



## Using social media to call for help in Hurricane Harvey: Bonding emotion, culture, and community relationships

Jing Li<sup>a,\*</sup>, Keri K. Stephens<sup>a</sup>, Yaguang Zhu<sup>b</sup>, Dhiraj Murthy<sup>a</sup>

<sup>a</sup> The University of Texas at Austin, Austin, TX, United States

<sup>b</sup> University of Arkansas, 417 Kimpel Hall, Fayetteville, AR 72701, United States



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### ABSTRACT

Social media plays a key role in disaster rescues, and it can facilitate feelings of support when people need rescue or want to tap into neighborhood relationships. Using semi-structured interviews of people affected by Hurricane Harvey in the Greater Houston area, we addressed our research questions around notions of social support. Using photo elicitation analysis and constant comparison analysis, three overarching themes emerged from the data that inform how social support functions in this context: (1) appreciation posts are a form of emotional support; (2) resources are a form of instrumental support; and (3) helpfulness is a form of informational support. Importantly, these support functions are not isolated, and they can appear in response to an explicit request, as an anticipated need, and as an emergent reaction to a different form of social support. We also find some support for intercultural differences especially considering that our Chinese respondents preferred to use WeChat to request resources and rescues, while other non-Chinese respondents predominately used Facebook. In addition, we found that neighborhood relationships were strengthened, and social support was spread through social media.

### 1. Introduction

In the summer of 2017, Hurricane Harvey devastated Greater Houston. In the ever-changing situation during the hurricane, official rescue forces were overwhelmed and lacked the resources needed to perform the rescues [1]. According to CBS News [2], 9-1-1 operators in Houston processed 75,000 calls between Friday night and Monday morning, which was the time that Hurricane Harvey hit the city, while normally 8000 to 9000 calls per day were received. Obviously, many calls during the hurricane were unanswered. In this case, many people were disappointed by the overloaded 9-1-1 and its speed of help [3]. When people could not receive effective help from official channels, they turned to social media to call for help. Social media platforms, such as Facebook, Twitter, Zello, Nextdoor, and WeChat were used to spread call-for-help information and coordinate rescues [4].

Communication is a core component of disaster response, and effective communication may lessen the impact made by the disaster [5]. Communication technologies, such as social media, have the potential to increase information capacity, dependability, and interactivity in disasters [6]. Research indicates that social media promotes disaster

information sharing and it can help spread emotional support to the affected communities and victims [7–9]. Emotional support is one form of social support that provides caring and empathy. Prior research has identified four types of social support: emotional, instrumental, informational, and appraisal support [10]. For people who have suffered during a disaster, research suggests that they have special needs for these supportive interactions [11], and social media can make such communication more visible to others who are not involved in Ref. [12].

In this paper, we examined the spread of three kinds of social support (i.e. emotional support, instrumental support, and informational support) that rescues used in social media to call for help during the Hurricane Harvey. The goal of this research is to understand how social support is manifest through social media when people ask to be rescued. Additionally, the intercultural nature of the data gathered in this study allows us to investigate how social support may be different when it is spread throughout different cultural communities, and how it might influence people's sense of neighborhood relationships when faced with rescue situations.

\* Corresponding author.

E-mail address: [lynn-jingli@utexas.edu](mailto:lynn-jingli@utexas.edu) (J. Li).

## 2. Theoretical background

### 2.1. Social support and disasters

Social support can be defined by three distinct operational facets of support, which are received support (actual receipt of help), social embeddedness (quality and types of relationship with others), and perceived support (the belief that help would be available if needed) [13]. Social support exists in social relationships and is perceived to be loving, caring, and available in times of need. Research examining social support in natural disasters has found that when natural disasters strike, victims face a double jeopardy: to cope with threats and losses simultaneously, and to marshal social support at a time when their social networks are most likely to be disrupted and unable to carry out supportive roles [14]. Well-developed social support provided by social media may benefit individuals in disasters [15]. In the Hati Earthquake of 2010, people used social media to access rescue forces, during which social media compensated for the lack of information related to rescue [16]. It was found that during Thailand Flooding in 2011 social media worked as a tool to convey emotional support and facilitate interpersonal connections between people who did not know each other before the disaster [17]. Due to the immediate and interactive nature of new media, publics are likely to seek out others with similar stories and experiences on the Internet [18]. Relationships formed online might allow individuals with similar interests or experiences to share information ([19]). Eriksson [20] argued that social media can enable people to connect after a disaster, which helps them to manage emotions.

In managing emotions, the first type of social support, emotional support, is highly relevant, and it refers to expressions of empathy, love, trust and caring. In addition to emotional support, there are three other forms of social support. Instrumental support means tangible aid and services; informational support indicates advice and suggestions; and appraisal support is information that is useful for self-evaluation. In this study, we examine three of these four forms of support (appraisal is not relevant) during Hurricane Harvey.

While people used social media to ask for help during the hurricane, it is less clear how social support is expressed by using texts and photos on social media to call for help during the hurricane. This leads to the first research question:

RQ1: How do combinations of images and texts shared through social media during a flood reflect forms of social support?

### 2.2. Social support and cultural differences in communication

Social support is believed to have a stress-buffering effect when people's networks can provide needed assistance [21]. Though social support is common in many contexts, research shows it differs across cultures. Asians and Asian Americans are less likely than European Americans to seek explicit social support like advice or emotional comfort, and they are less likely to perceive social support as an effective way to resolve stressors [22–24].

People from different cultures differ not only in their willingness to seek social support, but also in benefits of the support and what they expect to receive from people in close relationships [22]. Research suggest that cultural differences in seeking social support are associated with the goals of influence and adjustment [25]. For example, Asian descents expect to avoid bringing their personal problems to the attention of others to enlist their help [22].

Although social support is expressed by people differently depending on cultural contexts, little research has examined how social support appears in a natural disaster. Research suggests that understanding how messages are interpreted in different cultures is essential, as it could help determine which communication channels that can be used to reach people in need [26]. One potential concern is that people who are members of cultures more dominant in a given disaster area

may have had more access to communication practices that helped them be rescued, while others did not have that privilege. This brings us to the second research question:

RQ2: How did culturally relevant social media preferences shape how people shared information during an extensive flood?

### 2.3. Social support and community relationships

Chan and Seow [27] found that social support is important in community disaster management. Local relationships within communities are important support resources in emergent situations, but research suggest that a majority of people never receive social support from their neighbors [28]. Yet, research shows that neighborhood ties are the source of some specific types of support, such as provision of certain everyday services or emergency aid [29]. Additionally, social media can help establish community networks because they connect people to address issues of common interest in an emergency [30]. But how neighborhood relationships are created and built during an emergent situation remains unknown. In this study, we use theoretical understandings of social support to explore how social support was manifest in neighborhood relationships during a disaster.

Granovetter [31] argued that an interpersonal tie is satisfied by emotional intensity, intimacy, and reciprocal services provided in the relationship. Relationships with strong ties are valuable for emotional support, while weak ties are important to form a sense of integration [32]. Neighborhood relationships in communities, compared with ties outside community, are less prevalent [33]. In other words, neighborhood relationships are weak ties, but we understand much less concerning how weak ties—i.e., neighborhood relationships—function.

Considering social support may function differently depending on cultural norms, this is an important consideration. Research examining intercultural differences in social support has compared Asians and Americans and found reliable cultural differences in people's willingness to use social support in difficulties [23,24]. It is quite possible that the combination of providing social support through social media may vary between cultures. This brings us to the next research question:

RQ3: What role did the culturally relevant use of social media play in people's understanding of community after the flooding?

## 3. Method

### 3.1. Participants

This study is part of a larger study where participants were recruited from communities that were heavily flooded during Hurricane Harvey in Greater Houston, Texas. They participated a semi-structured interview that lasted 20–80 min. In the full study, forty-three one-on-one interviews were conducted, among which 15 people were rescuees, 24 people were volunteer rescuers, and the rest were official rescuers from police departments.

In this research, we narrowed our analysis by only including rescuees since their needs were most directly related to calls-for-help on social media. In our sample ( $N = 15$ ), one participants did not report his demographic information due to privacy concerns. A demographic overview of the remaining 14 participants shows that 57.1% ( $N = 8$ ) of our respondents were White, 21.4% ( $N = 3$ ) were Asian/Pacific Islander, 14.3% were Black ( $N = 2$ ), and others were mixed race ( $N = 1$ ). The average age of the interviewees was 46, and the sample was 35.7% ( $N = 5$ ) male, and 64.3% ( $N = 9$ ) female. The demographic information collected also included annual household income and 78.6% ( $N = 11$ ) of the interviewees reported annual household income over 75,000 dollars, while the remaining respondents made less than that amount.

### 3.2. Data collection

Interviews were conducted by using a photo elicitation approach [34]. Photo elicitation is a social science research approach that asks participants to share their own photos when they are interviewed [35]. This kind of data collection assumes that photos and textual posts can be defined as images that are counted as data in relation to descriptive languages in interviews. Analyzing these images is meaningful, as researchers can use photographs to expand on questions and simultaneously, participants can use photographs to provide a unique way to communicate their lives [36]. Besides public images posted on social media, this research collected images that are not open to the general public from interviewees. Thus, the protocol submitted to IRB and presented to interviewees was unique because of private data collection.

Semi-structured interviews were conducted by asking participants how they used social media during Hurricane Harvey to call for help, their emotions, and their successes and failures of communication in the disaster. For example, the questions we asked participants were: “what was your purpose for posting/reaching out to people?”, “How successful was this post?”, “Did you call 9-1-1?”, “Who/what was most helpful during your rescue?”, “What things did you try to communicate that didn’t work?”, “What emotions did you feel throughout the rescue process?”, and “What are your perceptions of the rescue effort you saw?”, etc. They described their experiences in the interviews, and they shared private photos and their posts on social media such as Facebook and WeChat during the hurricane. It should be clarified that we did not ask about specific social media platforms as part of our research design, but instead we let them emerge through the data. We focus on Facebook and WeChat because these two platforms were mentioned the most by our respondents, and their differences reflect the way they received social support.

Facebook images came from interviewees' personal Facebook profiles and community Facebook groups; WeChat images were from private WeChat group messages. All images were personal pictures, screenshots of texts, and pictures downloaded from media reports and government websites. As interviewees showed photographs and text messages, the interviewer asked permission to screenshot the posts, or the participant agreed to send images to our dedicated project mobile device. We received 210 images from Facebook and WeChat from 14 respondents included in this research, and each interviewer on average provided 15 images. At the end of each interview, interviewees were asked to provide basic demographic information. All interviews were audio-recorded with interviewees' permission and transcribed with pseudonyms. Data were analyzed by listening to audio recordings, reviewing field notes, and coding.

For the photo elicitation portion of the analysis, we used these images to support and elaborate on the findings from interview data. For example, textual images were coded by identifying what was present in screenshot posts. Fig. 1 shows a screenshot textual post containing key words like “hope,” “rescue,” and “safe,” etc. The interviews were coded by constant comparison analysis to study the phenomenon of using social media to call for help during Hurricane Harvey. According to Glaser & Strauss [37], constant comparison analysis aims to identify a phenomenon and process features of an experience. In the first step, the comparison was made within one interview. We examined every passage of the interview to decide what had been said by an interviewee and labeled each passage with an adequate code in open coding process. In the second step, comparing different parts of the interview were compared, which examined the consistency of the interview as a whole. In this third step, interviews from two different groups are compared with regard to the experience of a specific phenomenon. Once we collapsed the broad codes, we found that people received and sent three types of social support messages: Appreciation posts (e.g., grateful to others who helped in the rescues) are a form of emotional support. Resource posts (e.g., boats, and rescue devices and

services) are a form of instrument a support, 1 and Helpfulness posts (e.g., providing advice and suggestions) are a form of informational support. Interview transcripts were examined to match the posts and find the best way understand their combined meanings. At the end of coding process, research questions and coded data were examined again to make sense of all the coded data and interview data. All three forms of our data supported these themes since the texts and photos were often similar to what was conveyed in the interviews.

## 4. Results

### 4.1. Emotional support received and sent in rescue posts

The first overarching theme illustrates posts that were expressions of gratefulness. After people were rescued and safe, they posted to say thanks to those who had helped them (see Fig. 1). At the same time, rescuees posted to encourage others to be rescued and stay safe. Among the images we analyzed, this theme appeared in 83 screenshot textual images, 40 times in the texts, and the specific key words like “thank you”, “thankful”, and “grateful”, appeared 14 times in the texts.

In examining interview transcripts, we found that people mentioned how grateful they were after being rescued. A middle-aged Chinese man, with a pseudonym of Sam, said that he felt appreciative:

I (was) really touched by the volunteer(s). They have families. They have children. They just came by and rescued us. And they rescued one family after another with boats. And then, [the] HR people [who worked with my company] picked us up. We're grateful. We're all safe, and no matter, like HR, FEMA, brothers and sisters or friends, whoever has done something to take care of us, you know, to go through this struggle, people will appreciate that. I will never forget.

Sam felt grateful for rescuers and showed empathy toward them. The words he used such as “touched”, “grateful,” and “appreciate” are emotional expressions of gratefulness. This interview excerpt clearly illustrates how emotional support was demonstrated during rescues. This interviewee mentioned that rescuers provided their own boats during the rescue, which illustrates how the three main themes connected to one another. Boats are a form of instrumental support, the second overarching theme that is discussed next.

In addition, we found that the emotional support is not always provided in response to a request: it can be proactively provided. Sam, provides a good example of this proactive emotional support because he did not say he wanted or needed it when he was physically rescued by a boat. However, in the interview, Sam was thankful to volunteers who had boats and could come help him out of danger. Although Sam did not request any emotional support explicitly during the rescue, the instrumental support (the boat) was then experienced by Sam, and he in turn expressed his appreciation in a way that suggested instrumental support was also providing emotional support.

### 4.2. Instrumental support illustrated in private social media

Past research has shown that people are increasingly using social media to obtain and share information in emergent situations [38]. But our second overarching theme pushes this further by illustrating the resources people mentioned they could access that illustrated forms of instrumental support. For example, a Chinese interviewee (pseudonym John) described his experience as follows:

There are a lot of Chinese (people) living in X, but we don't talk to each other. Everybody's busy always. So, [when the flooding happened] several people created groups of people using WeChat. And the people were saying, OK, I got a kayak. I got a boat. Who needs help?

From this segment of the interview transcript, the words kayak and boat mentioned were rescue resources that people needed. These resources, as a typical form of instrumental support, were vital for water rescues. Many respondents in our interviews indicated that they were provided necessary instruments to be rescued and felt grateful.



Fig. 1. Posts with grateful expressions.

On WeChat, people communicated in group messages to share information about how to access to devices such as boats. Also, free services including accommodation and transportation were communicated over WeChat groups. These devices along with free services were crucial to facilitate rescue.

After examining the screenshot images from interviewees' Facebook and WeChat posts, we found examples illustrating instrumental support. The posts (see Fig. 2) illustrate coordination efforts to send people

to safe places. The first image from Facebook is a post about picking up people and taking them to a safe place. The second image from a WeChat group is a flow of messages focused on using boats and a helicopter to rescue people from flooded sites. Fig. 3 is a public bulletin posted outside a neighborhood community and it further explains how instrumental support was both provided and coordinated during rescues.

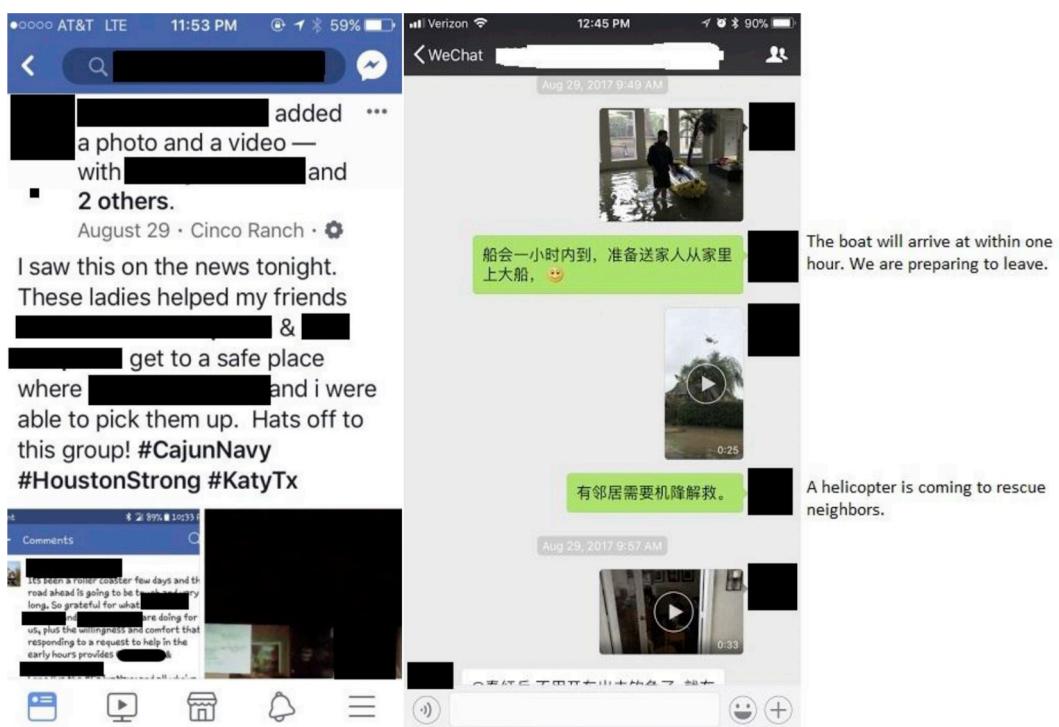


Fig. 2. Facebook and WeChat posts.



Fig. 3. Post about providing accommodation.

#### 4.3. Providing informational support in rescue posts

During Hurricane Harvey, people shared and searched for rescue information on social media. Our third main theme illustrated the role informational support played (see Fig. 4 for an example of this theme).

Fig. 4 is a screenshot from Facebook containing information about water levels and reminding people to avoid toxic water. The second image is a photo posted on an interviewee's Facebook profile, which warned people to be careful about a tornado, because tornadoes usually co-occur with hurricanes, and tornadoes can exacerbate the degree of a disaster. Images functioned as information-support to help people understand potential threats and to avoid dangers during and after the

Please Share!!  
 (It's important that you "Share" my post and not copy and paste. When you "Share" the post, everyone will get the updates that I make immediately. Even if you have read this post once, there may be updates that I add to it throughout the day. Thank you for getting out the word on this ever-changing situation.)

Update as of 8:00am Sunday:  
 The Barker Reservoir is at 99.17'. We will need to reach below 97' before we see all of our homes and businesses free of internal water.  
 We need to reach below 95' before we see all water recede off our streets and back into the reservoir.

Sewer Plant is still not operating!!  
 Cinco MUD 5, 6, 7 and 8 Affected

\*\*New info:  
 Per Mike Price, MUD Board 7  
 Bayou Oaks and Hunters Glen in MUD 7 are not part of the affected area. These two neighborhoods are serviced by a functioning sewer plant. Please use bathroom, kitchen, and utility as normal.

\*\*Critical: For those who are going into the standing water: The levels of toxicity are EXTREMELY high. We have rotting corpses of animals and fecal matter floating in still waters. Please use good judgment. We do not want our community to suffer further harm nor do we want to further overwhelm our hospitals with cases of life-threatening bacteria infections.\*\*

flooding.

Some of these findings reflect themes uncovered in prior disaster and emergency studies (e.g. Refs. [18,19]), but there, they highlighted new media as a positive force in the rescue process. In our study, people used social media to spread their calls-for-help and search for information to improve their well-being after this massive flood. These findings suggest that social media can be a carrier of multiple forms of social support in a disaster situation.

#### 4.4. Culturally relevant social media preferences shape how people shared information

WeChat was popular among Chinese respondents, while Facebook was the dominant platform used by most of our other participants. Facebook and WeChat are similar in that posts can be attached with images and people can provide text comments. However, two primary differences between the platforms are important to note because they do shape how we could interpret this particular finding. Posts on Facebook can be made more public through the use of hash-tags and other more public settings; this means that people with weak ties can see these posts, comment, and respond. WeChat, however, is a friend-based platform, and in our findings we saw that platform limitations also meant that information was exchanged through strong ties almost exclusively.

The Chinese respondents in our study were all part of the same religious group. Most of them had been living in the Greater Houston area for many years, and others had recently immigrated or were on temporary work assignments. Despite these differences, they all used WeChat, likely because of their connection to friends and family still living in China.

In addition, the audiences of WeChat and Facebook messages were different. Descriptions and text images from Chinese respondents suggested that they communicated through WeChat with people who they knew in their community. They shared flood related information in WeChat groups and helped people who were in their closed groups. Chinese participants reported that they received most of their help from people they knew prior to the disaster. Generally speaking, during the hurricane, Chinese respondents depended on WeChat to communicate, and they shared calls-for-help through relatively private space where only people in their groups could respond.

However, interviewees other than the Chinese respondents used larger private groups contained with Facebook, and then often their friends and family would share their posts outside of their immediate network. As a result, the Facebook users in our study received help from various sources, and they did not know much about people who rescued them.

Here is an example from the interview data that illustrates this



Fig. 4. Posts of weather suggestions.

comparison:

Chinese interviewees:

Sam: "I only keep WeChat."

Tracy: "I look at WeChat, I think I looked at WeChat quite a bit."

Interviewees from cultures other than Chinese:

Tammy: "The only thing I ever do is Facebook."

Faith: "I was totally on Facebook."

Although we had a small sample of cultural comparisons, it was obvious that cultural differences in using social media existed during Hurricane Harvey. While Chinese respondents used WeChat and the rest of respondents preferred Facebook, it is not as if those same Chinese respondents did not use Facebook. Actually, all the Chinese respondents reported that they had Facebook accounts and updated it during normal times, but they did not use it in emergency.

#### 4.5. Culturally relevant use of social media in people's understanding of community

Our findings suggest that during Hurricane Harvey, communication on social media connected people in the same communities (e.g., the Chinese church) and built neighborhood relationships. This kind of communication within communities provided a vehicle for social support among neighbors. A sense of community is related to bonding community issues, respect for and service to others, and a sense of connection [39]. We discovered a shift of the sense of community after Hurricane Harvey for people who experienced the disaster together.

People engaged in communication within the same community helped each other during the actual rescue process. The interviewees used many words related to community and neighborhood, especially when they discussed recovery from the flooding. They described how they built up neighborhood relationships and helped each other during the recovery phase. Roughly, half of our respondents described neighborhood relationships. For example, Mick Ann, explained how this occurred:

It (Facebook) got our neighborhood closer, and then brought it together to fight arguments, lawsuits and that kind of thing (in and after the hurricane). And neighbors really know each other's thoughts (through Facebook).

John, a Chinese rescue, said that his communication on Facebook after the disaster helped him build relationships with his neighbors whom he never talked much.

The neighbors close to my age have kids who play together. And the seniors, they play golf. They don't work. So, even though we know each other, we didn't talk much. But they set up a Facebook group after the hurricane. And then we started posting pictures. As I said, in my case, in my community, we developed a relationship through Facebook.

The selected two examples from different communities emphasize how neighborhood relationships were changed in this disaster, and how the changed relationships helped people begin to recover.

## 5. Discussion

Our findings suggest that different types of social support—emotional support, instrumental support, and informational support—were expressed via social media by individuals who personally experienced this disaster. The specific findings showcase how different forms of social support function when they are sought and received through social media. Three main themes illustrated this support: expressions of gratitude to others who helped rescue them, reachability to material support, and access to advice and suggestions. These forms of social support clearly indicated how social media is used as a vehicle for mobilizing social support in this emergency situation. We also found that emotional support, in particular, was received, and often appreciated even when people did not explicitly request this form of support: It was often provided along with instrumental support. These findings indicate that different kinds of social support can be expressed

integrally, which may help future researchers explore how to maximize the effectiveness of social support. The study contributes to social support theories by extending the theoretical concepts into an application of a disaster where textual and image posts on social media further illustrate how social support occurs.

Compared with traditional rescue resources in natural disasters, our respondents believed that social media was more efficient than conventionally acknowledged rescue resources like 9-1-1. We found that social media conveyed information and helped people reach rescue forces. Individuals accessed shared information on their personal Facebook pages, through Facebook groups, and within their WeChat groups. These findings confirm that information and advice spread online can result in actual rescues, a contribution to social support theorizing.

Cultural differences did exist in how calls-for-help were issued through social media during Hurricane Harvey. Our Chinese respondents preferred to use WeChat, while other respondents mainly used Facebook during the emergency. What lies behind the cultural differences warrants further consideration, including whether such differences will lead to differences in receiving and sending social support. Specifically, examining expressions of calls for help, emotions behind asking for help, and potential changes of interpersonal relationships after rescue will be fruitful research directions.

Culturally relevant social media use preferences in Hurricane Harvey mirrored how people preferred to be supported. Chinese respondents preferred to use WeChat, which is possibly because this is an exclusive online community through which they can build close relationships. Furthermore, past research has found that WeChat users who are more engaged with WeChat groups trust the group members more [40], which partially explains why Chinese respondents kept using WeChat during the hurricane to ask for a rescue. Gan [41] suggested that WeChat is a private social media platform where most of the users' contacts are their offline friends, which further explains that WeChat is a private communication platform. The cultural differences of using different social media platforms in an emergency should compel future researchers to explore if these differences are universal in other types of disasters and related crises.

These differences in uses of social media platforms suggests the need for subsequent discussions on the relationship between preferences of using social media and effective rescue resources people receive. We found that social media played a vital role by conveying all three types of social support and that it expanded the scope and improved the efficiency of information dissemination and rescue coordination. Thus, in emergency settings, our findings suggest that people's preferences to use social media may closely associate with their cultural backgrounds, which, in turn, influences the efficiency of receiving social support from others. This is an important finding that should be explored in future research.

During Hurricane Harvey, many people living in the same community shared information and helped each other, which served to strengthen neighborhood relationships. This finding could be explained as an extension of collective action, since past research has found that social media used during a disaster can be harnessed by people from the impacted communities as a common ground for collective action [17]. By exchanging social support, neighbors fostered and developed supportive relationships, which suggests that neighborhood relationships can be created, constructed and developed in disasters by the spread of social support.

However, it remains unknown whether positive changes in neighborhood relationships during a disaster will last in the long run, especially the relationships among community members who came from different cultures. Future research should continue this line of study. In our interviews, we found that communication appeared to be influenced by neighbors' different cultural backgrounds. Looking forward, in order to better understand communication dynamic in neighborhood relationships, future research should also pay attention to intercultural

differences among neighbors.

Additionally, these findings contribute to practice by suggesting that social media can be useful to disseminate helping information, and to support rescues during an emergency. For official emergency responders, like 9-1-1 offices, our findings suggest it could be feasible to communicate and coordinate rescue issues through social media. This could help official responders be more informed of rescue progress, which could ultimately influence the mobilization of rescue forces and improve rescue efficiency.

## 6. Limitations

While this study did extend and further develop an understanding of how social support is manifest through social media during a disaster, there are three limitations important to mention. First, the data we collected is self-reported. Self-report emphasizes description based on language and meanings, but actual behaviors cannot be observed. While the interviews and images gave us a comprehensive overview about their experiences in Hurricane Harvey, the respondents were recalling those experiences based on memories. Furthermore, these memories, even those prompted by revisiting images that they posted on social media, could be subject to social desirability biases.

The second limitation is the small sample size, as we only examined 39 interviews in this research. We gained valuable information from interviewees, but we must be careful when trying to generalize our findings to other situations and populations. Finally, we had fewer Chinese respondents compared to other respondents, and our findings should be universally generalized to the Chinese community as a whole.

## 7. Conclusion

This study articulated a more nuanced understanding of how people call for help on social media. Specifically, we found three types of social support illustrated in the photos and described in the interviews: emotional support represented by appreciation posts, instrumental support manifest when people provided resources and devices during the rescue, and informational support that helped people be informed of potential dangers, transportation options, and constantly changing weather situations. Meanwhile, emotional support was found to be provided implicitly while sending instrumental support, and people received emotional support without explicitly requesting it. Furthermore, our findings suggest that cultural differences existed in people's preferences to use social media to communicate social support in the flooding. Finally, we found neighborhood relationships developed during Hurricane Harvey, quite possibly due to the role that social support played in rescue situations.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijdrr.2019.101212>.

## References

- [1] M. Rhodan, "Please send help." Hurricane Harvey victims turn to Twitter and Facebook, Time (2017, August 30) Retrieved from <http://time.com/4921961/hurricane-harvey-twitter-social-media/>.
- [2] CBS News, Houston Emergency Officials Tell 911 Callers Not to Hang up, CBS Interactive Inc, 2017, August 29 Retrieved from <https://www.cbsnews.com/news/houston-flooding-911-calls-after-harvey/>.
- [3] I. Cowan, When 911 Failed Them, Desperate Harvey Victims Turned to Social Media for Help, Dallas News, 2017, August 27 Retrieved from <https://www.dallasnews.com/news/weather/2017/08/27/911-failed-desperate-harvey-victims-took-social-media-help>.
- [4] W.R. Smith, K.K. Stephens, B.W. Robertson, J. Li, D. Murthy, Social media in citizen-led disaster response: rescuer roles, coordination challenges, and untapped potential, in: K. Boersma, B. Tomaszewski (Eds.), ISCRAM 2018 Conference Proceedings-15th International Conference on Information Systems for Crisis Response and Management, Rochester Institute of Technology, Rochester, 2018, pp. 639–648.
- [5] J.B. Houston, J. Hawthorne, M.F. Perreault, E.H. Park, G.M. Hode, M.R. Halliwell, S.E.T. McGowen, R. Davis, S. Vaid, J.A. McElderry, S.A. Griffith, Social media and disasters: a functional framework for social media use in disaster planning, response, and research, *Disasters* 39 (1) (2015) 1–22, <https://doi.org/10.1111/dis.12092>.
- [6] P.T. Jaeger, B. Shneiderman, K.R. Fleischmann, J. Preece, Y. Qu, P.F. Wu, Community response grids: E-government, social networks, and effective emergency management, *Telecommun. Pol.* 31 (10–11) (2007) 592–604, <https://doi.org/10.1016/j.telpol.2007.07.008>.
- [7] N. Duffy, Using social media to build community disaster resilience, *Aust. J. Emerg. Manag.* 27 (1) (2012) 40–45.
- [8] M. Taylor, G. Wells, G. Howell, B. Raphael, The role of social media as psychological first aid as a support to community resilience building, *Aust. J. Emerg. Manag.* 27 (1) (2012) 20–26.
- [9] D. Yates, S. Paquette, Emergency knowledge management and social media technologies: a case study of the 2010 Haitian earthquake, *Int. J. Inf. Manag.* 31 (1) (2011) 6–13, <https://doi.org/10.1016/j.ijinfomgt.2010.10.001>.
- [10] C. Langford, J. Bowsher, J.P. Maloney, P.P. Lillis, Social support: a conceptual analysis, *J. Adv. Nurs.* 25 (1997) 95–100, <https://doi.org/10.1046/j.1365-2648.1997.1997025095.x>.
- [11] D. Coates, C.B. Wortman, A. Abbey, Reactions to victims, in: I.H. Frieze, D. Bar-Tal, J.S. Carroll (Eds.), *New Approaches to Social Problems*, Jossey-Bass, San Francisco, 1979, pp. 21–52.
- [12] J.W. Treem, P.M. Leonardi, Social media use in organizations: exploring the affordances of visibility, editability, persistence, and association, *Annal. Int. Commun. Assoc.* 36 (1) (2013) 143–189, <https://doi.org/10.1080/23808985.2013.11679130>.
- [13] K. Kaniasty, Social support and traumatic stress, *PTSD Res.* Q. 16 (2) (2005) Retrieved from <https://www.ptsd.va.gov/professional/newsletters/research-quarterly/v16n2.pdf>.
- [14] K. Kaniasty, F.H. Norris, Mobilization and deterioration of social support following natural disasters, *Curr. Dir. Psychol. Sci.* 4 (3) (1995) 94–98, <https://doi.org/10.1111/1467-8721.ep10772341>.
- [15] B.D.M. Peary, R. Shaw, Y. Takeuchi, Utilization of social media in the east Japan earthquake and tsunami and its effectiveness, *J. Nat. Disaster Sci.* 34 (1) (2012) 3–18, <https://doi.org/10.2328/jnds.34.3>.
- [16] K. Kodrich, M. Laituri, Making a connection: social media's key role in the Haiti earthquake, *J. Commun. Comput.* 8 (8) (2011) 624–627.
- [17] Y. Tim, S.L. Pan, P. Ractham, L. Kaewkitipong, Digitally enabled disaster response: the emergence of social media as boundary objects in a flooding disaster, *Inf. Syst.* J. 27 (2) (2017) 197–232, <https://doi.org/10.1111/isj.12114>.
- [18] K.K. Stephens, P. Malone, New media for crisis communication: opportunities for technical translation, dialogue, and stakeholder responses, in: W.T. Coombs, S.J. Holladay (Eds.), *The Handbook of Crisis Communication, fourth ed.*, Blackwell Publishing Ltd, 2010, pp. 381–395.
- [19] R.J. Swickert, J.B. Hittner, J.L. Harris, J.A. Herring, Relationships among Internet use, personality, and social support, *Comput. Hum. Behav.* 18 (4) (2002) 437–451, [https://doi.org/10.1016/S0747-5632\(01\)00054-1](https://doi.org/10.1016/S0747-5632(01)00054-1).
- [20] M. Eriksson, Managing collective trauma on social media: the role of Twitter after the 2011 Norway attacks, *Media Culture Soc.* 38 (3) (2016) 365–380, <https://doi.org/10.1177/0163443715608259>.
- [21] R.C. Kessler, J.D. McLeod, Social support and psychological distress in community surveys, in: S. Cohen, S.L. Syme (Eds.), *Social Support and Health*, Academic Press, New York, 1985, pp. 19–40.
- [22] H.S. Kim, D.K. Sherman, D. Ko, S.E. Taylor, Pursuit of comfort and pursuit of harmony: Culture, relationships, and social support seeking, *Pers. Soc. Psychol. Bull.* 32 (2006) 1595–1607, <https://doi.org/10.1177/0146167206291991>.
- [23] H.S. Kim, D.K. Sherman, S.E. Taylor, Culture and social support, *Am. Psychol.* 63 (2008) 518–526, <https://doi.org/10.1037/0003-066X>.
- [24] S.E. Taylor, D.K. Sherman, H.S. Kim, J. Jarcho, K. Takagi, M.S. Dunagan, Culture and social support: who seeks it and why? *J. Personal. Soc. Psychol.* 87 (2004) 354–362, <https://doi.org/10.1037/0022-3514.87.3.354>.
- [25] B. Morling, S. Kitayama, Y. Miyamoto, Cultural practices emphasize influence in the U. S. and adjustment in Japan, *Pers. Soc. Psychol. Bull.* 28 (2002) 311–323, <https://doi.org/10.1177/0146167202286003>.
- [26] S.R. Veil, T. Buehner, M.J. Palenchar, A work-in-process literature review: incorporating social media in risk and crisis communication, *J. Contingencies Crisis Manag.* 19 (2) (2011) 110–122, <https://doi.org/10.1111/j.1468-5973.2011.00639.x>.
- [27] N.W. Chan, T.W. Seow, The role of social capital and community resilience in facing flood disaster in Malaysia, *Proceedings of International Symposium of International Academic Consortium of Sustainable Cities*, vol. 13, Yokohama City University, 2015.
- [28] J. Kohlbacher, U. Reeger, P. Schnell, Strong ties inside and outside the neighbourhood: an exploratory analysis of the spatial dimension of ego/alter relations in three urban settings in Vienna, Finisterra - Revista Portuguesa De Geografia 96

(2013) 43–64.

[29] B. Wellman, S. Wortley, Different strokes from different folks: community ties and social support, *Am. J. Sociol.* 96 (1990) 558–588, <https://doi.org/10.1086/229572>.

[30] C.M.L. Leong, S.L. Pan, P. Ractham, L. Kaewkitipong, *ICT-enabled community empowerment in crisis response: social media in Thailand flooding 2011*, *J. Assoc. Inf. Syst.* 16 (3) (2015) 174–212.

[31] M.K. Granovetter, The strength of weak ties, *Am. J. Sociol.* 6 (78) (1973) 1360–1380, <https://doi.org/10.1016/B978-0-12-442450-0.50025-0>.

[32] M. Nordstrom, A. Duner, E. Olin, H. Wijk, Places, social relations and activities in the everyday lives of older adults with psychiatric disabilities: an interview study, *Int. Psychogeriatr.* 21 (2) (2009) 401–412, <https://doi.org/10.1017/S1041610208008260>.

[33] A. Guest, S. Wierzbicki, Social ties at the neighborhood level: two decades of GSS evidence, *Urban Aff. Rev.* 35 (1999) 92–111, <https://doi.org/10.1177/10780879922184301>.

[34] D. Harper, Talking about pictures: a case for photo elicitation, *Vis. Stud.* 17 (1) (2002) 13–26, <https://doi.org/10.1080/14725860220137345>.

[35] K. Hatten, T.R. Forin, R. Adams, A picture elicits a thousand meanings: photo elicitation as a method for investigating cross-disciplinary identity development, 120th ASEE Annual Conference and Exposition, Atlanta, Georgia, 2013, June

Retrieved from <http://peer.asee.org/19103>.

[36] M. Clark-Ibáñez, Framing the social world with photo-elicitation interviews, *Am. Behav. Sci.* 47 (12) (2004) 1507–1527, <https://doi.org/10.1177/0002764204266236>.

[37] B.G. Glaser, A.L. Strauss, *The Discovery of Grounded Theory: Strategies for Qualitative Research*, Aldine De Gruyter, New York, 1967.

[38] K. Kim, K. Jung, K. Chilton, Strategies of social media use in disaster management: lessons in resilience from Soul, South Korea, *Int. J. Emerg. Serv.* 5 (2) (2016) 110–125, <https://doi.org/10.1108/IJES.02.2016-0005>.

[39] F.H. Norris, S.P. Stevens, B. Pfefferbaum, K.F. Wyche, R.L. Pfefferbaum, Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness, *Am. J. Community Psychol.* 41 (1) (2008) 127–150, <https://doi.org/10.1007/s10464-007-9156-6>.

[40] W.H.S. Tsai, R.L. Men, Social messengers as the new frontier of organization-public engagement: a WeChat study, *Publ. Relat. Rev.* 44 (3) (2018) 419–429, <https://doi.org/10.1016/j.pubrev.2018.04.004>.

[41] C. Gan, Understanding WeChat users' liking behavior: an empirical study in China, *Comput. Hum. Behav.* 68 (2017) 30–39, <https://doi.org/10.1016/j.chb.2016.11.002>.