Research Progress and Hotspots in Epidemics and Public Opinion: Visual Review Based on CiteSpace

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Abstract

The paper aims to present a comprehensive analysis of the progress, hotspots, and trends of research in the study of epidemics and public opinion. Using CiteSpace as a research tool, this study focuses on 102 relevant literature on epidemics and public opinion published between 2013 and 2023 in the core database of Web of Science. Drawing on various data such as the annual number of publications, journal sources, authors, research institutions, and keywords, this paper constructs knowledge maps to provide an in-depth analysis of the research trends and developmental directions in the field of study over the past decade. The research findings indicate that the field of study has undergone three phases, namely exploration, outbreak, and retracement. The research hotspots in this field of study mainly focus on social media, epidemics model, media, public health, sentiment analysis, Twitter, behavior, and communication. Additionally, the research highlights that online public opinion is an essential trend for future exploration and study in this field.

Keywords

Epidemics, Public Opinion, Visual Review

1. Introduction

The outbreak of an epidemic is a natural disaster that can have a huge impact on people's lives, health, and property. Public opinion, an important social mentality and behavior, often affects the implementation of public policies and measures. Epidemics are characterized by suddenness and uncertainty, and once they

break out, they quickly become hot topics of public concern and discussion, triggering public opinion. Due to the knowledge gap and the silo effect of information, the public receives asymmetrical information, and their emotions are easily influenced by various external factors. This can cause phenomena such as group polarization, which increases the difficulty of managing public opinion and threatens social stability. Therefore, research on public opinion in the context of the pandemic is particularly important to maintain social harmony and stability. The interaction between epidemics and public opinion has become a hot topic of current research. While the academic community has conducted research and discussions on either public opinion or epidemics from different perspectives, there is still relatively little research analyzing the core issues of epidemics and public opinion. This article reviews literature in the Web of Science (WOS) core journal database and uses knowledge mapping to analyze the annual publication volume, authors, journal sources, and research institutions. This article also systematically presents the development and trend of research on epidemics and public opinion through the keywords burst and keywords co-citation.

2. Research Methods and Data Sources

2.1. Data Sources

The literature data in this study are obtained from the WOS core collection database with a topic search using the query terms "public opinion" and "epidemic". The search condition is set to the "exact search" option. The date range is from January 1st, 2013 to March 19th, 2023, and 112 relevant articles are retrieved. After excluding non-academic literature and conducting literature deduplication using CiteSpace, a total of 102 pieces of valid target literature are eventually obtained.

2.2. Research Method

The author conducts a study on epidemics and public opinion literature in the Web of Science database over the past decade using CiteSpace knowledge mapping software. The target literature information is imported into the CiteSpace 6.1R2 software in text format to generate a keyword bursts map and keywords co-citation map of the research field, illustrating the development, hotspots, frontiers, and trends of research topics on epidemics and public opinion over the past 10 years.

CiteSpace is visualization and statistical software developed by Chaomei Chen, a Chinese-American professor at Drexel University. This software can be used to classify, summarize, and statistically analyze literature published in databases such as WOS, CSSCI, and CNKI to reflect core authors, research institutions, journals, and highly cited papers in the field and to conduct visual analysis of historical research, research hotspots, and trends in the field through knowledge maps. In recent years, this software has been widely used in knowledge mapping research in various fields.

3. Results

3.1. Quantitative Analysis of Published Literature

Using Excel software to conduct a quantitative analysis of the annual publication rate for 102 relevant literature papers (shown in Figure 1), the overall number of articles published in the literature between 2013 and 2023 shows an upward trend and can be roughly divided into three phases: the exploration period, with 27 articles published in 2013-2019; the outbreak period, with 70 articles published in 2020-2022, and the retracement period, with 5 articles published in 2023. As can be seen, early research on epidemics and public opinion is relatively smooth. There is a spurt of rapid growth in the number of articles in 2020, which is closely related to the outbreak of the COVID-19 epidemic in late 2019, and a year-on-year increase in the number of articles from 2020-2022, as the research continues to fester. As of March 19, 2023, five articles have been published in just the first quarter, which is equivalent to the total number of 2019, showing that although the research interest in epidemics and public opinion has fallen back, it will still be a field of continued attention for scholars.

3.2. Journal Sources Analysis

Excel is used to analyze the journal sources of the 102 papers (shown in Table 1). The top 5 journals in terms of number of articles published are: International Journal Of Environmental Research And Public Health (8), Journal Of Medical Internet Research (5), Frontiers In Public Health (4), IEEE Access (3), and Plos One (3). The top 5 journals collectively published 22.55% of the target literature. From the perspective of disciplines, intelligence, journalism and media, and politics have conducted relevant research in this field, further reflecting the interdisciplinary nature of the research on epidemics and public opinion.
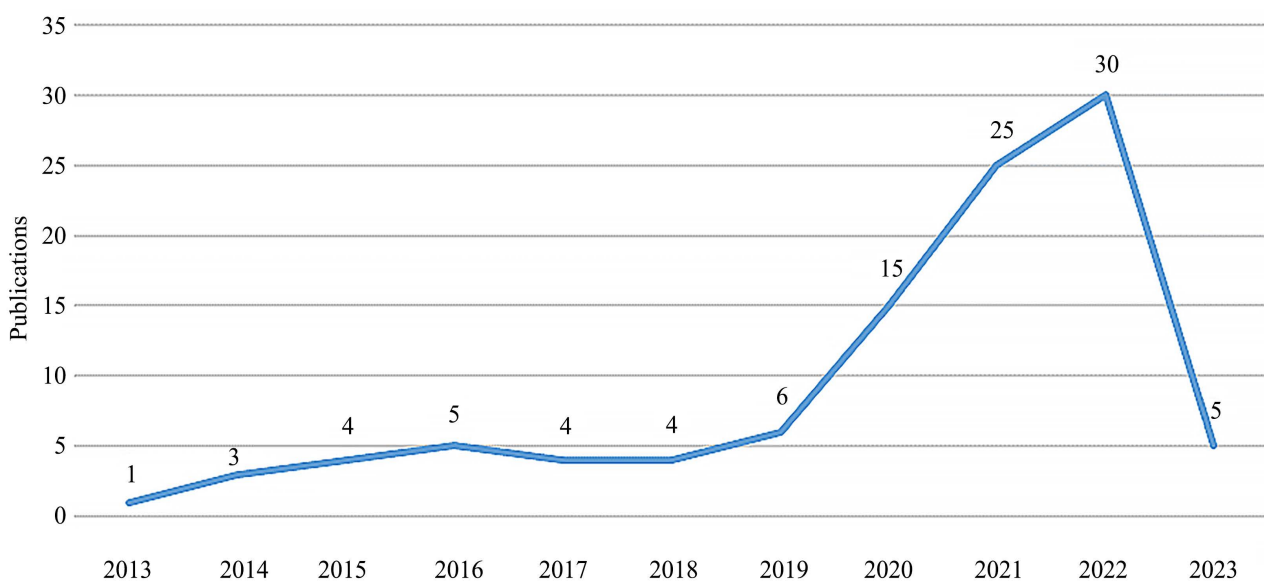

Figure 1. Statistics on the number of published literatures (in years).

Table 1. Top 5 journals ranked publications number.

Journal	Counts	Proportion
INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	8	
JOURNAL OF MEDICAL INTERNET RESEARCH	5	
FRONTIERS IN PUBLIC HEALTH	4	22.55%
IEEE ACCESS	3	
PLOS ONE	3	

3.3. Authors Analysis Cooperation

The literature data is imported into the CiteSpace software to create an author cooperation knowledge map, with the node type set to "author" and the time slice set to "1 year", and the threshold setting of "Top N per slice = 50". The 50 most frequently appearing authors within each time slice are selected, and a cooperation map of these authors is then generated (shown in Figure 2). The larger radius and font of the nodes in the graph indicate the more articles the author has published, and the more lines between authors indicate closer collaboration between authors. This map shows that the number of authors and the number of links indicate close collaboration between researchers. According to Preiss's law to calculate the core authors in this research field, the most prolific author are WANG J, LI J, LI Y and WU J with 7 publications between 2013 and 2023, and the least prolific author group has 1.67 publications. Accordingly, authors with 2 or more publications are included in the core author group. Statistics show that there are 388 authors in the field and 46 authors in the core author group, accounting for 11.9%, indicating that the core author group within the field has not yet been formed.

3.4. Research Institutions Analysis

Import the data into CiteSpace for cooperation analysis of institutions, set the time period to 2013-2023, select the node type as "institution" and the time slice as "1 year", and determine the threshold value setting of "Top N per slice = 50". Through the mapping (shown in Figure 3), the universities with the largest node radius, i.e. the number of publications, include York Univ, Nanjing Univ Informat Sci & Technol, Univ Sydney, etc. Most of the institutions are less connected to each other, and the collaborative network is loosely and independently distributed, indicating that there is less collaboration between them. In general, the research in this field has not yet formed an effective core collaborative institution, which is not conducive to the continued in-depth exploration of this topic.

4. Research Process and Hotspots Analysis of Epidemics and Public Opinion

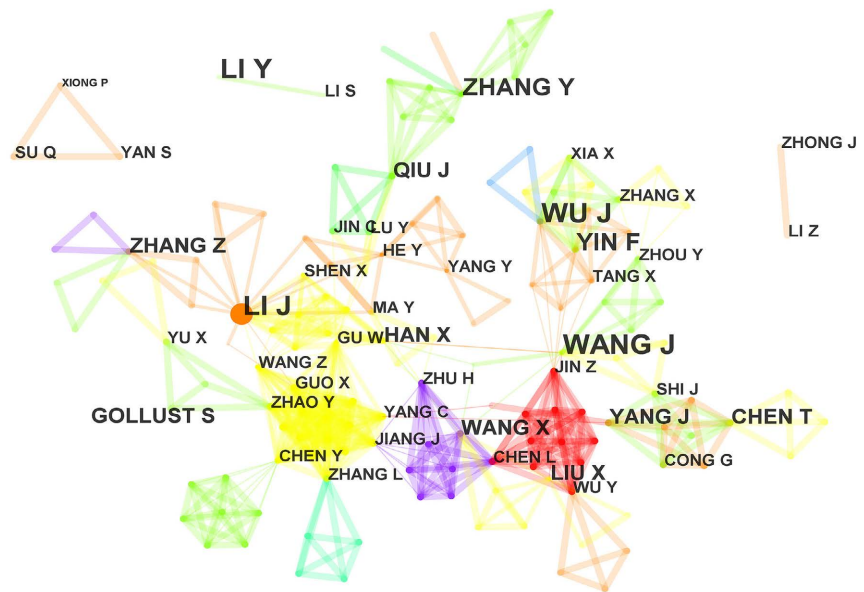By mapping keywords bursts and keywords co-citation in the literature of

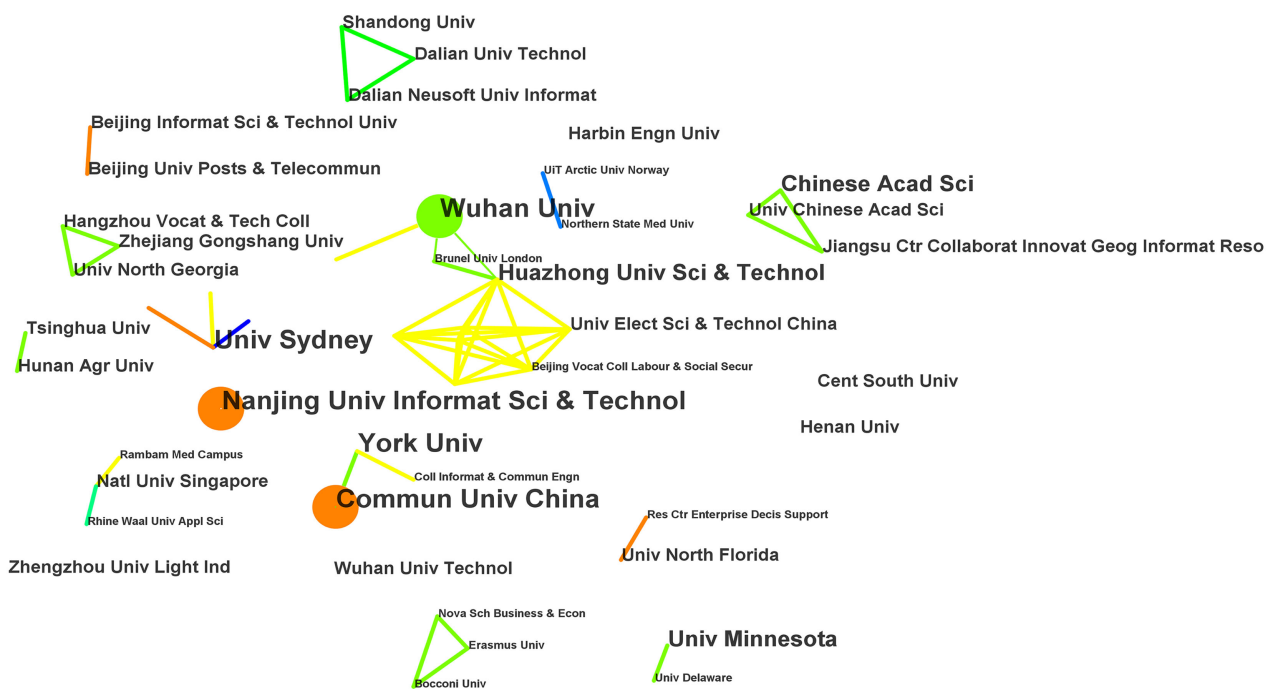**Figure 2.** Authors cooperation knowledge map.

Figure 3. Institutions cooperation knowledge map.

epidemics and public opinion research, the evolutionary trends and hot topics in this field are explored.

4.1. Research Process and Trends

Burst keywords refer to keywords that show a sudden and significant increase in research frequency, which are used to further explore the research progress and trend of each year. The following information can be read from the keywords

bursts in Table 2: 1) The earliest burst and the longest duration of burst is "behavior" (2014-2017), which has never left the researcher's sight in recent years although the research has been relatively flat; 2) In terms of burst intensity, the burst intensity of "opinion" is the largest in 2015, at 2.08; 3) The burst keywords for 2020-2023 are "public health", "sentiment analysis", "social networking" and "online public opinion", which are the hot research topics in recent years.

Based on the previous division of stages in research on epidemics and public opinion, the focus of each stage can be further summarized:

1) Exploration period (2013-2019): Research focused on topics such as influenza A virus, vaccination, behavior, women, impact, etc. In addition, the hot topics in the field of epidemics and public opinion research during this period also included "public opinion evolution", "social media", "sentiment analysis", "sudden events", etc. The research focus shifted from early emergency management and public crisis response mechanisms to the evolution and governance of public opinion in sudden events (Wu, Ni, & Shen, 2016). During this period, researchers paid attention to people's attitudes and emotions towards events or topics in the process of forming public opinion and proposed effective public opinion governance strategies (Moussaïd, Kämmer, Analytis, & Neth, 2013).

Table 2. Keywords analysis with the strongest citation bursts.

Top 15 Keywords with the Strongest Citation Bursts					
Keywords	Year	Strength	Begin	End	2013-2023
epidemic	2013	1.40	**2014**	2015	
influenza a virus	2013	1.24	**2014**	2015	
vaccination	2013	1.24	**2014**	2015	
behavior	2013	1.21	**2014**	2017	
opinion	2013	2.08	**2015**	2017	
public opinion	2013	1.46	**2015**	2016	
women	2013	1.18	**2015**	2016	
impact	2013	1.13	**2016**	2019	
twitter	2013	1.40	**2017**	2020	
information	2013	1.49	**2018**	2020	
media	2013	1.16	**2018**	2020	
public health	2013	1.16	**2020**	2020	
sentiment analysis	2013	1.60	**2021**	2021	
social networking (online)	2013	1.38	**2021**	2021	
online public opinion	2013	1.15	**2022**	2023	

2) **Outbreak period (2020-2022):** Research focused on topics such as public health, sentiment analysis, social networking (online), etc. In addition, "COVID-19", "prevention and control of epidemics", "mainstream media", "online rumors", "public opinion governance", etc. became the research hotspots during this stage. In 2020, researchers shifted their focus from sudden events to public opinion events related to the COVID-19 pandemic and combined big data technology with epidemic and public opinion research (Zhang, Zhou, Zhou, & Pratap, 2021; Li, Ma, Xu, Pei, & He, 2022). The public opinion research during this period became more in-depth, focusing on the dynamic development of the public opinion lifecycle and people's emotional changes in different stages in the context of the COVID-19 (Naseem, Razzak, Khushi, Eklund, & Kim, 2021), and including mainstream media, opinion leaders, rumors, etc. into the research scope (Nian, Guo, & Li, 2021), exploring how to prevent the fermentation of negative public opinion, guide effective epidemic prevention and control, and govern public opinion to avoid social unrest (Han, Wang, Zhang, & Wang, 2020; Sabat, Neumann-Böhme, Varghese, Barros, Brouwer, Van Exel, Schreyögg, & Stargardt, 2020; Zhang, Ma, & Sun, 2022; Zhao, Cheng, Yu, & Xu, 2020).

3) **Retracement period (2023-):** Research focuses on online public opinion. The research hotspots in this stage began to involve self-media, and the topics of "agenda-setting", "public opinion governance", "response strategies", etc., became important trends in current and future research. Deep research is conducted around the risk prevention and control of epidemic public opinion and government response strategies, aiming to make government media's functions, such as information dissemination, knowledge sharing, and policy promotion, play a greater role in epidemic information dissemination (Yang, Zhu, Yang, Lin, Huang, & Li, 2023).

4.2. Research Hotspots

By combining keywords co-citation map analysis with the exploration of the functions of emerging words, hot topics can be identified and understood in the research field. The 102 articles are imported into CiteSpace for analysis, with a time slice set to "1 year" and the threshold set to "Top N per slice = 50", with other settings remaining as default options. The final keywords co-citation map is obtained (shown in Figure 4). Based on the highlighted nodes on the map, the hot keywords in the cross-research of epidemics and public opinion include media, sentiment analysis, risk communication, Twitter, social media, etc. As shown in Table 3, the top ten keywords ranked by frequency include social media, epidemic model, media, public health, sentiment analysis, Twitter, behavior, communication, etc., while the top ten keywords ranked by centrality include media, management, information, attitude, impact, communication, complex network, prevalence, epidemic model, etc. Among them, media, communication, and epidemic model (except for epidemic and public opinion) are the focuses of cross-research on epidemics and public opinion, with both high frequency and centrality rankings.
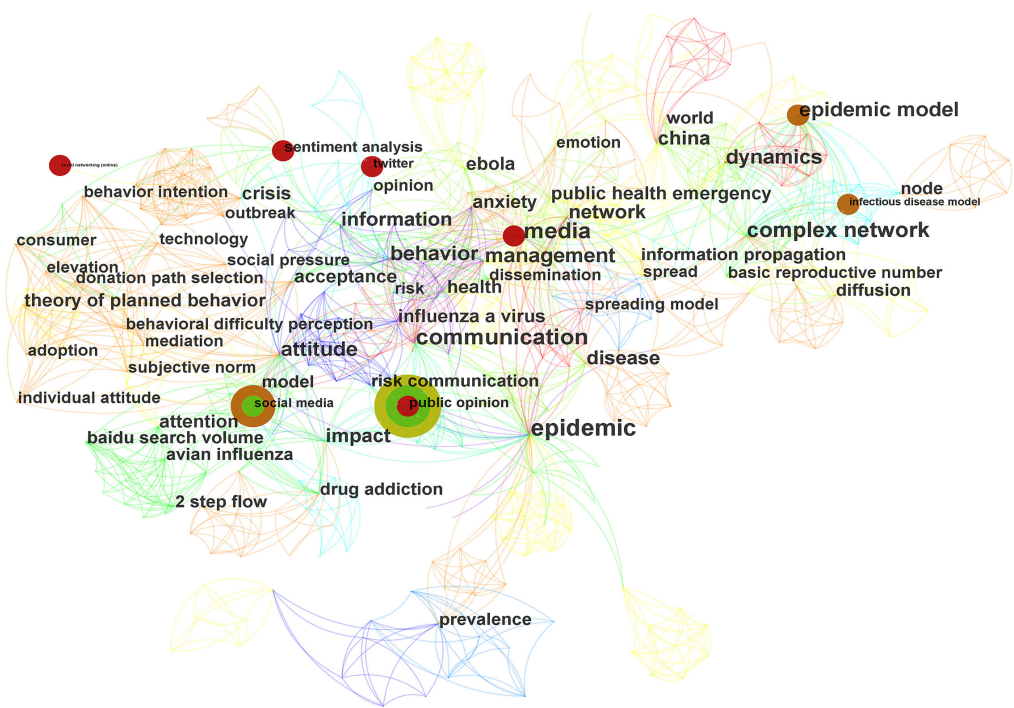
Figure 4. Keywords co-citation knowledge map.

Table 3. Top 10 ranked high centrality and high frequency keywords.

Ranking	Centrality	Keywords	Ranking	Frequency	Keywords
1	0.41	epidemic	1	20	public opinion
2	0.24	media	2	15	social media
3	0.14	management	3	10	epidemic model
4	0.13	information	4	9	epidemic
5	0.13	attitude	5	9	media
6	0.12	impact	6	8	public health
7	0.11	communication	7	8	sentiment analysis
8	0.11	complex network	8	7	twitter
9	0.11	prevalence	9	5	behavior
10	0.09	epidemic model	10	5	communication

5. Conclusion

Through the analysis of the evolution and hot topics of research on epidemics and public opinion, this paper reveals that this research field has undergone significant development in the past decade, experiencing three stages of exploration, outbreak, and retracement, with a particularly significant increase in research quantity after the outbreak of the COVID-19 epidemic in 2019. The research topic has an interdisciplinary nature, mainly involving disciplines such as intelligence, journalism, communication, and political science. There are many

researchers in this field, with frequent collaboration and communication among them, yet there is no core group of authors. There are many research institutions, but they are scattered and lack cooperation with each other. Colleges and universities are the main research entities, while governments and social organizations are less involved. The research hotspots mainly focus on social media, epidemic model, media, public health, sentiment analysis, Twitter, behavior, communication, etc., while online public opinion is the future trend of research. In summary, based on the characteristics and trends of the current epidemics and public opinion, cross-research on epidemics and public opinion will enter a long-term exploration and development stage. More research results will serve the epidemic response, public opinion guidance, and management practices of various countries, providing a reference for public health organizations and policymakers to focus on public needs and scientifically disseminate epidemic information.

Conflicts of Interest

No potential conflict of interest was reported by the authors.

References

Han, X., Wang, J., Zhang, M., & Wang, X. (2020). Using Social Media to Mine and Analyze Public Opinion Related to COVID-19 in China. *International Journal of Environmental Research and Public Health, 17,* 2788. https://doi.org/10.3390/ijerph17082788

Li, J., Ma, Y., Xu, X., Pei, J., & He, Y. (2022). A Study on Epidemic Information Screening, Prevention and Control of Public Opinion Based on Health and Medical Big Data: A Case Study of COVID-19. *International Journal of Environmental Research and Public Health, 19,* 9819. https://doi.org/10.3390/ijerph19169819

Moussaïd, M., Kämmer, J. E., Analytis, P. P., & Neth, H. (2013). Social Influence and the Collective Dynamics of Opinion Formation. *PLOS ONE, 8,* e78433. https://doi.org/10.1371/journal.pone.0078433

Naseem, U., Razzak, M. I., Khushi, M., Eklund, P. W., & Kim, J. (2021). COVIDSenti: A Large-Scale Benchmark Twitter Data Set for COVID-19 Sentiment Analysis. *IEEE Transactions on Computational Social Systems, 8,* 1003–1015. https://doi.org/10.1109/TCSS.2021.3051189

Nian, F., Guo, X., & Li, J. (2021). A New Spreading Model in the Environment of Epidemic-Related Online Rumors. *Modern Physics Letters B, 36,* Article ID: 2150569. https://doi.org/10.1142/S0217984921505692

Sabat, I., Neumann-Böhme, S., Varghese, N. E., Barros, P. P., Brouwer, W. B. F., Van Exel, J., Schreyögg, J., & Stargardt, T. (2020). United but Divided: Policy Responses and People's Perceptions in the EU during the COVID-19 Outbreak. *Health Policy, 124,* 909-918. https://doi.org/10.1016/j.healthpol.2020.06.009

Wu, J., Ni, S., & Shen, S. (2016). Dynamics of Public Opinion under the Influence of Epidemic Spreading. *International Journal of Modern Physics C, 27,* Article ID: 1650079. https://doi.org/10.1142/S0129183116500790

Yang, K., Zhu, J., Yang, L., Lin, Y., Huang, X., & Li, Y. (2023). Analysis of Network Public Opinion on COVID-19 Epidemic Based on the WSR Theory. *Frontiers in Public Health, 10,* Article ID: 1104031. https://doi.org/10.3389/fpubh.2022.1104031

Zhang, C., Ma, N., & Sun, G. (2022). Using Grounded Theory to Identify Online Public Opinion in China to Improve Risk Management—The Case of COVID-19. *International Journal of Environmental Research and Public Health, 19,* 14754. https://doi.org/10.3390/ijerph192214754

Zhang, X., Zhou, Y., Zhou, F., & Pratap, S. (2021). Internet Public Opinion Dissemination Mechanism of COVID-19: Evidence from the Shuanghuanglian Event. *Data Technologies and Applications, 56,* 283-302. https://doi.org/10.1108/DTA-11-2020-0275

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