Impact of Hurricane Ian forecast cone interpretation on evacuation decision making of individuals aged 55 and older

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Research Objective

- ❑ Investigate how the 55+ population of Pinellas County's evacuation decisions during Hurricane Ian were related to their interpretation of the hurricane forecast cone
- ❑ Provide information to improve hurricane risk communication

Background

Pinellas County, which has a large percentage of 55+ adults (**42.5%**) was affected by Hurricane Ian in 2022. The Forecast cone changed paths many times in the days leading to landfall (Figures 1-4). At one point Pinellas County was forecasted to be the area of landfall for Ian at major hurricane strength, but forecasts shifted south before landfall. By definition of the National Hurricane Center, the cone represents the probable track of the center of a tropical cyclone, its designed so that two-thirds of historical official forecast errors over a 5-year sample fall within the cone. Research conducted by Scotney et al. (2022) found a positive relationship between age and the number of questions answered correctly about the forecast cone

Figure 1: Forecast cone approx. 115 hours before Florida Landfall

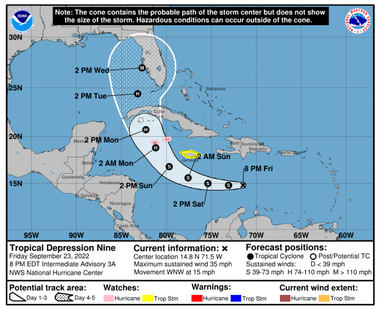


Figure 2: Forecast cone approx. 76 hours before Florida Landfall

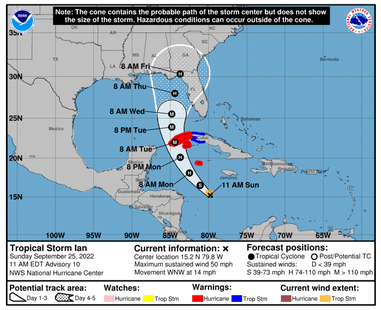


Figure 3: Forecast cone approx. 31 hours before Florida Landfall

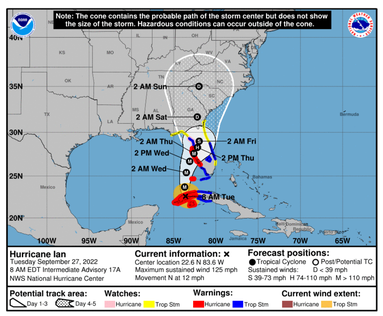
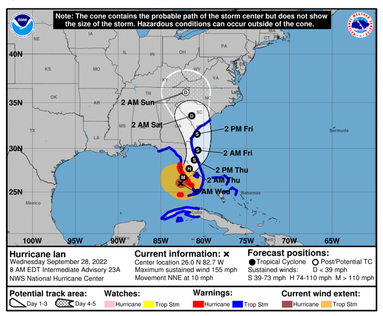


Figure 4: Forecast cone approx. 7 hours before Florida Landfall



Note: Hurricane Ian forecast cone. Figure 1: Sept. 23, 2022 8PM EDT Advisory. Figure 2: Sept. 25, 2022 11AM EDT Advisory. Figure 3: Sept. 27, 2022 8AM EDT Advisory. Figure 4: Sept. 28, 2022 8PM EDT Advisory.

Methods

Survey

- ❑ Florida residents in the path of Hurricane Ian were administered an anonymous survey, in both English and Spanish, via Qualtrics from October 9, 2022, to April 10, 2023. The 5-point Likert statements about cone interpretation were:

1. The size of the cone represents the size of the storm
2. Areas outside the cone are not at risk to hurricane impacts
3. The cone shows all possible paths a storm can take

Statistical Analysis

- ❑ Data was cleaned, organized, and categorized using R Studio
- ❑ IBM SPSS Version 29 was employed to run a logistic regression model that was constructed to analyze the relationship between cone interpretation and evacuation decision made.
- ❑ Statistical significance was set at $p < .05$ and all confidence intervals (CI) constructed at 95%

Results

- ❑ n= 662 individuals 55 years of age and older who reside in Pinellas County
- ❑ Size of cone question proved to be statistically significant:
  Odds Ratio = 1.13, 95% CI [1.006 - 1.270]
- ❑ Areas outside the cone question proved to be statistically significant:
  Odds Ratio = 1.223, 95% CI [1.003 - 1.492]
- ❑ Cone shows all possible paths question was not statistically significant:
  Odds Ratio = 0.951, 95% CI [0.854 – 1.058]

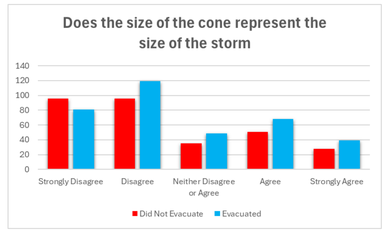


Figure 5. Clustered bar plots showing cross tabulation results of cone questions and evacuation decision

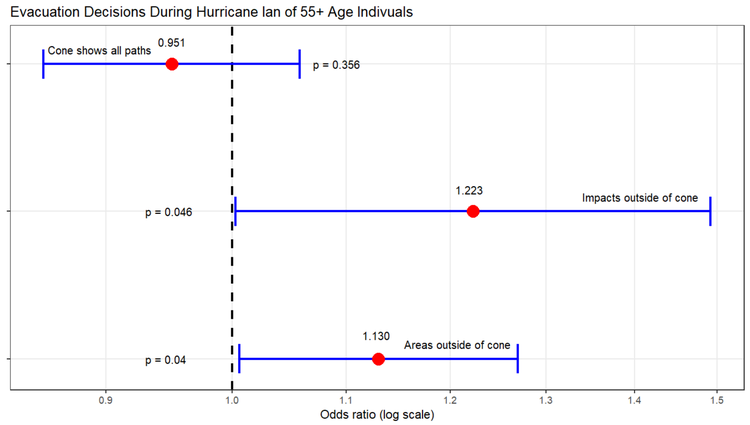


Figure 6. Odds ratio plot of results of logistic regression

Discussion

- ❑ The results of the logistic regression show:
  1. Individuals who evacuated were at greater odds of fully agreeing with the statement *Areas outside the cone are not at risk to hurricane impacts* by **22.3%**
  2. Individuals who evacuated were at greater odds of fully agreeing with the statement *The size of the cone represents the size of the storm* by **13.0%**
- ❑ Individuals who agreed with these statements interpreted the cone incorrectly
- ❑ A reason for small odds ratios could be because the make up of the evacuated group and did not evacuate group are very similar in size and demographics (Figures 8 & 9)
- ❑ Why is this the case? Could it be that those who evacuated relied more on government orders rather than personal forecasting knowledge? Is it because the forecast cone shifted south and those who recognized that decided not to evacuate?

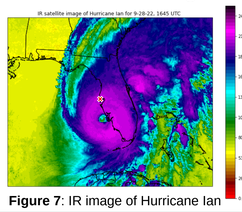


Figure 7: IR image of Hurricane Ian

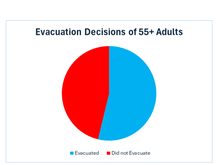


Figure 8: Evacuation decisions from survey

Race	Frequency
American Indian or Alaska Native	1
American Indian or Alaska Native,White	4
Asian	3
Asian,White	2
Black or African American	10
Black or African American,White	1
Native Hawaiian or Other Pacific Islander	1
Other (please specify):	9
Prefer not to answer	13
White	616
White,Other (please specify):	2

Figure 9: Racial makeup of survey respondents

Conclusions

During Hurricane Ian, older adults in Pinellas county who evacuated had higher odds of interpreting the forecast cone incorrectly compared to those who did not evacuate. Further investigation would be needed to investigate why.

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