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Mortality Surveillance During Winter Storm Uri, United States – 2021

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Original Research

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Abstract

Objective: On February 12, 2021, Winter Storm Uri hit the United States. To understand the disaster-related causes and circumstances of death, the Centers for Disease Control and Prevention (CDC) activated media mortality surveillance.

Methods: The team searched the internet daily for key terms related to Uri and compiled the information into a standardized media mortality surveillance database to conduct descriptive statistics.

Results: Between February 12 and March 2, 2021, the accessed media reported 136 Uri-related deaths from nine states. Most decedents were male (39%) and adults (62.5%). Exposure to extreme temperatures (47.1%) was the most common cause of death. Among indirect deaths, motor vehicle collision (12.5%), and carbon monoxide poisoning (7.4%) represented the top two circumstances.

Conclusion: This was the first time CDC activated media mortality surveillance for a winter storm. Media mortality surveillance is useful in assessing the impact of a disaster and provides timely data for an all-hazards response approach.

Introduction

On February 12, 2021, a North American Winter Storm formed over the Pacific Northwest and began to move southeast. The storm, also known as Winter Storm Uri (Uri), began moving across the United States, with major effects lasting for weeks post-impact.[1] By February 16, roughly 73% of the continental United States had snow coverage, the highest percentage since the National Oceanic and Atmospheric Administration started tracking snow coverage in 2011.[2] Additionally, Uri is reported to be the costliest winter storm on record for the United States, with an estimated Consumer Price Index-adjusted cost of $20.4 billion.[3] A total of 10 million people were without power at the height of storm-related outages.[3]

Winter storms cause power outages, drinking water issues, health concerns, and other wide-ranging effects. Snow, ice, and extreme temperatures disrupt travel and electrical services and create unsafe living conditions. They also disrupt public health services, creating challenges in providing critical services to the community and responding to storm-related needs.[4] Recent studies analyzing the health impacts of winter storms found increases in emergency department visits, all-cause mortality, cardiovascular hospitalizations, and injuries, as well as food and water-borne diseases, among others.[5] Carbon monoxide (CO) poisonings are also a major concern during winter storms. America's Poison Centers released an alert on February 17, 2021, about the dangers of CO poisoning because of unsafe generator use and the use of atypical heating sources, both of which can result in CO poisonings in households.[6] More than 1400 people were treated for CO poisoning across Texas during the winter storm power outages.[7,8]

While Uri affected several states, Texas was the most severely impacted. The Governor of Texas issued a disaster proclamation for severe winter weather on February 12, 2021, and all counties in Texas were under a disaster declaration.[9,10] Texans suffered state-wide power outages because of their isolated and unwinterized electrical grid. Because of this, Texas reported more than 4.5 million power outages.[11] Record low temperatures, roads made impassible by snow and ice, and compromised water supplies created challenges in providing critical community services. Road conditions reduced access to medical services and some hospitals lost access to water.[10] A total of 12 million people were under boil water advisories because of disruptions in approximately 590 public water systems.[12]

With the frequency of winter storms and blizzards increasing, understanding disaster-related causes and circumstances of death is needed to help inform preparedness and response efforts.[13,14] Timely mortality surveillance is vital for evidence-based public health action during response and recovery efforts. Historically, the Disaster Epidemiology and Response Team (DERT) in the Centers for Disease Control and Prevention's (CDC) National Center for

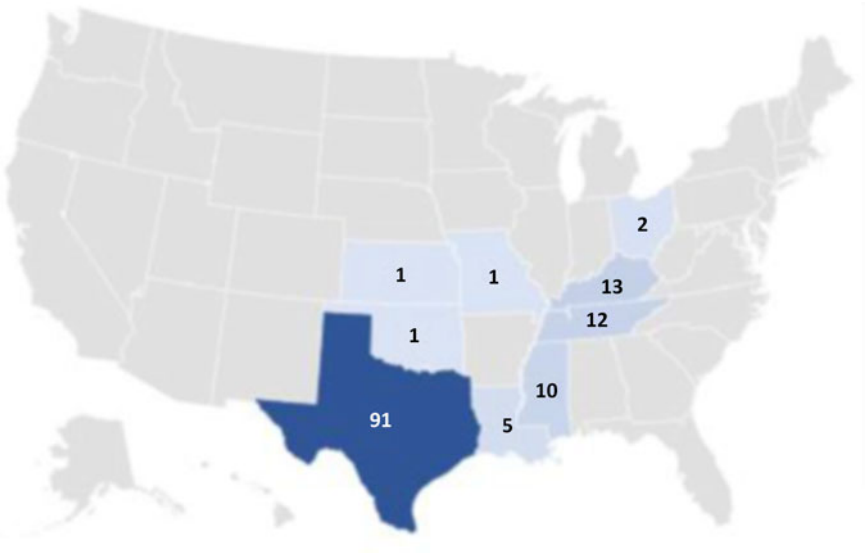

Figure 1. Media-reported winter storm-related deaths, by state, February 13 – March 2, 2021.

Environmental Health (NCEH) activates media mortality surveillance during hurricane responses to provide situational awareness and public health messaging during the disaster and its aftermath. Media mortality surveillance is a timely surveillance mechanism that can be used during disasters to quickly provide rough mortality estimates to support public health decisions and to understand the health impacts of the disaster.[15] Near real-time data during a disaster is important when vital statistics data for disaster-related deaths may be unavailable. Because of the far-reaching impacts of Uri, CDC activated media mortality surveillance (winter storm-related deaths reported in the media) for the first time during a winter storm to provide summary data for situational awareness to response leadership. This manuscript describes winter storm-related deaths in the continental United States that were reported in the media during CDC's response phase from February 12 to March 2, 2021, in the continental United States.

Methods

Between February 12 and March 2, 2021, NCEH activated media mortality surveillance to track winter storm-related deaths reported in the media for all states affected by the winter storm. The team used an internal standard operating procedure developed during the 2017 hurricane season. At the same time each day, two team members searched the internet using Google or a similar search engine for key terms related to the winter storm, including storm name and type (e.g., winter storm), location-specific terms (e.g., state, county, city), mortality-related terms (e.g., death, mortality, death toll), cause of death (e.g., exposure, motor vehicle collision, carbon monoxide poisoning), and other known information learned from previous days (e.g., name of individual, family details, circumstance of death). Team members also searched social media sites, such as Twitter, based on mentioning within the internal CDC communications report.

Data from the identified sources (e.g., news articles, state / local health department sites, social media posts, and funeral home announcements / obituaries) were compiled and coded into the standardized media mortality surveillance database in Microsoft Excel® (Microsoft Corporation, Redmond, Washington, USA). The team then produced descriptive statistics using Excel version 2102 (Microsoft Corporation, Redmond, Washington, USA) for daily internal situational awareness and public health messaging. The results provide a summary of all media reported winter storm-related deaths captured during the response phase.

Results

Between February 12 and March 2, 2021, DERT captured 136 winter storm-related deaths reported in the media in nine states (Figure 1). The winter storm had the greatest impact in Texas, with a mortality count of 91. The remaining 45 reported deaths occurred in eight states. (Figure 1). The next highest media reported mortality counts were for Kentucky (13 deaths) and Tennessee (12 deaths). The lowest winter storm-related mortality counts were for Oklahoma, Kansas, and Missouri, each with one reported death.

Of the 91 decedents with sex data available, the majority (n = 53, 58.2%) were male (Table 1). For the 93 decedents with age data available, the majority (n = 85, 91.4%) were adults ages 18 years and older. Adults ages 65 years and older represented 39.7% (n = 37) of deaths with known age (n = 93). Children ages 0 - 17 represented 8.6% of decedents with age data. Sex was not reported for 45 (33.1%) decedents and age was not reported for 43 (31.6%) decedents.

Cause of death is the specific injury or condition that leads to death; circumstance of death is the determination of how the specific injury or condition leads to death.[16] The most common cause of death was exposure to extreme temperatures (47.1%), followed by blunt force trauma (14.7%), CO poisoning (7.4%), and fire (6.6%) (Table 2). Direct deaths represent almost 50% of all circumstances of death (47.1%), and all were from exposure to extreme temperatures. Roughly 1-third of deaths (33.8%) were indirectly related to the winter storm, with motor vehicle collision (12.5%), CO poisoning (7.4%), and fire (6.6%) representing the top 3 circumstances of death for indirect deaths (Table 3). Cause and circumstance of death for 26 (19.1%) persons was undetermined.

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Table 1. Demographics of winter storm-related deaths reported in the media, February 13 – March 2, 2021

	N	%t
Total	136	100
Sex		
Female	38	27.9
Male	53	39.0
Unknown	45	33.1
Age category		
0-17 years	8	5.9
18-64	34	25.0
65 + years	37	27.2
Adult (age not specified)	14	10.3
Unknown	43	31.6

Table 2. Cause of deaths reported in media during Winter Storm Uri, 2021

Cause of death	N	%
Total	136	100
Exposure to extreme temperature	64	47.1
Blunt force trauma	20	14.7
CO poisoning	10	7.4
Fire	9	6.6
Other	4	2.9
Drowning	3	2.2
Undetermined	26	19.1

Table 3. Circumstances of deaths reported in media during Winter Storm Uri, 2021

Circumstances of death	N	%
Total	136	100
Direct (n = 64)		
Exposure	64	47.1
Indirect (n = 46)		
Motor vehicle collision	17	12.5
CO poisoning	10	7.4
Fire	9	6.6
Pre-existing condition	4	2.9
Drowning	3	2.2
Fall	3	2.2
Undetermined	26	19.1

Discussion

This is the first time CDC activated media mortality surveillance for a non-hurricane natural disaster. The winter storm surveillance found 136 media-reported winter storm-related deaths during the response phase. It provided timely data on cause and circumstance of death for evidence-based public health action and messaging. The top 3 causes of death included exposure to extreme temperature, motor vehicle collision, and CO poisoning. The winter storm severely affected residents of states where winter weather is less common, and this population may have been less likely to wear protective clothing and otherwise protect themselves, causing them to be susceptible to heat loss.[14]

Older adults were disproportionately affected by Uri, highlighting a population that is particularly vulnerable to winter weather.[14] Adults aged 65 years and older represented 39.7% of storm-related deaths with known age. According to 2019 Administration for Community Living population estimates, persons 65 years and older represented 16% of the population in the United States.[17] The nine states with reported winter storm-related deaths have a range of persons 65 years and older from 12.1% to 17.5%, reported in 2021 census population estimates.[18]

Power outages during disasters are largely responsible for fatal and nonfatal disaster-related CO exposures.[19] CO poisoning was the third most common cause of death identified through media mortality surveillance for Uri, which might underestimate the true extent of fatal CO poisonings during the winter storm. Prevention efforts should focus on targeted public health messaging, including best CO detector practices, such as keeping spare batteries in a household emergency supply kit.[20] Additionally, continued education on the dangers of unsafe generator and alternative heating practices is important to prevent further CO poisoning deaths.[20]

Media mortality tracking during Uri provided timely data for situational awareness and evidence-based public health messaging. Social media platforms are an important tool for public health communication. CDC's Environmental Health Twitter account tweeted about the dangers of CO exposure and precautions to take to avoid CO poisoning. During Uri, CDC CO-related tweets received up to 18 0307 impressions, with a potential reach of 731 9549. That compares with 7692 impressions, for a potential reach of 40 635, in the weeks before the 2021 winter storm (unpublished CDC Twitter analytics data, February, 2021). Timely data showing that CO poisoning was one of the top causes of death during the winter storm was useful for tailoring public health messaging. Although media mortality data are not the only option to gather information during disaster, methods such as active surveillance systems require more resources, training, and intensive partnerships with public health practitioners, as well as vital statisticians, medical examiners, coroner offices, and others. By contrast, media mortality reports can provide vital information during a disaster to support evidence-based public health messaging to aim to minimize mortality and injury in near-real time in a less resource-intense manner.[22]

Winter storms are the most common weather incident involving power outages, and the frequency and intensity of winter storms are increasing.[13,14] After a disaster, such as a winter storm, households may be without emergency health services and access to other resources.[20] Therefore, preparedness recommendations include preparing an emergency supply kit to help households be self-sufficient in the immediate aftermath of a disaster, as well as reduce the strain on public health resources. Emergency supply kits can help households survive the initial impact of a winter storm, reducing the need to travel in unsafe conditions that can lead to hypothermia, motor vehicle collisions, and other hazards. Future public health research and outreach should target emergency supply kits.

Limitations

This report is subject to at least three limitations. First, media mortality surveillance does not include official deaths from vital statistics, and thus may be incomplete or inaccurately attribute cause of death. This report includes variables with incomplete data (e.g., sex, cause of death). However, because there is often a lag time in receiving vital statistics data on disaster-related deaths, disaster response benefits from using nontraditional surveillance

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mechanisms for near real-time data, such as media mortality surveillance. Second, the media mortality surveillance only included deaths reported during the internal response phase (February 12 – March 2, 2021). It likely missed deaths that were later reported as winter storm-related and deaths that occurred outside the response phase. The Texas Department of State Health Services (DSHS) conducted surveillance between February 15, 2021, and October 27, 2021, using mortality surveillance forms, death certificates, and verification of deaths reported informally to identify deaths related to Uri. DSHS confirmed 246 winter storm-related deaths occurring between February 11, 2021, and June 4, 2021.[23] DSHS data likely report a more accurate picture of Uri-related mortality. Finally, media mortality surveillance might not have captured every article published on storm-related mortality. The 136 deaths attributed as disaster-related likely underestimates the true mortality count. Future mortality surveillance during a disaster might focus on supplementing current processes with automated algorithms to provide more robust decedent data. An evaluation of Hurricane Sandy media mortality tracking statistics found a moderate (76%) overall match with vital statistics data, demonstrating the usefulness of this surveillance mechanism.[21]

Conclusion

This was the first time DERT activated media mortality surveillance for a winter storm and this effort was successful in providing timely data for public health action. Media mortality surveillance continues to be a useful tool in assessing the human impact of a disaster. Such tools can provide timely data that are useful for an all-hazards response approach.

Author contributions[1]**.** Arianna Hanchey: concept development, data collection, cleaning, and analysis (lead writing author); Sumera Jiva: data collection / analysis, and report write-up; Tesfaye Bayleyegn: concept development, subject matter expert review, and report write-up; Amy Schnall: Senior author, team lead, concept development, and data cleaning, as well as analysis, and report write-up

Abbreviations. Uri, Winter Storm Uri; CO, Carbon monoxide; CDC, Centers for Disease Control and Prevention; NCEH, National Center for Environmental Health; DERT, Disaster Epidemiology and Response Team; DSHS, Texas Department of State Health Services

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[1]NOTE: The findings and conclusions in this report are those of the authors, and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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