Voices on Twitter: Emotional and Thematic Responses to COVID-19 in Mainstream Media of China and the United States

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Abstract

International social media is often used to study global public opinion and has gradually become an important platform for global media to gain user attention and participation. The globalization of information dissemination has forced mainstream media in various countries to agenda setting and re-agenda setting on social media platforms again and again. This paper analyzes relevant media tweets about "China's COVID-19" on the X (Twitter) platform, focusing on understanding the attitudes and reactions of mainstream media in China and the United States to this global epidemic topic, and providing response strategies for the global information dissemination of Chinese media. Based on digital media analysis methods, thematic analysis and sentiment analysis of tweets from eight mainstream media in three years were conducted, and the content dissemination effects of the eight media were systematically evaluated. The results show that Chinese media reports emphasize the effectiveness of epidemic prevention and control, and the emotional distribution tends to be positive, while American media focus on social tensions and policy disputes and express more negative emotions. The results provide an analytical framework for understanding the information dissemination and discourse construction of Chinese and American media in the context of the global epidemic.

Keywords: COVID-19, media coverage, emotional responses, agenda setting, mainstream meida

1. Introduction

The COVID-19 pandemic, which surfaced in late 2019, is widely acknowledged as the most significant global health crisis in recent history (Anwar et al., 2020). It has profoundly affected global health, economies, and national healthcare systems, posing a formidable challenge to the resilience of governments and populations (Ngai et al., 2022; Baldwin & di Mauro, 2020). The pandemic has imposed unparalleled strains on worldwide public health infrastructures, with its rapid spread and enduring effects on human health drawing extensive public and scholarly attention (Xie et al., 2021). In its initial phases, the uncertainty regarding the virus's origin and pathology led to global panic and adverse emotional responses, significantly influencing the dynamics of international media coverage (Hamidein et al., 2020; Giri & Maurya, 2021). Mainstream media, serving as primary channels for COVID-19 information, have played a crucial role in the international information flow during this crisis, shaping social opinions and public perceptions while also providing emotional support (Pieri, 2018; Choudhary, 2020; Ghasiya & Okamura, 2021).

According to the agenda-setting theory, the media can shape the public's focus on specific issues by prioritizing certain topics (Apuke & Omar, 2020; Lu & Atadil, 2021). China, being the initial epicenter of the outbreak, has been the subject of intense and broad international media scrutiny. Coverage of China's pandemic response has varied, highlighting both criticisms related to the government's stringent information controls and alleged disregard for human rights, and commendations for its swift actions to curb the virus spread and attempts at transparency (Oliveira et al., 2022; Xue et al., 2020). This dualistic portrayal underscores a complex narrative: on one side, China is lauded for its decisive public health measures, and on the other, it faces scrutiny for its information control and transparency issues (Lu & Atadil, 2021; Huang et al., 2021). The global public's interpretation of China's actions and the broader implications for its international relations are largely shaped by these varied media portrayals. Additionally, as noted by Kim and Jung (2021), media narratives of COVID-19 are often imbued with elements of concern, utilizing both positive and negative emotional tones to amplify diverse emotional responses, significantly influencing public sentiment and opinion shifts (Ngai et al., 2022; Huang et al., 2020; Ramos-Lira et al., 2020).

At the same time, the important role of social media in the dissemination of epidemic information deserves attention. Tsao et al. (2021) pointed out that during the outbreak, social media quickly became the main platform for the public to express their views and opinions on events and public health policies, effectively promoting the dissemination of epidemic information. Especially during periods of quarantine following national public health policies, social media usage surged (Aggarwal et al., 2022). Mainstream media in various countries are also increasingly relying on social media platforms for information dissemination, and are trying to set agendas and guide public discussion topics and emotions through social media (Abbas et al., 2021).

On May 5, 2023, the World Health Organization announced that COVID-19 no longer constituted a "public health emergency of international concern", marking the official end of the global epidemic emergency. So far, few studies have focused on the differences in news reports by mainstream media in different countries on international social media platforms. Therefore, this study analyzes relevant media tweets about "China COVID-19" on the X (Twitter) platform, focusing on understanding the reporting themes and emotional tendencies of mainstream media in China and the United States on this global epidemic topic. The two questions we studied are as follows:

RQ1: What are the differences in the themes of tweets about "China COVID-19" posted on Twitter by mainstream media in China and the United States?

RQ2: What are the differences in the emotions of tweets about "China COVID-19" posted on Twitter by mainstream media in China and the United States?

2. Literature Review

2.1 Media Coverage and Public Perception of COVID-19 on Social Media

As COVID-19 spreads around the world, the media has become an important source of information for millions of people, having a significant impact on individuals' perceptions of the risks associated with the virus and the measures they can take to slow its spread. Whether through traditional media channels or social media platforms, the nature of media coverage has a profound impact on public attitudes and behavior in following health guidelines. In this context, mainstream media such as newspapers, television, and online news platforms have played an important role in providing timely updates and important information about COVID-19. Despite the rise of social media, research shows that traditional media remain the public's main source of information (Oliveira et al., 2022). Laor and Lissitsa et al. (2022) pointed out that most COVID-related media consumption still comes from mainstream media, highlighting its continued importance in influencing public discourse during the pandemic.

Social media platforms like Twitter add complexity to the media landscape by enabling the swift spread of information and fostering public discourse, particularly during crises. Twitter not only extends the reach of mainstream media narratives but also promotes user-generated content, enhancing public engagement (Cinelli et al., 2020). The platform's features, such as retweeting and tagging, facilitate rapid information dissemination, bolstering the visibility of specific narratives and markedly shaping public perceptions. Studies indicate that Twitter serves not only to reinforce official accounts but also as a venue for challenging them, often leading users to scrutinize governmental narratives (Oliveira et al., 2022; Xue et al., 2020). Galloway et al. (2020) observe that Twitter frequently hosts critical views against official stances on COVID-19 in the United States, showcasing its significance as a forum for public debate. This aligns with Soroka et al.'s (2020) findings that Twitter amplifies emotional expressions and influences public opinion by highlighting emotionally resonant content.

Moreover, while social media provides avenues for community engagement and access to real-time updates, it also serves as a breeding ground for panic and misinformation (Joshua & Vethanayagam, 2023; Cheng et al., 2020). Research suggests that repeated exposure to inaccurate information can drastically alter individual risk perceptions and health behaviors, contributing to public confusion and anxiety during health crises (Xie et al., 2020; Hagan et al., 2022). Xue et al. (2020) highlight how incorrect reports can foster discrimination and prejudice, particularly against ethnic groups like the Chinese, exacerbated in a social media context where falsehoods can rapidly circulate and skew public understanding of a group or event. The detrimental effects of misinformation on public health communication underscore the critical role of mainstream media in reporting emergencies accurately and responsibly.

2.2 Emotional Tone in Media Reporting

The pivotal role of news media in disseminating information about health emergencies and shaping public awareness cannot be overlooked (Klemm, 2016; Zhao et al., 2020). News outlets frequently employ a variety of emotionally charged words to either instill fear or provide reassurance, influencing public perceptions and responses during crises (Ngai et al., 2022; Lakoff, 2004; Dudo et al., 2007). This strategic use of language profoundly affects how the public processes and reacts to emergency situations (Witte & Allen, 2000; Ngai & Jin, 2016; Brown & Johnson, 2019). Media reports on epidemics are often characterized by their emotional intensity. Goodall et al. (2012) observed that news coverage of the

H1N1 virus commonly featured language that heightened anxiety and fear. This approach was corroborated by Vasterman and Ruigrok (2013), who noted that some media outlets effectively employ a dramatic tone. Conversely, to mitigate public anxiety, media sources also sometimes adopt a comforting and positive tone. For instance, Holland and Blood (2010) discovered that Australian newspapers during the swine flu pandemic typically utilized reassuring language.

Research indicates that the mainstream media can significantly sway public perceptions of health risks through the use of emotionally laden language (Loewenstein et al., 2001; Biener et al., 2004; Ngai et al., 2022). Shih et al. (2020) pointed out that in the early stages of the COVID-19 outbreak, traditional media frequently highlighted fear and uncertainty about the virus to emphasize its severity. Such patterns align with findings that emotional language, whether calming or fear-inducing, directly influences risk perception and public adherence to health guidelines (Nabi & Myrick, 2019). Basch et al. (2020) supported this notion, finding that news reports focusing on concerns about COVID-19 could intensify negative public emotions and potentially lead to counterproductive behaviors. Li et al. (2023) further examined how media sources impact public attitudes towards virus prevention measures during the pandemic, noting a significant influence from traditional media. Emotional expressions on social media platforms tend to be more immediate and varied. Research shows that platforms like Twitter play an increasingly vital role in expressing a range of emotions such as hope, solidarity, fear, and concern (Cinelli et al., 2020). This distinction between traditional and social media underscores the unique capabilities of platforms like Twitter in evoking strong emotional responses, fostering social connections, and facilitating real-time information sharing (Zhao & Zhou, 2021).

2.3 Comparative Differences in News Coverage Across Countries

In recent years, a substantial body of research has been dedicated to examining various factors that shape news orientation and framing (Beaudoin, 2007; Luther & Zhou, 2005; Ngai et al., 2022). Notably, in the context of transnational media analysis, political influences (Elswah & Howard, 2020), cultural values (Liang, 2019; Varrall, 2020), and differing media systems (DiResta, 2020; Varrall, 2020) are widely acknowledged as significant determinants of variations in news reporting. It is important to highlight that global media coverage of COVID-19 illustrates how local conditions, cultural norms, and political agendas distinctively shape the narratives in each country. In China, for example, state-controlled media often underscores themes of government involvement and collective responsibility, promoting a narrative of resilience and unity (Gunasekeran et al., 2022; Zhu et al., 2023). Wang et al. (2021) observe that Chinese media frequently frame the pandemic as a "people's war," encouraging communal compliance and unity. This approach aligns with the broader Chinese media trend of fostering patriotism and collective endurance during crises (Li, 2020). Furthermore, Wang (2021) identifies emotional regulation as a primary motive for Chinese social media users during the pandemic, which in turn influences their engagement with mainstream media. Conversely, international media, particularly in the United States, often adopt a critical stance towards China's response, focusing more on the aspects of accountability and transparency in their reports (Ban et al., 2021). Hart et al. (2020)'s research demonstrates the importance of individual interests in the United States. They found that American media paid more attention to topics such as public debate on government restrictions, the impact of city lockdowns on the economy, and personal freedom. This difference in reporting not only affects the impression of China by the public in different countries, but also affects the world's view of China's fight against the epidemic.

In addition, thematic analysis of social media content reveals different ways in which Twitter users in China and the United States interact on the topic of COVID-19. Johnson and Veil (2021) found that American users tend to discuss topics related to personal freedom and government regulation. In contrast, Hu et al. (2023) found that in China, influenced by state-led media narratives, Twitter users (including those active on similar platforms such as Weibo) are more concerned with themes of collective efforts and community resilience. Based on this, our research focuses on whether there are differences in the degree of attention and emotional expression on the topic when mainstream media reports on the topic of "COVID-19 in China" through the social media platform Twitter. Based on the above analysis, we propose the following hypotheses:

  H1. There are significant differences in the coverage direction of news topics on the "COVID-19 in China" tweet by mainstream media in China and the United States.

  H2. There is a significant difference in the emotional tone on the "COVID-19 in China" tweet by mainstream media in China and the United States.

3. Methodology

3.1 Selection of Platform and Mainstream Media

As a global social media platform, Platform X is often considered an important tool for understanding public sentiment and opinions during public health crises (Hase, Boczek & Scharkow, 2022). As Boukes (2019) pointed out, Facebook and Twitter are the main platforms for the dissemination of news information. Compared with Facebook, Twitter provides a

higher level of interactivity and hypertextuality (Hase, Boczek & Scharkow, 2022). Additionally, Twitter's fragmented information dissemination characteristics make it more suitable for the dissemination of continuous and sudden news events (Dvir-Gvirsman et al., 2022; Sixto-García et al., 2024). Especially in the public health event COVID-19 that has occurred in recent years, Twitter has played an indispensable role in the dissemination of global epidemic news information. As an influential social media platform with 330 million unique visitors per month, it has an open API that allows access and search of user content (Chipidza et al., 2021). Based on this, this study uses the tweet text of Platform X as the data source for the study.

The relationship between China and US have always been the focus of the Chinese government and media (Sun, 2022; Loh & Loke, 2024). The image of China presented by the US media is one of the focuses of Chinese communication researchers (Li, 2022; Gao & Xu, 2020; Jiang, 2023; Gao, 2021; Sun, 2022). At the same time, Western media have long held prejudices and stereotypes against China (Kurlantzick, 2023; Hu et al., 2024; Chen et al., 2020), which is reflected in news media reports and affects many audiences, especially foreign audiences, their impressions and attitudes towards China (Nip & Sun, 2018; Chen et al., 2020; Loh & Loke, 2024). Therefore, this paper selected the Twitter accounts of eight mainstream media in China and the United States as the research objects. Among them, according to the monitoring and evaluation report of CTR's overseas social media communication data (see the attachment for specific data), this study selected the top four Chinese media, namely CGTN (@CGTNOfficial), People's Daily (@PDChina), Xinhua News Agency (@XHNews) and China Daily (@ChinaDaily). These four media are the most important central-level media that the Chinese government strongly supports to expand its global business, and are considered to be the most influential media in China on Twitter (Nip & Sun, 2018). At the same time, considering the influence and number of fans of American media on various international social media platforms (see the attachment for specific data), referring to the world media rankings (Gao & Xu, 2020; Sun, 2022), this study selected CNN (@CNN), New York Times (@nytimes), The Associated Press (@AP) and Wall Street Journal (@WSJ). The Reuters Institute Digital News Report's 2021 survey on news media trust will also be used as a reference.

Table 1. Media outlets, year of joining Twitter, followers and following

Twitter account	Join year	Followers	Following
CGTN	2013	12.8M	71
China Daily	2013	1.2M	277
People Daily,China	2011	6.6M	4010
XinhuaNews	2012	11.8M	79
CNN	2007	63M	1078
nytimes	2007	55.3M	874
WSJ	2007	20.7M	1085
AP	2009	15.9M	6492

3.2 Data Collection and Sample Selection

This paper uses Python crawler technology to obtain tweet data from eight research media from X (twitter), which is often used for data collection in social media (Chipidza et al., 2021). First, this study takes "COVID-19 in China" as the research theme, so "zero-covid policy", "Coronavirus", "Wuhan virus", "China virus", "COVID-19 China", "mask policy", "health code", "nucleic acid testing", "vaccination", "home isolation", "centralized isolation", "city lockdown" and "hospital treatment" are used as keywords for advanced search. Use python commands to crawl account information, tweet content, release time, "reply", "retweet" and "like". The dataset spans from January 1, 2020, to December 31, 2022, comprising 4032 media tweets and associated data that are valid for analysis.

Cleaning data from Twitter is an essential preliminary step prior to word segmentation, crucial for enhancing the efficacy of the subsequent text analysis. This procedure involves several key activities: eliminating text noise, incorporating necessary terms into the segmentation dictionary, and excluding irrelevant or non-meaningful words. Initially, text noise such as emojis and punctuation marks are removed to prepare the data for analysis (Xie et al., 2021; Celardo, Iezzi & Vichi, 2016). Subsequently, specific terms relevant to the study, including "Hong Kong", "Zhong Nanshan", "China CDC", "China virus", and "Wuhan Virus", are added to enhance the dictionary used for text segmentation. Lastly, the removal of superfluous or meaningless terms like "now", "after", "others", and "EXCLUSIVE" is conducted to refine the quality of the text analysis. Eliminating these terms helps streamline the analysis, thereby increasing both its precision and its overall impact.

3.3 Research Design and Method

3.3.1 Topic Mining Method

In recent years, Latent Dirichlet Allocation (LDA) has become a prominent method in social media data analysis (Xie et

al., 2022; Wang et al., 2022). It is widely applied in topic modeling (Yakunin et al., 2021; Barus et al., 2012). As an unsupervised learning algorithm, LDA is effective in identifying topics within social media content. The model offers an advantage over manual topic assignment. It automatically determines the topic of each document through probabilistic distributions and clustering methods (Schwartz et al., 2013). In this study, we use the Python-based Gensim package to extract topics from discussions on "China's COVID-19" posted by Chinese and American mainstream media on Twitter. This approach allows us to test hypotheses H1 and H2.

To determine the optimal number of topics, we rely on coherence scores and perplexity as evaluation metrics. Coherence scores measure the semantic similarity of words within each topic. A higher coherence score means that the words are more semantically related. Perplexity measures the model's ability to predict unseen data. A lower perplexity score indicates a better model fit. By examining trends in coherence and perplexity across different topic numbers, we identified 12 topics. These topics showed both high coherence and low perplexity, striking a balance between explanatory power and predictive accuracy.
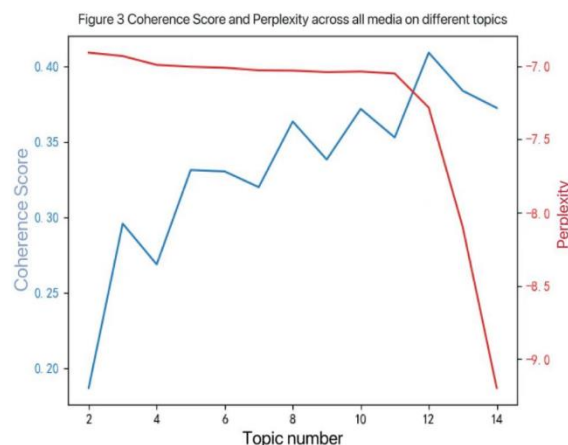

Figure 1. Coherence score and perplexity across all media on different topics

After determining the number of topics, we apply topic modeling to the dataset. This process generates a list of keywords for each topic and reveals the latent thematic structure of the corpus. We then use LDA visualization tools to show the distribution of topics and their key terms. These visualizations support detailed interpretation and analysis of the model. The approach uncovers the hidden semantic structure of the text data. It also provides a solid foundation for examining content trends across different media outlets.

3.3.2 Sentiment Analysis

The analysis of text sentiment is a common method in opinion mining. It helps reveal the emotions hidden in text data (Bhonde et al., 2015; Pérez-Pérez, 2019). In this study, we examined emotional expressions in tweets from Chinese and American mainstream media. We used natural language processing methods together with sentiment analysis techniques. Specifically, we applied VADER (Valence Aware Dictionary and sEntiment Reasoner).VADER is a tool designed for sentiment analysis of social media text. It relies on predefined dictionaries and rules to measure the strength of emotions in text. We used VADER to evaluate the emotional tone of the tweets. Based on the scores, we classified the tweets into three categories: positive, negative, and neutral (Ray & Chakrabarti, 2017).

To explore changes in sentiment across countries and time periods, we created a sentiment trend chart. We calculated the monthly sentiment scores of media in each country. We then conducted group analysis based on the posting time of the tweets. This method allowed us to show how sentiment changed over time. It also highlighted the fluctuations in media sentiment during major global events. We further extracted high-frequency words from tweets in each month and sentiment type. We focused on positive and negative tweets and combined this with VADER's sentiment intensity scores. This step highlighted words with strong emotional meaning. The extraction of high-frequency words helped reveal the semantic patterns behind the sentiment. It also reflected the media's emotional stance on specific events and topics.

4. Results

4.1 Descriptive Results

This study investigated 4034 tweets published by 8 mainstream media on X (original Twitter) from January 2020 to December 2022. Among them, Chinese media (CGTN, China Daily, People's Daily, Xinhua News Agency) reported 2278 times, and American media (CNN, New York Times, Wall Street Journal, Associated Press) reported 1756 times.

The binomial test (Table 2) showed a statistically significant difference, with Chinese media contributing 56% of the total posts and American media contributing 44% (p < 0.001).

Table 2. Binomial test of posts different between medias' origin

Category	N	Observed Prop.	Test Prop.	p value
China	2278	0.56	0.5	<0.001
US	1756	0.44		
Total	4034	1		

On this basis, we analyzed the number of tweets in each year by media source. Figure 2 shows the total number of annual posts by Chinese and American media. The line chart indicates that Chinese media posted more frequently than American media during the three years studied. Both countries' attention to "COVID-19 in China" dropped sharply in 2021. In 2022, the attention slightly increased. This trend reflects the global pattern of the pandemic. After the initial shock in 2020, attention to the crisis weakened. However, new variants and vaccination campaigns brought a small rebound in 2022 (Leetaru, 2021). The more consistent coverage from Chinese media can be linked to the country's strict "zero-COVID" policy. This policy required continuous public communication and frequent updates (Wang, 2020).
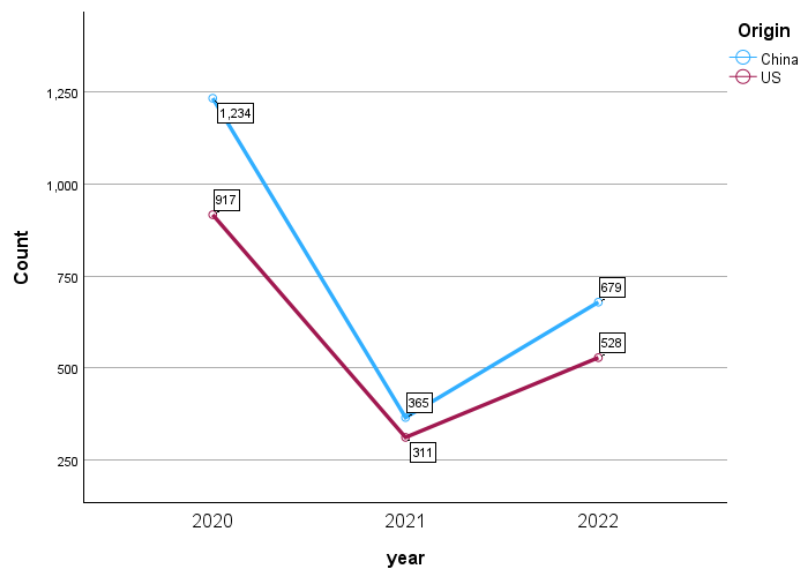

Figure 2. Number of posts in X by media origin

4.2 Results of Topic Mining

In the LDA analysis of the overall data of China and the United States, the extracted topics cover multiple levels, including concerns about the recovery of the epidemic, the implementation of lockdown measures, vaccine promotion, nucleic acid testing, virus transmission, and global prevention and control. In the overall theme, words such as "resurgence", "recovery", "effort", "vaccine", "testing", "lockdown", and "response" appear frequently, indicating that global media focus on key issues such as epidemic control, economic recovery, and public health measures in their epidemic reports. This consensus theme reflects the widespread concern about epidemic response measures around the world. Whether in China or the United States, controlling the spread of the epidemic, protecting public health, and promoting economic recovery are core issues in mainstream media reports.

Table 3. LDA topic model analysis of the corpus

Topics	Topic Words and Weights
Topic 1 The recurrence of the epidemic and its impact on emergency management	0.078*"resurgence" + 0.068*"recovery" + 0.059*"center" + 0.043*"emergency" + 0.032*"following" + 0.030*"related" + 0.028*"highly" + 0.026*"despite" + 0.025*"research" + 0.025*"chain"
Topic 2 Lockdown policies and their impact on the economy	0.077*"effort" + 0.066*"lockdown" + 0.039*"economy" + 0.034*"city" + 0.030*"restriction" + 0.025*"starting" + 0.023*"week" + 0.023*"contain" + 0.020*"home" + 0.018*"travel"
Topic 3 Social issues such as social conspiracy theories and racial discrimination	0.108*"beijing" + 0.050*"amid" + 0.049*"work" + 0.026*"capital" + 0.025*"community" + 0.024*"positive" + 0.024*"need" + 0.023*"infectious" + 0.022*"round" + 0.020*"district"
Topic 4 Regional epidemic prevention measures	0.072*"market" + 0.047*"tuesday" + 0.033*"area" + 0.030*"provide" + 0.027*"staff" + 0.026*"citizen" + 0.026*"arrived" + 0.021*"release" + 0.021*"temporary" + 0.021*"combat"
Topic 5 Market response and material support	0.228*"covid" + 0.043*"pandemic" + 0.040*"medical" + 0.038*"health" + 0.033*"anti" + 0.029*"fight" + 0.026*"shanghai" + 0.026*"supply" + 0.023*"mask" + 0.021*"economic"
Topic 6 Response of the medical system to the epidemic	0.111*"chinese" + 0.096*"coronavirus" + 0.061*"case" + 0.051*"outbreak" + 0.033*"infection" + 0.025*"resident" + 0.023*"reported" + 0.022*"latest" + 0.019*"spread" + 0.019*"number"
Topic 7 Outbreak in China and its control measures	0.144*"virus" + 0.054*"say" + 0.024*"donated" + 0.023*"medicine" + 0.022*"growth" + 0.021*"year" + 0.021*"effective" + 0.020*"second" + 0.019*"aid" + 0.017*"scientist"
Topic 8 Donations and drug research	0.146*"wuhan" + 0.092*"hospital" + 0.056*"patient" + 0.044*"coronavirus" + 0.039*"novel" + 0.021*"infected" + 0.019*"national" + 0.018*"fightvirus" + 0.014*"makeshift" + 0.014*"capacity"
Topic 9 Wuhan epidemic	0.102*"testing" + 0.075*"nucleic" + 0.075*"acid" + 0.054*"province" + 0.052*"treatment" + 0.031*"battle" + 0.028*"hubei" + 0.027*"monday" + 0.020*"pneumonia" + 0.020*"tianjin"
Topic 10 COVID-19 testing	0.162*"epidemic" + 0.069*"response" + 0.050*"life" + 0.043*"local" + 0.028*"time" + 0.026*"class" + 0.026*"people" + 0.024*"hongkong" + 0.023*"public" + 0.020*"president"
Topic 11 Impact of local response measures on daily life	0.075*"globalink" + 0.071*"vaccine" + 0.056*"policy" + 0.045*"covid" + 0.032*"zerocovid" + 0.022*"dynamic" + 0.021*"vaccination" + 0.017*"lab" + 0.015*"use" + 0.014*"batch"
Topic 12 Global vaccination policy and international cooperation	0.094*"country" + 0.082*"measure" + 0.035*"foreign" + 0.033*"government" + 0.028*"zero" + 0.026*"production" + 0.025*"firm" + 0.025*"variant" + 0.023*"disease" + 0.022*"omicron"

Analysis of topic modeling in China and the United States shows clear differences in how the two countries' media report on the epidemic. Chinese media often use keywords such as "resurgence," "recovery," "lockdown," "effort," "vaccine," and "supply." These words highlight concrete outcomes and practical strategies for epidemic prevention and control. The focus shows that Chinese media prioritize anti-epidemic actions, social management, and policy implementation. In addition, frequent mentions of "Beijing," "Wuhan," and "testing" indicate attention to the roles of specific cities in fighting the disease and supporting social and economic recovery.

In contrast, U.S. media narratives are more critical and highlight social crises. Their reports often use words like "protest," "anger," "concern," "struggle," "restriction," and "lockdown." This pattern shows a strong focus on social tensions, public dissatisfaction, and policy disputes. The repeated use of terms like "protester," "government," and "party" suggests that American media emphasize evaluating and criticizing China's response. This reflects a negative stance toward China's epidemic prevention policies. The themes reveal that U.S. media pay more attention to political debates and challenges to epidemic management, while offering less discussion of specific control measures or their effectiveness.

Chinese media do more than report on technical measures. They also stress a positive narrative of unity and recovery. Keywords such as "gratitude," "praise," "fight," and "strong" reflect this tendency. In contrast, U.S. media highlight power struggles during the global crisis. Words such as "global," "virus origin," and "organization" show concern about the source of the epidemic and the reshaping of global power structures. At the same time, terms like "vaccine," "scientist," and "company" suggest greater interest in competition and scientific progress in vaccine development. These differences show that Chinese media emphasize domestic achievements and active strategies, while U.S. media highlight global impacts and political consequences.

Overall, the mainstream media in China and the United States present very different thematic structures and narrative priorities in their COVID-19 reporting. These differences reflect how each media system constructs epidemic discourse. American media portray China's epidemic policy and social tensions in a critical way. In contrast, Chinese media focus on progress, effectiveness, and positive narratives of epidemic control. Topic modeling results therefore provide a useful framework for understanding how both sides shape information and discourse during the global epidemic. At the same time, these findings also confirm our hypothesis 1.

4.3 Sentiment Analysis Results

By using the VADER sentiment analysis model to analyze the tweet data of Chinese and American media on the Twitter platform, combined with the sentiment score of the text and the frequency distribution of keywords, the results show that the emotional tendencies of the media in the two countries when reporting the epidemic have significant difference. Specifically, Chinese media reports overall showed positive emotional characteristics. The number of tweets with positive emotions was 1,128, which was significantly higher than the 659 tweets with negative emotions and 491 tweets with neutral emotions. This shows that when reporting on the epidemic, Chinese media put more emphasis on positive

narratives such as the effectiveness of epidemic prevention and control and social cohesion. In contrast, there were 950 tweets with negative emotions in the US media, only 504 tweets with positive emotions, and 302 tweets with neutral emotions, reflecting that the US media more prominently expressed critical and negative sentiments in reporting on the epidemic. Emotions, especially in reporting on China's management of the epidemic and its spread around the world.
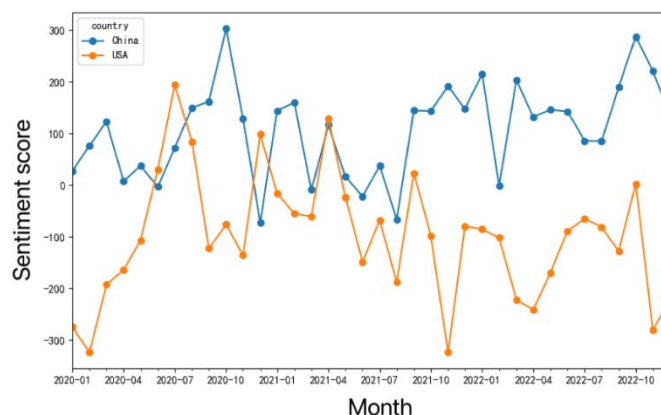

Figure 4. Monthly sentiment score of mainstream media in China and the US

From the perspective of sentiment scores, the sentiment of Chinese media remained positive in most months and peaked in October 2020 (303.38), when China successfully controlled the epidemic and the media reported positively on the achievements in fighting the epidemic and social solidarity. In a few months, such as December 2020 (-73.48) and August 2021 (-66.81), the sentiment score was negative, which may reflect the Chinese media's coverage of the rebound of the epidemic or other negative social events. However, the overall sentiment trend is relatively stable, and as the epidemic prevention and control progresses, the sentiment score generally shows an upward trend, especially during 2022, when the sentiment scores of most months are positive, indicating that the media has emphasized more positive progress and achievements in epidemic prevention and control during this year.
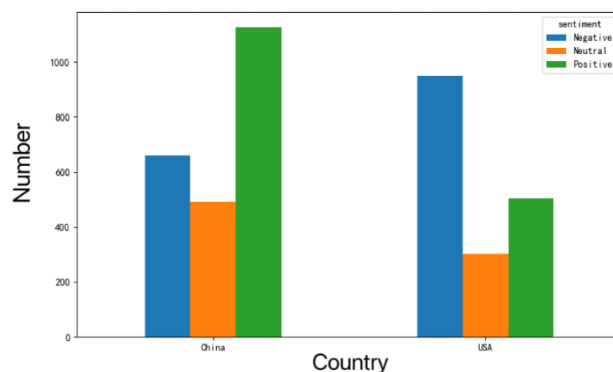

Figure 5. The sentiment distribution of mainstream media in China and the US

In contrast, the sentiment performance of the US media is more volatile, and negative sentiment dominates. In February 2020, the sentiment score dropped to the lowest point (-323.27), when the global epidemic was in its early stages and media reports were full of negative comments on China's epidemic management and panic about the spread of the epidemic. Even though the sentiment scores rebounded in the second half of 2020, such as in July 2020 (193.77) and December 2020 (98.15), the sentiment expression of the US media was still mainly negative overall. In the second half of 2021, the sentiment score dropped sharply again, with a sentiment score of -323.74 in November 2021, which was a moment when the US media once again expressed strong criticism and negative emotions when reporting on the epidemic in China. Although the sentiment scores of the US media rebounded slightly in early 2022, such as in January 2022 (-85.47), the overall sentiment tone was still negative, especially in November 2022, when the sentiment score dropped sharply again to -280.28.

The high-frequency words in the sentiment scores also further revealed this difference in emotional expression. In the positive emotional reports of Chinese media, high-frequency words such as "strong", "gratitude", and "love" indicate that their reporting content focuses on positive energy and high evaluation of the effectiveness of epidemic prevention and control. On the contrary, in the negative emotional reports of the US media, high-frequency words such as "failed", "threat", and "assault" frequently appear, reflecting its criticism of the epidemic management and its concern about the

social crisis. Especially in the time period dominated by negative emotions, such as February 2020 and November 2021, the keywords of negative emotions are more concentrated, showing that the US media emphasized the threat and negative impact of the epidemic more during this period.

From the overall emotional trend, the emotional expression of the media in China and the United States showed significant differences in three years. Hypothesis 2 was verified. The emotional tendency of the Chinese media was relatively stable throughout the research period. Although negative emotional fluctuations occurred in the early stage of the epidemic and in some specific months, it generally maintained a relatively positive reporting tone. The emotional fluctuations of the US media were more intense, especially in the early stage of the epidemic, when the expression of negative emotions was particularly prominent. Although there has been a slight reversal over time, overall it is still reported in a more critical manner.

5. Discussion

Researchers have used thematic analysis of media tweets to detect differences in topics and sentiment over time to identify topics and emotions that different media outlets have limited attention to (Noor et al., 2020). Comparing the coverage of the COVID-19 outbreak in China by mainstream media in China and the United States will help us understand how the narratives of mainstream media in different countries on Twitter influence public opinion in the context of a global health crisis. Chinese official media place great emphasis on topics such as group responsibility, government effectiveness, and public health measures. Topics they often emphasize are the need to quickly and effectively control the outbreak across the country. At the same time, they pay a lot of attention to mutual help and active dedication among people. Words such as "strong", "love" and "effort" are frequently used, emphasizing the great contributions of Chinese people who have helped people actively fight the covid-19 virus. The purpose is still to build a sense of solidarity in the minds of the public to strengthen the effective management of the epidemic. At the same time, China's ability to fight the epidemic and its good national image are better presented on Twitter.

This topic reporting selection is consistent with Hofstede's cultural dimension theory, which suggests that collectivist cultures may respond more positively to government directives, resulting in a higher degree of compliance with public health measures (Kavalski, 2021). The emphasis on the government's proactive actions may help the public form a more favorable view of the government's handling of the epidemic (Ouyang et al., 2022; Li & Liu, 2020; Lu & Atadil, 2021). The basic reporting principle of China's mainstream media has always been to serve as the mouthpiece of the Chinese government, so when they report news, they need to prioritize the Chinese government's future strategy and collective well-being (Damašević & Zailskaitė-Jakštė, 2022). News content needs to help the Chinese government build a sense of solidarity and maintain social harmony (Sing Bik Ngai et al., 2022), which may lead to more supportive and cooperative discourse on social media.

On the other hand, US media reports emphasize more accountability issues and criticism of the Chinese government's initial response to the epidemic, a conclusion consistent with the analysis of Faasse & Newby (2020) and Wang et al. (2022). It must be emphasized that since COVID-19 first appeared in China and is highly contagious, it poses a serious health threat to global citizens. As a result, U.S. media coverage of COVID-19 often promotes an ideology that is different from that of China, and they tend to use a negative or skeptical tone. This critical frame may lead American audiences to have a negative view of China, reinforcing existing prejudices and distrust (Morath et al., 2022; Ouyang et al., 2022). When China is perceived as the epicenter of the pandemic, it notably influences public engagement with the country and international relations (Zhong et al., 2021; Lin et al., 2020; Ameyaw-Brobbey, 2021). U.S. mainstream media tweets tend to highlight individualism and self-expression, focusing on citizens' personal experiences (Maaravi et al., 2021). This focus has led to emotionally charged media discussions about COVID-19, often reflecting public frustrations, anxiety, and resistance to government-imposed restrictions and lockdowns (Liu, 2021). Additionally, narratives in the U.S. media frequently raise concerns about misinformation and the necessity for transparent information, potentially shaping public skepticism regarding China's reporting of the pandemic (Subedi et al., 2020).

In summary, the coverage of the COVID-19 outbreak by mainstream media in China and the United States illustrates that media narratives significantly shape public perception during global health crises. The divergent reporting styles of the two countries' media reflect their broader political and cultural contexts, profoundly impacting the attitudes and behaviors of the populace. Although COVID-19 no longer represents a global public health emergency, its ongoing impacts and challenges persist. The findings of the study have wider implications for international crisis communication and the dissemination of public health information in addition to aiding in our understanding of China's and the US's media strategies in the realm of international public opinion.

Regarding global crisis communication, this study discovered that Chinese mainstream media presented more balanced and positive attitudes in their narratives by emphasizing collective efforts and successes in epidemic prevention and control. In times of crisis, this communication style can help maintain a comparatively consistent and favorable national

image and, to some degree, increase public confidence in government activities. This has significant implications for future public health crises in other nations: highlighting positive emotions and successful moments might strengthen social bonds and reduce public anxiety. On the other hand, during the outbreak, American mainstream media expressed more negative attitude and gave priority to social disputes, political discussions, and policy disagreements. This reporting style may heighten social differences and public dissatisfaction, but it also emphasizes the news media's oversight and crucial function. These findings imply that media agenda-setting and framing choices can have a direct impact on the development of public opinion and the psychological well-being of the people during international public health emergencies.

Second, in terms of the dissemination of public health information, this study highlights the disparate communication styles of international media. The implementation of public health policy can be advanced by encouraging public acceptance and compliance with information through positive and constructive reporting. However, critical and conflict-oriented reporting can weaken the credibility of information and the efficiency of policy implementation, even when it increases diversity in public discourse. A transparent, reliable, and credible information environment will be promoted if national media outlets and international public health organizations can work together to coordinate and support one another in crisis communication.

Furthermore, the analytical framework proposed in this study can be applied not only to understanding the differences in COVID-19 reporting between China and the United States but also to public opinion research on other transnational crisis issues, such as climate change, geopolitical conflict, and the global economic crisis. Scholars and policymakers can better understand the trends and impacts of information transmission and develop more effective communication strategies for future crises by methodically examining themes and sentiments expressed in various media platforms.

6. Conclusion and Limitation

During the global health crisis, mainstream media in various countries spread information about the epidemic through international social media sites and hoped to set the agenda for the public in an attempt to influence their views on the epidemic. This study found that there were significant differences in the perspectives and emotional tendencies of different countries when describing the topic of "COVID-19 in China". This study provides practical implications for China to develop effective strategies to deal with international social media public opinion in the future. Due to differences in cultural values, political factors and reporting strategies, news reports on the same topic often produce completely different reporting effects. This study provides evidence-based insights into Chinese media's overseas communication in order to provide reference for authorities to conduct effective political communication and policy advocacy. In conclusion, the differences in the topics selected by mainstream media in China and the United States on Twitter reflect broader cultural and political dynamics. Understanding these differences is critical to developing effective public health communication strategies that resonate with different audiences and promote compliance with health guidelines during current and future health crises. As the world continues to grapple with the impact of COVID-19, the role of the media in shaping public perception remains a key area for further research and analysis.

Our study has certain limitations. First, in terms of data selection, this study relied entirely on Twitter/X, an international social media platform. Although Twitter/X has a big impact on how information is shared globally, it is not the only platform for public discussion, and its use and impact differ greatly between nations. For instance, the site is not directly accessible to the public in mainland China, and tweets from Chinese media are primarily intended for global viewers, whereas those from American media are intended for both home and foreign audiences. Because of this platform difference, the research findings might not accurately represent the media's impact on public opinion and communication efficacy in the two nations.

Second, when it came to keyword selection, the study mostly used vocabulary search data associated with the "China epidemic," which might have led to the lacking of certain pertinent information.   Reports that discuss the epidemic, for instance, but do not specifically refer to "China" or make use of metaphorical language might have been left out. The objectivity and representativeness of the analysis results could be impacted by this selection bias. By using manual semantic filtering techniques or broadening the keyword range, further research could further enhance the data's integrity.

Finally, although we discussed and analyzed the topics and emotional tone of tweets from eight mainstream media over a period of three years in our study. However, given that the number of media studies is still not extensive enough, it is not necessarily possible to generalize the existing research results to other news media, especially the particularity of Sino-US relations, which makes the research results unable to be generalized to the media in China and other countries. In addition, since the data were collected in a specific period from January 1, 2020 to December 31, 2022, it is necessary to increase the research period in subsequent studies to examine whether there are differences in news coverage of COVID-19 at other times. In particular, the time around the WTO's announcement that COVID-19 no

longer posed a global epidemic threat is particularly worthy of further research. Further research may help to develop and identify some effective methods for responding to international social media public opinion crises. The insights discussed are essential and helpful for establishing a good and powerful media network when a global public crisis occurs.

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Authors contributions

Yan Dong and Dr. Julia Wirza Mohd Zawawi were responsible for study design and revising. Yan Dong, Dr. Rosmiza Bidin and Dr. Syed Agil Syed Alsagoff was responsible for data collection. Yan Dong drafted the manuscript and Dr. Julia Wirza Mohd Zawawi revised it. All authors read and approved the final manuscript. All authors contributed equally to the study.

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APPENDIX A

PHASE	PROCEDURE	PRODUCT

QUANTITATIVE
Data collection

- Content analysis of news articles from 8 Twitter accounts of Chinese and US' mainstream media (n=4034)

- Information have been coded in coding sheet

QUANTITATIVE
Data analysis

- LDA topic model for news themes
- VADER for Sentiment analysis

- Descriptive statistics
- LDA topic model analysis of the corpus, including topic and keywords
- Monthly sentiment score of mainstream media in China and the US
- The sentiment distribution of mainstream media in China and the US

Connecting all the findings of quantitative data analysis

- The explanation of the quantitative analysis results

- Discussion
- Implications
- Future research