

Using Local Community to Ease Long Haul Uncertainty during the COVID-19 Pandemic

No Author Given

No Institute Given

Abstract. The COVID-19 pandemic ushered in an era of unprecedented hardship worldwide, bringing uncertainty to new levels as people's routines were disrupted and what was once considered normal was called into question. Citizens initiated online local communities to support information-seeking amidst the pandemic. In this paper, we explore what types of information were sought and how people engaged in uncertainty reduction with others in their area during the initial phase of COVID-19. To this end, we conducted a content analysis on a pandemic-relief online local community. We found that people leveraged local networks to get updates about timely situations in local areas, clear confusion around local COVID-19 regulations, and seek confirmation on emerging social norms. However, there existed inaccurate information exchange about regulations and conflicting opinions on social norms. We provide design suggestions to increase the potentials of uncertainty management through online local communities.

Keywords: Crisis informatics, disaster communication, information seeking

1 Introduction

Uncertainty surges during disasters due to their unpredictable outbreaks and consequences [5]. A highly contagious virus, COVID-19, has caused waves of uncertainty for over a year in over 200 countries at the time of this writing [6]. At the onset of the pandemic, appropriate testing for the disease was short in supply, symptoms and aftereffects of the disease were changing frequently, and a vaccine had not yet been created [7]. Additionally, people did not have a clear answer about when the pandemic will end, which led to over-purchasing and panic buying behaviors [8]. Other than the virus itself, new policies and interventions to respond to the pandemic were unfamiliar to citizens. Moreover, policies and preventive measures for COVID-19 varied from place to place and were in a semi-constant state of flux as new data became available. The pandemic changed every aspect of everyday life and created multiple layers of confusion about the world.

People are often uncomfortable with unpredictable and unknown situations and will actively engage in information-seeking behaviors to alleviate that uncertainty [9]. Knowing the types of information people sought in previous disasters can guide what information should be appropriately distributed in future

crises, potentially enhancing uncertainty management. However, less is known about information demands amidst an epidemic crisis compared to other disaster scenarios due to its infrequency [10, 11]. Moreover, due to the long-lasting characteristic of the pandemic, uncertainties varied over time.

Due to social distancing measures mandated during the pandemic, people relied on social media (e.g., Facebook, Twitter) to fulfill information needs [12], which makes social media a valuable source to explore the information people sought and associated uncertainties. A body of research in crisis informatics emphasized the value of connecting with people nearby through online communities during crises because those in affected areas can provide precise and locale-specific information in real-time [17–20]. Although COVID-19 was a global disaster, each local community was affected differently (e.g., mask inventory status or severity of panic buying), which suggests that there are benefits in timeliness and accuracy to turning to an online community tied to one’s geographic area to seek information from people who live nearby.

In this study, we aimed to investigate information-seeking behaviors through the lens of the local geographic community, focusing on the initial phase of the pandemic (i.e., first six month) when people were still adjusting to new situations. The following research question guided our study: *What types of local-specific information were sought in local communities at the initial phase of COVID-19?* We performed a qualitative content analysis on posts that asked for information and associated comments in a local pandemic-relief Facebook group that focused on a city in Texas, United States. Our analysis surfaced that people sought information relating to assessing health risks of visiting local areas and inventory status, frequently changing local pandemic-related regulations, and seeking confirmation around new social norms. COVID-19 is likely not the only pandemic that humanity will face in the near-term future, therefore we suggest implications for designing systems that can augment the benefits of seeking information in local-focused online communities during epidemic crises.

Our contributions to crisis informatics are three-fold: First, we discover local-specific information demands that exist amidst an epidemic crisis. Second, we examined how online local communities responded to information requests. Third, we proposed design implications for improving online local epidemic-relief communities for information exchange.

2 Related Work: Online Local Communities for Uncertainty Management amidst Crises

Social media has been acknowledged as an effective and real-time channel for information exchange during crisis events due to its interactivity and accessibility [13]. It disrupted the traditional top-down model of disaster communication [14] as it facilitated peer-to-peer communication in response to a crisis with citizens actively disseminating text, photo, and video-based information as *citizen journalists* [15]. Research to date in crisis informatics has emphasized the unique role physical proximity plays in disaster communication. Individuals in impacted

areas favored social media posts from others nearby [16] because they were able to generate more accurate locally-relevant information in real-time than major news media [17–20].

However, it should be noted that information demands differ by disaster types because each of them creates distinct situations [21, 10]. For instance, during a wildfire outbreak, citizens wanted to know impacted local areas and evacuation places through local community websites [22], while they asked for a list of victims and missing persons after a mass shooting outbreak on Facebook groups [23]. Understanding information people seek in a specific disaster situation is essential to provide appropriate information and to manage public uncertainties effectively.

Compared to other common disasters (e.g., hurricanes, floods), local information citizens seek on social media during epidemic outbreaks is underinvestigated due to its infrequency. The few studies that explored information sharing on social media during epidemic outbreaks mostly analyzed posts from official disaster organizations [24, 25]. The only study that examined local information provided on online forums amidst the Zika outbreak mainly focused on information demands to make a rational decision on traveling rather than everyday life [11]. Moreover, COVID-19 was unprecedentedly long and expansive to this generation, which could have forced people to look for information that was not sought during previous epidemics. To discover what public uncertainties existed in these uncertain times of the global pandemic and how locals can help manage them, we directly examined information citizens asked others nearby in a pandemic-relief online local community.

3 Methodology

After the pandemic outbreak, people created online groups to exchange support with others nearby. A Facebook group dedicated to different counties or cities was the most widely-used platform to connect with local community members in the United States [26]. Previous research noted that participation in disaster communities declined as situations stabilized [22], so Facebook groups targeted in areas with high COVID-19 transmission over a long time were of interest in this study. Therefore, the following criteria were used to select a local pandemic-relief Facebook group to study: (1) covers a local area with consistently high severity of COVID-19 cases; (2) open to anyone to join, view, and post; and (3) high group activity (e.g., average posts per day, the number of members).

The selected group satisfied all selection criteria, ‘Local Community Support for COVID-19 Relief in Austin’¹ was focused on Austin, Texas. By the end of the data collection window, the group had around 4,500 members, with 11 posts uploaded per day on average. As we were interested in information-seeking behaviors at the beginning of the pandemic, we retrieved all posts uploaded within the first seven months of the pandemic: between the start of the group, March 14, 2020 and October 25, 2020. We collected 2,120 posts in total.

¹ pseudonym for anonymity

Members of the group uploaded a wide variety of posts, including recommendations for local places, advice on personal situations, local news articles, aid requests and offers, and virtual events. We were interested in posts that asked for information, advice, or suggestions to explore underlying uncertainties the poster had. One research team member read all the collected posts and categorized each post based on whether the poster was asking for information or something else to filter out irrelevant posts. To meet the criteria for *asking information*, the post needed to contain one of the following phrases (or variations thereof): “*Does anyone have suggestions...*”, “*Does anyone know...*”, “*Where/how can I...*”, “*Looking for recommendations/advice/suggestions...*”, “*How do you...*”, “*How are people...*”, “*Has anyone...*”, or “*...Any ideas/suggestions/recommendations?*”. In total, we identified 256 posts to be information-seeking posts.

In the next step, we coded the 256 posts based on the type of information the poster sought using the constant comparative analysis approach for data analysis [27]. One research team member initially performed descriptive open coding using Nvivo software. After the initial coding process, the research team of four had a series of meetings and collectively read and discussed the posts and associated comments to validate identified codes. The final coding scheme encompassed multiple codes, but we only selected those that directly matched the focus of this study: what COVID-19-related local information was sought specifically in a local-community-based disaster-relief group. We discarded codes associated with information requests irrelevant to COVID-19 (e.g., *general home maintenance, suggestions for products*), not local-specific (e.g., *COVID-19 symptoms and testing, COVID-19 prevention strategies*), or information that could be obtained from official national agencies (e.g., *Nationwide COVID-19 regulations*). The remaining codes included *Recommendations for safe and stocked local places*, *Local COVID-19 regulations*, and *Reasonable social behaviors*, which will be presented in the following section.

4 Findings

We discovered three pandemic-related locally relevant information types people asked: (1) up-to-date situations in local regions and recommendations on safe places; (2) confusion due to the absence of rules and emerging official regulations; (3) other’s confirmation on social behaviors and routines. Because the pandemic situation and guidelines were frequently evolving, we provided specific dates when each post or comment was uploaded for better understanding.

4.1 Recommendations for Safe and Stocked Local Places

We present findings related to perceived high risks of catching the virus, which raised uncertainties on which places are safe to visit, and during which hours. Moreover, panic buying ensued in the early stage of the pandemic, and people wondered which hours were best to get certain items at local stores. Because the community was targeted to a specific region, other members provided locale-specific (hyperlocal) and up-to-date (hypertemporal) information.

Hyperlocal Information People wanted to be assured that the places they were visiting were low-risk of COVID-19 with fewer people or proper safety measures. For example, a poster had to take precautions due to pre-existing health conditions and asked what preventive measures were being done at a specific grocery store. The poster received very detailed information from other members:

***Comment:** The one downtown does a pretty good job [...] They limit volume of customers, wipe down carts, offer disposable gloves and sanitizer, and the staff wears masks. They space out lines to check out and have a plexi shield between cashier and shopper. They don't let people bring reusable bags in from home [...]* (May 31, 2020)

Because personal health conditions were disclosed in that post, the poster also received adjusted recommendations: “If you are a senior or immune-system-compromised you can shop an hour before the regular hours” (both May 31, 2020).

Some wanted recommendations on local stores that took proper preventive measures. One user asked for a hair salon that was doing a good job of disinfecting. Others suggested local salons, sharing personal experience on their disinfection measures ever since the pandemic outbreak:

***Comment 1:** My stylist came to my home and cut my hair on the back patio. We both wore masks. It was nice to get it back to normal. I felt very safe outside.*

***Comment 2: Business A** in downtown did an amazing job. You can't walk in, [they] let you in, then you sanitize, they take your temp, everyone has masks on, and anything anyone touches (employee or guest) was sanitized immediately.
(July 16, 2020)*

Similarly, people were unsure which places to visit because large crowds can increase the risk of infection, and many places were temporarily closed due to the pandemic. For instance, a user with health concerns who was new to the area wanted to know which places were less-crowded. Group members oriented the poster to safe local places:

***Comment:** Bike the Walnut Creek Trail on a weekday. It runs from Govalle Park all the way out to Manor. Usually empty, plus you'll be biking by anyone outdoors, so very low risk.* (June 20, 2020)

Hypertemporal Information Many posts asked about the inventory status at local stores or where they could get a specific item such as toilet paper or masks. These posts were common in the initial phase of the COVID-19 outbreak in Texas, in March and April, when panicked people stock-piled household goods, food, and PPE [34].

For those posts asking about inventory status, some people commented with photos of shelves at stores to give the poster a sense of the situation. Sometimes, others told posters which local stores to go with a reference to the specific time or date that they visited:

Comment 1: *Dollar Tree, yesterday. They were small containers but they had quite a few.*

Comment 2: *Target @ [this location] had some tubes of Lysol wipes in stock a few hours ago.*

Comment 3: *Was able to get a pack of Clorox wipes at Costco on Saturday by being there at opening time*

Comment 4: *Just saw a lot at the cashier counter at the H-E-B gas station at [this location]*
(all July 17, 2020)

Besides inventory status, knowing up-to-date busy hours was important for people who wanted to avoid a large crowd at stores. Also, some stores limited the number of customers inside to reduce the risk of infection, which resulted in long line-ups. Some users asked about other's experiences at particular grocery stores, such as crowd levels. People provided a specific day of the week or time they visited when narrating their experience because store situations changed by day and time. These are exemplary comments from different posts asking about when they should visit stores to avoid crowdedness:

Comment 1: *I went early last Friday and it was very quiet.* (May 31, 2020)

Comment 2: *I recommend to go during the week and early afternoon in order to avoid any lines [...] I've actually gone a few times on Sundays and it wasn't even that bad though.* (May 31, 2020)

Comment 3: *Go in the morning at like 8am.. I went at 7am the other day, right when they opened. No line.. but there were more people [...] when I left at 8.* (April 18, 2020)

Comment 4: *I went about an hour and a half before closing Wednesday and it was fine* (April 18, 2020)

During COVID-19, people were unsure of safe places to visit, such as places taking proper preventive measures or less crowded outdoors. They were also unsure when to visit local stores to find specific items or avoid a large crowd. Online local community members provided local-specific and timely information, being in the same neighborhood.

4.2 Uncertainty about Local COVID-19 Regulations

Citizens had to follow up with frequent changes in orders that differed by state and county and differed from day to day, which added another layer of uncertainty. People had to keep up with what the correct measure was, depending on place and time.

People were not familiar with emerging COVID-19-related regulations. One user was unsure if any official agencies were accepting reports against a local business where staff was not wearing a facial mask. Other members specifically guided her to official routes she could report them through. However, there was one member who complained that suggested penalties were not applicable in a county close to Austin:

Comment 1: *It's up to a \$2,000 fine in Austin for not wearing a mask. Call 311!*

Comment 2: *[a link to the 'Report a Hazard Form' on a county government website]*

Comment 3: *Note that really only works within the city limits of Austin. If you report one in [this county] the police don't care and will not take action.*

(uploaded between July 9-10, 2020)

Comment 3 implies that Austin practically imposed, or at least had official penalties against people not abiding by mask mandate. In contrast, a county near Austin might not have executed such penalties or did not even have one. In either case, different situations by the county could increase uncertainty.

There was also a case where a poster asked about the COVID-19 policies in Texas in general. People referred to the situation in Austin, probably because the Facebook group focused on Austin, Texas. However, the poster restated that she wanted policies in another county close to Austin, which turned out to have different orders:

Poster: *Will someone please share the official guidance for Texas on high-risk people? My 83-year old mother with asthma decided it was a good idea to go to church this weekend. [...] If she won't listen to me, perhaps she will listen to official guidance.*

Commenter: *High risk people should not be in groups greater than 10 [...] [a link to the Austin government website]*

Poster: *She is in El Paso.*

Commenter: *Ok, it appears to be better there than here. They are at the lowest level [...] and churches are 50% capacity.*

(uploaded between September 21-22, 2020)

Their conversation implies how different situations were by county, which led to distinct orders. It implies that it can be better to set up an online local community on the county level, where everyone has a common ground that they are all stating to the same locality. It could make the communication process more effective and increase the likelihood of getting the right information.

In Texas, the state governor altered COVID-19 regulations several times, constantly mandating or lifting face-covering policies depending on the situation. This added another confusion about the situation. Under a post where a group member asked how to deal with local stores not having their staffs wear a mask, contrasting responses were left, which reflected their confusion with frequently changing orders:

Commenter 1: *I believe it's not being mandated. I don't know what reporting our concerns would really do.*

Commenter 2: *Austin is masks in public and in all businesses as of Tuesday*

Commenter 3: *it is re-mandated now.*

Commenter 1: *Oh, GOOD! Should have never been lifted.*
(June 20, 2020)

In that post, three other members mentioned a date when mask mandate begins, but they all referred to different dates:

Commenter 1: *It's not required until Tuesday.* [which is 22nd]

Commenter 2: *Starting the 25th they will be required to wear them.*

Commenter 3: *23rd, not 25th*
(June 19, 2020)

We discovered that different counties had differing rules, which increased uncertainty and emphasized the importance of setting up an online local community on a narrower level by county. Frequently changing regulations sometimes led to the diffusion of misinformation within the community, and people who kept an eye on them corrected it.

4.3 Seeking Confirmation on Social Behaviors

Due to the lack of specific mandates and inexperience in living in the pandemic era, what social behaviors were considered rational depended on personal beliefs and values and how people around them behaved. Reasonable behaviors were socially defined, and the local-based online community was a channel to confirm surrounding social expectations.

There was uncertainty about whether wearing a mask had now really become a general social behavior. For instance, a poster asked others if one can directly ask house cleaners to wear a mask:

We are moving. We will have the house professionally cleaned the day after the furniture arrives. 1) Is it ok to ask the house cleaners to wear masks? 2) Is it ok to move in the day they clean or should we wait a day or two to be on the safe side?

(July 6, 2020)

People assured the poster that wearing a mask was now regarded as a social norm: *"Yes it's ok to ask them to wear masks, they should be anyway given the mandate"* (July 6, 2020). Some shared their similar recent experience to convey more assurance: *"It's absolutely okay to ask, we just moved as well and our moving company were already planning on wearing masks"* (July 6, 2020).

The second question in the post above was related to proper COVID-19 preventive measures when moving-in, which was usually unavailable in official guidelines, which focused on addressing daily activities. In this Facebook group, the poster was able to get confirmation and suggestions from others who already had experienced house-moving during the pandemic:

We have had maid service at our home as well as rental property [...] I'd wait at least a day or two before moving in after they clean [and] open some windows and move right in after they clean. (July 6, 2020)

Similarly, there was a hairdresser who wanted to get other's thoughts on whether or not it was acceptable to book customers selectively, which was also not explicitly addressed in official guidelines. She asked if it was irrational to turn away some customers who might be high at risk of transmitting the virus:

Asking in earnest As a hairdresser, am I being unreasonable by turning away clients who work with many other people? [...] I feel that by only accepting clients who are sheltering in place, I'm not exposing client A to all of client B's coworkers. I believe that by accepting public-facing clients, I'd be exponentially increasing the risk of my salon becoming a vector for covid. (July 8, 2020)

Before the pandemic, refusing to provide service to certain people was generally considered unethical. However, because it was risky to interact with others during the pandemic, others assured the poster that the safety should be prioritized: *"It is your right to screen in any way you choose. It is ultimately your health, the health of your clients and your liability"* (July 8, 2020). Some users appreciated the poster for being socially responsible. However, other comments pointed out potential flaws in her approach:

Comment 1: *The fallacy of it all is at end of day those clients aren't catching it from other clients directly. You're the common variable. So unless you take yourself out of the equation, the risk will continue to be quite high, regardless if you asked if they've been sheltering in place. You have no way of knowing if they're lying about it.* (July 8, 2020)

Comment 2: *I know so many people who will claim they're being safe but aren't really.* (July 16, 2020)

There was also a comment which pointed out possible discrimination embedded in this protocol:

Are you saying you won't do all the people on the front line? Like grocery workers? What about immune compromised? [...] There's a fine line for some form of discrimination here. (July 16, 2020)

People had contrasting reactions to the post because one prioritized the safety of the hairdresser and customers, while others recognized that some people could not shelter at home due to their classification as essential workers. Both approaches were rational.

In another example, a poster also received two contrasting but reasonable opinions. As it had not been long since wearing a mask became the "new normal", people were unsure in which situations it was mandatory to wear a mask and when not wearing one was excusable. One poster was skeptical about not wearing a mask when biking or running outside and asked others for help deciding what to do. In the comments, people discussed whether or not wearing a mask should be mandatory when working out:

Commenter 1: *If you click on the link [to official guidelines] and scroll down you will find the requirements. I assume that while running you could be restricted from breathing if you wear it..*

Commenter 2: *That is not an exception. I see almost no-one wearing them while out running and biking and it makes me cringe... the whole point is to keep your breath and the droplets in it from getting out into the air, and the people exercising are likely putting out far more of this [...]*

Commenter 3: *It is an exception - [(a link to a news article)].*

Commenter 2: *not sure why the article interprets the actual county announcement and guidelines that way [...] I still think they're all being inconsiderate.*

Commenter 3: *But in my neighborhood - people walking and running are mostly 20 to hundreds of feet apart. I would not expect they should wear a mask. If you have allergies or any underlying condition, impeding your breathing could be serious.*

(between April 18 and 19, 2020)

Commenter 1 and 3 insisted that masks were not mandated when exercising outside and provided links to an official guideline and a news article. Commenter 3 reminded others of a few exceptional cases where wearing a mask while exercising could be life-threatening. In contrast, Commenter 2 emphasized that not wearing a mask while exercising could put others around them at risk. Although the official guideline that Commenter 1 posted did not explicitly specify mask mandates during exercise, the news article from Commenter 3 said that exercise activities were not part of the mask mandate. The vagueness of the official guidelines raised questions about the appropriateness of exercising without a mask.

People also conflicted on the right to know about someone's positive COVID-19 status. Although many felt that notifying their contacts that they tested positive was a social obligation, it was not easy for them to tell others that they might have infected them with a potentially life-threatening disease. People wondered to whom and when they should tell others about the possible infection. In the following example, a poster described a situation and asked whether people whom they contacted should be notified of the potential risk:

A staff member at a pre-school facility had family in their home last week and the family members tested positive for Covid-19 within 3 days of returning home [...] Do coworkers, auxiliary staff, students, etc need to be quarantined? Should parents of students be notified of the staff member's exposure to the virus [...] ? (October 19, 2020)

Some suggested that the poster did not need to tell others of the possible risk in this case, such as:

Comment 1: *No they generally wouldn't be notified unless the person that works there is positive. [...] I'm almost certain APH would not ask*

you to notify anyone until the staff directly involved has a positive test. It is not confirmed without that.

Comment 2: *Contact Austin Public Health. They can help you. I have a licensed preschool in my home and I've been told to direct these types of questions to their offices [...] I'm pretty sure notifications only go out when symptoms of infectious disease are present or if there is a positive test result*

(both October 19, 2020)

They made their assertions by referring to the existing regulations, health agencies, or relevant personal experience. However, there were conflicting comments which argued that the poster should notify parents and students of the situation. For example, one comment emphasized the right to know about possible risks:

Our company states that if symptom free, just monitor and isolate the sick one. I was a total turd when a sick person was in my work [...] I was mad because I wanted to know so I could test if needed. (October 19, 2020)

Due to the altered world, people sought others' opinions on their behaviors or decisions, which used to be their routines pre-COVID-19. Local members responded with diverse opinions, which sometimes did not reach a consensus. Heated discussions ignited when people responded with different but rational viewpoints.

5 Discussion

In this section, we discuss each of three uncertainties that lingered amidst the initial phase of the pandemic that led to information seeking: (1) uncertainty on where and when to visit local places; (2) uncertainty on confusing regulations; (3) uncertainty on reasonable social behaviors. We state how local members alleviated or added uncertainties and suggested design implications that can better online local pandemic-support community for uncertainty management.

5.1 Hyperlocal and Hypertemporal Information Requests During the Pandemic

The types of hyperlocal and hypertemporal information people seek after common disasters have been well-investigated [35, 36, 22], but information needs amidst an epidemic crisis are yet unknown due to its infrequency. In this study, we fill this gap by discovering what hyperlocal and hypertemporal information people asked in the online local community during COVID-19 when it was one of the few channels to retrieve information due to lockdowns and stay-at-home orders. Unlike other disaster situations, risks associated with each location have not been stable amidst the pandemic. For instance, places considered safe at one point may not be in a few hours if a large crowd gathers. Thereby, demands for

situational updates during an epidemic crisis turned out to be highly frequent. In the Facebook group we analyzed, people asked about: disinfection measures taken at a local store; less crowded outdoors; recent inventory status; less busy hours at stores.

We have seen that group members provided highly contextual and up-to-date local knowledge to posts that asked for hyperlocal and hypertemporal information, which extends the findings of prior research that emphasized the value of geographically focused online communities during disasters [17, 22, 28]. For example, they shared which local areas were safe to visit, what time local stores got crowded with long line-ups each day, and which hard-to-find items they got at what time at which stores. Local knowledge they shared was highly relevant to everyday life and to residents, which national news media for a wider audience was not able to provide [18–20]. Although COVID-19 was a global pandemic, detailed local-specific information was still crucial as the severity of the pandemic and associated situations differed by locality.

However, posts requesting local information and comments were mixed with other posts, which could quickly be buried in the Facebook group timeline. Also, the process of getting such information was question-and-answer-based; someone had to upload a post to ask for such information; otherwise, the information was not available to anyone. A crowdsourced geo-tagging feature can facilitate information exchange about less crowded outdoors, recent inventory status, less busy hours, and disinfection measures taken at local stores. For instance, users can enable automatic location-sharing on their phones or manually mark which local area they visit. Highly crowded areas can be colored in red, moderate in orange, and less in green. Users can add inventory tags or photos of shelves at local stores with timestamps for items that are hard to find during epidemic crises (e.g., facial masks, disinfectant sprays). Regarding disinfection measures taken at local stores, users may check on one or more boxes that indicate safety protocols, like sanitized carts and baskets or limits in the number of customers.

5.2 Confusing COVID-19 Regulations

How COVID-19 regulations were passed down from state and local governments in the U.S. escalated citizens' confusion; emerging laws were different not only by state but also by county. Adding to that, citizens had to follow up with frequently changing regulations. Frequent regulatory changes resulted in the accidental sharing of incorrect information. Although some members provided accurate rule-related information with reference to local government websites, others shared inaccurate information (e.g., wrong dates for mask mandates). Such incorrect information worsened uncertainty rather than alleviation.

In the online community group we observed, some members actively corrected inaccurate information in the comments when they encountered it. This echoes findings from previous research where members of online groups voluntarily corrected inaccurate information shared by others [38, 39]. Behaviors of correcting inaccurate information were valuable in the community we observed, as inaccurate information on safety regulations can lead to inappropriate health-protective

behaviors (e.g., not wearing facial masks). However, citizens can be overloaded following up with quickly changing local COVID-19 policies and keeping an eye on possible accidental sharing of inaccurate information in the community to fix it.

Disaster relief communities should plan effective strategies to communicate new local regulation updates during a crisis. The findings suggest that setting up online disaster relief groups on a county basis instead of state-level can help reduce dissemination of inaccurate information around policies in the U.S. where regulations differ by county. They can also consider the cooperation with local governments to effectively inform citizens of changing policies. Online platforms widely used for disaster relief like Facebook tend to have a large user pool and are likely to be more frequently visited than government websites, which can effectuate communication of policy updates. During the pandemic crisis, most states imposed multiple phases of regulations on social gatherings and local businesses based on the severity of COVID-19 [40]. A banner that specifies a phase of regulation can be incorporated into a platform for disaster relief. With the banner having different colors representing distinct phases, the level of policy strictness and correct information on policies can be disseminated under control.

5.3 Collective Sense-making Under Uncertainty

Unfamiliar situations make people question daily routines [22], and they often seek other’s opinions to predict possible outcomes of certain behaviors before they act [41]. We discovered a similar pattern in the local pandemic-relief group. There were no detailed official guidelines on how to handle life events which occur seldomly (e.g., moving house), and ambiguous gray areas in the guidelines triggered different interpretations and risk assessments from various people. People were uncertain about their behavioral choices and were unsure if their perceptions of ongoing situations were on the same page with others. They asked others’ thoughts on their reasoning to make sense of the situation collectively. However, this collective sense-making process was not always smooth with conflicting opinions which was in line with previous studies [19, 42, 43]; some confirmed that they were reasonable, while others gave them denial and pointed out how their reasoning could be troublesome. While the conflicting opinions could be logical on all sides, not absurd, they did not completely resolve uncertainties.

Conflicting opinions were dispersed throughout unstructured comments on the original post, making it harder to measure what is right and wrong and to come up with conclusions on rational behavior. Moreover, when people face opinions that conflict with their beliefs, they easily feel cognitive dissonance, which can lead to ignore conflicting opinions, and halting their assessment of them [44]. However, stubbornly rejecting opinions can pose a risk to one’s health and safety amidst an epidemic crisis. Nudging people to hold a dialogue with others and outlining the pros and cons of two different viewpoints are essential for collective sense-making [45].

To help people cope with cognitive dissonance, we suggest including a venue for public deliberation in online platforms for disaster relief. Public deliberation

is a way to bring in diverse opinions, compare the pros and cons of possible decisions, and come up with new solutions [46]. The concept has been applied to politics or urban planning [47–49], but its usage can be extended to disaster management. Common public deliberation systems involve a pro and a con list, and this feature can be used to make the collective reasoning process more visible and structured. Under each confirmation seeking request, those who agree with the poster can leave their rationale on the pro list, while those who disagree can post their arguments on the con list. Positives and negatives associated with two different behavioral choices can become apparent, which can help the poster conveniently weigh confirmations and denials of their behavioral choice in order to make a decision in their best interest.

Limitations. In this study, we investigated one local Facebook pandemic-relief group to understand locally relevant information requests in the initial phase of the pandemic when people have not yet adapted to new situations. Our key focus was an in-depth understanding of certain information demands amidst an epidemic crisis and how local-focused online communities can fulfill them rather than obtaining broad trends. The Facebook group was focused on Austin, Texas, in the U.S., which had a relatively high number of infections in the first six months of COVID-19. Future studies can observe other communities based on different areas or analyze posts uploaded in a different timeframe of the pandemic to see if other information demands exist.

6 Conclusion

COVID-19 disrupted social functioning worldwide, which prompted citizens to engage in online local communities to understand the confusing world. To decipher how peer-to-peer interactions alleviate uncertainty during this long-lasting crisis, we observed information-seeking behavior in a local Facebook group for disaster relief. Uncertainty arose around frequent updates on local places, the ever-changing and confusing local regulations, and emerging social norms. Mitigating uncertainty during epidemics through online local communities could be better enabled with crowdsourced geo-tagging maps, increased visibility around regulatory updates, and opportunities to engage in public deliberation. When the next pandemic will occur is unknown, but we believe that leveraging local online communities will help citizens adapt.

References

1. Author, F.: Article title. Journal **2**(5), 99–110 (2016)
2. Author, F., Author, S.: Title of a proceedings paper. In: Editor, F., Editor, S. (eds.) CONFERENCE 2016, LNCS, vol. 9999, pp. 1–13. Springer, Heidelberg (2016). <https://doi.org/10.1007/1234567890>
3. Author, F., Author, S., Author, T.: Book title. 2nd edn. Publisher, Location (1999)
4. Author, A.-B.: Contribution title. In: 9th International Proceedings on Proceedings, pp. 1–2. Publisher, Location (2010)

5. Longstaff, P. H.: Security, resilience, and communication in unpredictable environments such as terrorism, natural disasters, and complex technology. Center for Information Policy Research, Harvard University (2005)
6. WHO coronavirus disease (COVID-19) dashboard, <https://covid19.who.int/>. Last accessed 12 Sept 2021
7. Wu, Y. C., Chen, C. S., Chan, Y. J.: The outbreak of COVID-19: An overview. *Journal of the Chinese medical association* **83**(3), 217 (2020)
8. Arafat, S. Y., Kar, S. K., Marthoenis, M., Sharma, P., Apu, E. H., Kabir, R.: Psychological underpinning of panic buying during pandemic (COVID-19). In: *Psychiatry research*, pp. 113061. Psychiatry research (2020)
9. Berger, C. R., Calabrese, R. J.: Some explorations in initial interaction and beyond: Toward a developmental theory of interpersonal communication. *Human communication research* **1**(2), 99–112 (1974)
10. Olteanu, A., Vieweg, S., Castillo, C.: What to expect when the unexpected happens: Social media communications across crises. In: *Proceedings of the 18th ACM conference on computer supported cooperative work & social computing*, pp. 994–1009. ACM (2015)
11. Gui, X., Kou, Y., Pine, K. H., Chen, Y.: Managing uncertainty: using social media for risk assessment during a public health crisis. In: *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, pp. 4520–4533. ACM (2017)
12. Pine, K. H., Lee, M., Whitman, S. A., Chen, Y., Henne, K.: Making Sense of Risk Information amidst Uncertainty: Individuals’ Perceived Risks Associated with the COVID-19 Pandemic. In: *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, pp. 1–15. ACM (2021, May)
13. Jaeger, P. T., Shneiderman, B., Fleischmann, K. R., Preece, J., Qu, Y., Wu, P. F.: Community response grids: E-government, social networks, and effective emergency management. *Telecommunications Policy* **31**(10-11), 592–604 (2007)
14. Palen, L., Hughes, A. L.: Social media in disaster communication. In: *Handbook of disaster research*, pp. 497–518. Springer (2018)
15. Gillmor, D.: We the media: The rise of citizen journalists. *National Civic Review* **93**(3), 58–63 (2004)
16. Kogan, M., Palen, L., Anderson, K. M.: Think local, retweet global: Retweeting by the geographically-vulnerable during Hurricane Sandy. In: *Proceedings of the 18th ACM conference on computer supported cooperative work & social computing*, pp. 981–993. ACM (2015, February)
17. Sutton, J. N., Palen, L., Shklovski, I.: Backchannels on the front lines: Emergency uses of social media in the 2007 Southern California Wildfires (2008)
18. Starbird, K., Palen, L.: Pass it on?: Retweeting in mass emergency. In: *ISCRAM*. (2010)
19. Heverin, T., Zach, L.: Use of microblogging for collective sense-making during violent crises: A study of three campus shootings. *Journal of the American Society for Information Science and Technology* **63**(1), 34–47 (2012)
20. Hagar, C: The information and social needs of Cumbrian farmers during the UK 2001 foot and mouth disease outbreak and the role of information and communication technologies. *The socio-cultural impact of foot and mouth disease in the UK in* (2001)
21. Fraustino, J. D., Liu, B., Jin, Y.: Social media use during disasters: a review of the knowledge base and gaps. (2012)
22. Shklovski, I., Palen, L., Sutton, J.: Finding community through information and communication technology in disaster response. In: *Proceedings of the 2008 ACM conference on Computer supported cooperative work*, pp. 127–136. ACM (2008)

23. Vieweg, S., Palen, L., Liu, S. B., Hughes, A. L., Sutton, J. N.: Collective intelligence in disaster: Examination of the phenomenon in the aftermath of the 2007 Virginia Tech shooting. University of Colorado Boulder, CO (2008)
24. Guidry, J. P., Jin, Y., Orr, C. A., Messner, M., Meganck, S.: Ebola on Instagram and Twitter: How health organizations address the health crisis in their social media engagement. *Public relations review* **43**(3), 477–486 (2017)
25. Lwin, M. O., Lu, J., Sheldenkar, A., Schulz, P. J.: Strategic uses of Facebook in Zika outbreak communication: implications for the crisis and emergency risk communication model. *International journal of environmental research and public health* **15**(9), 1974 (2018)
26. Kneare, T., Jo, J., Tsai, C. H., Carroll, J. M.: Making Space for Support: An Exploratory Analysis of Pandemic-Response Mutual Aid Platforms. In: *C&T'21: Proceedings of the 10th International Conference on Communities & Technologies-Wicked Problems in the Age of Tech*, pp. 38–43. ACM (2021, June)
27. Charmaz, K.: *Constructing grounded theory: A practical guide through qualitative analysis*. sage (2006)
28. Carroll, M. S., Cohn, P. J., Seesholtz, D. N., Higgins, L. L.: Fire as a galvanizing and fragmenting influence on communities: the case of the Rodeo-Chediski fire. *Society and Natural Resources* **18**(4), 301–320 (2005)
29. Eshghi, K., Larson, R. C.: Disasters: lessons from the past 105 years. *Disaster Prevention and Management: An International Journal* (2008)
30. Ludvigson, S. C., Ma, S., Ng, S.: COVID-19 and the macroeconomic effects of costly disasters (No. w26987). National Bureau of Economic Research (2020)
31. Van Damme, W., Dahake, R., Delamou, A., Ingelbeen, B., Wouters, E., Vanham, G., ..., Assefa, Y.: The COVID-19 pandemic: diverse contexts; different epidemics—how and why?. *BMJ global health* **5**(7), e003098 (2020)
32. Olalekan, A., Iwalokun, B., Akinloye, O. M., Popoola, O., Samuel, T. A., Akinloye, O.: COVID-19 rapid diagnostic test could contain transmission in low-and middle-income countries. *African Journal of Laboratory Medicine* **9**(1), 1–8 (2020)
33. Trends in Number of COVID-19 Cases and Deaths in the US Reported to CDC, by State/Territory, <https://covid.cdc.gov/covid-data-tracker/#trendsdailytrendscases>. Last accessed 12 Sept 2021
34. Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., ..., Agha, R.: The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International journal of surgery (London, England)* **78**, 185–193 (2020)
35. Shklovski, I., Burke, M., Kiesler, S., Kraut, R.: Technology adoption and use in the aftermath of Hurricane Katrina in New Orleans. *American Behavioral Scientist* **53**(8), 1228–1246 (2010)
36. Qu, Y., Huang, C., Zhang, P., Zhang, J.: Microblogging after a major disaster in China: a case study of the 2010 Yushu earthquake. In: *Proceedings of the ACM 2011 conference on Computer supported cooperative work*, pp. 25–34. ACM (2011)
37. Williams, S. N., Armitage, C. J., Tampe, T., Dienes, K.: Public perceptions of non-adherence to COVID-19 measures by self and others in the United Kingdom. *MedRxiv* (2020)
38. Huang, Y. L., Starbird, K., Orand, M., Stanek, S. A., Pedersen, H. T.: Connected through crisis: Emotional proximity and the spread of misinformation online. In: *Proceedings of the 18th ACM conference on computer supported cooperative work & social computing*, pp. 969–980. ACM (2015, February)
39. Starbird, K., Spiro, E., Edwards, I., Zhou, K., Maddock, J., Narasimhan, S.: Could this be true? I think so! Expressed uncertainty in online rumoring. In: *Proceedings*

- of the 2016 CHI Conference on Human Factors in Computing Systems, pp. 360–371. ACM (2016, May)
40. Courtemanche, C., Garuccio, J., Le, A., Pinkston, J., Yelowitz, A.: Strong Social Distancing Measures In The United States Reduced The COVID-19 Growth Rate: Study evaluates the impact of social distancing measures on the growth rate of confirmed COVID-19 cases across the United States. *Health Affairs* **39**(7), 1237–1246 (2020)
 41. Berger, C. R.: Beyond initial interaction: Uncertainty, understanding, and the development of interpersonal relationships. *Language and social psychology* **6**, 122–144 (1979)
 42. Bordia, P., DiFonzo, N.: Problem solving in social interactions on the Internet: Rumor as social cognition. *Social Psychology Quarterly* **67**(1), 33–49 (2004)
 43. Shibutani, T.: *Improvised news: A sociological study of rumor*. Ardent Media (1966)
 44. Festinger, L.: *A theory of cognitive dissonance* (Vol. 2). Stanford university press (1957)
 45. Muhren, W., Eede, G. V. D., Walle, B. V. D.: Sensemaking and implications for information systems design: Findings from the Democratic Republic of Congo’s ongoing crisis. *Information technology for development* **14**(3), 197–212 (2008)
 46. Gastil, J.: *Political communication and deliberation*. Sage (2008)
 47. Kriplean, T., Morgan, J., Freelon, D., Borning, A., Bennett, L.: Supporting reflective public thought with considerit. In: *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work*, pp. 265–274. ACM (2012, February)
 48. Semaan, B., Faucett, H., Robertson, S. P., Maruyama, M., Douglas, S.: Designing political deliberation environments to support interactions in the public sphere. In: *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, pp. 3167–3176. ACM (2015, April)
 49. Borning, A., Friedman, B., Davis, J., Lin, P.: Informing public deliberation: Value sensitive design of indicators for a large-scale urban simulation. In: *ECSCW*, pp. 449–468. Springer (2005)