# Analyzing the Hot Points of Emergency Public Health Based on Biometrics

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**Abstract:** **[Objective/Significance]** it is the first task to analyze and mine the hot spots and trends of domestic scholars in the field of public health emergencies in real time. **[Methods/Process]** Using literature measurement, with the aid of visual analysis tools CiteSpace for domestic 2015–2020, 1,368 of the keywords of public health emergencies literature in visual analysis, determine the key words of emergent public health events occurred in our country. **[Results/Conclusion]** The research results show that the hot topics of public health emergencies in China will focus on the risk assessment of public health emergencies, infectious diseases, response to school emergencies, emergency preparedness, emergency material disposal, public health publicity, epidemiology, and other 12 high and secondary hot topics.

**Keywords:** Public Health Emergencies; Visualization; Bibliometrics

## 1. Introduction

At present, public health events occur frequently in China. How to accurately grasp the hot spots of public health emergencies is the basic work for many scholars to understand the research frontier and determine their own research topics. However, the accurate grasp of research hotspots and trends of public health emergencies is not a simple study of a field of public health emergencies. It is based on the scientific analysis of various fields.

In terms of research methods of public health emergencies, Li Yuelin et al. (2020) found that in the face of public health emergencies, the current research situation mainly focuses on research methods, research contents and research trends. Epidemic reporting, health science popularization, prevention and control trends, and media news are the main types of information release of these departments and institutions; Du Zhe et al. (2019) used grounded theory to build the evaluation index system of medical institutions; Liu Yanjun (2019) proposed suggestions to improve the handling capacity of public health emergencies in China in view of the problems existing in the management system of public health emergencies in China; In terms of research content of public health emergencies, Xu Linjia et al. (2018) focused on the dissemination of public health emergency information on social media. Focusing on the impact of social media content and communication network structure on information forwarding behavior; (Wang Yi, Gao Junling, & Chen Hao, 2020) studied the relationship between public media exposure and mental health during the outbreak of new coronavirus (covid-19) epidemic in 2019 from the aspects of public media exposure, health behavior cognition and mental health status; (Qin Tongzhou, Li Zhen, & Lin Lei 2019) adopted stratified cluster sampling method. Objective to analyze the knowledge, attitude and behavior of college students in response to public health emergencies. In terms of research trend of public health emergencies, (Wu Weiming,2020) used big data and artificial intelligence technology to mine the tracking and screening information of patients' close contact groups; (Li Yanling and Liu Chao 2019) used bibliometric method to sort out the research field of domestic public health emergencies of animal epidemic; (Yang Honglin, Zheng Bo, & Du Shuai 2017) studied the impact of foreign risk communication on domestic public health emergencies; an Lu et al. (2017) constructed the micro blog influence model of public health emergencies by using potential dilichlet distribution model and random forest method.

## 2. Method selection and data sources

### 2.1 Method selection

Bibliometrics is a quantitative analysis method, which takes various external characteristics of scientific and technological literature as the research object, and uses mathematical and statistical methods to describe, evaluate and predict the current situation and development trend of science and technology. Through quantitative analysis of the existing literature, high-frequency keywords, word frequency co-occurrence matrix, similarity matrix, dissimilar matrix and keyword clustering are obtained, so as

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to obtain the research hotspots and trends in a certain research field. This paper uses bibliometric method to mine the hot spots of public health emergencies

## 2.2 Data sources

Taking the Chinese journal papers collected by CSSCI in the general database of online publishing of Chinese academic journals as the research sample, 9 key words are set as follows: public health emergency or epidemic situation, emergency medical materials, epidemic prevention, public opinion in epidemic situation, HINI, new coronavirus or avian influenza. These 9 key words basically cover the main research objects of public health emergencies. The time span is from 2015 to 2020. A total of 3,180 literatures on public health emergencies were retrieved and 1368 related literatures were obtained after screening

## 2.1High frequency keywords

From 1368 articles, there are 307 subject words with the total frequency of 2,998, with an average of 2.19 per article. After removing 15 key words that cannot be reflected such as "emergency", "public emergency", "emergency management" and "emergency capability", the high-frequency keywords are obtained. The top 20 keywords are taken as the research direction of public health emergencies from March 2015 to February 2020, as shown in Table 3,Among the 20 key words listed, 9 key words related to infectious diseases were infectious diseases (97), epidemic situation of infectious diseases (71), epidemic characteristics (71), Epidemiology (57), Epidemiology (36), epidemiological characteristics (34), new coronavirus (20), epidemiological analysis (17) and grassroots epidemic prevention (16), accounting for 45%. Therefore, in the field of public health emergencies, the number of key words related to infectious diseases was 45%. At the end of 2019, the frequency of new-type virus prevention and control increased, accounting for about 17.5% of the total number of articles in China

| order | Freq | Keyword |
|---|---|---|
| **Table 1.** Statistics of keyword frequency from March 2015 to February 2020 (ranking ≥10) | | |
| 1 | 123 | Public Health |
| 2 | 97 | Infectious Diseases |
| 3 | 80 | risk assessment |
| 4 | 71 | Epidemic situation of infectious diseases |
| 5 | 71 | Popular features |
| 6 | 59 | Emergency capability |
| 7 | 57 | epidemiology |
| 8 | 47 | Health emergency publicity |
| 9 | 36 | epidemiology |
| 10 | 34 | Epidemiological characteristics |

Note: the data in Table 2 are eliminated

## 2.2 Key words, high frequency dissimilar matrix and common matrix

Cooccurrence matrix refers to the frequency matrix of keyword co-occurrence. The higher the co-occurrence frequency is, the closer the relationship between keywords is, so as to analyze the correlation between keywords. The key words in **Table 2** are extracted, and the key "public health", "health emergency publicity" are merged into "public health publicity", and "colleges and universities" are merged into "School Emergency Prevention". As shown in Table 4 and table 5, the diagonal of the co-occurrence matrix represents the frequency of the keyword. Import the data from **Table 2** into SPSS to construct the co citation matrix of key high-frequency words. The diagonal value is equal to the highest cited frequency of other authors plus L (Qiu Junping, 2008). For example, in the co-occurrence matrix of high-frequency words in **Tables 2**(a).

| Table 2. Cooccurrence matrix of high frequency keywords | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Public health Health promotion | Health should Emergency ability | Schools should Emergency prevention | risk assessment | contagion illness | Infectious Diseases answer | Epidemic characteristics of infectious diseases |
| Public health publicity | 12 | 0 | 11 | 5 | 12 | 0 | 0 |
| Emergency capability | 0 | 6 | 0 | 0 | 5 | 0 | 0 |
| School Emergency Prevention | 11 | 0 | 22 | 0 | 21 | 5 | 7 |
| risk assessment | 5 | 0 | 0 | 61 | 0 | 60 | 0 |
| Infectious Diseases | 12 | 5 | 21 | 0 | 22 | 0 | 18 |
| Infectious disease response | 0 | 0 | 5 | 60 | 0 | 61 | 0 |

| Epidemic characteristics of infectious diseases | 0 | 0 | 7 | 0 | 18 | 0 | 19 |
|---|---|---|---|---|---|---|---|

In order to eliminate the influence of frequency difference, the Salton cosine coefficient, which represents the relative strength of keyword co-occurrence, is introduced to transform it into a correlation matrix, which is subtracted from each data of the correlation matrix by formula (1). Thus, the difference between the two keywords is obtained

$$O_{i,j} = \frac{N_{i,j}}{\sqrt{N_i} \cdot \sqrt{N_j}} \quad (1)$$

Among them, and means co-occurrence of high-frequency words, and refers to high-frequency words, frequency of occurrence refers to the frequency of CO words. SPSS program is used to calculate the respective correlation matrix of emergency management and crisis management, as shown in **Table 3**.

| Table 3. Keyword similarity matrix | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Public health Health promotion | Health should Emergency ability | Schools should Emergency prevention | Risk assessment | Contagion illness | Infectious Diseases answer | Infectious Diseases Popular features |
| Public health publicity | 1.0000 | 0.0395 | 0.1095 | 0.0401 | 0.1128 | 0.0106 | 0.0000 |
| Health emergency response capability | 0.0395 | 1.0000 | 0.0322 | 0.0000 | 0.0608 | 0.0000 | 0.0374 |
| School Emergency Prevention | 0.1095 | 0.0322 | 1.0000 | 0.0000 | 0.2418 | 0.0651 | 0.0990 |
| risk assessment | 0.0401 | 0.0000 | 0.0000 | 1.0000 | 0.0232 | 0.7857 | 0.0000 |
| Infectious Diseases | 0.1128 | 0.0608 | 0.2418 | 0.0232 | 1.0000 | 0.0000 | 0.2403 |
| Infectious disease response | 0.0106 | 0.0000 | 0.0651 | 0.7857 | 0.0000 | 1.0000 | 0.0151 |
| Characteristics of infectious diseases | 0.0000 | 0.0374 | 0.0990 | 0.0000 | 0.2403 | 0.0151 | 1.0000 |

In the correlation matrix, the size of the value reflects the distance between keywords, which can reflect the similarity between keywords. The correlation degree of keywords is 1 (the maximum value).

# 3. Conclusion

The results show that the research on public health emergencies in China has been at a high level by using the high-frequency and common occurrence matrix. There are three kinds of research hotspots on public health emergencies: the first and the second are the main hot areas. It includes 20 topics: infectious disease response, risk assessment of public health emergencies, emergency response measures, prevention and control, emergency materials disposal, and grassroots epidemic prevention of public health emergencies.

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