Spatiotemporal Characteristics of College Students' Health Information Seeking in Public Health Emergencies: Postprint

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Abstract

[Purpose/Significance] To explore the relationship between university students' health information seeking behavior and the spatiotemporal context of public health emergencies, thereby revealing the coupling characteristics between user health information seeking behavior and public health emergencies. [Method/Process] Using 380 diary entries of university students' health information seeking collected through the mobile experience sampling method and critical incident technique as the research sample, and taking the process (information source selection, information seeking patterns) and outcomes (information utilization methods, health awareness, and emotional perception) of user information seeking in public health emergencies as the entry point, statistical analysis was conducted on the spatiotemporal characteristics of health information seeking among university students in the context of public health emergencies. [Results/Conclusion] The spatiotemporal coupling characteristics of university student users' health information seeking outcomes are evident in public health emergencies. Both the combined utilization methods of university students' health information seeking and changes in health awareness show significant differences in spatiotemporal distribution. During the outbreak period and in high-risk areas, users prefer self-utilization while simultaneously sharing information offline, with relatively higher levels of health awareness change; whereas during the persistent period and in medium- to low-risk areas, users prefer self-utilization and online sharing, with relatively lower levels of health awareness change. Although single information utilization methods and emotional perception do not exhibit significant temporal and spatial distribution differences, the spatiotemporal coupling characteristics of single information utilization methods are still reflected in descriptive data. Meanwhile, the process of university students' health information seeking demonstrates normalized characteristics such as users' habitual use of mobile devices as information sources and preference for information encountering. This reveals

the spatiotemporal contextual characteristics of health information seeking behavior in emergencies, which can help information service departments deeply grasp the patterns of information behavior changes across different periods and regions of public health emergencies, thereby enhancing their precision information service levels.

Full Text

Preamble

Research on Spatiotemporal Characteristics of College Students' Health Information Search in Public Health Emergencies

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[**Purpose/Significance**] This study explores the relationship between college students' health information search behaviors and the spatiotemporal context of public health emergencies to reveal the coupling characteristics between user health information search behaviors and such emergencies. [**Method/Process**] Using 380 diary entries of college students' health information searches collected through mobile experience sampling and key event methods, this research statistically analyzed the spatiotemporal characteristics of college students' health information search in public health emergency contexts, focusing on the process (information source selection, search patterns) and outcomes (information utilization methods, health awareness, and emotional perception) of user information search during these events. [**Result/Conclusion**] The spatiotemporal coupling characteristics of college students' health information search outcomes are evident during public health emergencies. Both the combined utilization methods of health information search and changes in health consciousness show significant differences across temporal and spatial distributions. During the outbreak period and in high-risk areas, users prefer to share information offline while using it themselves, and the level of health awareness change is relatively high. In contrast, during the duration period and in medium-low risk areas, users prefer online sharing alongside self-use, and the level of health awareness change is relatively lower. Although single utilization methods and emotional perception do not show significant temporal or spatial distribution differences, the spatiotemporal coupling characteristics of single information utilization are still reflected in descriptive data. The health information search process among college students demonstrates normalized features such as habitual use of mobile devices as information sources and preference for information encountering. This research reveals the spatiotemporal contextual characteristics of health information search behaviors in emergencies, helping information service departments grasp the patterns of information behavior changes across different periods and regions of public health emergencies and improve the precision of

information services.

Keywords: public health emergency; health information search; life cycle; risk level

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1 Introduction

According to the 47th "China Statistical Report on Internet Development" released by CNNCI (China Internet Network Information Center), by December 2020, China' s internet penetration rate had reached 64.5%, with a national netizen population of 989 million [1]. With the rapid development of network and information technologies and continuous improvement in living standards and medical care, public attention to health information has significantly increased, making health information search a new normal for health information acquisition [2]. Public health emergencies refer to sudden occurrences that cause or may cause serious damage to public health, including major infectious disease outbreaks, unexplained group illnesses, major food and occupational poisonings, and other events that seriously affect public health [3]. In recent years, frequent public health emergencies have severely impacted social stability and economic development. Existing research has explored information behavior in emergencies from two important dimensions—time [4-5] and space [6]—while studies on health information search behavior in public health emergencies have become a research hotspot for revealing user needs and behavioral patterns [7-8]. Uncovering the spatiotemporal evolution patterns of college students' health information search behavior characteristics during public health emergencies can help relevant information service departments fully understand public information behavior features, grasp the spatiotemporal variation patterns of user health information search behavior and health information impacts, thereby improving health information services more targeted and effectively, and providing theoretical basis and reference for future information release during similar emergencies to help guide college students in correctly utilizing health information and reducing damages from public health emergencies.

2 Literature Review

2.1 Public Health Emergency Research

Existing research on the temporal development stages of public health emergencies is largely based on life cycle theory from biology. The most famous is S. Fink' s [9] four-stage model proposed in 1986, which divides crisis management into incubation, outbreak, spread, and recovery periods. R. Heath [10] proposed the 4R emergency development process model comprising reduction, readiness, response, and recovery stages. Public health emergency life cycles can also be divided into three-stage or five-stage models. For instance, B. T. Burkholder et al. [11] divided emergencies into three stages based on mortality rates: acute emergency phase, late emergency phase, and post-event phase. Li Zhihong et al. [12] divided information dissemination in emergencies into five stages: precursor, outbreak, spread, mitigation, and termination, analyzing the periodic characteristics of information dissemination. Building upon life cycle research, management studies of public health emergencies have gradually become a hotspot. Zhao Yan et al. [4] provided strategic suggestions based on different characteristics of different periods to manage online public opinion more effectively. Zeng Ziming et al. [5] constructed a public health emergency knowledge management system supporting the full knowledge life cycle based on previous research. I. Bongiovanni et al. [13] explored intervention measures in the latter two stages (implementation and response, recovery) of fire emergency based on the four-stage emergency management model determined by the American Society for Healthcare Risk Management (ASHRM). An Lu et al. [14] analyzed the concerns and evolution patterns of stakeholders in public health emergencies. Wang Lin et al. [15] analyzed the propagation and evolution patterns of public opinion based on a life cycle theory model of influencing factors for public opinion dissemination in public health emergencies.

Spatial characteristics of regions have similarly attracted researchers' attention regarding their impact on public health emergencies. Zhang Lun et al. [16] found that emergencies occur more frequently in economically developed areas. Gong Kai et al. empirically demonstrated significant heterogeneity in attention to sudden hot events across different regions [17]. Teng Wenjie et al. [18] and Li Yanling et al. [6] found that economic development levels affect the spatial distribution of online public opinion attention and risk perception. The spatiotemporal distribution patterns of events are also research foci. Liu Guowei et al. [19] revealed the spatiotemporal distribution patterns of online public opinion evolution in emergencies, discovering spatial clustering characteristics of "peak type" in areas near the event location and "valley type" in remote areas. Li Gang et al. [20] pointed out that different degrees of spatial impact from emergencies significantly influence topic evolution patterns, suggesting that information search in public health emergencies can also be studied from the perspective of spatial risk levels.

2.2 Health Information Search Behavior Research

Health information search has become an important part of daily information seeking and has been a research hotspot in information behavior in recent years. Existing research primarily focuses on process and outcome indicators of health information search behaviors among different user groups, including information source selection, search patterns, information utilization methods, and health awareness and emotional perception.

2.2.1 Information Source Selection Information source selection is the initial element of information search. Wang Fang et al. [21] reviewed and summarized research on information source selection and constructed a theoretical model. J. G. Myrick et al. [22] found that the internet has become an important and primary channel for users to obtain health information in recent years. Numerous studies have explored influencing factors of information source selection, including source accessibility [23] and information quality. Jin Yan et al. [24] found that college students'use of mobile terminals as health information sources is influenced by factors such as availability, ease of use, and health information quality.

2.2.2 Search Patterns Information search processes can be reflected through search patterns [25]. M. J. Bates [26] identified four modes of information search behavior: searching, browsing, encountering, and monitoring, establishing a two-dimensional framework based on the initiative and directionality of information search. Zhou Xiaoying et al. [27] further proposed three health information search behavior patterns through interviews and case analysis: information encountering acquisition, problem-solving, and long-term attention, analyzing the characteristics and influencing factors of each pattern. Yang Xia et al. [28] conducted empirical research on Henan college students'health information behavior based on these patterns.

2.2.3 Information Utilization Methods Information value is only realized through utilization, making it necessary to study user information utilization behavior. In the most representative information-seeking behavior theoretical models, user needs are central, including need expression, information query, and information utilization [29]. T. D. Wilson [30] viewed information utilization as the reorganization of existing knowledge bases, encompassing a series of physiological and psychological behaviors. Japanese scholar Kurimura Norihisa et al. [31] improved the information encountering function model by dividing the "capture" stage into three parallel stages: self-use, sharing, and storage, which has been widely recognized and applied domestically and internationally. Tian Mei [32] established a sensitive factor model for mobile internet encountered information utilization (save, share, use).

2.2.4 Health Awareness and Emotional Perception Health awareness and emotional perception are also important research contents in health in-

formation search. With internet popularization, health information obtained through health information search has impacted college students' health awareness formation [33]. R. McGloin et al. [34] found that health awareness is an important indicator affecting online health information search behavior. Emotional perception has also attracted scholars' attention in information search research. E. Jonas et al. [35] studied how individuals search for information after making decisions under positive and negative emotional influences to resolve the interaction between dissonance and emotion. I. Lopatovska et al. [36] examined the relationship between emotion and mood during online search, finding that emotion neither easily affects search results nor is easily changed by search experience.

Notably, Wu Dan et al. [37] found that users' online information search behavior is cross-affected by factors such as time and location. Liu Jing et al. [38] pointed out that searching for epidemic information on social media changed significantly with epidemic evolution and constructed three user profiles of emergency information search behavior that had significant correlations with local risk levels. Meanwhile, Wu Chuanhui et al. [39] indicated a significant mild positive correlation between user perceived risk and online information search behavior. In summary, it is necessary to study user health information search characteristics in public health emergencies from spatiotemporal dimensions. Therefore, this study takes college students as research objects, uses process and outcome indicators as entry points, and investigates users' health information search spatiotemporal characteristics based on public health emergency life cycles and risk zone divisions.

3 Research Design

Based on comprehensive analysis of the entire user information search process and inspired by Kuhlthau' s six-stage model (initiation, selection, exploration, formulation, collection, presentation) [40] and Choo' s three-stage model (information needs, information search, information use) [41], this study divides the search process into three stages: search initiation, search formation, and search completion. Information source selection and search patterns represent the initiation and formation stages of information search, thus serving as process indicators. Information utilization, health awareness, and emotional perception are all result assessments or effect outcomes after users complete searches, thus serving as outcome indicators. This study systematically analyzes user health information search characteristics in public health emergencies from temporal and spatial dimensions, using process and outcome indicators as analysis objects. Specific research questions are: What are the spatiotemporal characteristics of college students' health information search process (information source selection, search patterns) in public health emergencies? What are the spatiotemporal characteristics of college students' health information search outcomes (information utilization methods, health awareness, and emotional perception) in public health emergencies?

The division of public health emergency life cycles and risk zones is a prerequisite for analyzing users' health information search spatiotemporal characteristics. Existing research indicates that event inflection points and main manifestations of each stage can effectively divide event development stages [14]. Therefore, this study uses these as division criteria, combined with key time nodes from news reports, to divide the life cycle of this public health emergency as shown in . The data collection period was from February 7 to March 10, 2020, corresponding to the outbreak period and duration period, with 269 and 111 diary entries collected for each stage respectively.

In this public health emergency, the country divided regions by county level into low, medium, and high risk levels based on infectious disease conditions in each county, with different control measures implemented in each region. This study based its risk zone division on daily county-level risk classifications published on official websites such as the National Health Commission (http://www.nhc.gov.cn), comprehensively considering confirmed cases, new cases, and timing of emergency response level adjustments in various provinces and municipalities for data with unclear risk zone standards. As time progressed, risk level classifications in various regions changed accordingly, and the 380 original diary entries were classified accordingly. Due to the small sample size in low-risk zones, they were combined with medium-risk zones into medium-low risk zones, resulting in 205 diary entries from high-risk zones and 175 from medium-low risk zones.

Data collection employed mobile Experience Sampling Method (mESM) and key event method. Mobile Experience Sampling Method, developed from traditional Experience Sampling Method (ESM), integrates mobile internet technology and characteristics to remind participants over a period of time, enabling users to record behaviors, thoughts, and feelings in real situational contexts when events occur [44]. The key event method can capture critical user behavior data, with users actively recording and completing entries when specific events occur or shortly thereafter [45]. These methods offer high ecological validity for obtaining detailed data in real-world contexts.

The experiment required each participant to immediately complete a structured diary after each key health information search that triggered their attention during the experimental period, using voice recording methods. To ensure timely data recording, researchers sent reminder signals at 12:00, 16:00, and 20:00 daily via WeChat groups. The structured diaries primarily collected data on information sources used, search processes, information utilization methods, and changes in health awareness and emotional perception. After data collection, each participant received 100 RMB compensation.

For convenience sampling, this study used the COVID-19 public health emergency in early 2020 as the background and recruited 30 college students (including graduate students) from Wuhan University and Central China Normal University as experimental users, collecting their health information search behavior and perception data during the emergency from February 7 to March 10,

2020, resulting in 380 original diary entries. Participant IDs were designated as [redacted], with basic participant information shown in .

Based on data characteristics, appropriate analytical methods were selected to analyze spatiotemporal features of each indicator: on the basis of descriptive statistics and chi-square tests, Fisher' s exact test was used for spatiotemporal characteristics of information source selection and information utilization methods, Pearson chi-square test for search patterns, and Mann-Whitney U test for health awareness and emotional perception change levels, to obtain spatiotemporal characteristics of users' health search behavior content—both process and outcome indicators—thereby revealing patterns of college students' health information search behavior in major public health emergencies from temporal (life cycle) and spatial (risk zone) dimensions and excavating coupling characteristics between information search and public health emergencies.

4 Results

4.1 Information Source Selection Characteristics

This study divided information sources in health information search into single and multiple sources. Data results show that during public health emergencies, the use of paper materials and health lectures as information sources completely disappeared. In single source selection, chi-square test analysis indicated significant preference differences in users' information source selection (p=0.000) as shown in . Mobile devices (93.9%) were the most preferred information source, while desktop computers (4.2%), TV/radio (1.4%), and medical personnel (0.6%) were rarely used as sources, and family/friends completely disappeared as a single source. Notably, users' information source selection preferences showed no significant spatiotemporal distribution differences (time: p=0.709; space: p=0.848). Further analysis revealed that users selected mobile devices (94.0%), TV/radio (1.6%), and medical personnel (0.8%) slightly more frequently during the outbreak period than during the duration period (mobile devices 93.6%, TV/radio 0.9%, medical personnel 0%), while desktop computers showed the opposite pattern, being selected slightly more frequently during the duration period (5.5%) than during the outbreak period (3.6%). Similarly, high-risk zone users (94.8%) selected mobile devices slightly more frequently than medium-low risk zone users (92.8%), while selecting desktop computers, TV/radio, and medical personnel slightly less frequently than medium-low risk zones (high-risk/medium-low risk: 3.7%/4.8%, 1.0%/1.8%, 0.5%/0.6%).

The study also found that while users clearly preferred using mobile devices alone as an information source for health information search, the phenomenon of multiple source search still existed. Due to small data volume, only descriptive statistical analysis was conducted for multiple sources (see). When users selected multiple sources, mobile devices were the important foundation for combining multiple sources to obtain health information, most frequently used together with family/friends (4.5%+50.0%+4.5%=59.0%), followed by TV/radio

(4.5%+22.7%=27.2%). Additionally, family/friends needed to be used in combination with other sources, with no single utilization phenomenon. Users utilized multiple sources far more during the outbreak period (90.9%) than during the duration period (9.1%), and high-risk zone users (63.6%) also utilized multiple sources more than medium-low risk zone users (36.4%).

4.2 Search Pattern Characteristics

As shown in , users' search pattern distribution during health information search in public health emergencies differed significantly (p=0.000). Information encountering acquisition (75.3%) dominated absolutely, followed by problem-solving (16.8%), with long-term attention (7.9%) being the least common. Although the difference characteristics were not significant (time: p=0.410; space: p=0.061), users' search pattern characteristics remained stable with some variations. Information encountering acquisition was the normalized search mode, but during the outbreak period (problem-solving: 17.5%; long-term attention: 8.9%) and in high-risk zones (problem-solving: 19.0%; long-term attention: 10.2%), users actively paid more attention to health information than in other periods and regions. Moreover, the frequencies of problem-solving and long-term attention modes were slightly higher in the outbreak period and high-risk zones than in the duration period (problem-solving: 15.3%; long-term attention: 5.4%) and medium-low risk zones (problem-solving: 14.3%; long-term attention: 5.1%).

4.3 Information Utilization Method Characteristics

When users utilize obtained health information, they may employ multiple utilization methods and combined utilizations. This study divided information utilization methods into single utilization and combined utilization. Chi-square test analysis of single utilization methods after users obtained health information showed significant preference differences (p=0.000). Users typically utilized information for themselves (90.7%), followed by offline sharing (6.1%), with online sharing (3.3%) being the least common. Descriptive statistical analysis revealed coupling between the outbreak period and high-risk zones, and between the duration period and medium-low risk zones in single information utilization method selection. Users shared more (including online and offline sharing) during the outbreak period (10.7%) and in high-risk zones (10.9%) than during the duration period (6.8%) and in medium-low risk zones (7.7%), while self-use of information was slightly lower in the outbreak period (89.2%) and high-risk zones (89.1%) than during the duration period (93.2%) and in medium-low risk zones (92.3%).

Although users clearly preferred using health information alone, especially for self-use, the phenomenon of combined utilization remained common. In combined utilization methods (see), chi-square test results indicated significant preferences (p=0.000). Combining self-use with information sharing, particularly offline sharing, was a significant characteristic of users' combined utiliza-

tion, accounting for 75.4% of the total, while combined online and offline sharing was the least common pattern, 仅占 2.2%. Notably, users' combined information utilization showed significant temporal and spatial distribution differences, with temporal significance at p=0.05 and spatial significance at p=0.027, highlighting spatiotemporal coupling characteristics. The frequencies of combining self-use with offline sharing and combining offline with online sharing were far higher in the outbreak period (54.1%; 2.7%) and high-risk zones (60.5%; 2.6%) than in the duration period (30.4%; 0) and medium-low risk zones (36.2%; 1.7%), while the frequencies of combining self-use with online sharing (outbreak/high-risk: 18.0%/17.1%; duration/medium-low risk: 43.5%/29.3%) and combining self-use with both offline and online sharing (outbreak/high-risk: 25.2%/19.7%; duration/medium-low risk: 26.1%/32.8%) were lower in the outbreak period and high-risk zones.

4.4 Health Awareness and Emotional Perception Characteristics

Information dissemination during epidemic spread can improve people' s health awareness and guide groups to adopt effective self-protection measures [46], thereby positively impacting epidemic prevention and control [47]. Analysis results showed that users' health awareness change levels differed significantly across both temporal and spatial dimensions of public health emergency development, with p-values of 0.05 and 0.001 respectively. Using 2.5 as the medium level starting point on the Likert 5-point scale [48], users' health awareness change levels were slightly higher during the outbreak period (mean: 2.72, SD: 1.193) and in high-risk zones (mean: 2.82, SD: 1.196) than during the duration period (mean: 2.47, SD: 1.135) and in medium-low risk zones (mean: 2.45, SD: 1.133). The outbreak period and high-risk zones showed consistent characteristics, as did the duration period and medium-low risk zones. However, emotional perception change levels showed no significant differences in temporal or spatial distribution (time: p=0.606; space: p=0.161). Users' emotional perception change levels during the outbreak period (mean: 2.43, SD: 1.348) were almost equivalent to those during the duration period (mean: 2.36, SD: 1.375), while high-risk zone users' emotional perception change levels (mean: 2.32, SD: 1.354) were slightly lower than those in medium-low risk zones (mean: 2.52, SD: 1.351).

Based on these findings, this study examined correlations between process and outcome indicators. Tests revealed that at significance level α=0.01, health awareness change level was weakly correlated with information utilization methods (P=0.000, r=0.293). Additionally, at α=0.05, emotion level was weakly correlated with selected information sources (P=0.014, r=0.132), indicating statistical significance, while no correlations existed between other variable pairs.

5 Discussion

5.1 Information Combined Utilization Methods Significantly Correlate with Event Risk Level, Showing Spatiotemporal Coupling Characteristics

In public health emergencies, college students' combined utilization methods of health information show significant differences across time and space, with spatiotemporal coupling characteristics. During the outbreak period and in high-risk zones, users tend toward offline sharing while using information themselves, whereas during the duration period and in medium-low risk zones, they tend toward online sharing. The outbreak period and high-risk zones show coupled characteristics, as do the duration period and medium-low risk zones. Further analysis reveals that users' information sharing is closely associated with self-use, with information sharing rarely occurring without self-use. This phenomenon may be caused by users' social characteristics. Under epidemic prevention and control in the outbreak period and high-risk zones, users' physical social distance with family becomes closer, making them pay more attention to offline utilization of health information with family and friends. As social activities like work resumption affect the situation, users' prosocial behavior of online sharing after obtaining information becomes more prominent.

5.2 Health Awareness Change Degree Significantly Correlates with Event Risk Level, Showing Spatiotemporal Coupling Characteristics

Another interesting finding is that college students' health awareness change degree shows significant differences across time and space. During the outbreak period and in high-risk zones, users' health awareness change levels are slightly higher than during the duration period and in medium-low risk zones, indicating coupled characteristics between outbreak period/high-risk zones and duration period/medium-low risk zones. Due to differences in epidemic risk levels across time and space, users in the outbreak period and high-risk zones change their health awareness more to adapt to situational changes. However, users' emotional perception shows no significant differences across time and space, indicating relatively stable emotional perception states that are rarely affected by obtained information and context.

5.3 Process Indicators of College Students' Health Information Search Show Normalization

When college students search for health information in public health emergencies, their information source selection and search patterns are relatively fixed and not affected by context to show spatiotemporal differences—that is, process indicators are influenced by user habits and show normalization. Compared with other studies [27, 42], the differences are notably prominent. In public health emergencies, college students use mobile devices extensively, while the frequency of using family/friends, TV/radio, and medical personnel as information sources

decreased substantially, with paper materials and health lectures as information sources even disappearing. Search patterns also differed significantly from Zhou Xiaoying et al.' s [27] findings, with more information encountering and significantly less problem-solving in public health emergencies. Since society pays high attention to public health emergencies and today' s information technology features powerful information push functions for mobile terminals, users rarely need to actively input search terms to obtain health information. Most users are not aware of active needs for health information, but their potential needs prompt further browsing or clicking behaviors when encountering health information, which is also an important reason for this phenomenon.

6 Conclusion

Against the background of major public health emergencies, this study examined college students' health information search behavior and perception characteristics in different contexts from temporal (life cycle) and spatial (risk zone) dimensions, using process indicators (information source selection, search patterns) and outcome indicators (information utilization methods, health awareness, and emotional perception) as entry points. The conclusions are as follows: Although process indicators of information search are normalized in public health emergencies and do not show spatiotemporal differences due to contextual influences, they differ significantly from other studies [27, 42]. In public health emergencies, college students extensively use mobile devices, while the frequency of using family/friends, TV/radio, and medical personnel as information sources has decreased substantially, with paper materials and health lectures as information sources even disappearing. Search patterns also differ significantly from Zhou Xiaoying et al.' s [27] findings, with more information encountering and less problem-solving in public health emergencies. Outcome indicators differ, however: combined information utilization and health awareness change degree are contextually influenced and show coupling characteristics across time and space. When risk is higher, users pay more attention to offline utilization of information with family and friends, and health awareness change degree is relatively higher.

Research results indicate that in the information search process, process indicators are difficult to influence by spatiotemporal context and are often determined by user habits, while outcome indicators are closely related to the spatiotemporal context where search behavior occurs. Therefore, research on outcome indicators should be combined with spatiotemporal context. In public health emergencies, college students are keen to use mobile devices for searching regardless of spatiotemporal context, and this development trend will become increasingly evident with continuous information technology advancement. Therefore, besides leveraging traditional media like TV and radio for information dissemination in epidemic prevention and control, relevant information service departments should also timely conduct online information release work, actively use official platforms to release authoritative information to improve service efficiency,

while strictly monitoring and managing online information, timely distinguishing truth from falsehood, making correct information guidance, and suppressing rumor generation and dissemination to alleviate public anxiety and psychological pressure during epidemics. This study confirms some conclusions from Li Yuelin et al. [49]: since users have different information needs in different life cycle stages or risk zones, information utilization methods also differ. Therefore, more targeted information content can be provided according to different spatiotemporal information dissemination needs. For example, besides continuously broadcasting epidemic status and trends, the outbreak period and high-risk zones should vigorously disseminate disease prevention and transmission information, while the duration period and medium-low risk zones should also include social phenomena, government behaviors, etiology, pathology, and diagnosis information [50], and guide users to utilize information in multiple ways to maximize information utilization value. Users' health awareness transformation is related to risk level, requiring attention to strengthening health prevention awareness in the later epidemic period and medium-low risk zones, improving health prevention awareness among users in rural and remote medium-low risk zones, and striving to form good health concepts to control large-scale epidemic spread.

This study reveals the spatiotemporal contextual characteristics of health information search behaviors in emergencies, further advancing real-context information behavior research, and its conclusions can provide theoretical foundations for future related research. On the other hand, the study provides theoretical basis and reference for future information release during similar emergencies, helping relevant information service departments thoroughly grasp user information behavior change patterns across different periods and regions of public health emergencies, improving precise information service levels, and thereby reducing damages caused by public health emergencies. However, the study has certain limitations: the mobile experience sampling method requires participants to repeatedly fill out diaries over a long period, inevitably interfering with their daily work and life, testing patience and attention [44]. Future research will further explore relationships between health awareness transformation and information utilization methods, use different research methods to study health information search characteristics of different user groups in public health emergencies, and construct theoretical models of user health information search behavior to further enrich theoretical research on health information behavior.

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