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Navigating the COVID-19 Health Crisis: A Content Analysis of Organizational Communication Strategies on Social Media

Yuhan Wang

Correspondence: Yuhan Wang, Convergence Media Center, Guangdong University of Technology, Guangzhou, Guangdong, 510006, China.

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Abstract

The COVID-19 pandemic has posed an unprecedented threat to global health and well-being, with social media emerging as a pivotal platform for organizations to disseminate outbreak-related information swiftly, thereby shaping public risk perceptions and influencing preventive behaviours. Guided by the Crisis and Emergency Risk Communication (CERC) model, this study examines COVID-19-related content posted by organizations on Sina Weibo, focusing on the communication strategies employed and their impact on public engagement. Using content analysis and Semantic Network Analysis (SNA), a dataset of 10,996 salient Weibo posts was collected and analysed. Findings reveal that word prevalence, inter-word relationships, and the use of CERC model elements varied across different crisis stages and organization types. The analysis indicates that posts predominantly emphasized case reports, responders, governmental interventions, and positive outcomes. Furthermore, in terms of public engagement, certain content dimensions—such as requests for feedback, expressions of appreciation, and provision of detailed informational resources—were particularly effective in drawing public attention.

Keywords: organizational communication strategies, social media, risk and crisis communication, COVID-19, Crisis and Emergency Risk Communication (CERC) model

1. Introduction

The COVID-19 pandemic has precipitated a significant global health crisis. Governments and organizations worldwide have implemented numerous measures to mitigate risks and facilitate societal recovery, such as urban lockdowns and quarantines. However, the success of these initiatives critically hinges on public compliance with health guidelines. Extensive research underscores the effectiveness of health behavior adoption, like mask-wearing, in curbing virus transmission and reducing infections(Chu et al., 2020; Eikenberry et al., 2020; Koh et al., 2020). Consequently, motivating public adherence to protective health behaviors has become paramount.

Effective risk and crisis communication is a key factor in promoting health behaviour adoption(Sumo et al., 2019). During the COVID-19 pandemic, social media emerged as a vital information source, with the public frequently relying on these platforms for timely updates on safety guidelines and related news(Dawi et al., 2021; Li et al., 2020; Saud et al., 2020). This constant flow of information has significantly shaped public perceptions and understanding of the crisis, influencing behavioral responses and the efficacy of governmental policy implementation(Cinelli et al., 2020; van der Meer, 2018).

China has achieved considerable success in its battle against the COVID-19 pandemic, becoming one of the first economies to rebound from its impacts. This achievement is largely attributed to China's robust pandemic information dissemination system, which emphasizes continuous news updates and positive risk communication, effectively encouraging the public to adhere to national health directives(Dai et al., 2020). The extensive exposure to pandemic-related media in China has effectively fostered positive public perceptions and compliance with preventive behaviors(I. Ju et al., 2021).

However, the effectiveness of crisis communication varies across organizations. Research indicates that organizations differ in their crisis management and communication strategies depending on their nature (e.g., state-owned vs. private), type (e.g., government vs. corporate), and internal culture and structure(Li et al., 2017). This diversity underscores the importance of understanding how different organizations communicate during crises and the subsequent impact on public behavior.

This study employs the Crisis and Emergency Risk Communication (CERC) model to investigate the information dissemination strategies and effects of various organizations in China on social media during the COVID-19 pandemic. The success of China's epidemic response, combined with its distinctive management and communication mechanisms, provides a unique context for this investigation. Through our analysis, we aim to offer both theoretical insights and practical recommendations for enhancing risk and crisis communication.

2. Literature review

2.1 Risk Communication and Crisis Communication

Risk communication is pivotal in informing the public to potential threats and guiding proactive measures to mitigate harm(Hagen et al., 2020). In catastrophic emergencies, it serves as a crucial part of organizational response, significantly influencing disaster management effectiveness. Crisis communication, on the other hand, involves using communication strategies to effectively manage information and meaning, thereby fostering stakeholders'understanding and identification. This, in turn, aids in maintaining organizational reputation and reducing damage(Coombs & Holladay, 2014). Both risk and crisis communication are paramount in managing and mitigating the adverse consequences of public health crises, notably the COVID-19 pandemic(Flores & Asuncion, 2020).

In public health, research has largely concentrated on the characteristics and styles of messaging, effective crisis communication strategies, the influence of risk and crisis communication on public attitudes and behaviors, and public perceptions of risk-related messages(Chan et al., 2018; Oh et al., 2021; Sobowale et al., 2020; B. Yang et al., 2021). For instance, Meadows et al. (2021) analyzed Weibo posts from major state-owned media in China during the COVID-19 pandemic, finding that these posts primarily focused on virus investigations, government policies, response efforts, and preventive measures, all aimed at reinforcing government legitimacy. Similarly, Wang et al. (2021) examined tweets from U.S. federal agencies and health departments during the COVID-19 outbreak, observing notable differences in timing, frequency, and content among agencies.

Despite the valuable insights provided by existing studies, the ongoing evolution of the pandemic underscores the need for more nuanced, context-specific, and multi-dimensional research. This study addresses this gap by employing both traditional content analysis and Semantic Network Analysis (SNA) to explore the communication themes of various organizations on social media throughout the pandemic. Accordingly, we pose the following research question:

RQ1: How have organizations presented risk and crisis themes and content on social media during the COVID-19 pandemic?

2.2 Crisis and Emergency Risk Communication (CERC)

The CERC model, originating from practices developed by the U.S. Centers for Disease Control and Prevention, emphasizes the need to consider the social, psychological, and physical dimensions of crises to effectively minimize community harm(Reynolds, 2010). It is built upon six key principles: correctness, credibility, empathy, action promoting, and respect. The model advocates that trust, compliance, and support during a crisis can be partially attained by providing the public with essential information to correctly perceive and understand the crisis(Ophir, 2018; Veil et al., 2008). It categorizes crisis events into five stages—precrisis, initial, maintenance, resolution, and evaluation—each recommending tailored communication strategies.

In the precrisis stage, communication efforts center on raising public awareness and promoting health education, with messages adapting to changing risks. The initial stage prioritizes the universality, timeliness, and relevance of communications, facilitating swift assessments and the dissemination of information on crisis progression and possible outcomes. This stage also emphasizes psychological support to encourage effective health behaviors and appropriate crisis responses (Avery & Park, 2016; Chong et al., 2020). The maintenance stage involves support provision, clarification of misconceptions, and confidence reinforcement, crucial for counteracting rumors and misinformation. The resolution stage Continues the dissemination of health information to encourage enduring positive health behaviors and a comprehensive understanding of the risks, preparing communities for future crises. while the evaluation stage Concentrates on summarizing lessons learned and refining future response strategies.

The CERC model's communication strategies have proven highly adaptable and effective in public health contexts. Infectious disease crises, in particular, tend to align well with the model's stages and principles (Reynolds & W. SEEGER, 2005).For instance, Yong et al. (2020) developed a questionnaire based on the CERC model to assess perceptions during the COVID-19 pandemic in a Singaporean hospital, confirming the model's critical role in crisis management. Similarly, Sauer et al. (2021) analyzed the crisis responses of U.S. public health agencies and government departments through the CERC model's key principles.

The CERC model has also been employed to evaluate media coverage of public health crises. Ophir (2018)investigated the coverage of H1N1, Ebola, and Zika in mainstream U.S. newspapers, noting discrepancies between actual coverage

and CDC's goals under the CERC model. Vos and Buckner (2016) analyzed Twitter messages regarding the H7N9 virus, observing a prevalence of sense-making content but a lack of efficacy-focused information.

Despite its extensive application, literature often highlights areas for improvement in the CERC model, such as enhancing organizational preparedness and reducing uncertainty, with most studies focusing on specific organizational practices or case studies. Notably, there remains a gap in understanding how diverse institutions—including health organizations, governments, and businesses—strategize their communications during epidemics, particularly in non-Western contexts like China. To address these gaps, this study poses the following research questions:

RQ2: How have organizations exemplified the CERC model on social media during different stages during the COVID-19 pandemic?

RQ3: Are there distinctions in how various organizations have exemplified the CERC model on social media during the COVID-19 pandemic?

2.3 Health Campaigns on Social Media and Public Engagement

Public health campaigns strive to enhance health knowledge, bolster positive behaviors, and mitigate health risks (Dumbrell & Steele, 2015; Poole et al., 2014). Technological advances have elevated social media as a vital tool for health campaigns, leveraging its capacity to disseminate information rapidly in an interactive and engaging setting. Public engagement on these platforms—evident through emotional, cognitive, and behavioral responses to organizational messages—serves as a key measure of campaign effectiveness (Ji et al., 2019). Engagement typically manifests as likes, reposts, and comments, each reflecting underlying psychological and cognitive factors that shape behavior (Khan, 2017; Kim & Yang, 2017). Media health campaigns predominantly aim to influence proximal variables such as awareness, comprehension, and attitudes, making audience engagement a critical metric for evaluating campaign success (Halsall et al., 2019).

The effectiveness of health campaigns is significantly shaped by various forms of content presentation, including content type, media format, emotional tone, and associated social cues (Bonson et al., 2019; Gough et al., 2017; Lee-Won et al., 2016; Rubenking, 2019; Wang et al., 2019). Studies suggest that the success of health campaigns by organizations can be hindered by underutilizing social media's structural features, such as hashtags, images, and links, which are known to enhance public engagement (Chung, 2016; Theiss et al., 2016). For example, Chen et al. (2021) analyzed TikTok posts from China's National Health Commission during the COVID-19 crisis, finding that while governmental guidance fostered retweeting behavior, more immediate crisis reports tended to receive fewer likes.

Considering the evolving landscape of social media and its impact on health communication, this study seeks to explore the dynamics of organizational content and its effects on public engagement during health crises. Accordingly, we propose the following research question:

RQ4: How does the content posted by organizations on social media affect social media engagement?

3. Methods

3.1 Study Design

The study began with the official disclosure of the novel coronavirus outbreak by the Wuhan Municipal Health Commission on December 31, 2019. Recognizing the evolving trajectory of the pandemic, which largely stabilized within China by March 2020—with most subsequent outbreaks occurring internationally—we conducted our content analysis over a period from December 31, 2019, to March 31, 2020. This timeframe encompasses the escalation, peak, and initial decline of the pandemic within China.

For data analysis, we employed Semantic Network Analysis (SNA) alongside traditional content analysis. SNA is valuable in identifying frequently mentioned terms and understanding the structural interconnectivity within textual data by examining word co-occurrence(Xiong et al., 2019). In semantic networks, nodes represent key pieces of information, while connections (or edges) indicate shared meanings and associations, allowing us to infer the framing, selective presentation, or omission of content by organizations(Shim et al., 2015; Tang et al., 2018).

3.2 Data Collection

Sina Weibo, comparable to Twitter and Facebook, was selected as the primary platform for this study due to its extensive user base in China(Bolsover & Howard, 2019). As of September 2020, Weibo had an impressive 511 million monthly active users(Weibo Corporation, 2020). During the COVID-19 pandemic, Weibo has served as a crucial medium for information dissemination, public mobilization, and emotional expression(Chen et al., 2020; Han et al., 2020).

Our dataset comprised all original Weibo posts related to COVID-19 featured in the platform's "Hot" section between December 31, 2019, and March 31, 2020. This section highlights content with the highest user engagement, including

search lists, posts, topics, and updates(Zhao et al., 2020). Given the vast and rapidly updating nature of this data, we utilized a computer program to scrape relevant posts, ensuring a comprehensive and accurate collection. Search criteria included keywords such as “新型肺炎” (novel pneumonia), “新冠肺炎” (novel coronavirus pneumonia), “冠状病毒” (coronavirus), and “疫情” (COVID-19 pandemic). The initial data pull yielded 17,103 Weibo posts. After rigorous filtering—excluding posts unrelated to COVID-19, containing minimal relevant content, duplicates, non-accredited organization posts, or posts without textual content—the final sample consisted of 10,996 posts.

3.3 Crisis Stage

The CERC model conceptualizes crisis development as stage-specific, with distinct communication strategies suited to each phase. However, the model lacks precise boundaries between these stages. Given the prolonged and evolving nature of the COVID-19 pandemic, we adapted the CERC model to the context of the pandemic in China, informed by prior research and official discourse(Lu, 2020; State Council Information Office of the People's Republic of China, 2020). This adaptation led to the establishment of three distinct stages.

The precrisis stage spanned from December 31, 2019, to January 19, 2020, marking the period before the outbreak was widely recognized. To provide a nuanced understanding of the initial stage, we further divided it into two substages based on the crisis’s progression. Initial Stage 1 extended from January 20 to February 20, 2020, characterized by the official acknowledgment of human-to-human transmission and the enforcement of stringent health measures. Initial Stage 2 followed from February 21 to March 17, 2020, representing a phase of intensified containment efforts and gradual societal recovery. Finally, the Maintenance Stage ran from March 18 to March 31, 2020, beginning with the notable milestone of no new confirmed domestic cases in China.

Due to the limited number of posts from the precrisis stage, our analysis concentrated on the latter three stages: Initial Stage 1 (Stage I), Initial Stage 2 (Stage II), and Maintenance Stage (Stage III), offering a comprehensive view of the pandemic's evolution and corresponding responses in China.

3.4 Coding Scheme

To construct a comprehensive coding scheme, we began with an extensive literature review of studies relevant to CERC model. This initial review established foundational categories for our coding framework. Subsequently, we conducted a preliminary analysis on a random sample of data to refine these categories, ensuring they accurately represented the textual content and contextual usage within our dataset.

Our coding scheme consists of three types of codes. General Information codes capture basic metadata, including publication dates and engagement metrics (such as comments, likes, and reposts), providing a foundational understanding of each post’s reach and impact.

Drawing from prior research(Lwin et al., 2018; Ophir, 2019), we distilled the core elements of the CERC model into six major dimensions: risk messages, warnings, preparations, uncertainty reduction, efficacy, and reassurance. Detailed definitions for each code are provided in Table 1.

Finally, publisher identities were classified into 12 specific categories: central party and government institutions, local party and government institutions, medical public institutions, nonmedical public institutions, nonprofit associations, international organizations (i.e., accredited agencies of other governments), private enterprises, state-owned enterprises, foreign enterprises, central media, local media, and new media. This classification enables a nuanced analysis of the diverse communicative actors involved in disseminating information during the pandemic. This multifaceted coding approach provides a robust framework for data analysis, ensuring a comprehensive understanding of both the content and context of the risk and crisis communication observed.

Table 1.Codebook

CERC model key variables	Definition	Example
Risk messages		
Disease mechanisms	Messages include details on the occurrence and transmission of COVID-19.	"Novel coronaviruses are associated with wildlife."
Symptoms	Messages describing COVID-19 symptoms.	"Most patients experience symptoms of lower respiratory tract infection, such as dyspnea."
Warnings		
Risk factors	Messages outlining risk factors for contracting COVID-19	"Novel coronavirus can be transmitted by contact."
Threat	Messages mentioning the threat posed to the country, society, or individuals.	"We all recognize that the situation of coronavirus transmission is critical and likely to deteriorate further."
Preparations		
Responders	Messages mentioning organizations or persons managing the outbreak.	"City CDC informs about the case of Ms. Lai imported from the United States."
Recommendations	Messages providing advice on actions to prevent COVID-19	"If you notice symptoms of infection, such as fever, please call the hotline immediately to report it."
Uncertainty reduction		
Case report	Messages providing updates on case numbers and clusters	"Novel pneumonia has killed 17 persons in Hubei."
Local locality	Messages including geographic details related to COVID-19 cases.	"A 36-year-old male patient, usually residing in Futian, Shenzhen."
Information resources	Messages that provide access to further information resources.	"For more details, please visit↓↓ #Crowded to fight the epidemic#."
Feedback	Messages addressing public or media concerns (e.g., rumors).	"There is no evidence that pets like dogs and cats can be infected with the novel coronavirus."
Efficacy		
Common responsibility	Messages expressing collective responsibility among the public and stakeholders.	""The whole society is working together to prevent and control the epidemic."
Self-efficacy	Messages encouraging personal confidence in taking preventive measures.	"One of the best and healthiest actions right now is self-isolation."
Response efficacy	Messages emphasizing the effectiveness of recommended preventive behaviors.	"Experts say mild cases are easily cured with traditional Chinese medicine."
Collective efficacy	Messages highlighting community or societal capabilities in COVID-19 prevention.	"Information exchange mechanisms have been established between cities to promote efficient epidemic management."
Reassurance		
Calming	Messages aiming to alleviate uncertainty or fears (e.g., treatment developments).	"Academician Chen Xiaoping: a vaccine will soon be available; drug research is underway."
Thanking and regards	Messages expressing gratitude or appreciation.	"I would like to express my appreciation and gratitude to China for its successful pandemic response."
Government interventions	Messages detailing government interventions (e.g., quarantine measures).	"Guangdong requires all entrants to quarantine at their own expense for 14 days."

3.5 Intercoder Reliability

To ensure coding reliability, the process was conducted by the primary author alongside an undergraduate student majoring in public health and preventive medicine. A training period, including trial coding of selected posts, was organized to familiarize the secondary coder with the coding process and category definitions. Following this training and an initial trial coding of 10% of the dataset, discussions were held to resolve any inconsistencies and to establish a unified understanding of the coding categories. The average Cohen's kappa across all categories was above 0.83, indicating a high level of agreement between the coders.(Hallgren, 2012).

3.6 Statistical Analyses

The statistical analysis was conducted in two stages. First, we used the ROST Content Mining System version 6.0 (ROST CM6) for word segmentation, which facilitated both semantic network and social network analysis. The second stage of analysis was performed using SPSS (version 26.0). We applied the chi-square test to investigate the relationships between crisis stage and information type, as well as between organization type and information type.

To address the data's dispersion and variance commonly observed in communication studies, we employed a negative binomial regression model. This model is particularly appropriate for count data with over-dispersion and has been validated for its effectiveness in various types of communication research(Alhassan & AlDossary, 2021; Payne et al., 2018). Using this model, we examined the relationship between different content dimensions and levels of public engagement.

4. Results

In addressing Research Question 1 (RQ1) regarding how organizations presented risk and crisis themes and content on social media during the COVID-19 pandemic, our study employed word frequency analysis and semantic network analysis of posts from organizations on Sina Weibo.

We categorized these keywords into five distinct groups based on contextual relevance and frequency:

a) Medical high-frequency terms: This category includes terms directly related to the medical dimensions of the crisis, such as "pneumonia," "cases," and "confirmed diagnosis." These keywords are central to posts that emphasize the health and medical specifics of COVID-19 and its effects.

b) Action-oriented high-frequency terms: Keywords such as "prevention and control," "quarantine," and "detection" represent the active measures and strategies employed or recommended by organizations to curb the pandemic's spread.

c) Emotional high-frequency terms: Terms like "we" and "cheer up" signify the emotional and motivational aspects of the communications, focusing on solidarity, encouragement, and emotional support during the crisis.

d) Geographic high-frequency terms: This category encompasses place names such as "China," "Hubei," "Wuhan," and "the United States," indicating the geographic spread and areas of concern or focus during the crisis.

e) Situational high-frequency terms: Terms such as "epidemic," "newly increased," and "total" provide context and updates about the pandemic's evolving situation.

semantic network analysis reveals the modular structure of the discourse, with 3–4 modules emerging in each crisis stage, each representing distinct thematic focuses(Figure 1). In Stage I, the network can be divided into modules centered on topics such as the virus, case notifications, treatment, and observation. The virus module emerges as the most central, underscoring the primary concern with understanding and communicating the characteristics and transmission of COVID-19. Stage II shows a slight shift in focus, with fewer modules but an increased number of terms, reflecting a broader discourse that includes recovery discussions. Finally, Stage III presents a more diversified thematic network, encompassing topics such as case updates, locations of outbreaks, and imported cases, indicating an expanded and more complex discourse as the pandemic's impacts evolved.

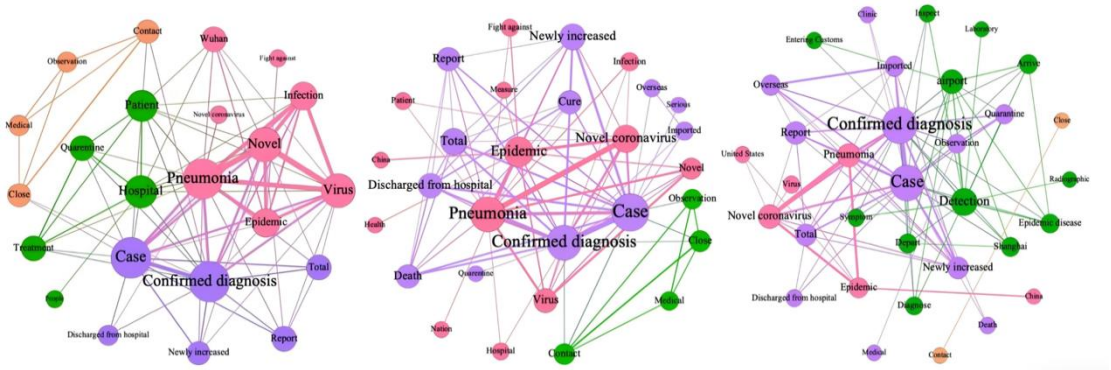

Figure 1. Network analysis of high-frequency words posted on Weibo in different Stages

RQ2 sought to assess how elements of the CERC model were represented in messages posted by organizations on Weibo during the COVID-19 pandemic. The chi-square test revealed that differences in the frequencies of these variables were statistically significant (χ^2=12301, p<.001). Among the elements, "case report" was the most frequently mentioned (n=2625, 23.9%), followed closely by "responders" (n=2472, 22.5%), "government interventions" (n=2262, 20.6%), and "collective efficacy" (n=2216, 20.2%). Conversely, "response efficacy" appeared least often, accounting for only 0.2% of the elements (n=23).

To further investigate the dynamics of communication across different stages of the pandemic, chi-square tests were applied to examine variations in information types. Most message types exhibited shifts over the stages; for instance, mentions of "disease mechanisms" dropped from 2.3% in Stage I to 0.8% in Stage III (χ^2=24.6, p<.001). These longitudinal chi-square tests confirmed significant differences in communication dimensions across the three stages, underscoring the adaptive nature of crisis communication in response to the pandemic's progression.

RQ3 explored how different organizations on Weibo demonstrated elements of the CERC model, employing both longitudinal and lateral comparisons to understand the diversity and dynamics of their communication strategies. Significant differences were observed in the frequencies of all CERC model elements across organizations, with the exception of "response efficacy."

In the category of "risk messages," international organizations and local media outlets most frequently referenced "disease mechanisms" (χ^2=73.5, p<.001), while local party and government institutions primarily mentioned "symptoms" (χ^2=124.8, p<.001). For "warnings," central and local media outlets were the most vocal about infection risk factors (χ^2=73.5, p<.001). The "preparations" category saw widespread mentions across all organization types, with local party and government institutions frequently referencing "responders" (χ^2=784, p<.001) and medical public institutions focusing on "recommendations" (χ^2=49.7, p<.001).

Regarding "uncertainty reduction," local party and government institutions and central media were prominent in reporting case updates (χ^2=812.6, p<.001), while international organizations and private enterprises led in offering diverse information formats (χ^2=49.7, p<.001). In terms of "efficacy," nonprofit and international organizations emphasized "common responsibility" (χ^2=253.4, p<.001), private companies focused on "self-efficacy" (χ^2=100.9, p<.001), and local party and government institutions frequently highlighted "collective efficacy" (χ^2=966.7, p<.001). Finally, "reassurance" elements were broadly utilized across organizations, especially through expressions of "thanks and regards."

To examine the impact of content on social media engagement (RQ4), our analysis indicated that most predictor variables significantly influenced engagement metrics, although there were some variations among "risk factors," "responders," and "case report."

Specifically, "case report" emerged as a significant predictor of both reposts and likes (reposts: β=-0.32, SE=0.051, p<.001; likes: β=0.25, SE=0.05, p<.001), while "responders" significantly influenced comments and likes. Within the uncertainty reduction dimension, "information resources" strongly predicted reposts (β=0.58, SE=0.04, p<.001), and "feedback" was a robust positive predictor for both likes and comments (likes: β=1.13, SE=0.06, p<.001; comments: β=0.96, SE=0.06, p<.001).

For preparation, only "recommendations" negatively predicted engagement metrics. In the reassurance dimension, "government intervention" had a mixed impact—reducing reposts but increasing likes and comments.

5. Discussion

The importance of risk and crisis communication in guiding the public to mitigate harm and reduce negative outcomes has been increasingly recognized by various organizations (Guidry et al., 2017; Ozanne et al., 2020). Despite this, the roles of governments and nonprofit organizations during infectious disease outbreaks have been underexplored in the existing literature(Lachlan et al., 2016), which has often relied on unidimensional research methods. This study, guided by the CERC model and health communication literature, seeks to address these gaps by analyzing the content and public engagement of organizational posts on Weibo during different stages of the COVID-19 crisis, from December 31, 2019, to March 31, 2020.

5.1 Semantic Network of Messages Posted by Organizations on Weibo

Our findings indicate that the keywords used by organizations in their Weibo posts varied significantly across different stages of the crisis, reflecting the evolving nature of the pandemic and corresponding shifts in communication focus. During the initial stage, terms such as "epidemic," "pneumonia," "confirmed," "prevention and control," "Wuhan," "newly increased," and "masks" were predominant, aligning with the Chinese government's extensive interventions and the widespread societal and healthcare impacts. As the situation progressed to the second stage, with a decline in new cases, the narrative shifted toward recovery, with terms like "discharged" and "cure" becoming more central in the discourse. The third stage saw a focus on "imported" cases and other related terms, reflecting the emerging challenge of managing cases from abroad and a gradual shift toward resuming normal activities, as indicated by terms like "school opening."

The study underscores the critical role of social media in shaping public perceptions during a health crisis. As individuals turn to these platforms for timely and relevant information, the content provided by organizations significantly influences public understanding and response to the crisis. This finding aligns with previous research, which highlights that during infectious disease outbreaks, individuals actively seek information about the disease, its impact, and response strategies on social media platforms(Lu & Zhang, 2020; Zhao et al., 2020).

Consequently, the study suggests that in preparation for future epidemics, organizations should not only increase the provision of content directly related to the disease but also continuously adapt their communication strategies to reflect the evolving landscape of the crisis. By doing so, organizations can more effectively address public concerns and contribute to a more informed and prepared society. This approach requires a dynamic and responsive communication strategy, one that can navigate the complexities of a health crisis and leverage the power of social media to disseminate critical information and foster collective action.

5.2 CERC Model Elements on Social Media

Throughout the pandemic, the representation of CERC model elements on social media followed a dynamic pattern, adapting to the evolving crisis stages. Initially, organizations focused on case numbers, governmental measures, societal efforts, risk factors, and protective measures, reflecting a comprehensive approach to crisis communication. As the pandemic progressed and public familiarity with the crisis increased, the focus shifted towards sustaining public morale, reducing uncertainty, and promoting ongoing vigilance through real-time updates and encouragement of continued protective behaviors.

This pattern highlights that social media serves as a powerful tool for implementing the CERC model, enabling organizations to strategically communicate risk and crisis information. However, the analysis revealed that posts rarely addressed the mechanisms of the disease, local specifics, or response efficacy. This omission may reflect the limited information available during the early stages of the pandemic when understanding of the virus was still developing.

The CERC model emphasizes the importance of sense-making and efficacy information in fostering crisis awareness, reducing harm, and enhancing crisis coping capabilities. Over half of the posts concentrated on outbreak notifications, organizational measures, and risk information, likely contributing to alleviating public uncertainty. Despite previous studies identifying response efficacy as a key factor in encouraging individuals to adopt health behaviors during infectious disease outbreaks(Cui et al., 2017; Yu et al., 2020), response efficacy was notably underrepresented. This may be attributed to the early absence of a vaccine and the incomplete understanding of the novel coronavirus, leading organizations to cautiously address response efficacy in their communications.

Interestingly, the use of efficacy-related information varied among organizations. Nonprofit organizations frequently emphasized communal responsibility, reflecting their public service orientation, while private enterprises focused on self-efficacy, often integrating it with interactive activities and promotions. This suggests that while organizations adhered to the general guidelines of the CERC model, they tailored their communication strategies to align with their specific goals and audience engagement strategies.

Despite the CERC model's emphasis on addressing diverse informational needs, our study identified a lack of tailored guidance for specific groups, such as the elderly, pregnant women, or children, as well as a noticeable absence of mental health information. Mental health issues, a significant secondary effect of COVID-19(Cameron et al., 2020), were insufficiently addressed in organizational posts.

Regarding public engagement, our findings align with prior research showing that certain types of messages, particularly those offering reassurance and reducing uncertainty, foster higher engagement(Chen et al., 2020; Lwin et al., 2018). Conversely, information related to recommendations was negatively associated with engagement levels, possibly due to public saturation with preventive information and the anxiety resulting from information overload. This underscores the need for organizations to adapt their messaging strategies continually, avoiding redundancy and ensuring that communication remains relevant and urgent.

In line with previous studies, we found that content relating to disease symptoms, threats, confirmed cases, and collective action tends to garner higher public engagement(Li et al., 2021; Tang et al., 2021). Interestingly, "local locality" information, though less frequently mentioned, was positively associated with public engagement. This supports the idea that content addressing individuals' immediate surroundings or personal experiences is more engaging, as it resonates with their direct concerns (Kothari et al., 2022).

Moreover, while our study did not specifically categorize media richness (such as images, hyperlinks, or videos), we found that these information resources strongly predicted public engagement. This finding is consistent with prior research, which suggests that a diverse presentation of information can mobilize psychological factors for information processing, especially in contexts like the COVID-19 pandemic, where movement is restricted and individuals rely heavily on digital media (R. Ju et al., 2021; Y. Yang et al., 2021).

Reflecting on the application of the CERC model, which originated in public health practice, our study suggests that while the model offers a robust framework, modifications and adaptations are often necessary to fit specific contexts and crises. We observed that certain social media responses from organizations during the crisis did not fully align with traditional CERC elements such as gratitude, common responsibility, and collective efficacy. These findings suggest

that the CERC model may need further adaptation to account for the dynamic and interactive nature of social media, which enables broader, more diverse health communication strategies. This includes considering how organizations can leverage social media to stabilize social order and mobilize resources.

Furthermore, while the CERC model emphasizes addressing concerns and correcting misperceptions during its maintenance phase (Veil et al., 2008), our study found that providing feedback is critical across all crisis stages, serving as a significant driver of engagement. Given the prevalence of infodemics during crises, particularly in the COVID-19 pandemic (Zhang et al., 2021), timely and effective feedback is crucial. Organizations should leverage social media to provide prompt responses, thereby reducing uncertainty and countering misinformation.

Lastly, while the CERC model outlines distinct communication strategies for different crisis stages, it does not clearly define these stages. By subdividing the stages based on the pandemic's progression, we found that organizations' strategic use of social media varied not only across but also within these phases. As the crisis progressed from the initial to the later stages, the focus of communication shifted from the severity and susceptibility of the virus to recovery and preventive measures for incoming threats. This observation suggests a need for further exploration and validation of the CERC model's application, particularly in non-Western contexts, to optimize its effectiveness in guiding crisis communication across various stages and scenarios.

5.3 Strategies for Seeking Opportunities from Crises on Social Media

Throughout the COVID-19 crisis, organizations have leveraged social media not only as a platform for crisis communication but also as a means to seek opportunities and build relationships. Studies have shown that the release of high-quality information early in an outbreak significantly reduces infection rates(Du et al., 2021), underscoring the critical importance of timely and accurate information dissemination. Social media's role extends beyond information distribution; it becomes a medium for organizational growth and the strengthening of public relations.

Chinese organizations, which are culturally inclined to capitalize on crises through strategies such as holding conferences, declaring victories, and praising exemplary figures(Jing, 2021), have effectively utilized social media to highlight their contributions and proactive measures in combating the COVID-19 pandemic. This trend is widespread across different organizational types, with government agencies, in particular, leveraging social media to mobilize public support. Messages often emphasize the fight against the pandemic as a collective responsibility, rallying community efforts and expressing confidence and hope. This reflects a consistent approach to mobilization, despite variations in organizational types.

The digital landscape, shaped by governance, societal norms, and cultural habits, significantly influences content production and distribution (Van Dijck & Poell, 2013). China's centralized governance structure and unique political system have played a crucial role in coordinating a unified response to the pandemic (Cai et al., 2021). This coordination extends to private and social organizations, aligning them with government directives and integrating them into the collective fight against the pandemic. The frequent and co-occurring references to government prevention and control measures in social media posts emphasize this alignment.

In societies with a strong collectivist culture, such as those influenced by Confucian values, the mobilizing power of government and collective action is often more effective and better received (Yan et al., 2020). This cultural predisposition towards collectivism and compliance with mandatory measures enhances the impact of social media mobilization strategies, making them more powerful tools for public engagement and behavior change.

Our study affirms the pivotal role of social media during the pandemic, emphasizing its potential for organizations to navigate crises effectively, strengthen community ties, and explore new avenues for engagement and growth. By confirming the significant role of social media in crisis communication, our study aligns with previous research and provides valuable insights for future exploration into the strategic use of social media for crisis management. This research highlights the multifaceted role of social media in crises—not only as a tool for information dissemination and risk communication but also as a strategic platform for organizational development, public mobilization, and societal resilience.

6. Limitations and Future Research

While this study provides valuable insights into the use of social media for risk and crisis communication, particularly through the lens of the CERC model, it is not without its limitations. First, the study focused exclusively on "hot" content from Weibo, which may have overlooked a broader spectrum of organizational communications. By concentrating on the most engaged posts, we may have missed less popular but still relevant information. Future studies should consider a more inclusive sampling strategy that captures a wider range of posts, including those that may not have garnered significant attention or circulation but still contribute important insights.

Additionally, our analysis was confined to the microblogging platform Weibo, which limits the scope of the findings to a single platform. Social media communication is multifaceted, with different platforms offering unique user bases,

functionalities, and cultural contexts. These factors can significantly influence the nature and effectiveness of crisis communication. Previous research has suggested that various social media platforms can have different effects on public engagement, behavior, and attitudes(Guidry et al., 2017; Vannucci et al., 2019). Therefore, to gain a more comprehensive understanding of risk and crisis communication across digital platforms, future research should expand to include multiple social media types. This would allow for an examination of how organizations tailor their communication strategies to the unique characteristics of each platform, and how these strategies impact different audience segments.

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Data sharing statement

No additional data are available.

References

Alhassan, F. M., & AlDossary, S. A. (2021). The Saudi Ministry of Health's Twitter Communication Strategies and Public Engagement During the COVID-19 Pandemic: Content Analysis Study. *JMIR Public Health Surveill*, *7*(7), e27942. https://doi.org/10.2196/27942

Avery, E., & Park, S. (2016). Effects of crisis efficacy on intentions to follow directives during crisis. *Journal of Public Relations Research*, *28*(2), 72-86.

Bolsover, G., & Howard, P. (2019). Chinese computational propaganda: automation, algorithms and the manipulation of information about Chinese politics on Twitter and Weibo [Article]. *Information Communication & Society*, *22*(14), 2063-2080. https://doi.org/10.1080/1369118x.2018.1476576

Bonson, E., Perea, D., & Bednarova, M. (2019). Twitter as a tool for citizen engagement: An empirical study of the Andalusian municipalities. *Government Information Quarterly*, *36*(3), 480-489. https://doi.org/10.1016/j.giq.2019.03.001

Cai, C., Jiang, W., & Tang, N. (2021). Campaign-style crisis regime: how China responded to the shock of COVID-19. *Policy Studies*, 1-21. https://doi.org/10.1080/01442872.2021.1883576

Cameron, E. E., Joyce, K. M., Delaquis, C. P., Reynolds, K., Protudjer, J. L. P., & Roos, L. E. (2020). Maternal psychological distress & mental health service use during the COVID-19 pandemic [Article]. *Journal of affective disorders*, *276*, 765-774. https://doi.org/10.1016/j.jad.2020.07.081

Chan, M. P. S., Winneg, K., Hawkins, L., Farhadlooa, M., Jamieson, K. H., & Albarracin, D. (2018). Legacy and social media respectively influence risk perceptions and protective behaviors during emerging health threats: A multi-wave analysis of communications on Zika virus cases. *Social Science & Medicine*, *212*, 50-59. https://doi.org/10.1016/j.socscimed.2018.07.007

Chen, Q., Min, C., Zhang, W., Ma, X. Y., & Evans, R. (2021). Factors Driving Citizen Engagement With Government TikTok Accounts During the COVID-19 Pandemic: Model Development and Analysis. *Journal of medical Internet research*, *23*(2), Article e21463. https://doi.org/10.2196/21463

Chen, Q., Min, C., Zhang, W., Wang, G., Ma, X. Y., & Evans, R. (2020). Unpacking the black box: How to promote citizen engagement through government social media during the COVID-19 crisis [Article]. *Computers in Human Behavior*, *110*, 11, Article 106380. https://doi.org/10.1016/j.chb.2020.106380

Chong, Y. Y., Chien, W. T., Cheng, H. Y., Chow, K. M., Kassianos, A. P., Karekla, M., & Gloster, A. (2020). The Role of Illness Perceptions, Coping, and Self-Efficacy on Adherence to Precautionary Measures for COVID-19. *International journal of environmental research and public health*, *17*(18), 6540.

Chu, D. K., Akl, E. A., Duda, S., Solo, K., Yaacoub, S., Schunemann, H. J., & Review, C.-S. U. (2020). Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis [Review]. *Lancet*, *395*(10242), 1973-1987. https://doi.org/10.1016/s0140-6736(20)31142-9

Chung, J. E. (2016). A Smoking Cessation Campaign on Twitter: Understanding the Use of Twitter and Identifying Major Players in a Health Campaign. *Journal of Health Communication*, *21*(5), 517-526. https://doi.org/10.1080/10810730.2015.1103332

Cinelli, M., Quattrociocchi, W., Galeazzi, A., Valensise, C. M., Brugnoli, E., Schmidt, A. L., Zola, P., Zollo, F., & Scala, A. (2020). The COVID-19 social media infodemic [Article]. *Scientific Reports*, *10*(1), 10, Article 16598. https://doi.org/10.1038/s41598-020-73510-5

Coombs, W. T., & Holladay, S. J. (2014). How publics react to crisis communication efforts Comparing crisis response reactions across sub-arenas. *Journal of Communication Management*, *18*(1), 40-+. https://doi.org/10.1108/jcom-03-2013-0015

Cui, B., Liao, Q. Y., Lam, W. W. T., Liu, Z. P., & Fielding, R. (2017). Avian influenza A/H7N9 risk perception, information trust and adoption of protective behaviours among poultry farmers in Jiangsu Province, China. *BMC Public Health*, *17*, Article 463. https://doi.org/10.1186/s12889-017-4364-y

Dai, B. B., Fu, D., Meng, G. T., Liu, B. S., Li, Q., & Liu, X. (2020). The Effects of Governmental and Individual Predictors on COVID-19 Protective Behaviors in China: A Path Analysis Model. *Public Administration Review*, *80*(5), 797-804. https://doi.org/10.1111/puar.13236

Dawi, N. M., Namazi, H., Hwang, H. J., Ismail, S., Maresova, P., & Krejcar, O. (2021). Attitude Toward Protective Behavior Engagement During COVID-19 Pandemic in Malaysia: The Role of E-government and Social Media [Article]. *Frontiers in Public Health*, *9*, 8, Article 609716. https://doi.org/10.3389/fpubh.2021.609716

Du, E. H., Chen, E., Liu, J., & Zheng, C. M. (2021). How do social media and individual behaviors affect epidemic transmission and control? *Science of the Total Environment*, *761*, Article 144114. https://doi.org/10.1016/j.scitotenv.2020.144114

Dumbrell, D., & Steele, R. (2015, Jan 05-08). #worldhealthday 2014: The Anatomy of a Global Public Health Twitter Campaign.*Proceedings of the Annual Hawaii International Conference on System Sciences* [2015 48th hawaii international conference on system sciences (hicss)]. 48th Annual Hawaii International Conference on System Sciences (HICSS), Kauai, HI.

Eikenberry, S. E., Mancuso, M., Iboi, E., Phan, T., Eikenberry, K., Kuang, Y., Kostelich, E., & Gumel, A. B. (2020). To mask or not to mask: Modeling the potential for face mask use by the general public to curtail the COVID-19 pandemic [Article]. *Infectious Disease Modelling*, *5*, 293-308. https://doi.org/10.1016/j.idm.2020.04.001

Flores, R., & Asuncion, X. V. (2020). Toward an improved risk/crisis communication in this time of COVID-19 pandemic: a baseline study for Philippine local government units. *Jcom-Journal of Science Communication*, *19*(7), Article A09. https://doi.org/10.22323/2.19070209

Gough, A., Hunter, R. F., Ajao, O., Jurek, A., McKeown, G., Hong, J., Barrett, E., Ferguson, M., McElwee, G., McCarthy, M., & Kee, F. (2017). Tweet for Behavior Change: Using Social Media for the Dissemination of Public Health Messages. *JMIR Public Health Surveill*, *3*(1), e14. https://doi.org/10.2196/publichealth.6313

Guidry, J. P. D., Jin, Y., Orr, C. A., Messner, M., & Meganck, S. (2017). Ebola on Instagram and Twitter: How health organizations address the health crisis in their social media engagement [Article]. *Public Relations Review*, *43*(3), 477-486. https://doi.org/10.1016/j.pubrev.2017.04.009

Hagen, L., Neely, S., Scharf, R., & Keller, T. E. (2020). Social Media Use for Crisis and Emergency Risk Communications During the Zika Health Crisis. *Digital Government: Research and Practice*, *1*(2), 1-21. https://doi.org/10.1145/3372021

Hallgren, K. A. (2012). Computing inter-rater reliability for observational data: an overview and tutorial. *Tutorials in quantitative methods for psychology*, *8*(1), 23.

Halsall, T., Garinger, C., Dixon, K., & Forneris, T. (2019). Evaluation of a Social Media Strategy to Promote Mental Health Literacy and Help-Seeking in Youth. *Journal of Consumer Health on the Internet*, *23*(1), 13-38. https://doi.org/10.1080/15398285.2019.1571301

Han, X. H., Wang, J. L., Zhang, M., & Wang, X. J. (2020). Using Social Media to Mine and Analyze Public Opinion Related to COVID-19 in China [Article]. *17*(8), 22, Article 2788. https://doi.org/10.3390/ijerph17082788

Ji, Y. G., Chen, Z. F., Tao, W. T., & Li, Z. C. (2019). Functional and emotional traits of corporate social media message strategies: Behavioral insights from S&P 500 Facebook data [Article]. *Public Relations Review*, *45*(1), 88-103. https://doi.org/10.1016/j.pubrev.2018.12.001

Jing, Y. (2021). Seeking opportunities from crisis? China's governance responses to the COVID-19 pandemic. *International Review of Administrative Sciences*, *87*(3), 631-650. https://doi.org/10.1177/0020852320985146

Ju, I., Ohs, J., Park, T., & Hinsley, A. (2021). Interpersonal Communication Influence on Health-Protective Behaviors Amid the COVID-19 Crisis. *Health Communication*. https://doi.org/10.1080/10410236.2021.1956792

Ju, R., Jia, M. Y., & Cheng, J. Q. (2021). Promoting Mental Health on Social Media: A Content Analysis of Organizational Tweets. *Health Communication*, 1-10. https://doi.org/10.1080/10410236.2021.2018834

Khan, M. L. (2017). Social media engagement: What motivates user participation and consumption on YouTube? [Article]. *Computers in Human Behavior*, *66*, 236-247. https://doi.org/10.1016/j.chb.2016.09.024

Kim, C., & Yang, S. U. (2017). Like, comment, and share on Facebook: How each behavior differs from the other. *Public Relations Review*, *43*(2), 441-449. https://doi.org/10.1016/j.pubrev.2017.02.006

Koh, W. C., Naing, L., & Wong, J. (2020). Estimating the impact of physical distancing measures in containing COVID-19: An empirical analysis [Article]. *International journal of infectious diseases*, *100*, 42-49. https://doi.org/10.1016/j.ijid.2020.08.026

Kothari, A., Walker, K., & Burns, K. (2022). #CoronaVirus and public health: the role of social media in sharing health information. *Online Information Review*. https://doi.org/10.1108/oir-03-2021-0143

Lachlan, K. A., Spence, P. R., Lin, X., Najarian, K., & Del Greco, M. (2016). Social media and crisis management: CERC, search strategies, and Twitter content. *Computers in Human Behavior*, *54*, 647-652. https://doi.org/10.1016/j.chb.2015.05.027

Lee-Won, R. J., Abo, M. M., Na, K., & White, T. N. (2016). More Than Numbers: Effects of Social Media Virality Metrics on Intention to Help Unknown Others in the Context of Bone Marrow Donation. *Cyberpsychology Behavior and Social Networking*, *19*(6), 404-411. https://doi.org/10.1089/cyber.2016.0080

Li, L., Zhang, Q., Wang, X., Zhang, J., Wang, T., Gao, T.-L., Duan, W., Tsoi, K. K.-f., & Wang, F.-Y. (2020). Characterizing the Propagation of Situational Information in Social Media During COVID-19 Epidemic: A Case Study on Weibo [Article]. *Ieee Transactions on Computational Social Systems*, *7*(2), 556-562. https://doi.org/10.1109/tcss.2020.2980007

Li, Q., Ruan, W., Shao, W., & Huang, G. (2017). Information disclosure in an environmental emergency. *Disaster Prevention and Management: An International Journal*, *26*(2), 134-147. https://doi.org/10.1108/DPM-06-2016-0125

Li, Y. C., Guan, M. F., Hammond, P. G., & Berrey, L. E. (2021). Communicating COVID-19 information on TikTok: a content analysis of TikTok videos from official accounts featured in the COVID-19 information hub. *Health education research*, *36*(3), 261-271. https://doi.org/10.1093/her/cyab010

Lu, J. H. (2020). Themes and Evolution of Misinformation During the Early Phases of the COVID-19 Outbreak in China-An Application of the Crisis and Emergency Risk Communication Model. *Frontiers in Communication*, *5*, Article 57. https://doi.org/10.3389/fcomm.2020.00057

Lu, Y., & Zhang, L. L. (2020). Social media WeChat infers the development trend of COVID-19. *Journal of Infection*, *81*(1), E82-E83. https://doi.org/10.1016/j.jinf.2020.03.050

Lwin, M. O., Lu, J., Sheldenkar, A., & Schulz, P. J. (2018). Strategic Uses of Facebook in Zika Outbreak Communication: Implications for the Crisis and Emergency Risk Communication Model. *Int J Environ Res Public Health*, *15*(9), 19, Article 1974. https://doi.org/10.3390/ijerph15091974

Meadows, C. Z., Tang, L., & Zou, W. (2021). Managing government legitimacy during the COVID-19 pandemic in China: a semantic network analysis of state-run media Sina Weibo posts. *Chinese Journal of Communication*, 1-26. https://doi.org/10.1080/17544750.2021.2016876

Oh, S.-H., Lee, S. Y., & Han, C. (2021). The effects of social media use on preventive behaviors during infectious disease outbreaks: The mediating role of self-relevant emotions and public risk perception. *Health Communication*, *36*(8), 972-981. https://doi.org/10.1080/10410236.2020.1724639.

Ophir, Y. (2018). Coverage of Epidemics in American Newspapers Through the Lens of the Crisis and Emergency Risk Communication Framework. *Health Secur*, *16*(3), 147-157. https://doi.org/10.1089/hs.2017.0106

Ophir, Y. (2019). The effects of news coverage of epidemics on public support for and compliance with the CDC–An experimental study. *Journal of Health Communication*, *24*(5), 547-558. https://doi.org/10.1080/10810730.2019.1632990

Ozanne, L. K., Ballantine, P. W., & Mitchell, T. (2020). Investigating the Methods and Effectiveness of Crisis Communication. *Journal of Nonprofit & Public Sector Marketing*, *32*(4), 379-405. https://doi.org/10.1080/10495142.2020.1798856

Payne, E. H., Gebregziabher, M., Hardin, J. W., Ramakrishnan, V., & Egede, L. E. (2018). An empirical approach to determine a threshold for assessing overdispersion in Poisson and negative binomial models for count data. *Communications in Statistics-Simulation and Computation*, *47*(6), 1722-1738. https://doi.org/10.1080/03610918.2017.1323223

Poole, M. K., Seal, D. W., & Taylor, C. A. (2014). A systematic review of universal campaigns targeting child physical abuse prevention. *Health education research*, *29*(3), 388-432.

Reynolds, B. (2010). Principles to enable leaders to navigate the harsh realities of crisis and risk communication. *Journal of Business Continuity & Emergency Planning*, *4*(3), 262-273.

Reynolds, B., & W. SEEGER, M. (2005). Crisis and emergency risk communication as an integrative model. *Journal of Health Communication*, *10*(1), 43-55.

Rubenking, B. (2019). Emotion, attitudes, norms and sources: Exploring sharing intent of disgusting online videos. *Computers in Human Behavior*, *96*, 63-71.

Saud, M., Mashud, M., & Ida, R. (2020). Usage of social media during the pandemic: Seeking support and awareness aboutCOVID-19 through social media platforms [Article]. *Journal of Public Affairs*, *20*(4), 9, Article e02417. https://doi.org/10.1002/pa.2417

Sauer, M. A., Truelove, S., Gerste, A. K., & Limaye, R. J. (2021). A FAILURE TO COMMUNICATE? HOW PUBLIC MESSAGING HAS STRAINED THE COVID-19 RESPONSE IN THE UNITED STATES [Editorial Material]. *Health Security*, *19*(1), 65-74. https://doi.org/10.1089/hs.2020.0190

Shim, J., Park, C., & Wilding, M. (2015). Identifying policy frames through semantic network analysis: an examination of nuclear energy policy across six countries. *Policy Sciences*, *48*(1), 51-83. https://doi.org/10.1007/s11077-015-9211-3

Sobowale, K., Hilliard, H., Ignaszewski, M. J., & Chokroverty, L. (2020). Real-Time Communication: Creating a Path to COVID-19 Public Health Activism in Adolescents Using Social Media. *J Med Internet Res*, *22*(12), e21886. https://doi.org/10.2196/21886

State Council Information Office of the People's Republic of China. (2020). *Fighting COVID-19: China in Action*. http://www.scio.gov.cn/zfbps/32832/Document/1681809/1681809.htm

Sumo, J., George, G., Weah, V., Skrip, L., Rude, J. M., Clement, P., Naiene, J. D., Luwaga, L., Okeibunor, J. C., Talisuna, A., Yahaya, A. A., Rajatonirina, S., Fallah, M., Nyenswah, T., Dahn, B., Gasasira, A., & Fall, I. S. (2019). Risk communication during disease outbreak response in post-Ebola Liberia: experiences in Sinoe and Grand Kru counties. *Pan African Medical Journal*, *33*, Article 4. https://doi.org/10.11604/pamj.supp.2019.33.2.16877

Tang, L., Bie, B., & Zhi, D. (2018). Tweeting about measles during stages of an outbreak: A semantic network approach to the framing of an emerging infectious disease. *Am J Infect Control*, *46*(12), 1375-1380. https://doi.org/10.1016/j.ajic.2018.05.019

Tang, L., Liu, W. L., Thomas, B., Tran, H. T. N., Zou, W. X., Zhang, X. Y., & Zhi, D. G. (2021). Texas Public Agencies' Tweets and Public Engagement During the COVID-19 Pandemic: Natural Language Processing Approach. *JMIR Public Health and Surveillance*, *7*(4), Article e26720. https://doi.org/10.2196/26720

Theiss, S. K., Burke, R. M., Cory, J. L., & Fairley, T. L. (2016). Getting beyond impressions: an evaluation of engagement with breast cancer-related Facebook content. *Mhealth*, *2*.

van der Meer, T. G. (2018). Public frame building: The role of source usage in times of crisis. *Communication Research*, *45*(6), 956-981.

Van Dijck, J., & Poell, T. (2013). Understanding social media logic. *Media and communication*, *1*(1), 2-14.

Vannucci, A., Ohannessian, C. M., & Gagnon, S. (2019). Use of multiple social media platforms in relation to psychological functioning in emerging adults. *Emerging adulthood*, *7*(6), 501-506. https://doi.org/10.1177/2167696818782309

Veil, S., Reynolds, B., Sellnow, T. L., & Seeger, M. W. (2008). CERC as a theoretical framework for research and practice. *Health Promotion Practice*, *9*(4_suppl), 26S-34S.

Vos, S. C., & Buckner, M. M. (2016). Social media messages in an emerging health crisis: tweeting bird flu. *Journal of Health Communication*, *21*(3), 301-308.

Wang, X. H., Chen, L., Shi, J. Y., & Peng, T. Q. (2019). What makes cancer information viral on social media? *Computers in Human Behavior*, *93*, 149-156. https://doi.org/10.1016/j.chb.2018.12.024

Wang, Y., Hao, H., & Platt, L. S. (2021). Examining risk and crisis communications of government agencies and stakeholders during early-stages of COVID-19 on Twitter. *Comput Human Behav*, *114*, 106568. https://doi.org/10.1016/j.chb.2020.106568

Weibo Corporation. (2020). *Weibo Reports Third Quarter 2020 Unaudited Financial Results*. http://ir.weibo.com/news-releases/news-release-details/weibo-reports-third-quarter-2020-unaudited-financial-results

Xiong, Y., Cho, M., & Boatwright, B. (2019). Hashtag activism and message frames among social movement organizations: Semantic network analysis and thematic analysis of Twitter during the #MeToo movement. *Public Relations Review*, *45*(1), 10-23. https://doi.org/10.1016/j.pubrev.2018.10.014

Yan, B., Zhang, X. M., Wu, L., Zhu, H., & Chen, B. (2020). Why Do Countries Respond Differently to COVID-19? A Comparative Study of Sweden, China, France, and Japan [Article]. *American Review of Public Administration*, *50*(6-7), 762-769, Article 0275074020942445. https://doi.org/10.1177/0275074020942445

Yang, B., Li, Y., Yan, K., Choi, Y., & Bennett-Jones, B. (2021). Analyzing U.S. State Governments' COVID-19 Homepages during the Initial Lockdown in March and April 2020: Information Content and Interactivity. *Health Commun*, 1-11. https://doi.org/10.1080/10410236.2021.2007574

Yang, Y., Deng, W., Zhang, Y., & Mao, Z. J. (2021). Promoting Public Engagement during the COVID-19 Crisis: How Effective Is the Wuhan Local Government's Information Release? *International journal of environmental research and public health*, *18*(1), Article 118. https://doi.org/10.3390/ijerph18010118

Yong, L. M. O., Xin, X., Wee, J. M. L., Poopalalingam, R. S. O., Kwek, K. Y. C., & Thumboo, J. (2020). Perception survey of Crisis and Emergency Risk Communication in an acute hospital in the management of COVID-19 pandemic in Singapore. https://doi.org/10.21203/rs.3.rs-23558/v2

Yu, Y. Q., Lau, J. T. F., & Lau, M. M. C. (2020). Competing or Interactive Effect Between Perceived Response Efficacy of Governmental Social Distancing Behaviors and Personal Freedom on Social Distancing Behaviors in the Chinese Adult General Population in Hong Kong. *International Journal of Health Policy and Management*. https://doi.org/10.34172/ijhpm.2020.195

Zhang, S., Pian, W. J., Ma, F. C., Ni, Z. N., & Liu, Y. M. (2021). Characterizing the COVID-19 Infodemic on Chinese Social Media: Exploratory Study. *JMIR Public Health and Surveillance*, *7*(2), Article e26090. https://doi.org/10.2196/26090

Zhao, Y., Cheng, S., Yu, X., & Xu, H. (2020). Chinese Public's Attention to the COVID-19 Epidemic on Social Media: Observational Descriptive Study. *J Med Internet Res*, *22*(5), e18825. https://doi.org/10.2196/18825