

The effect of uncertainty information and graphic design on decision-making

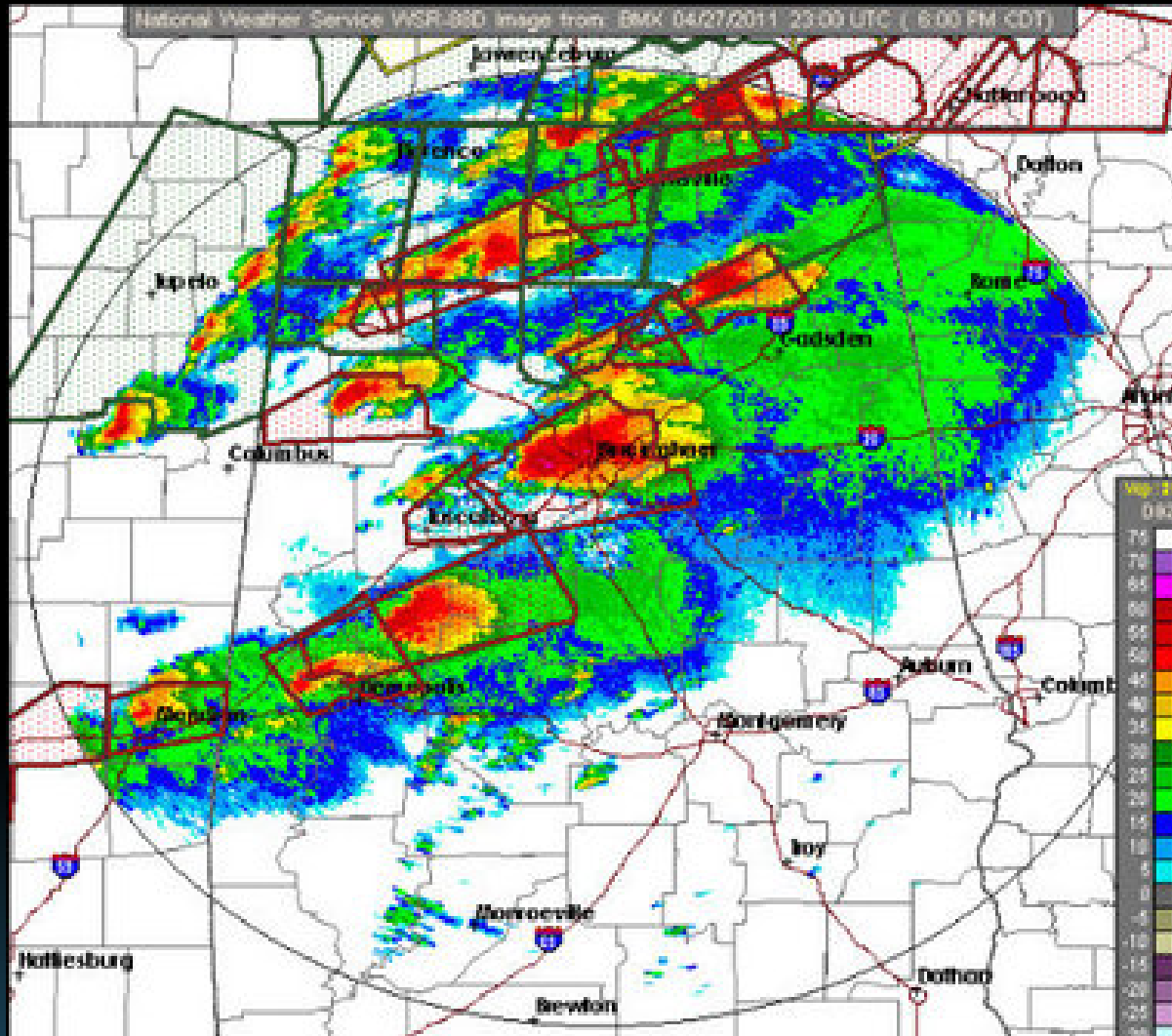
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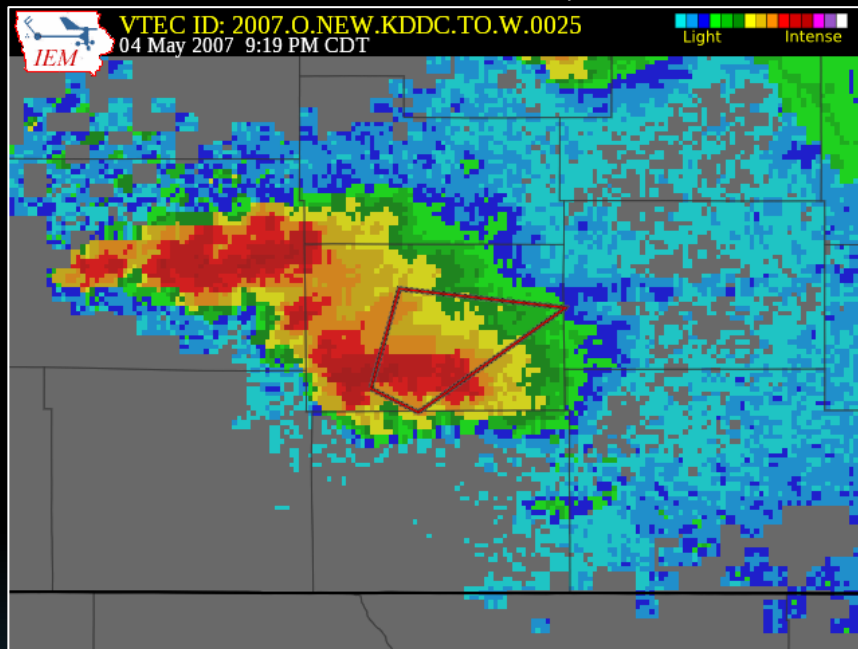
Motivation: Research for Operations



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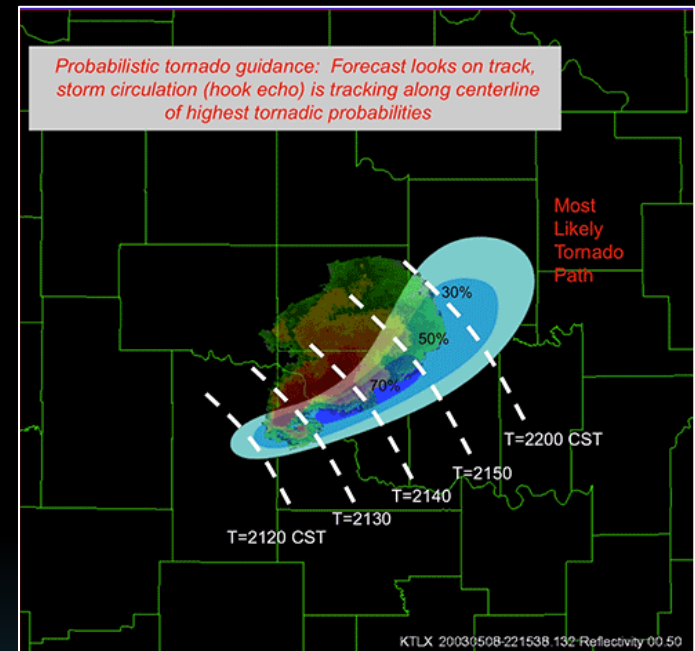
What might the effects be of each of these ways of depicting tornado risk?

From Iowa State University



Current warning technique:
Warn-on-detection

From Stensrud et al. 2009



Future alerting technique:
"Warn"-on-forecast

Motivation: Research for Operations

Specific questions:

-How does warning *length* influence the perception of risk within and outside the warning?

-How does the inclusion of *uncertainty information* change the perception of risk over the warning space?

-How do symbolic risk elements, such as *color*, influence the perception of risk?

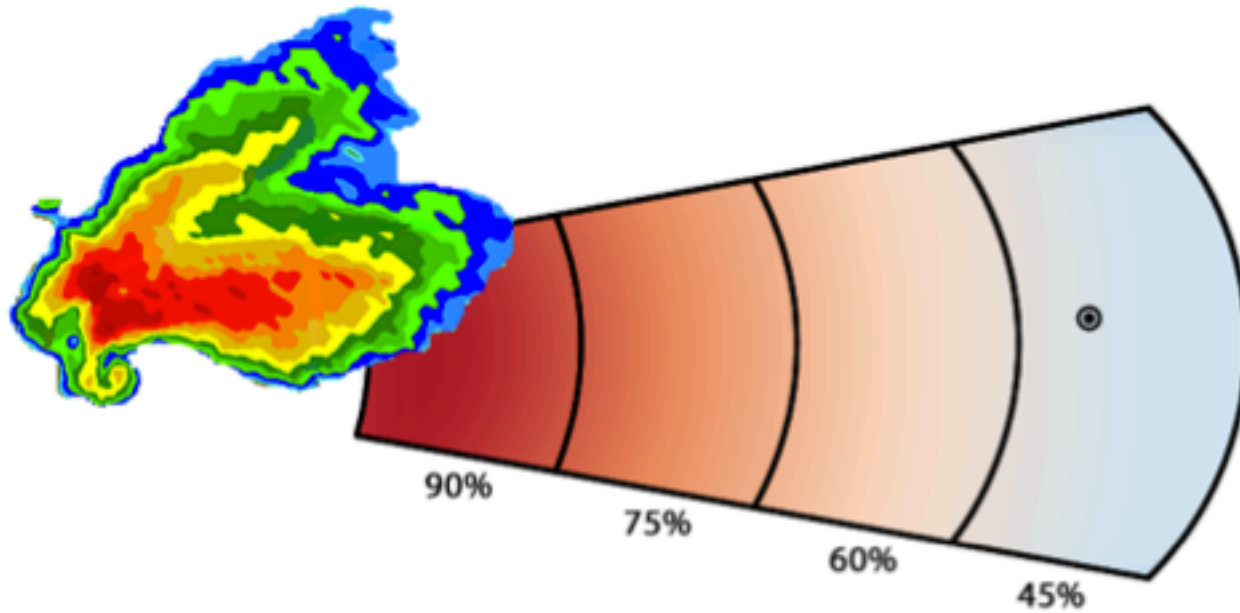
In general: What kinds of warning policies might we consider targeting in the future?

Experimental method

Choice scenario

- Participants decide whether or not to order an aircraft hangar to shut down operations and **protect for a tornado**
- **Cost/loss**: \$3000 to protect, \$6000 loss if a tornado hits and you failed to protect
 - Should protect if the probability is 50% or above
- **Simplified** scenario compared to real-life: No dynamic choices considered.
- Sampling method: **Web interface**, census-balanced panel provided by SSI*
 - N = 5564 participants

Tornado Warning Experiment

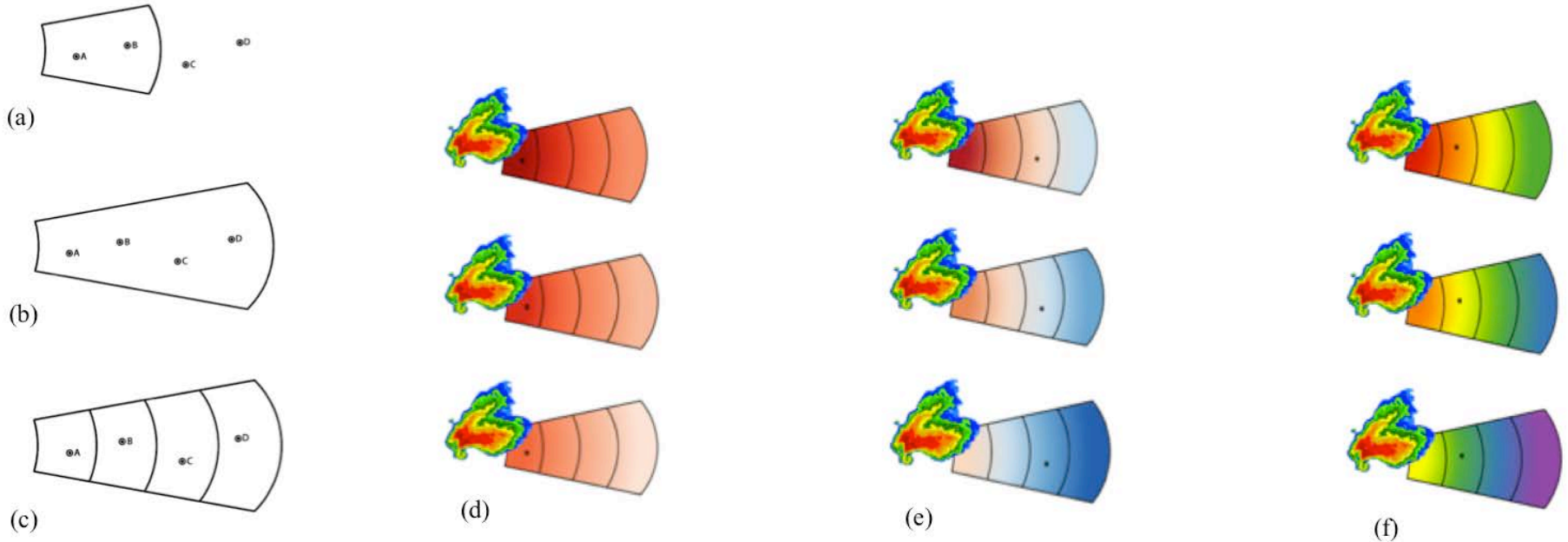


There is a low chance of a tornado at your location.

Protect

Do Not Protect

Decision experiments



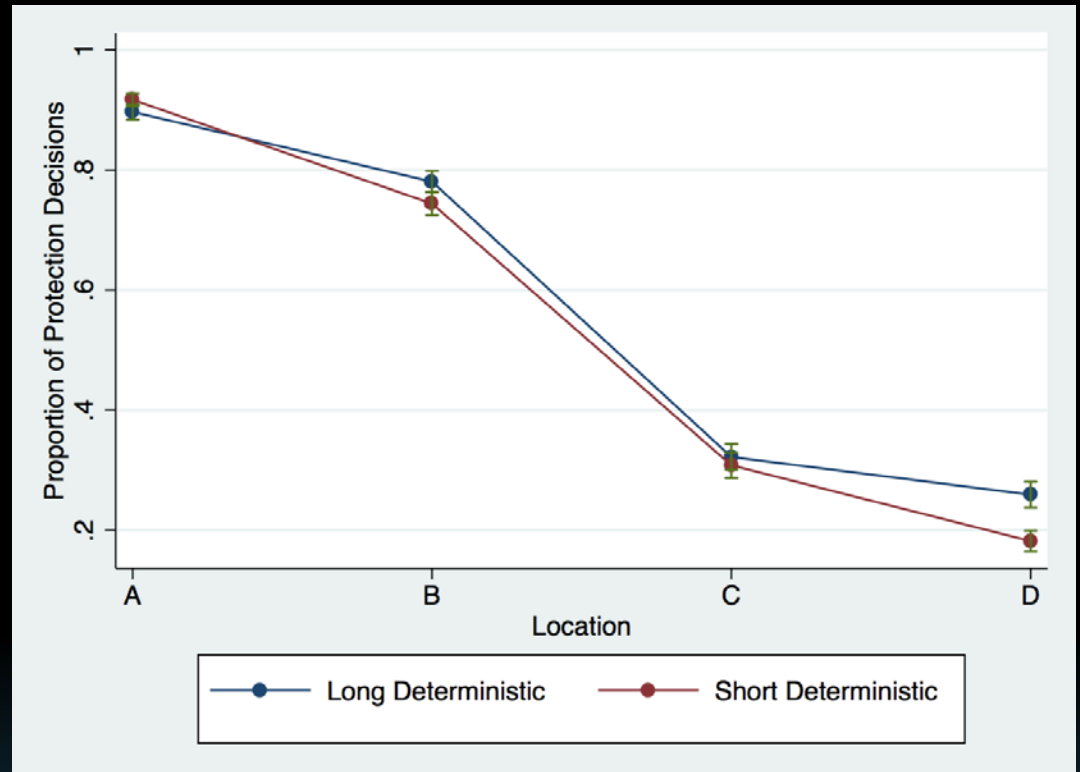
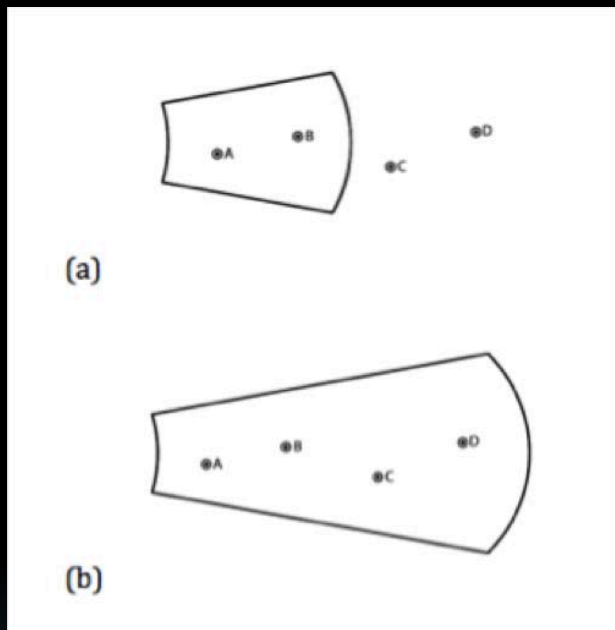
Half of the sample received simple verbal guidance:

A storm either had a “high” or “low” chance of producing a tornado.

Verbal guidance followed the decision criterion assigned in the experiment (50%).

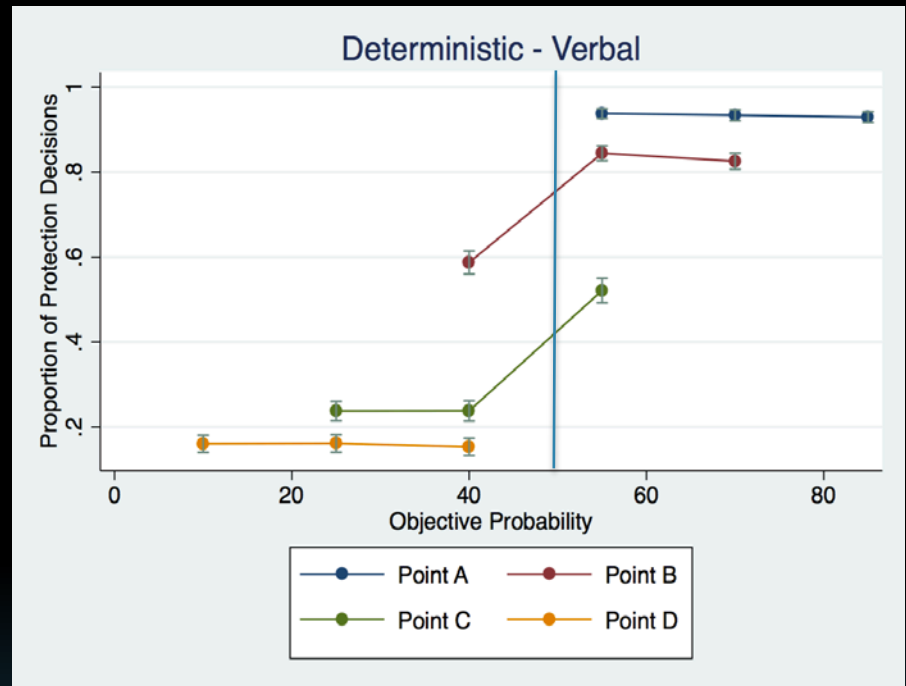
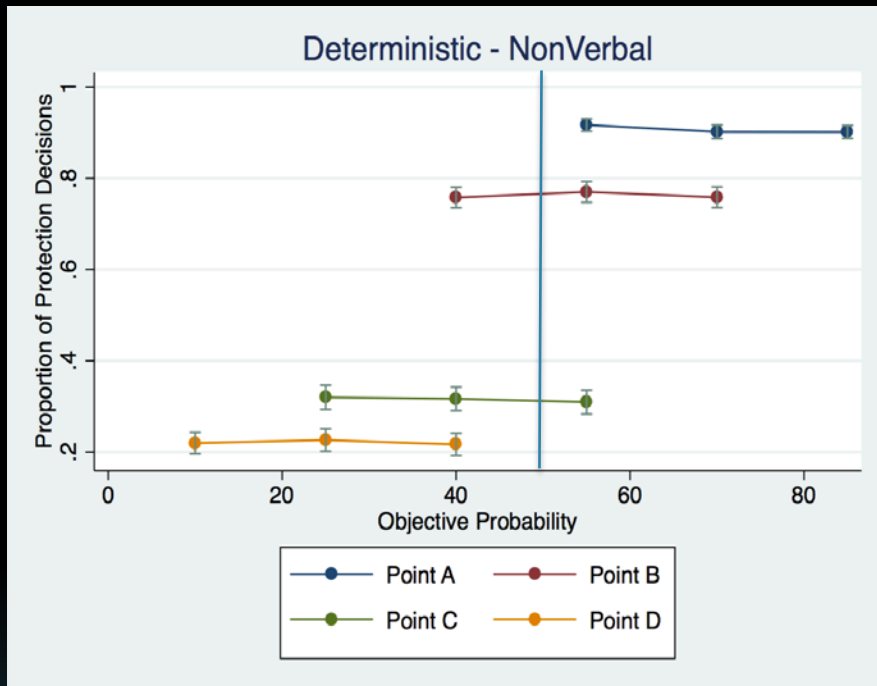
Decision experiments

Effect of distance and boundary inclusion/exclusion



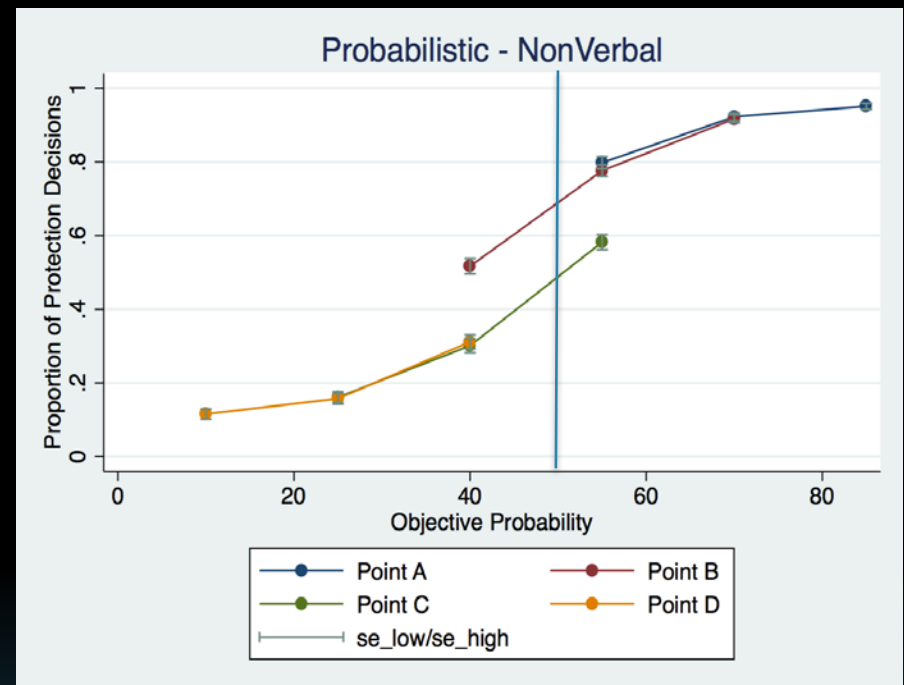
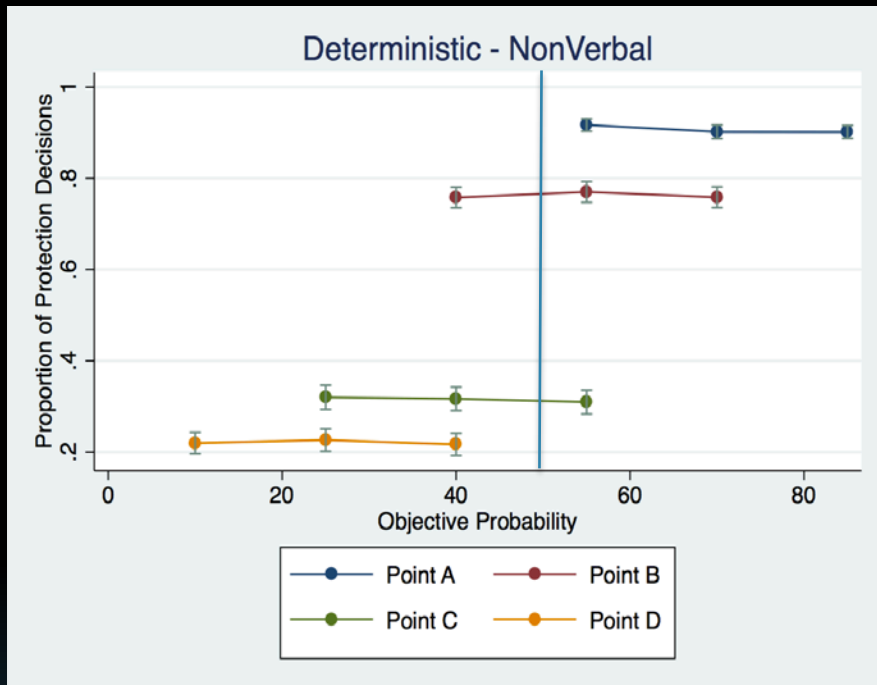
Decision experiments

Effect of verbal guidance

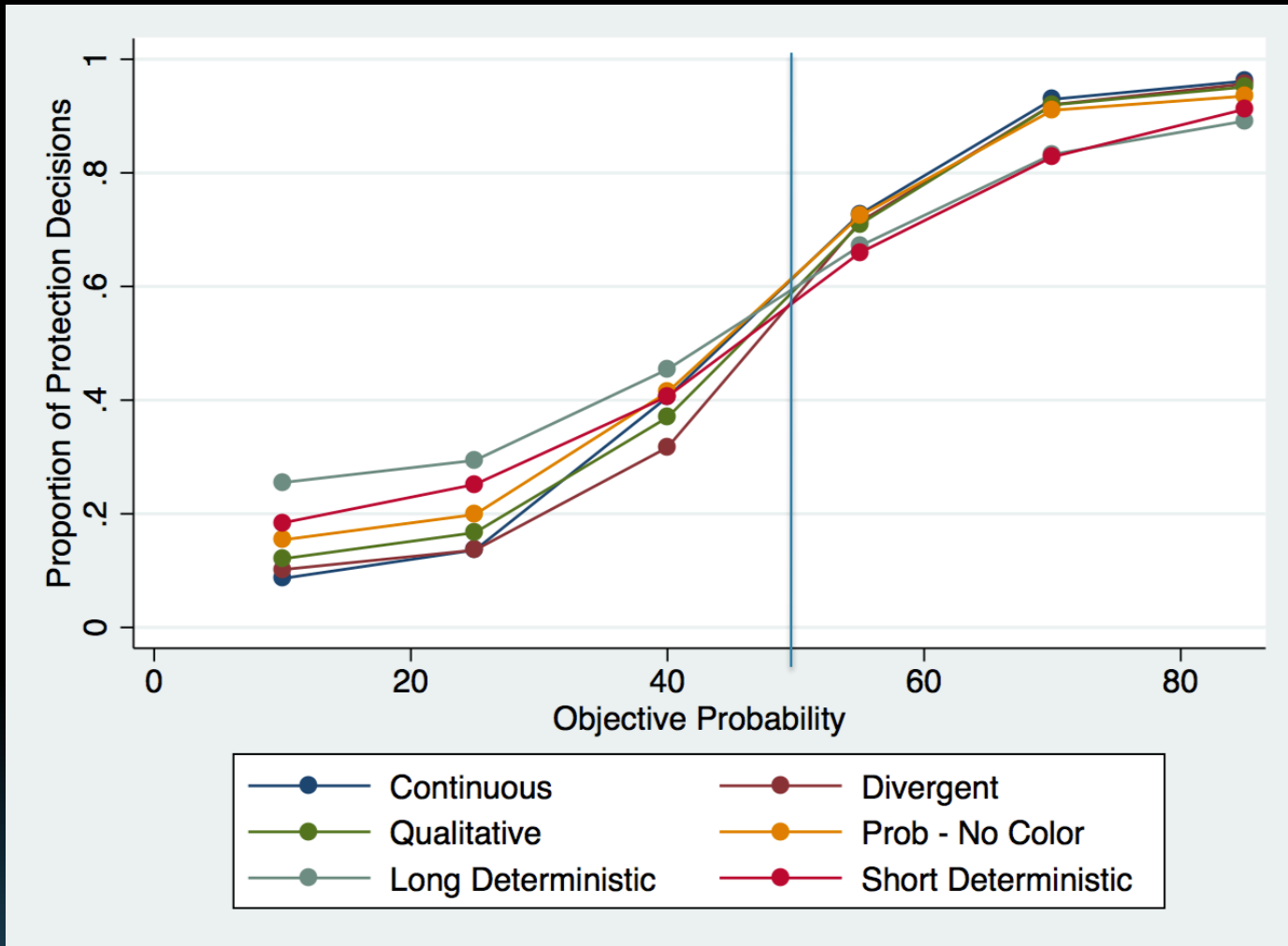


Decision experiments

Effect of probabilistic information



Decision experiments

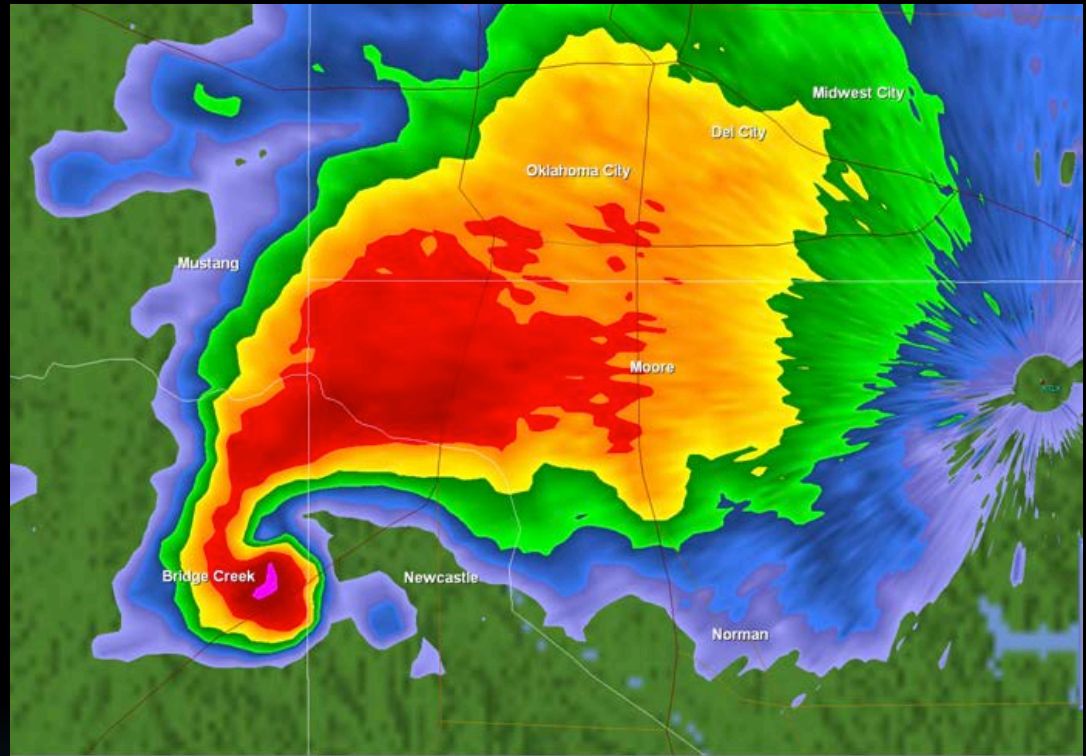
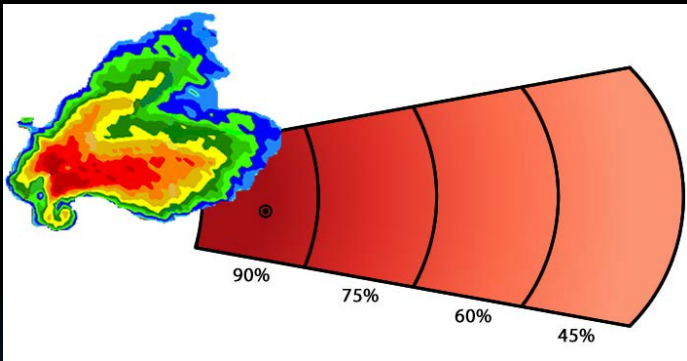
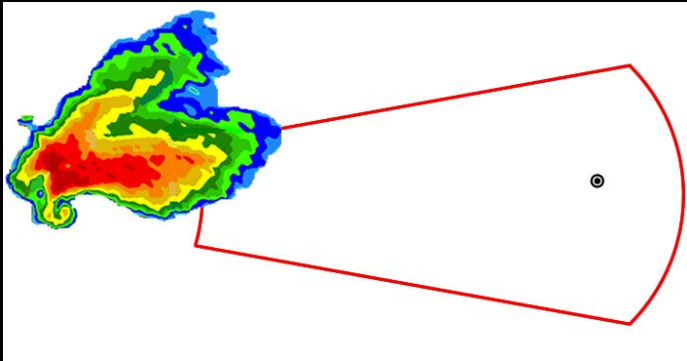


Implications of experimental findings for warning practice

- Lengthening deterministic warnings
 - Tradeoffs: Implications near and far from the warning
- Including verbal information or probabilities
 - Positive indications, with some caveats
- Using colors
 - Symbolic meanings translate to risk perception

Conclusions

- New representations of risk could potentially **change** the way risk spaces are perceived
 - Forecasters can **shape perceptions** through use of warning length; visual, verbal and numeric expressions of uncertainty
- **More work is needed** to connect findings from experiments to real-world behaviors
 - Response is more **complex** than simple yes/no protection decisions at a given point in time
 - Real-world studies: sheltering largely in the last minutes, preparation begins much sooner



Open for questions/discussion!