DOUGLAS COUNTY TORNADO RECOVERY SURVEY

This report contains a summary of the results from the rapid needs assessment conducted in Douglas County, Nebraska in response to the Arbor Day Tornado Outbreak, 2024.

Final Report
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Executive Summary

Background. On April 26, 2024, a tornado outbreak occurred impacting Central Nebraska to Central Iowa. During what is referred to as the Arbor Day Tornado Outbreak, the National Weather Service (NWS) in Omaha identified 25 tornado tracks with 5 classified as EF-3 or higher. The Douglas County tornado was rated as an EF-4, with max wind speeds of 170 miles per hour, a track length of 31.2 miles, and a maximum width of 1 mile. No deaths and few injuries were reported.

Purpose and Objectives. We surveyed Douglas County residents within a 2-mile area of the tornado path using a rapid needs assessment method appropriate for the area and the assessment needs. Specifically, we used a stratified simple random sample, that used publicly available tax parcel data from the Douglas County Assessor's Office to identify residential addresses in the sampling frame. We also identified addresses from the damage reports shared by the Douglas County Health Department (DCHD). Selected households were invited to participate in the survey via postcard mailouts (May and June 2024). Due to limited physical accessibility, data were collected online and via phone. The objectives of this survey were to evaluate the NWS early warning system and messaging; evaluate local emergency management planning and response; determine the mental and physical health impacts of those affected; determine the extent of community needs; and understand child health emergency preparedness needs related to tornadoes.

Accomplishments. Due to restrictions on physical access to Douglas County communities affected by the tornado, we utilized a completely remote, modified rapid needs assessment approach to assess community needs and impacts related to the tornado. We effectively utilized an academic-practitioner partnership to accomplish the objectives of this work.

Findings. *Households.* In total, 150 households completed the survey. The majority (96%) of households reported living in a stand-alone, detached, permanent structure like a house. The mean household contained 2.8 individuals. Almost 70% of households reported no or minimal damage, followed by 17% who reported that their homes were damaged but repairable. Just 4% reported that their homes were destroyed or uninhabitable. Among the total households surveyed, 99% reported English as the main language spoken at home.

Preparedness and communications. Over 75% of households reported having plans for where to shelter safely and receiving emergency information, and 61% reported having a communication plan to contact family members if they were not together when the disaster happens. Fewer households, however, reported having plans for getting copies of important documents, such as insurance records (41%) or community evacuation routes (29%). Out of households that reported having an emergency supply kit prior to the tornado (15% total), 34% reported using it and 12% reported needing items from their kit that they did not have. Respondents who needed additional supplies reported needing emergency flashlights, additional power supplies, such as batteries, solar chargers, a generator and ways to charge their cell phones, additional shoes and clothing, work gloves, and umbrellas.

Participants reported receiving the tornado warning by different means. Many (74%) learned of it by an outdoor warning siren, 67% through automatic text or phone notification, and 53% through television. Upon receiving the tornado warning, most respondents (59%) moved to the most sheltered part of the building they were in, and 29% moved family or friends to shelter while not sheltering immediately themselves. Critically, over one in five respondents reported no actions after the tornado warning. During the event, 55% reported losing power and/or access to information sources.

Barriers. Complex medical needs – including insulin reliance (7%) and assistive mobility device use (5%) – and barriers to effective communication – including impaired hearing (5%), developmental or cognitive disability (5%), and impaired vision (1%) – were important underlying concerns affecting participating households. Among households reporting complex medical needs, 11% reported interruptions in maintaining their needs or receiving services.

Health impacts. About 1% of households reported injury from the tornado impact and 2% from cleanup. A majority (65%) reported having had a tetanus shot in the past 10 years, while 12% reported not knowing their vaccination status. Participants were asked about worsening mental and physical health conditions among their household members after the tornado, with the most common being allergies (7%), exacerbation of previously existing mental health conditions (4%) and asthma or chronic obstructive pulmonary disease (3%). New conditions reported among adults since the event included trouble sleeping or nightmares (13%), difficulty concentrating (11%), and agitated behavior (8%). Similarly, households with children reported new conditions since the tornado, including their child(ren) feeling nervous or afraid (48%), being concerned about their physical safety (17%), and having problems sleeping (16%). Among individuals, 33% reported any symptoms of anxiety and 20% reported any symptoms of depression in the previous two weeks.

Open-ended responses. Households were asked to provide additional feedback or information to DCHD and other county officials. The most frequent responses centered on positive experiences with broadcast warnings and forecasts. Community response was also rated highly. Respondents reported discontent with trespassers and looters following the tornado.

Recommendations. The tornado warnings and alerts issued for this event undoubtedly saved lives and helped prevent significant injuries. However, it is important to note that the tornado occurred during daylight hours, when many individuals were commuting from school or work, increasing their situational awareness. To enhance preparedness for future events, county officials and emergency response groups should collaborate with community members to develop more robust and accessible warning systems that ensure alerts are clear, actionable, and effective in any scenario. One critical area for improvement is household emergency preparedness. Prior to the tornado, only 15% of households had an emergency preparedness kit, which can be essential for accessing necessary supplies during a disaster. Preparedness professionals should actively engage communities in building emergency kits, providing guidance on essential supplies, and connecting residents with local public health and emergency management resources to obtain needed materials.

While the initial response to the disaster was exceptionally strong, the community would benefit from clearer communication about mid- and long-term recovery resources, particularly regarding state and federal assistance programs. To streamline access to recovery funding, publicly available, easy-to-understand guidance should outline:

- What funds are available
- Who qualifies, how they can be used, and the application process
- Additional non-governmental resources, including financial, logistical, and emotional support

Another pressing issue is the mental health impact of the disaster. Many households reported worsening pre-existing mental health conditions or experiencing new behavioral health challenges since the tornado, including symptoms of anxiety, depression, or post-traumatic stress disorder (PTSD). Disasters often exacerbate existing conditions while also delaying access to mental health services, as individuals prioritize urgent needs such as shelter, food, and transportation. Given the limited availability of mental health services in the area, we recommend:

- Activation of behavioral health responders and services in the immediate aftermath of a disaster
- Onsite mental health counseling and behavioral health services in the near term
- Long-term assistance to help residents access sustained care for chronic mental health needs

By addressing these key areas—emergency warning systems, household preparedness, recovery resources, and mental health support—the community can build greater resilience and preparedness for future disasters.

Background

Limited information exists about the immediate needs and health impacts that a community faces following a tornado. Conducting quick-response research is crucial for helping public health and emergency management professionals reduce fatalities and injuries, while improving operational forecasting and emergency messaging. In addition to direct impacts such as fatalities and trauma-related injuries, tornadoes can lead to numerous indirect health consequences, including carbon monoxide poisoning from generator use, food and waterborne illnesses due to power outages, and significant mental health effects.

Post-tornado assessments typically focus on structural damage and mortality surveillance, with limited emphasis on broader public health needs. To our knowledge, only one rapid public health needs assessment has been conducted following a tornado—the assessment of the March 2012 Laurel County, KY tornado outbreak.[1] This assessment used the Community Assessment for Public Health Emergency Response (CASPER) methodology to evaluate a pharmaceutical emergency order's effectiveness, residents' ability to access medications, the effectiveness of warnings and messaging, mental health impacts one month after the event, and childcare access and safety concerns. CASPER, developed by the Centers for Disease Control and Prevention (CDC), is an epidemiologic tool designed to rapidly gather household-level data on community needs, both during disaster response and in non-disaster settings. This methodology provides valuable insights to inform preparedness, response, and recovery efforts in the aftermath of extreme weather events and other disasters.[2]

On Friday, April 26, 2024 (Arbor Day), a series of tornadoes swept across the Midwest, impacting areas from central Nebraska to central Iowa during the afternoon and evening hours. Within the National Weather Service (NWS) Omaha/Valley coverage area—spanning eastern Nebraska and western Iowa—meteorologists identified 25 tornado tracks, with a combined track length of 208.1 miles. At least five tornadoes were classified as EF-3[3] (3-second wind gusts of 136-165 mph)[4] or higher on the Enhanced Fujita (EF) Scale. One particularly strong EF-4 tornado (3-second wind gusts of 166-200 mph)[4] struck multiple populated areas in western Douglas County, Nebraska, producing estimated maximum winds of 170 mph and covering a 31.2-mile track.[3] Remarkably, no fatalities were reported from this tornado.[3] In response to the destruction, Governor Jim Pillen issued a post-tornado emergency declaration on April 28, 2024, authorizing the use of state emergency funds for the affected counties (Douglas, Lancaster, and Washington) through the Nebraska Emergency Management Agency (NEMA).[5] Subsequently, on May 2, 2024, Governor Pillen formally requested a federal disaster declaration from President Joe Biden to secure federal aid for recovery efforts, a request that was approved on May 3, 2024.[6]

On April 29, 2024, the University of Nebraska Medical Center (UNMC) Water, Climate and Health Program (WCHP) contacted the Douglas County Health Department (DCHD) to offer support in conducting a rapid needs assessment (RNA) to better understand the tornado's impact on Douglas County residents. We began planning the assessment on May 1, 2024, and a post-tornado RNA was ready and scheduled to launch by mid-May 2024, just weeks after the tornado outbreak.

The primary objectives of this assessment were to:

- Evaluate the effectiveness of the NWS early warning system and messaging
- Assess local emergency management response and communications
- Identify the mental and physical health impacts on affected individuals
- Determine the extent of ongoing community needs to inform recovery efforts.

Methods

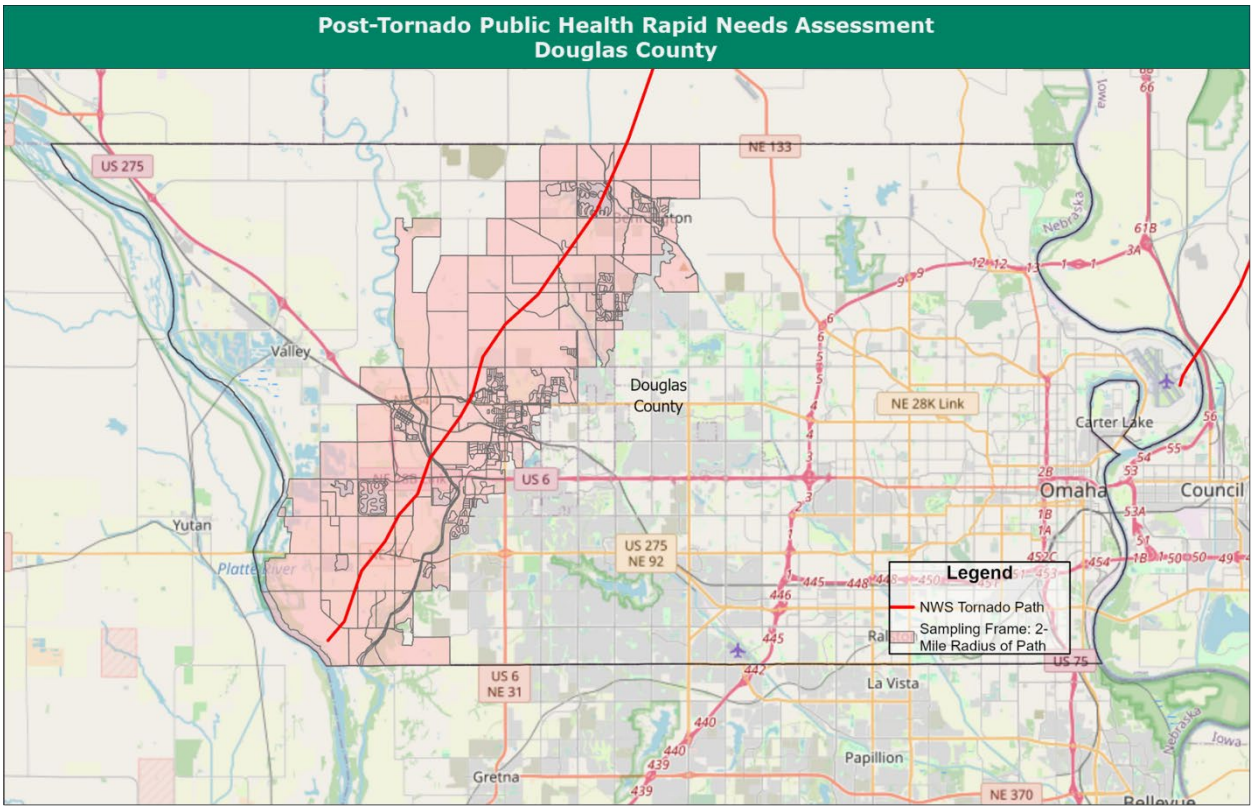
Douglas County, Nebraska

According to the U.S. Census Bureau, Douglas County has 584,526 residents and 245,050 total housing units. The median age of residents of Douglas County is 36.1 years, with 14.6% of the population being 65 years or older. The median household income is $77,457, the proportion of the population living in poverty is 12.0%, and the employment rate is 68.5%. Related to health, 12.3% of the population of Douglas County are classified as having some disability (e.g., hearing, vision, ambulatory impairments), and 7.2% do not have health insurance.[7]

Assessment Design

Due to the logistical concerns with having survey teams on the ground, we tested an alternative method to the traditional CASPER methodology, specifically a stratified simple random sample. In consultation with DCHD, we decided to focus on the most impacted areas of the county. Using the NWS tornado path, we selected all Douglas County Census blocks within 2-mile radius of the tornado path (**Figure 1**).

Figure 1. Sampling area and tornado path in Douglas County



Stratum 1 included addresses from the DCHD damage reports, with 648 households sampled from 900 damage reports. Stratum 2 included households within the 2-mile radius of the tornado

path not included in the damage report. For this stratum, we used publicly available tax parcel data from the Douglas County Assessor's Office to identify residential addresses in the sampling frame, excluding addresses in the damage report list. We selected 1,864 households from 12,383 available households. For each stratum, we weighted responses by the inverse probability of selection. Strata were differentiated by the data source from which the household was sampled (i.e., damage reports or tax parcel data).

Sample Size

The required sample size from a simple random sample to estimate the impacts of the tornado within a 7.5% margin of error, with 95% confidence, and with frequency of responses assumed to be 50% is 168. A final response rate of at least 80% of the calculated sample size (134 out of 168) is required to ensure accurate and unbiased results are obtained.

Survey Development

We used standard CASPER survey questions[2] for many of the household-level questions, including those related to household-level preparedness, health, and wellbeing. County-specific resource questions were informed by DCHD and partners. To evaluate tornado early warning systems, questions developed by the National Oceanic and Atmospheric Administration (NOAA) – specifically, the NOAA Tornado Post-Event Survey[8] – were included and adapted to assess household-level, rather than individual-level, information. We developed specific questions for this assessment for the purpose of evaluating post-tornado resources and communications. Based on anecdotal information, questions were included related to pediatric health and well-being. Four individual-level questions on health and well-being were also included. The final survey included 60 questions, including questions related to demographic characteristics; household preparedness; the NOAA Tornado Post-Event Survey; physical health, mental health and well-being; pediatric health, if applicable; communications; and an open-ended question. The entire survey is provided in **Appendix 1**.

Data Collection

A virtual assessment, including both online and telephonic surveys, was selected due to limited physical accessibility of the impacted area. Following household selection, we sent initial postcard invitations (**Appendix 2**) to selected households on May 24, 2024, with a reminder postcard sent on June 3, 2024. The survey remained open from May 22 – June 24, 2024. In total, we mailed 2,512 postcards. By taking the survey online or calling in to complete the survey, all participated households consented to participate.

Analysis

We calculated certain rates to determine the success of the assessment using the following formulas:

$$Sampling\ Rate = \frac{households\ sampled}{total\ households\ in\ stratum}$$

$$Response\ Rate = \frac{completed\ interviews}{households\ sampled}$$

$$Completion\ Rate = \frac{completed\ interviews}{interviews\ intended\ to\ complete}$$

We conducted basic weighted descriptive analyses, including calculating weighted frequencies and percentages for categorical variables, and means for continuous variables, with associated 95% confidence intervals (CI) around all estimates. Weighted results represent the entire sampling frame, which includes households and individuals residing within Census blocks within a 2-mile radius around the tornado track through Douglas County. In other words, each household participating in the survey represented a certain number of other households from the larger population from which the sample was drawn (i.e., all of those living within a 2-mile radius around the tornado track). We weighted household-level questions based on the household probability of selection to estimate the number and percentage of similar households in the sampling frame. We weighted individual-level health questions based on the individual probability of selection to estimate the number and percentage of similar individuals within the sampling frame. In other words, the results have been adjusted, or weighted, according to the sampling strategy to better represent the entire population in the impacted area. Therefore, the numbers and percentages shown reflect the estimated totals for all households in the area, rather than just the specific people who responded to the survey. Open-ended, or qualitative text, responses are not weighted.

Software

We used EpiInfo 7.2.6.0 (CDC; Atlanta, GA) for sample size calculations; ArcGIS Pro 3.3.0 and ArcMap 10.8.2 (ESRI; Redlands, CA) for mapping; REDCap 14.4.1 electronic data capture tools hosted by UNMC[9,10] (Vanderbilt University; Nashville, TN) for data entry and online survey collection; and SAS v 9.4 (SAS Institute, Inc; Cary, NC) for statistical analysis.

Results

Response Rates

We received 150 complete responses to the virtual assessment. The overall response rate was 6.0% (i.e., invited households that completed the survey). The required sample size to estimate the impacts of the tornado on affected Douglas County households was 168 households, with at least an 80% completion rate needed to yield unbiased, generalizable results. We ended with a completion rate of 89.3% (i.e., surveys completed from the required sample size).

Household Characteristics and Demographics

Household sizes ranged from 1 – 9 people, with a mean of 2.8 (95% CI: 2.6 – 3.1). Most households spoke English as the main language (98.8%), the remaining 1.2% spoke Spanish or other language. Most residences (95.9%) were classified as stand-alone, detached, permanent structures like a house (**Table 1**).

Table 1. Household Characteristics

Type of Residence	Percent (n)	95% CI
Stand-alone, detached, permanent structure like a house	95.93% (633)	92.43 – 99.43
Condo, townhouse, or duplex that is attached to another structure	1.64% (11)	0.00 – 3.73
Other	0.21% (1)	0.00 – 0.61

Household Emergency Preparedness

There was a range of preparedness for household-level emergency planning (**Table 2**). The most common emergency plans reported by households included where to shelter safely if needing to shelter in place (77.4%), how to receive emergency alerts and warnings (76.5%), and how to contact family members if they were not together when a disaster happened (60.7%). Only 28.8% of households reported knowledge of evacuation routes in their community, the least common emergency plan reported.

Households shared a range of locations where they typically shelter during a tornado. Among households where one or more household members were home during the Arbor Day tornado, 85.2% sheltered in their basement; 8.3% in a small interior room without windows, such as a closet, bathroom or tub, utility or laundry room, or stairwell; and 4.2% in a safe room.

Emergency supply kits – or items stored together in containers that can easily be accessed in an emergency – were prepared prior to the tornadoes for 15.1% of households. Most households reported not having an emergency supply kit available (83.7%). Among the households that did have emergency kits, 34.0% (34 households; 95% CI: 13.3 – 54.7) used them during the tornado. Of those that used items, 91.8% used batteries, 48.4% used water, 40.2% used food, and 23.8% used medical supplies from their kits. Other materials used included a weather radio, flashlights/lanterns, and generators. Some households noted that they needed materials that were not available in their household or in their emergency supplies kits (12.3%), such as working sources of light, generators, chargers, clothing items like shoes, and work gloves.

Table 2. Household Emergency Preparedness

Emergency Plans	Percent (n)	95% CI
Where to shelter safely if it is safer to shelter in place	77.35% (511)	69.44 – 85.26
How to receive information such as emergency alerts and warnings?	76.51% (505)	68.58 – 84.44
How to contact family members if you are not together when a disaster happens	60.69% (401)	51.56 – 69.83
How to get copies of important documents such as insurance records	40.99% (271)	31.86 – 50.12
Routes to exit your community if there is an evacuation	28.82% (190)	20.49 – 37.16
Shelter Location if at Home	**Percent (n)**	**95% CI**
Basement	85.19% (563)	78.66 – 91.73
Small interior room without windows (e.g., closet, bathroom/tub, laundry room, stairwell)	8.31% (55)	3.16 – 13.45
Safe room	4.24% (28)	0.32 - 8.15
Designated private tornado shelter	1.22% (8)	0.00 – 3.24
Other (e.g., left home, under stairs)	1.43% (9)	0.00 – 3.49
Designated community/public tornado shelter	0.00% (-)	0.00 – 0.00
Not applicable	5.50% (36)	1.48 – 9.52
Emergency Supply Kit Prior to Tornado	**Percent (n)**	**95% CI**

Yes	15.07 (99)	8.72 – 21.41
No	83.72 (553)	77.14 – 90.30
Missing	1.22 (8)	0.00 – 3.24
Emergency Supply Kit Items Used, Among Those With a Kit	Percent (n)	95% CI
Batteries	91.79% (31)	80.11 – 100.00
Food	40.18% (14)	5.67 – 74.68
Water	48.39% (16)	12.84 – 83.94
Other (e.g., flashlight, weather radio, generator)	36.07% (12)	1.97 – 70.17
Medical supplies	23.75% (8)	0.00 – 57.15

Household Tornado Awareness and Response

Questions from the NOAA Post-Tornado Survey were adapted to the household level to help us better understand household experiences before, during, and immediately following the tornado. Households were asked to identify where members of their household were when the tornado touched down (**Tables 3-5**). The most common locations of family members were at home (88.0%), at work (22.9%), and at school (9.7%). Other locations mostly included people being out of town, at a friend's house, or at a doctor's office at the time of the tornado.

For households with at least one member at home or at school, 29.0% reported feeling very safe, and 31.3% moderately safe. For households with at least one household member at work at the time of the tornado, 31.0% felt very safe and 31.9% felt moderately safe in their workplace structure when the tornado occurred. Building/structure type for workplaces included primarily single-story (51.3%) and multi-story (38.1%) buildings. Given the small number of respondents who were at a place of business during the tornado, we did not include further analysis related to type of structure or feelings of safety in the business structure. For households with members at various locations at time of touchdown, 24.7% reported that this influenced how members took protective actions, while 26.1% reported that it did not (**Table 3**).

Table 3. Location and Level of Security at Time of Impact

Location of Respondent and Household Members at Touchdown	Percent* (n)	95% CI
At home	88.00% (581)	82.19 – 93.81
At work	22.91% (151)	15.10 – 30.71

At school	9.73% (64)	4.26 – 15.21
Other (e.g., friend, doctor, traveling)	8.52% (56)	3.36 – 13.67
In a vehicle	5.87% (39)	1.48 – 10.27
At a business	1.43% (9)	0.00 – 3.49
Safety in Household or School Structure, Among Those at Home/School		
	Percent (n)	95% CI
Very safe	29.02% (177)	19.97 – 38.07
Moderately safe	31.34% (191)	22.32 – 40.36
Somewhat safe	23.22% (141)	15.00 – 31.44
Only slightly safe	8.53% (52)	2.99 – 14.06
Not at all safe	2.63% (16)	0.00 – 5.72
Safety in Workplace Structure, Among Those at Work		
	Percent (n)	95% CI
Very safe	30.95% (47)	13.00 – 48.90
Moderately safe	31.87% (48)	13.89 – 49.85
Somewhat safe	27.48% (42)	10.39 – 44.56
Only slightly safe	0.00% (-)	-
Not at all safe	9.70% (15)	0.00 – 21.48
Family Members at Multiple Locations Affected Protective Action(s)		
	Percent (n)	95% CI
Yes	24.66% (163)	16.50 – 32.82
No	26.09% (172)	17.80 – 34.39
Do not recall	1.43% (9)	0.00 – 3.49

*Can be over 100% as family members may be at multiple locations.

The NWS uses a tornado watch to indicate that current weather conditions could produce a tornado (i.e., tornadoes are possible) and that people in the area should be prepared and aware.

On the other hand, a tornado warning is used to indicate that a tornado has been sighted or has been indicated as having occurred on radar (i.e., tornadoes are expected) and that people should take immediate action.[11] Most households reported being aware of the difference between a tornado watch and warning prior to the event (93.1%; 615 households; 95% CI: 88.3 – 97.9). Over half of households reported at least one member of the household seeing and/or hearing the tornado (67.5%; 446 households; 95% CI: 58.6 – 76.4).

Additionally, 94.6% of households received a tornado warning related to the April 26 tornado outbreak and received the warning mostly commonly through a siren (74.3%) or automated text/wireless emergency alerts (67.5%). Other common sources of the warnings were television broadcasts (53.1%) and word-of-mouth (23.1%, which includes phone, text, email, or other communication from family, friends, neighbors, employers, co-workers, etc.). Importantly, 5.5% or 36 households either did not receive the warning or do not recall receiving it. Respondents were generally confident in their ability to act to protect themselves and their household members after receiving a warning (43.9% very confident, 29.4% moderately confident). Of the actions taken after receiving the warning, most reported that they moved themselves (59.5%) and family or friends (28.9%) to the most sheltered part of the building. Only 21.9% (144 households; 95% CI: 14.1 – 29.6) reported needing to seek additional information on actions to stay safe after receiving a warning. Results related to receiving the tornado warning are provided in **Table 4**.

Table 4. Tornado Warning: Mode of Communication and Protective Actions

Received Tornado Warning	Percent (n)	95% CI
Yes	94.55% (624)	90.19 – 98.91
No	2.43% (16)	0.00 – 5.28
Do not recall	3.02% (20)	0.00 – 6.41
How Warning was Received	**Percent (n)**	**95% CI**
Siren or other alarm	74.33% (491)	66.05 – 82.61
Automated text or phone notification	67.45% (445)	58.60 – 76.30
TV	53.06% (350)	43.70 – 62.43
Word-of-mouth	23.12% (153)	15.31 – 30.92
Internet	20.10% (133)	12.75 – 27.44
Weather radio (NWS)	15.35% (101)	8.46 – 22.24

Broadcast radio	14.81% (98)	8.27 – 21.34
Social media	12.38% (82)	6.33 – 18.43
Other (e.g., security system, work notice)	2.64% (17)	0.00 – 5.51
Do not recall	1.01% (7)	0.00 – 2.99
Confidence in Protective Action after Warning		
	Percent (n)	95% CI
Very	43.92% (290)	34.60 – 53.23
Moderately	29.41% (194)	20.97 – 37.85
Somewhat	12.96% (86)	6.69 – 19.24
Only slightly	5.24% (35)	0.90 – 9.59
Not at all	1.01% (7)	0.00 – 2.99
Actions after Warning		
	Percent (n)	95% CI
Moved to the most sheltered part of the building, but did not leave the building	59.48% (393)	50.30 – 68.66
Moved family or friends to the most sheltered part of the building, but did not leave the building	28.94% (191)	20.42 – 37.46
Monitored the situation, but did not move to shelter	20.64% (136)	13.01 – 28.26
Moved to a specially constructed storm shelter in the building	9.90% (65)	4.19 – 15.61
Nothing, continued daily activities	3.44% (23)	0.00 – 6.88
Left the building and drove from the tornado warning area	2.22% (15)	0.00 – 5.04
Something else (e.g., picked up kids from school)	1.43% (9)	0.00 – 3.49
Moved to nearby location/building that provided safer shelter	1.22% (8)	0.00 – 3.24

Among responding households, 81.4% received a tornado watch and again, the most common way to receive the alert was through TV (45.8%) and automated text or phone messaging (41.6%),

with internet (26.3%) and siren (27.1%) coming in next. Of the actions taken after receiving the watch, most people reported turning on local TV news/weather (56.0%) and checking a weather app frequently (52.1%). Results related to receiving the tornado watch are provided in **Table 5**.

Table 5. Tornado Watch: Mode of Communication and Protective Actions

Received Watch	Percent (n)	95% CI
Yes	81.38% (537)	74.07 – 88.68
No	6.08% (40)	1.67 – 10.49
Do not recall	12.54% (83)	6.29 – 18.80
How Watch was Received	**Percent (n)**	**95% CI**
TV	45.76% (302)	36.42 – 55.11
Automated text or phone notification	41.57% (275)	32.40 – 50.75
Siren or other alarm	27.10% (179)	18.70 – 35.49
Internet	26.34% (174)	18.14 – 34.55
Word-of-mouth	19.63% (130)	12.16 – 27.10
Social media	17.20% (114)	10.09 – 24.31
Broadcast radio	10.95% (72)	5.18 – 16.72
Weather radio (NWS)	9.48% (63)	3.79 – 15.16
Other (e.g., organizational email)	1.01% (7)	0.00 – 2.99
Do not recall	1.22% (8)	0.00 – 3.24
Actions after Watch	**Percent (n)**	**95% CI**
Had local TV news/weather on	56.04% (370)	46.74 – 65.33
Checked weather app on phone frequently (NOAA weather radar, etc.)	52.06% (344)	42.68 – 61.43
Called friends and family nearby to warn them	25.67% (170)	17.39 – 33.95

Had local radio news/weather on	13.38% (88)	7.09 – 19.68
Nothing	8.89% (59)	3.47 – 14.32
Made sure NOAA/NWS radio was on and charged/plugged in	2.85% (19)	0.00 – 5.75
Checked emergency supplies	6.50% (43)	2.06 – 10.95
Sought information on tornado safety	1.43% (9)	0.00 – 3.49
Other (e.g., returned home)	1.43% (9)	0.00 – 3.49

Household Communications and Preferences

Most households were aware that resources were available to aid in recovery (64.2%; 424 households; 95% CI: 55.2 – 73.3). The most common form of communication related to post-tornado resources was TV (52.8%), friends/family/word of mouth (45.6%), and internet or online news (44.6%). However, 14.9% of households (99 households) either did not recall how they received the information or reported receiving no information. Households were also asked about their awareness of specific resources available in Douglas County to assist in recovery efforts, including Red Cross and other shelters (56.7%), tree limb and debris drop-off locations (46.6%), the Douglas County 2-1-1 damage reporting hotline and online form (28.5%), and landfill fee waivers (28.5%) (**Table 9**).

Table 9. Resources: Communication Source and Awareness

How Household Received Information on Available Recovery Resources	Percent (n)	95% CI
TV	52.81% (349)	43.45 – 62.17
Friends, family, word-of-mouth	45.64% (301)	36.36 – 54.93
Internet/online news	44.59% (294)	35.30 – 53.89
Social media	39.47% (261)	30.30 – 48.65
Church/place of worship	35.49% (234)	26.61 – 44.38
Radio	11.16% (74)	5.38 – 16.94
Newspaper	9.10% (60)	3.66 – 14.54
Other (e.g., mail, FEMA, signage)	6.92% (46)	2.46 – 11.39
Awareness of Recovery Resources		

	Percent (n)	95% CI
Red Cross and other shelters	56.71% (375)	47.40 – 66.03
Tree limb and debris drop-off locations	46.56% (307)	37.20 – 55.92
2-1-1 damage reporting hotline/web form	28.45% (188)	20.22 – 36.67
Landfill fee waivers	28.45% (188)	20.22 – 36.67
Reunification center	24.08% (159)	16.02 – 32.13
Tetanus vaccine clinics	23.28% (154)	15.35 – 31.21
Building permit fee waivers	22.79% (150)	15.25 – 30.32
Other (e.g., Omaha Rapid Response Team, Outreach Centers, volunteers)	3.65% (24)	0.19 – 7.11

Households were also asked about their **one main source** of information during the tornado event, along with their top **three preferred methods** of communication about emergencies (**Table 10**). The main source of information about the tornado during the event was TV (51.3%), followed by internet and online news (17.0%) and text messages and cell phone notifications (9.4%). Households were asked to identify their three preferred sources of information for receiving emergency communications. The top three responses were TV (73.5%), text message/cell phone (67.9%), and sirens (59.3%). Some households reported one or more members having conditions that could be barriers to effective communication during an emergency, including barriers to hearing (5.2%) and having a development or cognitive disability (4.9%).

Table 10. Emergency Communication Preferences and Potential Barriers

Main Source of Information About Tornado During Event	Percent (n)	95% CI
TV	51.34% (339)	41.98 – 60.69
Internet/online news	17.03% (112)	10.08 – 23.99
Text message/ cell phone	9.38% (62)	4.16 – 14.56
Friends, family, word-of-mouth	5.08% (34)	1.09 – 9.06
Social media	3.44% (23)	0.00 – 6.88
Radio	2.43% (16)	0.00 – 5.28

Other (e.g., local news app, other cell phone apps)	1.22% (8)	0.00 – 3.24
Church/place of worship	1.01% (7)	0.00 – 2.99
Preferred Sources of Information for Emergency Communications (Top 3)	Percent* (n)	95% CI
TV	73.45% (485)	65.24 – 81.65
Text message/cell phone	67.87% (448)	59.03 – 76.71
Siren	59.31% (392)	50.09 – 68.53
Internet/online news	46.73% (309)	37.36 – 56.09
Radio	18.83% (124)	11.52 – 26.14
Friends, family, word-of-mouth	15.56% (103)	8.66 – 22.46
Social media	7.93% (52)	3.09 – 12.77
Church/place of worship	0.21% (1)	0.00 – 0.61
Barriers to Effective Communication	Percent (n)	95% CI
Impaired hearing	5.24% (35)	0.90 – 9.59
Developmental/cognitive disability	4.87% (32)	0.90 – 8.84
Impaired vision	1.43% (9)	0.00 – 3.49
Difficulty understanding English	1.22% (8)	0.00 – 3.24
Other	1.01% (7)	0.00 – 2.99
Difficulty understanding written material	0.21% (1)	0.00 – 0.61

*Reported as frequencies of ‘yes’ for all responses.

Only 27.2% of households encountered local disaster response teams (180 households; 95% CI: 19.7 – 34.7), and 66.9% of households reported not encountering response teams (442 households; 95% CI: 58.8 – 75.1). Finally, 44.2% of households reported a member of the household volunteering to assist in recovery efforts (292 households; 95% CI: 34.9 – 53.5).

Household Health and Well-Being

Households were asked about damage to their homes, and 69.5% reported no or minimal damage, while only 3.7% reported that their homes were destroyed or uninhabitable (**Table 6**). At the time of survey completion, 88.8% of households were structurally safe to live in (586 households; 95% CI: 83.5 – 94.0). Roughly 8.3% of households interviewed were displaced (55 households; 95% CI: 4.5 – 12.0); among these, sheltering locations for these households included with family or friends (47.2%) or at hotel or temporary accommodations (2.9%). In total, 54.7% of households lost power and/or access to information sources during the tornado (361 households; 95% CI: 45.4 – 64.0).

Table 6. Impacts on Households

Damage to Home	Percent (n)	95% CI
None/minimal	69.52% (459)	61.77 – 77.28
Damaged but repairable	17.08% (113)	10.29 – 23.86
Significant damage but habitable	5.63% (37)	3.13 – 8.14
Destroyed/uninhabitable	3.74% (25)	1.37 – 6.11

Respondents were asked questions about the health and well-being of members of their households. Most households reported all (90.3%; 596 households; 95% CI: 84.6 – 96.0) or some (5.2%; 35 households; 95% CI: 0.9 – 9.6) members having health insurance. Some households reported that one or more members have a complex medical need (15.2%; 100 households; 95% CI: 8.5 – 21.9). Common conditions included having diabetes (7.3%; 48 households; 95% CI: 2.5 – 12.1) and use of an assistive device for mobility (5.2%; 35 households; 95% CI: 0.9 – 9.6). Other complex medical needs consisted of cardiovascular conditions, sleep apnea, and reliance on daily medication. Roughly 10.8% of these respondents (11 households; 95% CI: 0.0 – 24.1) reported that they had challenges accessing services or maintaining these needs.

Under 1% reported injuries resulting from the tornado (1 household; 95% CI: 0.0 – 0.6), and 2.3% reported injuries resulting from cleanup activities (15 households; 95% CI: 0.1 – 4.5). Among adult respondents, 65.4% (432 households; 95% CI: 56.5 – 74.4) had received a tetanus shot within the past 10 years, 18.6% (123 households; 95% CI: 11.2 – 26.1) reported not having received a tetanus shot within that timeframe; and 11.7% (78 households; 95% CI: 5.7 – 17.8) reported not knowing their vaccination status.

We also asked about the physical and mental health conditions among all members of the household (**Table 7**). The most common health conditions reported as worsening since the tornado include allergies (7.2%), previous mental health conditions (3.9%), and asthma or chronic obstructive pulmonary disease (COPD; 2.6%). The most frequently reported well-

being/behavioral factors following the tornado included trouble sleeping or nightmares (13.1%), difficulty concentrating (11.2%), and agitated behavior (8.2%).

Table 7. Health Conditions Since Tornado

Worsening Health Conditions Since Tornado	Percent (n)	95% CI
Allergies	7.18% (47)	3.05 – 11.31
Mental health condition	3.86% (25)	0.38 – 7.34
Asthma/COPD	2.64% (17)	0.00 – 5.51
Other (e.g., stress, anxiety, chronic condition flares)	2.48% (16)	0.26 – 4.70
Hypertension	1.64% (11)	0.00 – 3.73
Diabetes	1.01% (7)	0.00 – 2.99
Behavioral Health and Well-Being Conditions Since Tornado	**Percent (n)**	**95% CI**
Trouble sleeping/nightmares	13.10% (86)	7.51 – 18.69
Difficulty concentrating	11.21% (74)	5.66 – 16.75
Agitated behavior	8.19% (54)	3.65 – 12.72
Other (e.g., anxiety, memory issues)	4.45% (29)	0.51 – 8.38
Increased alcohol consumption	4.07% (27)	0.57 – 7.57
Loss of appetite	3.06% (20)	0.15 – 5.98

Child Health and Well-Being

In total, 36.3% of households had children aged 2 – 17 years (240 households; 95% CI: 27.3 – 45.2). These households were asked questions about the physical and mental health and well-being of their children. Most households reported their child(ren)'s health was about the same as prior to the tornado (86.5%; 207 households; 95% CI: 77.0 – 96.0), and reported as excellent (66.3%), very good (26.8%), good (3.5%), or fair (0.6%). We asked about any worsening conditions in children since the tornado: 47.6% reported their child(ren) feeling nervous or afraid, 16.9% reported issues with sleeping, and 16.3% reported concerns for physical safety or wellbeing (**Table 8**).

Table 8. Child Health and Well-Being

Mental Health Effects on Children, Among Those with 2-17 Year Olds in Household	Percent (n)	95% CI
Felt nervous/afraid	47.64% (114)	8.09 – 52.50
Experienced concerns for physical safety/well-being	16.89% (40)	6.21 – 27.57
Had problems sleeping	16.31% (39)	5.67 – 26.95
Other (e.g., irritability, aggression, feelings of guilt)	7.86% (19)	0.07 – 15.66
Been very sad or depressed	3.93% (9)	0.00 – 9.55
Had problems getting along with other children	3.93% (9)	0.00 – 9.55
Been unable to attend school or extracurricular activities	1.16% (3)	0.00 – 2.72

Individual Health and Well-Being

Individuals responding on behalf of their households were asked about their individual health and well-being (**Table 11**). Most individuals reported, overall, that they had not experienced any of the poor mental health outcomes during the previous weeks at the time of the survey. Feeling nervous or anxious (24.1%); feeling down, depressed, or hopeless (17.0%); and being unable to control worrying (16.4%) were the most frequent conditions reported by individuals in the previous two weeks. Overall, 32.9% of individuals reported any symptoms of anxiety (456 individuals) and 20.2% reported any symptoms of depression (281 individuals). With respect to severity of these conditions, less than 1% reported severe symptoms, 5.3% reported moderate symptoms, and 10.6% reported mild symptoms of anxiety or depression.

Table 11. Individual Health and Well-Being

Little Interest or Pleasure in Doing Things in Last 2 Weeks	Percent (n)*	95% CI
Not at all	60.93% (846)	51.29 – 70.57
Several days	11.71% (163)	5.92 – 17.50
More than half the days	2.61% (36)	0.00 – 5.65
Nearly every day	4.93% (68)	1.11 – 8.74

No response	19.82 (275)	11.30 – 28.33
Feeling Down or Depressed in Last 2 Weeks		
	Percent (n)*	95% CI
Not at all	62.68% (871)	53.14 – 72.22
Several days	17.02% (236)	9.67 – 24.37
More than half the days	2.11% (29)	0.00 – 5.10
Nearly every day	1.56% (22)	0.00 – 3.55
No response	16.63 (231)	9.01 – 24.25
Felt Nervous, Anxious, or On Edge in Last 2 Weeks		
	Percent (n)*	95% CI
Not at all	58.27% (809)	48.58 – 67.97
Several days	24.10% (335)	15.64 – 32.55
More than half the days	5.71% (79)	1.17 – 10.25
Nearly every day	1.48% (21)	0.18 – 2.77
No response	10.45 (145)	3.97 – 16.93
Unable to Stop or Control Worrying in Last 2 Weeks		
	Percent (n)*	95% CI
Not at all	63.74% (885)	54.30 – 73.17
Several days	16.36% (227)	9.62 – 23.10
More than half the days	6.24% (87)	0.90 – 11.59
Nearly every day	0.98% (14)	0.00 – 2.09
No response	12.68 (176)	5.72 – 19.65
Overall Severity of Depression or Anxiety		
	Percent (n)*	95% CI
Severe symptoms	0.70% (10)	0.03 – 1.37
Moderate symptoms	5.31% (74)	1.16 – 9.45
Mild symptoms	10.63 (148)	4.97 – 16.30

No symptoms	55.70% (774)	45.91 – 65.50
No response	27.66% (384)	18.34 – 36.97

*Reported as frequency of individuals, rather than households, for this table.

Open-Ended Responses

Households were given the opportunity to provide any additional information they wanted to share with us. Most frequently, households shared positive experiences with news broadcast warnings, and initial response from first responders, volunteers, and community members.

> "The warnings were very good, earlier forecasts in the week prior on local news stations helped prepare for the storm."
>
> "Local tv stations did a fantastic job letting us know the storm was approaching."
>
> "Thank God for all the warnings."
>
> "The clean-up and rebuilding take time, and [it] is tedious, but we're neighbors helping neighbors and we're getting it done."
>
> "What an amazing response by the community within hours of the event!"

Other comments were focused on concerns about how to access resources and frustrations surrounding insurance and Federal response.

> "Since the event it's hard to determine what we need to do to report our impact (who do we inform?), what resources we qualify for, how to access those resources, etc."
>
> "I wish they [the National Guard] had come in sooner and started keeping unnecessary bodies out of the neighborhood."
>
> "It is frustrating how insurances and FEMA and everyone makes us the victims go through loopholes, but yet, at the end of the day all the time wasted filling out forms and providing documentation and most of us if not all have not received any help from either our insurances or FEMA. Just discouraging and frustrating."

The common themes pulled from the free-text comments are shown in **Figure 2**.

Figure 2. Word Cloud of Common Terms in Open-Ended Response Question

Conclusions

Preparedness

Household-level emergency planning among Douglas County residents is generally well-developed in terms of identifying safe shelter locations, receiving warnings and alerts, and maintaining family communication in the event of a disaster. Most respondents (93.1%) reported that their household members knew the difference between a tornado watch and warning. This level of understanding is somewhat undermined by almost 1/3 of respondents stating they received the tornado watch alert via siren. Sirens are used to indicate tornado warnings for people who are outdoors – they are not activated for tornado watches. Other household preparedness areas, related to evacuation routes, securing copies of important documents, and assembling emergency supply kits, also emerged as key areas for improvement. The tornado struck around 4:00 PM, when many residents were at home. Understanding community evacuation routes is essential for reducing injuries and ensuring family reunification in such a situation where evacuation is considered safer than sheltering in place (e.g., flood warning). Additionally, 54.7% of households reported losing power or access to critical information during the event, highlighting the need for emergency supply kits equipped with alternative light and power sources, as well as weather radios, to maintain communication and safety during future disasters.

Communications

Effective communication before and after a disaster is crucial for saving lives and ensuring a swift response and recovery. During the April 26 tornado event, the most used sources for receiving warnings were sirens, automated text or phone notifications, such as Wireless Emergency Alerts (WEAs), and television sources. Only 15.4% of households reported receiving alerts from a weather radio. The NOAA Tornado Post-Event Survey has been used in other regions of the U.S. Compared to responses from other regions, residents of Douglas County were more likely to receive the tornado warning from a siren (74.3% vs. 44.9%) or TV (53.1% vs. 39.5%), and less likely to receive the warning from social media (12.4% vs. 41.0%) or a weather radio (15.4% vs. 22.4%). There were also discrepancies in the way Douglas County residents received the tornado watch compared to respondents in other states or regions of the U.S. Television was the most common option in Douglas County compared to other regions (45.8% vs. 39.4%). Social media was the most popular option in other areas compared to Douglas County (49.7% vs. 17.2%).[12]

Our findings highlight key differences in communication preferences at various stages of a tornado event and discrepancies between preferred and actual sources of information. For tornado warnings, sirens (74.3%) and automated text/phone notifications (67.5%) were the most common sources. For tornado watches, TV (45.8%) and automated text/phone notifications (41.6%) were more prevalent. This suggests that sirens play a critical role in imminent warning scenarios in Douglas County. During the tornado event, TV was the primary source of information (51.3%), while reliance on automated notifications (9.4%) and social media (3.4%) was low, indicating a shift toward real-time broadcast updates. However, when asked about preferred sources for emergency communications, respondents favored TV (73.5%) and automated

notifications (67.9%) but also indicated strong preference for sirens (59.3%) – highlighting a disconnect between preference and actual usage during different stages of the tornado.

In the recovery phase, the most frequently used sources of information were TV (52.8%), word of mouth (45.6%), and the internet (44.6%), with social media (39.5%) and churches/places of worship (35.5%) playing significant roles. This underscores the importance of alternative, community-based sources of information in recovery efforts. The findings also reinforce the necessity of multiple communication channels throughout all phases of a tornado event, as no single method is universally effective.

Households also identified barriers to receiving emergency alerts, including hearing impairments (5.2%) and developmental or cognitive disabilities (4.9%), which can make it more difficult to receive and interpret warnings. These findings emphasize the need for diverse communication strategies to ensure accessibility, as well as the promotion and increased use of weather radios to enhance emergency preparedness.

The tornado alerts issued for this event undoubtedly protected lives and prevented serious injuries. However, it is important to recognize that the tornado occurred during daylight hours when many people were commuting from school or work, increasing their situational awareness. Had this event taken place overnight, when most individuals are asleep, the outcomes could have been significantly different. Without broad access to multiple modes of communication (e.g., weather radios), the risk of injury and loss of life could have been much greater.

Health and Well-Being

Some households reported having members with complex medical needs (15.2%, 100 households), which can make evacuation challenging or impossible and may affect an individual's resiliency and ability to recover after a disaster. In Douglas County, 5.2% of households surveyed reported the use of mobility assistance technology, while 7.3% relied on insulin for diabetes management. Among these respondents, 10.8% experienced difficulties accessing or addressing these needs in the aftermath of the tornado.

Overall, the health and well-being impact on households were minimal. Only one household reported injuries directly caused by the tornado, while 2.3% reported injuries sustained during clean-up activities (15 households). The most reported pre-existing health condition that worsened after the tornado was allergies, likely due to seasonal weather changes or increased outdoor exposure during cleanup efforts. Additionally, some households noted a deterioration in pre-existing mental health conditions, potentially triggered by the stress of the disaster.

Households also reported new health concerns arising after the tornado, including trouble sleeping or nightmares, difficulty concentrating, and agitated behavior. Among the 36.3% of households with children aged 2 to 17, most rated their children’s health as excellent or very good, with no significant changes since the tornado. However, some parents noted that their children experienced feelings of nervousness or fear, sleep disturbances, or concerns about their physical safety and well-being.

At the individual level, the most frequently reported well-being impacts included feelings of nervousness or anxiety, persistent sadness or hopelessness, and difficulty controlling worry following the tornado. Among those who answered the individual health questions, 8.3% (83 households) reported moderate to severe anxiety or depression symptoms. This closely aligns with the 8.5% prevalence reported in the 2021 metro area Community Health Needs Assessment for Western Douglas County.[13] Notably, the metro area survey was conducted at the peak of the COVID-19 pandemic, a period during which anxiety and depression rates increased by up to 25%.[14] For a pre-pandemic comparison, 20.2% of respondents in this assessment reported symptoms of depression, higher than the 18.5% reported in 2019 CDC data. Similarly, 32.9% of respondents reported symptoms of anxiety, more than double the 15.6% reported in the CDC's 2019 estimates.[15] This demonstrates the potential impacts that experiencing the Arbor Day tornado had on the mental health of those in its path.

Recommendations

- Promote and distribute NOAA weather radios to ensure households receive timely emergency alerts
- Provide community emergency preparedness education, focusing on:
    - Accessing and using multiple sources of emergency information
    - Developing family emergency plans and communication strategies, including evacuation planning
    - Assembling emergency supply kits that include alternative light and power sources
- Ensure that households with individuals with communication barriers (e.g., vision or hearing impairments) have appropriate communication methods to receive and respond to emergency information effectively
- Ensure community emergency response plans address the needs of individuals with complex medical needs, including those requiring medical or mobility assistance
- Re-evaluate emergency communication strategies and methods based on reported community preferences and gaps identified during past events
- Expand access to behavioral and mental health services immediately post-event and throughout recovery to support individuals experiencing psychological distress or trauma, including services specializing in pediatric behavioral and mental health
- Provide clear, accessible, and timely communication about mid- and long-term recovery resources

Summary

On April 26, 2024, a series of tornadoes swept across the Midwest, with Douglas County, Nebraska, experiencing a destructive EF-4 tornado. In response, UNMC collaborated with DCHD to conduct a rapid needs assessment to evaluate the tornado's impact. The assessment identified high levels of tornado preparedness, with most households understanding tornado warnings and watches, though gaps in evacuation planning and emergency supply kits were noted. Communication preferences varied by stage of the event, with sirens and automated alerts being the most common sources for tornado warnings, while TV and automated notifications were preferred for general emergency communication. Barriers to emergency alert access were

reported among individuals with hearing and cognitive impairments, emphasizing the need for diverse communication strategies. Health impacts were generally low, though some residents reported worsening pre-existing conditions, post-event anxiety, and stress-related symptoms. The findings underscore the need for enhanced emergency communication strategies, improved preparedness education, expanded behavioral health support, and increased access to NOAA weather radios and alternative communication methods to ensure inclusive and effective disaster response and recovery efforts.

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Appendices

Appendix 1: Douglas County Tornado Response Survey

HOUSEHOLD-LEVEL QUESTIONS

Demographics

1. Including yourself, how many people live in your household?
2. Including yourself, how many people living in your household are:
    a. <2 years old
    b. 2-17 years old [If any in this age range, they will be prompted to answer Questions 43-46]
    c. 18-64 years old
    d. 65+ years
3. What is the main language spoken in your household? (check one)
    a. English
    b. Spanish
    c. Other, please specify:
    d. Do not know
    e. Refused
4. Which of the following best describes your current, primary residence? [If in-person survey, interviewer would identify housing type and this question would be deleted]
    a. Stand-alone (detached) permanent structure, like a house
    b. Condominium, townhouse, or duplex that is attached to another structure
    c. Apartment or dormitory room that is part of a larger residential complex
    d. Mobile home (where placed on a permanent foundation or not)
    e. Other, please specify:
    f. Do not know
    g. Refuse to answer

Preparedness

5. Does your household have any of the following emergency plans?
    a. How to contact family members if you are not together when a disaster happens? (yes, no, do not know, refused)
    b. Routes to exit your community if there is an evacuation? (yes, no, do not know, refused)
    c. Where to shelter safely if it is safer to shelter in place? (yes, no, do not know, refused)
    d. How to receive information such as emergency alerts and warnings? (yes, no, do not know, refused)
    e. How to get copies of important documents such as insurance records? (yes, no, do not know, refused)
6. Where does your household typically shelter for a tornado? [open ended]
7. If one or more members of the household were at home, where did your household shelter during the tornadoes?
    a. Basement
    b. Designated tornado shelter (private)

c. Designated tornado shelter (community/public)
d. Small interior room without windows, such as a closet, bathroom/tub, laundry room, stairwell
e. Other (please describe)

8. Did you feel that sheltering would protect you and members of your household from physical injury?
   a. Yes
   b. No
   c. Do not know
   d. Refused

9. An emergency supply kit or go-kit has items stored together in containers that can be easily accessed in an emergency. Did your household have an emergency supply kit prior to the tornado?
   a. Yes
   b. No [if no, skip Questions 10-12, go to Question 13]
   c. Do not know
   d. Refused

10. [If yes to Question 9] Did your household use emergency supplies from the emergency supply kit?
    a. Yes
    b. No
    c. Not applicable – did not have an emergency supply kit [not needed with electronic survey]
    d. Do not know
    e. Refused

11. [If yes to Question 10] Did your household use any of the following?
    a. Food
    b. Water
    c. Batteries
    d. Medical Supplies
    e. Other, please specify
    f. Did not use any emergency supply kit supplies [not needed with electronic survey]
    g. Not applicable – did not have an emergency supply kit [not needed with electronic survey]

12. Did your household need emergency supplies that were not included in your emergency supply kit?
    a. Yes
    b. No
    c. Do not know
    d. Not applicable – did not have an emergency supply kit [not needed with electronic survey]
    e. Refused

13. What supplies were needed that your household did not have? Please specify: [NOTE: ask all participants]

NOAA Tornado Post-Event Survey

14. Where were you and members of your household when the tornado touched down? (check all that apply)

a. At home
b. At work (go to Question 16)
c. At school
d. At a business (such as a store or restaurant) [go to Question 17]
e. In a vehicle (such as a car, truck, or bus)
f. Somewhere else (please specify) [VERBATIM]
g. I don't recall

15. (If at home [15A] or school [15B] from Question 14) How safe did you and members of your household feel in this structure when the incident occurred?
    a. Not at all safe
    b. Only slightly safe
    c. Somewhat safe
    d. Moderately safe
    e. Very safe

16. (If at work from Question 14) Which of the following categories best describes your household's work setting? (check all that apply)
    a. Single-story building
    b. Multi-story building
    c. Big box store, e.g., Lowes, Home Depot, Walmart
    d. Shopping mall
    e. Industrial or construction setting
    f. Other type (please specify) [VERBATIM]
    g. N/A – no members of household at work when the tornado touched down [not needed with electronic survey]

    A.) How safe did you and members of your household feel in this structure when the incident occurred?
        a. Not at all safe
        b. Only slightly safe
        c. Somewhat safe
        d. Moderately safe
        e. Very safe

17. (If at a business from Question 14) If you or any members of your HH were at a business, which of the following categories best describes the business? (check all that apply)
    a. Single-story building
    b. Multi-story building
    c. Big box store, e.g., Lowes, Home Depot, Walmart
    d. Shopping mall
    e. Other type (please specify) [VERBATIM]
    f. N/A – no members of household at a business when the tornado touched down [not needed with electronic survey]

    A.) How safe did you and members of your household feel in this structure when the incident occurred?
        a. Not at all safe
        b. Only slightly safe
        c. Somewhat safe
        d. Moderately safe
        e. Very safe

18. If your household was at various locations, did this factor into how members of your household did or did not take protective action?
    a. Yes
    b. No
    c. Do not recall
19. Did anyone in your household see and/or hear the tornado?
    a. Yes
    b. No
    c. Do not recall
20. Were individuals in your household aware of the difference between a tornado watch and warning before the incident?
    a. Yes
    b. No
    c. Do not recall
21. A Tornado Warning is issued by the National Weather Service when a tornado is imminent. Did you or any member of your household receive a tornado warning for your area?
    a. Yes
    b. No
    c. Do not recall
22. How did you and members of your household learn about the tornado warning? Please select all that apply.
    a. Broadcast radio
    b. Weather radio (National Weather Service radio)
    c. Television
    d. Siren or other alarm
    e. Internet
    f. Social media (e.g., Twitter, Facebook
    g. Word-of-mouth (including telephone or text messages, email, etc.) from family, friends
    h. Neighbors, employers, co-workers, etc.
    i. Automated text or phone notification
    j. Other source (please specify) [VERBATIM]
    k. Do not recall
    l. No warning received
23. When your household received the tornado warning, how confident were you and the members of your household that you could take action to protect yourselves?
    a. Not at all confident
    b. Only slightly confident
    c. Somewhat confident
    d. Moderately confident
    e. Very confident
    f. Don’t recall
    g. No warning received
24. When your household received the tornado warning, did you or the members of your household need to seek additional information on actions you could take to stay safe?
    a. Yes
    b. No
    c. Unsure

25. What did your household do when you got the tornado warning? Please select all that apply.
    a. Nothing; continued my daily activities
    b. Monitored the situation, but did not move to shelter
    c. Moved to the most sheltered part of the building, but did not leave the building
    d. Moved family or friends to the most sheltered part of the building, but did not leave the building
    e. Moved to a specially constructed storm shelter in the building
    f. Moved to a nearby location or building that provided safer shelter
    g. Left the building and drove away from the tornado warning area
    h. Something else (please specify) [VERBATIM]
    i. Don't recall

26. A Tornado Watch is issued by the National Weather Service when tornadoes are possible in and near the watch area. Did you or any member of your household receive a tornado watch for your area?
    a. Yes
    b. No
    c. Do not recall

27. How did your household learn about the tornado watch? Please select all that apply.
    a. Broadcast radio
    b. Weather radio (National Weather Service radio)
    c. Television
    d. Siren or other alarm
    e. Internet
    f. Social media such as Twitter or Facebook
    g. Word-of-mouth (including telephone or text messages, email, etc.) from family, friends
    h. Neighbors, employers, co-workers, etc.
    i. Automated text or phone notification
    j. Other source (please specify) [VERBATIM]
    k. Do not recall
    l. Did not receive tornado watch

28. What did your household do when you got the tornado watch? Please select all that apply.
    a. Checked emergency supplies
    b. Bought emergency supplies
    c. Made sure NOAA/NWS radio was on and charged/plugged in
    d. Had local TV news/weather on
    e. Had local radio news/weather on
    f. Checked weather app on phone frequently (NOAA weather radar, etc.)
    g. Called friends and family nearby to warn them
    h. Sought information on tornado safety
    i. Something else (please specify) [VERBATIM]
    j. Nothing
    k. Do not recall
    l. Did not receive tornado watch

29. Did your household lose access to power and/or information sources during the incident?
    a. Yes
    b. No
    c. Do not recall

30. Did your location and available resources make it easier or harder to protect yourself and members of your household?
    a. Easier
    b. Harder
    c. Neither easier or harder
    d. Do not recall

Physical and Mental Health and Wellbeing

31. How would you describe the damage to your home?
    a. None / minimal
    b. Damaged but repairable
    c. Significant damage but habitable
    d. Destroyed / uninhabitable
    e. Do not know
    f. Refused

32. Does your household feel that your home is structurally safe to live in presently?
    a. Yes
    b. No
    c. Do not know
    d. Refused

33. Was your household displaced from your primary residence?
    a. Yes (continue to Question 34)
    b. No
    c. Do not know
    d. Refused

34. (If yes to Question 33) Where is your household currently sheltering?
    a. Community shelter, including churches, Red Cross, etc.
    b. With family or friends
    c. Hotel or temporary accommodations
    d. Secondary residence
    e. Currently unsheltered
    f. Other, please specify:
    g. Do not know
    h. Refused

35. Does everyone in your household currently have health insurance?
    a. Yes – all
    b. Yes – some
    c. No
    d. Do not know
    e. Refused

36. Does anyone in your household have complex medical needs? (check all that apply) [note to interviewer: let the participant self-identify complex medical needs]
    a. Reliance on oxygen or ventilation
    b. Dialysis
    c. Use of assistive technology for mobility, including wheelchairs, power chairs, walkers
    d. Insulin / diabetes
    e. Other, please specify:

37. (If any selected in Question 36) Have you or anyone in your household experienced interruptions or increased difficulty in accessing or maintaining these needs?
    a. Yes
    b. No
    c. Not applicable – no complex medical needs
    d. Do not know
    e. Refused
38. Were you or anyone in your household injured as a result of the tornado?
    a. Yes
    b. No
    c. Do not know
    d. Refused
39. Were you or anyone in your household injured during cleanup activities so far?
    a. Yes
    b. No
    c. Do not know
    d. Refused
40. Have all adults in your household had a tetanus shot (e.g., DTap/Tdap/Td) in the past 10 years?
    a. Yes
    b. No
    c. Do not know
    d. Refused
41. Since the tornado, have you or any members of your household experienced worsening of any of the following conditions? (check all that apply)
    a. Asthma/COPD
    b. Allergies
    c. Diabetes
    d. Hypertension
    e. Previous mental health condition
    f. Other, please specify
42. Since the tornado, has anyone in your household had any of the following?
    a. Difficulty concentrating
    b. Trouble sleeping / nightmares
    c. Loss of appetite
    d. Agitated behavior
    e. Witnessed firsthand violent behavior/threats
    f. Increased alcohol consumption
    g. Increased drug use
    h. Other, please specify

Pediatric Mental Health (only if children aged 2-17 in household)

43. In general, how would you describe the health of children in the household?
    a. Excellent
    b. Very good
    c. Good
    d. Fair
    e. Poor

f. Other, please specify
g. Do not know
h. Refused to answer

44. Compared with before the tornado, would you say the health of children in the household is better, worse, or about the same?
    a. Better
    b. Worse
    c. About the same
    d. Other, please specify
    e. Do not know
    f. Refused to answer

45. Since the tornado, have children in the household experienced any of the following issues?
    a. Been very sad or depressed (yes, no, do not know, refused)
    b. Felt nervous or afraid (yes, no, do not know, refused)
    c. Had problems sleeping (yes, no, do not know, refused)
    d. Had problems getting along with other children (yes, no, do not know, refused)
    e. Experienced concerns for physical safety or wellbeing (yes, no, do not know, refused)
    f. Been unable to attend school or extracurricular activities (yes, no, do not know, refused)
    g. Had any other behavioral or emotional problems, please specify:

46. Is there a healthcare professional you could turn to if any children in your household had physical or mental health problems that may be related to the tornado?
    a. Yes
    b. No
    c. Do not know
    d. Refused

Communications

47. Does your household know about resources to aid in recovery in your area?
    a. Yes
    b. No
    c. Do not know
    d. Refused

48. How has your household received information on resources available to aid in recovery in your area? (Check all that apply)
    a. Newspaper
    b. Internet/online news
    c. Social media (e.g., Twitter, Facebook)
    d. TV
    e. Radio
    f. Friends/family/word of mouth
    g. Church/place of worship
    h. Other, please specify:
    i. None
    j. Do not know
    k. Refused

49. Is your household aware of the following resources that were made available in Douglas County to assist in recovery efforts?
    a. 2-1-1 damage reporting hotline/web form (yes, no, do not know, refused)
    b. Red Cross and other shelters (yes, no, do not know, refused)
    c. Reunification center (yes, no, do not know, refused)
    d. Tetanus vaccine clinics (yes, no, do not know, refused)
    e. Tree limb and debris drop-off locations (yes, no, do not know, refused)
    f. Landfill fee waivers (yes, no, do not know, refused)
    g. Building permit fee waivers (yes, no, do not know, refused)
    h. Other, please specify:
50. What was your household's ***main*** source of information about the tornado during the event? (Check ONE)
    a. TV
    b. Radio
    c. Internet/online news
    d. Social media (e.g., Twitter, Facebook)
    e. Friends/family/word of mouth
    f. Text message/cell phone alert
    g. Church/place of worship
    h. Other, please specify:
    i. None
    j. Do not know
    k. Refused
51. What is your household's three (3) preferred source of information for receiving emergency communications? (select 3 only)
    a. TV
    b. Radio
    c. Internet/online news
    d. Social media (e.g., Twitter, Facebook)
    e. Friends/family/word of mouth
    f. Text message/cell phone alert
    g. Church/place of worship
    h. Other, please specify:
    i. None
    j. Do not know
    k. Refused
52. Does anyone in your household have any of the following conditions that could be barriers to effective communication during an emergency? (Check all that apply)
    a. Impaired hearing
    b. Impaired vision
    c. Developmental/cognitive disability
    d. Difficulty understanding English
    e. Difficulty understanding written material
    f. Other, please specify:
    g. None
    h. Do not know
    i. Refused
53. Did your household encounter any local disaster response teams?
    a. Yes (go to Question 54)

b. No
c. Do not know
d. Refused

54. (If yes to Question 53) How many days after the tornado did your household encounter the local disaster response team?
    a. 0 days
    b. 1-2 days
    c. 3-4 days
    d. 5-7 days
    e. 8+ days
    f. Other, please specify:
    g. Do not know
    h. Refused

55. Did you or anyone in your household volunteer to assist in recovery efforts?
    a. Yes
    b. No
    c. Do not know
    d. Refused

INDIVIDUAL-LEVEL

Mental health and wellbeing

56. Over the last two (2) weeks, how often have you had little interest or pleasure in doing things?
    a. Not at all
    b. Several days
    c. More than half the days
    d. Nearly every day
    e. Do not know
    f. Refused

57. Over the last two (2) weeks, how often have you felt down, depressed, or hopeless?
    a. Not at all
    b. Several days
    c. More than half the days
    d. Nearly every day
    e. Do not know
    f. Refused

58. Over the last two (2) weeks how often have you felt nervous, anxious, or on edge?
    a. Not at all
    b. Several days
    c. More than half the days
    d. Nearly every day
    e. Do not know
    f. Refused

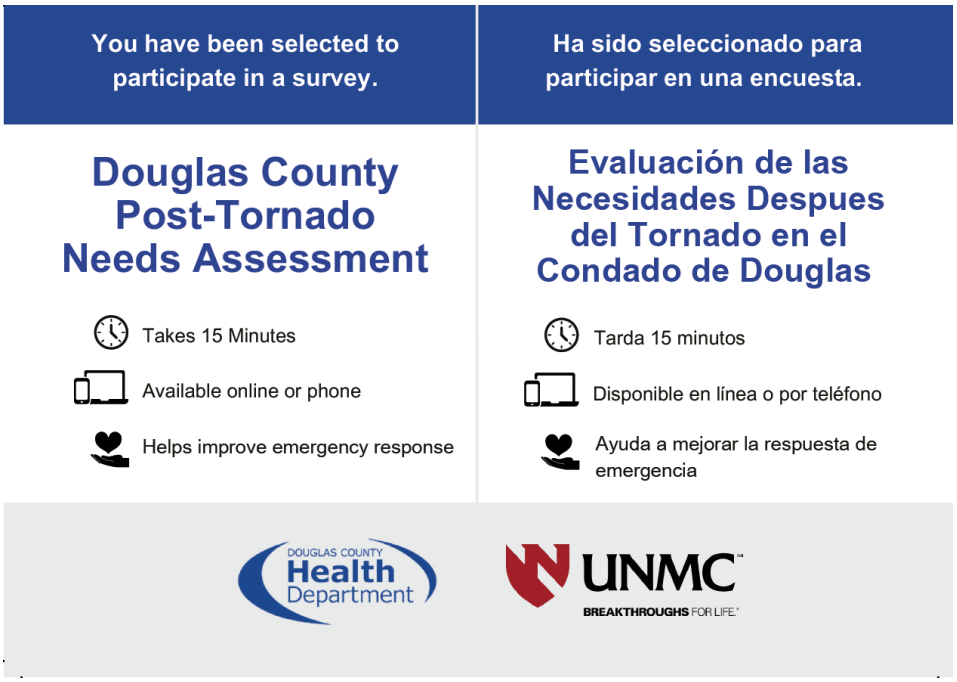
59. Over the last two (2) weeks, how often have you been unable to stop or control worrying?
    a. Not at all
    b. Several days
    c. More than half the days
    d. Nearly every day
    e. Do not know
    f. Refused

CLOSING QUESTION

60. What other information would your household like us to know about this event? This can be anything you want to share about your experience with this tornado. [VERBATIM]

Appendix 2: Postcard Invitation to Participate in Assessment

A. Front



B. Back