Original Research Article

Hotspot Discovery in the Field of Emergency Management

Mengjie Luo[1]

School of Economics and Management, Southwest University of Science and Technology, Mianyang 621010, China

Abstract: [Purpose/Significance] Real time analysis and mining of hot spots and the research trends of domestic scholars in the field of emergency management are the basic work to promote the theory and application of emergency management. **[Methods/ Process]** Using the Bibliometrics method and CiteSpace visual analysis tool, the key words of 1619 domestic emergency management documents from 2013 to 2019 were mapped and clustered to identify the hot spots of emergency management research; Through the co-occurrence matrix and similarity matrix of high-frequency keywords, the research trend of emergency management is further explored; **[Results/Conclusions]** The research results show that the research focus of domestic emergency management mainly focuses on 21 topics, such as public opinion management and control, emergency coordination, emergency network and system optimization, emergency resource capacity reserve, disaster risk assessment etc.

Keywords: Emergency Management; Research Hotspots; Bibliometrics

1. Introduction

At present, there are many research fields of emergency management in China, and most of the research topics come from theoretical extension and practical needs. How to accurately grasp the hot spots and development trend of emergency management research in China is the basic work for many scholars to understand the research frontier and determine their own research topics, It is not a simple study of emergency management events in a field, but based on the effective analysis and scientific data processing of each field of emergency management, we can grasp it scientifically.

With regard to the research on hot topics of emergency management, the existing research results focus on the influencing factors of literature hotspots, the mining of hot spots in emergency management research and trend prediction methods. In terms of influencing factors of literature hotspots, (Zhong Kaibin, Lin Weiwei, &Yao Pengtao, 2019) explored the hot spot distribution of urban risk governance research in China from the aspects of academic attention, discipline distribution, journal distribution and organization distribution; (Wang Yuncai and Niu Jufen, 2012) explored the development trend of international emergency management by visual research method for international emergency management research; As for the research on hot spot mining and trend prediction methods of emergency management, (Lu Xiaoli, Zhu Xian, &Xu Hao, 2019) used stage comparison analysis method to explore the research status and development trend in the field of crisis management; (Yao Leye and Hu Kanglin, 2016) used the method of combining bibliometrics and content analysis to summarize Foreign Emergency Management research literature according to the research content theme and key areas; In terms of hot trend prediction of emergency management, (Xu ruzhi, Chang Taihua, & Lv guangjuan, 2010) used neural network and grey system theory to predict the future network security situation; (Yang Fengfeng, Zheng Chao, & Zhang Jufeng, 2019) established the provincial fire accident number prediction model based on unbiased grey GM (1,1) theory.

2. Frequency analysis of hot words in emergency management

2.1 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, eight key words are set, which are "emergency" or "emergency management" or "emergency" or "natural disaster" or "accident disaster" or "public health event" or "public security event" or "group event". These eight key words basically cover the main research objects of emergency management from 2013 to 2019, a total of 1619 literatures on emergency management were retrieved

2.2 Keyword frequency analysis

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1 About the author: Mengjie Luo (1997), female, bachelor's degree, research direction: public management.

Based on bibliometrics, this paper uses CiteSpace software as an analysis tool. On the selection of influencing factors for hot spot analysis, CiteSpace software provides 11 functional choices. Most scholars focus on cooperation map, including author cooperation, national cooperation and institutional cooperation, and co-occurrence map, including feature words, keywords, subject categories, and Co citation map (Chen Yue, Chen Chaomei, Liu Zeyuan, Hu Zhigang, & Wang Xianwen, 2015). This paper mainly explores the research hotspots and future research trends of emergency management

(1) Through the keyword frequency statistics, the top 10% keywords are taken as the research direction of emergency management during 2013–2019 (as shown in **Figure 1**).

Figure 1. Top 10 keywords of emergency management research in 2013-2019.

In **Figure 2**, the top 5 keywords of word frequency are shown in **Figure 2**, which are: #0 public opinion management and control of sudden disaster, frequency: 864; #1 emergency management, frequency: 408; #2 comprehensive disaster assessment, frequency: 219; #3 big data, word frequency: 190; #4 coordination, coordination, 117; #5, group behavior, 114; The top keywords above basically represent the main directions of emergency management research during 2013–2018, but the topics in each direction are often numerous, so it is necessary to further mine the topics under each keyword to accurately determine the hot issues of emergency management research during 2013–2018,The research topics under each core keyword are shown in **Table 1**.
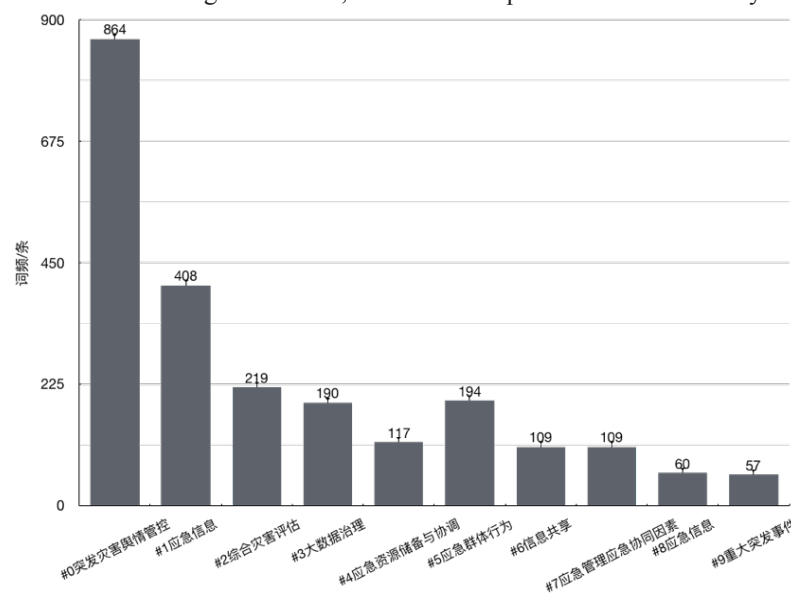

Figure 2. Keyword clustering.

Table 1. High frequency keywords

Key word	High frequency topic words (top 3 words frequency)
Public opinion control of sudden disasters （864）	Emergency (432,), disaster public opinion management and control (117), public emergency (57)
contingency management (408)	Emergency management (269), public security (11), local government (10)
Comprehensive disaster assessment (219)	Comprehensive disaster assessment (88), new media (15), disaster vulnerability (13)

big data (190)	Emergency scenario simulation and decision making (53), big data (26), knowledge element (16),
coordinate (117)	Emergency resource capacity: emergency resource capacity reserve (12), emergency logistics (11), emergency coordination factors (10)
Emergency group behavior (114)	Emergency group behavior (66), mass emergency (21), system dynamics (15)
information sharing (109)	Unconventional emergencies (35), public opinion (10),, case-based reasoning (8)
Emergency management emergency coordination factors (109)	Emergency plan (32), emergency capability (10), index system (8)
Emergency information (60)	Social media (10), emergency resources (9), emergency information (8)
Major emergencies（57）	Major emergencies (15), emergency treatment (8), emergency report (8)

(2) Similar matrix

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.

Step 1: calculate word frequency in public health emergencies U_a and U_b Intersection of the same items $I_{a,b}$.

Step 2: in I, calculate the public health emergencies by using cosine similarity, Pearson correlation coefficient and Jaccard correlation coefficient U_a and U_b Score similarity for the same item $S_{a,b}$ The specific calculation formulas are as follows:

$$S_{a,b} = \frac{\sum_{i \in I_{a,b}} R_{a,i} \cdot R_{b,i}}{\sqrt{\sum_{i \in I_{a,b}} R^2_{a,b} \cdot \sum_{i \in I_{a,b}} R^2_{b,i}}} \quad (1)$$

$$S_{a,b} = \frac{\sum_{i \in I_{a,b}} (R_{a,i} - \overline{R}_a)(R_{b,i} - \overline{R}_b)}{\sqrt{\sum_{i \in I_{a,b}} (R_{a,i} - \overline{R}_a)^2 \sum_{i \in I_{a,b}} (R_{b,i} - \overline{R}_b)^2}} \quad (2)$$

$$S_{a,b} = \frac{|I_a \cap I_b|}{|I_a \cup I_b|} \quad （3）$$

Among them, $R_{a,i}$ and $R_{b,i}$, they represent word frequency respectively U_a and U_b On the project i, the preference score of, $\overline{R}_a$ and $\overline{R}_b$ Represent the user respectively U_a and U_b Preference score for the project, I_a and I_b It means word frequency respectively U_a and U_b Evaluation of the project.

Step 3: repeat the above steps 1 and 2 until the word frequency of public health emergencies is obtained U_a and U_b All similarity sets of $S_{a,b}$, and adopt $Top-N$ Method to obtain the nearest neighbor set U_N.

Step 4: public health emergency prediction U_a. For a project not evaluated j, the specific calculation formula is as follows:

$$P_{a,j} = \frac{\sum_{u \in U_N U_j} R_{uj}}{\sum_{u \in U_N U_j} S_{a,u}} \quad （4）$$

Among them, U_j indicates that the project has been evaluated j. All public health emergencies set based on preference degree.

Step 5: repeat step 4 until the public health emergency is obtained U_a The prediction set of preference degree for all items not evaluated $P_{a,x}$, reuse $Top-N$ The method selects the front from the preference prediction set N The items with the highest preference score were public health emergencies. Some tables are shown in **Table 2**.

Table 2. Similarity matrix

	fragile nature	Disaster vulnerability analysis	meet an emergency Administration	natural disaster	Emergency information system	Kaiser model	Vulnerability evaluate	Vulnerability analysis	disaster Vulnerability	disaster Medical Science	disaster harm
Vulnerability	1.0000	0.0000	0.0523	0.4182	0.0000	0.0000	0.0000	0.0000	0.0405	0.0453	0.1358
Disaster vulnerability analysis	0.0000	1.0000	0.3203	0.0000	0.0000	0.5393	0.0000	0.0000	0.0000	0.2080	0.0000

meet an emergency Administration	0.0523	0.3203	1.0000	0.0000	0.0937	0.4082	0.0000	0.4924	0.1291	0.4330	0.1443
natural disaster	0.4182	0.0000	0.0000	1.0000	0.0000	0.0000	0.2108	0.0000	0.0000	0.0000	0.0000
Emergency information system	0.0000	0.0000	0.0937	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Kaiser model	0.0000	0.5393	0.4082	0.0000	0.0000	1.0000	0.0000	0.3015	0.0791	0.1768	0.0000
Vulnerability assessment	0.0000	0.0000	0.0000	0.2108	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.1826
Vulnerability analysis	0.0000	0.0000	0.4924	0.0000	0.0000	0.3015	0.0000	1.0000	0.0000	0.3198	0.3198
Vulnerability of disaster	0.0405	0.0000	0.1291	0.0000	0.0000	0.0791	0.0000	0.0000	1.0000	0.1118	0.0000
disaster Medical Science	0.0453	0.2080	0.4330	0.0000	0.0000	0.1768	0.0000	0.3198	0.1118	1.0000	0.0000
disaster	0.1358	0.0000	0.1443	0.0000	0.0000	0.0000	0.1826	0.3198	0.0000	0.0000	1.0000

In general, the linear coefficient is greater than 0.7, indicating that the linear correlation is relatively high, and the closer to 1, the closer the sign is.

3. Conclusion

This paper uses bibliometric method to find the existing research hotspots. The research results show that the research focus of domestic emergency management mainly focuses on 21 topics, such as public opinion management and control, emergency coordination, emergency network and system optimization, emergency resource capacity reserve, disaster risk assessment etc.

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