NCST Technical Investigation of Hurricane Maria (Puerto Rico)

Emergency Communications and Evacuation

Project Leader: Katherine J. Johnson (Jo), *Social Scientist*

Objective: To investigate the role of emergency communications in public response for those under imminent threat from Hurricane Maria. This project will also investigate the use of communications in disaster response (during and immediately after the hurricane event).

Motivation

Project falls under two duties of the NCST, to:

- evaluate technical aspects of evacuation and emergency response procedures, and recommend research or other appropriate actions needed to improve evacuation and emergency response procedures.

In the NIST memo to recommend the Hurricane Maria Investigation, the purpose is further tailored to needs in Puerto Rico to:

- characterize the performance of emergency communications systems and the public's response to such communications.

Background:

Evacuation and emergency response challenges found during NIST's Preliminary Reconnaissance Mission

- Category 5 Hurricane Maria preceded by Irma two weeks prior
- Heterogeneous terrain across the island posed multiple risks requiring different protective actions (flooding and storm surge, winds, landslides)
- Societal preference for sheltering-in-place
- Extended lack of communication among emergency officials, building officials, and the public after the storm
- Many people required rescues; in particular from multiple flooded towns across the island

Project Goals

Goal 1: **Characterize the use of emergency communication** (technology and information) before, during, and after the hurricane.

Goal 2: Identify the **factors that influenced the public's decision to take protection** (evacuate) prior to the hurricane, and to understand the role of emergency communications in that decision.

Data Collection Instruments

		Primary Goal	Contractor Assistance	Notes
A	Qualitative Content Analysis	1	✗	Focus: characterizing emergency messages n= ~1,000
B	Emergency Info Providers Interview	1	✓	Focus: communication process & recommendations n= 35
C	Household Survey	2	✓	Focus: protective actions & previous experience n= 1,520
D	Public Interviews	2	✓	Focus: explore evacuation decision-making factors in more detail n= 100

Recent Project Progress

- Contract awarded to support survey and interview data collection) (Jan. 2020)
- Contract kick-off meeting (Feb. 2020)
- New project leadership (Mar. 2020); Johnson participation from Nov. 2019
- Project team includes one social science term hire, two undergraduate researchers for the Summer, and plans for additional hires:
  - Vacancy for full-time term social scientist with expertise in emergency communications and protective action closed early June 2020
  - Graduate researcher to be hired in the Fall

Status of Qualitative Content Analysis

- Emergency communication messages collected (previous)
- Core message dataset curated (Jan. 2020)
- Research plan for Qualitative Content Analysis finalized (Feb. 2020)
- Project re-scoping, personnel change (Mar.-Apr. 2020)
- Refined research plan and literature review completed (May 2020)

Note: Focus on key components of message effectiveness (*e.g.*, source, guidance, time, location, hazard); planned expansion to additional attributes of message effectiveness (*e.g.*, specificity, consistency, certainty, urgency) in future.

Status of Information Provider Interviews

- Information provider interview draft completed by NIST (Jan. 2020)
- List of interviewees finalized for IP interviews with contractor input (May 2020)
- Contractor input on information provider interview incorporated (Apr. 2020)
- Information provider interview draft finalized (May 2020)

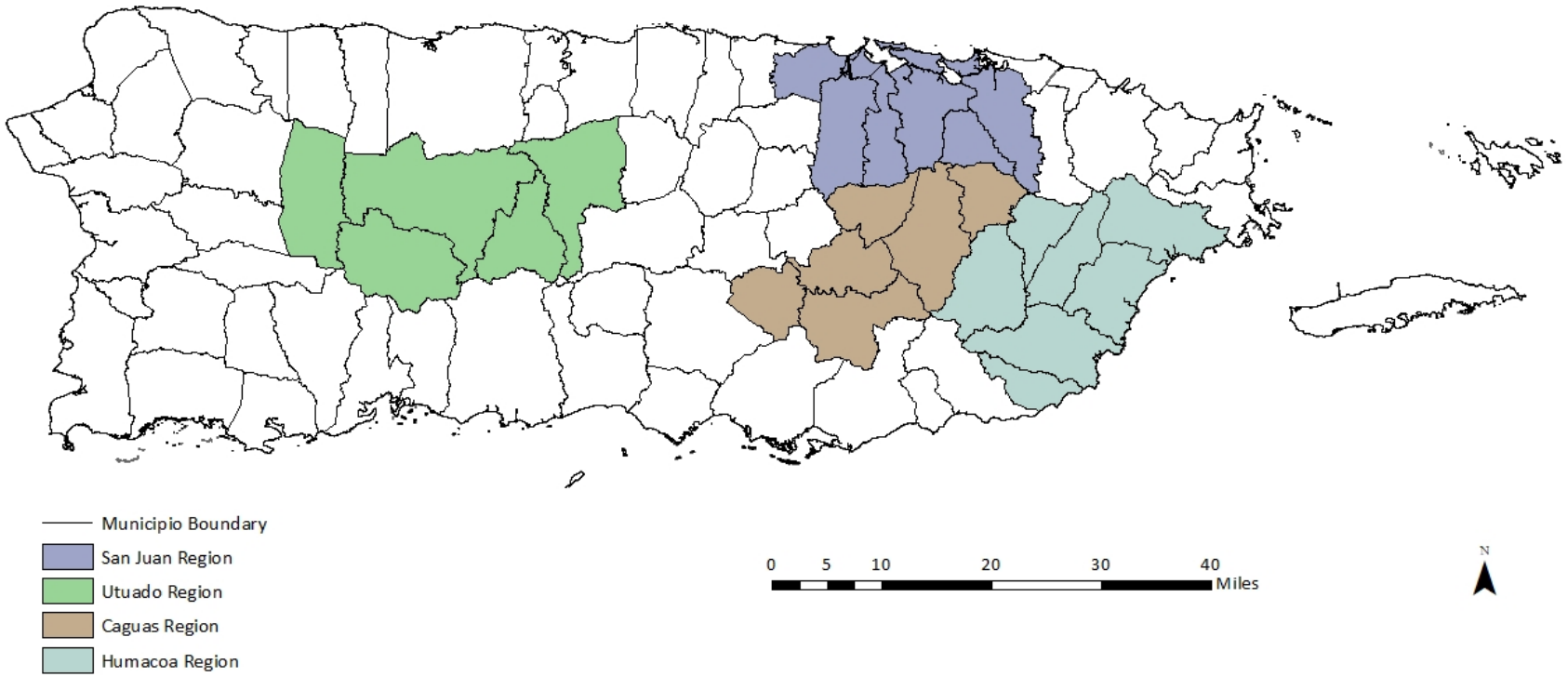
Note: Original plan to conduct these semi-structured interviews in-person, but now we are exploring the possibility of conducting these remotely via telephone or internet. However, we do not anticipate any significant delays or reduction in quality of data with this change.

Status of Household Survey

- Household survey instrument drafted by NIST (Feb. 2020)
- Contractor input on information provider interview incorporated (Apr.-May 2020)
- Household survey sampling plan finalized by contractor (May 2020)
  - Frames include: targeted study areas (*see next slide*); flood prone municipalities; representation of diverse economic status
- Household survey draft finalization (Jun. 2020)

Note: Still determining whether or not we will rely upon in-person surveying; if not, alternate methods and survey adaptation will be necessary.

Study Areas for NIST Hurricane Maria Program



Data Source: US Census Bureau TIGER/Line 2016, FEMA 2017
Developed: NIST 2020; using ESRI software
Coordinate System: GCS NAD 1983
Datum: NAD 1983
Scale: 1:700,000

Status of Public Interviews

- Public Interview guide still-to-be developed
- Original intent was to base this interview instrument on data gathered from the household survey, to further refine key questions related to risk perception and evacuation decision making
- Given timeline, and possible inability to interview in person, we are considering re-scoping the interview
- May decouple public interviews from the household survey and transition to a virtual interview format, providing the best opportunity to harvest the richest data from each instrument

Priority Next Steps

- Paperwork Reduction Act approval needed for household survey and information provider interview instrument
- Deployment of Information provider interviews
- Deployment of household survey pilot
- Addition of new team members and re-distribution of responsibilities as appropriate