

Evacuation of Carless Populations:

Emergency Management Registries: Merging of Research into Practice

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INTRODUCTION

The mass evacuations prior to and following Hurricane Katrina in 2005 stirred a strong reaction from the academic community as well as from the fields of emergency management, planning, and engineering. Even though the evacuations were actually quite successful for the majority of the population (Wolshon, 2009), the evacuation procedures received much negative publicity because of the dramatic failure to evacuate a small percentage of the population that were particularly vulnerable. The plans which accounted for the majority of the population were executed smoothly but the remaining populations that did not fit the norm were left to suffer.



Hurricane Katrina evacuation. Photo: http://www.washingtonmonthly.com/blogphotos/Blog_Katrina_Evacuation.jpg

Increasing frequency of severe weather events due to climate change (IPCC, 2007) and the effects of these hazards intensifying because of urban development, the need to better prepare for the impact of these natural hazards is quite clear. Increasing settlement and development in coastal regions in particular highlights the need for

competent and effective strategies to deal with these incidents. Evacuation and sheltering of large populations during storms have been successful in many cases but all too often specific demographic sectors are overlooked and unaccounted for. Assumptions made about car ownership, access to transportation, and financial resource put some populations at a dangerous and costly disadvantage. Communities have made efforts to account for these atypical populations with systems like emergency management registries. Through the development of these registries, some municipalities have highlighted discrepancies in resources available for vulnerable populations and in many cases prompted improvements in the steps taken to prepare for hazardous events. However, there may be weakness in their approach. There are challenges in defining the characteristics of need, identifying populations with these characteristics, reaching these individuals, establishing trust and communication with these individuals, and formulating an effective strategy to assist them during an emergency. These challenges are the focus of my research inquiry.

My area of study is not emergency management, disaster policy, or even really public policy. However, this is an area of research that spans each of the areas in which I have taken an interest. The evacuation of large populations is a logistical challenge for transportation professionals and the settlement of populations in naturally vulnerable areas is a recurring question for those in urban planning and policy. The culmination of efforts involved in successfully accommodating populations in the face of natural hazards makes this topic not only relevant to current events but also to my particular area of study.

The purpose of this paper is to explore how communities are accommodating atypical populations in evacuations, and if the special considerations being made by municipalities through emergency management registries align with academic research in the field. The research is not focused on any specific community; however, data and policies from specific communities will be used to elucidate behaviors and policies which are likely representative of many communities across the United States.

This paper proceeds with an introduction into basic concepts of vulnerability in the section titled, "Conceptual Framework", followed by a section titled "Methodology of Assessment Process" where I describe the set of indicators that I will use to assess the chosen communities. The indicators were chosen based on concepts and concerns highlighted in the literature reviewed in "Conceptual Framework". Also in the methodology section, I introduce the trio of communities I evaluate in my assessment. A state, city, and county's system of vulnerable population registration are evaluated against the qualitative set of indicators in the section, "Assessment". The paper concludes with a short discussion of results, challenges, and future areas of research.

CONCEPTUAL FRAMEWORK

Evacuation has become a widely accepted method of adapting to the potential negative impacts of hurricanes and other natural hazards. From 1990 to 2003, there were 230 evacuations that involved more than 1,000 people (National Cooperative Highway Research Program, 2009) and with current trends in climate change and settlement patterns it can be inferred that this

rate will increase in the future. A basic definition of the term “evacuate” calls for the removal of some element from a dangerous area¹, but the concept of evacuation in United States has come to mean something along the



Hurricane Katrina evacuation. Photo: <http://recessionreadyamerica.com/2009/12/what-you-can-learn-from-my-hurricane-katrina-survival->

lines of the removal of a population by means of some form of transportation from an area which is dangerous or presumed to become dangerous. While the concept is very simple, execution is quite complicated because of variation in ability and access to resources.

¹ As defined by Oxford English Dictionary

There are many stakeholders and variables in evacuations and while there is a need to recognize this complexity, at some point the information must be synthesized and streamlined so that large-scale public decisions can be made. In creating policies and decisions about evacuations a set of assumptions about physical or mental ability, access to economic resources, communication level, etcetera is created for the majority of the population, and the remaining sectors are considered “special”, “atypical”, “vulnerable”, or any one of a host of other terms that have been adopted by the emergency management field. The disparity in planning for the “standard case” and the “special case” has existed for many years, but it has taken a major event like Hurricane Katrina to bring the hardships experienced by these populations into focus. Addressing this has become a major challenge for the emergency management and disaster science community.

The need to accommodate special populations has been formally recognized for many years, with FEMA being a good example of this. The Federal Emergency Management Agency (or FEMA) has recognized and committed to equal treatment of individuals with disabilities from the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA) of 1990, and most recently, the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) which expanded the commitment to state that, “no person shall, on the grounds of race, color, national origin, sex, religion, nationality, age, disability, limited English proficiency, or economic status, be denied the benefits of, be deprived of participation in, or be discriminated against in any program or activity conducted by or receiving financial assistance from FEMA” (FEMA Office of Equal Rights, 2009). The

inclusion of special needs populations has occurred in many federal, state, and local level emergency management and planning documents but comprehensive action plans are not as common. Small steps or initiatives can be found throughout policy as the need for it is widely recognized, but coming up with a truly effective and comprehensive plan has yet to be accomplished in most cases. Federal guidelines have prompted the creation of policies and procedures for the sake of simply having them in place but there seems to be a disconnect between academic research and practice.

One method of accommodating people who fall into the “special”, “atypical”, or “vulnerable” designation is with the use of a registry or database. This tool is becoming popular in municipalities with elderly and disabled individuals but the creation, maintenance, and utilization of these registries may benefit greatly from insights from the literature and the academic community. From identifying what qualifies an individual as atypical to how to communicate with him or her and address his or her special physical, emotional, or mental needs, there become innumerable combinations of situations to accommodate. Sorting this out with a database of knowledge has the potential to be very powerful, yet current versions seem to fall short of this potential.

Registries aimed at elderly and disabled populations are oftentimes managed by departments of health or aging population within municipalities, and the amount and type of information they collect varies widely. Common categories include contact information,

impairments (sight, hearing, speech, physical, mental, etcetera), current medications, medical device use (ventilators, wheelchairs, oxygen, etcetera), primary language, caregiver information, and communication and transportation limitations. Eligibility for registration to special needs assistance programs varies by municipality with some allowing anyone who claims a need for assistance to requiring individuals be, for example, “so restricted by immobility that others provide assistance to meet their basic needs and those people may be unavailable during an emergency or disaster” or “they have a respiratory condition requiring special equipment such as monitors or oxygen” (Office of Emergency Management Polk County Wisconsin, 2008). While the registries with limited eligibility requirements may allow a large portion of atypical populations to register, in most cases they are still not marketing toward all vulnerable sectors. Ambiguity exists on the technical specifics of the registries on issues like access, security, timeliness, and effective use but if useful and comprehensive data is not collected, there may be little point to even address the registry specifics. Research into these topics to answer a few simple questions may aid in the creation of a registry system that better serves the community and emergency managers.

What is vulnerability?

The first step in creating a special population database is in deciding who needs help, and this starts with defining what is meant by vulnerability. Numerous fields of study have explored the concept of vulnerability within the greater context of society and researchers in disaster science have related these findings to what it means in terms of

emergency management and policy making. Going once again back to a very basic definition, we can define vulnerability as a concept similar to susceptibility, and the greater exposure to risk than the majority of a system². The field of disaster science often makes the distinction between hazards and disasters where by hazards only become disasters when a population is exposed to a hazard. The disruption of society by hazards is when a “disaster” occurs. The exposure to the hazard and subsequent risk that could occur has much to do with vulnerability. Nicholls and Hoozemans defined vulnerability within the context of climate change as “the degree of capability to cope with the consequences” whether those consequences were additional risk, adaptation measures, or losses (Nicholls & Hoozemans, 2000). Fothergill, Maestras, and Darlington used the environmental justice movement as a comparison in “Race, Ethnicity and Disasters in the United States: A Review of the Literature” to how vulnerable populations could be viewed within the field of disaster science and emergency preparedness. Disproportionate vulnerability of some populations should be examined and appropriate policies should be made to protect and account for their needs (Fothergill, Maestas, & Darlington, 1999). The author cited Blaikie et al. for stating that “people’s vulnerability to natural hazards is determined not so much by the event but, by social, economic, and political processes, society creates different conditions under which people face hazards” (Blaikie, Cannon, Davis, & Wisner, 1994).

The traditional look at vulnerable populations included those with physical or mental handicaps, and it has been widely established that these types of vulnerabilities

² As defined by Oxford English Dictionary

affect how an individual experiences a disaster (Mileti D. , 1999). These populations sometimes have previous ties to aid or service organizations during non-disaster times and locating them is easier than someone who is, for example, homeless but otherwise physically and mentally healthy. The aftermath of Hurricane Katrina in 2005 prompted researchers to look further into other population groups that fall under the definition of a vulnerable population as the traditional preparation for those having a physical or mental handicap left a significant number of people without adequate attention. Some municipalities have even termed their registries “Vulnerable Population” registries yet overlook and sometimes even exclude populations who fall outside of the traditional physical and mental disability categorization (Broward County, n.d.).

What are vulnerable populations?

With vulnerability and the concept of a vulnerable population explained, identifying actual populations is necessary in order to create a comprehensive registry. It is not clear why municipal emergency management planning frequently stops with the obviously disabled groups because it seems as though a logical progression into vulnerability and disadvantaged parts of a community would reveal many of the same populations that academics have highlighted. Sorensen prepared the report “Populations with Special Needs” for the Department of Homeland Security in 2006 and she provided a comprehensive overview of special and vulnerable populations (Sorensen, 2006). The author makes an important distinction between special needs populations and vulnerable populations with the former primarily having some recognizable disability and the latter

being more difficult to recognize. Sorensen suggests the working poor as an example of a vulnerable population which can easily go unidentified during a disaster yet be very much in need. The author suggests that while these groups are not as easy to identify and accommodate as special needs populations, there are strategies to reach these individuals.

Individuals which could be considered “special needs”, “atypical”, “vulnerable”, etcetera may already fall under an institutional umbrella as Sorenson suggests. Examples include prisoners, school children, nursing home residents, residents of intermediate care



Orleans Parish Prison inmates on overpass during Hurricane Katrina evacuation. Photo: AP, <http://prisonphotography.wordpress.com/2008/10/>

facilities and homes for the mentally disabled, hospital patients, etcetera. These populations are already grouped and defined within the boundaries and authority of a core organization. Their evacuations may be coordinated between the overarching organization and the emergency management organization, but even if they are not (as

this is not necessarily required) this association creates a predefined route to

reach or identify these individuals. Another category of potentially vulnerable populations come from those who have contact with or utilize public or social services. While an interruption in the particular service may cause hardship, subscription to these services

can also serve as an indicator to identify an individual who may need assistance. Citizens who use public transit may not have access to an automobile to evacuation, or those seeking assistance from food pantries may not have the resources necessary when a disaster occurs. There are



Hospital evacuation during Hurricane Katrina. Photo: CNN, <http://www.emergencyrailconcepts.org/medical.htm>

many examples of indicators like this which could be used to reach out to vulnerable and special populations and include them in a needs registry. However, once the individuals are located, practitioners must tackle questions about what kinds of information should be obtained, how often and how to update the database, who has access to the database, etcetera and these questions have been too daunting for many practitioners to tackle.

How do we reach vulnerable populations?

Risk communication and particularly the formulation, packaging, and dissemination of warning messages have been popular topics for researchers in the field of emergency management and disaster science. The concept of the warning messages has been described (Donner, 2007; Mileti & Sorensen, 1990; Mileti D. , 1999) as a series of stages including receiving the warning, understanding the warning, believing the warning, confirming the threat, personalizing the threat, determining needed action, determining feasibility, and finally taking action. The whole process is affected by social and

environmental variables including culture, gender, access to resources, previous knowledge, standing in and ties to the community, and many of the same characteristics which designate a population vulnerable. While this research is focused on a traditional warning message, it can be inferred that many of these same findings could apply to communicating with vulnerable populations for the purpose of creating a registry database and also for when this database is utilized just prior to a disaster.

Creating, maintaining, and utilizing an emergency management registry would arguably be more impacted by these factors than a single warning message as the relationship between the overarching organization and the vulnerable individual must be sustained. It is not just a one-way communication. The organization must reach out to the community to establish what factors are necessary in a database, establish a means for registering, market this towards vulnerable populations, provide motivation or incentive for the individuals to register, somehow maintain communication for the purpose of updating the information, and then when necessary, utilize the information in the database to provide the necessary accommodations. These accommodations may come in the form of a special warning message in terms of content, a unique delivery form of a warning message, health resources, mental or emotional resources, additional physical or personnel resources to accommodate evacuation, etcetera. Establishing trust, understanding, personalization, appropriate actions, and the other factors of the communication stages throughout the creation, management, and use of the database will be crucial in the success of an emergency management registry.

What about the actual database?

The use of registries to address the needs of vulnerable populations seems like a fairly new trend and as a result there is limited research on the specific topic. From casual browsing of municipal websites and accompanying evacuation plans, there seems to be a true lack of procedural documentation of how these registration databases are to be used in formal emergency management systems. These connections may exist yet but they do not seem to be developed in formal documentation. Research within the field of record and database management reveals some aspects which should be considered for emergency management registries. While the specific recommendations may not be applicable, the concepts can transfer. For example, a look into the creation of a records database in a generally unrelated field reveals common practices or details about regulatory compliance, timeliness of information, data post-processing, record storage, record preservation, privacy, confidentiality, record destruction, record maintenance, and system design (McLemore, 2008).

Elaboration about security and information sharing is oftentimes included in the form of a standard municipal government statement with very limited detail (Loudon County, 2007). While this may satisfy the resident looking to enroll, it may limit the overall effectiveness of the database as it may limit access for planning and modeling purposes. Emergency management registries hold sensitive health and personal information which is not only an issue of security, but it is also quite time sensitive. There is a need to associate

the element of time with the records as many disabilities and vulnerabilities vary over time (Broward County, n.d.). In practice, this means establishing a schedule for updating or organizing the records in a way which ensures regular maintenance. Some municipalities have left this up to the discretion of the registrant (Loudon County, 2007) but when taking into account that these are vulnerable populations who may have limited access and ability to update, this appears it may be a faulty policy. These are the types of considerations that need to be evaluated more thoroughly as academic insights are provided.

The task of creating a comprehensive, sensitive, and secure registry that is also efficient, attainable, and accessible is quite challenging and this fact can be recognized by the vast number of registries which only attempt to accommodate physically or mentally disabled populations. While it may not be a quick and hurdle-free process, if done correctly it may serve as a great resource in emergency management. If it is not executed properly, there is the potential for broken promises and unfulfilled expectations. The following section turns these observations into recommendations for practice.

Moving from Research into Practice

There is no single perfect way to create and manage an emergency management registry database but there are certain steps which may aid in guiding the way. Some of these concepts were presented above but they will now be integrated into a more straightforward process. It is necessary to establish who the targeted audience is for an

emergency management or evacuation registry. Assuming that the emergency management registry is aimed at serving a broad range of vulnerable populations, a municipality should determine characteristics which affect vulnerability in their particular community. These may pull from academic definitions like race, income, physical or mental disability, homelessness, etcetera but may also include vulnerability concepts of specific populations exclusive to a certain geographic region. Emergency managers can gain insights from existing relationships and local organizations to create this list. Contacting and working with organizations that deal with these specific characteristics of vulnerable populations will be useful to begin to generate vulnerable areas of the population. These organizations may include food banks, shelters (women's, homeless, etcetera), transit organizations, assistance programs, and many others. The goals and objectives of a municipality will dictate what action could come next.

There may be benefit in conducting an informal survey of these organizations and their members to obtain better understanding of the types of things that should be included in a registration database. Coming from a transportation planning perspective, knowing things about current transportation practices would be beneficial in not only providing services in the future but in broader planning topics. Appropriate topics for survey questions may include public transportation usage, reliance on friends and family for mobility, and knowledge about transportation infrastructure (i.e. location of stops, scheduling, fares, or where to obtain this information). For example, if a certain vulnerable population sector relies heavily on taxis to get around, the likelihood of these individuals to

utilize public transit during an evacuation is quite low. Not only do they have no prior knowledge about where to obtain this service or how to use it, they are simply not comfortable with it. From an emergency management perspective, this group will either require additional attention in the form of education and communication, or a completely different mode of transport.

The characteristics obtained during research into vulnerable populations in the area should have generated a solid list of topics to cover in a registration document. Instead of having a “voluntary registration” where potential registrants must reach out and participate, the municipality needs to be proactive and make a concerted effort to contact these individuals. Not only will this result in a more robust registry, but it may aid in gaining the trust of the population. At present, it is common for municipalities to host a registration site online and offer paper forms to elder care facilities and disability organizations. However, they fail to reach the “non-traditional” atypical populations. Examples of overlooked populations include the impoverished but otherwise healthy individuals and community members who have little or no access to transportation. The distribution system must expand to include the social and public service organizations that have already been mentioned but it may also need to include community based organizations or even faith based organizations that have established relationships with individuals considered part of the vulnerable population.

As research indicated, the maintenance of the database is nearly as important as the creation of the database. If a large amount of the data becomes incorrect or outdated the database will result in the waste of time and resources during a disaster. Maintaining contact and prompting the updating and revision of information is one method of doing this, but there may be a more efficient way. The emergency management registries could be tied into already existing social service, health, and public service databases so that when one is updated, the changes are applied throughout the system. Specific legal and privacy issues will vary depending on the intricacies of the databases and the over-arching regulations.

The benefits of an emergency management registry are highly dependent on how exactly they are created and maintained. If time and care is taken to create a comprehensive registration document, the information can be transformed into useful data. Accommodating “special”, “atypical”, “vulnerable”, or any population is about integrating the individualization of needs into a system that favors standardization. This creates a great challenge for practitioners but with enough forethought about community characteristics and the people within the community, a comprehensive and valuable database is possible. In the following section I describe how I evaluated three regions on their integration of these suggestions into an emergency management registry.

METHODOLOGY OF ASSESSMENT

Determining a way to assess how well municipalities are addressing the discrepancies brought forth in the literature review was a challenge. Literature containing discussions of vulnerability and the role of special populations in disasters alluded to the concept of emergency management registries but were not explicit in prescribing it as a solution. I was unable to locate a best practices type document and there seems to be no authority on the matter. I was unable to locate any critical reviews of systems currently in use, and this may be because their popularity is fairly new, or because there are few areas which really have the opportunity to put them into use on a regular basis. Also, unique demographics and characteristics of communities make judging emergency management registries quite difficult as an outsider. There are, however, certain areas of the country which have emergency management registries in place which are also affected quite regularly with severe weather or instances where a registry might be put into use. These are the areas that I selected to examine but my methodology for doing so was forced to be quite subjective due to the nature of this research.

Time and resource constraints dictated that it was beyond my capacity to quantitatively assess exactly how effective a particular system is, or how well, in

quantitative terms, the agency could meet the needs of their more vulnerable residents during a disaster. However, what I could do was perform a qualitative assessment from the perspective of a potential registrant. This type of analysis would provide a general idea of how well a system serves the needs of the customers without requiring in-depth original research through a survey or experiment. It would also allow me to explore how integrated issues raised in academia are reflected in practice.

There are numerous features of an emergency management registry system raised in the literature which are noted as being lacking or absent in municipalities. These factors are related to mobility, accessibility, communication, and integration into the wider system. I created a list of indicators by which I reviewed the websites and registration systems against. The indicators are not scored or rated but rather the status for each of them is discussed and impressions noted. Should additional quantitative research be conducted in the future on the performance of these systems, this review provides a good foundation.

The Indicators

The literature review revealed numerous concepts but I group these into three basic areas of focus. These three areas are replicated as themes of consideration for this qualitative review. The list is not meant to be comprehensive as there are an almost endless number of factors to consider within a particular community. They were chosen to be broad enough so I can carry the same topics through the three communities. Each

category contains a series of questions related to the topic but the intention was not to directly answer the question but rather provide feedback on the general state of the topic.

The three areas of consideration are:

- Eligibility
- Transportation
- Communication

Each of these sectors is described in more detail below along with the series of questions that I considered while I looked further into the municipal internet sites.

Eligibility

One of the main concerns identified in the literature review was the specific inclusion of individuals outside of the traditionally narrow vulnerable population definition. While a balance must be reached because too large a database could result in thinly stretched resources failing to reach those truly in need, there is adequate research showing that vulnerable populations include more than just those with physical or mental disability.

As mentioned in the literature review, some municipalities specifically exclude anyone without a physical or mental disability, others are ambiguous about eligibility

needs, and some explicitly allow anyone with a self-perceived need. It was not my intention to determine the municipal operating policies regarding registration requirements. Rather, I explore how a citizen looking to register might interpret their own eligibility based on the website content. Questions to consider are shown in Figure 1.

- How is eligibility addressed on the form? Is it explicit or vague?
- Are there separate registration forms based on the nature of citizen need? ie physical impairment versus economic impairment?
- If there is only one form, are mental and physical disabilities the overwhelming focus of the form?
- What department is the registration through? Is it through emergency services, the health and aging department, family services, etc?
- Is the registration database linked through other community supporting organization like food assistance programs or welfare agencies?
- Is there an easy way to inquire about eligibility? A self administered quiz or a helpline?

Figure 1. Questions to consider regarding eligibility of vulnerable populations.

Transportation

Evacuation has become one of the most popular ways of protecting the population from hazards yet transportation access is something that can literally disable a vulnerable demographic sector during a disaster. While there are indeed other strategies for protecting against natural hazards like, for example, sheltering in place, having detailed transportation data is quite important in assessing which option to recommend.

Special considerations needed for transportation of an individual is one of the most logical questions to include in an emergency management registration yet the literature suggests that it is not a common question topic. My interest in transportation related data fields is broken up into three areas. I am interested in if the municipality or unit of government asked specifically about special transportation needs like, for example, if they needed a handicapped accessible van or if they could transfer from their wheel chair to a regular van with some amount of assistance. I am also interested to know if there was a section about car ownership, knowledge of the transportation system and infrastructure, and their current transportation behavior. Questions that I considered included:

- Did the registration form address specific transportation needs? Wheelchair access, bedridden, transferable, etc?
- Did the form address car ownership, or access to a car via a relative or friend?
- Was current transportation behavior addressed at all? Was regular bus system or transit use addressed?
- If the public transportation system was not used as a frequent mode, were they aware of the resources available and confident in their use of the system?
- Was there any link to existing transportation resources or mention of other options?

Figure 2. Questions to consider regarding transportation for vulnerable populations.

Communication

The issue of communication is widely covered in the literature from the perspective of the warning message. My goal was to see if any of these concepts transferred over into a municipality's data gathering or registration form. Doing so would require obtaining language proficiency information, communication barriers, but also areas like providing directions on how to continue communication with the individual. Questions to consider include:

- Was primary language addressed?
- Was language proficiency addressed?
- Were forms available in multiple languages? If forms were not available in other languages, was there direction on how to proceed if there were language barriers?
- In addition to the text based form, was there an option to register over the phone? Or to make an appointment to register through another organization?
- Was contact information obtained for not only the primary registrant but also any caretakers or others living in the same household? This could include children in the household.
- Were alternate contacts requested?
- In the event that the registrant needed to update or change their information, was there a way to do this without resubmitting the same registration form? Was there a specific updating time period to ensure the information provided was up-to-date and accurate?
- Was participation in other public organizations a field to include, if desired?

Figure 3. Questions to consider regarding communication with vulnerable populations.

These three indicator areas and the questions included in Figures 1, 2, and 3 are the main focus of my qualitative review of the municipal websites. The review of the municipal sites is not bounded by the questions as issues and concerns came up which I did not anticipate. The questions are not meant to be answered sequentially and explicitly, but rather they are meant to guide an assessment on the ease of access a potential registrant might encounter should they be interested in an emergency management registry.

Study Area Selection

Three geographic areas were chosen based on their recent experience with a large natural disaster, and the fact they have a functioning emergency management registry. They are all located in the south or southeast United States but it should be noted that this is not a study about these particular counties or cities and their particular registries. The point is to explore how registries are addressing concerns raised in academic research.

The existence of the registry during the previous natural disaster is not a factor in the selection. In fact, I am not even certain when the registries were established nor was this a concern that I inquired about. I did not have access to their registration system at the time of the prior event and therefore it was not a concern of mine. Choosing a region with experience dealing with a large scale natural disaster had to do more with expectations of higher proficiency. I presume that if any area would have a robust registration system it would be an area that had experienced previous disasters.

A brief description of the three study areas is provided below. Demographic and socioeconomic trends are included but only as they might pertain to registration of vulnerable populations. I also note local past experiences with natural disasters and while all of the selected areas are most prone to hurricanes out of the common natural hazards, the concept of emergency management evacuation databases extends into all types of hazards. The three selected areas represent three different scales of emergency management. This was not originally intended but the three regions I wanted to focus on handle atypical, special needs, vulnerable populations, et al registration systems in differing ways.



Figure 4. Map showing communities under assessment. (Source: Laura Black)

State of Alabama

	State of Alabama	United States
Total Population	4,447,100	-----
Population Over 65 years of age	13%	12.4%
Disability Status	23.2%	19.3%
Speak a Language Other than English at home	3.9%	17.9%
Individuals Below Poverty Level	16.1%	12.4%

Figure 5. Census 2000 Data

Hurricane Katrina in 2005 broke records for being the costliest hurricane in history and among the top five deadliest hurricanes ever in the United States (Knabb, 2006). The disaster became the impetus for research by many municipalities into how to address the special needs of vulnerable populations during a disaster. Choosing one of the directly affected states or counties was the initial objective, however in a relatively extensive key term search and examination of the City of New Orleans Office of Emergency Preparedness web presence (City of New Orleans, 2010) it did not appear that a registration system was available for special needs populations. I explored the Health Department’s Emergency Preparedness site but was still unable to locate anything. There is extensive information about self-preparation for a natural disaster, including self-preparation for special needs populations, but no mention of organized assistance or a registration. While one may exist, I was unable to locate it with what I would consider a considerable amount of effort. If I were a resident looking for a vulnerable population registration system, I would have been unlikely in finding one.

Knowing that Hurricane Katrina affected numerous states, my next option was to explore Alabama. I was unsure if a registration system would be state or county based so I began with a search for, “Alabama special needs registration” and immediately the Alabama Special Needs Population Program was highlighted. With the knowledge that some type of emergency management registration database was in place, I included the state of Alabama into my case collection. I later found out that Alabama has registries at both the state and county level.

While Hurricane Katrina led me to the state of Alabama, recent hits have included Hurricane Ivan (2004), Hurricane Cindy (2005), and Hurricane Dennis (2005). The state may not have experienced the same amount of turmoil as New Orleans or Louisiana, but it is geographically located in an area prone to natural hazards including both hurricanes and record breaking tornadoes (NCDC, 2008).

City of Houston, Texas

	Houston, Texas	United States
Total Population	1,953,631	-----
Population Over 65 years of age	8.4%	12.4%
Disability Status	20.5%	19.3%
Speak a Language Other than English at home	41.3%	17.9%
Individuals Below Poverty Level	19.2%	12.4%

Figure 6. Census 2000 Data

The city of Houston, Texas experienced Hurricane Katrina as well but in a very different way. The city became the evacuation destination for nearly one hundred thousand people and surrounding suburbs sheltered many thousand more (Frank, 2005). While Houston has never experienced a category 5 hurricane, the city is well versed in issuing large scale evacuations like those issues for Hurricane Rita (2005) and Hurricane Ike (2008). The evacuation of 2.5 million resident in preparation for Hurricane Rita called just one month after Hurricane Katrina had infiltrated the city was the largest urban evacuation in history (Flakus, 2005). Additionally, the infamous warning by the National Weather Service calling for “certain death” by anyone who chose not evacuate occurred during Hurricane Ike (Mount, 2008). With directives and experiences like these, I expected the city to have adequate preparation for special needs populations.



Evacuation for Hurricane Rita.
Photo: AFP, <http://www.smh.com.au/news/world/evacuees-flee-out-of-ritas-path/2005/09/22/1126982151256.html>

Just as with the search for a special needs registry in Alabama, my search on the City of Houston easily revealed a citizen information page where registration instructions could be found. Having satisfied both of my requirements to consider the city as a case study, I moved on to a county with probable experience with traditional special needs populations.

Miami-Dade County, Florida

	Miami-Dade County, Florida	United States
Total Population	2,253,362	-----
Population Over 65 years of age	13.3%	12.4%
Disability Status	22.8%	19.3%
Speak a Language Other than English at home	67.9%	17.9%
Individuals Below Poverty Level	18%	12.4%

Figure 7. Census 2000 Data

Miami-Dade County is located in southeastern Florida and is home to two and a half million residents, the most of any county in Florida (Census, 2008). Following Hurricane Andrew in 1992, Florida established emergency management registries to deal with the disparities facing elderly residents during disasters. These registries were the first in the nation (Nordheimer, 1992). Florida also established statutes which required counties to maintain these registries for residents with physical or mental disability (Florida Statute 252.355).

Like the other selected regions, Miami-Dade County is prone to natural hazards, particularly hurricanes. In establishing a registry years prior to their popularity following Hurricane Katrina, I wanted to include this case to see if evolution and maturity has improved their operation and registration practices and also if the state has expanded their view on special needs populations to include the nontraditional vulnerable populations described in academic literature.

ASSESSMENT

The following sections contain my analysis of each of three selected regions by the methodology described previously. A box figure in each section includes a condensed version of the concepts described in the questions above and a checkmark to indicate a positive response to the topic.

State of Alabama: Alabama Emergency Management Agency

The State of Alabama Emergency Management Agency website (Alabama Emergency, n.d.) effectively directs you to the Alabama Special Needs Population Program (also known as the Alabama SPP) if the user is interested in vulnerable population preparedness (Online, n.d.). The redirected target site is straightforward with a great deal of information on citizen readiness, caregiver information, and program information, and there is the option of viewing a Spanish version of the site.

Special needs is explicitly defined as those with physical or mental disabilities, those without nearby assistance from family or friends, people who do not have transportation, non-English speakers, and children “left alone without nearby assistance.” Registration of individuals who do not fit into one of these categories is allowed, however the authors

request that you not apply if you are not in true need of assistance. Still on the topic of eligibility, the site provides a simple self-administered test to see if you should register for the program. In numerous locations there are prompts for additional assistance, but only via telephone and only in one language.

All of the eligibility details are found outside of the actual registration form. Once the user enters the registration form, it is again obvious that this registry is meant to accommodate a wider range of applicants than those fitting the traditional definition of “special needs”. Beyond the basic contact information, the form attempts to obtain information about the social ties that the individual has with the community. This may be in the form of children, care providers, or simply alternate contacts. The form inquires if the registrant can evacuate or shelter in place with the help of their “network” if they have a network. The emphasis on community networks that was seen in the eligibility requires is seen again in the form.

As would be expected on any comprehensive form, medical equipment needs, mobility impairments, cognitive, and mental or emotional conditions are requested, but there are also explicit questions about reading comprehension, special reading needs, and preferred language. One of the most direct indicators of acceptance of nontraditional vulnerable populations is where a registrant can select a lack

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| <p>Eligibility</p> <ul style="list-style-type: none">✓ Clarity✓ Distinction✓ Focus- Managing organization- Related service links✓ Ease of inquiry <p>Transportation</p> <ul style="list-style-type: none">- Special equipment needs✓ Car ownership- Transportation behavior- Infrastructure knowledge✓ Self-help options <p>Communication</p> <ul style="list-style-type: none">✓ Primary language✓ Language proficiency✓ Availability of alternate forms✓ Inclusion of dependents✓ Alternate contacts- Method of updating✓ Frequency of updating- Tie to other organizations |
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Figure 8. State of Alabama

of a car or inability to drive as a primary cause for registration. While in this narrative the medical related questions seem to overwhelm the inquiries, they account for less than a quarter of all fields.

As shown in Figure 8, even though the registry addresses some of the academic insights, there are some very obvious elements that are missing. To begin, there is not explicit direction on the type of transportation equipment needed to transport the registrant and there is no inquiry about the current travel behavior. Network reliance is covered in a general sense but not specifically for transportation. Taking these questions just one step further would have allowed for more comprehensive considerations for evacuation procedure decisions. The Alabama Special Needs Population Program website mentions in one section the importance of keeping the information in the database up-to-date but at that location there is no note on how to do this. However, on another page it is revealed that update forms are sent out regularly to currently registered citizens where they have the opportunity to update the information. The interval of these updates is not mentioned but at that same location, a toll-free phone number is provided where a citizen could call in to update on their own schedule.

The Alabama SPP does not express very extensive collaboration efforts with state social services or aid agencies and while this could be understood to be a weakness, its absence also kept the website clear and straightforward. It is possible that these connections are more publicized through joint activities, programs, or in the face-to-face

interactions in the respective offices but those interactions go beyond the scope of this assessment. The Alabama SPP appears to perform strongly in the academic areas that are addressed, and the areas that are overlooked could be incorporated into their existing framework.

City of Houston, Texas

The Houston Office of Emergency Management homepage (Houston Office, n.d.) is available in both English and Spanish, and there are three main options to explore including “Hazards”, “Preparation”, “Transportation Assistance”, and relevant resource contacts. Considering that special needs registries are a form of preparation I began under “Preparation” and searched for registration options. In addition to a special needs checklist aimed at care facilities, there is a “Special Needs Planning” link with general information about preparation for individuals. There is no connection to any registration system from that area.

The “Transportation Assistance” link proved to be exactly what I was looking for. Rather than classifying a registration system under special needs, vulnerable, or atypical populations distinction, the city made an excellent choice by deemphasizing the disability or plight of those populations and providing a straightforward term for the system. The pull down menu allows a registrant to select the form in English or Spanish and provides little direction other than to fill out one copy of the form for each member of the family,

according to that members needs. I chose to explore only the English form as English is my primary language.

Even though the form I was filling out was in English, the form began by inquiring about the registrants primary language. This is not limited to just English and Spanish, but presumably the most prevalent languages of the city and also an option to specific beyond the provided options. Immediately following basic contact information, the city form moves onto focusing on pet ownership. This was an unexpected inclusion based on my research on vulnerable populations but in hindsight it makes perfect sense. Research has revealed the role of pets in the family and the impact that pets have on evacuation behavior (Whitehead, 2000). Once the user provided an address, it has to be verified on a map that is generated by the interactive registration form. The Houston registration form shows advances not only in these two areas, but instead of just asking for an “alternate contact” that prompted the user for a number of a friend or relative as other municipalities may do, they inquire deeper about the secondary emergency contact.

The fifth and final portion of the registration process involves obtaining special medical needs. As a way of accommodating those without a mental or physical disability, a registrant is first prompted to select a quick “yes” or “no” about if they had a special need. Special need is defined as, “one who needs assistance during evacuation and sheltering because of physical or mental handicaps OR one who requires a level of care and resources beyond the basic first aid level of care that is available in shelters for the general

population” (Survey, 2008). Because my areas of inquiry involved accommodation of some medical special needs, I proceeded in my review as if I had a medical or special need. Broad levels of need are described including a person needing assistance for daily function (but not medical professionals), a person who has a hearing or vision impairment, a person needs assistance with medical care administration, to a person who needs care equivalent to that provided in an institutional setting. Specific medical needs such as oxygen use, service animals, wheelchair, scooter, etcetera are included as are questions on being bedridden, and electricity needs (constant or just for recharging). There is no open space to describe special needs beyond those included in the form.

The registration system of Houston’s Office of Emergency Management provides a different approach from that seen in the state of Alabama. Houston’s form does not focus on traditional special needs populations and is accommodating in not labeling those simply without transportation as “special needs”. I think this distinction is important as it may increase registration numbers and make more people willing to subscribe to a transportation needs database instead of a vulnerable population, special needs, etcetera system. Transportation behavior is not addressed, nor is car ownership. It can be assumed though that if a person is registering for a “transportation assistance” program they either do not own a car or are unable to operate one. Specifics on the types of

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| <p>Eligibility
 ✓ Clarity
 ✓ Distinction
 - Focus
 ✓ Managing organization
 - Related service links
 - Ease of inquiry</p> <p>Transportation
 ✓ Special equipment needs
 - Car ownership
 - Transportation behavior
 - Infrastructure knowledge
 ✓ Self-help options</p> <p>Communication
 ✓ Primary language
 - Language proficiency
 ✓ Availability of alternate forms
 ✓ Inclusion of dependents
 ✓ Alternate contacts
 - Method of updating
 - Frequency of updating
 - Tie to other organizations</p> |
|---|

Figure 9. Houston, Texas

transportation needed for evacuation of individuals with medical special needs is not explicit however questions about being bedridden or mobility assistance use could likely provide the information needed by city officials.

The registration program is set up as an interactive form which presents some limitations if the answers the registrant chooses to give don't fit the format of the field. There are also no contact numbers immediately visible to the registrant as he or she is filling out the form, and if the registrant clicks on the "Contact Us" link at the bottom of the page, the number provided is to the entire city switchboard. A direct number to the Office of Emergency Management is included on the site but it is hidden within other areas of the website. There is no option for potential registrants to request a paper form or register over the phone, or at least these are not apparent via the website.

The state of Alabama's Special Needs Populations Program includes explicit directions on how to update the registration information and also explains how the organization would initiate updates on a regular basis. Houston's system not only doesn't include information on update intervals, but they have no information on who to even contact. Being that the department phone number is not obvious, I would suggest that registrants would be likely to resubmit a registration form making the database now outdated with multiple entries for the same person. As mentioned earlier, there is no area for notes or additional comments so this resubmission could not even be highlighted by the registrant. On a similar note, the inclusion of social links or networks is something which

Alabama allowed for but Houston does not. The Transportation Assistance forms give direction to fill out one form for each individual needing assistance. However, there is no place to indicate relation or connection to previous forms. A registrant can include a spouse or caretaker as the emergency contact on their form but that still would not account for any children or additional relatives in the system.

Houston's Transportation Assistance program provides a good example of how to incorporate non-traditional vulnerable populations as described in the literature into a special needs registration database but they overlook some simple concepts, particularly having to do with contact information. They are well incorporated into health and aging sites as well as the main City system from an informational point of view, but this may lead to some confusion for those looking to contact the Office of Emergency Management. The lack of inquiry information for potential registrants presents problems in each of the areas of focus I looked in to. There is no apparent way for an individual to contact the organization to find out more about eligibility, no apparent way to update his or her registration profile once in the system, and no apparent way add additional special needs to those which are standard on the form. A correction to this simple issue of contact information and the inclusion of more narrative response fields would have more closely aligned their practice with the ideals from my research.

Miami-Dade County, Florida

The main page of the Miami-Dade Department of Emergency Management website is dense with information on related organizations and programs, volunteer opportunities, preparation tips, offered services, and most importantly for the purpose of my research, a link for “People with Special Needs” (People, 2010). It is immediately evident that their definition of special needs is from the traditional perspective of those individuals with mental or physical disability. Miami-Dade’s site describes special needs as “residents who require daily skilled nursing care, assistance with daily living, or have life-saving medical equipment dependent on electricity” (People, 2010) and does so on the very front page of their registration system. The Emergency Evacuation Assistance Program provides an individual assignment to a special needs evacuation center that meets their needs, transportation to the center if needed, and periodic contact with the individual to ensure their needs have not changed. This type of information on how exactly the office uses the information in the emergency management registry is an element that none of the other regions did. There are links to additional information for care providers looking to register their patients for the program and also information about how the system is not meant to be used as a call for help once an event is already occurring. The narrative about the details about the system far exceeds those of either Houston, Texas or the state of Alabama.

Once a registrant has decided that he or she is eligible and the services provided are the type they are interested in, they are directed to printable forms in English, Spanish, Creole, Braille, and phone numbers for assistance in registering if those languages do not

suit the registrant's needs. As I did with Houston, I chose the English form to evaluate. As opposed to jumping directly into name and contact information, the form begins with a one page summary of directions and expectations. It is once again explicit that the registrant must have a medical need to register and he or she must also obtain medical verification from his or her doctor. There is a description of the role of the emergency management registry system within the greater emergency preparedness plan, and clear details on the update procedures and intervals. A dedicated Special Needs Hotline phone contact number is provided as are other contact numbers, websites, and physical addresses for office locations.

The data collection fields begin with traditional contact information, alternate contacts, and the designation of a person who would accompany the registrant to the shelter. Medical information dominates the rest of the form, although the length of the form is quite short compared to the other two regions I looked at. The registrant is asked to notate the types of medical assistance they would need at a shelter. Options include personal care, communication or guidance (such as if hearing or vision impaired), medical oxygen and electricity needs, bedridden, and also if the registrant has the ability to transport his or herself to the shelter or if transportation assistance would be needed as well. The form provides a list of medical conditions for the registrant to select if the condition affects them and also a blank area to describe any other conditions or needs. These fields are the extent of the information obtained from the registrant. A doctor would

be needed to describe the individual's diagnosis and provide his or her name, physician's license number, contact information, and signature.

The breadth of information obtained in Miami-Dades' registration form is quite narrow compared to the other regions however their use of the information is very distinct. The county's purpose and services are well described, and while it is shorter, the form obtains the necessary information. Contact information and communication features are prevalent throughout the website and form. Language and communication difficulties are addressed appropriately for the purposes of the registry. While eligibility is not extended to those without physical or mental impairments, this is made very clear. The focus of the forms is quite clearly medical needs and other organizations are integrated into the action plans and suggestions the site made for special needs population planning. Access to transportation and special equipment considerations should the county need to provide transportation are addressed, and while transportation behavior or knowledge of are not addressed these are not relevant to the format of the program.

Eligibility <ul style="list-style-type: none">✓ Clarity✓ Distinction✓ Focus✓ Managing organization✓ Related service links✓ Ease of inquiry
Transportation <ul style="list-style-type: none">✓ Special equipment needs✓ Car ownership- Transportation behavior- Infrastructure knowledge✓ Self-help options
Communication <ul style="list-style-type: none">✓ Primary language✓ Language proficiency✓ Availability of alternate forms- Inclusion of dependents✓ Alternate contacts✓ Method of updating✓ Frequency of updating✓ Tie to other organizations

Figure 10. Miami-Dade County, Florida

The Miami-Dade County Office of Emergency Management's emergency management registry is more developed than Alabama's or Houston's. I was initially displeased that they so explicitly excluded vulnerable populations without diagnosed

medical needs, further exploration of the site and links revealed that there is quite a variety of resources available for less traditional vulnerable populations like for example, those who are otherwise healthy but with access to an automobile. While this went beyond the scope of my initial research, I found plans for populations relying on bus transit and citizen guides to using transit to evacuate. Just as with the Miami-Dade special needs Emergency Evacuation Assistance Program, there is easily accessible contact information and education resources available for residents. The emergency management registry system does not address the needs of all vulnerable populations but their other programs may adequately fill the gaps that are addressed in the literature. This distinction will be discussed in my concluding remarks.

CONCLUDING REMARKS

I first became interested in the use of registries to accommodate atypical populations' special needs in 2008 when I was introduced to a smaller scale registry system for fire and EMS providers. Community residents with special needs could contact their local emergency dispatch center and provide supplementary information regarding their health care needs so that in the event of an emergency first responders could provide appropriate care more quickly. My work in a disaster evacuation project and a need for data on vulnerable populations led me to emergency management registries, a concept which is very similar to those used for fire and EMS providers. This first enquiry was the foundation for this analytical paper.

The original research question calls for exploration into communities' use of emergency management registries as a method of accommodating atypical populations in evacuations, and assessment of how the registries' operations or methodology aligned with academic research in the disaster science and emergency management fields. My literature review does not reveal any authoritative source for municipal emergency management registries, but I put together a list of major issues that should be addressed by a registry. These topics translate into indicators and investigation areas. It was my original intention to only assess the content within the confines of the emergency management registry form

or process, but it was quickly apparent that deeper exploration of the full emergency management site or even larger government site was necessary.

While the three study areas in this paper have emergency management registries, the role of a registry in the agency's overall emergency management approach varies. Miami-Dade County is the most explicit example of this. The county excludes anyone without a confirmed medical condition. However, they have other resources available for residents without transportation. If I had assessed only the emergency management registry and ignored the rest of the system, the county appears to be poorly prepared. Future research in this area should consider the services available or intended by the entire system instead of just one area or tool. A questionnaire or survey of the agency would be useful in accomplishing this, and it would also provide clarity to some indicator areas where inferences were required. The nature of the paper and research create some limitations on my ability to make system-wide conclusions, but there are still several important concepts to highlight.

Emergency management registries are a powerful idea but, as I suspected, they are not fully developed in practice. The time sensitive aspect of registries presents a real problem. While a registry administration may send out postcards asking for updated information or call the registrant several times to make contact, what is the municipality to do if no response is ever provided? If the municipality keeps the record on file and exerts energy or resources for an entry that doesn't exist or no longer needs assistance, the resource

available for truly vulnerable populations is reduced. However, if you delete the entry of the registrant who fails to respond and the registrant maintains a belief that they are going to be assisted in the event of an emergency, further problems are created. This issue is not really addressed in literature or in practice. Privacy is another area that remains unclear. I have an interest in the use of the data collected in emergency management registries for planning purposes. I was unable to find research on the use of vulnerable population data in planning applications prior to an emergency. I also found no mention of this on the sites I explored. Municipalities may be collecting information and not using it most effectively due to a lack of available guidance.

These concepts are of concern and likely deserve more attention, but the area of citizen expectations and the potential for broken promises needs to be addressed first. For the most part, there is very little information about what exactly “joining” a registry entails. The Miami-Dade County registry provides explicit direction on this but the two other agencies reviewed provide no details. During my literature search I reviewed several other municipal systems and the overwhelming trend was a registration system with no detail on what the registrant should expect in the event of an emergency. Before an agency needs to address communication challenges or transportation behavior, two areas from my indicators, they first must decide how exactly they plan to use their registry. These decisions and policies need to be publicized and their registration system can then be tailored to fit the services they intend to provide to registrants. Without doing this, citizens

register for additional help and draw their own assumptions about the level of care or assistance that they will receive during an emergency.

System-wide assessment is an important strategy in looking at emergency management registries as is defining the role of the registry in the greater emergency management response, and ensuring that this function is clear to the public. I do not have definitive suggestions for each of the indicators I created but this was not the original intention. In comparing the practice of the three study area agencies with academic indicators I was able to provide several insights. My research provides a beneficial foundation for this area of study and also emphasizes why this potentially powerful tool needs further research in order to become more effective and meaningful in the field of emergency management.

REFERENCES

- Alabama Emergency Management Agency. (n.d.). Retrieved 2010, from
<http://ema.alabama.gov/>
- Blaikie, P., Cannon, T., Davis, I., & Wisner, B. (1994). *At Risk: Natural Hazards, People's Vulnerability, and Disasters*. New York: Routledge.
- Broward County. (n.d.). Vulnerable Population Registration. Retrieved from
<http://www.broward.org/registry/who.htm>
- City of New Orleans. (2010). City of New Orleans: Office of Emergency Management.
Retrieved from <http://www.cityofno.com/portal.aspx?portal=46>
- Donner, W. (2007). An Integrated Model of Risk Perception and Protective Action: Public Response to Tornado Warnings. PhD Dissertation . Newark, DE: Department of Sociology and Criminal Justice, University of Delaware.
- FEMA Office of Equal Rights. (2009, June 4). FEMA Policy. Retrieved from Federal Emergency Management Agency:
http://www.fema.gov/oer/reference/fema_policy.shtm
- Fothergill, A., Maestas, E., & Darlington, J. (1999). Race, Ethnicity and Disasters in the United States: A Review of the Literature. *Disasters* , 23 (2), 156-173.

Flakus, G. (2005, September 25). Recovery Beginning in Areas Affected by Hurricane Rita. VOA News. Retrieved from <http://www1.voanews.com/english/news/a-13-2005-09-25-voa33-67400172.html>

Florida Statute 252.355. Registry of persons with special needs;(2009), http://www.leg.state.fl.us/STATUTES/index.cfm?App_mode=Display_Statute&Search_String=&URL=Ch0252/Sec355.HTM.

Frank, T. (2005, August 31). Astrodome to become new home for storm refugees. USA Today. Retrieved from http://www.usatoday.com/news/nation/2005-08-31-astrodome_x.htm

IPCC, 2007: Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning,Z. Chen, M.

Knabb, R. D., Rhome, J. R., & Brown, D. P. (2006). Tropical Cyclone Report: Hurricane Katrina. Retrieved from National Hurricane Center website: http://www.nhc.noaa.gov/pdf/TCR-AL122005_Katrina.pdf

Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Loudon County. (2007). Security and Privacy Information. Retrieved from Office of Emergency Management: <http://www.loudoun.gov/Default.aspx?tabid=2494>

- McLemore, D. D. (2008). A Model Records Management System for Texas Public Utilities. San Marcos, TX: Department of Political Science, Texas State University.
- Mileti, D. (1999). Disasters by Design. Washington, DC: John Henry Press.
- Mileti, D., & Sorensen, J. (1990). Communication of Emergency Public Warnings: A Social Science Perspective and State of the Art Assessment. Oak Ridge, TN: Oak Ridge National Laboratory.
- Mount, M. (2008, September 12). Weather service warns of 'certain death' in face of Ike. CNN International. Retrieved from <http://edition.cnn.com/2008/US/weather/09/11/hurricane.ike.texas/index.html>
- National Climatic Data Center: Tornado Climatology. (2008). NOAA Satellite and Information Service [State of the Climate: Alabama]. Retrieved from <http://www.ncdc.noaa.gov/oa/climate/severeweather/tornadoes.html>
- National Cooperative Highway Research Program. (2009). Transportation's Role in Emergency Evacuation and Reentry. Washington, DC: Transportation Research Board.
- Nicholls, R. J., & Hoozemans, F. M. (2000). Global Vulnerability Analysis. In Encyclopedia of Coastal Science. Kluwer Academic Publishers.
- Nordheimer, J. (1992). Hurricane Andrew: Workers try to track down elderly scattered by storm. The New York Times. Retrieved: <http://query.nytimes.com/gst/fullpage.html?res=9E0CE5D6113FF93AA1575BC0A964958260>

Office of Emergency Management Polk County Wisconsin. (2008). Emergency Management Special Needs. Retrieved from Polk County Wisconsin:

http://www.co.polk.wi.us/emergency-mgmt/special_needs.asp

Online Registration Form. (n.d.). Alabama Special Needs Popularion Program. Retrieved 2010, from <http://www.alabamaspp.com/registration/online-form.php>

People with Special Needs and Emergency Evacuation Assistance Program. (2010). Miami-Dade Office of Emergency Management. Retrieved 2010, from

http://www.miamidade.gov/oem/special_needs.asp

Sorensen, B. (2006). Populations with Special Needs. Oak Ridge National Laboratory.

Survey: Transportation Assistance Registry. (2008). City of Houston Office of Emergency Management. Retrieved 2010, from

<http://mycity.houstontx.gov/oemtar/default.aspx?Lang=EN>

Whitehead, J. C., Edwards, B., Van Willigen, M., Maiolo, J. R., & Wilson, K. (2000, April).

Heading for Higher Ground: Factors Affecting Real and Hypothetical Hurricane Evacuation Behavior . Retrieved from East Carolina University website:

<http://www.ecu.edu/cs-educ/econ/upload/ecu0006.pdf>

Wolshon, B., & McArdle, B. (2009). Temporospatial Analysis of Hurricane Katrina Regional Evacuation Traffic Patterns. *Journal of Infrastructure Systems*, 15(1). Retrieved from

[http://dx.doi.org/10.1061/\(ASCE\)1076-0342\(2009\)15:1\(12\)](http://dx.doi.org/10.1061/(ASCE)1076-0342(2009)15:1(12))