Surveillance of Mortality During the Texas Panhandle Wildfires (March 2006)

In March 2006, Texas experienced the largest wildfires in state history with approximately one million acres burned (*1*) and 12 reported human deaths. This wildfire outbreak resulted in the largest loss of life from wildfires in the United States in 2006. Conditions in the Texas Panhandle were ideal for grassfires; the area had been in a drought for 11 months and under extremely critical drought conditions for five months. The National Weather Service Storm Protection Center issued an *Extremely Critical Fire Danger* warning for March 8, 10, 11, and 12 (*1*). The East Amarillo Complex (EAC) wildfire, made up of two large fires covering over 900,000 acres and six smaller ones each less than 1,000 acres, burned over a nine day period from March 12 (1:25 p.m.) to March 20 (6:00 p.m.), 2006 in the Texas Panhandle (*1*). The two largest fires in the complex were caused by power lines downed by sustained winds of 46 mph and gusts up to 53 mph, and spread to nine Texas counties (*1*).

The East Amarillo Complex wildfires destroyed over 89 structures, including nine homes and 80 outbuildings, and five vehicles, with estimated losses in excess of $16 million (*1*). The fires caused the evacuation of eight towns with a cumulative total population of 4,072 (*2*). More than 1,040 electrical poles were destroyed resulting in approximately 80 homes without electrical power. An estimated 4,296 head of livestock perished (*3*) and 2,000 miles of fencing were destroyed (*4*). A 90-mile stretch of Interstate Highway 40 was closed for nine hours due to heavy smoke (*5*). The wildfires moved 45 miles in just nine hours with a spread rate of five miles an hour and flame lengths of greater than 11 feet (*1*).

The wildfires represented what appeared to be the first mass human fatality event in Texas in 2006 and the most deaths related to grassfires in Texas history. In response to the disaster, regional and state public health preparedness staff at the Texas Department of State Health Services activated mortality surveillance and initiated an investigation to describe the epidemiology of deaths associated with the disaster. The purpose of the surveillance was twofold. First, we used epidemiological methods in the historic public health tradition to describe the circumstances surrounding the deaths with the intent to identify opportunities for intervention and prevention activities in future wildfires. Second, within the emergent culture nationally of an all hazards approach in public health preparedness, we used the wildfire mortality surveillance to advance strategic directions in disaster epidemiology and inform preparedness protocols and activities.

METHODS

Case Definition

The case definition was any death, directly or indirectly, associated with the EAC wildfire among civilians or firefighters (volunteer or paid). Deaths classified as "directly-related" included any death for which the decedent had direct contact with the

wildfire or wildfire products (e.g., smoke). Deaths classified as "indirectly-related" were any death for which the decedent had indirect contact with the wildfire products (e.g. automobile crash resulting from low visibility caused by smoke).

Case Finding

Cases were identified through multi-source case finding efforts during different phases of the incident. During the initial phase, case finding focused on interviews with local emergency management officials, justices of the peace and highway safety officials and a review of local newspapers which covered the wildfire. Post incident, we reviewed death certificate information.

Data Analysis

We conducted a descriptive analysis of the deaths associated with the EAC Wildfire using Microsoft Excel 8.0 and Epi Info Version 3.3.2. We also used Geographical Information Systems (GIS) to plot the approximate location of the injury exposure for the decedents.

RESULTS

There were 12 identified human deaths associated with the EAC wildfire. Injury exposure for all 12 decedents occurred within an estimated 45-mile radius (see Figure 1) and occurred on March 12, 2006 in a 6.5 hour period (between 1:30 p.m. and 7:00 p.m.). Eleven of the 12 deaths occurred within seven hours of the start of the fire. The exposures occurred in four rural counties (Roberts, Gray, Hutchinson, and Donley) in the Texas Panhandle.

The 12 human deaths occurred in five separate incidents. Three of the five incidents involved multiple deaths including two incidents in which four people died and one in which two people died. The circumstances of deaths in the multiple death incidents included four individuals driving to work in a remote location who were trapped and overcome by the wildfire. Another four individuals were involved in a nine-car collision on a major interstate caused by reduced visibility due to smoke from the wildfire. The multiple vehicle collision occurred within the first five minutes of the start of the grassfires.

The decedents were eight males and four females ranging in age from 14 years to 94 years. Eleven of the victims were civilians who died on March 12. The twelfth victim was a volunteer firefighter involved in responding to the wildfire who sustained serious injuries on March 12 and died 27 days later.

The manner of death for all decedents was classified as "accidental". The immediate cause of death for eight (67%) of the decedents was smoke inhalation. The listed underlying cause for four of the eight decedents was superheated air from grass wildfires. The immediate cause of death for four (33%) of the decedents was blunt force trauma and complications due to injuries sustained in an automobile accident with the underlying

cause listed as vehicular accident/collision. For seven decedents the time interval from exposure to onset of death was listed as instantaneous to minutes; for four decedents the time was not listed on the death certificate; and for one decedent the time interval was 27 days. Seven deaths were classified as directly related to the wildfires and five deaths were classified as indirectly related.

DISCUSSION

The EAC Wildfires resulted in Texas' first mass human fatality outbreak in 2006 and the most deaths related to grassfires in Texas history with 12 reported human deaths. A mass fatality event is defined here as a closely grouped series of at least 10 deaths occurring in well defined patterns in terms of time or place or both.

This wildfire outbreak resulted in the largest loss of life due to wildfires in the United States in 2006 and the most deaths in the country since 2003. Eleven of the 12 deaths occurred within seven hours of the start of the fire; 11 of the 12 deaths were civilians; all deaths occurred within a 45-mile radius; and all were potentially preventable.

The environmental and weather conditions in the Panhandle in March converged into a "perfect storm" situation for grass wildfires. Over the past two decades, the Panhandle area of Texas has experienced dramatic changes in land use moving from cultivated acreage to grassland and increasing the amount of fuel available for fires. Some areas of the Panhandle have also experienced population growth putting more people and more property at risk from wildfires (*1*). Local fire departments, the majority (81%) of which are volunteer departments in Texas, represent the first line of defense in fighting wild land fires. Although local departments currently are able to suppress more than 90 percent of the wildfires in Texas each year, the local departments often have a limited ability to respond to wildfires over long distances and for extended periods of time. The Texas Forest Service is the agency responsible for providing response to fires that exceed local capacity. In addition to firefighting capabilities, the Texas Forest Service also has strong programs for public education and awareness. In 1998, the agency developed the first comprehensive approach to address the state's wildfire problem in the Texas Wildfire Protection Plan (*1*). Prevention is one of the main emphases of the plan and could provide an opportunity for partnership with public health preparedness prevention and education efforts.

Based on our experience with the EAC Wildfire, we have three primary recommendations. First, wildfire prevention messages need to be disseminated. Wildfire prevention messages have already been developed and are available for use from the Texas Forest Service, U.S. Fire Administration, Federal Emergency Management Agency, and the U.S. Centers for Disease Control and Prevention (CDC) (*6-9*). Local and state public health, particularly preparedness-funded public health, may be the ideal conduit to either provide these messages and/or partner with other state and local organizations to assist in providing these messages. One of the messages is that there are proven effective methods that homeowners and responders can take to protect home and property to create "defensible spaces", but need to be accomplished before the fire starts.

This is consistent with the public health message of being prepared for all hazards events before the events take place.

Other risk communication messages include the importance of adhering to warning and evacuation orders, not driving through smoke on roadways, having an exit strategy, and avoiding the path of the wildfire. Partnering with local, regional, and state stakeholders, as well as nontraditional partners such as local service organizations, to disseminate health and safety messages provides a service to the community. It also allows public health to activate and exercise public health resources such as risk communication channels that will be needed in public health emergencies.

Second, local, regional, and state public health departments need to strengthen collaboration with emergency managers and local officials before, during, and after all hazard events, particularly those like the wildfire that fall outside of "typical" public health emergencies. A mass fatality event should always be viewed as a public health issue and be analyzed for potential public health impact and preparedness lessons. In the case of the EAC Wildfire, public health was able to provide assistance with medical issues regarding the short-term and long-term effects of exposure to smoke and to conduct the mortality surveillance.

Third, the public health preparedness community can accumulate the lessons learned and best practices from their involvement with all hazards events in an objective and directed fashion. These lessons learned and best practices can be shared with other entities within the state and among states.

The wildfires in the Texas panhandle illustrate one real-life example of the type of all hazard event to which public health must respond. The CDC Cooperative Public Health Preparedness Cooperative Agreement with states requires an "all hazards" approach to planning and disaster planning and response. The purpose of the cooperative agreement is to develop emergency-ready public health departments to prepare and respond to all hazards and other public health emergencies. The challenges for public health are to develop and maintain true all hazards capabilities, be aware of resources outside the typical public health arena, partner with local emergency management on nontraditional public health events, and to become active participants in all hazard events.

The mortality surveillance conducted for the wildfires reinforced the need for an epidemiologic response to all hazard events. Conducting an epidemiological evaluation of mass fatality events is essential to the disaster planning, response, and mitigation cycle. The goals of disaster-related mortality surveillance and investigation are to (1) identify the number of deaths, the cause of death, and provide basic demographic information; (2) to identify and inform public health interventions; (3) assesses the direct and indirect impact of the disaster on human life; and (4) provide information on disaster related mortality for emergency managers and public health officials to assist in future planning and mitigation efforts (*10*).

An all-hazards approach to emergency response requires public health to have a full spectrum of epidemiological capabilities to respond to any and all public health emergencies, not only a bioterrorism event. As noted in Dominici et al's recent article on disaster epidemiology, "epidemiologists must view disasters as important opportunities to learn about the etiology of disease [and injury], the relation between exposures and responses, the efficacy of surveillance systems, the strength of emergency response measures, and the intervention strategies that may reduce the burden of future disasters." (*11*). This would include developing epidemiologic surveillance protocols to monitor not only mortality but also morbidity (e.g., hospitalizations, emergency room admissions). It would involve conducting analytical epidemiology investigations to identify risk factors for mortality and morbidity.

The full spectrum of epidemiologic capabilities would including: (a) developing all hazards epidemiology toolkits and protocols; (b) using innovative methods including GIS; capturing and analyzing data rapidly to inform prevention strategies; (c) raising awareness on the benefits of all hazards epidemiology; (d) building partnerships to improve coordinated epidemiological responses; (e) documenting examples of how epidemiology was used in response to an all hazard event; and (f) evaluating the effectiveness of evacuation orders and wildfire safety warnings. A recent resolution by the State and Territorial Injury Prevention Directors Association recommended, in part, that each state and territory establish and maintain expertise in disaster epidemiology (*12*).

We hope that the lessons learned from the Panhandle wildfires will inform future prevention activities. We believe the approach taken can serve as a model for future public health responses to all hazards events.

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FIGURE 1. TEXAS PANHANDLE WILDFIRES (MARCH 2006)