Two-Year Post-Hurricane Matthew Field Study in Lumberton, North Carolina Housing/Household Recovery Survey

U.S. Department of Commerce
National Institute of Standards and Technology
Generic Clearance for Community Resilience Data Collections
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For each proposed request using this generic clearance, NIST will submit the actual instrument and related documents (letters, emails to respondents, scripts, etc.), as well as proposed statistical methods to be employed to OMB along with responses to the following questions:

1. Explain who will be surveyed and why the group is appropriate to survey.

The Center of Excellence (CoE) field studies team in conjunction with NIST researchers will conduct another round of data collection as part of the field study in Lumberton, North Carolina, which experienced major flooding damage due to Hurricane Matthew in early October 2016. The purpose of this field study is to explore the interconnectivity between structural damage (buildings, roads, bridges, power, water) and social-economic impacts to the community. The goal of the current survey collection is to determine the status of recovery for these households. Furthermore, Lumberton was also impacted by another significant flooding event in September 2018 with Hurricane Florence. The information collected in this household survey instrument will augment findings from December 2016 and January 2018. The data from this longitudinal collection will contribute to the housing recovery modeling in the IN-CORE community resilience modeling environment, as well as to NIST research on community resilience.

The new household survey instrument is written to assess the continued housing recovery, dislocation, work and school impacts for households in Lumberton, NC following Hurricane Matthew (October 2016). From the initial household survey conducted in December 2016, we are aware that the structural damage from Hurricane Matthew was significant in its impact to the population in terms of leading to dislocation and associated social and economic impacts. In January 2018 a one-year post-Hurricane Matthew Housing/Household Recovery Survey was conducted in addition to further exploration of the structural damage, school closures, and housing dislocation and recovery patterns. At that time most household survey respondents had not yet completed recovery from Hurricane Matthew. Approximately two years since the initial collection, the team aims to collect information on the recovery of these housing units and the associated households. The team will expand the collection to assess impacts and recovery from the latest flood event in September 2018 due to Hurricane Florence.

We will be surveying randomly sampled households that are part of the sample previously used in both 2016 and 2018 studies in Lumberton, NC; the goal for 2019 will be to survey 400

households. The 2016 sample design relied on a cluster sample of households within the most heavily impacted school attendance zones. The sampling strategy is outlined in Response 3.

There is minimal quantitative primary data collection on housing recovery following a large-scale natural hazard event. Additionally, there is minimal primary data on longitudinal housing recovery to understand factors that affect long-term recovery of housing units and households affected by hurricane events. Lumberton provides a unique case for analyzing medium- and long-term recovery in the face of multiple hurricane events (i.e., Hurricane Matthew – 2016 and Hurricane Florence—2018). Survey respondents are household members and when no household is present, a neighbor or a property manager. Some of these households will have been directly affected by Hurricane Matthew and/or Hurricane Florence (e.g., structural damage, dislocation, utility outages, employment/school impacts) while others were not. At this point in time, household members will still retain information about recovery activities from Hurricane Matthew immediately before Hurricane Florence hit the community and immediately after Hurricane Florence, which can be meaningfully recorded and collected for data analysis.

PII is collected in this instrument, but information is not retrieved by personal identifiers in the system. Although this is not a Privacy Act System of Records, appropriate notice is given to the participant of the survey.

2. Explain how the survey was developed including consultation with interested parties, pretesting, and responses to suggestions for improvement.

The survey instrument was developed by the NIST funded Resilience Center of Excellence in collaboration with NIST researchers. Many sections of the survey focused on recovery financing and timing of return draw from the 2018 survey. Likewise, sections on household dislocation and associated social and economic impacts of Hurricane Florence were drawn from the initial survey instrument used in 2016. A new section on mitigation actions was added. This collection was based in part on the CoE/NIST damage assessment conducted after Hurricane Florence in October 2018. Additionally, the survey draws from the rich experience of the CoE and NIST researchers in the area of disaster studies.

During development, the survey instrument underwent several rounds of review by researchers on both the CoE team and at NIST, specifically in the Community Resilience Group of NIST's Engineering Laboratory (EL). Finally, the survey instruments were reviewed by the broader, interdisciplinary team that participated in the first and second data collection efforts in Lumberton, NC. This iterative collaboration created a relatively brief and thorough instrument. Interviewer guidance has been added throughout the revision process in order to support the proper elicitation of responses when in the field. Lessons learned from both years of data collection have informed both the form of the questions and the guidance to surveyors.

3. Explain how the survey will be conducted, how customers will be sampled if fewer than all customers will be surveyed, expected response rate, and actions your agency plans to take to improve the response rate.

The survey will be conducted by an interviewer as a face-to-face survey for up to 400 households. A consent script will be used. Each survey should require no more than 15 minutes. The surveying will likely take place across several long weekends in order to maximize the response rate by surveying at times when householders are more likely to be present. Surveyors will receive training prior to being in the field.

For household surveys conducted in December 2016 and January 2018, we conducted a cluster sample of households within the most heavily impacted school attendance zones. The sampling strategy is outlined below:

1) We developed a baseline assessment of the population of individuals/household in our focus areas prior to the flooding. This was done using Census block data from the 2010 Decennial Census of Population and Housing, as well as Census block-group data from the American Community Survey 2014 5-year estimates.

2) We selected a representative sample of households for the focus areas (i.e., the school attendance zones for the focus schools within Lumberton). Using existing data to help inform the sample selection, the goal was to obtain variability and representativeness with respect to damage (flood heights and structural damage), socio-demographic characteristics (race/ethnicity, income, and tenure), and housing types (single attached, multi-attached townhouses, duplexes, and other multi-family structures), to the greatest extent possible.

3) Based the above factors and the purposes and goals of the fieldwork, we applied a two stage cluster sample in which our penultimate sampling units are Census blocks and our primary sample units are housing units/households.

Stage 1: We identified all census block that are 1) within the attendance zones of our target schools and 2) are within the 100 and 500-year flood plains. Given available data, we utilized a 100m buffer zone around the 100/500 year flood plains as a conservative estimate of the extent of flooding experienced in Lumberton. Based on the criteria above, we identified blocks falling into the target and buffer zones. We gathered data on all block groups for Lumberton including the boundary files for block groups and Census data on number of individuals, household, race and ethnicity, housing units, housing types, etc.

Stage 2: Based on these data our penultimate sampling units (blocks) were selected utilizing a probability proportion to size random sampling procedure. This process was evaluated to guarantee the generation of a good representative sample of the area.

4) Once the blocks were selected, the data from these blocks combined with Google mapping data, and parcel data was used to estimate the numbers of structures and, most importantly, housing units on the block along with the potential location, distribution among the housing structures on the block.

5) The primary sampling was based on a random selection of a fixed sample size of housing units for all blocks – this will ensure that we have a nice random sample of our primary sampling units for the study.

6) Final sample determination was based on advanced team's actual observation and verification of the numbers of structures and housing units in each block. A critical element of this procedure was the assignment of numbers to each housing unit in the block. Again, since there may be multiple housing units in each structure, we want to assure that we are getting accurate counts AND the appropriate assignment of numeric values to each housing unit within the structure. This ensures that we have not introduced potential bias in our final sample.

7) Finally, the sample was spatially and temporally ordered so as to make the field work as efficient, logical, and safe as possible. The primary sample units are housing units/households located in various forms of housing structures (single family, single family attached, duplexes, multi-family structures of various forms).

The expected response rate is 60%. It should be noted that responding to any or all the survey is considered as a survey response. Assuming a 100% response rate, the total burden hours for this collection would be 100 hours (Burden estimate: 400 households x 15 minutes = 100 hours).

Although resources (staff, time, and funds) will be limiting factors, several actions will be taken to improve the outcomes of the field study data collection. These actions have proven successful in prior field studies. To ensure a higher response rate, the team will:

- Train surveyors for maximum efficiency in the field,
- Concentrate surveying on weekends and evenings,
- Make repeat visits to households (if no one was present at the time of the initial visit),
- Arrange scheduled follow up times for households not available for surveying during initial visit (if willing to participate),
- And, adjust the field work plan and team composition based upon daily evaluation of results.

4. Describe how the results of the survey will be analyzed and used to generalize the results to the entire customer population.

It is expected that the findings of this survey will inform the understanding of the CoE field studies team in conjunction with NIST researchers in terms of housing recovery and best practices and circumstances for recovery over medium- and long-term timeframes and when households face multiple extreme flooding events (i.e., Hurricanes Matthew and Florence).

The data will be analyzed as a case study in the specific context of Lumberton, NC and the existing social, economic, and built infrastructure elements to the community. Statistical analysis will be used to determine trends and correlations in the data, as well as relationships between factors that contributed to housing recovery, dislocation, work and school impacts. There are seven main survey sections in the household survey tool that related to both Hurricane Matthew and Hurricane Florence. The sections are:

1) Occupancy and eligibility
2) Housing damage and repair
3) Financial assistance for housing recovery
4) Impacts of Hurricane Florence (utilities, dislocation, work)
5) Recovery
6) Mitigation
7) Household demographics

Analyzing these types of data singularly and in conjunction is expected to extend understanding of housing recovery alone and in relation to the recovery of the community, more broadly. Of particular interest to NIST researchers are the dependencies between housing recovery and household recovery along with the interconnections of housing, business, and school recovery following a hazard event.

Research on housing and household recovery to date has been limited by a lack of over time data following a single event in a community as well as an absence of cases that collect the same data across events and communities. Nor are there a great deal of geographic areas studied in detail that were affected by multiple extreme hurricane hazards in relatively quick succession. Several factors that impact the timeline associated with the recovery of housing and households have been identified in prior research. In this field study, these factors are expected to be quantified for a model of housing recovery. The data from this collection will continue to refine the housing recovery modeling in the IN-CORE community resilience modeling environment. Additionally, these data in combination with the business recovery data will be analyzed to understand the dependencies between these two critical sectors.

The data will also be used to inform conceptual and quantitative modeling of the community as a system, including interdependencies between housing, business, and school recovery, the timing of aspects of community recovery, and the resources available versus those needed. Furthermore, it is expected that administering the survey tool will continue to provide useful information on best practices for field research on housing recovery following a natural disaster. The survey tool itself is one that has been designed to be applicable for field studies in other communities for a range of hazard events.