

Postprint: Information Needs and Satisfaction of University Students in Public Health Emergencies

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Abstract

[Purpose/Significance] This study investigates the changes in university students' information needs within the context of public health emergencies, the importance of various information need types and their degree of fulfillment (hereinafter referred to as “satisfaction”), and reveals the characteristics of information features with high and low satisfaction levels. [Method/Process] Initially, through preliminary surveys, we identified the categories of university students' information needs in public health emergency contexts, encompassing disease-related, self-related, society-related, and school-related information. Building upon this, a questionnaire survey was administered, yielding 556 valid responses to clarify the specific categories within each level of information needs. [Results/Conclusion] The findings indicate that when confronted with public health emergencies, university students' priority information needs primarily concern disease prevention, treatment, and development, government response measures, and the event's impact on their academic and daily lives. Information types with high satisfaction exhibit characteristics such as quantified data, clear processes, explicit expression, authoritative sources, and utilization of audio-visual information sources. Conversely, information types with low satisfaction are often marked by uncertainty, complex influencing factors, vague content, and lack of authoritative sources. The research results can, on one hand, facilitate the provision of more targeted information services for university students in public health emergency contexts; on the other hand, they can also inform government practices in epidemic information management and dissemination to better satisfy university students' information needs.

Full Text

Information Needs and Satisfaction Levels of College Students in the Context of Public Health Emergencies

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Abstract

[Purpose/Significance] This study explores how college students' information needs change in the context of public health emergencies, the importance of different types of information needs and the extent to which they are satisfied (hereinafter referred to as "satisfaction level"), and reveals the characteristics of information with high and low satisfaction levels. **[Method/Process]** First, through preliminary investigation, this study identifies the types of college students' information needs in the context of public health emergencies, including disease-related, self-related, social-related, and school-related information. Based on this, a questionnaire survey was conducted, collecting 556 valid questionnaires to clarify the categories contained in each level of information needs. **[Result/Conclusion]** The study finds that when facing public health emergencies, college students' priority information needs mainly involve disease prevention, treatment and development, government response measures, and the impact of the event on study and life; information types with high satisfaction levels are characterized by quantified data, clear processes, explicit expression, authoritative information sources, and use of audio-visual information sources; information types with low satisfaction levels often feature uncertainty, complex influencing factors, vague information, and lack of authoritative information sources. The research results can, on the one hand, help provide more precise information services for college students in the context of public health emergencies; on the other hand, they can also provide reference for government information management and release during epidemics to better meet college students' information needs.

Keywords: Public health emergencies; Uncertainty; Information needs; College students

1. Introduction

Environment and context are important factors that influence and shape user information behavior. Public health emergencies that disrupt normal social operations—such as the Coronavirus Disease 2019 (COVID-19) pandemic (hereinafter referred to as the "COVID-19 epidemic")—create entirely new information environments that introduce numerous uncertainties. Uncertainty and uncertainty discrepancy are important motivations for users' information-seeking

behavior [1]. C. Atkin [2] and C. Kuhlthau [3] point out that when people perceive a discrepancy between what they “know” and what they “want to know” (or don’t know) about an event, cognitive uncertainty forms, subsequently triggering anxiety. W. Afifi et al. [4], based on the Theory of Motivated Information Management (TMIM), note that the way to reduce anxiety is to develop information-seeking strategies to meet people’s information needs. Existing research shows that in medical contexts, uncertainty about diseases persists longer and is more likely to trigger fear and anxiety [5]. Thus, in the unconventional context of public health emergencies, understanding the public’s information needs and providing relevant information in a targeted manner can help alleviate public anxiety and panic, helping them navigate the epidemic period smoothly and maintain stability in both online and offline society. On the other hand, to improve the effectiveness of government information release, it is also necessary to understand the public’s information needs [6]. Clarifying the importance of different information needs for different types of public groups and understanding the current satisfaction level of these needs can provide guidance for targeted information release.

Therefore, this study selects college students as the research subject and uses questionnaire surveys to explore college students’ information needs and their satisfaction levels in the context of public health emergencies. It focuses on the following research questions:

RQ1: What types of information needs do college students have in the context of public health emergencies?

RQ2: From the perspective of college students, how important are these different types of information needs? How satisfied are they with these information needs?

RQ3: What are the characteristics of information with high and low satisfaction levels?

The data for this study was collected from March 7-10, 2020. The research results can help government, school, and social departments and organizations quickly identify college students’ information needs in the context of public health emergencies, and provide targeted information services for college students, offering reference for better meeting their information needs. At the same time, it can also provide reference for government and relevant departments in future epidemic information management and release.

2. Literature Review

2.1 Uncertainty, Information Needs, and Public Health Emergencies

Human brain activity triggers individual information needs, specifically manifested as people’s cognitive perception of uncertainty about their environment, expecting to reduce this state through information seeking, which generates

information needs. Information needs are also a prerequisite for information-seeking behavior [2, 7]. Combining uncertainty research, many renowned scholars have explored the concept of information needs from different perspectives and formed research theories. For example, R. Taylor [8] identified different levels of information needs from a cognitive perspective: visceral needs, conscious needs, formal needs, and compromised needs. N. Belkin [9], based on the first two stages, proposed the “Anomalous State of Knowledge (ASK)” hypothesis, further describing information needs as a problem that users cannot articulate precisely [10]. B. Dervin [11] believed that information needs represent gaps in users’ knowledge that require information seeking to complete a “sense-making” process and bridge these knowledge gaps. In recent years, based on these concepts and theories, scholars have regarded information needs as information retrieval problems, exploring the impact of information needs on information retrieval in context [12], and further dividing them into explicit and implicit information needs [13-14]. In the face of public health emergencies, the public’s cognitive uncertainty about the event and the unpredictability of event development may make their information needs more complex.

Existing research has found that perceived uncertainty is a motivation for users’ information seeking. C. Kuhlthau’s [15] Information Search Process (ISP) model shows that in the initial search stage, when people’s understanding of a topic or problem is vague, or when they perceive gaps in their knowledge or understanding, they generally experience anxiety and panic emotionally. Emotions, thoughts, and behaviors influence and shape each other, and as the search process progresses, anxiety and panic gradually decrease until they are replaced by satisfaction or new uncertainties emerge. W. Afifi et al. [4] proposed the Motivated Information Management theory, which states that cognitive uncertainty differences trigger anxiety, stimulating people to seek information and evaluate expected outcomes, and to develop information-seeking strategies based on these evaluations. Thus, cognitive uncertainty triggers emotional anxiety, which further influences and shapes people’s information-seeking behaviors and strategy choices. In the context of unconventional public health emergencies, the public’s unclear understanding of events translates into cognitive uncertainty about them. Combined with the unpredictable nature of public health emergencies, this leads to negative impacts. Existing research shows that false information causes public panic, and only the release of true information can effectively avoid such situations [16]. Therefore, clarifying public information needs and releasing relevant information in a targeted manner to eliminate uncertainty caused by public health emergencies and positively guide public emotions is essential.

Scholars have also examined the relationship between uncertainty management and communication based on discussions of cognitive uncertainty triggering emotional anxiety. D. Brashers [5] categorized anxiety triggered by uncertainty into three types: negative anxiety, optimistic anxiety, and neutral anxiety. Negative anxiety refers to when perceived uncertainty hinders the implementation of information-seeking strategies; optimistic anxiety refers to when people perceive that current uncertainty can bring about knowledge improvement; and neutral

anxiety manifests as indifference. These three types of anxiety can transform into each other as information is obtained and communication occurs [17]. In different environments, people can manage uncertainty through participation in or avoidance of communication to meet their needs [18]. Thus, uncertainty management is closely related to communication. In the face of public health emergencies, the public's hope for reducing anxiety and panic often rests on the release of authoritative information. However, the current one-way information push mechanism of government departments is not based on meeting public information needs, making it urgent to build an information release mechanism suitable for public health emergencies. To establish such a mechanism, it is necessary to understand public information needs.

Since public health emergencies involve personal safety, the public's lack of corresponding knowledge about the truth of the event and its scientific aspects exacerbates public anxiety. A. Babrow [19] pointed out that various reasons, such as controversial treatment plans [20], complex or unknown disease etiology factors [21], and the complexity and ambiguity healthcare workers encounter in diagnosis and treatment [22], can lead to various forms of uncertainty, creating information needs different from those in traditional contexts. Additionally, information needs in public health emergencies are also influenced by information dissemination. For example, news dissemination affects users' information needs [23]. Li Gang et al. [24] further studied online news about emergencies and netizens' expression of information needs, finding that there is an equilibrium relationship between the quantity of online news reports and the quantity of netizens' information needs expression. The above studies discussed information needs from medical contexts and emergency information dissemination perspectives. However, public health emergencies involve all levels of society with complex influencing factors. Identifying the information needs of different groups in this context can help the government release information more clearly and effectively, avoiding public opinion and information epidemics. Therefore, conducting related research has certain theoretical and practical significance.

2.2 Research on College Students' Information Needs

Contemporary college students have grown up in an environment of rapid ICT development, and their information behavior has distinct characteristics of the internet era, primarily using online channels to meet their information needs [25-26]. Research shows that college students' information needs are greatly influenced by tasks or daily activities [27], and there are significant differences in information need types among college students of different disciplines, grades, and genders [28]. For example, among learning-related information needs, business college students have a higher demand for financial news and more frequently utilize their interpersonal relationships to complete learning tasks [29], while medical students' information needs are mainly manifested in experimental aspects [30]. Additionally, college students' personal information needs change as their academic progress advances, shifting from learning and entertainment

to employment and postgraduate entrance examinations [28].

Existing research shows that in conventional contexts, different college students' information needs are primarily centered on meeting learning needs. Influenced by tasks, college students' learning information needs are mainly manifested as obtaining relevant information for completing homework, writing papers, classroom discussions, preparing for exams, and other learning activities [29, 31]. To meet these information needs, college students mostly use libraries and the internet. Research finds that college students believe current library resources cannot effectively meet their information needs [32-33], and they prefer to frequently obtain information through search engines, mostly choosing to use electronic resources [34]. Additionally, college students' information needs reflect diverse characteristics; they also have needs for entertainment, employment, health, and other aspects of information. Influenced by cultural background and economic development levels, college students in some regions show unique information needs. For example, international students studying in Malaysia show higher concern for immigration information [35], while Nigerian college students pay more attention to internship-related information [36]. Existing research focuses on college students' information needs in conventional contexts, lacking relevant research on college students' information needs in the unconventional context of public health emergencies. Therefore, this study attempts to fill this gap by focusing on exploring the characteristics and satisfaction levels of college students' information needs in the new information environment triggered by public health emergencies.

3. Research Methods

To explore college students' information needs in this context, this study conducted a preliminary investigation to identify the types of college students' information needs and further developed a questionnaire survey.

3.1 Data Collection

First, researchers conducted a preliminary investigation of college students' information needs through WeChat and QQ, asking respondents to comprehensively describe the information needs brought about by the COVID-19 epidemic or to describe scenarios that prompted their information needs. A total of 74 valid responses were received, and preliminary results were obtained through open coding, which formed the basis for designing the questionnaire. The questionnaire was edited and produced through the Wenjuanxing platform. Researchers posted the web link of the questionnaire on social platforms (such as WeChat groups, WeChat Moments, and QQ groups) for college students to fill out (from 13:00 on March 7, 2020, to 17:00 on March 10, 2020), with instructions stating that the questionnaire was only for college students and for academic research purposes only, with no other purposes involved. The research team received 615 questionnaires, and after eliminating invalid questionnaires (those

with completion times less than 110 seconds and with identical responses to all scale questions), 556 valid questionnaires were obtained.

The questionnaire mainly investigated college students' information need satisfaction levels, the importance of different information to them, and college students' epidemic information-seeking characteristics. Satisfaction level was measured using a 5-point Likert scale, where 1 represented "not satisfied at all" and 5 represented "completely satisfied." Additionally, a "no need" option was designed (with an N/A option, i.e., not applicable, indicating no need). The complete questionnaire can be accessed via PC at <https://www.wjx.cn/jq/61637029.aspx>.

To further identify the characteristics of information with high and low satisfaction levels in the context of public health emergencies and to provide reference for improving the quality of information release by government and relevant departments, this study selected information with the highest satisfaction values and information with the lowest satisfaction values based on the identified categories. Through the advanced search function of Sina Weibo, corresponding categories of information were obtained to form the analysis dataset. Based on this dataset, the characteristics of information with high or low satisfaction levels were identified.

3.2 Data Analysis

3.2.1 Coding For the 74 valid responses obtained from the preliminary investigation, since the response texts were relatively brief, this study used open coding to analyze, summarize, and 归纳 the obtained data to identify the dimensions and categories of information needs, answering RQ1. For the dataset obtained from Sina Weibo, open coding was used to analyze the textual characteristics of information types with high or low satisfaction levels. The coding process was as follows: First, 20 randomly selected information texts were coded to form a coding table. Then, based on this coding table, 20 pieces of information randomly selected from each category of information needs were analyzed. If new codes emerged, 10 more pieces from the remaining data were analyzed. If no new codes were found, theoretical saturation was determined. After achieving theoretical saturation, 5 more pieces from the remaining data were randomly analyzed to verify the results. If no new concepts emerged, the coding process ended. Inconsistencies and new codes that emerged during the coding process were discussed and determined by the research team to ensure the reliability of the characteristics. The analysis conclusions answered RQ3.

3.2.2 Questionnaire Data Analysis (1) Analysis Methods and Tools: This study used Excel to process the 556 valid questionnaire responses, statistically analyzing the frequency and percentage of "no need" (N/A) for different categories of information, the importance of different information types, and the satisfaction levels of information needs.

(2) Sample Characteristics: The samples were distributed across 30 provinces, municipalities, autonomous regions in China, and overseas, providing broad coverage. The gender and education level distributions are shown in [Figure 1: see original paper]. As shown in [Figure 1: see original paper], the sample was primarily undergraduate students, covering different levels of college students; in terms of gender, the proportion of females was higher, reaching 63.67%. The analysis of questionnaire data answered RQ2.

4. Research Results

4.1 Analysis of Information Need Categories

The analysis found that college students' information needs in the context of public health emergencies are reflected in four dimensions: "disease-related," "self-related," "social-related," and "school-related," with each dimension containing multiple needs. As shown in :

TABLE:1 shows the dimensions and categories of college students' information needs in the context of public health emergencies, including: - Disease-related: disease medical level information, disease transmission routes, treatment methods and drugs, vaccine development progress, disease development status (domestic, overseas), disease future development, public health event development status in residence location - Self-related: how to conduct autonomous learning, psychological counseling information, physical exercise information, graduation and job-seeking information - Social-related: confirmed, suspected, death, and cure numbers, government measures for public health events, economic losses caused by public health events, development status in core areas of the event, heated discussions about the event in society, protective medical supplies information, online shopping and logistics information, cultural and entertainment information - School-related: school opening time, school teaching plan arrangements, development status of public health events in school location, online class information, work status of medical workers

As shown in [Figure 2: see original paper], college students have relatively high levels of information needs for "social-related" and "school-related" information (with low N/A proportions). The "social-related" dimension includes 13 information need categories, with generally low N/A (no need) frequencies across categories, the highest being "economic losses caused by public health events" at 6.83%, not exceeding 10%. This indicates that in the context of public health emergencies, college students have high concern for the social environment triggered by the event. Except for "economic losses caused by public health events," "confirmed, suspected, death, and cure numbers," and "market order," which had over 5.4% of college students selecting N/A, the remaining 10 items all showed relatively high need levels, especially "protective medical supplies information," "travel information," and "online shopping and logistics information," which only had 2.52%, 3.06%, and 3.06% respectively selecting N/A. This shows that college students have high demand for social-related information while also

indicating that college students lack due concern for economic losses and market order.

The “school-related” dimension includes 5 categories of information needs, among which “exam information” had the highest N/A frequency, but only accounted for 6.65%, the lowest proportion of N/A selection among all information needs. In contrast, college students’ selection of N/A for “graduation and job-seeking information” and “psychological counseling information” under “self-related” information reached as high as 16.01% and 15.83% respectively. This shows that college students place obtaining “school-related” information in a more important position, while the importance of “self-related” information is relatively weaker. For “how to conduct autonomous learning,” only 4.68% of college students selected N/A, indicating that college students still place learning in an important position during isolation periods and need more information to arrange learning tasks. College students showed the highest demand level for “school opening time,” with only 2.34% selecting N/A, making this category the highest in demand among all categories. This shows that in the context of public health security events, college students urgently need to obtain information related to their studies from schools, especially school opening time.

Regarding “disease-related” information, 10.25% of college students indicated they did not need “disease medical level information,” while the proportion selecting “vaccine development progress” was 2.7%. This shows that college students are more concerned with prevention and treatment information, with relatively lower demand for disease science-level information.

4.2 Analysis of Information Need Importance

To further identify college students’ most important information needs, the questionnaire required respondents to select the 3 or 5 most important categories from each of the four types of information needs (since “disease-related” and “social-related” contained more categories, respondents were asked to select 5 most important information needs for these two dimensions, and 3 for the other two dimensions). The results are shown in [Figure 3: see original paper].

[Figure 3: see original paper] shows that the most important information needs for college students in the COVID-19 epidemic context (with proportions exceeding 60%) are:

1. **Disease-related:** Disease future development (75.54%), treatment methods and drugs (70.32%), protective measures (64.03%), and vaccine development progress (64.03%)
2. **Self-related:** How to conduct autonomous learning (87.41%), public health event development status in residence location (85.43%)
3. **Social-related:** Protective medical supplies information (66.91%), government measures for public health events (65.83%), travel information (64.75%)

4. **School-related:** School opening time (82.73%), school teaching plan arrangements (59.53% (60%))

This shows that when facing public health emergencies, college students generate multiple types of information needs, but priority information needs mainly focus on disease prevention and treatment and development, government response measures, and the impact of events on study and life.

4.3 Analysis of Information Need Satisfaction Levels

This study further analyzed the satisfaction levels of different information needs, with results shown in .

TABLE:2 shows the distribution of satisfaction levels for different information needs. The analysis reveals that for different information categories, the proportion of college students selecting “5” (completely satisfied) was highest at 66.67% (20/30); the proportion selecting “4” (satisfied) was highest at 26.67% (8/30); and the proportion selecting “3” (neutral) was highest at 6.66% (2/30). This shows that for most categories, the proportion of respondents who believed their information needs were completely satisfied was the highest, including disease transmission routes, protective measures, disease development status, public health event development status in residence location, how to conduct autonomous learning, confirmed/suspected/death/cure numbers, government measures for public health events, heated discussions about the event in society, protective medical supplies information, online shopping and logistics information, cultural and entertainment information, etc. However, except for the satisfaction level “5” for confirmed numbers and protective measures exceeding 50%, other categories ranged between 19-44%, with 76.67% of categories having completely satisfied proportions below 40%. This shows that there is still considerable room for improvement in college students’ information satisfaction levels.

From the perspective of selecting “4” and “5” (i.e., “satisfied” and “completely satisfied”), the proportion exceeded 50% for as many as 93.33% of information categories, indicating relatively high satisfaction levels for different types of information. However, categories where the proportion did not exceed 60% still accounted for a certain percentage, at 26.67% (8/30). These information categories include: disease medical level information, treatment methods and drugs, vaccine development progress, psychological counseling information, graduation and job-seeking information, economic losses caused by public health events, market order, and school opening time. Among them, the satisfaction levels for psychological counseling information and graduation and job-seeking information were less than 50%, at 46.76% and 42.8% respectively.

The overall satisfaction level for “school-related” information needs was relatively low. The proportion of respondents selecting “1” (not satisfied at all) and “2” (not very satisfied) for satisfaction levels of various categories under “school-related” information was relatively large. For example, 14.21% of col-

lege students rated satisfaction level as “1” for “school opening time,” and the proportions selecting “4” and “5” were relatively small. Except for “online class information,” the proportions selecting “4” and “5” for other categories were all below 40%. This shows that for college students, there is still considerable inadequacy in the satisfaction level of “school-related” information, and information formulation and release departments, such as governments and universities, still have considerable room for improvement in information provision and delivery.

This study conducted correlation analysis between gender, education level, and information need satisfaction levels. The results showed no significant relationship between gender and satisfaction levels across need categories. Although there were significant relationships between education level and satisfaction levels for some need categories, the sample sizes for each education level were unbalanced with large gaps, resulting in weak explanatory power of statistical results, which this paper does not analyze in depth.

4.4 Analysis of Characteristics of Information with Different Satisfaction Levels

To identify categories of information with high or low satisfaction levels, we calculated the mean and standard deviation of satisfaction levels for different information needs, with results shown in .

TABLE:3 shows the mean and standard deviation of information need satisfaction levels. For the convenience of research, we selected the 5 categories of information with the highest satisfaction values and the 4 categories with the lowest satisfaction values (since some information categories did not have corresponding information releases, such as vaccines, only 4 categories were selected). Through the search function of Sina Weibo, corresponding information for these categories was obtained to form the analysis dataset. Considering the imbalance in the quantity of different categories of information, to ensure analysis effectiveness, no fewer than 40 relevant pieces of information were sequentially selected from each category based on search results as analysis samples, with the time interval from 0:00 on February 1, 2020, to 24:00 on March 31, 2020. Additionally, all selected information was released by Weibo accounts with Sina Weibo Blue V certification (government, enterprise, school, media, and other large organizations). Specific details are shown in .

TABLE:4 shows the collection and analysis quantities of information text for categories with high and low satisfaction levels. The study found that information with high satisfaction levels has characteristics of quantified data, clear processes, explicit expression, authoritative information sources, and use of audiovisual information sources. Information corresponding to protective measures and disease transmission routes also features the use of videos, pictures (comics), and other visual explanations. In contrast, information with low satisfaction levels often has characteristics of uncertainty, complex influencing factors, vague information, and lack of authoritative information sources. The characteristics

and text examples or explanations are shown in .

TABLE:5 shows the characteristics of information with high and low satisfaction levels. The analysis reveals that information texts with high and low satisfaction levels have distinct features. The characteristics of high-satisfaction information help college students grasp and understand relevant information, such as quantified data, audio-visual information sources, authority, and explicit expression. The characteristics of low-satisfaction information show obvious uncertainty, ambiguity, and complexity, making them difficult to grasp and understand. Thus, the characteristics of the information itself may also be the reason for high or low satisfaction levels.

5. Discussion and Conclusion

Based on uncertainty theory and related research on information needs, this study explores college students' information needs and their satisfaction levels in the context of public health emergencies, focusing on changes in college students' information needs, information need satisfaction levels, and the characteristics of information with high and low satisfaction levels in unconventional, uncertain contexts. The following sections discuss related issues based on the research results.

5.1 Multi-Centered Information Needs of College Students in Public Health Emergency Contexts

The study shows that when facing public health emergencies, college students' priority information needs mainly focus on disease prevention and treatment and development, government response measures, and the impact of events on study and life. These differ significantly from college students' information needs in conventional contexts. In conventional contexts, although college students' information needs are diversified, influenced by their social roles, their learning-related information needs occupy a central position [28, 31], with other types of information needs being relatively less prominent, thus forming a “single-centered, multi-needs auxiliary” information need structure.

However, this study finds that in the face of public health emergencies—an unconventional context with prominent uncertainty—college students' information need characteristics show features different from those in conventional contexts: there are four dimensions of information needs, with no particularly prominent information need, breaking the original single-centered information need structure centered on learning. Thus, in the context of public health emergencies, college students' information needs have changed significantly in both content and structure. Specifically, in terms of content, epidemic-related information has become the focus of their attention. The study found that due to the potential impact of public health emergencies on college students' life safety, they show high demand and concern for disease-related issues, particularly focusing on disease prevention, treatment, and development. When facing public health

emergencies, college students' lives are also greatly affected, with significantly increased information needs for social issues. Government measures for health events, material supplies, and travel information have attracted high attention from college students. In the face of public health emergencies, college students' learning environments and life states have been disrupted, breaking the previous balance of information needs primarily focused on learning needs, thus forming a multi-centered information need structure different from that in conventional contexts.

5.2 Uncertainty and Information Need Satisfaction Levels in Public Health Emergency Contexts

Existing research shows that uncertainty is a key factor triggering information needs and information-seeking behavior [1, 3]. Previous studies have mostly focused on the types of information needs, paying insufficient attention to information need satisfaction levels. Public health emergencies, due to their unique etiology and unprecedented nature, have obvious characteristics of ambiguity and unpredictability, thus creating a new and uncertain information environment. Discussing information need satisfaction levels can help improve the precision of information release by governments and relevant departments. The results of this study show that the more uncertain the information category, the lower its satisfaction level, such as disease medical level information, treatment methods and drugs, graduation and job-seeking information, and school opening time. Relatively clear information with lower uncertainty has higher satisfaction levels, such as disease transmission routes, public health event development status in residence location, how to conduct autonomous learning, and confirmed/suspected/death/cure numbers. This indicates that in this public health emergency context, government departments at all levels in China have achieved transparency, timeliness, and accessibility in information release, demonstrating relatively high efficiency in information processing and release. These information texts simultaneously have characteristics of quantified data, explicit expression, audio-visual information sources, and authoritative sources. Thus, in the process of information dissemination, how to make information accurately reach its audience deserves attention, especially the characteristics of information texts themselves.

Uncertainty is also an important reason for the formation of college students' multi-centered information need structure. As mentioned earlier, in conventional contexts, college students' lives and studies proceed in an orderly manner, and their information needs reflect the characteristics of a single-centered information need structure [29, 31]. However, public health emergencies break the routine, bringing many uncertainties. Information related to diseases, society, schools, and self all have different degrees of uncertainty and difficulty in obtaining. This uncertainty largely depends on the development and control of the health event and requires joint efforts from the government to schools to the whole society to resolve. Thus, the concerted efforts of all parties have be-

come an important guarantee for eliminating uncertainty, with college students also playing an important role in it. At the same time, this uncertainty has also triggered the transformation of college students' information needs from a single-centered to a multi-centered structure. This transformation and the attention to all aspects of related information triggered by concern for the epidemic have promoted college students to shift their focus from more school and learning concerns to social concerns, thus becoming an important force and opportunity to promote their rapid growth into social backbone. Seizing this opportunity to timely carry out national conditions and social sentiment education for college students, enhancing their concern for society and people's livelihood and their understanding and recognition of the national governance system, is undoubtedly an important responsibility for educators.

When facing public health emergencies, due to college students' lack of sufficient knowledge at the cognitive level, cognitive uncertainty arises, triggering unhealthy emotions such as anxiety and panic [3]. When users search for information, they also feel anxious and cognitively uncertain about whether they can find the correct (appropriate) answers [37]. This study found that although college students have the awareness to actively obtain information, the timing and form of receiving information are passive because government departments are the main information sources for releasing public health emergency-related information. However, government information release has the characteristic of fixed epidemic notification patterns [6], without considering public information need categories, let alone achieving personalized information release, which cannot maximize the reduction of users' cognitive uncertainty, resulting in some information needs not being fully satisfied. Although due to research limitations, this study cannot determine whether the uncertainty brought by public health emergencies has caused college students' anxiety and panic, it can be inferred from the satisfaction levels of some information needs that the low satisfaction levels may bring about anxiety. Additionally, C. Berger [18] found that people can manage uncertainty through communication to meet their information needs. Therefore, an effective solution is to identify public information need categories in the context of public health emergencies, establish a two-way communication mechanism for information release, and release targeted information based on the dimensions and subcategories of public information needs, combined with epidemic notification patterns, to ensure the effectiveness of public access to public health emergency information and improve public information need satisfaction levels, thereby reducing the public's cognitive uncertainty in public health emergencies and lowering unhealthy emotions such as anxiety and panic.

5.3 “No Demand” Information Categories

The study shows that most college students need different categories of information to meet their needs for help with their own learning and life and their attention to social and epidemic development. However, students who have no demand for certain information also account for a certain proportion, includ-

ing “disease medical level information,” “psychological counseling information,” and “graduation and job-seeking information,” with the proportion of college students having no demand for these information categories all exceeding 10%. Since most college students in the sample had not yet entered the graduation and job-seeking stage, they had no demand for “graduation and job-seeking information.” The fact that a certain proportion of college students had no demand for “psychological counseling information” indicates that college students have maintained a good and healthy mentality in the face of the sudden public health emergency. On the other hand, it cannot be ruled out that some students may have psychological problems but are not actively seeking psychological counseling and external help. As universities, they should pay attention to the psychological status of such students and provide timely psychological counseling. The proportion of no demand for “disease medical level information” exceeding 10% should attract university attention. On the one hand, this result indicates that college students lack interest in scientific-level issues related to public health emergencies; on the other hand, it also shows that these students’ scientific literacy is somewhat lacking. Not paying attention to this type of information is not conducive to student growth, as science education and scientific literacy cultivation are important contents of university talent training. Additionally, the study found that some college students lack due concern for the economy and market order. Therefore, future general education for college students should strengthen content in these areas, stimulate students’ interest in science and their concern for society and people’s livelihood, and enhance their scientific literacy and comprehensive quality.

5.4 Research Implications, Limitations, and Future Directions

Through preliminary investigation and subsequent questionnaire surveys, this study identified college students’ information needs, the importance of needs, need satisfaction levels, and revealed the characteristics of information texts with high and low satisfaction levels in the context of public health emergencies. The research results inspire us that college students show demand for multiple types of information when facing public health emergencies, breaking the single-centered information need structure in conventional contexts and forming multi-centered information structure characteristics. This finding 弥补了此前针对大学生的信息需求, 缺乏突发情境下的相关研究的不足, 延伸了情报学领域对用户信息需求的认识。

The research results reveal the information needs that college students perceive as relatively important in the unconventional and uncertain context of public health emergencies, the degree of attention to these needs, and the satisfaction levels of different information needs. At the same time, it identifies information categories with high and low satisfaction levels, further analyzes the characteristics of relevant information texts, reveals the characteristics of information with high and low satisfaction levels, and points out that improving information satisfaction levels requires, on the one hand, the gradual clarification of information brought about by the further development of events, and on the other

hand, making released information possess the characteristics of information with high satisfaction levels. These research results provide useful reference for governments and relevant departments to improve the content and methods of information release and enhance the quality of information release.

The study further discusses the importance of uncertainty in the formation process of college students' information need characteristics in the context of public health emergencies, extending and expanding the explanatory scope of uncertainty theory for user information behavior research. The information categories that some college students do not pay enough attention to reveal their neglect of scientific-level knowledge. This research finding inspires universities to pay more attention to scientific literacy cultivation for college students in the talent training process.

The limitations of this study lie in that it only used questionnaire surveys to study college students' information needs in the context of public health emergencies (the COVID-19 epidemic). Although it identified information need dimensions and different categories, importance, and satisfaction levels, the use of questionnaire methods alone cannot reveal the factors influencing college students' judgments of important information needs and factors affecting satisfaction levels. Furthermore, the sample in this study is primarily undergraduate students, which limits the applicability of the research results, and the revealed information needs, importance, satisfaction levels, etc., mostly can only reflect the information need characteristics of undergraduate students. Additionally, the higher proportion of females in the sample may also lead to bias in the research results.

Future research will obtain larger samples of college students' online behavior data through web scraping, mine and identify college students' information needs from it, and further verify the results of this study. Additionally, in-depth interviews will help reveal the reasons and influencing factors for the formation of information needs and are the focus of the next research work. At the same time, further exploring the correlation between needs and behaviors is also necessary. In summary, the development of this series of studies will contribute to user information behavior research in the context of public health emergencies.

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

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