



QUICK RESPONSE REPORT

The Super Tuesday Tornado Disaster at Lafayette, Tennessee: Preparedness, Response, and Previous Experience

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The views expressed in the report are those of the authors and not necessarily those of the Natural Hazards Center or the University of Colorado.

Introduction

Modern advances in tornado prediction have made significant contributions to reducing human exposure to these hazards; however, there is still a need for research on warning communication and behavioral responses (Golden and Adams 2000). This research investigates preparedness and response to tornadoes by focusing on the concept of geographical familiarity with natural hazards. This concept tells us that people view hazards they are familiar with as an acceptable risk because they have learned to adapt to their local environment and its potential threats to life and property (Tobin and Montz 1997). A logical assumption this leads to is that residents of a tornado-prone region have a relatively high level of awareness of tornadoes, that they are adequately prepared for a tornado warning, and that they respond appropriately when they receive a tornado warning. However, familiarity may lead to complacency about the severity of the threat and result in a lack of awareness, preparedness, and inappropriate response.

There is also the assumption that residents of a tornado-prone region have previous experience with being directly involved in a tornado disaster, and that this experience had a positive influence on their level of preparedness and perception of danger. However, the magnitude of the tornado and whether or not the person was forced to seek shelter are important factors to consider when determining if previous experience leads to greater awareness and preparedness or to complacency (Balluz et al 2000; Comstock 2005).

The study site for this research is the city of Lafayette, Tennessee, which is located in Macon County in the north-central region of the state. Lafayette is a small community in a rural setting approximately 50 miles northeast of Nashville. The total population of Lafayette is approxi-

mately 4,238, and the total population of Macon County is approximately 21,726, according to a recent estimate of the U.S. Census Bureau (2008a,b). This site was chosen for the study because it was one of the hardest hit communities during the Super Tuesday Tornado Outbreak of February, 2008 (NWS 2008a). Furthermore, Lafayette was determined to be an appropriate location for evaluating tornado awareness and preparedness because tornadoes are one of the most common natural hazards in the state.

Super Tuesday Tornado Disaster at Lafayette, Tennessee

On February 5-6, 2008, a storm system passing over the east-central U.S. produced an unusually high number of tornadoes in what is now commonly referred to as the Super Tuesday Tornado Outbreak. As the storm system swept across central Tennessee, the National Weather Service (NWS) office at Nashville identified approximately 13 tornadoes in its region (NWS 2008b) and issued approximately 26 tornado warnings from 7:30 p.m. CST on February 5 to 1:59 a.m. CST on February 6.

The NWS Storm Prediction Center issued a tornado watch for Macon County at 8:20 p.m. CST. The NWS regional office at Nashville issued a tornado warning for Macon County at 10:06 p.m. CST. Most of the local residents interviewed for this study indicated that they were aware of the tornado warnings for the central Tennessee area, but they never received the warning for Macon County. For example, many of the local residents commented during their interviews that they received the warning that was issued for an adjacent county (Sumner County) at 9:40 p.m. CST, but did not receive the warning for Macon County.

The primary reason for the breakdown in warning dissemination is that the tornado destroyed a key

component of the local electric grid (the Columbia Gulf Transmission Company pumping station near Hartsville) before entering Macon County, which cut off electricity to many of the homes in its path. Most of the local residents were relying on local TV stations from Nashville for storm reports, so the loss of electric power cut off their primary source of information at a critical time. The county did not have an outdoor warning siren system, so that method of warning dissemination was not an option.

The tornado was later determined to be a category EF3 on the Enhanced Fujita Scale of Tornado Intensity. The path was estimated to be 51 miles long and caused a swath of damage up to three-quarters of a mile wide (NWS 2008b). Thirteen people were killed by the storm according to early estimates.

Post-Disaster Survey at Lafayette, Tennessee

The post-disaster survey was conducted in Lafayette on February 9-15, 2008. The survey form consisted of 33 structured questions (multiple choice format) that covered response to tornado warnings, preparedness for a tornado disaster, previous experience with a tornado disaster, and demographic characteristics (Appendix 1).

The study group consisted of 127 local residents who were present during the tornado. The majority of the study group members (112) were interviewed at the Red Cross station that was set up to provide emergency aid to the tornado victims. Five people at the Red Cross station declined to participate in the survey due to tornado-related deaths/injuries in the family. An additional 15 people were interviewed in the field while inspecting damage to homes and buildings in the tornado's path through the outskirts of the city.

The demographic characteristics of the study group are summarized in Table 1. Some of the basic characteristics of the study group are as follows: 52% male, 98% white, 66% married, 34% with children in the household, 72% high school graduates or higher, 66% household income of \$40,000 or less. According to the 2000 U.S. Census (U.S. Census Bureau, 2008a), the general demographic characteristics of the city of Lafayette are as follows: 54% female, 98% white, 62% high school graduates or higher, \$25,750 median family income. These statistics suggest that the study group is a reasonable sample of the total population of the local community.

Response to Tornado Warnings

Ninety-eight percent of the 127 survey participants indicated that they were at home when the tornado hit the area. Most of the participants were at a location (house or building) that was hit by the tornado (78%), and a majority of the participants (56%) rated the amount of damage inflicted on the house or building they were in as severe.

Ninety-one percent of the participants were aware of the tornado warnings. However, as noted earlier, many

participants stated that they did not receive the tornado warning that was issued for Macon County. The most common sources for alerting the survey participants to the warnings were local TV stations (78%), friend/family (37%), and emergency weather radio (7%).

Thirty-three percent of the 116 survey participants who were aware of the tornado warnings rated their perception of danger as high when they heard the warnings. However, 45% indicated that they did not believe that they were in danger when they heard the warnings. Some of the factors that might account for this lack of fear include confusion over the difference between a tornado watch and a warning, confusion over the timing of when the watches and warnings were issued, a lack of awareness of tornado hazards, and complacency due to previous experience with tornadoes.

Comments from some of the participants suggest that lack of awareness and complacency from previous experience might be relevant issues. Many participants recounted their experiences during previous tornadoes in Macon County and in the nearby community of Gallatin, while others said that tornadoes never happen in this area, or that they always change course and go somewhere else.

The reported estimates for the amount of time between when the participants received the warnings and when the tornado actually hit were relatively evenly distributed among the following: 0-5 minutes (30%), 5-15 minutes (36%), 15-30 minutes (23%), greater than 30 minutes (9%), and don't know (2%). Although a lead time longer than 5 minutes for warning dissemination is preferable, the overall amount of variability is reasonable when considering the length of the storm path across the county, the confusion over warning dissemination discussed earlier, and the stress of the situation.

The most common responses to the tornado warnings were to seek shelter (84%), look outside (46%), call someone (17%), seek more information (17%), and continue with business as usual (8%). Paul and Huang (2004) found similar results in that approximately 90% of the members of that study group received the tornado warnings, and 86% of the people who heard the warnings took appropriate action by seeking shelter. Although many of the survey participants at Lafayette might have sought shelter "immediately" upon hearing the tornado warning, it appears that seeking shelter was a delayed response for many others as they took time to investigate the situation further (e.g., look outside, call someone) as noted previously by Sorenson (2000).

The most common locations sought for shelter were the basement (19%), bathtub/bathroom (17%), closet (14%), interior hallway (12%), or someone else's house (17%). Comments from the participants on this issue included going to a neighbor's house with a basement, fleeing a mobile home to go to a safer location (nearby grocery store), and staying with a family member.

Seventy percent of the survey participants owned a pet, and 53% of the pet owners took the pet with them to

shelter. Twenty-six percent of the pet owners did not have time to take the pet with them to shelter, and 18% were not concerned with the pet at the time.

Preparedness for a Tornado Disaster

Seventy-six (60%) of the survey participants indicated that they had an emergency response plan for seeking shelter during a tornado. Eighty-eight percent of those participants followed their plan when the tornado hit, which is consistent with the findings of Balluz et al. (2000).

A preliminary assessment of this issue from a demographics perspective indicated that the participants who were most likely to have an emergency response plan were married, had children living in the home, had a high education level, had a high income, and lived in a brick or wood frame house (Table 2). The participants who were least likely to have an emergency response plan were single, separated/divorced, had a low education level, had a low income, and lived in a mobile home.

Most participants (76%) did not have any type of tornado-proof shelter at their home; however, the remaining participants had a basement (21%), underground storm shelter (2%), or an interior safe room (1%). Twenty-three percent of the participants owned an emergency weather radio. However, several commented that they did not know where it was (e.g., "I think the last place I saw it was in the camper...").

Most participants indicated that they understood the definition of a tornado watch (76%) and a tornado warning (86%). However, only 57% indicated that they had ever received any type of information or training on how to prepare for, or respond to, a tornado. Furthermore, only 58% indicated that they had ever participated in a tornado drill. The participants indicated that the most common sources of information or training were public announcements (24%), work (18%), and school (17%). The most common places for participating in a tornado drill were school (37%) and work (28%).

Previous Experience with a Tornado Disaster

Thirty-seven of the survey participants (29%) indicated that they had previously been in a tornado disaster. Forty-one percent of those participants with previous experience indicated that the previous tornado had made a direct hit on their location (house, building, etc.), 14% rated the amount of damage to their location as high, 68% sought shelter, and 54% rated the amount of property damage and personal injury the tornado did to the local community as high. Thirty-five percent indicated that the Fujita Scale rating for the previous tornado as F3-F5, but 46% indicated that they didn't know the F-Scale rating.

Interestingly, of the participants with previous experience, 57% did not have an emergency response plan for seeking shelter, 95% did not own an emergency weather radio, and 49% lived in a mobile home (Table 3). Although

42% of these rated their perception of danger as high when they became aware of the tornado warning, 30% indicated that they did not believe they were in any danger.

The 37 participants with previous experience were primarily male (76%), 40 years old or above (84%), white (95%), married (78%), no children living at home (70%), high school graduate or above (73%), and household income of \$40,000 or below (65%).

Summary and Conclusions

The results of this study suggest that the level of tornado awareness and preparedness was relatively high among the local residents of Lafayette. However, the high number of survey participants who did not believe they were in danger when they heard the tornado warnings suggests that tornado awareness could be improved, possibly through the dissemination of basic information and training on tornado preparedness and response. Improvements could also be made in the areas of warning dissemination (e.g., more emergency weather radios) and the development of emergency response plans.

A majority of the survey participants with previous tornado experience thought that they were in danger when they heard the warnings. This response suggests that previous experience might have increased their awareness of tornadoes. However, the high percentage of these people who did not think they were in danger, did not have an emergency plan, did not own an emergency weather radio, and lived in a mobile home suggests otherwise. Clearly, additional research needs to be conducted on the role of previous experience in preparedness and response.

Additional research in this field of study will produce findings that are relevant to other types of natural hazards, such as hurricanes and earthquakes, where the concepts of geographical familiarity and previous experience are critical issues.

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References

- Balluz, L., Schieve, L., Holmes, T., Kiezak, S., Malilay, J. 2000. Predictors for people's response to a tornado warning: Arkansas, 1 March 1997. *Disasters* 24 (1): 71-77.
- Comstock, R. D., 2005. Comparing reactions to two severe tornadoes in one Oklahoma community. *Disasters* 29 (3): 277-287.

Golden, J.H., and Adams, C.R., 2000. The tornado problem: forecast warning, and response. *Natural Hazards Review* 1: 107-118.

National Weather Service Forecast Office, Huntsville, Alabama. 2008a. Super Tuesday Outbreak Weather Summary. www.srh.noaa.gov/hun/stormsurveys/2008-02-06/weather.php (last accessed 19 May 2008).

National Weather Service Forecast Office, Nashville, Tennessee. 2008b. Storm tracks and photo links from the Super Tuesday Tornado Outbreak – February 5-6, 2008. www.srh.noaa.gov/ohx/surveys/images/020508/poststorm_020508.php (last accessed 19 May 2008).

Paul, B.K., and Huang, B. 2004. Predictors for public response to tornado warnings: The May 4, 2003 tornadoes in Kansas, Missouri, and Tennessee. *Papers of the Applied Geography Conferences* 27: 51-57.

Sorenson, J.H., 2000. Hazard warning systems: review of 20 years of progress. *Natural Hazards Review* 1: 119-125.

Tobin, G.A., and Montz, B.E. 1997. *Natural hazards, explanation and integration*. Guilford Press, New York.

U.S. Census Bureau, 2008a. Population Finder: Lafayette, Tennessee, 2006 Population Estimates. www.census.gov (last accessed 18 May 2008).

U.S. Census Bureau, 2008b. State and County Quickfacts: Macon County, Tennessee, 2006 Population Estimates. www.census.gov (last accessed 18 May 2008).



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