Managing Disaster:

20 May 2013
Central Oklahoma Tornado




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Cover photos: Top – 20 May 2013 EF-5 tornado, Gabe Garfield; Bottom – the aftermath of the tornado, Alek Krautmann.

This report is dedicated to the Oklahomans who were deeply affected by the 20 May 2013 tornado.

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Executive Summary

The EF-5 tornado that struck the central Oklahoma communities of Newcastle, Oklahoma City and Moore on 20 May 2013 required the full engagement of local, state and federal emergency management and captured the attention of the nation and even some parts of the world. Even though the event was exceptionally well-forecasted, 24 people were killed and 387 were treated for injuries at local hospitals. Central Oklahoma has recent experience with violent tornadoes. Prior to the 20 May 2013 tornado, two other violent tornadoes took similar paths, on 3 May 1999 and 8 May 2003.

At the crux of responding to a tornado disaster are the efforts of emergency responders to rescue and tend to victims. Emergency managers (EMs), who not only prepare their communities for such an event but also manage the storm's aftermath, play vital roles as well. In order to respond effectively, appropriate planning and preparation must take place prior to an event. Actually experiencing a disaster provides an opportunity to see how well the planning, preparedness and response efforts worked and what might be improved should another disaster occur.

The 20 May tornado provided a unique opportunity to learn how city, county and medical emergency management officials and non-profit organizations in the local area dealt with what could be considered a repeat event. The purpose of this report is to share the perspectives of eight officials who were involved in planning for and responding to the 20 May tornado. Their assessments were collected through semi-structured interviews.

The research questions that are addressed in this report include:

> 1a) How did the response to the 20 May 2013 tornado compare to prior plans and expectations?
>
> 1b) How did the management experiences from the 3 May 1999 and 8 May 2003 tornadoes or other disasters influence the management of the 20 May event?
>
> 2) For communities that have not yet experienced a disaster of this magnitude, what crucial elements should be included in their planning exercises and documents?

1. Comparison of 20 May 2013 to Plans and Experiences

A comparison between the 20 May event to prior plans and experiences revealed that many facets of the response went well. The magnitude of the 20 May tornado required much time and many resources to respond to and recover from the event. Yet, according to the participants, emergency response personnel were very well prepared, all patients and those who sought shelter at the destroyed hospital escaped without any injuries, and countless life-saving medical decisions were made at the hospitals that received tornado victims. Some improvements could be made, however. A reduction in the number of first responders who self-deployed and better coordination among churches and volunteer fire departments were examples.

Past experience and planning demonstrated that relationships are a key component to disaster planning and response. Not only are relationships among police, fire, and other emergency personnel important, but relationships with tribal nations, churches, and non-profit organizations are also vital

to successfully dealing with a disaster. Many actions taken on 20 May were only possible because of the relationships that had already been formed prior to the event. For example, access and functional needs populations were served because of relationships that have been established between local government and non-profit organizations. Furthermore, more than 100 lives were saved at two area hospitals because of innovative care strategies and proactive supply decisions that were implemented as a result of past events.

In addition to covering many aspects of the response, the study participants were asked in-depth about four topics including tending to critical infrastructure, sheltering, volunteer and donation management, and debris removal. Critical infrastructure such as water, utilities and transportation were handled very well in the affected areas. Public and private officials were accustomed to responding to these types of events and little coordination was needed in the immediate aftermath of the storm to shut down and repair utilities. One safety issue surfaced with the backup generator at the destroyed hospital in the immediate aftermath of the tornado, but the hazard was quickly mitigated.

The proliferation of individual and family storm shelters in central Oklahoma since the late 1990's certainly saved lives. The storm shelter registries that were in place at the time of the event were referenced as intended but were not needed in some instances. Furthermore, the ability of students and staff to seek proper shelter in schools was a topic that surfaced after this event due to fatalities at one elementary school. However, given that city and county EMs had no jurisdiction over whether schools had proper shelters or safe rooms, they could not speak on the issue in detail. Finally, the decision to shelter patients and visitors in the cafeteria at the destroyed hospital, although not part of an official plan, saved countless lives.

One of the hallmarks of this event was the outpouring of support from local communities across the nation and around the world. While this attention benefitted the affected communities, that support also created many challenges, including managing a large number of volunteers and a high volume of donations. Many of the EMs coordinated with churches or non-profit organizations who had existing connections with individuals interested in volunteering. Little coordination occurred in rural areas, however, which sometimes led to wasted man-power. Additionally, managing a large amount of donations almost became a second disaster. Man-power and space was needed to administer the donations, some of which were unusable. Municipalities also had different opinions as to whether they should be involved in such a task. In a lot of cases, churches and non-profit organizations accepted donations. Developing a donation management plan was an action item for many of the participants following this disaster.

Debris removal went well compared to past events. Some jurisdictions were able to take advantage of a Federal Emergency Management Agency pilot program that provided additional monetary incentives to clean up debris quickly. The pilot program was very well-received. However, some participants were critical of the start dates for each reimbursement rate benchmark considering the time that was needed to prepare debris for collection and for contactors to begin operating, even with a contract already in place.

2. Messages to Other Communities

All but one of the participants in this study had prior experience managing or dealing with the aftermath of a tornado disaster. That experience, in addition to planning that had taken place, turned out to be invaluable. Consequently, the participants were asked to provide advice to communities who

have not yet experienced a disaster of this magnitude about the crucial elements that should be included in planning exercises and documents. Specifically, they were asked about managing donations and volunteers, reducing the loss of lives or property, and any other important messages.

For those who may be involved in coordinating donations or running a donation warehouse, the participants recommended having a management plan. Identifying possible locations such as empty warehouses in advance, making contact with the owners of those empty spaces, determining who will run the warehouse, and communicating to various organizations what items will and will not be accepted are very important. Establishing potential contacts ahead of time will lead to a smoother donation acceptance process when a disaster occurs. In terms of volunteers, emergency management officials should think outside the box regarding what organizations might want to help and what their role might be. The officials should then build relationships with those contacts prior to the disaster.

In regards to reducing loss of life and property, promoting the installation of storm shelters was a priority for most of the participants. Higher construction standards in areas that have a relatively high risk of strong tornadoes was also suggested.

Finally, several participants cited the planning process and relationship building as being very important in responding to and managing a disaster. It is especially important to establish relationships between organizations that do not normally interact with one another, but may during the aftermath of a disaster. Establishing relationships and roles prior to an event decreases response times and improves care for victims and the affected area, which leads to more positive outcomes.

"We endeavor to get people back into their homes as quickly as possible so that they can begin the recovery process, they can pick through their things and they can start securing their properties. The quicker they secure their property, the quicker they're able to get their valuables and get them secure, the quicker the city can release the scene and its resources." – City emergency manager, speaking on their city's philosophy of getting affected families and individuals back into their homes after the tornado

1. Introduction

The EF-5 tornado that struck the central Oklahoma communities of Newcastle, Oklahoma City and Moore on 20 May 2013 required the full engagement of local, state and federal emergency management and captured the attention of the nation and even some parts of the world (Bacani 2013, BBC 2013). The event was exceptionally well-forecasted. The National Weather Service (NWS) predicted the possibility of severe weather on that date as early as 15 May 2013 (Kuligowski et al. 2013). By 8:00 am on the 20th, an email was sent to emergency support function personnel in the area from the Norman, Oklahoma NWS Weather Forecast Office (NWS Norman). A tornado watch was issued at 1:10 pm CDT and a tornado warning was issued at 2:40 pm CDT. A tornado emergency was issued at 3:01 pm CDT for a tornado, which would later be rated at EF-5 intensity, as it tore through central Oklahoma for 14 miles. It was on the ground for 39 minutes. Figure 1 shows the path of the storm in green. Local television news stations broadcast wall-to-wall coverage and news helicopters transmitted live video of the storm. A hospital was destroyed and later demolished. An estimated 2,393 structures were impacted overall, 1,128 of which were destroyed (FEMA 2013). Twenty-four fatalities, including seven children at an elementary school, occurred from the storm, and 387 people were treated for injuries at local hospitals.[1]

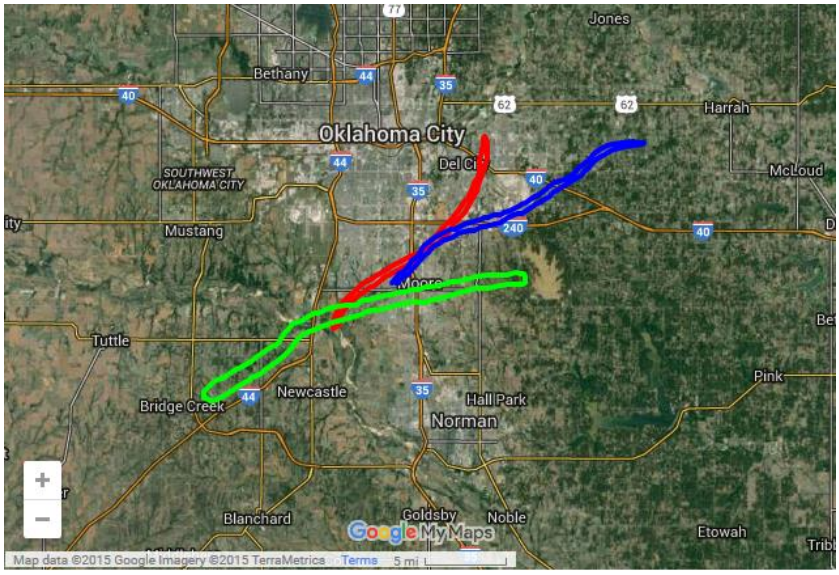

Figure 1: Paths of 3 May 1999 F-5 (red), 8 May 2003 F-4 (blue), and 20 May 2013 EF-5 (green) tornadoes that struck similar parts of central Oklahoma. Source: KFOR-TV.

[1] For more details on the event timeline, see Kuligowski et al. (2013): http://www.nist.gov/manuscript-publication-search.cfm?pub_id=914721.

The area has experienced violent (EF-4 or EF-5) tornadoes in recent years. Prior to the 20 May event, two other violent tornadoes took similar paths within the previous 14 years (figure 1). More broadly, the region experienced seven days with violent tornadoes between 1999 and 2013.

Due to the magnitude of the 20 May tornado, much time and many resources were required to respond to and recover from the event. Yet despite the destruction, several facets of the response can be deemed successful. For example, the potential for severe weather in the area was identified several days in advance and the warning lead-time on the tornado was 16 minutes, two minutes greater than the national average. The peak number of power outages from the two-day event (tornadoes also occurred on 19 May) was 61,500, but all customers capable of receiving power were expected to have it restored by 26 May (Kuligowski et al. 2013). Additionally, NWS Norman preemptively dealt with potential social media problems of sharing old information by manually adding time-stamps to their posts on Twitter and Facebook (NWS 2014).

Another component of success can be observed by comparing the number of casualties on 20 May 2013 to other recent violent tornadoes that have struck populated areas. For example, the EF-5 tornado that destroyed parts of Joplin, MO on 22 May 2011 killed 158 people and injured over 1,000 (NWS 2011). The Tuscaloosa – Birmingham, AL EF-4 tornado that occurred on 27 April 2011 killed 65 and injured over 1,500 (NWS, cited 2015a). More locally, the F-5[2] that struck the Bridge Creek – Moore – Oklahoma City, OK area on 3 May 1999 killed 36 people and caused 583 injuries (NWS, cited 2015b). Therefore, given the 20 May tornado's path and intensity, the casualties could have been much worse. The advanced warning, installation of home storm shelters over recent years and community weather preparedness education (to be discussed later) all likely helped contribute to the low casualty number.

At the crux of responding to a major tornado are the efforts of emergency responders to rescue and tend to victims. Emergency managers (EMs), who not only prepare their communities for such an event but also manage the storm's aftermath, play vital roles as well. In order to respond effectively, appropriate planning and preparation must take place prior to an event. Some communities have a greater capacity to plan, prepare for and respond to a tornado disaster than others. Actually experiencing an event provides an opportunity to see how well the planning, preparedness and response efforts worked and what might be improved should another disaster occur.

The 20 May tornado provided a unique opportunity to learn how emergency management officials in the affected area dealt with what could be considered a repeat event. Tornadoes are relatively rare for any specific location, even in the Southern Plains. So, the opportunity to study emergency management practices driven out of reality and actual needs as opposed to theory was distinct. The purpose of this report is to share the perspectives of city, county and medical emergency management and a non-profit organization involved in planning and preparing for and responding to the 20 May 2013 EF-5 tornado. All but one of the participants were involved in managing and responding to previous tornado disasters in the area. The research questions that will be addressed in this report are listed below. Public response to tornado events and sheltering in schools, although important topics, are not covered in this report.

[2] The Fujita (F) Scale was revised and renamed the Enhanced Fujita (EF) Scale in 2007.

1a) How did the response to the 20 May 2013 tornado compare to prior plans and expectations?

1b) How did the management experiences from the 3 May 1999 and 8 May 2003 tornadoes or other disasters influence the management of the 20 May event?

2) For communities that have not yet experienced a disaster of this magnitude, what crucial elements should be included in their planning exercises and documents?

2. Background

Emergency management is an evolving field. Initially rooted in a military-like command and control structure, the field has transitioned into a more collaborative, dynamic and flexible network, as noted by Waugh and Streib (2006). The researchers say that emergency management comprises a broad set of functions including: 1) hazard mitigation, 2) disaster preparedness including emergency planning and training, 3) disaster response, and 4) disaster recovery. To fulfill these functions, successful emergency management includes organizational preparation such as educating citizens and businesses on sheltering actions, siren use, and promoting individualized plans (Brotzge & Donner 2013), and collaboration among a variety of entities including all levels of government and non-governmental organizations (Waugh & Streib 2006). For example, the researchers state that while the bombing of the Alfred P. Murrah Federal building in Oklahoma City in 1995 occurred at a federal building and resulted in deaths of federal officers, the search and rescue operation was managed by the local fire department. Additionally, search and rescue was performed by local agencies from several states across the region, perimeter security was managed by local and state law enforcement, the American Red Cross was involved in food and sheltering, and private businesses supported first responders.

Much effort has been put forth into determining guidelines and best practices for emergency planning. Perry and Lindell (2003) summarized the work of many researchers and list 10 guidelines for emergency planning in their paper:

1. Planning should be based upon accurate knowledge of the threat and likely human responses. That knowledge can be gained through hazard assessment and vulnerability analysis.
2. Effective planning should encourage appropriate actions by emergency managers.
3. The planning process should emphasize response flexibility so that those involved in operations can adjust to changing disaster demands, both agent-generated and response-generated.
4. Emergency planning should address inter-organizational coordination. Perry and Lindell (2003, p. 343) state that organizations should "be aware of each other's missions, structures and styles of operation, the capabilities and limitations of the communication system and the mechanisms for coordinating the allocation of scarce resources to different functional areas of the emergency response."
5. Emergency processes should integrate plans for each individual community hazard managed into a comprehensive approach for multi-hazard management.
6. Plans should have a training component. Waugh and Streib (2006) add that participating in planning and training exercises builds capacity to respond.

7. Planning provides for the opportunity to test proposed response operations. Ford and Schmidt (2000), Simpson (2001) and Alexander (2003) state that emergency drills and exercises provide a setting in which operational details may be critically examined.
8. Planning is a continuing process rather than a product. Wenger et al. (1980) found that some officials tend to see planning as only a product (i.e. a document).
9. Emergency planning is almost always conducted in the face of conflict and resistance (Quarantelli 1982). For example, citizens might not recognize the value of planning and the time and resources associated with it until after a disaster occurs.
10. The emergency plan should recognize that planning and management are different functions and that the true test of a plan rests with its implementation during an emergency (Quarantelli 1985).

Planning for a disaster is one thing, actually managing it is another. Aside from the previously mentioned government and non-governmental agencies involved, Stallings and Quarantelli (1985) note the importance of emergent groups in the aftermath of a disaster. These groups are typically private citizens who work together to respond to a disaster, such as collecting and distributing clothing, food and emergency supplies or clear debris from affected areas. Typically there is no clearly defined leader and the roles of these groups are not highly specialized.

3. Methodology

Data for this study were collected through semi-structured interviews that were conducted with eight individuals who played a significant role in planning for and responding to the 20 May tornado. This study was approved by the University of Oklahoma Institutional Review Board. The interview guide (Appendix A) contained 36 questions but not every question was relevant to each participant. Five area emergency managers, two area medical emergency managers, and one representative of a non-profit organization participated in the study. The participants averaged 10 years of experience in their position with a range of 1 to 23 years. The average years of experience in their respective fields was 24 with a range of 8 to 36.

The interviews were recorded with the participant's consent, and then transcribed. The data were then coded and analyzed thematically by research question and sub-topics that surfaced during analysis. Microsoft Visio was used to visualize the responses from the participants.

4. Comparison of 20 May 2013 to Prior Experience and Plans

In this section, the response to the 20 May tornado is compared to the participants' prior plans and expectations, including how their experiences managing previous disasters influenced their management of the 20 May event. Sub-topics centered around how planning influenced the response to the tornado and what could be improved, critical infrastructure, sheltering, volunteer and donation management, and debris removal. All but one of the study participants had prior experience dealing with a tornado disaster. The data show that past events motivated the participants to implement new planning and preparedness strategies or policies, many of which influenced response and recovery strategies that played out successfully on 20 May. Their experiences turned out to be invaluable.

4.1 From Planning to Response

According to the participants, most facets of managing the disaster went well. The tornado warning process was "great," one EM said. Police, fire, and emergency response officials were very well prepared, and the state incident management team, a new resource since the last major disaster, was "a fabulous asset," according to the same EM. Additionally, all patients and those seeking shelter at the destroyed hospital escaped without any significant injuries. One city EM noted that their response plan was developed in collaboration with city departments. Roles and responsibilities were defined, the key difference being that employees work longer hours during the disaster. This collaboration served them well during and after the event. The hospital officials that were interviewed said that they have drilled for similar scenarios and were very well prepared for the event.

While many components of the response went well, some could be improved. One city EM said that they had some initial problems communicating with their radios because of delayed state maintenance. Additionally, some first responders from other parts of the state and even the region self-deployed, which was unnecessary in a lot of cases. Another city EM noted that in his area, coordination between churches and volunteer fire departments could be improved. The non-profit participant agreed that coordination could be improved, especially among the area EMs. They noted that the EMs are better trained than they used to be, but tend to focus only on their jurisdiction and the affected communities could benefit from some cross-municipality coordination. The participant also cited general staffing challenges, given the multi-day response to the disaster. They stated,

> . . . the phones did not stop ringing 24/7 going, 'Where do I send my donations?' or 'I've got clothes. I want them to go to people' or 'I've got this that I want to give.' They were just calling, calling, calling and so we had to be dealing with all of that and still cover being out in the community . . . so we saw ourselves that even our best laid plans were not laid out well enough to cover the scope of this disaster.

Several unsolicited challenges surfaced with a number of participants regarding working with the Federal Emergency Management Agency (FEMA). One frustration was that frequently changing rules make it difficult to plan for or anticipate how best to respond when a disaster strikes. Similarly, many of the FEMA employees working in the disaster area are temporary and rotate on a routine basis. Each person interprets rules differently, and the employees do not have local knowledge that can be vital to properly assessing situations. Another dissatisfaction centered on the FEMA hazard mitigation plan requirements. A county EM said the plan is largely strategic and does not have any bearing on operations. He thought a lot of the requirements were "fluff", such as requiring a detailed assessment of each hazard's impact on each jurisdiction, even if multiple jurisdictions are impacted in the same way (e.g., hail impacts one city in the same manner as a neighboring city). The EM continued, ". . . I think under FEMA's direction, our plans have become phone book-sized documents that are less and less useful." Local resources can be used more efficiently if planning requirements are more straight forward and practical. A better use of local resources can also translate into more efficient use of state and federal resources.

Some miscommunication may be inevitable when numerous organizations are working together over a short period of time, even with planning and prior experience. Almost all of the participants said there was confusion or overlap at least one time between local, state, federal, or non-governmental organizations. A city EM said there was initial confusion among church and volunteer groups, and a county EM said that volunteer service areas overlapped initially. For instance, multiple groups handed out meals to the same areas. The non-profit participant also identified some confusion, redundancy,

and miscommunication in feeding and caring for some people. "You know, one person says, 'There's babies in [Town A] that need diapers.' When factually there was one baby in [Town A] that needed a box of diapers and a truckload of diapers went to [Town A]," they commented. Miscommunication among state and federal entities also occurred. A city EM said that state and federal officials told people to bring donations to a mall, which was not accurate. Furthermore, a FEMA representative inaccurately identified a donation warehouse as a FEMA warehouse, even though FEMA was not involved in the operation. A county EM was also frustrated with mixed messages coming from FEMA regarding debris removal reimbursement. Lastly, a medical EM was frustrated by the fact that federal officials would not let health care workers into their facility to take food to employees or replace security officers. They understood the idea behind restricting access but noted, "Not a lot of people are walking about with a fake hospital badge." Finally, there were some challenges with debris removal when multiple jurisdictions were involved and donation management, both of which are discussed later in further detail.

Although much of the response was pre-planned, some decisions were made on-the-fly. One city EM who was already dealing with the aftermath of an EF-4 tornado from the previous day had to "race back to the multi-agency coordination center" once they realized there was a legitimate threat to their jurisdiction on the 20th. That same EM noted that the incident commander was established while the tornado was still ongoing. These quick actions were difficult to anticipate but important for the timely response. Another EM commented that the incident command system was set up more quickly than in 1999. Some of the immediate medical response decisions that were made on-the-fly included using lab cars and home run vans to transport patients out of the destroyed hospital since the cars in its parking lot were unusable, writing patient vitals on their chests with a Sharpie marker (12 patients in critical condition were transported to two nearby hospitals), and securing the pharmacy and medicines. One participant said that they could not locate a police officer with a gun to protect the radioactive isotopes and pharmaceuticals and the best deterrent they could come up with was a megaphone, hammer, and lights. Local police were searching homes and were not available for security at the hospital. The two medical participants said they learned a lot from the tornado that struck Joplin, MO in 2011, especially in terms of where to shelter people and how to use donations for impacted hospital employees. One of the participants even visited the Joplin hospital that was damaged in search of best practices. Moreover, experience with the 3 May 1999 tornado taught them how to structure the medical response once victims arrive at hospitals, and that they needed to "be more proactive on supplies to treat patients." In 1999, suture kits had to be obtained from nearby urgent care clinics. This time, a semi-truck full of supplies arrived from Oklahoma City before the tornado hit.

On a longer timescale, some of the on-the-fly decisions included a grassroots organization forming to coordinate volunteers, volunteers being recruited to assist with social media accounts, and a non-profit developing a procedure for how to work with a third-party fundraiser. The participant who worked for a non-profit organization described the reason for the new agreement, "We've had tornado funds before and it's always been local. It's not been this outpouring from all over the world that you don't know how to…that you weren't prepared for." Fortuitously, a charity fund was established on 19 May because of the tornadoes on that day, so it was already in place on 20 May. Obtaining waivers for debris removal on private drives was another unplanned decision.

Dealing with a disaster is difficult for anyone, but people with access and functional needs (e.g., including but not limited to infants and young children, aging populations, people with weakened immune systems, and people with visual or mobility disabilities) may need extra assistance before, during, and after an event. The participants in this study had different opinions as to how to serve this

population. For instance, an EM from a smaller community had a list of people on file whereas an EM from a large community served them via existing organizations who already had relationships with those clients. He commented, "They know who their client is. They know who they're serving. They know when they drop off. They know when they move." The participant said that registries are a problem because they quickly go out of date and that people often think that the government will take care of them if they are on a registry. In fact, disability advocates generally do not support registries. Another city EM said he does not partake in any specific outreach with the access and functional needs community. He has given some preparedness presentation to senior citizen groups, but only if he is invited.

The participants made it clear that relationships are a key component to successful disaster planning and response. Not only are relationships among police, fire, and other emergency personnel important, but relationships with tribal nations, churches, and non-profit organizations are also vital to successfully dealing with a disaster. Many actions taken on 20 May were only possible because relationships had already been formed. Some examples included churches providing food and accepting donations, debris being moved to the curb by faith-based organizations, United Way serving individuals with access and functional needs, the American Red Cross and Salvation Army feeding and sheltering people as well as providing some medical and mental health assistance, and other organizations such as Big Brothers Big Sisters who serve a niche population but played a vital role in caring for children while parents filled out recovery paperwork. The non-profit participant said that some of the relationships they established while sheltering Hurricane Gustav evacuees in 2008 positively impacted their response to 20 May. A lot of the Gustav evacuees had access and functional needs, so they learned to call on their partners to help care for those individuals, whether it be providing medications, mental health care, etc. The medical participants also noted that local emergency planning committees and medical emergency response centers (MERC) are relationships that are important in healthcare.

Social media was a new tool used in the response phase that did not exist when previous violent tornadoes struck the area. A participant's use (or use by their department or jurisdiction) varied. One EM office did not use social media because of staffing limitations but said their city's public information officer did. Another participant said they used it but said "it has to be managed and controlled." Another EM said victims were connected with belongings via Facebook, and social media assisted people in finding help. The non-profit participant noted that social media played a major role in a grassroots volunteer organization getting up and running. They cautioned, however, that the platform has to be used carefully because myths can be propagated through it. The use of social media is one area of disaster response that is still evolving.

One aspect of planning for disasters is mitigating their impact. The participants were asked about their hazard mitigation and emergency management funding priorities[3] and whether those priorities change over time. Several of the participants said that storm shelter/safe room rebate lotteries are priorities. One EM noted that their outdoor warning sirens were upgraded a few years ago, and their top mitigation priorities are now flood-related, such as removing repetitive loss properties. The non-profit

[3] One primary hazard mitigation funding mechanism is through FEMA's hazard mitigation grant program (HMGP). That money only becomes available, however, when a disaster declaration is issued. Prior to the 20 May 2013 tornado, mitigation funding from previous disasters had substantially declined. Many jurisdictions wished to continue storm shelter rebate programs, for example, but did not have funding to support those programs. As it is currently designed, the program operates as a catch 22: Mitigation activities can help lessen the impact of a disaster, but often those activities can only be afforded when HMGP funding becomes available following a disaster.

participant said their priorities have not changed; their funds help people with recovery needs and gaps (e.g. rental deposits, utility deposits, clothing replacements). Finally, the medical participants said providing green emergency kit totes to staff is a priority. They used to *suggest* departments have the kits but after the event on 20 May, they now supply them to every department. The kits contain items such as head lamps, glow sticks, lanyards that can hold patient information, evacuation stickers, gloves, masks, etc. The evacuation stickers were implemented after the 20 May event because there was redundancy in searching rooms at the hospital for victims. Now, staff and first responders can use the stickers to label a room as having already been searched.

4.2 Critical Infrastructure

Relevant participants were asked how critical infrastructure is addressed in their plans and how those plans performed on 20 May. One city EM said they have a plan to bring in emergency power for their water treatment plant. They added this contract after the plant lost power during a tornado in 2010. Another city EM said their plan is to turn off power to the affected structure immediately if it is damaged or destroyed. A medical participant noted that the backup generator was located on the roof of the destroyed hospital, unprotected from the elements. It surprisingly still operated after the tornado but became a hazard when it kicked on since the generator was providing a badly damaged electrical system with power. Only one person was trained on how to turn it off, which was a problem. The participant commented on how more than one person should know how to operate the generator.

The effort to shut down utilities after the disaster was effective. In some areas, the affected utilities were underground. In other areas, the utility companies or maintenance staff had so much experience that they shut them down themselves instead of waiting for a city or county official to contact them. One inconvenience occurred when a high-tension transmission line fell and blocked a road in a relatively rural area for three weeks. Some residents had to take a four mile detour to access their homes.

Transportation was not disrupted for very long during and after the event. In fact, one EM said they had much larger transportation problems when thunderstorms, including tornadoes, occurred several days later on 31 May. In some cases, roads were cleared of debris within 30 minutes. In other cases, roads were clear within two days. The highway patrol also handled gawkers well.

Unique to this event in central Oklahoma was a hospital being destroyed. Victims seeking care showed up at the hospital initially but quickly realized the situation and went to triage where ambulances were located in a nearby parking lot. The victims were then sent to two other hospital campuses that were prepared to accept an influx of patients. The medical EM described the response plan that was designed by a nursing director and called it "the best in the country." Each of the 40 emergency department rooms in the other hospitals were staffed with a surgeon, an emergency department nurse and an intensive care unit nurse. He noted that these staff are "used to people coming in with random things happening every day" and that the system is designed to give patients the best care. This innovative system allowed them to save the lives of more than 100 people that day, almost all of whom came in with severe injuries (the life of one victim was unable to be saved).

Looting was a problem at the hospital immediately after the tornado. As previously mentioned, an armed officer could not be located so the staff relied on a megaphone, hammer, and lights as a deterrent. One participant said "it got pretty intense" at times and that they threatened to kick gasoline

that was leaking from damaged vehicles on the looters because the looters were very adamant about gaining access to the pharmaceutical area (they were successfully kept at bay).

4.3 Sheltering

Seeking proper shelter during a tornado can save one's life. Since the 1998 establishment of the FEMA safe room program, tens of thousands of Oklahoma residents have installed storm shelters in their homes, whether they be above-ground safe rooms or below-ground shelters. Size varies, but a typical shelter can hold 6-8 people. It is nearly impossible to get an accurate estimate of the number of shelters that have been installed because of disparate funding sources including FEMA, state, tribal or local communities, non-profit organizations, individuals and families, even casino and TV station giveaways. Two examples of communities that have a high percentage of shelters per capita include the City of Moore which has 23,000 residential properties and 5,500 shelters that were voluntarily registered as of May 2014 (Natural Hazard Mitigation Association 2015), and the City of Newcastle, which has a population of about 8,000 and contains about 500 shelters and one 1,000-person community shelter. Many cities have volunteer registries for residents who wish to sign-up. The registry can help first responders locate shelters. The registry systems that were in place were referenced as intended. In some instances they were not really needed. One city EM said one person was trapped in the shelter because of debris but was rescued almost immediately. Another city EM was unaware of any examples where someone was in a shelter that was unknown. They commented that their initial search and rescue was completed within several hours of the tornado and everyone was accounted for less than 48 hours after the event. Another city EM had some technical difficulties with their registry in that the electronic version was not organized well and they had a year-old hard copy at the time of the event. That problem was fixed after the event, but even then the participant said they did not think the registry was as useful as some might think since the affected areas are going to be searched no matter what. They commented that the fire department disagrees with their opinion, however, and values the shelter registry.

Many lives were saved because individuals and families sought proper shelter. The ability to seek proper shelter while in school was a topic that surfaced locally, at the state level, and even nationally after this event given the fatalities at one elementary school. The city and county EMs have no jurisdiction over whether schools have proper shelters or safe rooms so they could not speak on the issue in detail. The participants who commented on the issue supported the idea of safe rooms in schools, but recognized that funding is always going to be a limitation and that a balance has to be found between building a fortress and an educational environment. The 20 May event was also unique in that the tornado struck so early in the afternoon while school was still in session. Most tornadoes in Oklahoma occur outside of school hours. In fact, Brooks (2013) stated that from 1950-2012, only 8.8% of all tornadoes in Oklahoma touched down during the school day. That said, a few participants were involved in the state's pilot program (Oklahoma Emergency Management 2015) to identify the safest existing locations in schools. Hallways, once thought to be the safest areas, are now known to not necessarily be the best option. The scope of having an outside team assess the safest location at every school building in the state continues to be overwhelming. Hospital officials were also reassessing the best places to shelter in their buildings and relocating command centers to safer locations. The primary shelter location in the cafeteria of the hospital that was struck was the best location for them, even though it was not the designated safe area ahead of time. The decision to shelter as many people as possible in the centrally-located cafeteria certainly saved lives.

4.4 Volunteer and Donation Management

One of the hallmarks of this event was the outpouring of support from local communities across the nation and around the world. While this attention certainly benefitted the affected communities, that support also created many challenges, including managing a large number of volunteers and high volumes of donations. Many of the EMs coordinated with churches or non-profit organizations who had existing connections with individuals who were interested in volunteering. One city EM said regional disaster volunteer management guidelines, which were developed based on experience with a tornado event in 2010, provided them with a framework by which to work with volunteers. Part of the plan includes looking at core competencies within their city and non-governmental organizations and determining who is already doing the needed tasks rather than creating new organizations to do those tasks. Properly staffing the plan was a challenge, though.

Little coordination occurred in rural areas, which sometimes lead to wasted man-power (e.g. multiple groups passing out food to the same location). A county EM noted that until the incident command system is set up, "It's mass chaos and it's very inefficient." Likewise, a city EM said that they initially had three sign-in locations for volunteers but cut down to one when they realized that having multiple locations was problematic. That same EM said they used Facebook to announce where volunteers were needed and where to sign in. No other EMs said social media was used to recruit volunteers. However, a grassroots organization named Serve Moore formed to support the ongoing needs of their community and used social media as their primary communication method. The hospital had a memorandum of understanding in place to coordinate with the MERC if necessary, but their services were not needed.

The participants said volunteers were never a hindrance, but they were concerned about their cities being liable for injuries that could occur while working in the disaster area. One city EM noted that there are, ". . . challenges and liability with supervising this large group of volunteers of basically unskilled labor . . ." In the vast majority of cases, the city and county EMs worked with organizations who already had liability waivers in place and were coordinating groups of volunteers. As an added protection, volunteers were not authorized to access private property without a release from the property owner.

Managing donations almost became a second disaster. People from local communities as well as around the state and even the nation sent physical and monetary donations to central Oklahoma. The EMs were appreciative of the support they received but recognized that managing a large volume of goods was incredibly challenging. One challenge was that some of the donations were not usable, such as used clothes, rusted bicycles, and even an old boy scout canteen. A city EM said, ". . . we've learned that disaster survivors need new furniture and new clothes to help them with recovery, not somebody's old stuff." Another challenge was with the sheer volume of goods being donated. The goods had to go somewhere, and someone needed to manage that space. Therefore, one city EM agreed to operate a 103,000 sq. ft. warehouse. It was not an easy task. The individual had a difficult time recruiting volunteers to work at the warehouse and relied on cameras to let them know when semi-trucks arrived with donations. Additionally, operating the warehouse was costly and the EM said that some other cities and, at least initially, the state, did not want to get involved.

The participants had different philosophies about whether local municipalities should be involved in accepting and managing donations. In the example above, that individual was keen on using donations to meet local needs and made sure that happened instead of letting national-level organizations get

involved and relocate donations to other parts of the county. This EM had experience with that scenario happening when they helped manage a man-made disaster almost 20 years prior. They noted, "I made a very concentrated effort to make sure all the local organizations had everything that they could possibly handle. Before it disappeared to corporate America." Another EM said their city had nothing to do with donations and that a local non-profit was prepared to accept donations if needed. They also noted that they did not advertise this arrangement because they did not want to be inundated with unwanted items. A third city EM said they recommended to their city manager to not get involved in donations, but other city departments decided differently. This individual welcomed the idea of charitable organizations accepting donations but thought the city should not be involved.

In a lot of cases, churches and non-profit organizations accepted donations. Quite a bit of care was taken to ensure that donations were used as intended. For example, one church received too many used clothes, but found an organization in Texas that was interested in them. An overabundance of water was also a problem. Sometimes the water was sent to nearby locations, otherwise it was transferred to other communities and even other states. The non-profit participant did not play a role in accepting goods but accepted monetary donations. They made sure that the money was spent as intended by the donor. "We don't ever want a donor dollar to not be spent appropriately," they said. A city EM said that a lot of the non-profits identified the need from past events to coordinate with one another in terms of the people they help. Previously, self-induced privacy rules limited these organizations from sharing records with one another. When 20 May happened, many of them had implemented non-disclosure agreements so that they could communicate with one another and limit fraud, such as non-tornado victims taking advantage of donations and victims seeking more than their fair share. Following their experience with donations for this event, the participants said they would be working on donation management plans that could be implemented for the next disaster.

4.5 Debris Removal

A component of any natural disaster, including tornadoes, is that an immense amount of debris is left in its wake. According to FEMA (2007), 27% of their disaster recovery costs between 2002 and 2006 went toward debris removal. After Hurricane Sandy hit the U.S. East Coast in 2012, FEMA enacted a pilot program to help speed up the debris removal process. The new pilot program policy states that jurisdictions who have a debris removal contract in place prior to the event can be reimbursed at a rate of 85% within the first 30 days of the event, 80% for 31-90 days, 75% for 91-180 days, and 0% thereafter (FEMA 2015). Prior to the pilot program, the reimbursement rate was 75% (G. Bruey, FEMA, 2016, personal communication). All of the affected jurisdictions had debris removal plans, and several of them had contracts in place and were able to take advantage of the incentive program. A city EM said the program saved their city millions of dollars. For the two jurisdictions that did not have a contract in place, one EM was unaware of the program before the tornadoes hit. They were initially told by a FEMA representative that they could take advantage of the reimbursement by setting up their plan within 10 days of the event, but were told after the fact by another FEMA representative that they were not in fact eligible. The other jurisdiction's EM said their city's philosophy is to not have a contractor in place prior to the event because they receive the most accurate bid at the time of the event. Otherwise the contractor likely plans for a worst-case scenario and may overestimate the cost. They have the capability to solicit emergency bids though.

Being a private entity, the affected hospital had insurance and a bid in place for clean-up. Special care had to be given to their debris, however, given the amount of hazardous waste that was present. In fact, an official from the University of Oklahoma Medical Center assisted with the radioactive material

to make sure it was disposed of properly. The medical participant noted that the medical chain of custody was followed to remove the hazardous materials.

The FEMA reimbursement program provided some incentive for some jurisdictions to move quickly, but the participants already had the mindset of getting debris cleaned up as soon as possible so that citizens could return to a sense of normalcy. Even then, one participant said, "Everyone loved this pilot program" and described the excitement of various city leaders when they heard about it, given the cost-savings potential. The medical EM noted that they could have gotten their insurance deductible reimbursed by FEMA, but the paperwork was not worth the hassle. In fact, they had business continuation insurance that covered hospital costs for a time as if it were still operating, so employees and bills were paid in the aftermath of the storm.

Although the FEMA reimbursements were appreciated by the participants, one criticism of the program was the date in which the first of the 30 days began: the disaster declaration's incident date (which was actually 18 May because the declaration covered the severe weather that occurred 18 May-2 June). Even with a contractor in place, it can take time for that contractor to gear up and get to the affected area, especially if they are located in a different state. Time is also needed for victims to sort through their belongings and to move debris to the curb where it can legally be picked up. In one jurisdiction, 15 of the first 30 days had already elapsed when debris was ready to be picked up. Another participant noted that the lag-time would be even worse for flooding, since floodwaters may take some time to recede. A second criticism was that FEMA debris rules frequently change. This time though, a participant was relieved to hear that foundation slabs could automatically be included as debris, which was not the case in 1999. They noted that it was "a big breath of fresh air."

One aspect of debris removal that can be challenging to deal with is the fact that publicly-owned or contracted equipment cannot access private property to remove debris. Most of the affected land in the disaster was privately-owned, and one participant noted that in a lot of cases faith-based organizations moved debris to the public right-of-way (i.e. curb). Another city EM said they provided outreach to their community to let them know about the debris removal rules. In another area, waivers were obtained from the state to access and remove debris from private drives that were affected. Landowners still had to get their debris within 10 feet of the curb, though. Private drainages were a problem, too. A lot of debris washed down creeks during heavy rain events that followed 20 May, but FEMA does not allow their resources to be used to clear private drainages. Fortunately, funding was secured from the Natural Resource Conservation Service and the U.S. Department of Housing and Urban Development Community Development Block Grant Program to obtain access to and clear many of the affected drainages.

5. Messages to Other Communities

Some of the emergency management strategies that were implemented for this event were driven by experiences with past local disasters and from neighboring Joplin, MO. To encourage the continuation of shared dialogue, the participants were asked to provide advice to communities who have not yet experienced a disaster of this magnitude about the crucial elements that should be included in planning exercises and documents. Specifically, they were asked about managing donations and volunteers, additional strategies that should be implemented to reduce life or property loss, and finally, the most important message other communities should know.

5.1 Donation and Volunteer Management

The participants recommended having a donation management plan to agencies and organizations who may be involved in coordinating donations or running a donation warehouse. Identifying possible locations such as empty warehouses in advance, making contact with the owners of those empty spaces, determining who will run the warehouse, and communicating to various organizations what items will and will not be accepted are very important. Getting to know potential contacts ahead of time will lead to a smoother donation acceptance process when a disaster occurs. One county EM said that monetary donations are best since corporations typically provide clothing donations. Additionally, some participants thought that having only one or two locations accept donations would be more efficient than having numerous locations. Donations are more effective if they are centrally located. The non-profit participant agreed that planning for donations is important and is something that is not well-defined like some of the other tasks that take place after an event such as first responders tending to victims, cleaning up debris, and serving meals. The participant also recommended creating a third-party fundraiser policy so staff know how to handle third-party fundraisers such as a benefit concert.

In terms of volunteers, a participant suggested thinking outside the box regarding the organizations that might want to help, what their role might be, and to build relationships with those contacts prior to the disaster. They encouraged organizations to be part of a plan and not part of a problem. Some non-profits also might want to recruit certified professional accountant (CPA) volunteers to help with monetary donations after disasters. A city EM summarized the preparations they had undergone to utilize volunteers and volunteer agencies when a tornado or other disasters strikes. "We've identified the primary agencies. We've identified the supporting agencies. Everyone knows their role and responsibility. They know where they fit in . . ." Lastly, whether donations or volunteers, exercising those plans rather than simply talking about them provides an opportunity to identify what could be improved or what might have been overlooked, before time is of the essence.

5.2 Reducing Future Loss of Life and Property

The participants suggested the following actions to reduce future loss of life or property during tornado events, in addition to the work they had already completed to improve safety. Continuing to educate people about tornado safety, such as sheltering in the center of one's house on the lowest level and protecting oneself from flying debris, if they do not have a properly rated[4] storm shelter or safe room or basement was cited by a participant. Personal severe weather preparedness is a message communicated every year in central Oklahoma by local media, the NWS, and particularly in schools. Brooks and Doswell (2002) suggest in a 1999 study that the education of school children was a strong contributor to their safety at home during the 3 May 1999 tornado. Furthermore, a city EM recommended that people do not try to drive away from tornadoes, unless they leave two to three hours before the storm initiates. On the other hand, "To continually wait to do nothing until the sirens go off is a bad plan," they also stated. Continuing to promote the installation of storm shelters was a recommendation from another city EM. At the organizational level, the county EM said improving volunteer coordination was important, and is actively working on a list of 75-100 volunteers who are trained and can be activated for an event. Improving relationships with rural EMs was a priority for the non-profit participant. Two EMs also said higher construction standards, such as including

[4] As identified in the FEMA P-320 publication, https://www.fema.gov/media-library/assets/documents/2009.

hurricane straps on all new homes should be a goal, especially since they are a relatively inexpensive addition to construction.[5]

Construction standards were also brought up by the two medical participants. One of them said that construction bids and decisions should take hazards into consideration, not just the cost. "Pretty stucco on the outside with crown molding on the inside doesn't protect your patients or your citizens," they commented. At the time of the interview, discussions were ongoing about how to fortify the facility that would be built as a replacement for the destroyed hospital. The new facility will have a "tornado-safe zone" for hospital patients and staff (Norman Regional Health System, cited 2015). A participant also said that hospital staff need to be trained on how to position patients, such as in bed with the head side raised up, facing away from windows or doors. Putting shoes on the patients when a storm is imminent is also important. Even if a patient is ambulatory after a storm, they cannot exit a building without shoes because of the sharp objects and potentially hazardous materials that will inevitably be on the ground.

5.3 Other Messages

When asked about other important messages that the participants would like to share with communities, their responses centered on the relationships that are built during planning for and responding to disasters. Several participants spoke about the importance of the planning process and building relationships with people and organizations that one does not work with on a normal basis. One participant said, "What's much more important than any plan that you have is relationships you have with the people in the community and the people who can provide services to community . . ." Another participant cited an example of planning for sheltering hurricane evacuees from Texas several years prior. They successfully put that plan into action when they sheltered 1,800 people who were evacuated from Hurricane Gustav in 2008. They were successful because the organizations involved had previously defined roles and responsibilities and the command, control, coordination, and support structure. Another participant noted the importance of Local Emergency Planning Committees, whose sole purposes are to plan for hazards and the impact they might have on local communities. The medical participants spoke about the importance of planning as well and to resist complacency. They noted that hospital staff need to practice relocating patients to safe areas and not just talk about it. Furthermore, not only should the staff be prepared at work, but they also need to have plans for themselves and their families, so that the staff who play critical roles in the aftermath of the storm can be fully present. Another suggestion was to perform tabletop drills and practice out different scenarios.

One participant focused on the importance of personal responsibility in the immediate aftermath of a disaster. They said that residents should be prepared to take care of themselves for three days before government assistance, since it can take a while for infrastructure to get established. In the meantime, the participant noted that churches can sometimes assist with immediate needs, and are often up and running within a matter of hours.

[5] Almost a year after the disaster, the Moore City Council unanimously voted to adopt stronger residential building codes. New construction must be built to withstand winds of 135 mph, equivalent to an EF-2 tornado. Moore was the first city in the country to implement such codes. More information can be found on the City of Moore's website, http://www.cityofmoore.com/node/2111.

6. Conclusions

The purpose of this study was to understand how the emergency management response to the 20 May 2013 EF-5 tornado compared to expectations and how prior planning and experience managing disasters influenced that response. Identifying the elements that communities who are less experienced with disasters should include in their planning exercises and documents was also a goal. The data showed that past events motivated the participants to implement new planning and preparedness strategies and policies, many of which influenced response and recovery strategies that played out successfully on 20 May and the weeks following the disaster.

Numerous best practices for emergency planning that were identified by Perry and Lindell (2003) and Waugh and Streib (2006) were used by central Oklahoma emergency support function personnel for this event. Collaboration among a variety of entities (Waugh & Streib 2006) was incredibly evident among all of the participants. Inter-organizational coordination (Perry & Lindell 2003) was especially apparent among the EMs that worked with non-profit organizations during the time of disaster who already perform certain functions as part of their regular duties, and some of the participants worked with emergent groups (Stallings & Quarantelli 1985). Training exercises (Waugh & Streib 2006) were also valued by several of the participants. Moreover, consistent with Quarantelli (1985), the 20 May tornado provided the participants with the opportunity to truly test the implementation of their plans.

Considering the circumstances and devastation in the area, many components of the disaster response went well. Timely rescues, utility repairs, debris removal, and allowing residents to access their properties in a timely fashion were, for the most part, considered successes. Additionally, the actions of several employees at the destroyed hospital kept everyone there safe. The swift actions of the doctors, nurses and employees at two other hospital campuses saved more than 100 lives. These successes, as well as the others described in the previous pages, were due to prior planning and experiences with disasters. Past events certainly shaped how agencies and organizations responded on 20 May. Relationships that were built among local, state, federal and tribal governments and non-profit organizations during previous disasters and planning exercises played a key role in the ability of officials to take quick actions to reduce the impact of the tornado.

Even with those successes and lessons learned from prior events, there was room for some improvement. Self-deployment of first responders and coordination among EMs across jurisdictions and with churches and volunteer fire departments could be improved. Staffing challenges in the hours and days after the storm, which were cited by some participants, are likely to remain unless funding were to increase. One unanticipated challenge surfaced with donations. As noted by Whybark (2007), little literature is available on disaster relief inventories, so it may be unsurprising that donations became a great challenge. While central Oklahoma communities were grateful for the outpouring of support, managing a large volume of goods in a very short amount of time created substantial logistical challenges and was very expensive. At the time of the interviews, the participants for whom it was relevant said they were planning on developing and implementing a donation management plan. Part of that plan should include communicating to various groups such as media and non-profit organizations about the items that will and will not be accepted, and city governments should decide whether or not they want to be involved in the process. That decision may depend on several variables, including the size of the jurisdiction, whether other organizations within the community would be available to serve in a donation management role, and how likely the area might be to receive attention from national and/or international media.

Several of the participants also had recommendations to pass on to FEMA. First, the initial debris removal reimbursement benchmark should be lengthened to 45 days after the event to allow for necessary response and recovery activities to take place. Secondly, some of the hazard mitigation plan requirements are unnecessarily burdensome and are not helpful to operational planning.

Communities who have not yet experienced a disaster of this magnitude should understand the importance of the planning process, not just the plan itself. The planning process supports relationship development and allows one to identify scenarios and needs that they may not otherwise discover. EMs should establish relationships with non-profit organizations and churches prior to the disaster since those organizations, in addition to the jurisdiction's emergency response officials, play key roles in the immediate aftermath of a disaster. Incident complexity can vary widely from jurisdiction to jurisdiction, depending on the percentage of the area affected and other factors. The 20 May 2013 tornado was a major emergency for one community, but catastrophic for another. Through learning from past events and proper planning and preparedness, communities can work to lessen the impacts of disasters and speed up recovery processes.

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Appendix A: Interview Guide

Note: The specific questions asked to each participant varied depending on their role.

Demographic Information:

- What is your position title?
- How many years of experience do you have in your current position?
- How many years of experience do you have with your current community?
- How many total years of experience do you have in your field?
- What is your organizational jurisdiction or area of responsibility?

RQ1a: How did the response to the 20 May 2013 tornado compare to prior plans and expectations?

First, some general questions about planning and recovery:

IQ1: First off, please walk me through your role before and during the event, and subsequent response.

IQ2: How effective do you feel your emergency response plans were?

IQ3: What decisions were made on-the-fly before, during or after the tornado?

IQ4: How did your city coordinate emergency response teams? Were assets such as fire, police, and medical personnel prepositioned?

IQ5: How does your community address access and functional needs populations such as low income, minority, elderly, or non-English speaking resident groups? Were these groups specifically addressed in plans, such as special circumstances for warnings and response?

IQ6: How important are the relationships you've built with various agencies and organizations over the years to managing a disaster such as this? Which relationships are most critical to your success?

IQ7: Were there any roles or areas of local/state/federal/NGO overlap that created confusion?

IQ8: What role do you think social media played in the response to and recovery from this event? How was it different from previous events?

IQ9: What are the priorities for disaster mitigation and emergency management funding? Do those priorities change from time to time?

Next, some questions about critical infrastructure:

IQ10: How are critical infrastructure such as water supply, gas lines, schools, and hospitals addressed in your plan?

IQ11: Was the effort to shut down and return various utility services such as gas, electricity and water effective? What could be improved?

IQ12: How did having the hospital destroyed affect plans for providing medical care? Was a backup plan in place?

IQ13: How were transportation issues such as road closures, blocked roads and controlled access managed during and after the tornado? Were cars stopped on I-35 during the tornado?

IQ14: With so much attention to the damage area how were continuity of services (police/fire/911) and public safety maintained in other parts of town? Was looting a problem?

Next, a couple of questions about sheltering:

IQ15: How well did the storm shelter registry system work? How long did it take to check on all registered shelters and get people out? How were unregistered shelters located?

IQ16: How long did it take for rescue and recovery? How did that timeline compare to expectations?

IQ17: Following May 3, 1999, was there an effort to install safe rooms in all newly constructed schools?

IQ18: For new construction between 1999 and 2013, what barriers prevented installation of safe rooms in schools?

Next, a few questions about managing volunteers and donations:

IQ19: How did your city coordinate volunteers, including in the days immediately after the storm and longer? What role, if any, did social media play in the coordination?

IQ20: How have volunteer groups benefitted the community? Are volunteers ever a hindrance?

IQ21: How did the city [or state] manage monetary donations and large volumes of donated goods? How did they handle donation of perishable goods versus non-perishable (such as paper products, school supplies, furniture)? What role did churches or non-profit organizations play in donation management?

Now, some questions about debris removal:

IQ22: Were any debris or clean up contracts in place prior to the event? [If yes,] How well did those agreements perform?

IQ23: Did FEMA's incentive structure (85% first 30 days, 80% 31-90 days, 75% 90-180 days) speed up the debris removal process? How did the timeline compare to past disasters? Because this was a new innovation from FEMA following Hurricane Sandy, were you prepared to take full advantage of the incentive? What adjustments did you need to make in order to speed up debris removal?

IQ24: How were decisions made about which properties could be cleared first, especially in order to move as much debris within the first 30 days to get the higher FEMA reimbursement rate? Was there an existing strategy or was this developed on the spot?

IQ25: What has been the process for debris removal in more rural areas, undeveloped parts of the city, or creeks/drainage areas?

RQ1b: How did the management experiences from the 3 May 1999 and 8 May 2003 tornadoes or other disasters influence the management of the 20 May event?

IQ26: What lessons learned from the 1999 and/or 2003 events were implemented for this event? You may have mentioned some already.

RQ2: For communities that have not yet experienced a disaster of this magnitude, what crucial elements should be included in their planning exercises and documents?

IQ27: What policies did you enact that are not required by FEMA or state plans?

IQ28: What is one strategy you think other communities should know about managing volunteers and donations after a disaster?

IQ29: Thinking longer term, what changes would you like to see in your city to reduce future loss of life or property? What needs to be done to achieve these changes?

IQ30: Given your experience in dealing with these type of events, what are three of the most important messages you would like other communities to know who may someday be faced with a similar situation?

And, a final question:

IQ31: Given that disaster response is complex, we would like to talk to people who played a variety of roles during and after the event. Do you have any recommendations?

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