
Location	Ability of NWS impact statement to convey location (where storm will hit)
Timing	Ability of NWS impact statements to convey timing (when storm will hit an area)

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