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Reducing Public Health Risk During Disasters: Identifying Social Vulnerabilities

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Abstract

All regions of the US experience disasters which result in a number of negative public health consequences. Some populations have higher levels of social vulnerability and, thus, are more likely to experience negative impacts of disasters including emotional distress, loss of property, illness, and death. To mitigate the impact of disasters on at-risk populations, emergency managers must be aware of the social vulnerabilities within their community. This paper describes a qualitative study which aimed to understand how emergency managers identify social vulnerabilities, also referred to as at-risk populations, in their populations and barriers and facilitators to current approaches. Findings suggest that although public health tools have been developed to aid emergency managers in identifying at-risk populations, they are not being used consistently. Emergency managers requested more information on the availability of tools as well as guidance on how to increase ability to identify at-risk populations.

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Keywords

at-risk; disaster; emergency management; public health; social vulnerabilities

“Anybody that doesn’t have the ways and means to get out of harm’s way is an at-risk population...you can’t leave [anybody] behind, you have to be prepared to handle any and all situations.”

1 Introduction

According to the Federal Emergency Management Agency (FEMA), there were 62 Presidentially Declared Major Disasters in the United States (US) in 2013, an increase of 60% over the number declared in 2000 (FEMA 2014a). With changes in the intensity and frequency of extreme weather events associated with climate change, this trend is expected to continue to rise as the number of natural disasters increases (Haines et al. 2006; O’Brien et al. 2006; Balbus and Malina 2009). Most disasters have major public health consequences. Hurricane Katrina, for example, resulted in more than 1800 deaths, at least 7500 injuries and illnesses, and destroyed most of the areas’ health and public health infrastructure (Weisler et al. 2006).

Social vulnerability is defined as the characteristics of a person or group in terms of “their capacity to anticipate, cope with, resist and recover from the impact” of a discrete and identifiable event in nature or society (Blaikie et al. 2004). There are many characteristics that influence social vulnerability for the US population; among the most commonly accepted ones are age, gender, race, socioeconomic status, medical status, disability, and English language proficiency (Cutter et al. 2003). Socioeconomic status is one of the largest categories of social vulnerability and includes employment, income, and education level (Morrow 1999; Blaikie et al. 2004; Cutter et al. 2010; Phillips et al. 2010).

Social vulnerabilities include the conditions and social factors that limit a person’s abilities to cope with daily life and also make them vulnerable to the effects of disasters (Blaikie et al. 2004). Previous research has demonstrated that socially vulnerable populations, also referred to as at-risk populations, are more likely to be adversely affected in emergencies (Morrow 1999; Cutter et al. 2000, 2003; O’Brien et al. 2006; Hutton 2010; Phillips et al. 2010; Flanagan et al. 2011). In particular, “the nation’s poorest, sickest, most dependent and most isolated residents” face increased exposure to “physical hazards and to the social, economic, political, and psychological impacts” of disasters (Enarson 2007).

Public health and social science researchers have developed approaches and tools to quantify and geographically visualize social vulnerabilities within populations (Cutter et al. 2003; Blaikie et al. 2004; Flanagan et al. 2011). Susan Cutter’s Social Vulnerability Index was one of the first tools developed to assist with the identification and visualization of social vulnerabilities (Blaikie et al. 2004). The Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry’s Geospatial Research, Analysis and Services Program developed a similar tool, the Social Vulnerability Index (Flanagan et al. 2011). Although there is strong evidence that populations with higher levels of social

vulnerability are at greater risk during a disaster and despite the development of tools to assess social vulnerabilities, it is unknown how emergency management officials are identifying these populations and whether emergency management has incorporated social vulnerability assessments into emergency management practices. By knowing vulnerabilities within a community, state, local, and tribal officials can design and implement community-based efforts during each of the four phases of disaster: preparedness, response, recovery, and mitigation. In providing increased assistance over the course of a disaster, emergency managers can consequently reduce the public health impact of disasters (Morrow 1999; Cutter and Emrich 2006; Flanagan et al. 2011).

While consideration for at-risk populations is not a new concern for emergency managers, the emphasis has typically been on response rather than mitigation (Enarson 2007). Mitigation is taking action before the next disaster to reduce human and financial consequences later (FEMA 2014b). A focus on mitigation can help emergency managers plan ahead for the needs and resources of at-risk groups who may suffer the greatest losses from a disaster. Effective mitigation requires understanding local risks and taking actions that will lessen the impact of disasters (FEMA 2014b). Emergency managers could facilitate effective mitigation by knowing the vulnerabilities that exist in their population.

The purpose of this study was to understand how emergency managers are identifying social vulnerabilities within their populations. Additional objectives were to learn of barriers to identifying socially vulnerable populations and what would facilitate the identification of these groups by emergency managers. Key informant interviews were conducted with nine emergency managers and a follow-up workshop with additional stakeholders was conducted to gain a deeper understanding of the barriers and facilitators to current approaches.

2 Methods

Nine key informant interviews were conducted with emergency managers to understand the methods used to identify social vulnerabilities in their jurisdictions. Following the interviews the CDC organized a workshop with emergency managers and other stakeholders to gain a deeper understanding of current approaches in disaster management. Because emergency managers are more familiar with the term “at-risk” populations, the researchers used that term when asking emergency managers about populations with high levels of social vulnerabilities. For the purposes of this research, the terms are interchangeable. Each interview began with the interviewer defining the term “at-risk population.”

2.1 Key Informant Interviews

2.1.1 Study Participants and Sampling—Interview candidates were identified through key national organizations including the National Emergency Managers Association, International Association of Emergency Managers, Disaster Epidemiology Community of Practice, and Council of State and Territorial Epidemiologists’ Disaster Epidemiology Subcommittee. Nine local-level emergency managers were selected through purposive sampling. At least one emergency manager was included from each of the five US regions (Northeast, Southeast, Midwest, Southwest, and West). Additional consideration was given to selecting at least two emergency managers from jurisdictions falling within the following

population size categories: small (less than 50,000); medium (50,000–175,000); and large (greater than 175,000). Candidates were recruited via email; interested participants were scheduled for a 30 min telephone interview.

2.1.2 Data Collection—Telephone interviews were conducted between June and August 2013. A semi-structured approach was employed to allow common issues to be explored, while giving participants the freedom to introduce unanticipated topics of relevance to their experience. All interviews were conducted by the same researcher (the lead author) in order to enhance consistency. Also present during the interviews was a qualitative researcher who listened and took notes. The emergency managers verbally consented to participation at the time of interview, and based on this consent, interviews were then audio-recorded. Each interview was transcribed and transcripts were reviewed for accuracy and compared to the research team’s interview notes.

Emergency managers were asked to provide some general information (e.g. *What is your job title? How many years have you had this job?*) and asked questions about current approaches used to identify at-risk populations (e.g. *How does your county currently identify at-risk populations? Do you have a special-needs registry? What tools do you use?*). In addition, emergency managers were asked to discuss barriers and facilitators needed to address challenges faced in identifying at-risk populations (e.g. *What gaps need to be addressed to help your county identify at-risk populations?*).

The study protocol was approved by the Institutional Review Board at CDC and was deemed exempt from further review by the University of North Carolina at Chapel Hill.

2.1.3 Data Analysis—A qualitative researcher developed codes which were organized in a codebook based on the research questions and interview guide. Coding was applied to each transcript using ATLAS.ti (version 6.2.28), a qualitative data analysis software tool. Coding is a way of organizing the text which allows researchers to systematically read for themes and compare themes across interview respondents. Deductive codes based on the interview questions were applied to all transcripts, as well as inductive codes based on the themes observed by the interviewer and qualitative researcher.

The research team conducted a 20 percent quality assurance review of coding and resolved discrepancies through consensus and by adding additional codes where necessary. Coding was followed by a systematic analysis of code reports generated by ATLAS.ti, which were read for emergent themes that were common across interviews. By examining full narrative accounts by theme, commonalities in particular domains emerged despite the differences (e.g. geographic location, jurisdiction size) among interview respondents.

2.2 Emergency Managers and Social Vulnerability Workshop

In order to expand upon the themes that emerged during the key informant interviews, CDC hosted a workshop on July 11 and 12, 2013 in Atlanta, Georgia. The 40 workshop participants included local-level emergency managers (of which seven were also key informant interviewees), state-level emergency managers, academic researchers, public health and human resource practitioners, and representatives from CDC. The workshop

agenda included demonstrations of social vulnerability tools (i.e. CDC/ATSDR's Social Vulnerability Index and North Carolina's *Vulnerable and At-Risk Populations Resource Guide*) and breakout sessions to discuss the themes that emerged from the key informant interviews. To capture information from the workshop, presentations and break out discussions were recorded and designated attendees took notes. The audio recordings and notes were used to develop a comprehensive workshop summary. The workshop summary was used to supplement the systematic analysis of the interviews; information gathered from the workshop added to the knowledge learned in the interviews. Themes identified in the interviews were discussed at the workshop to gain a deeper understanding of current approaches and barriers.

3 Results

The results presented here are based on information gathered from emergency managers during the interviews and workshop. The workshop provided additional information on the themes that emerged from the interviews; results are presented together.

3.1 Identification of At-Risk Populations

Emergency managers noted the use of multiple methods to identify at-risk populations. Among the methods used was a self-identification process for the registration of at-risk populations. Several counties maintain a registry or database where people needing special assistance can register by phone, online, or by mail. While some emergency managers supported the use of registries, some cited concerns with the accuracy of the registry information, as it can quickly become outdated, especially among transient populations.

“Trying to develop a registry and maintain it and keep it up to date is really kind of an overwhelming task, and I think as soon as you create your registry it's [going to] be out of date.”

Additional concerns included the fact that the use of registries during a disaster may shift responsibility from the individual to emergency management. A person who is on a registry might behave as though the jurisdiction will be able to provide needed assistance during a disaster when in reality emergency management might not be able to meet the needs of all of those registered. There was also the concern that people may not know to put themselves on the registry or how to register. Finally, registries are not all-encompassing; some registries are just for those who require special assistance in the event of evacuation (e.g. the electrically dependent, those with mobility issues, etc.).

Emergency managers also reported identifying at-risk populations by reaching out to community stakeholders to develop coalitions with organizations, agencies, and others tied into special needs groups through advocacy or provision of services. They stated that engaging partners in emergency preparedness was important to help identify at-risk populations, increase general knowledge in the community about emergency preparedness resources, and improve messaging and communication efforts to at-risk groups. Many emergency managers utilized partners that were considered trusted networks by the at-risk population such as local churches, health departments, local businesses, and advocacy groups. Several emergency managers reported that partner organizations are better linked to

the community and therefore are better able to identify persons at-risk and communicate information to their clients or members before, during, and after an emergency.

“What we want to be able to do is develop relationships with the various human service agencies...so when something happens, then we can push information out to them and they can push it out to their service populations because they’re already a trusted voice and a trusted source by those target populations.”

Emergency managers stressed the importance of these partnerships, as they felt that the “whole community” was responsible for the identification of at-risk populations, not just emergency management.

“The whole thing cannot be shoved off on emergency managers because that is setting us up to fail...the whole community has to participate in their own preparedness because if they don’t, if they just say ‘Well, you’re [going to] take care of us’ nobody’s [going to] be happy and we’re [going to] fail.”

3.2 Tools Used by Emergency Managers

During the interviews, we asked emergency managers if they were aware of specific social vulnerability tools that have been developed to assist emergency managers in identifying at-risk populations (Table 1). While some mentioned they had heard of specific social vulnerability tools, the majority had not received any training on how to use the tools available. During the workshop emergency managers also mentioned using US Census data and Geographic Information Systems to assist with identifying at-risk populations.

We asked emergency managers not currently using tools to identify social vulnerabilities in their communities what would encourage their use. Features that were listed as appealing included the ability to view data by disaster type or type of population, common operating platforms, large and detailed pictures, and ability to layer with other hazard or state-specific information. In particular, emergency managers wanted a tool that provides a shell that can be used to input state- or jurisdiction-specific data. One emergency manager stated that for tools to be useful, the data being used by the tools would need to be trustworthy and accurate. Others expressed the need for tools that are web-based as well as available for download or use off-line in the event of a power outage.

3.3 How Information is Used

Emergency managers who collected information on at-risk populations reported using the data during each disaster phase. Table 2 summarizes the ways emergency managers described using this information for each disaster phase.

Specifically, one emergency manager described using information from social vulnerability tools to identify areas with at-risk populations to be able to target resources to areas with a higher percentage of those in need.

“If there was a specific area of the county that was impacted greater than others, we would look at those that fall within those different vulnerability areas to see what percentage of those are in that impacted area so we can focus on the specific types of resources those groups might require.”

3.4 Current Barriers to Identifying At-Risk Populations

Emergency managers discussed several barriers or challenges faced by their jurisdictions when trying to identify at-risk populations. The most commonly cited barrier was difficulty with outreach to certain at-risk populations. There were several emergency managers who discussed the lack of willingness of some individuals and organizations to share information for various reasons, such as distrust of government or perceived violation of the Health Insurance Portability and Accountability Act.

“We have some populations here who are flat-out distrustful of the government, and when neighboring jurisdictions have had flooding and they open a shelter at the police department, the people won’t come because they don’t trust the police.”

Additionally, many at-risk individuals are not affiliated with any of these organizations.

“But you’re always worried that somebody is [going to] slip through the gap...not slip through the gap because we forget them, I say slip through the gap because we don’t know about them.”

Some emergency managers were concerned about the constant updating and intensive resources needed to maintain registries. Further, registries may be inaccurate when people fail to self-identify themselves as at-risk because they do not consider themselves a member of a vulnerable population.

“Some of these individuals don’t want to be considered a vulnerable population. Some of them don’t want you to look at them in that way.”

Emergency managers mentioned complacency as a barrier where perceived risk might not be high enough to drive someone to register.

“People say, ‘I don’t need to call in. I’m not worried about it.’ And at the 11th hour they’re going to call in. They think ‘I don’t need to put myself on this list. We’re not going to have a hurricane this year’ or ‘No, we’ll register when the time comes.’”

Emergency managers also cited a lack of resources such as staff time and funding as barriers to identifying at-risk populations. While some felt that tools would be useful, they worried that the tools were highly technical and would require training. Another concern was the funding needed to sustain long-term use of these tools. Finally, the amount of data that the tools provide could be overwhelming. Emergency managers suggested expanding the use of tools to areas beyond preparedness (e.g. city planning) for cost sharing and to justify the investment in time, money, and training.

Of note, many emergency managers expressed the desire to learn from others that might face similar barriers and challenges regarding the best way to reach vulnerable populations. One interviewee looked forward to the workshop as an opportunity to learn “how other people are reaching (at-risk populations) and how we can apply that to our county.”

3.5 Facilitators Needed to Identify At-Risk Populations

Emergency managers mentioned various facilitators needed to address barriers or challenges faced in identifying at-risk populations.

Emergency managers expressed a need for additional resources to engage and forge partnerships with community groups that serve at-risk populations, because building and maintaining partnerships is resource and time intensive. They felt that funding would also help to increase education and outreach efforts and to hire additional staff to accommodate the increased outreach efforts. This could lead to improved messages and communication for the purpose of identifying at-risk populations.

“More partnerships to pool resources and share common messages would be a good thing. Initiatives...where we’re just engaging a lot of non-traditional stakeholders in disaster preparedness and response to share our information and our messaging and just getting it out to more people.”

Emergency managers also noted the importance of engaging individuals in their own preparedness. One approach for encouraging at-risk individuals to self-identify is to engage people and increase their perceived risk, which could help people be less complacent and take more individual responsibility. Although all regions of the US are at-risk for disasters, this may be easier to do in areas that frequently experience natural disasters, such as the gulf coast, than in jurisdictions that see few if any disasters.

“We are trying to get the disability community and the vulnerable populations more engaged in self-preparedness so that they don’t rely on state and county and local resources and not prepare at all.”

Further, emergency managers emphasized the importance of having the cooperation of individual community members to spread the word about preparedness in the community.

“What...pushes more people’s preparedness is not what we as an emergency management organization tell them to do but what they might hear from a neighbor or a friend or a relative with regards to their own personal preparedness. So I guess the more we can get people in the community to talk about these things the better.”

4 Discussion

Previous research has demonstrated that populations with higher levels of social vulnerability are more likely to experience negative consequences to disasters (O’Brien et al. 2006). By knowing and mapping the vulnerabilities within their communities, emergency managers can mitigate the impact of a disaster on at-risk populations. The results of this qualitative study suggest inconsistencies among emergency managers in awareness and use of available tools to identify at-risk populations. While some emergency managers used or had heard of social vulnerability tools currently available, the majority had not received any training on their use. They also described features which would encourage the future use of social vulnerability tools, including customizability, common operating platform, large and detailed pictures, and availability for use off-line. Of those emergency managers using

information on at-risk populations, they reported applying this information in a number of different ways during each of the four disaster phases.

Emergency managers identified several barriers to identifying at-risk populations. A main barrier was reaching at-risk populations especially when those populations were not associated with a community group, agency, or trusted network that could assist with outreach. An additional barrier included a lack of self-registration to registries of at-risk populations because of issues such as distrust of government, complacency, people not considering themselves as vulnerable, and people being unaware that they needed to register or not knowing how to register. Lack of resources, such as funding and staff time, was another barrier mentioned. Additionally, emergency managers highlighted the difficulties in maintaining a registry including the geographic fluidity and constantly changing health factors and functional needs of populations. Facilitators included increasing partnerships with community organizations, involving the whole community in emergency preparedness, and increasing funding, resources, and tools. In addition, improving emergency preparedness messaging and communication to the general population could increase awareness of available resources and encourage people to self-register.

The use of a qualitative study design was valuable as it allowed for open communication with emergency managers and prompting for more information. However, a major limitation of this study is that it was not representative of all emergency managers across the country and was limited to the experiences, perceptions, and practices conveyed by study participants. While only nine emergency managers participated in the key informant interviews portion of the study, by the end of the nine interviews the responses were generally the same, and enough information was gathered to reach saturation on all areas of inquiry. This research was not designed to be representative of a larger population and generalizability was not a goal of this study. While the interview portion of this study was limited to nine emergency managers, the interviews and the additional information gathered from the workshop were sufficient to inform future work.

Future research should address the gap between the existence of social vulnerability tools and use by emergency managers. Research that addresses this gap, along with other gaps between public health and emergency management, would add greatly to the current practices in the disaster preparedness and response community.

In response to the gaps identified by this study and needs expressed by emergency managers, CDC is currently developing a guidance document to provide emergency managers with critical information, strategies, and tools they need to improve their ability to identify at-risk populations. The guidance document will pull together resources that have been previously published to provide emergency managers with the knowledge and technical capacity to use the available tools. The guidance document will highlight the Social Vulnerability Index (SVI) tool created by CDC and the Agency for Toxic Substances and Disease Registry's Geospatial Research, Analysis and Services Program. The SVI tool was created to help emergency response planners and public health officials identify and map the communities that will most likely need support before, during, and after a hazardous event. The SVI uses US Census and American Community Survey data to determine the social vulnerability of

every census tract. The SVI has recently become available and can be accessed by the public for free at <http://svi.cdc.gov> (Flanagan et al. 2011; Agency for Toxic Substances and Disease Registry 2014).

To complement the guidance document, the public health community could educate at-risk communities and the groups and organizations serving them. This education might increase awareness of individual roles and capacities in disaster preparedness and response as well as the realities of emergency response during a disaster. In placing more of an emphasis on personal resiliency, communities as a whole may be better prepared for disasters.

5 Conclusion

This study aimed to provide insight into methods emergency managers are using to identify at-risk populations, current barriers to identifying these groups, and practical solutions to addressing those barriers. Findings suggest that although public health tools have been developed to aid emergency planners in identifying at-risk populations, some emergency managers were not aware of these tools, and for multiple reasons, others who were aware did not use them. Future research might address the gap between the existence of social vulnerability assessment tools and use of these tools by emergency managers. Education, outreach, and guidance could increase the practice of identifying at-risk populations in emergency management. Available evidence indicates that efforts made by local emergency managers to identify vulnerabilities, meet critical needs, build on the capacities of even the most vulnerable, and partner with high-risk groups can reduce the public health impact on vulnerable populations, and in turn improve public health overall.

References

- Agency for Toxic Substances and Disease Registry. The Social Vulnerability Index. 2014. Available at: <http://svi.cdc.gov/Documents/FactSheet/SVIFactSheet.pdf> (accessed July 7, 2014)
- Balbus JM, Malina C. Identifying Vulnerable Subpopulations for Climate Change Health Effects in the United States. *Journal of Occupational and Environmental Medicine*. 2009; 51(1):33–37. [PubMed: 19136871]
- Blaikie, P., Cannon, T., Davis, I., Wisner, B. *At Risk: Natural Hazards, People's Vulnerability and Disasters*. New York, NY: Routledge; 2004.
- Cutter SL, Emrich CT. Moral Hazard, Social Catastrophe: The Changing Face of Vulnerability Along the Hurricane Coasts. *The Annals of the American Academy of Political and Social Science*. 2006; 604(1):102–112.
- Cutter SL, Mitchell JT, Scott MS. Revealing the Vulnerability of People and Places: A Case Study of Georgetown County, South Carolina. *Annals of the Association of American Geographers*. 2000; 90(4):713–737.
- Cutter SL, Boruff BJ, Shirley WL. Social Vulnerability to Environmental Hazards. *Social Science Quarterly*. 2003; 84(2):242–261.
- Cutter SL, Burton CG, Emrich CT. Disaster Resilience Indicators for Benchmarking Baseline Conditions. *Journal of Homeland Security and Emergency Management*. 2010; 7(1):1–22.
- Enarson, E. Identifying and Addressing Social Vulnerabilities. In: Waugh, WAT., J, K., editors. *Emergency Management: Principles and Practice for Local Government*. Washington, DC: ICMA Press; 2007. p. 257-278.
- Federal Emergency Management Agency. Disaster Declarations by Year. 2014a. Available at: <http://www.fema.gov/disasters/grid/year> (accessed June 2, 2014)

- Federal Emergency Management Agency. What is Mitigation?. 2014b. Available at: <http://www.fema.gov/what-mitigation> (accessed August 1, 2014)
- Flanagan BE, Gregory EW, Hallisey EJ, Heitgerd JL, Lewis B. A Social Vulnerability Index for Disaster Management. *Journal of Homeland Security and Emergency Management*. 2011; 8(1)
- Haines A, Sari Kovats R, Diarmid C-L, Carlos C. Climate Change and Human Health: Impacts, Vulnerability and Public Health. *Public health*. 2006; 120(7):585–596. [PubMed: 16542689]
- Hutton D. Vulnerability of Children: More Than a Question of Age. *Radiation Protection Dosimetry*. 2010; 142(1):54–57. [PubMed: 20798187]
- Morrow BH. Identifying and Mapping Community Vulnerability. *Disasters*. 1999; 23(1):1–18. [PubMed: 10204285]
- O'Brien G, O'Keefe P, Rose J, Wisner B. Climate Change and Disaster Management. *Disasters*. 2006; 30(1):64–80. [PubMed: 16512862]
- Phillips, BD., Thomas, DS., Fothergill, A., Blinn-Pike, L. *Social Vulnerability to Disasters*. Boca Raton: CRC Press; 2010.
- Weisler RH, Barbee JG, Townsend MH. Mental Health and Recovery in the Gulf Coast after Hurricanes Katrina and Rita. *Journal of American Medical Association*. 2006; 296(5):585–588.

Table 1

Social Vulnerability Tools Mentioned by Emergency Managers.

Tool	Number of Times Mentioned	Tool Website
Social Vulnerability Index (SoVI®)	1	http://webra.cas.sc.edu/hvri/products/sovi.aspx
Social Vulnerability Index (SVI)	1	http://svi.cdc.gov/
Snap Shots of State Population Data (SNAPS)	3	http://emergency.cdc.gov/snaps/
Oxfam Maps	1	http://adapt.oxfamamerica.org/
Threat and Hazard Identification and Risk Assessment (THIRA)	2	https://www.fema.gov/threat-and-hazard-identification-and-risk-assessment

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Table 2

Use of Information on At-Risk Populations.

Phase	Use of Information
Preparedness	Create evacuation and contingency plans
	Conduct community outreach and engagement
	Determine resource needs and allocation
Response	Determine resource allocation
	Provide targeted data to decision-makers and first responders
	Prioritize response efforts
	Tailor communication messages
Recovery	Determine resource allocation
	Identify subpopulations that are the least resilient
	Track recovery and identify ongoing problems
Mitigation	Develop hazard mitigation plans
	Determine where to set up permanent community shelters
	Develop structural planning and policies

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