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Rural Natural Disaster Stress: A Survey of Community Resource Use and Effect

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ABSTRACT

Objective: This study identified rural community experiences and preferences related to available resources and their effects on stress following tornadoes and floods.

Methods: The Rural Natural Disaster Stress and Recovery survey was distributed from December 2021 to February 2022 in rural disaster-affected communities. Within the analysis sample (N = 159) of self-selected participants representing both agricultural and non-agricultural occupations, 125 responded to the Resource Use and Effect survey component that evaluated the effects of 22 resources on post-disaster stress. Additional qualitative questions provided further data.

Results: The most frequently used resources post-disaster were found to be talking about the event (98.3%), friends and neighbors (97.6%) and family (97.6%). Using a derived Impact per Use score, groups from the neighboring community and personal faith activities most often reduced stress. Resources that increased stress were identified as FEMA or other government organizations; repairing, replacing, or rebuilding property; and following news or social media. Participants reported help from their community (35.8%) or things they did for themselves (31.2%) most effectively decreased disaster stress. Family, friends, faith, neighbors, and community were top choices to decrease stress in a future disaster.

Conclusion: Rural residents identified available resources for reducing disaster stress, but some common post-disaster activities were found to increase stress. Rural emergency management should adapt response and recovery plans and activities to leverage readily accessible people, groups, and activities to mitigate negative mental and emotional health effects.

KEYWORDS
Disasters; recovery; resources; rural; stress

Introduction

From 2020 to 2022, the United States sustained 60 natural disasters that individually exceeded a billion dollars in damages, with an aggregated estimated cost of 434.6 billion dollars and 1,460 lives lost.[1] Natural disaster survivors may experience a range of mental and emotional health challenges including posttraumatic stress symptoms, depression, and substance use.[2,3] With 97% of U.S. land area and 19.3% of the population outside urban areas,[4] it is important to identify available community resources for enhancing emotional recovery in rural areas where accessible and effective mental health services may be limited.[5]

Acute-onset disasters, also called rapid-onset or sudden-onset, begin suddenly due to an unexpected hazardous event such as a tornado, flood, earthquake, or fire. Slow-onset, or gradual-onset, disasters such as drought develop over a longer period of time and may not have a clear starting point.[6,7] There is limited published research in U.S. rural populations related to mental health and stress following acute-onset natural disasters and even less research involving agricultural producers. Findings from international populations or slow-onset disasters may not generalize to rural agricultural or non-agricultural U.S. residents following an acute disaster.

A primary report from the Rural and Agricultural Natural Disaster Stress and Recovery (RNDSR) study, conducted by these authors, showed agricultural residents did not experience a significantly different pattern of post-disaster stress and recovery compared to their non-agricultural, rural counterparts after an acute-onset natural disaster.[3] Residents did, however, commonly experience disaster-related posttraumatic stress symptoms up to 8 years after the

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event, and women in agriculture were identified as a subgroup who may benefit from additional support post-disaster.[3]

Other studies have used small-sample surveys, observational assessments, and interviews with rural residents to identify community factors supporting resilience following exposure to flood, tornado, and hurricane.[8–11] In the post-disaster setting, hardships caused by the disaster, pre-existing health conditions, and greater losses of property or basic services have been identified as risk factors contributing to negative outcomes such as posttraumatic stress symptoms and inability to recover.[8,11] Resources such as faith, cultural values, social support, and communal coping have been protective or supportive for resilience and growth.[8,9,11] One study found community support after disaster had a greater benefit to mental health in nonurban settings compared to urban, recommending a joint effort between residents and responding agencies to improve mental health recovery in nonurban communities.[11] For example, clergy were identified as an important rural community resource for support and potentially for training to recognize stress symptoms and refer for care.[10,12]

Evidence-based public health practice requires integration of science-based interventions and knowledge of community preferences.[13] Understanding community experiences and preferences is valuable for developing evidence-based disaster preparedness, response, and recovery plans that incorporate mental and emotional health support. In addition, systems thinking provides a framework for leveraging lay or non-traditional resources alongside professional services, a useful option for rural communities with limited access to trusted mental or behavioral health professionals.[14,15]

In addition to comparing disaster stress and recovery experiences between agricultural and non-agricultural residents,[3] a second primary objective of the RNDSR study aimed to identify available resources that have been most effective and preferred for disaster-related stress reduction from the rural community perspective, specifically including both occupational groups. For this report, the authors questioned whether 1) rural communities have local resources available to effectively decrease disaster-related stress, and 2) rural residents prefer community resources over those from outside the community. Findings may inform disaster preparedness, response, and recovery approaches in rural and agricultural settings to improve the mental and emotional health of disaster-affected populations.

Methods

The RNDSR study[3] was conducted from December 2021 to February 2022 among disaster-affected rural residents who voluntarily self-selected and submitted responses through self-report on a survey tool online or on paper. Rural was defined as an area with population less than 10,000, as proposed by the U.S. Census Bureau in 2021.[16] Survey distribution was targeted to communities in Arkansas and Nebraska that experienced devastating damage from EF-4 tornadoes in 2014 and/or historic levels of river flooding in 2019,[1,3,17,18] where the authors had relationships with community partners to facilitate local participation.

A sample size of 128 was estimated for 80% power to detect a medium effect size ($d = 0.5$) in the occupational group comparison,[3] allowing for 20% incomplete surveys. As no statistical hypothesis test was planned for the resource analysis addressed in this report, no additional sample size calculation was performed.

The RNDSR survey, previously published in full as supplemental material,[3] includes a novel qualitative Resource Use and Effect (RUE) inventory (Figure 1) along with the Brief Resilience Scale (BRS),[19] Revised Impact of Event Scale (IES),[20] Posttraumatic Growth Inventory – Short (PTGI-SF),[21] and demographic, exposure, and open field questions.[3] To maintain a participant-centered approach allowing participants to provide as much or as little information as they desired according to their preferences, no survey questions required completion. The RUE did not require any specific number of items to be completed as there was no individual participant combined score for the inventory.

The RUE, the focus of this report, yields quantitative item values assigned to four categorical qualitative responses to describe how 22 resources including people, groups, and activities affected

Section X. Please tell us how people and activities affected your stress from the EVENT.

Please tell us **how people or groups affected stress you felt from the EVENT**. If the person or group was not part of your recovery experience, please mark NA.

	Decreased stress	No effect on stress	Increased stress	NA
A. Family				
B. Friends and neighbors				
C. Employer, school, or faith community (leader or group)				
D. Other local leader or group (business, city council, civic club, clean-up volunteers, etc.)				
E. Counselor or therapist				
F. Other health professional				
G. Person who had been through the same or similar thing				
H. Insurance representative(s)				
I. FEMA, Farm Service Agency, or other government group				
J. Group from neighboring community				
K. Outside relief group (Red Cross, Farm Rescue, etc.)				
L. First responders (police, fire, ambulance)				

Please tell us **how activities affected stress you felt from the EVENT**. If you did not participate in the activity, please mark NA.

	Decreased stress	No effect on stress	Increased stress	NA
A. Repairing, replacing, or rebuilding my own property				
B. Personal faith activities such as prayer, meditation, or readings				
C. Following news or social media about the event				
D. Finding stress or recovery information on websites				
E. Talking about the event				
F. Working at my occupation				
G. Helping others in my community				
H. Community function (fundraiser, commemoration, school activity, etc.)				
I. Visiting local disaster relief center				
J. Attending emergency response town hall meeting				

Figure 1. Resource use and effect (RUE) inventory from the rural natural disaster stress and recovery (RNDSR) survey.

respondents' disaster stress after the event: decreased stress (item value −1), no effect (0), increased stress (+1), or NA (value 8), where participants were instructed to select NA if the person, group, or activity was not part of their experience. Participants were asked only to report the direction of the effect and did not record a magnitude of effect. Participants who rated a resource by selecting one of the first three categories – increased stress, no effect, or decreased stress – were considered to have used the corresponding resource and were included in both the user count and the item respondents for that resource. Participants who responded NA to an item were considered non-users, and their responses were included in the item respondent

count but not the user count or the aggregate effect sum described as follows.

Four summary statistics were derived for each item in the RUE inventory to describe both individual and community level impacts:

(1) The Use Percentage was calculated as user count (i.e., number of participants who rated the resource) divided by the total number of respondents for the item. A relatively higher Use Percentage suggests greater accessibility across the community.

$$Use\,\% = \frac{User\ Count}{Item\ Respondents} \times 100 \quad (1)$$

(2) The aggregate Effect Sum was calculated by adding item scores across all users. The sum represents the difference between the number of people who felt the item decreased their stress and those who felt the item increased their stress, i.e., the community net effect. Those who reported no effect were represented indirectly because the value of the sum was limited by the number who reported an effect. A positive Effect Sum indicates greater frequency of reported increased stress, and a negative Effect Sum indicates greater frequency of reported decreased stress.

$$Effect\ Sum = \sum(User\ Item\ Scores) \quad (2)$$

(3) The Impact per Use (IPU) score is the average effect per user calculated as the aggregate effect sum divided by use count for each resource. Mathematically, IPU is the difference between proportions of users reporting an associated decrease in stress and users reporting an increase, limited by the proportion of users reporting no effect. An IPU = −1 would indicate all users reported decreased stress, and IPU = 1 would indicate all users reported increased stress. For interpretation, an IPU closer to −1 suggests more frequently experienced individual stress reduction and is therefore a more favorable score.

$$Impact\ per\ Use = \frac{Effect\ Sum}{User\ Count} \quad (3)$$

(4) The Community Impact (CI) score includes non-users by dividing the aggregate effect sum by total respondents for that item regardless of use status, thus accounting for both the frequency of use and the aggregate stress effect. Similar to the IPU mathematically, it is the difference between proportions of respondents reporting decreased stress and respondents reporting increased stress, but now limited by the combined proportion of respondents reporting no effect or non-use. As with the IPU, a CI closer to −1 is preferred, in this case indicating both frequent use and frequent stress reduction. A resource frequently effective for users but infrequently used would have a lower absolute CI relative to IPU.

$$Community\ Impact = \frac{Effect\ Sum}{Item\ Respondents} \quad (4)$$

Following the RUE, a separate categorical question in the RNDSR survey[3] addressed perceived most effective type of help for reducing stress following an acute natural disaster. Participants answered the question, "What kind of help was most effective for reducing your stress?" (hereafter Most Effective Help). They selected from five options: *Things I did for myself*, *Help from my community*, *Help from outside my community*, *No difference*, and *None of these helped decrease my stress*. The online survey allowed a single choice. On the paper version, some participants selected more than one option. For these participants, the question was left blank when entered in the electronic data capture platform, but their responses were recorded in a separate data set by participant identifier so that no information was lost.

In addition, qualitative open field responses provided information about community preferences. Participants were asked, "If you experienced another natural disaster in the future, what people, groups, or activities would you turn to first in order to decrease your stress? List up to 3" (hereafter First Choices). Because of the brevity and specific nature of the responses, a single rater conducted the qualitative analysis based on a framework of internal community resources versus resources external to the

community, understanding that participants could take cues from the RUE and subsequent questions. A grounded aspect was used to determine themes or patterns. Other open field responses about resilience, the disaster event, stress, recovery, and resources were reviewed to provide context but are not reported here.

Data management

Study data were collected and managed using the REDCap electronic data capture tools hosted at the University of Nebraska Medical Center (UNMC). Service and support were provided by the Research Information Technology Office (RITO), which is funded by the Vice Chancellor for Research. Data analysis was performed in SAS Studio 3.8 (Cary, North Carolina) and Excel (Microsoft 365).

Human subjects and informed consent

The UNMC Office of Regulatory Affairs approved the Rural Disaster Stress and Recovery Study as exempt research under IRB #729–21-EX. While human subjects were involved in the survey study, no identifying protected health information was collected.

Both the online and paper versions of the RNDSR survey included an introductory statement informing participants of the purpose of the survey, the voluntary nature of their response, their ability to skip any question, and possible risk and benefits of participation. They were informed that their names would not be recorded and that taking the survey implied agreement that answers may be used for research. Contact information for the principal investigator and UNMC Office of Regulatory Affairs were provided.

Results

Study population

The full analysis data set for the RNDSR study included 159 participants.[3] Of these, 125 voluntarily responded to at least one RUE inventory item.[3] Table 1 provides a demographic and disaster event summary of the 125 RUE respondents.

Resource use and effect inventory

Analysis of responses to the RUE inventory of the most frequently used resources based on Use Percentage, most effective for individuals based on Impact per Use (IPU), and most effective for community based on Community Impact (CI) are shown in Table 2. As shown, Talking about the event (117 users/119 respondents = 98.3%), Friends and neighbors (122/125 = 97.6%), and Family (120/123 = 97.6%) were accessed most often. The five resources used least often were Counselor or therapist (35 users/123 respondents = 28.5%), Other health professional (44/124 = 35.5%), Finding stress or recovery information on websites (59/119 = 49.6%), Attending emergency response town hall meeting (60/118 = 50.9%), and Visiting local disaster relief center (72/117 = 61.5%).

From aggregate Effect Sum analysis, the top five relative stress decreasing resources were Group from neighboring community (Effect Sum −70, 104 users), Personal faith activities such as prayer, meditation, or readings (−66, 101), Helping others in my community (−59, 100), Other local leader or group (business, city council, civic club, clean-up volunteers, etc.) (−52, 108), and Outside relief group (Red Cross, Farm Rescue, etc.) (−49, 98). The Impact per Use (IPU) and Community Impact (CI) scores, shown in Table 2, produced similar rankings to the Effect Sum but also brought Community function (fundraiser, commemoration, school activity, etc.) into the top five through the IPU. This was a resource used less often but with a high ratio of decreasing to increasing stress for individual users.

Five resources showed aggregate stress neutrality (values = 0) or stress increase (values >0) in all three effect scores due to Effect Sums ≥ 0: Insurance representative(s) (Effect Sum 0, IPU 0.00, CI 0.00), Finding stress or recovery information on websites (15, 0.25, 0.13), FEMA, Farm Service Agency, or other government group (30, 0.33, 0.24), Repairing, replacing, or rebuilding my own property (50, 0.56, 0.42), and Following news or social media about the event (57, 0.50, 0.48).

Figure 2 shows the relative use and effect of all 22 variables listed on the RUE. Complete use and effect scores and ranks are available in Appendix A. Due to the qualitative nature of the inventory,

Table 1. Demographic and disaster event characteristics of resource use and effect analysis population ($N = 125$).

Demographic/Group	Number	Percent
Age		
19-20	4	3.2
21-25	4	3.2
26-35	14	11.2
36-45	24	19.2
46-55	17	13.6
56-65	29	23.2
Over 65	33	26.4
Sex		
Female	93	74.4
Male	32	25.6
Race or Ethnicity		
White	114	91.2
Other	5	4.0
Unreported	6	4.8
Residence		
Not in town	48	38.4
Town <10,000	73	58.4
Urban[a]	4	3.2
Occupation		
Not in agriculture	96	76.8
Agriculture	25	20.0
Unreported	4	3.2
Dependents in home		
Yes	48	38.4
No	75	60.0
Unreported	2	1.6
Disaster Type[b]		
Tornado	73	58.4
Flood	48	38.4
Other acute event	3	2.4
Unreported	1	0.8
Disaster State		
Arkansas	63	50.4
Nebraska	57	45.6
Other state	1	0.8
Unreported	4	3.2
Disaster Year		
2014	71	56.8
2019	48	38.4
Other year	5	4.0
Unreported	1	0.8

[a]Four participants identified urban residence but were determined to be closely tied to rural locations through open field responses and targeted survey distribution.

[b]Fourteen participants (11.2%) reported being affected by more than one natural disaster; they were asked to select the event that affected them most and complete the survey with that event in mind. Only one event per participant was included in event data.

the authors recommend interpreting rankings by tertile groups rather than by strict score order – high (ranks 1–7), medium (8–15), and low (16–22) use or effectiveness.

Most effective help

Participants ($N = 109$) answered the Most Effective Help question with a single answer as allowed by the online version of the survey. Overall results shown in Figure 3 were stratified by agricultural and non-agricultural subgroups. The agricultural subgroup selected Help from my community most often (9/19, 47%), followed by Things I did for myself (5/19, 26%), while the non-agricultural subgroup chose Things I did for myself (28/86, 33%) and Help from my community (27/86, 31%) almost evenly; 5% (1/19) in agriculture and 9% (8/86) not in agriculture indicated None of these helped decrease my stress.

First choices

There were 71 participants (occupational subgroups: 16 (22.5%) agriculture, 55 (77.5%) non-agriculture) who provided a cumulative total of 152 qualitative responses to the First Choices open field question. Family was the most frequently cited category overall (32/152, 21%) and by the non-agricultural subgroup (27/117, 23%) for decreasing stress in a future disaster. The agricultural subgroup most frequently indicated neighbors (7/35, 20%) as a first choice. Table 3 provides the six most often identified First Choices categories by subgroup and overall.

Non-agricultural respondents mentioned employer/workplace/co-workers 6 times, referring to the people at work, not the activity of working. Agricultural respondents did not mention occupation-related people or activities.

Besides categories of assistance for decreasing stress, other qualitative themes were noted. Participants mentioned primarily people and groups while only four responses referenced activities: two planning ahead, one volunteering, and one caring for others. Throughout all responses, the word "my" was used 13 times (9%), including the only two references to healthcare professionals phrased as "my doctor" and "my therapist." Some individuals included traits to describe people they would turn to, such as "organized," "disciplined," "conservative," and "people who had experience with it."

Discussion

Effect of resources

The authors questioned whether rural communities have local resources available to

Table 2. Top five People, group and activity resources for perceived disaster stress reduction by use percentage, impact per use, and community impact.

Rank	Use Percentage	Impact per Use (IPU)	Community Impact (CI)
1	Talking about the event (98.3%)	Group from neighboring community (−0.67)	Group from neighboring community (−0.57)
2	Friends and neighbors (97.6%)	Personal faith activities such as prayer, meditation, or readings (−0.65)	Personal faith activities such as prayer, meditation, or readings (−0.56)
3	Family (97.6%)	Helping others in my community (−0.59)	Helping others in my community (−0.50)
4	Following news or social media about the event (95.0%)	Community function (fundraiser, commemoration, school activity, etc.) (−0.53)	Other local leader or group (business, city council, civic club, clean-up volunteers, etc.) (−0.42)
5	Employer, school, or faith community (leader or group) (93.5%)	Outside relief group (Red Cross, Farm Rescue, etc.) (−0.50)	Outside relief group (Red Cross, Farm Rescue, etc.) (−0.40)

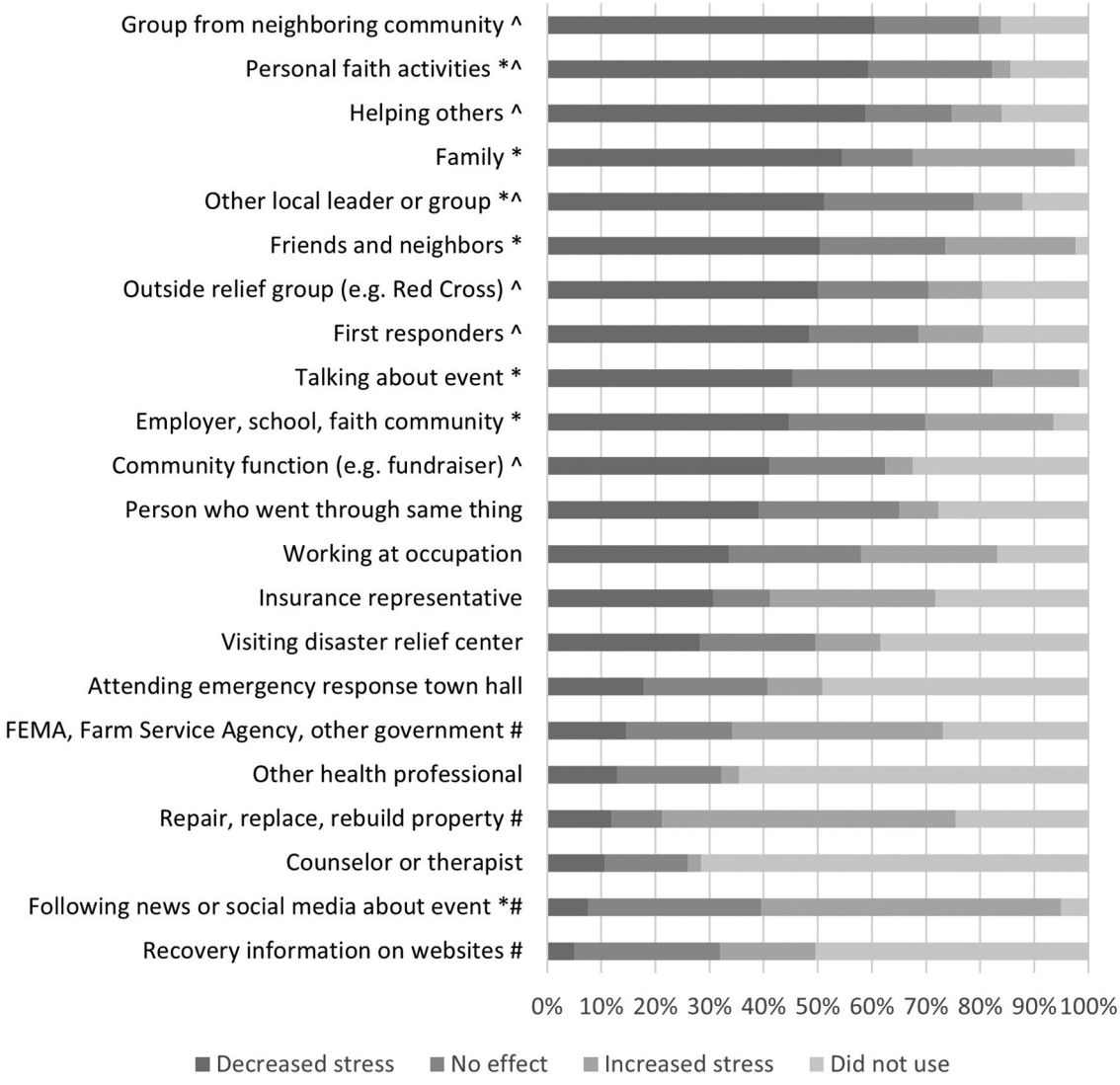

Figure 2. Relative frequency of use and stress effect for 22 rural community resources after acute-onset natural disaster. *Top tertile by use percentage suggest accessibility; ^Top tertile by IPU suggests effectiveness; #Increased stress on IPU

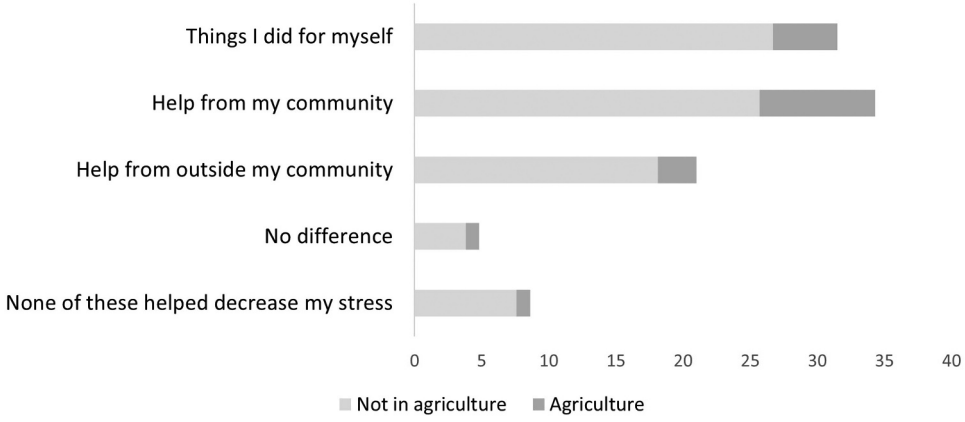

Figure 3. Perceived most effective help for decreasing disaster stress by occupational group.

Table 3. Qualitative first choices to reduce stress after a future disaster by resource category and occupational group, based on open field responses.

	Primary Occupation		
Category	Agriculture $N_{Ag} = 35$	Not in Agriculture $N_{non\text{-}Ag} = 117$	Overall $N = 152$[a]
Family, count (%)	5 (14)	27 (23)	32 (21)
Friends	4 (11)	17 (15)	21 (14)
God/church	5 (14)	14 (12)	19 (13)
Outside relief groups	3 (9)	12 (10)	15 (10)
Neighbors	7 (20)	5 (4)	12 (8)
Community	2 (6)	10 (9)	12 (8)
Other	9 (26)	32 (27)	41 (27)

[a]Participants were asked to list up to 3 choices. Seventy-one participants provided a cumulative total of 152 responses.

effectively decrease disaster-related stress. The RUE inventory results demonstrate communities provided support that individuals perceived to decrease stress through a range of people, groups (organizations), and activities. Many of these resources were widely accessible, and for several, a majority of respondents reported an associated effect of decreased stress (Figure 2). We recognize that in this context, "effectively" referred to respondents' perceptions of what resources were helpful for decreasing stress, and their responses on the RUE were not analyzed for association with quantitative stress recovery measures. This approach is consistent with the goals of qualitative research to identify trends and patterns rather than absolute scores.

On the separate Most Effective Help question, over 90% of respondents reported that at least one of the broad resource categories (things they did for themselves, community help, and help from outside the community) was most effective for reducing stress. Conversely, the remaining respondents reported none of these helped decrease their stress, and this latter group may be individuals who would most benefit from quality therapeutic care.

The RUE analysis was intended to help understand both how resources could affect an individual's stress (IPU) and aggregate community stress (Effect Sum, CI). Disaster events often impact multiple people in families, neighborhoods, and communities. The resulting stress can interfere with relationships and functional activities at many levels, from personal to work and civic.[22,23] The RUE identified resources most effective both for individuals (IPU) and at community levels (CI). Resources with high IPU (Table 3) could be deployed to maximize CI. Resources with high use percentage (Table 3) were most accessible and represent opportunities for adaptation to decrease stress through modification or education. In this way, high rates of mitigation of both individual and aggregate community stress could be expected. Mental health professionals should also be aware of resources which are frequently used but risk increasing stress, such as using websites to find recovery information; interactions with FEMA, Farm Service Agency, or other government groups; repairing, replacing, or rebuilding damaged property; and following news or social media about the event.

Although the RNDSR survey asked participants about posttraumatic stress symptoms they

experienced, the RUE did not specify what type of stress was increased or decreased. Individuals may have a limited capacity for coping with stress. Stress beyond capacity may result in dysfunction, unhealthy coping, mental health symptoms, and physical symptoms. Healthy coping and stress relief strategies diminish stress and restore capacity to cope.[24,25] The authors propose that posttraumatic stress resulting in symptoms such as avoidance, hyperarousal, intrusive memories, and negative changes in thinking and mood[26] may function or manifest differently from general life stress but still draws on the same capacity for coping with stress. Traditional stress relief methods may not effectively resolve posttraumatic symptoms, and general life stress and recovery-associated stress may overflow capacity due to a high underlying level of posttraumatic stress. In this context, resources perceived to effectively reduce stress of any kind, or to build capacity for healthy coping, may mitigate some post-disaster mental and emotional health burdens, restoring individuals to a level where coping is possible and giving them time to recover.

While participants did select many RUE resources as effective for decreasing stress, a majority had also experienced multiple disaster-associated symptoms in the month before the survey, as previously reported.[3] The RUE inventory provides evidence that many interactions and activities following a disaster, such as required by insurance claims or repairing property, may increase or compound the stress that began with the event itself, so the physical recovery becomes an ongoing source of stress.

A surprising result from the RUE was that 28.5% of participants had seen a counselor or therapist, but the IPU ranked 10th (Appendix A). This suggests professional mental health services were accessible but not consistently perceived to be effective for decreasing stress, and not more effective than other readily accessible lay resources. In addition, only two participants said a therapist or doctor would be one of their first three choices to decrease stress after a future disaster, suggesting that in this population, professional mental health services were not frequently preferred for future use.

Preferred resources

Because self-reliance and distrust of outsiders are commonly reported as traditionally rural values,[27–30] the authors also questioned whether rural residents prefer community resources for disaster stress relief over those from outside the community. Based on frequency of mentions in the First Choices open field, rural residents do prefer community resources such as family, friends, God/church, community, and neighbors over external resources for decreasing disaster-related stress. These categories accounted for 96/152 (63%) of the choices cited. A complete list of resources mentioned by survey participants is provided in Appendix B to inform community leaders of additional focal points for developing disaster stress preparedness education and recovery activities such as psychological first aid training or implementation. Broadly viewed, family, friends, God and church, neighbors, community, and local volunteers or organized local groups are locally accessible to rural residents. The workplace, local businesses, utility providers, and first responders are already present in the community as avenues through which stress-relieving approaches can be developed. Existing relationships in the community, highlighted by the use of the word "my" in the First Choices question, can be leveraged for maximum impact.

Help from outside the community was also acknowledged for effectively reducing stress. Outside relief groups was ranked 5 of 22 in all three effect scores on the RUE inventory, and Group from neighboring community was ranked 1 in all three effect scores. While rural residents may often prefer community resources based on their most frequent First Choices for stress reduction, study participants also recognized the great supportive role disaster relief organizations and more informal groups like high school teams or church groups played in helping their community recover.

Meeting physical needs associated with disaster relief was intertwined with decreasing stress. Participants specifically mentioned meals, food, and water provided by the Red Cross and Salvation Army. The designation of outside relief

groups and organized groups of local volunteers as first choices for decreasing stress could be understood as referring to these groups' traditional response and relief actions rather than anything intentionally designed to relieve mental or emotional stress. Other open field responses highlighted this contribution. One participant wrote, "The out of state group came and worked when we were physically and mentally exhausted. We will be forever grateful for everyone that helped us."

Differences between agricultural and non-agricultural populations

This study suggested some differences between the occupational subgroups in both most effective and preferred resources for relieving natural disaster stress. Nearly half the agricultural subgroup found community help to be most helpful for decreasing stress, and only about one-fourth found self-help most effective, while the non-agricultural respondents were evenly split between these two choices at about one-third each. In addition, the open field responses from participants in agriculture frequently included neighbors, then family, and God/church. Non-agricultural subgroup cited family most often, followed by friends and God/church. Of agricultural responses, 20% specified neighbors; only 4% of non-agricultural responses included neighbors. Further qualitative research may be beneficial to understand whether this is an artifact of language or a true difference in social support network that could inform post-disaster emotional health support in rural populations.

Implications for disaster preparedness, response, and recovery

Rural and agricultural communities can elevate baseline knowledge about disaster stress symptoms and management before an event strikes. Educational materials on psychological first aid, posttraumatic stress symptoms, and disaster recovery are available from reputable sources such as Red Cross, Substance Abuse and Mental Health Services Administration, and Ready.gov.[31–35] Schools could educate students and families about stress they may experience from a disaster event and subsequent community disruption and clean-up. Faith groups should discuss foundational beliefs and practices for coping with traumatic events, including disaster. Community organizations and local businesses may be recruited to disseminate posttraumatic stress information as a part of preparedness and response plans. Agricultural residents and their families should be specifically included in community disaster planning.

Most resources in this study were marked as both increasing stress and decreasing stress, especially the most frequently used items such as talking about the event, friends and neighbors, and family. Intentional strategies should be employed to move the balance toward decreasing stress more frequently, or at least moving the increased stress to no effect. For example, how can stress be minimized or mitigated in physical recovery processes such as insurance claims, FEMA assistance, and rebuilding? Media training and social media strategies could be initiated that are sensitive to disaster survivors while communicating clear and positive messages that help them move forward instead of focusing on and exacerbating their distress. The IPU score can also be useful for identifying resources that can be expanded or leveraged as they are most frequently associated with stress reduction.

Finally, recognizing that counselors, therapists, and other health professionals were not consistently reported to help decrease stress, they may benefit from additional training related to and informed by disaster-affected rural populations.[36] Mental health services remain an important resource, but consistent benefit toward stress reduction was not demonstrated in this survey from the participant perspective.

Limitations

The RNDSR survey and data collection had limitations leading to possible selection bias. The survey sample was self-selected and by convenience. Bias may have been introduced due to differences in online or paper survey completion. Some participants did not complete the RUE inventory, which was near the end of the survey. Those who had unpleasant memories triggered early in the survey may have been

less likely to complete the RUE, potentially skewing results. The delayed collection of data post-disaster could be subject to recall bias although research literature shows that individuals who personally experience trauma, including natural disaster, often demonstrate strong and detailed recall of such events even years later.[3,37–40]

Generalizability of the RUE variables could be a limitation as communities may be heterogeneous in resources, culture, and geography, and disasters may have unique features. The survey population was a majority female and may not be representative of the overall rural population. However, broad categories of resources identified in this study should have parallels in most communities, and the inclusion of agricultural participants is a strength.

Perceived stress effects reported on the RUE inventory were not analyzed in relation to participants' disaster exposure or stress recovery scores. It was not determined whether level of exposure was associated with perceptions of stress effects, and it is unknown whether number of resources used or number of stress-decreasing resources reported on the RUE correlated to reduced count of posttraumatic stress symptoms. These are interesting questions for further exploration.

Conclusion

Participants in the RNDSR study commonly experienced posttraumatic symptoms in the days and years following an acute natural disaster event[3] but recognized that people, groups, and activities available in their rural settings helped to decrease their stress. This study shows rural communities have many opportunities to leverage and build on existing resources to strengthen their natural disaster emotional health preparedness, response, and recovery.

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