Evolving Probabilistic Tornado Warnings and User Understanding
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Background and Research Goals
- Current tornado warning polygon is deterministic, implying a tornado will occur inside.
- Research suggests that probabilistic forecasts improve understanding of tornado likelihood (Qin et al., 2023).
- However, tornado forecasts are evolving: Consecutive forecasts are issued for same event.
- Will advantages for probabilistic forecasts generalize to multiple forecast scenarios?
- We recruited participants from the Southeastern US where the risk of tornadoes is heightened to find out.

Research Questions:
1) Do people perceive trends in tornado likelihood in consecutive forecasts?
2) If so, do they think the trend will continue into the future?
3) Do people lose trust when consecutive forecasts for the same event are different?

Experimental Procedure
- Scenario: Imagine that you were traveling in the Southeastern US and received a tornado warning from a cell phone app. The potential windspeed of the tornado is 86-135 miles per hour.
- Each trial consisted of 1 or 2 forecasts based on underlying probability defined as tornado frequency: 30% tornado hits for 30% chance trials.
- 2nd forecast issued 10 virtual minutes after the 1st unless a tornado hit after 1st forecast.
- Participants: 293 (46% female) Prolific participants from Southeastern US.

Dependent Variables at Each Forecast:
- Perceived Likelihood
- Decision: Do not shelter
- Shelter
- Do Not Trust at All
- Completely Trust

Point Structure to Encourage Engagement:
Goal: End with as many points as possible. Start with 25,000 points.

Results
- Participants recognize the trend in evolving, updated tornado forecasts, but tend to predict the likelihood will increase in the near future.
- Perhaps due to defensive pessimism and cautiousness in face of imminent threats.
- This is consistent with previous research where participants took shelter and perceived a non-zero likelihood even when explicitly told 0% probability of a tornado (Qin et al., 2023).
- Participants showed higher overall trust & increased trust in the forecast in “decreasing trends.”
- Perhaps a decrease of the probability was viewed as good news and inspired greater trust for that reason, consistent with a desirability bias (Windschittl et al., 2010).
- Forecast consistency does not increase trust, contradicting the notion in the weather forecasting community that forecasts should be consistent to preserve user trust (Burgeno & Joslyn, 2020).

Conclusions
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References

Acknowledgement
This material is based upon work supported by NOAA under Grants NA200AR4590385 and NA200AR4590386.
For further information, please contact Chao Qin at robertqc@uw.edu. Our appreciation to our NOAA collaborators: Pam Heinselman (NOAA/OAR/NSRL), Chris Karstens (NOAA/NWS/SPC), Holly Obermeier (NOAA/OAR/ESRL).