
AI translation · View original & related papers at
chinaxiv.org/items/chinaxiv-202404.00070

Postprint: Analysis of Emergency Event Information Dissemination on Weibo Based on User Characteristics

Authors: Li Sijia, Zheng Deming, Masayoshi Son

Date: 2024-04-03T00:00:00+00:00

Abstract

Purpose/Significance: With the popularization and development of social media, Weibo has become an important platform for information dissemination. Understanding the patterns of emergency event information propagation on Weibo based on user characteristics is of significant importance for grasping event development trends, evaluating information influence, and formulating effective response strategies. **Method/Process:** By selecting typical cases of four categories of emergency events (natural disasters, accidental disasters, public health incidents, and social security incidents) as research subjects, we crawled user data regarding information dissemination from the Weibo platform and analyzed the differences and commonalities in user characteristics and propagation patterns across these four categories of emergency events. **Results/Conclusion:** The audiences for information propagation of all four categories of emergency events exhibit distinct regional characteristics, with users from economically developed provinces demonstrating generally higher attention levels. The propagation user groups for various emergency events are predominantly concentrated among active users with strong propagation power, as well as grassroots users with weak propagation power and influence, accompanied by a small number of authoritative users with strong influence participating in propagation. Different types of emergency events also exhibit variations in audience breadth and gender distribution.

Full Text

Analysis of Emergency Information Dissemination Based on User Characteristics on Weibo

Li Sijia¹, Zheng Deming¹, Sun Zhengyi²

¹ Research Center for Network Public Opinion Governance, China People's

Police University, Langfang 065000

² Public Security Detachment of Tongzhou Branch of Beijing Municipal Public Security Bureau, Beijing 101100

Abstract

[Purpose/Significance] With the proliferation and development of social media, Weibo has become a crucial platform for information dissemination. Understanding the patterns of emergency information propagation based on user characteristics is essential for grasping event development trends, evaluating information impact, and formulating effective response strategies. **[Methods/Process]** This study selected typical cases across four categories of emergencies—natural disasters, accidental disasters, public health incidents, and social security events—as research objects. By crawling user data from information dissemination processes on the Weibo platform, we analyzed the differences and commonalities in user characteristics and propagation patterns across these four emergency types. **[Results/Conclusions]** The audiences for all four emergency types exhibited distinct regional characteristics, with users from economically developed provinces demonstrating generally higher attention levels. The dissemination user groups for each emergency type primarily concentrated on two extremes: highly active users with strong propagation power and grassroots users with weak propagation power and influence, accompanied by a small number of authoritative users with strong influence. However, different emergency types showed variations in audience breadth and gender distribution.

Keywords: social media; Weibo; information dissemination; user characteristics; emergency

1. Related Research

Research on emergency information dissemination has garnered extensive attention. Early studies primarily focused on information propagation characteristics, dissemination networks, and other structural features. For instance, some scholars constructed Weibo information forwarding networks and employed social network analysis methods to examine propagation patterns and characteristics from perspectives of network features and node influence [4]. Others studied the path evolution of typical models such as centralized and chain propagation models in Weibo forwarding, analyzing key nodes in the information dissemination process and discovering that large-scale information propagation models are composed of multiple key nodes with different functions [5].

As research deepened, scholars gradually shifted their focus to the mechanisms and influencing factors of emergency information dissemination. Some constructed public health event public opinion propagation influence factor models, exploring how information release, content, and timing affect public opinion

propagation [7]. Others conducted in-depth analyses of Weibo information dissemination and government response strategies in specific incidents, arguing that environmental events develop into broad public events closely related to public psychology [8]. Scholars have also examined response strategies for emergency information dissemination, analyzing local government Weibo information response, content characteristics, and dissemination effectiveness during events to propose effective public opinion management strategies [9].

Despite these advances, current research still has room for further development. Since users are the main subjects of information dissemination on social platforms, analyzing user characteristics is crucial for understanding emergency information propagation mechanisms and formulating targeted guidance strategies. This study draws on existing research methods, selects typical cases representing four basic emergency types—natural disasters, accidental disasters, public health incidents, and social security events—and explores the differences and commonalities in user characteristics and propagation patterns for these four emergency types on the Weibo platform, providing theoretical guidance for developing effective information dissemination strategies.

3. Analysis of User Characteristics in Emergency Information Dissemination

Through data crawling and preprocessing, we collected user information from Weibo posts about four representative emergencies: the Turkey earthquake, Henan Anyang factory fire, sour soup poisoning incident, and Shinzo Abe shooting. The final dataset comprised 33,744, 153,326, 17,061, and 24,548 samples respectively. Tables 1 through 4 display the top 10 user data entries for each event. Based on the crawled user characteristics—including gender, region, follower count, and following count—we analyzed four key aspects: (1) gender distribution to understand participation patterns across genders; (2) geographical distribution to assess regional impact; (3) follower/following count distribution to examine user roles; and (4) user type distribution to investigate propagation power and influence across the social network.

3.1 User Characteristics in Natural Disaster Information Dissemination Natural disasters are sudden, widespread, and destructive events caused by natural factors such as earthquakes and forest fires. We selected the February 2023 Turkey earthquake as a typical case.

Gender Distribution: Female users accounted for approximately 63% of participants, while male users comprised about 37%. This reflects differences in attention levels and emotional responses to emergencies across genders, with female users showing higher concern and participation, possibly due to greater empathy for disaster victims.

Geographical Distribution: As shown in Figure 1 [Figure 1: see original paper], Guangdong province exhibited the highest user participation, followed by

Jiangsu. This phenomenon likely relates to several factors: these economically developed regions have high internet penetration and user activity, providing favorable conditions for online participation. Additionally, residents in these areas show higher concern for major domestic and international events. Notably, Guangdong has experienced multiple severe earthquakes historically, potentially creating higher cognitive sensitivity among its users, who may more actively forward information to express concern or initiate discussions about earthquake preparedness.

Follower and Following Count Distribution: Figure 2 [Figure 2: see original paper] shows that users with fewer followers and following counts constitute the vast majority of disseminators, though some users with high follower counts also participated. Users with many followers typically have greater influence, while those following many accounts often serve as information recipients.

User Type Distribution: Figure 3 [Figure 3: see original paper] illustrates user type distribution, with the vertical axis representing Weibo user level (reflecting activity and participation) and the horizontal axis showing the follower-to-following ratio (measuring influence). The propagation user group concentrates on two extremes: active users with strong propagation power (high user level) and grassroots users with weak influence and propagation power, with only a small number of authoritative users participating. Active users, often public figures or opinion leaders with high prestige, have authoritative and credible information that easily attracts attention and forwarding. Grassroots users, though ordinary social network members with low user levels and weak influence, constitute a large group whose collective propagation effect cannot be ignored.

3.2 User Characteristics in Accidental Disaster Information Dissemination Accidental disasters are sudden, destructive events caused by human negligence, technical failures, or other reasons, including industrial accidents and building collapses. We selected the November 2022 Henan Anyang factory fire as a typical case.

Gender Distribution: Male users far outnumbered female users in disseminating information about this incident, indicating that male users played a more critical role in the information propagation process.

Geographical Distribution: Figure 4 [Figure 4: see original paper] reveals several characteristics. First, participation was highest in the event location (Henan), influenced by emotional factors and geographical proximity. Second, Shandong showed relatively high participation, possibly related to its regional culture's emphasis on safety awareness and geographical proximity to Henan. However, overall participation was relatively low, which may be because regional events do not always spread rapidly or widely enough, even locally.

Follower and Following Count Distribution: As shown in Figure 5 [Figure 5: see original paper], propagating users almost exclusively had low follower

and following counts, indicating that the main dissemination group consisted of ordinary grassroots users.

User Type Distribution: Figure 6 [Figure 6: see original paper] demonstrates that, similar to natural disasters, the user group concentrated on active users with strong propagation power and grassroots users with weak influence, with only a few authoritative users participating. This suggests that natural and accidental disasters share similar audience characteristics.

3.3 User Characteristics in Public Health Incident Information Dissemination Public health incidents involve sudden events threatening human health and public safety, such as infectious disease outbreaks and food safety incidents. We selected the October 2020 sour soup poisoning incident as a typical case.

Gender Distribution: Female users accounted for approximately 69.2% of participants, significantly higher than male users (30.8%). This likely reflects women's greater sensitivity to food safety issues.

Geographical Distribution: Figure 7 [Figure 7: see original paper] shows that Shandong province had the highest participation, likely due to cultural dietary habits—sour soup being a common and beloved food in Shandong. Guangdong and Fujian also showed relatively high attention, possibly related to their economic development levels and information dissemination mechanisms. These economically developed regions have complete information infrastructure, strong public information acquisition capabilities, and heightened risk perception, making it easier to form hotspots during information dissemination.

Follower and Following Count Distribution: Figure 8 [Figure 8: see original paper] shows that propagating users almost exclusively had low follower and following counts, indicating that grassroots users constituted the main dissemination group.

User Type Distribution: Figure 9 [Figure 9: see original paper] reveals that, compared to other events, the user group for this incident was more concentrated among users with strong propagation power but weak influence, with fewer authoritative users participating. This may be because much information originated from local residents and victim families—people without high social status but possessing highly valuable information, making them the primary force in disseminating such incidents.

3.4 User Characteristics in Social Security Event Information Dissemination Social security events are sudden, destructive incidents caused by social conflicts, terrorist activities, or violent crimes that threaten public safety and social order. We selected the July 2022 Shinzo Abe shooting as a typical case.

Gender Distribution: Female users exceeded 60% of participants, showing greater activity than male users.

Geographical Distribution: Figure 10 [Figure 10: see original paper] shows relatively high participation from Guangdong, Jiangsu, Zhejiang, and other economically developed provinces with high internet penetration and usage rates. Users in these regions likely have broader international perspectives and higher education levels, making them more attentive to international political events. However, user distribution covered most Chinese provinces, reflecting the event's strong political nature and broad international impact, which attracted nationwide attention.

Follower and Following Count Distribution: Figure 11 [Figure 11: see original paper] shows that users with few followers and following accounts constitute the vast majority, though some users with high following counts also participated. Compared to regional events, international incidents tend to attract more diverse participants.

User Type Distribution: Figure 12 [Figure 12: see original paper] indicates that, unlike other events, the user group for this incident was less concentrated, featuring not only active users with strong propagation power and grassroots users with weak influence, but also more authoritative users with strong influence. This diversification likely stems from the event's international relations implications and inherent news value, attracting attention from various backgrounds.

3.5 Comparative Analysis of Information Dissemination User Characteristics The above analysis reveals both differences and commonalities across the four emergency types:

Commonalities:

First, all four emergency types exhibit obvious regional characteristics, with economically developed provinces like Guangdong, Jiangsu, and Zhejiang showing consistently high attention levels. Second, propagation user groups universally concentrate on two extremes: active users with strong propagation power and grassroots users with weak propagation power and influence, accompanied by a small number of authoritative users. This pattern reflects social network characteristics and user behavior modes.

Differences:

First, natural disasters have the broadest audience and relatively high attention, while accidental disasters and public health incidents tend to be localized with relatively low attention, concentrating in and around affected areas. Social security events' audience breadth depends on the event's nature, scope, and dissemination channels, often being more dispersed. Second, gender distribution varies: female users show higher concern for natural disasters, public health incidents, and social security events, while male users pay more attention to

accidental disasters. These differences relate to varying emotional orientations and psychological characteristics across genders.

4. Conclusion

This study analyzed user characteristics in Weibo information dissemination across four emergency types—natural disasters, accidental disasters, public health incidents, and social security events—revealing distinct features and propagation patterns for each category. The findings offer insights for developing targeted information dissemination guidance strategies. Governments should establish robust emergency plans, release authoritative and accurate information promptly, and formulate tailored guidance strategies considering public concerns and regional differences. Collaboration with authoritative users and opinion leaders can help guide public opinion and ensure accurate information dissemination. Future research should incorporate data from other social media platforms, obtain richer user characteristic information through multiple channels, and employ more in-depth analytical methods to comprehensively explore the dynamic mechanisms of emergency information dissemination, thereby improving research accuracy and effectiveness.

References

- [1] WANG L, WANG K, WU J. Public opinion propagation and evolution of public health emergencies in social media era: A case study of 2018 vaccine event[J]. *Data analysis and knowledge discovery*, 2019, 3(4): 42-52.
- [2] WANG H. An analysis of the definition of “emergency” [J]. *Journal of Huaihai Institute of Technology (Humanities & Social Sciences Edition)*, 2013, 11(24): 9-11.
- [3] GENG C H, WANG S B, HAO X Y, et al. Governance of public health emergencies in colleges and universities: Concept definition, status analysis and response paths[J]. *Journal of North China University of Science and Technology (Social Science Edition)*, 2022, 22(6): 49-54.
- [4] REN J H. Weibo’s information dissemination in emergencies and its thinking—Based on the empirical analysis of “PX project explosion in Zhangzhou, Fujian” [J]. *Social Scientist*, 2016(8): 53-55.
- [5] HUANG J T, YE W J. Strategy of governmental micro-blog’s public opinions work in emergency—A case study of “9·5” Luding earthquake[J]. *Secretary*, 2023(4): 81-92.
- [6] WANG S X, ZHU M M, LUO Y Y. Competitive propagation between true and false information in the context of infodemic[J]. *Journal of Modern Information*, 2023, 43(9): 124-136.

- [7] ZHANG Y, WANG J C. On the problems and countermeasures of government information release mechanism in emergency—Based on the case study of 2015 Shanghai Bund stampede incident[J]. Journal of Intelligence, 2015, 34(5): 111-117, 65.
- [8] YANG M, WANG Y, WANG C B, et al. Network propagation law and characteristics of emergencies—Take the CNKI incident as an example[J]. Journal of Communication University of China (Science and Technology), 2022, 29(6): 58-67.
- [9] ZHANG H B, TONG X. Changes in the structure of emergency management in China and a theoretical generalization[J]. Social Sciences in China, 2015(3): 58-84, 206.
- [10] WANG L, LIU Q Z. Analysis on propagation evolution of network public opinion for unexpected emergency[J]. Modern Industrial Economy and Informationization, 2016, 6(3): 97-99.
- [11] OUYANG T H, ZHENG S W, CHENG Y. The construction of a governance system for large-scale public health emergency: A case study based on the Chinese scenario[J]. Management World, 2020, 36(8): 19-32.
- [12] CHEN Y X, SU Z W, ZHOU L. Key factors and effective path of disaster relief information network dissemination[J]. Journal of Intelligence, 2022, 41(5): 106-111.

Note: Figure translations are in progress. See original paper for figures.

Source: ChinaXiv –Machine translation. Verify with original.