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Pandemic Prevention Information Disclosure on Social Media During a Public Health Crisis: Meaning, Information Quality, and Posting Method

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Abstract

Government information disclosure on social media is crucial for disease prevention during public health crises. This study investigates public responses to evaluate posts published by China's official health commission department accounts (HCDAs) on Weibo. We collect 716 posts and 45,135 related user comments and perform content analysis to extract the posts' meanings. We categorized the user comments by topic, namely information meaning, information quality, and posting method, as well as according to the emotions users expressed via their comments on HCDA posts. The findings reveal that these official accounts mainly provide factual information, neglecting other crucial types. Public comments highlight a demand for information that is easy to understand and apply, suggesting that current disclosures are falling short in quality. The lack of interaction with users also indicates that these government accounts are not fully leveraging the potential of social media for effective communication. The study concludes that to maximize the impact of information disclosure, governments must shift from being just an information source to an active social media user. They should also create content based on a broader understanding of "information," ensuring it is not only factual but also clear, useful, and engaging for the public.

Keywords: type of meaning; information quality; posting method; government information disclosure; public health crisis

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1. Introduction

During a public health crisis, social media platforms enable users from different perspectives to share crisis-related information regardless of time and space constraints (Liu and Kim 2011; Guidry et al. 2017; Hagen et al. 2018; Tang et al. 2018; Jang and Baek 2019; Tsao et al. 2021). Social media platforms have become an important conduit and rich source of crisis-related information during public crisis in many countries (Raamkumar et al. 2020; Padeiro et al. 2021). By leveraging the crisis-related information circulating on social media, governments can improve their ability for crisis prevention, prediction, and management (Terry et al. 2023). This includes predicting the level of crisis activity (Wang et al. 2023), tracking public sentiments and response (Han et al. 2020), and coping with infodemics and misinformation (Corinti et al. 2022). Moreover, public seeking and

adoption of disseminated information enhances people's understanding of the disease, helps them make sense of the situation, make decisions during uncertain situation, and improves their trust in the government (Gui et al. 2017; Soroya et al. 2021). Yet, the reliability and accuracy of such information vary considerably. Therefore, government disclosure and communication of pandemic-related information become essential to ensure that accurate and authoritative information is delivered to the public, serving as key pillars of responding to a public health crisis (World Health Organization [WHO] 2020). Many studies have examined government crisis communication during public crises. They often draw on frameworks such as the Situational Crisis Communication Theory (SCCT), Image Restoration Theory, and the Social-Mediated Crisis Communication (SMCC) Model (Wang and Dong 2017). These theories highlight the influence of crisis type, communication strategy, channel, and audience characteristics on public attitudes. As the objectives being received, understood, and applied to copy with the crisis, information itself receives less attention on how it affects the communication effects. Information is a combined product of data and meaning; consequently, it has complex attributes associated with both elements (Bawden 2007; Yu 2015). These attributes reflect various aspects of the communication process. For instance, meanings are extracted by individuals based on their understanding of the message, individuals hold preferences of the messages delivered in various modes. Therefore, this study returns to the information itself to examine how these embedded elements influence public attitudes during public health crises.

This study presents a "meaning-quality-posting method" framework to investigate government information disclosure and public response during a public health crisis. Meaning are the topics, events, or persons to which the information refers, without which the information conveys nothing (Yu 2015). Most studies have investigated the meaning of online posts through their topics, which has entailed observing the public's responses to different topics such as epidemic updates, preventive instructions, and actions (Chen et al. 2020; Ngai et al. 2020; Luo et al. 2021). These studies have, based on public reactions, offered suggestions on topics government posts should cover. However, the topic is not the sole reason users choose information. When seeking information to cope with a public health crisis, people have other information-related concerns that lead them to consider attributes such as the type of meaning the information intends to convey, including facts, news, or knowledge, among others (Yu 2015). The type of meaning indicates the goal of the information communicated; facts describe reality, news informs people about noteworthy events, and knowledge raises awareness or improves understanding of things or events. Observing the public's reactions to these types of meaning is another approach to exploring people's information needs and devising how the goals of information disclosure can be achieved in the context of a public health crisis.

Information must meet the quality criterion to be considered fit for use (Wang and Strong 1996). Information quality determines users' decision-making and actions in the context of information adoption (Stvilia et al. 2007). Concern about online information is prevalent because of its variable sources and creators. For example, knowledge co-creation platforms, such as collaborative encyclopedias, aim to secure quality user contributions because they value the accuracy and completeness of the generated content (Stvilia et al. 2008). Savolainen (2011) applied content analysis to the study of user-generated content in a popular online forum and identified information usefulness, correctness, and specificity as the criteria most commonly used to determine information quality. However, a recent study on online health information interpreted information quality based on credibility and trustworthiness (Zhang and Song 2020), suggesting that multifaceted criteria can result in a more comprehensive evaluation of information quality to ensure the satisfaction of users' multidimensional informational needs.

The method by which information is presented, communicated, and disseminated affects how users perceive and utilize it (Petty and Briñol 2011). Posting method refers to how a social media account presents information to the public. Users seeking information to cope with public health crises seek health-related information and crisis-dealing dynamics. Because pandemics have spread more rapidly in recent years (World Health Organization [WHO] 2020), the public has higher expectations of government-disclosed information to cope with the unfamiliarity, swift development, and inherent uncertainty of public health crises. Existing research has investigated public responses to crisis-related information delivered through traditional and social media (Xu 2020) as well as via mediums such as institutional websites, blogs, and Facebook (Kulkarni 2019). Public perceptions of posts comprising various media, such as text, pictures, and videos, have also been examined to investigate how the information delivery mode affects public engagement (Chen et al. 2020; Luo et al. 2021). Such studies have accumulated ample evidence demonstrating public preferences for information channels and media. Timely, reliable information delivery is crucial to reduce uncertainty and anxiety during a public health crisis, whereas random or neglectful information release can worsen information reliability evaluations and hinder public adoption of public health authorities' advice and instructions during crises.

Studies have shown the great potential of social media for spreading crisis-related information to empower the public during health crises. Users' perceptions on disclosed information directly reflect the impact and effectiveness of the communication conducted via social media and reveal the gap between disclosure strategies and dynamic public information needs. Yet, few studies are conducted to examine government information disclosure based on users' feedback. To fill this gap, we used the government posts and user comments from official provincial-level health commission department accounts (HCDAs) in China as data source and analyzed users' responses to government posts in types of meaning, information quality, and their posting methods. By doing so, this study aims to enhance government's practice of information disclosure on social media to improve public health and well-being during public health crises.

2. Literature Review

2.1. Government Information Disclosure on Social Media

Previous studies on government information disclosure during public health crises have focused on content and found that government posts center on epidemic updates (Chen et al. 2020; Ngai et al. 2020; Luo et al. 2021; Zhang et al. 2022), preventive actions (Chen et al. 2020; Luo et al. 2021; Zhang et al. 2022) and instructions (Chen et al. 2020; Ngai et al. 2020; Luo et al. 2021; Zhang et al. 2022), rumor corrections (Luo et al. 2021; Zhang et al. 2022), and social influences (Luo et al. 2021). Posts serve multiple functions such as releasing facts (Syn 2021), informing the public (Syn 2021; Tang et al. 2021), providing instructions (Syn 2021), developing conversations with the public (Syn 2021), and encouraging residents (Tang et al. 2021; Zhang et al. 2022). Content has been investigated from different perspectives, such as whether it is conveyed narratively (Chen et al. 2020), with certainty (Zhu and Hu 2023), or imbued with an emotional purpose (Bakker et al. 2019) to bolster its communication effectiveness.

Studies have also focused on the quality of government information disclosure as indicated by attributes such as information usefulness and richness, the importance of the content, its timeliness, and transparency. Information usefulness refers to the extent to which the content relates to an ongoing health crisis. Researchers have evaluated this attribute to determine whether posts have tended to declare goals and provide detailed instructions or summarize the government's crisis management actions (Chen et al. 2023). Zhang et al. (2022), assessed information richness according to the number of words in

government posts and reported results indicating that the provision of rich information positively increases public engagement in the later stages of a pandemic. Moreover, a study investigating fact-checking government posts defined content importance as topics' salience as evaluated by the Weibo platform (Chen et al. 2021). Prior research has defined the timeliness of government posts as whether relevant information was disseminated within 24 h. Information transparency has been defined as comprising dimensions such as accuracy, completeness, and future actions (MacKay et al. 2021).

Several studies have underscored the significance of the dissemination of government information from the perspective of dialogic loops and media. A dialogic loop entails the use of hashtags, votes or surveys, @functions, and the posing and answering of questions in government posts (Chen et al. 2020). Chen et al. (2020) found that the dialogic loop can positively predict public engagement with government posts; however, another study conducted at the beginning of a health crisis found no significant correlation between dialogic loops and public engagement (Paul and Das 2023). Zhang et al. (2022) probed the role of dialogic loops at different stages of a health crisis and found that their use triggered more public engagement in later stages although no significant improvements were detected at the beginning of the crisis. These findings suggest that the Chinese government, which presently employs a one-way rather than mutual communication mode (Chen et al. 2023), should incorporate the dialogic loop to enhance its information disclosure on social media. Moreover, Chen et al. (2020) assessed the richness of the media used for government information disclosure and found a significant correlation with public engagement; that is, residents are more likely to interact with posts conveyed through videos, owing to the format's media richness.

2.2. Public Information Needs Expressed via Social Media During a Public Health Crisis

Public information needs can be ascertained through user engagement, information topics, and the emotions embedded in user comments. User engagement on social media is an important indicator of public information needs during crises. It is typically evaluated according to the number of comments, posts, and likes. Research has demonstrated that government posts on certain topics trigger greater public engagement, such as epidemic updates (Chen et al. 2020) and preventive instructions (Ngai et al. 2020) and actions (Chen et al. 2020). Additionally, posting information in narrative and emotional styles is more likely to attract greater public engagement (Chen et al. 2020; Luo et al. 2021).

Users express their expectations and informational needs when seeking information online. Public information needs during health crises have increased. These needs primarily revolve around newly diagnosed cases, countermeasures, medical services, and preventive knowledge (Zhao et al. 2020). Research has found that apart from preventive knowledge, the public has frequently discussed the topic of "quarantine" during public health crises, indicating the need for related information (Han et al. 2020). Notably, the government is short in supply to meet people's need for epidemic updates and scientific knowledge by falling short of disclosing sufficient information on these topics (Zhang and Yu 2021).

User comments on social media are subjected to emotion analysis to allow researchers to evaluate information satisfaction. Comments are often collected and analyzed using valence or specific sentiment measures. Gu et al. (2022) investigated user emotions in response to posts by different types of accounts and found that more negative emotions were expressed in response to government versus unofficial accounts. Cao et al. (2021) found that reproach and fear dominated the early stages of the COVID-19 lockdown, but negative emotions gradually decreased as the situation improved. User emotions also reveal people's attitudes towards the topics of posts. Cao et al. (2021) found that comments about daily life were significantly related to distress and joy, whereas those

on quarantine revealed greater reproach, admiration, and distress. Vemprala et al. (2021) noted a tendency of the public to express fear when discussing the health influences of the pandemic. MacKay et al. (2021) observed that posts aimed at rumor correction often received negative responses.

Previous studies have demonstrated the potential of social media as a supportive tool for governments to disclose information related to health crises and effectively ascertain public perceptions of such information. To understand the crisis situation and act wisely during critical periods, users need high-quality information that has clear, specific functions and is delivered properly to assist their understanding and decision-making. Little empirical evidence has been found regarding user evaluations of government information disclosure from these aspects. Therefore, by examining users' comments on government posts, we aimed to investigate public responses to the types of meaning of the information disclosed and ascertain public evaluations of information quality as well as people's expectations regarding posting methods.

3. Methods

The social media platform Weibo allows users to communicate and share information and is widely used in China. As of 2020, 511 million active users and over 140,000 verified government agency accounts have registered (Weibo 2023). An increasing number of government agencies have chosen to use Weibo accounts to disclose information, which has triggered Weibo users to express their opinions on such posts. User comments directly reflect public opinion on government information disclosures. Since the Chinese government announced its epidemic control measures on 20 January 2020 (The State Council Information Office of the People's Republic of China 2020), health commission departments have proactively employed Weibo accounts for related information disclosure, and their posts have attracted queries and suggestions from the public. This study collected official provincial-level HCDAs' posts on pandemic prevention as well as user comments on such posts in the six weeks following the epidemic control announcement. Using a qualitative approach, we investigated user responses to public health crisis-related government posts with diverse meanings, information quality, and posting methods.

3.1. Data Collection

This study selected official provincial-level HCDAs on Weibo as research targets. The accounts met the following criteria: (1) published posts relevant to the public health crisis during the six-week period following the Chinese government's epidemic control announcement (20 January–1 March 2020) and (2) all published posts received comments from the public. We selected ten accounts: Healthy Beijing, Healthy Guangdong, Healthy Jiangsu, Healthy Shandong, Healthy Shanxi, Healthy Shanghai, Healthy Sichuan, Healthy Tianjin, The Health Commission of Henan, and The Health Commission of Jilin. We used web crawlers to collect all posts and user comments from the accounts. The original dataset contained 728 government posts and 52,485 user comments.

3.2. Data Cleaning

Two researchers performed data cleaning. Government posts not relevant to the health crisis were removed, yielding 716 posts. We cleaned the user comments according to the following criteria: (1) relevant to the content of the posts, (2) text-based, (3) and not merely a repost. After data cleaning, we obtained 45,135 comments. On average, each government post received 63 comments. Table 1 shows the data sources and distribution of posts and comments.

Table 1. Sources and distribution of government posts and user comments.

Health Commission Microblog	Posts *n* (%)	Comments *n* (%)	Average Number of Comments per Post
Healthy Shanghai	191 (26.68)	6168 (13.67)	32
Healthy Tianjin	105 (14.66)	1146 (2.54)	11
Healthy Shandong	79 (11.03)	5820 (12.89)	74
Healthy Beijing	65 (9.08)	14,911 (33.04)	260
Healthy Shanxi	62 (8.66)	2691 (5.96)	43
Healthy Guangdong	51 (7.13)	2188 (4.85)	43
Healthy Sichuan	50 (6.98)	3514 (7.79)	70
The Health Commission of Henan	40 (5.59)	4750 (10.52)	119
The Health Commission of Jilin	37 (5.17)	903 (2.00)	24
Healthy Jiangsu	36 (5.03)	3044 (6.74)	85
Total	716	45,135	63

3.3. Data Analysis

Content analysis of text can yield valid inferences regarding the context of use while also revealing patterns and trends in documents (Stemler 2000; White et al. 2006). We conducted content analyses to ascertain the meaning of the government posts, which we categorized as communicating facts, news, or knowledge. Information conveying facts provides a fundamental and detailed description of a situation. News reports government actions in an ongoing situation. Knowledge involves substantial intellectual labor and instructs preventive behavior. The coding process comprised two steps. First, we identified the meaning of the posts based on the aforementioned taxonomy. Second, we identified themes for each type of meaning. We used another dataset comprising 300 randomly selected posts to test the coding schema and made some modifications. Two researchers performed the coding, and disagreements were resolved by a third researcher. Table 2 shows the final coding scheme.

We organized the government posts into seven categories of meaning: facts, facts and news, facts and knowledge, news, news and knowledge, knowledge, and facts, news and knowledge. We performed descriptive analysis to investigate the focus of the posts and the average responses each type of post received from the public.

We subjected the user comments to theme and emotion analyses. The data were first processed using machine learning, and two researchers verified the results. First, we used a Chinese stop-word dictionary to remove stop words. Second, we used Jieba segmentation tool in Python 3.12 together with a commonly used Chinese lexicon to perform initial tokenization and split the comments into meaningful units. Then, we selected the user comments on Healthy Beijing's posts as a sample dataset for tokenization because the account received the most comments per post on average. The researchers examined the results and identified new context-specific phrases that were then compiled as a user-defined dictionary and used to improve the accuracy of tokenization. We applied the updated tokenization to deconstruct each user comment into semantic units for further topic and emotion analyses.

We conducted topic modeling of the user comments based on the semantic units. Two researchers coded a dataset comprising 750 randomly selected user comments. Thematic labels, including comments on meaning, information quality, and posting method, were generated, as shown in Table 3. We calculated the high-frequency words associated with each thematic label. These words were used as features for topic modeling. We applied the updated tokenization of the labeled dataset to a support vector machine (SVM) model to identify the comments' semantic units and construct a classification model. The model

was used to thematically classify the comments. It showed a topic classification accuracy of 80.1%. Therefore, we used it to predict the themes of the remaining user comments.

Table 2. Coding schema for government posts.

Types of Meaning	Themes	Definitions	Example
Fact	Data collection methods	Data collection time point and frame as well as criteria, and data disclosure time point	From 18:00 to 24:00 on 23 January…
	Case statistics	Data of new, current, and historical cases that have been confirmed, suspected, or cured, or are deceased	Ten new cases have been reported.
	Case profiles	Demographic background, travel history, and disease progression of cases	A 32-year-old female patient was admitted to the hospital for treatment on 21 January.
News	Preventive measures	Preventive regulations and actions	The government has implemented a screening procedure.
	Medical measures	Medical procedures and actions to diagnose, treat, and follow up confirmed cases	The government has organized an expert panel for consultation and medical care.
Knowledge	Disease control directives	Instructions or suggestions regarding individual activities	We encourage residents to minimize outings and reduce family gatherings.
		Instructions or suggestions regarding public activities	Enterprises and institutions should minimize group activities and enhance indoor ventilation.

Table 3. Coding schema for user comments.

Comment Type	Themes	Example Comments
On meaning	Response to meaning	Take precautions and stay safe during the epidemic.
On information quality	Completeness	Which district is it? What's their travel history?
	Accuracy	Patient numbers are up, but close contacts haven't changed. The numbers may be incorrect.
	Timeliness	Please update the number.
	Usefulness	Information on travel history is more informative than disclosing the number of the cases.
	Ease of use	I don't understand. Does it mean recovered patients have antibodies?
On posting method	Responsiveness	Could you respond to my questions?
	Regularity	Information is not released on a regular schedule.
	Format	Can you post information in the same format every day?

The researchers also labelled the emotions expressed in the randomly selected comments as positive, neutral, or negative. The high-frequency words for comments with each emotion were also calculated and combined with the Tsinghua University's positive and negative dictionaries for emotion classification. We used SVM modeling to construct an emotion-based classification model and achieved a 76% emotion classification accuracy rate. We then used the emotion classification model to predict the emotion labels applicable to the remaining user comments. The results underwent the same verification and modification processes.

Additionally, a Random Forest model was implemented as a comparative approach because it is suitable for text classification and can effectively handle classification tasks with many features. The classification results produced by the SVM and Random Forest models were cross-validated, and comments exhibiting inconsistent predictions were manually examined by two researchers to reduce potential misclassification errors. The inter-coder agreement between the two researchers was 88.9%. Disagreements were discussed with a third researcher to reach a final decision.

We recorded descriptive results of the theme and emotion analyses over a six-week period of interest. The interaction effect between the meaning type of posts and user emotions was analyzed through chi-square test. The words co-occurrence analysis for the comments on information quality identified major concerns regarding the quality of the government's information disclosures.

4. Results

4.1. Distributions of the Types of Meaning

Among the full sample of government posts, those conveying facts accounted for 60.61%, whereas those containing news and knowledge accounted for the smallest proportion. Posts conveying facts, facts and knowledge, and facts, news and knowledge received the most comments from the public on average, whereas those communicating knowledge received the least (Table 4).

Table 4. Types of government posts and comments received.

Type of Government Posts	Total (%)	Number of Comments	Average Comments Received per Post
Facts	434 (60.61)	34,392	79
Facts and news	105 (14.66)	2336	22
Facts and knowledge	60 (8.38)	4354	73
News	30 (4.19)	670	22
News and knowledge	5 (0.70)	201	40
Knowledge	51 (7.12)	1024	20
Facts, news and knowledge	31 (4.33)	2158	70
Total	716 (100)	45,135	63

4.2. Distributions of the Topics and Emotions in User Comments

User comments on the meaning of government posts accounted for 74.1% of all comments. Comments on information quality also accounted for a significant proportion, comprising 25.5% of the total (Table 5). Posting method received the least attention, comprising only 0.4% of all comments.

Among all negative comments, those concerning meaning accounted for 76.9%, and those on completeness accounted for 15.5%.

As shown in Table 6, the chi-square test indicated there were significant differences in the distribution of the emotions of comments across different types of Weibo posts. Posts conveying facts, facts and news, and facts, news and knowledge were more likely to receive negative comments. Posts categorized as fact-type received significantly more negative comments than other types. Over a third of the comments on posts conveying news and knowledge expressed negative emotions. As shown in Figure 1, negative comments on posts conveying facts and on those communicating facts and knowledge decreased gradually over six weeks.

Table 5. Topic and emotion analysis of user comments.

Types of Comments (%)	Comment Topics	Total *n* (%)	Positive *n* (%)	Neutral *n* (%)	Negative *n* (%)
On meaning (74.1)	Response to meaning	33,451 (74.1)	4627 (93.3)	20,335 (70.0)	8489 (76.9)
On information quality (25.5)	Completeness	6226 (13.8)	92 (1.9)	4418 (15.2)	1716 (15.5)
	Timeliness	1316 (2.9)	43 (0.9)	945 (3.2)	328 (3.0)
	Accuracy	1134 (2.5)	83 (1.7)	849 (2.9)	202 (1.8)
	Usefulness	218 (0.5)	6 (0.1)	124 (0.4)	88 (0.8)
	Ease of use	2608 (5.8)	96 (1.9)	2348 (8.1)	164 (1.5)
On posting method (0.4)	Responsiveness	106 (0.2)	11 (0.2)	58 (0.2)	37 (0.3)
	Regularity	45 (0.1)	3 (0.1)	37 (0.1)	5 (0.1)
	Formats	31 (0.1)	1 (0.0)	13 (0.0)	17 (0.2)
Total		45,135 (100)	4962 (100)	29,127 (100)	11,046 (100)

Table 6. Emotions expressed in user comments on meaning by type of government post.

Topic of Government Post	Positive *n* (%)	Neutral *n* (%)	Negative *n* (%)	Total *n* (%)
Facts	3427 (13.7)	15,074 (60.3)	6496 (26.0)	24,997 (100)
Facts and news	312 (16.5)	1112 (58.8)	468 (24.7)	1892 (100)
Facts and knowledge	613 (17.9)	2088 (61.0)	721 (21.1)	3422 (100)
News	95 (16.4)	336 (58.2)	147 (25.4)	578 (100)
News and knowledge	4 (2.7)	91 (61.5)	53 (35.8)	148 (100)
Knowledge	44 (5.3)	542 (65.4)	243 (29.3)	829 (100)
Facts, news and knowledge	132 (8.3)	1092 (68.9)	361 (22.8)	1585 (100)
χ^2	193.53a	58.73a	61.18a	
df	6	6	6	
p	<0.001	<0.001	<0.001	

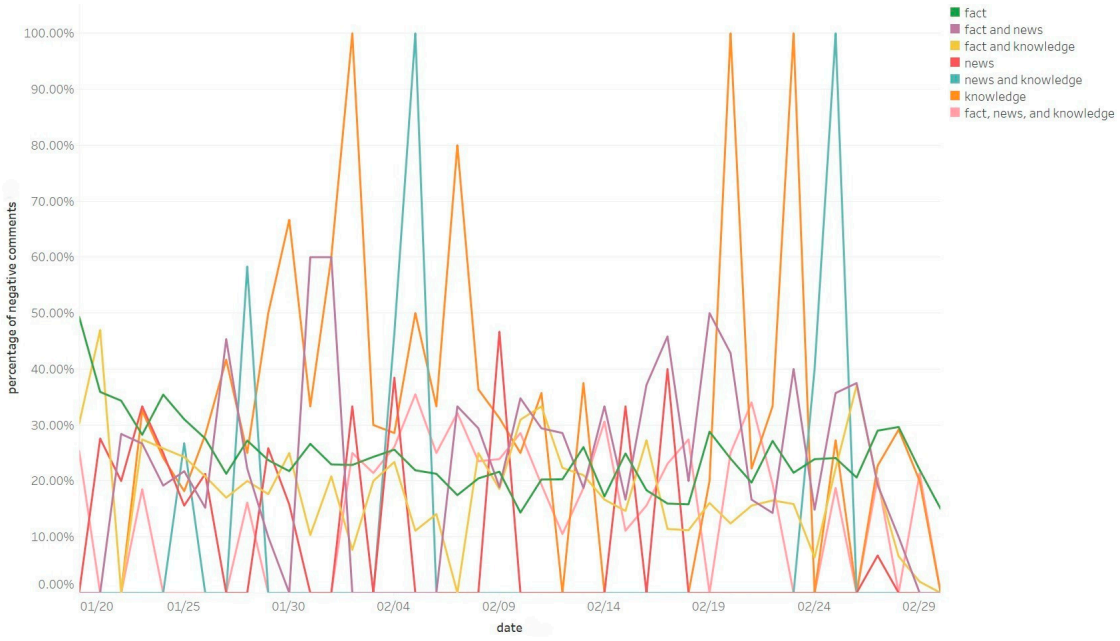

Figure 1. Negative comments on the meaning of government posts over time.

The number of positive comments on information quality was relatively low, as shown in Table 7. Comments on information quality largely centered on completeness, followed by ease of use and timeliness, indicating the public care about these quality criteria most.

The largest cohort of negative comments centered on completeness, followed by timeliness, and accuracy. Negative comments on usefulness accounted for approximately 40% of all user comments on the usefulness of government posts. This revealed that the public had higher expectations for these aspects of the quality of government posts.

Table 7. Emotions expressed in user comments on information quality.

Topics of Comments on Quality	Positive *n* (%)	Neutral *n* (%)	Negative *n* (%)	Total *n* (%)
Completeness	92 (1.5)	4418 (70.9)	1716 (27.6)	6226 (100)
Timeliness	43 (3.3)	945 (71.8)	328 (24.9)	1316 (100)
Accuracy	83 (7.3)	849 (74.9)	202 (17.8)	1134 (100)
Usefulness	6 (2.8)	124 (56.8)	88 (40.4)	218 (100)
Ease of use	96 (3.7)	2348 (90.0)	164 (6.3)	2608 (100)

As shown in Table 8, the majority of negative comments centered on HCDAs' responsiveness, whereas users paid little attention to the regularity and format of information disclosures.

Table 8. Emotions expressed in user comments on posting method.

Topic of Comments on Posting Method	Positive *n* (%)	Neutral *n* (%)	Negative *n* (%)	Total *n* (%)
Responsiveness	11 (10.4)	58 (54.7)	37 (34.9)	106 (100)
Regularity	3 (6.7)	37 (82.2)	5 (11.1)	45 (100)
Format	1 (3.2)	13 (41.9)	17 (54.8)	31 (100)

4.3. Public Concerns About Information Quality

As shown in Figure 2, public concerns centered around facts such as case statistics and profiles, likely because posts conveying facts received the most comments. Users requested detailed information, disease course in new and fatal cases, and disease trajectory. Example comment was "Please post more detailed information. The report only mentions that the patient is from that city, but where exactly in that city do they reside?"

Negative comments on ease of use were primarily in response to the use of jargon and ambiguous terms in government posts (Figure 3). In the pandemic prevention context, information sharing necessarily employs medical terminology to ensure accurate expressions and avoid misunderstandings among the different parties involved in the prevention campaign. However, most users are not specialized or trained in a health-relevant field, which creates a barrier to understanding such messages. Consequently, the use of jargon in government posts without accompaniment by a clear explanation can frustrate lay users. Additionally, ambiguous terms may trigger confusion. For example, a user in our sample raised a question about the phrase "people from other regions", pointing out that it does not clarify whether the persons referred to are "originally from another region but relocated, or recently arrived and visited for a short time".

The comments on timeliness revealed intensive relevance relations among "update," and "data" (Figure 4). Moreover, close relationships were observed between the words "information" and "transparency", "timely" and "publicize" as well as between "slowest" and "around the country". User comments on timeliness were often accompanied by comments containing the words "open" and "transparency".

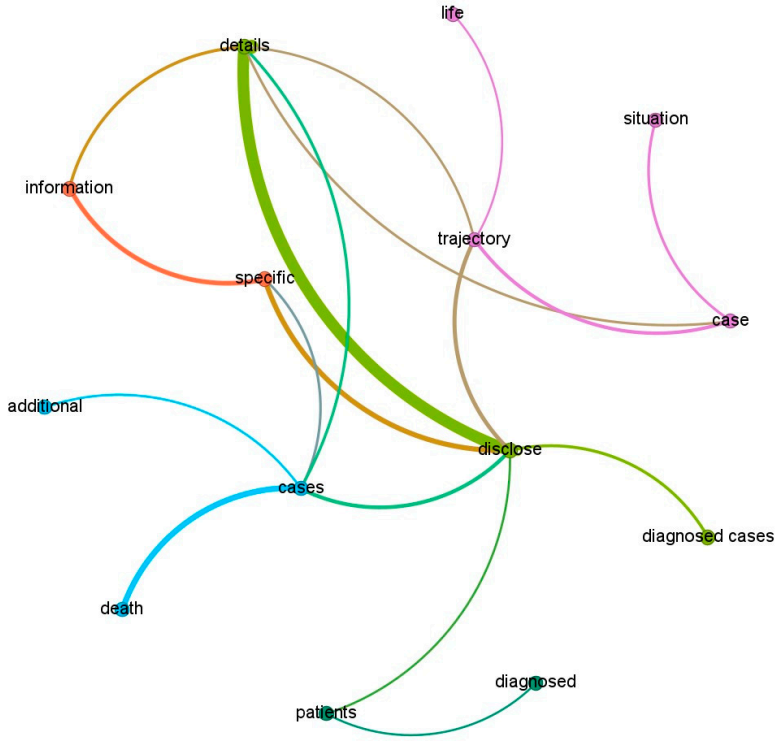

Figure 2. Co-occurred words for comments on information completeness. Note: Lines and nodes of the same color indicate that the words co-occur in the same comment. The thickness of the lines and the size of the nodes represent the frequency of co-occurrence.

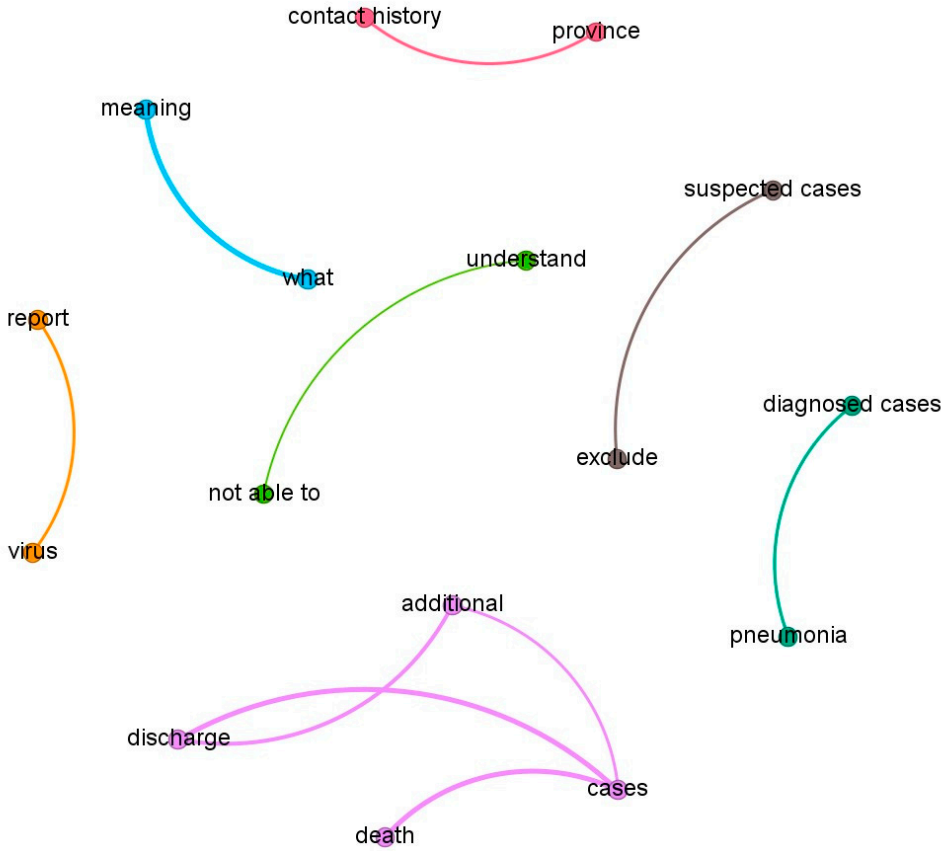

Figure 3. Co-occurred words for comments on ease of use. Note: Lines and nodes of the same color indicate that the words co-occur in the same comment. The thickness of the lines and the size of the nodes represent the frequency of co-occurrence.

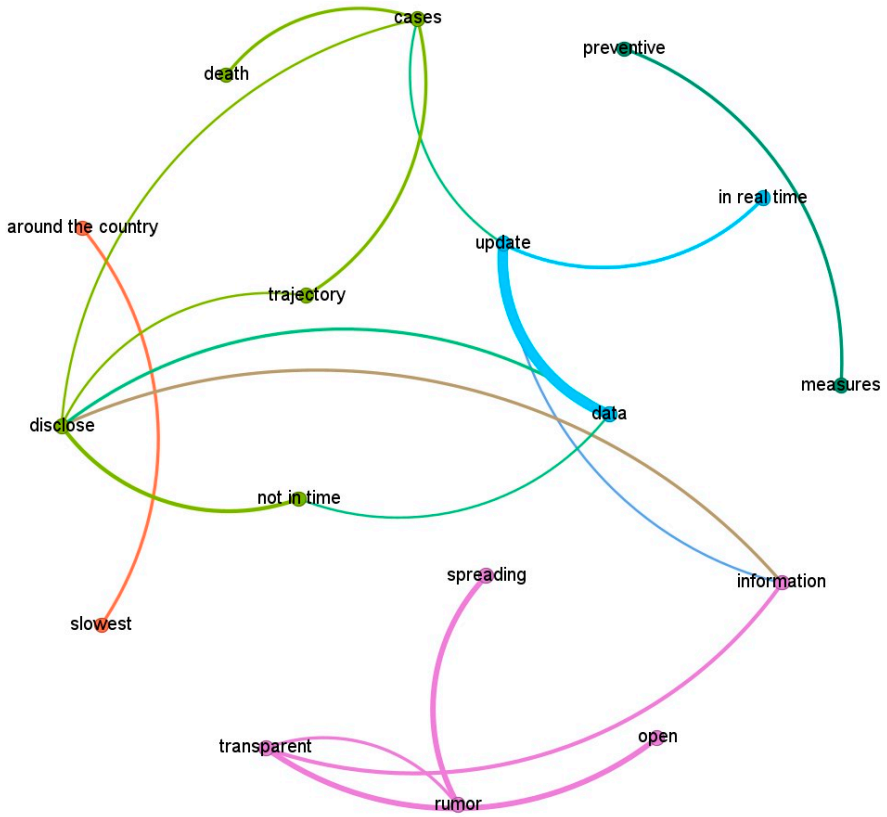

Figure 4. Co-occurred words for comments on timeliness. Note: Lines and nodes of the same color indicate that the words co-occur in the same comment. The thickness of the lines and the size of the nodes represent the frequency of co-occurrence.

The co-occurred words in comments on information accuracy revealed several user concerns (Figure 5). High frequency words were "accurate data", "fatal cases", and "actual situation", indicating that the public's attention towards the number counts. "Rumor spreading" and "Reduce alertness" comprised another concern, which is unsurprising given the high prevalence of misinformation during the early stages of a pandemic. Users expressed concerns about rumors and their consequences, for example, "Rumors can lead to misconceptions of government actions, reducing the public's awareness of self-protection".

Users' negative evaluations of government posts based on information usefulness mainly cited inadequate information organization and the absence of elaboration on the data presented (Figure 6). Users indicated that the information provided was "oversimplified" and that, in some cases, original data were presented in tables without refinement or explanation, resulting in its low utility as a reference to clarify the situation. Frequently co-occurred words revealed public demand for information on cases and the disease trajectory, both of which were classified as facts (Table 2) and updated almost daily. Example comments are "What is the point of posting information in tables?" and "What meaning do you expect this table to convey? There are only numbers but nothing about contact history." These remarks indicate that the HCDAs attempted to publicly disclose as much information per post as possible, whereas users were expecting information directly applicable to their decision-making. These differing communication priorities resulted in poorer evaluations of information usefulness from the user perspective.

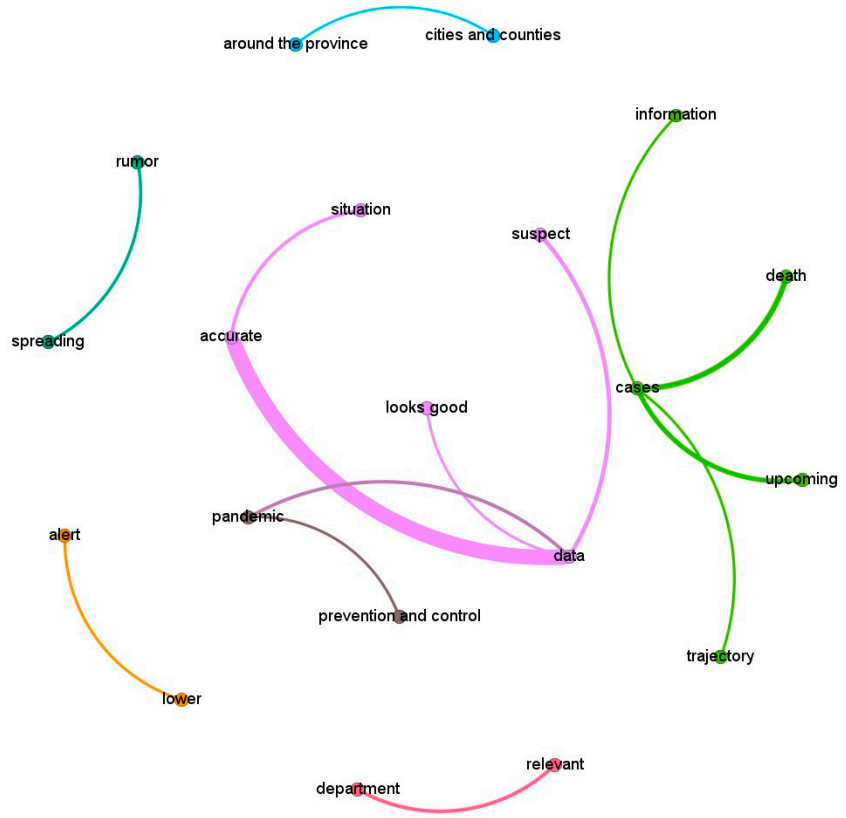

Figure 5. Co-occurred words for comments on information accuracy. Note: Lines and nodes of the same color indicate that the words co-occur in the same comment. The thickness of the lines and the size of the nodes represent the frequency of co-occurrence.

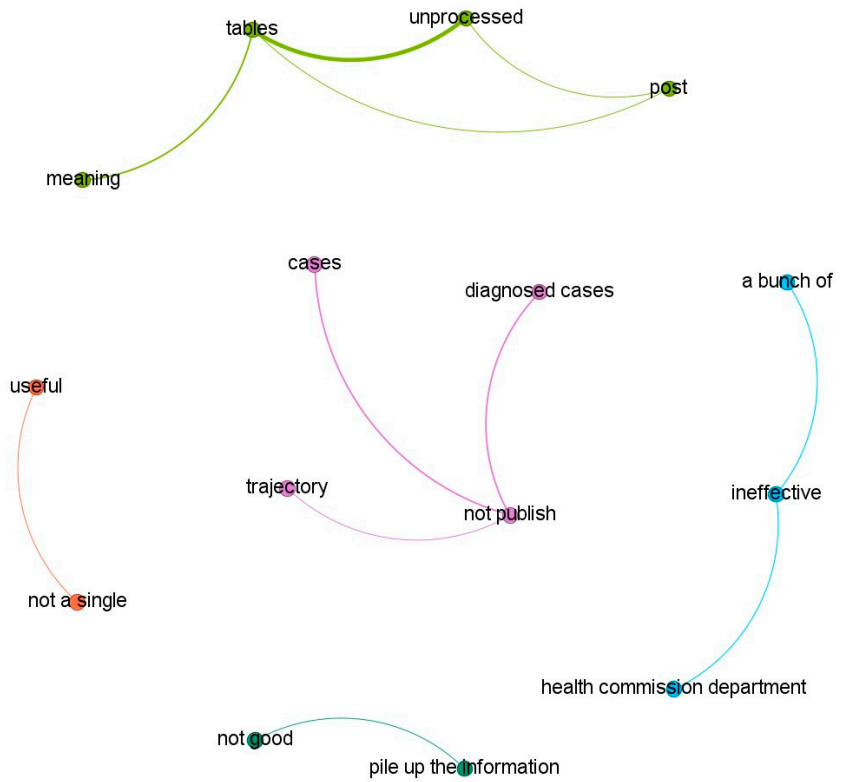

Figure 6. Co-occurred words for comments on information usefulness. Note: Lines and nodes of the same color indicate that the words co-occur in the same comment. The thickness of the lines and the size of the nodes represent the frequency of co-occurrence.

5. Discussion

This study evaluates the impact of the information disclosure of provincial HCDAs on social media during a public health crisis by examining users' perceptions of the meaning, quality, and posting method of the government posts. Regarding meaning, we found that HCDAs posted factual information more than any other type. This finding aligns with earlier research conducted in similar contexts and indicates that HCDAs prioritize reporting the status of public health crises (Chen et al. 2020; Syn 2021). User comments on meaning accounted for a significant portion of user responses, whereas those on information quality and posting method comprised smaller though not negligible proportions. These findings suggest that public's attention mainly concentrates on the meaning of information. The results highlight government disclosed information must enable the public to access the critical information that will help them understand the situation and inform their actions during critical periods. The comments addressing information quality and posting methods, though proportionally small, revealed public demand for information beyond the content of the posts, a finding that complements previous studies (Han et al. 2020).

The proportion of negative comments on posts across all types of meaning was high, with no significant change over six weeks except for a gradual decrease in those on posts conveying facts and facts and knowledge. This pattern aligns with findings from studies covering broader timeframes, which show that users' engagement with posts peaks during early stages of an outbreak and then decreases gradually in UK, US, and Scandinavia countries (Hasselström and Larsson 2025; Song et al. 2025). These observations suggest that the initial phase of a crisis represents a critical window for disseminating timely information. However, HCDAs in China may focus on disseminating timely information while neglecting other factors that may have affected public reception. Consequently, the information quality and posting methods did not meet many users' criteria, triggering their expression of negative sentiments via comments.

We also noted that HCDA posts conveying knowledge received a large proportion of negative comments, and post conveying facts and knowledge experience a declining trend of negative comments over time. The findings contrast a study conducted in Canada where posts providing knowledge on instructions received fewest negative responses (MacKay et al. 2021). This difference may be attributed to the fact that China's government incorporated Weibo as part of the pandemic prevention campaign and took swift communication as the priority at the earlier phase. Therefore, the posts were created to promote general knowledge for the widest application instead of being tailored to individual needs. The government should pay attention to the meaning of their information disclosures aimed at instructing the public to implement precautions during public health crises. Instead of simply giving directives, posts should integrate information on up-to-date epidemic trends to justify the necessity for the instructions disseminated to the public. Our findings also suggest that when sharing information online, the government should consider combining information that conveys different types of meanings to simultaneously acknowledge, alert, and instruct the public according to the purpose of the information disclosure.

User comments on information quality primarily centered on information completeness, followed by ease of use, timeliness, accuracy, and usefulness. Evidently, the distribution of user attention did not reflect their emphasis on information quality in the context of their everyday activities. Van der Sluis et al. (2024) identified information accuracy as the most important attribute from users' perspectives, followed by completeness and usefulness, with little concern for ease of use. Additionally, users more markedly address completeness, ease of use, and timeliness in public health crisis contexts than in everyday situations. These differences can be explained by abrupt changes in people's life order during a public health crisis coupled with most lay people's lack of knowledge of unfamiliar

domains. During the epidemic, the government's disclosed information did not fully cover multiple aspects to reduce users' uncertainty or navigate critical decision-making, leading to significant concerns regarding the information completeness. For example, a user our study sampled requested the travel history of reported cases to allow people to determine whether they had contact with the patients.

Generally, information should be easy for members of the public to understand and apply behaviorally. The fact that a user in our sample requested explanations of medical terms indicates that government posts do not always achieve this. Furthermore, the government has been insufficient in providing timely information to equip people to cope with dramatic and rapid changes during an epidemic. For example, users in our study requested real-time data updates reflecting the evolving situation. Information accuracy did not receive as much attention in user comments on information quality as completeness or ease of use. This is probably because the government has faced fewer challenges from the public regarding its authority and trustworthiness (Sun et al. 2019). Negative comments accounted for a larger proportion of user evaluations of information usefulness, with most indicating overgeneralization. In this study, the government provided overgeneralized information which presented the situation, trends, and prevention measures within a provincial scope, leading to lower applicability to users at a specific location in a province. This finding suggests that provincial HCDAs should pay more attention to improving the quality of the disclosed information. Specifically, details on epidemic development, expanding traces, and impacts on individuals should be shared to help the public prepare. Explanations and interpretations of specialized terms are also necessary to enhance the ease of use of information among users who lack background knowledge. Moreover, information usefulness can be improved through an appropriate balance of division of labor and collaboration among government agencies at different levels. For example, provincial HCDAs should provide an overview of the situation in a given province and issue directives to the local agencies responsible for disclosing information tailored to specific neighborhoods.

User comments on posting methods focused heavily on HCDAs' responsiveness. Update regularity and information format received less attention. It indicates users' expectation of uncertainty clarification from the government (MacKay et al. 2021). This aligns with the principles of public participation and conversation in many government information disclosure policies. It demonstrates that the government has not effectively leveraged the potential of social media to facilitate mutual communication and interactivity between post publishers and users (Carr and Hayes 2015). The HCDAs should increase interaction with users to fulfill their information needs in unfamiliar domains and fast-evolving situation (Liu et al. 2023). Furthermore, users expressed concern that HCDAs posted information irregularly and in informal formats. These findings imply a preconception on users' part that the information government agencies release will follow certain rules regarding regularity and format to demonstrate authenticity and seriousness. These expectations could outweigh users' recognition of social media platforms as tools for timely and flexible discussions in critical situations. However, the HCDAs' low response indicates that these accounts were utilized for information publishing rather than as communication channels with the public. Nevertheless, users' expectation of regular and formalized posts from HCDAs reveals that members of the public view these accounts as a means to access official information services during public health crises. Therefore, account operators must recognize the gaps between the government and the public's concept of social media platforms and maximize the information disclosure function.

Our study offers several practical implications for government information disclosure during public health crises across different countries. Disclosing pandemic prevention

information on social media interweaves two activities in a process, creating functional information and conducting effective interactions with users. The successful completion of information disclosure is determined by the performance of both activities. As aforementioned, information is a combined product of data and meaning, which have complex attributes associated with both elements (Yu 2015). In pandemic prevention context, various attributes of information beyond the message should be taken into consideration to compose functional information. In particular, the type of meanings should be clarified and enriched to target at specific tasks and needs of the public. User concerns about information quality highlight that data presentation can highly impact the communication effects so that quality control of disclosed information is indispensable. In addition, social media provides the user with a space for self-presence and interaction (Carr and Hayes 2015). Comparing to other social media such as WeChat and TikTok, Weibo is a microblogging social media platform which enables users to quickly post content in short text and the posts can be publicly shared and discussed (Zhang and Pentina 2012). As such, Weibo users exhibit non-deliberative interactions, especially in terms of emotional expression (Medaglia and Zhu 2017; Ruan et al. 2022). Consistent with these findings, our study reveals that in the context of a public health crisis, Weibo has become an effective platform for the government to conduct timely information disclosure and for the public to express their opinions. Our study further highlights that the government has mainly utilized Weibo's fast-release feature to enhance the timeliness of information disclosure but have insufficient interaction in the post discussion. This indicates that HCDAs stick to the role as information broadcasters and view the public as audience as in traditional communication channels. The misperception of identity impedes HCDAs to notice and utilize the interaction features on Weibo and dilutes the impact of disclosing pandemic prevention information. This tendency is also influenced by the institutional context in China. First, it could be explained that each level of the government is responsible for implementing preventive actions and disclosing related information. The provincial government in our sample is in charge of communicating information for the entire province. As a result, provincial-level accounts often post more general content. Second, government information disclosure is gradually shifting from informing and notifying the public through traditional media to communicating on new media platforms like Weibo. The established pattern in both functions and channels has not yet fully adapted to the interaction mechanism of social media. All these suggest that corresponding to the completion of pandemic prevention information, an insight into the definition of information and the nature of social media can be necessary. It requires HCDAs to have a solid understanding of not only the data and meaning to represent information, but to make use of the attributes relevant to both elements to address the function and quality of the information. Moreover, it requests HCDAs to ground the information disclosure in the comprehensive adoption of social media functions as well as a recognition of their new identity as social media users.

Using social media data from the six-weeks after a national epidemic control announcement, this study offers an approach researchers and official account operators can adopt to examine the impact of government information disclosure through public perceptions and responses. Findings from our study bear important implications for future government information disclosure confronting the issues in early stage of public health crises. First, posts should convey sufficient and proper meanings to serve information disclosure purposes. Second, in addition to delivering meaningful information, posts should include explanations and individually applicable information and instructions to better support users' decision-making under emergent circumstances. Third, the government should utilize the spontaneous communication function of social media and operate social media accounts as information service platforms that complement offline administrative services.

Finally, social media platforms' interactive features should be utilized to create mutual communication between the government and the public.

6. Limitations and Future Studies

This study has several limitations. First, we selected the research samples from the top tier HCDAs in China, which endeavor to promote prevention information at the highest efficiency. The findings may reflect contextual and institutional differences, which limits the generalizability HCDA in other tiers or in other countries. In addition, focusing on accounts with the highest number of comments did not account for regional variations across China. The data were collected only during the early stage of the crisis, without considering differences across subsequent crisis phases, which may affect the generalizability of the findings. Second, user comments on social media are typically brief and tend to lack context, which constrained our ability to further explore user intentions and information needs based on their responses. Third, we categorized the public's emotions as positive, neutral, or negative to represent their evaluations of government posts. However, a classification system based on specific types of emotions, such as anxiety, anger, and encouragement, may better identify the triggers and contexts in government posts that elicit emotional reactions. Finally, this study relied on SVM and Random Forest models for comment classification, rather than large language models (LLMs). It may limit the precision and contextual sensitivity of classification.

Future studies can consider including official accounts at different levels of government and incorporating data from different stages of a crisis to obtain a more comprehensive observation of public evaluations of disclosed information. In addition to user comments, researchers can collect exploratory data from users to establish a deeper understanding of the response context and the public's information requirements. More specific emotions can also be incorporated into the analysis to paraphrase users' feelings and expressions. Future research could employ LLM-based classification methods to further enhance accuracy and better detect subtle variations in user emotions and themes.

7. Conclusions

This study examines the communication performance of provincial health commission departments using Weibo during a public health crisis. The finding showed that the government has not optimized social media posts to inform the public about the crisis situation and recommended actions. A better understanding of types of meaning carried by information can help improve the communication impact. The HCDAs should also pay attention to information quality and posting methods to maximize the advantage of social media in disclosing information to the public.

As the COVID-19 is still prevailing and other disease outbreaks are announced as we write these lines, information has growing significance in coping with public health crises. Social media platforms provide a swift and timely venue for governments to deliver information to the public. Realizing this inevitable trend, governments need to adapt to a new role in social media-based communication and to meet the requirement raised by this new communication environment.

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Informed Consent Statement: Not applicable.

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Conflicts of Interest: The authors declare no conflict of interest.

Abbreviation

The following abbreviation is used in this manuscript:

HCDA Health Commission Department Accounts

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