Hurricane Maria NCST Investigation Update

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National Institute of Standards and Technology

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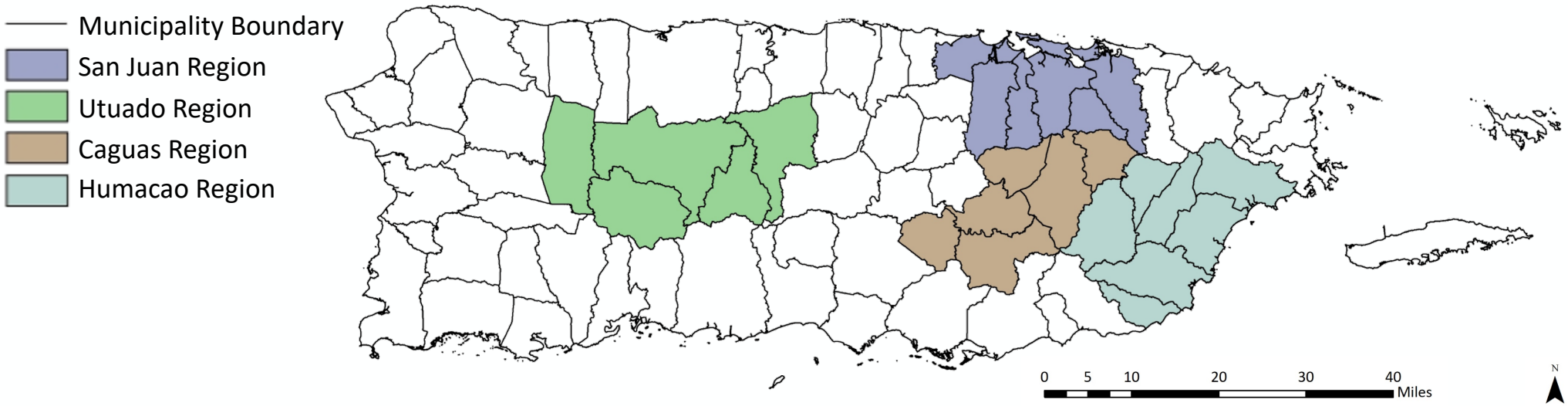
National Institute of Standards and Technology
U.S. Department of Commerce

NCST Investigation Goals

Goals of the NCST investigation are to characterize:

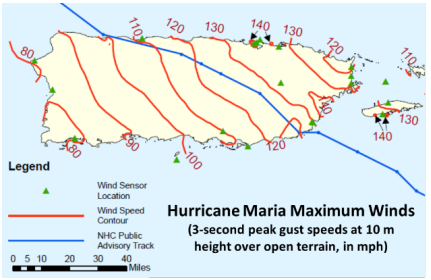
1. *the wind environment and technical conditions associated with deaths and injuries*
2. *the performance of representative critical buildings, and designated safe areas in those buildings, including their dependence on lifelines*
3. *the performance of emergency communications systems and the public's response to such communications*

Four selected regions of particular focus:



NCST Investigation Projects

Hazard Characterization: Document and understand the storm's wind environment and other hazards including storm surge, rainfall, flooding, and landslides



Performance of Critical Buildings: Evaluate how critical buildings performed (specifically hospitals, schools, and shelters) – including their dependence on electricity, water, and other infrastructure

Public Response to Emergency Communications: Document how emergency communications systems performed and the public's response to those communications – focusing on communications in disaster response (during and immediately after the hurricane)

Morbidity and Mortality: Better understand how damaged buildings and supporting infrastructure played a role in injuries and deaths associated with the hurricane

Three complementary projects focused on recovery are being conducted under the National Windstorm Impact Reduction Program

NCST Investigation Updates

- Progress Report completed, in preparation for publication (*next slide lists contents*)
- Contract-related updates (*further details in subsequent presentations*):
  - Contract awarded to George Washington University for morbidity and mortality data collection
  - All major contracts now awarded and in progress
- IRB non-research exemption granted for all NCST investigation projects
- PRA/OMB approval received for pilot household survey conducted under the emergency communications project
- Selection process nearing completion for a new hire to support the Emergency Communications project
- Privacy Impact Assessment (PIA) approved by DOC for new EL-managed data systems for the Disaster and Failure Studies Program, including the Hurricane Maria work
- Data collection updates (*further details on subsequent slides*):
  - Field measurement of topographic effects on winds at cell tower sites
  - Wind tunnel testing and CFD simulations of topographic effects on winds
  - Data collection for evaluation of critical buildings
  - Data collection for public response to emergency communications

Progress Report: *Learning from Hurricane Maria's Impacts on Puerto Rico*

NIST Special Publication 1262

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NIST Special Publication 1262

Executive Summary

E.1 Introduction
E.2 NIST Response and Scope of the Hurricane Maria Program
E.3 Progress in Carrying out the Hurricane Maria Program

1. Introduction

1.1 NIST's
1.2 Scop

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2.1 Haz
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2.5 Econ
2.6 Decision to Establish a Team

3. The NIST Hurricane Maria Program

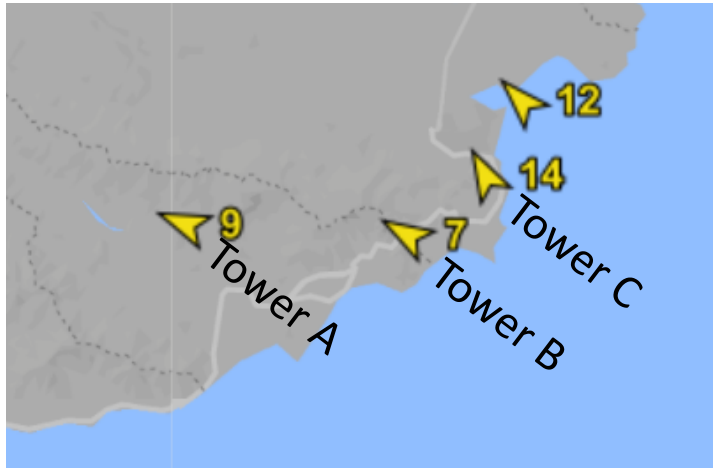
3.1 Scope and Goals
3.2 Team Leadership and Members
3.3 Technical Plan and Projects
3.4 Advisory Committee
3.5 Coordination with Other Organizations
3.6 Estimated Duration and Cost
3.7 Impact of Events in Puerto Rico Following Hurricane Maria

Highlights of Progress:

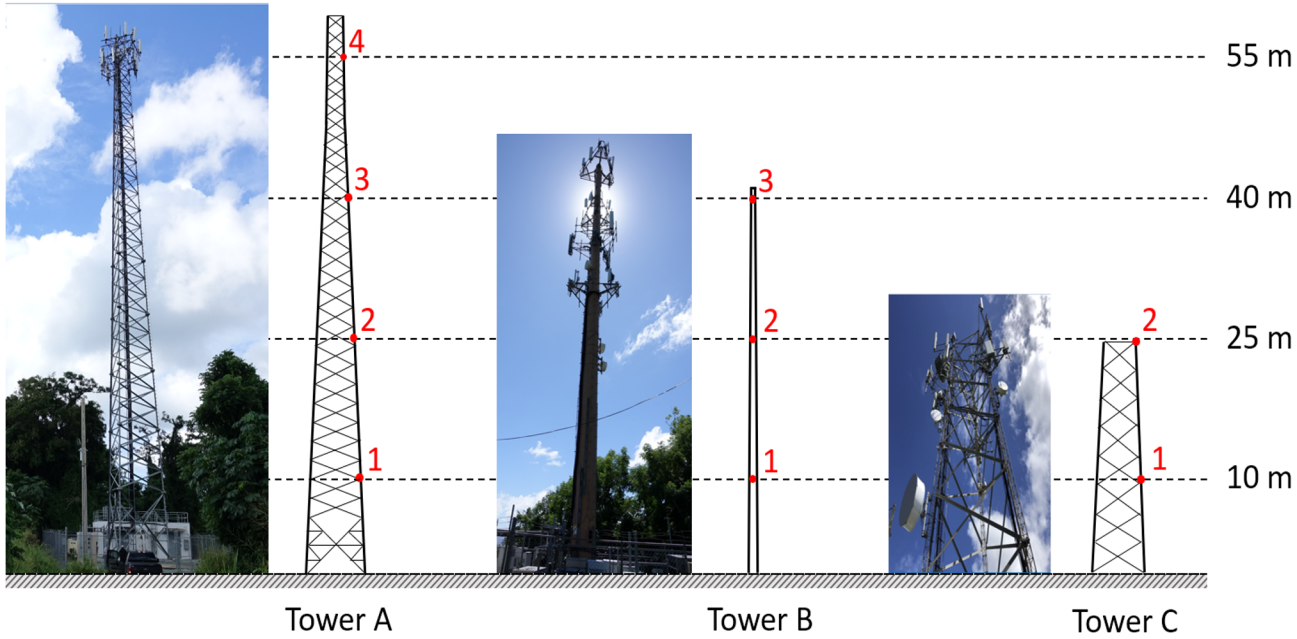
- Information Requested and Obtained from Other Agencies and Organizations
- Wind-Field Model Development
- Wind Tunnel Testing and Computational Modeling
- Deployment of Anemometers at Cell Tower Sites
- Evaluation of Critical Buildings
- Characterization of Morbidity and Mortality
- Sample Design for Surveys and Interviews
- Data Collection on Recovery of Business and Supply Chains

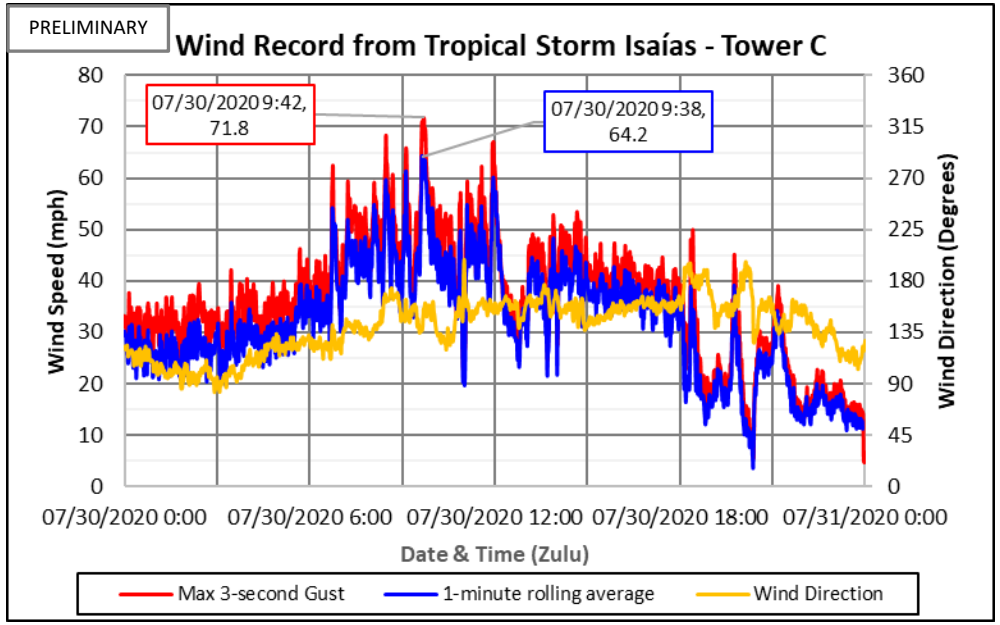
Field Measurement of Topographic Effects on Winds at Cell Tower Sites

- Anemometer installation completed at three tower sites:
  - Installation and maintenance by WeatherFlow (UF subcontract)
  - Tower space provided by American Tower Corp.
- Significant wind speeds measured at “Tower C” during Tropical Storms Isaias and Laura
- Field measurements will be used for validation of wind tunnel measurements and computational models



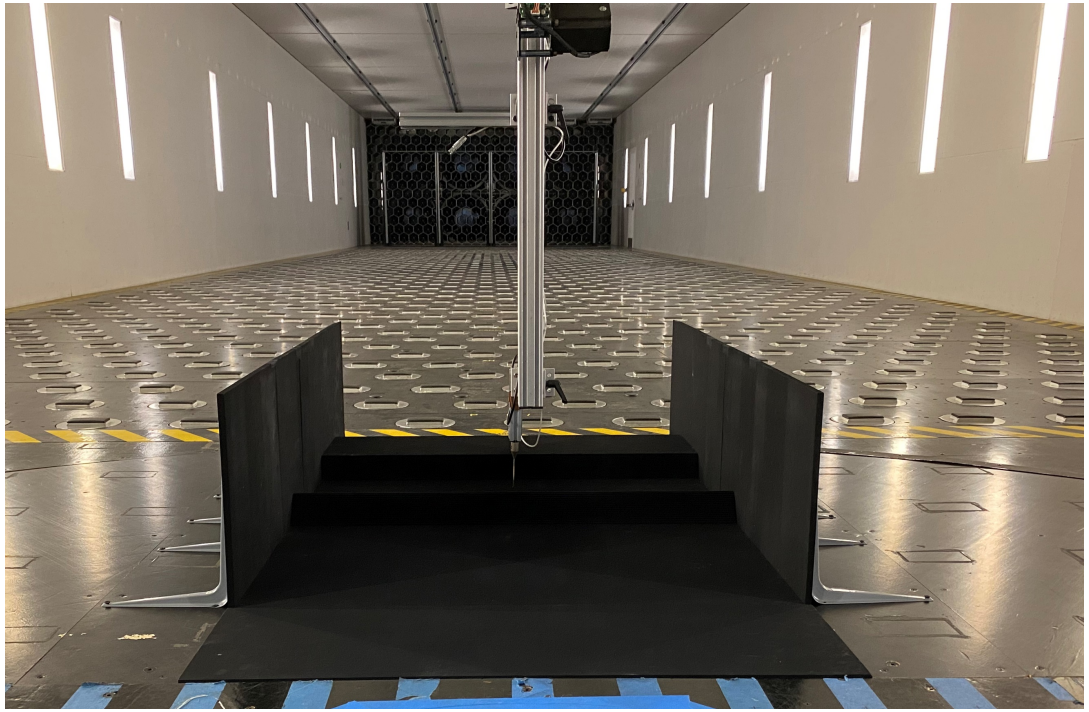
Cell Tower Sites in Yabucoa Region



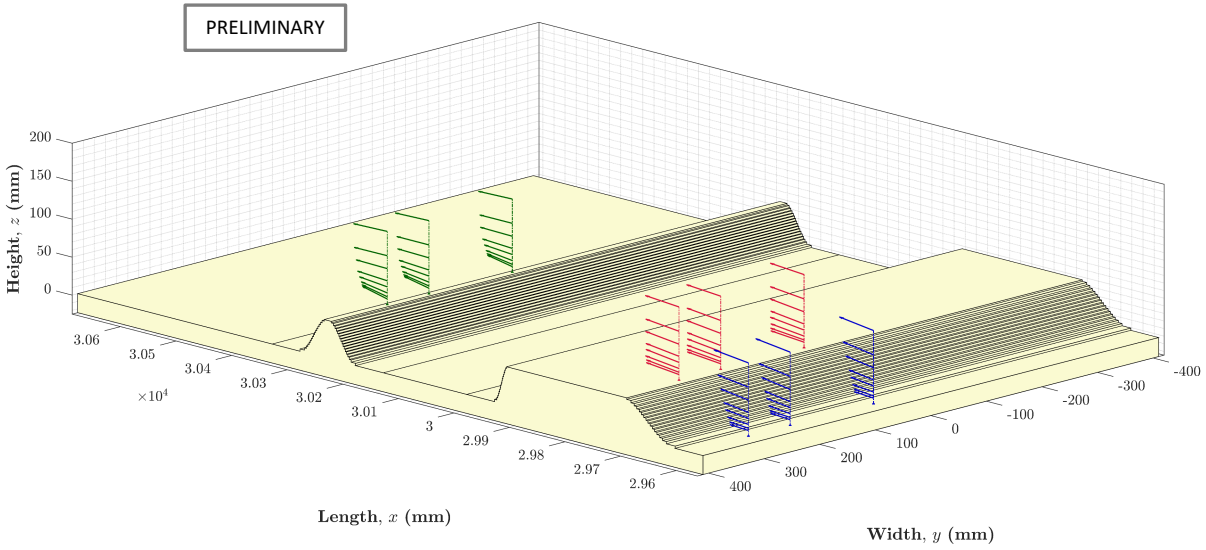


Wind Tunnel Testing and CFD Simulations of Topographic Effects on Winds

- Wind tunnel testing performed on topographic models at University of Florida with measurements using Cobra probes
- Computational Fluid Dynamics (CFD) simulations performed of UF wind tunnel facility to evaluate alternative configurations to block laser light from PIV system while minimizing flow distortion; approval for PIV testing configuration granted by laser safety officer



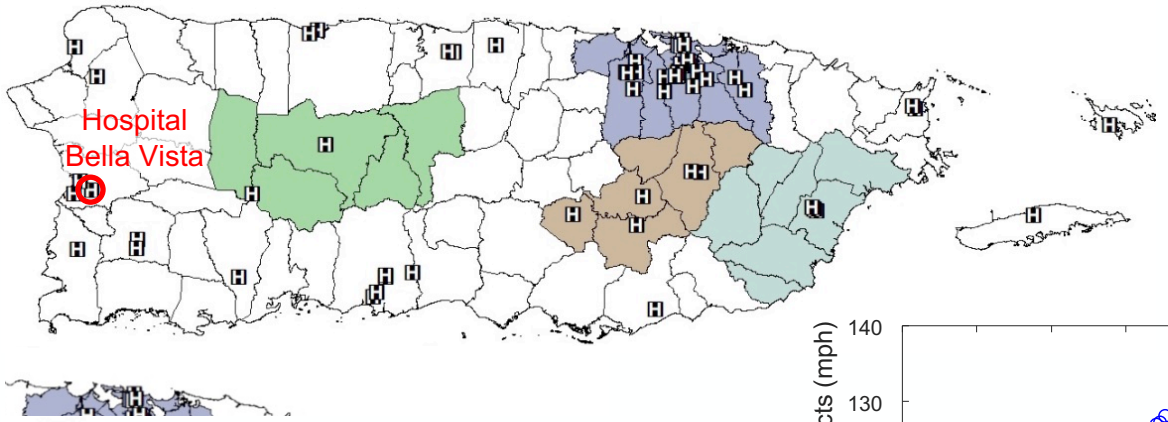
Wind Tunnel Testing of Generic Terraced Model

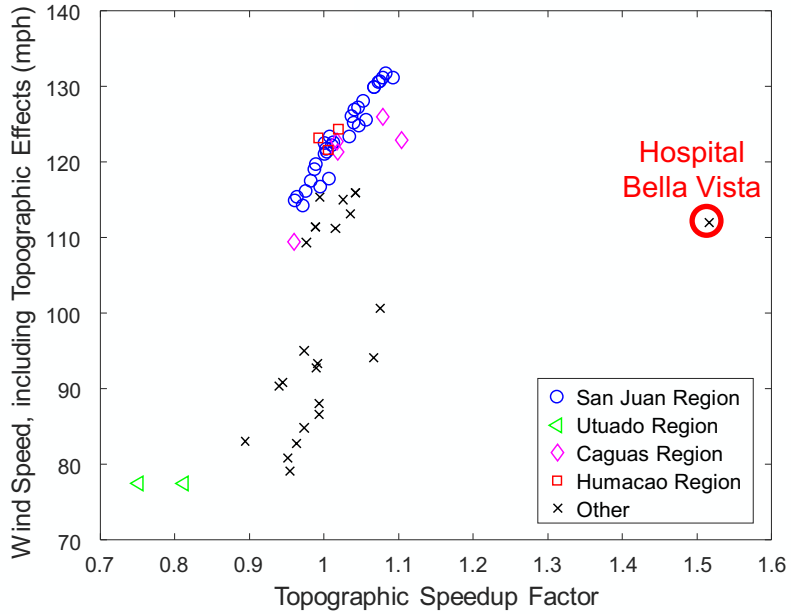


Velocity Profile Measurements

Data Collection for Evaluation of Critical Buildings

- Drone photography completed at Hospital Bella Vista by Stantec team and 3D model created from the drone images to support fabrication of a wind tunnel model
- Outreach, document collection, and document review ongoing for five selected hospital facilities with Stantec team

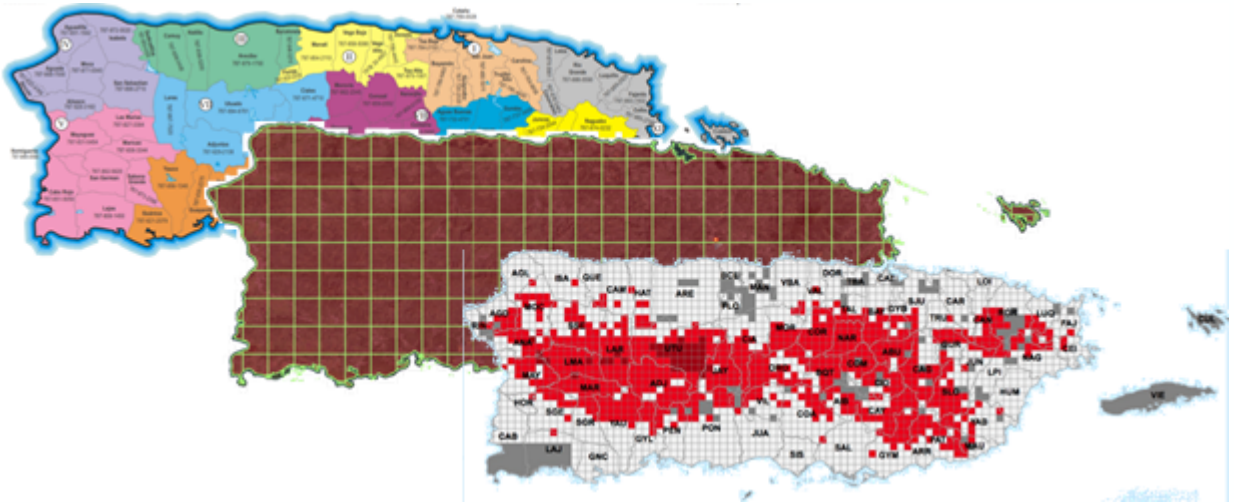




3D Model of Hospital Bella Vista Created from Drone Images

Data Collection on Public Response to Emergency Communications

- Sampling plan for household surveys complete
- Household survey has cleared necessary approvals (IRB and OMB/PRA) for piloting
- Data collector training is complete
- Pilot test of survey to begin late October 2020
- Full deployment of survey expected early spring 2021 (following PR holiday season)



Mapping information from FEMA, USGS, and Census Bureau used for sample framing

Rough distribution of Landslide Area Starting points for data collection assignments

COVID-19 Pandemic Updates

- Wind tunnel testing work has resumed
- Anemometer installation at tower sites is complete
- Outreach to hospital staff has resumed
- Specific adaptations for projects supported by Survey Research Contract: (*Emergency Communications and three NWIRP Projects: Recovery of Business and Supply Chain, Recovery of Social Functions, Recovery of Critical Infrastructure*)
  - Phone and/or web modes of data collection will be used – no face to face surveying or interviewing is planned
  - Pandemic training and safety protocols are in place to support field teams who will still travel within study area to collect contact information for households
- NIST HM team members continue to operate via 100% telework; all meetings of NIST team and contractors continue remotely

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Questions?

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