

Identifying Social Network and Mobile Technology Use and Its Correlation with Household Evacuation Behavior in Hurricane Sandy

[Investigators and Department Affiliation]

Texas A&M University

PI - Justin Yates, Assistant Professor, Industrial and Systems Engineering

co-PIs - Thomas Ferris, Assistant Professor, Industrial and Systems Engineering

- David Matarrita, Assistant Professor, Recreation, Parks and Tourism Sciences

- Erick Moreno-Centeno, Assistant Professor, Industrial and Systems Engineering

This project seeks to understand how social networking and mobile technology influence individual evacuation decision-making and, in particular, how the perceived reliability of information obtained through social networks affects evacuation behavior. We have developed a post-event survey and distributed it to a random sample of the population within the mandatory evacuation region of Hurricane Sandy (28 - 30 Oct, 2012). The post-event survey focuses on addressing the following questions:

1. What percentage of households use mobile technology during an evacuation, and what are the associated demographics of these households?
2. How frequently are mobile devices and social networks being used during evacuation, and what is the content of information being viewed or posted?
3. To what extent is this information being used dynamically in the evacuation process (e.g. route selection, destination choice, timing of evacuation decision, etc)?

Hurricane Sandy represents one of the more massive and catastrophic storms to hit the Northeastern United States in the past half century. With an expected storm surge of 11 feet above normal high tide, Hurricane Sandy “is the most catastrophic event that we have faced and been able to plan for in any of our lifetimes.” Beginning at 4:35am on 29 October 2012, the National Weather Service began issuing hurricane force wind warnings along much of the Northeast US from Delaware to Maine with “life threatening coastal flooding” expected through the morning of 30 October 2012. Given the strength of this storm is its expected destructive consequence, mandatory evacuations have been declared by the states of New York, New Jersey and Delaware in addition to the closing of the NYC Subway system, the trading floor of the NY Stock Exchange and the cancelation of thousands of flights inbound and outbound to the East coast. The goal of this research is to understand how individuals faced with evacuation decisions obtain, filter, prioritize and act on information provided through social networks and mobile technology and the degree to which mobile technology now impacts evacuation behavior.

Today, 4 out of 5 active internet users visit social networks and blogs with close to 40% of those users accessing social media content from their mobile phone. **It is critical that the next generation of evacuation models and analytical tools be tailored to social media and mobile technology users, the future self-evacuees of the United States.** To accomplish this, we must first understand how social media and mobile technology is specifically affecting the way in which self-evacuees gather information and make decisions during extreme events. **Over 70% of American teens are active on social networking services with an average of 201 friends while 37% of these teens send daily messages through social media outlets.** Today’s teens are tomorrow’s self-evacuees and the effective exploitation of their social connections and mobile technology use will define the next generation of evacuation strategy.

Hurricane evacuee behavior has been studied extensively through direct surveying of evacuees with a predominant focus on deciphering the underlying considerations that motivate an individual’s decision to evacuate. While many publications on hurricane behavior surveys exist, conclusions on evacuee decision-making and the pertinent information used in making these decisions differ and predictive assumptions (intention’s surveys) of people’s behavior during extreme events are not always reliable due to the large number of unanticipated/unexpected circumstances experienced by evacuees during extreme events.

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The vast majority of literature agrees that a few key evacuee considerations positively correlate with an individual's decision to evacuate. In no particular order, these are: (1) perceived safety, (2) delivery of the evacuation notification and (3) perceived storm severity. Information pertaining to the category of the storm, the projected impact area, and the way in which information is worded/disseminated have all shown to be important in determining one's perceived safety. Considerations that do not increase an individual's likelihood to evacuate include the timing of the evacuation (e.g., day or night), prior evacuation experience, and certain demographic factors such as age, occupation, marital status, number of children, etc. Evacuees have also reported various degrees of dependence on factors such as the reliance and importance on friends, family and peers and demographic factors such as disposable income, which played a major role in evacuee decision-making during Hurricane Katrina. The challenge in addressing the role of these factors lies in the inherent confounding between variables.

Past research shows that social media and mobile technology users exhibit similar patterns to geographical on-site behavior during extreme events and imply that the collection and assessment of event information is no longer confined by geographic bounds. **None of this research, however, has explicitly focused on how individuals have used mobile technology to actively solicit information and make decisions in extreme events.** Knowledge on evacuee decision-making is critical to the development of strong, robust optimization models as is evident by the number of humanitarian relief, pre-positioning and evacuation models, all of which include some form of decision-making parameters or variables.

In our survey, we specifically focus on the degree to which social networks and mobile technology augment evacuee decision-making. With respect to those factors that have consistently been deemed to be important to evacuees, we are collecting information to address the following questions:

- Can mobile technology effectively be used to deliver timely, personal and credible evacuation notices to individuals without “overwarning”?
- Can effective two-way communication between Local Law Enforcement and residents be supported through social media and mobile technology?
- What are the most effective modes of communication through social media and mobile technology (e.g., text alerts, Facebook group pages, Tweets, etc.)?

With respect to those unresolved factors, we are collecting information to address the following questions:

- Can mobile devices enable or enhance the familial dissemination of information (i.e., do mobile technology and social media increase an individual's “Hurricane Savvy”) ?
- Can mobile technology improve the speed, reliability and confidence in group decision-making during the planning stages of an evacuation ?

Through this survey, we expect to find that individual's are consistently increasingly using and relying on mobile technology and social media during the evacuation planning process. We anticipate that family/friend/peer communication will show increased frequency in the number of contacts and in the passage of information obtained through the Internet. Supported through literature, we expect that local news and information will retain its priority over national news sources (i.e., CNN, ABC). In contrast to the literature, we believe that the wide-spread use and reliability of mobile technology networks will show through our survey that the perception of “timely, personal and credible” information will change. We believe that individuals will show a higher likelihood to accept information through social media and mobile networks and to use this information directly in their decision-making process.

The target population of our survey is residents of Monmouth County, New Jersey. This particular county offers a large enough population sample size (232,500 households), and importantly, was significantly affected but not devastated by the fallout from Sandy. Prior to Sandy making landfall, different regions of Monmouth were issued evacuation mandates and advisories with different degrees of severity, with mandatory evacuations primarily given to its coastal regions. Interestingly, anecdotal

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evidence from news outlets suggests that despite mandatory evacuation orders, many social venues did not evacuate and operated “business as normal,” which reflects differences in evacuation decision making with the same information/instruction from officials.

In administering our survey, **we follow the Tailored Design Method (TDM)** proposed by Dillman. Dillman’s TDM has repeatedly been shown to result in high **response rates (typically greater than 75%)**. A postcard announcing the survey was sent prior to mailing the first wave of the survey. This postcard gives some brief information on the survey’s purpose and was followed up approximately 1 week later by the actual survey accompanied with a letter explaining the study in further detail. One week after mailing of the first wave survey, a reminder/thank you postcard was sent. Finally, two weeks after the reminder postcard, the full survey was sent again to non-responders as a follow-up. The entire survey mailing process is scheduled to be completed by mid-May 2013. Responses will be compiled, coded and analyzed during the summer of 2013 to infer the basic social media usage statistics of the population and the extent to which social media outlets played a role in coordinating and executing evacuation activities.