Hotspots and Frontiers of Health Literacy Research in Mainland China: Bibliometric Analysis Based on CNKI Core Journals

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Abstract: In order to reveal the hotspots, evolution and frontiers of health literacy research in mainland China, Using Citespace to conduct a bibliometric analysis of 648CNKI core journal articles in the field of health literacy.The research found that health literacy research can be divided into three stages: initial (2007-2010), slow development (2011-2014), and rapid development (2015-2020); the core academic community is less, and the period is limited. Regional characteristics are obvious; research hotspots include health literacy survey and its influencing factors, evaluation index system and its connotation, disease prevention and intervention, and health management; the frontier of research in this field is electronic health literacy and mental health literacy. The research results are consistent with the existing results, indicating that the bibliometric method are reliable.
Key words: health literacy; research hotspots; research frontiers; bibliometrics

Since the 1990s, health literacy has been highly concerned by government agencies, health personnel and researchers. The Health Literacy of Chinese Citizens - Basic Knowledge and Skills (Trial) issued by the former Ministry of Health in 2008 (hereinafter referred to as "Health Article 66") is the first government document in the world to define the health literacy of citizens [1]. The Outline of the "Healthy China 2030" Plan issued by the Central Committee of the CPC and the State Council in 2016 clearly puts forward the need to strengthen health education and improve health literacy [2].The outbreak of new coronaviruses in 2020 is widespread in the world. Apart from other reasons such as inadequate staffing of infectious disease prevention and control personnel and poor professional quality, the overall low level of public health literacy is also an important influencing factor.

The concept of health Literacy was first put forward by American scholar Simonds in Health Education and Social Policy in 1974. At present, the widely adopted definition in China is that health literacy is an individual's ability to acquire, understand and process basic health information or services, and make correct decisions using these relevant information and services [3].Studies have shown that low health literacy not only affects health status, but also causes great waste of public health care [4].

In order to clarify the research hotspots, evolution and frontier trends of health literacy, this article used CitespaceIII software to conduct a bibliometric analysis of the knowledge map of

health literacy in Chinese mainland as a reference for researchers.

1. Study objects and methods

1.1 Study subjects

648 relevant core papers on health literacy in China searched form CNKI.

1.2 Study methods

1.2.1 Search methods

In the Chinese Knowledge Infrastructure (CNKI abbr.) database, advanced retrieval methods were adopted, with the literature object of "journals" and the retrieval conditions as follows: "title: health literacy". The search scope and retrieval time were not limited, "source category: core journals, CSSCI". "Refworks" literature format was derived. Documents named "download" were used to exclude the bibliographic information of journals, such as inconsistent with this study, no author, no unit, duplicate literature, supplements and special editions, and notifications. The retrieval deadline was 2020.

1.2.2 Research methods

The time distribution characteristics of downloaded Journal papers, the amount of Journal papers, and the amount of papers issued by authors and institutions were statistically analyzed using Excel software. The Citespace 5.6.R5 (64-bit) software was used to draw the author/institution cooperation map, keyword co-occurrence knowledge map, key word timing map and high-frequency keyword time-zone view spectrum, and further analyzed. Through repeated debugging of thresholds, the final generated atlas structure is remarkable and clustering is efficient, that is, module value Q > 0.3, contour value > 0.7, as follows:The time span is 2007-2020, with a total of 13 years. Time Slicing is set to 1 year. Node Types select Author, Institution and Keyword successively.Thresholds were selected (frequency, co-occurrence frequency, co-occurrence rate), and each threshold interpolation was set as: author (2, 2, 15; 2, 2, 15); mechanism (2, 2, 15; 2, 2, 15; 2, 2, 15);Key words (3, 3, 15; 4, 4, 15; 4, 4, 15), these knowledge maps can intuitively reflect the relevant information in this field.

2. Result

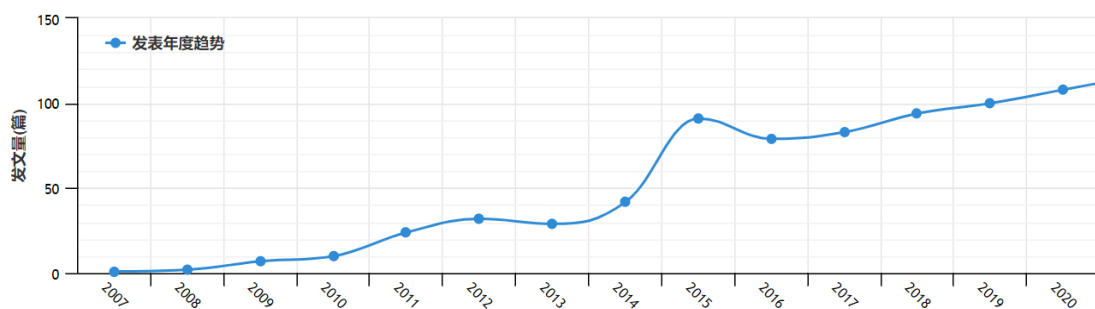### 2.1 Time distribution of literature

Fig. 1 Time distribution of papers

Statistics show (see Figure 1), from 2007 to 2010, health literacy-related research is in its infancy, with only a single-digit number of core papers published each year. During 2010-2014, the annual journal publication volume can reach about 10-32 articles, and the growth trend is relatively obvious. The volume of publications reached 91 in 2015, which was the highest increase since the

study. Although the volume of publications declined slightly in 2016, it still remained at the level of more than 81 articles per year. Since 2017, it has been increasing steadily every year. In 2019, the number of articles issued is 100. Especially with the outbreak of the coronavirus epidemic in 2020, the number of articles issued has reached a historical high level of 108. Research on health literacy will continue to grow greatly in the future.

2.2 Number of papers published in core journals

According to statistics, 648 high-level literatures on health literacy in China are published in 124 core journals, involving public health and preventive medicine, education, clinical medicine, nursing, society, library and information archives, sports, psychology and other fields. There are 11 journals with more than 10 articles (see Figure 2), accounting for 76.5% of the total volume. The top four journals, China Health Education, China School Health, Modern Preventive Medicine and China Public Health, accounted for 59.6% of the total volume. The comparison found that there were two more journals, Environmental and Occupational Medicine and China Chronic Disease Prevention and Control, in 2020 than 2018 [5], indicating that more and more journals and fields began to pay attention to health literacy research.
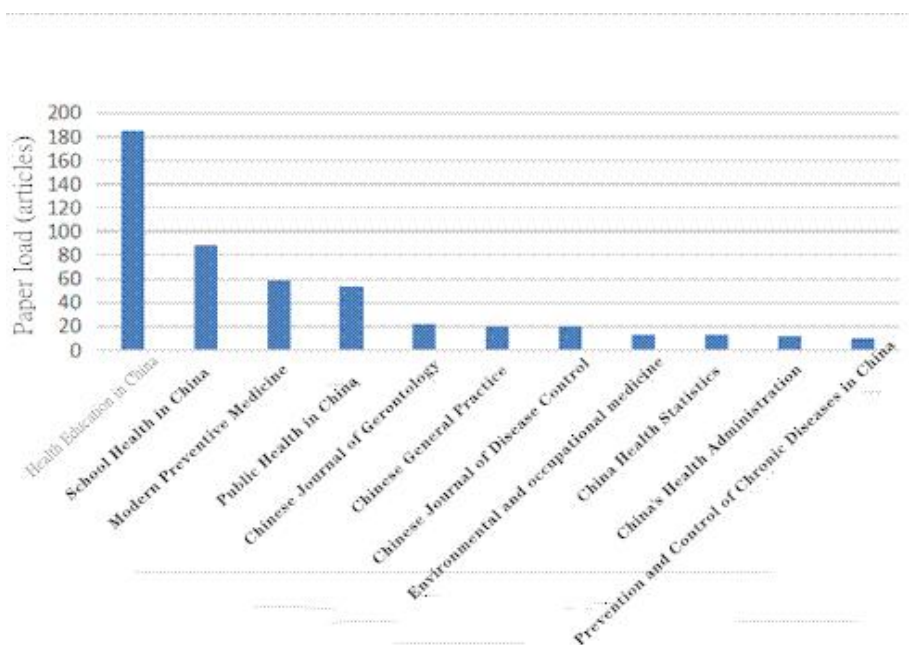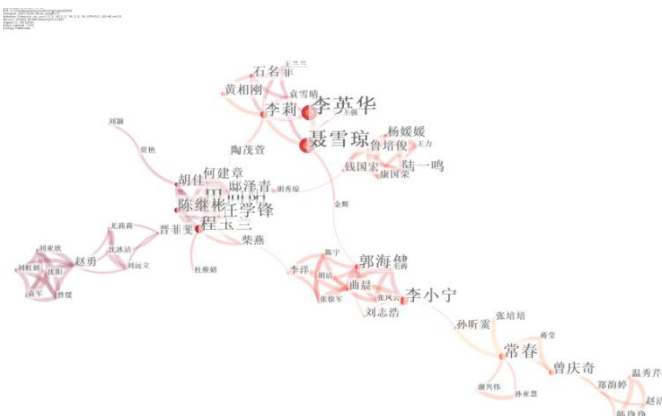

Fig. 2 The number of journals with more than 10

2.3 Authors, institutions and cooperation map analysis

Statistics show that there are 514 authors (the first author) in 648 literatures, 28 with 3 or more articles, Zhang Shichen, Yan Liping and Lu Yiming ranked first, 5 articles each, 7 articles each, 11 articles with 10 or more authored articles, and 19 articles with Li Yinghua ranked first. There are 11 institutions with 10 or more articles, and 5 institutions with 20 or more articles, including 40 articles from China Health Education Center, 40 from Peking University, 37 from Fudan University, 27from Anhui Medical University, and 21 from Central South University.

The map of collaboration between authors (Fig. 3) shows a network density of 0.0145, indicating that collaboration between authors is not close enough. Among them, Tian Xiangyang, Ren Xuefeng, Cheng Yulan, Li Xiaoning, Guo Haijian and other cooperation teams are the largest two teams, each with 11 people; nine, seven, five, four cooperation teams each have 1; six

cooperation teams have 2.

Figure.3 Author collaboration map

Figure 4 shows that the network density of the institutional cooperation map is only 0.0135, indicating that the cooperation between institutions is relatively distant. Among them, China Health Education Center, Peking University School of Public Health, and China Center for Disease Control and Prevention constitute the largest institutional cooperative community, with 1 of the 3 institutional cooperative communities and 3 of the 2 institutional cooperative communities.

Figure. 4 Map of Institutional Cooperation

2.4 Clustering results of high frequency keyword co-occurrence maps

Keyword co-occurrence analysis is the analysis of the keywords provided by the authors in the data set. By investigating the frequency of keyword co-occurrence in the atlas and the centrality of the nodes and the thickness of the connections, it can intuitively reflect the research hotspots, mutations and turning points [6].With keywords as retrieval conditions, the knowledge map of keyword co-occurrence was obtained with the number of nodes 400, the connection 674 and the density 0.0084 (see Fig. 5).The size of the circles represents the frequency of keywords appearing in the literature, the font size represents the centrality of the keywords, and the wiring thickness between the circles represents the degree of connection between the keywords, which

together constitute the research hotspots. As can be seen from Fig. 5, besides "health literacy" as the most popular vocabulary,"influencing factors", "health education", "students", "questionnaire", "health promotion" factor analysis"," health status"," health behavior"," urban and rural"," residents"," adolescents"," college students"," middle school students"," chronic diseases/infectious diseases/diabetes" and so on are also hot words. And the atlas shows that the mediation of health literacy is the highest, followed by the influencing factors, which means that health literacy and its influencing factors have always been the hot research area.
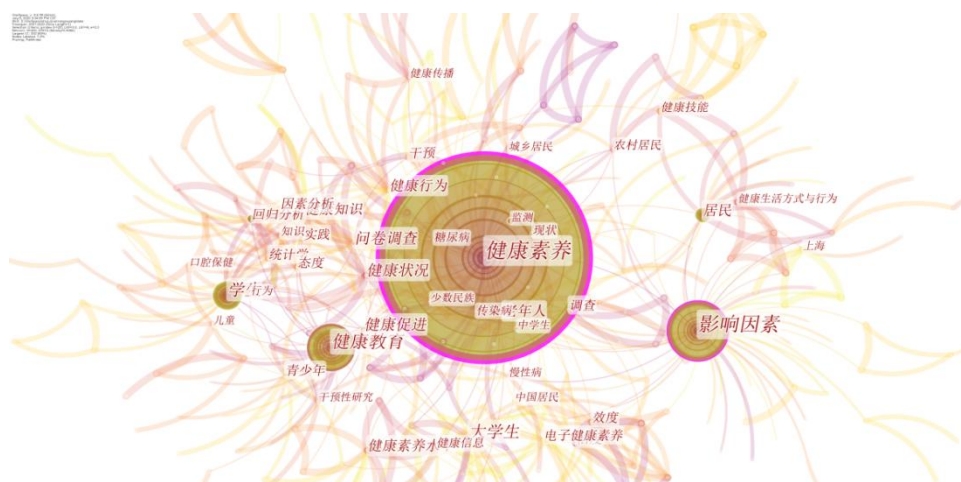

Fig. 5 High frequency keyword co-occurrence knowledge map

2.5 Evolution course of health literacy research

Through the time distribution of literature (Fig. 1) and time zone view of high frequency keywords (Fig. 6), the research of health literacy for more than ten years can be divided into three stages of development.

The first phase (2007-2010) is the initial phase of health literacy research. In 2007, the former Ministry of Health convened more than 100 experts and scholars in the medical and health system to discuss the basic contents of Chinese citizens' health literacy, thus formally opening the curtain of theoretical research and practice of health literacy.In 2008, after the publication of the first government document defining citizens' health literacy, Health Article 66 and the Work Program of China's Citizens' Health Literacy Promotion Action (2008-2012), health literacy promotion was fully launched [7].At this stage, the number of publications in the core journals is a single digit per year, which focuses on the investigation, influencing factors, evaluation system and connotation of health literacy of urban and rural residents.

Fig. 6 Time zone Atlas of high frequency keywords

The second period (2011-2014) is a slow development phase. In this stage, the volume of publications increased exponentially, from the number of individuals per year in the first stage to 24, 32 and 42.The subjects of study were expanded from urban and rural residents to students, farmers, workers, the elderly and adolescents, from normal healthy groups to specific population/disease groups such as pregnant women, diabetes patients, hypertensive patients, chronic disease patients, etc., from public health perspective to clinical perspective;And the research content is more focused and micro, from the current situation, evaluation and connotation of health literacy to health management and intervention, from theory to application.

The third period (2015-2020) is a period of rapid development. The volume of publications in this stage doubled compared with that in the second stage, and after that, although it declined, it still maintained a relatively stable and rapid growth period. At this stage, all provinces and cities have strengthened the monitoring of the health literacy of urban and rural residents, and the investigation of the status quo of health literacy of different objects and the analysis of influencing factors are the mainstream. The research on the evaluation system and assessment tools of different objects, especially adolescents and students, has jumped out of the scope of the evaluation system of public health literacy and is more in line with the characteristics of the objects.

2.6 Frontier analysis of health literacy research

Highlighted subject terms are more suitable for detecting new trends and emergent changes in subject development than the most frequently used subject terms [8].The keyword salience map (Figure 7) shows that before 2014, the focus and hotspot of the research were the knowledge sexual transmission of health literacy and the investigation and analysis. In 2014, the key words of "diabetes mellitus" emerged, indicating that relevant and disease prevention research has received attention, and the research has more practical significance. Facts have proved that disease prevention and related research is a hot research field at present. The emergence of the keyword "electronic health literacy" in 2017 indicates that the increasing reliance on the Internet to obtain health information has attracted the attention of researchers.Especially with the emergence of the epidemic in 2020, health-related information and knowledge can be obtained without going out, and how to make correct judgments and decisions will be the research topic of electronic health

literacy. According to the time zone Atlas of high frequency keywords, mental health literacy appears in the region. Combined with the current situation of the epidemic in 2020, it can be predicted that electronic health literacy and mental health literacy will become new research directions.

Top 4 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2007 - 2020
Questionnaire investigation	2007	4.1033	2011	2014	
Knowledge	2007	2.8488	2011	2014	
Diabetes	2007	3.1075	2014	2017	
Electronic health literacy	2007	2.9923	2017	2020	

Figure.7 Keyword highlight map

3. Conclusion

From the above studies, the following conclusions can be drawn:

(1) Health literacy research will be paid more and more attention in the field and journals. The improvement of health literacy and health promotion are not unilateral matters, which require the participation and cooperation of individuals, families, schools and communities in many aspects.

(2) Comprehensive, public health or medical professional universities, centers for disease prevention and control, and local health education institutes are the main research forces in the field of health literacy in China. There are few cooperative communities and insufficient continuity, which are mostly found in the cooperation between different institutions in a unified region or unit, breaking regional, professional and unit boundaries, and strengthening cross-regional, cross-professional, cross-unit and even cross-border exchanges and cooperation.

(3) The knowledge map and related literatures show the evolution path of health literacy well: from the initial stage, the slow development stage to the rapid development stage; from the proposal of the concept of health literacy, evaluation system to the improvement of evaluation tools;From public health literacy to low health, from literacy population, from urban and rural residents to the elderly, children, adolescents, College students, women and other studies, to focus on the health literacy of clinical patients such as diabetes, cancer, hypertension and so on;From the public health perspective to the clinical perspective, the research objects are constantly refined, and their connotations are constantly enriched and expanded with the proposition of functional health literacy, electronic health literacy, mental health literacy and other concepts.

(4) There are currently five hot spots in the field of health literacy.

First, the status quo of health literacy and the analysis of influencing factors. The keywords of this clustering are:Influencing factors, knowledge, health knowledge, current situation, survey, questionnaire, monitoring, regression analysis, health promotion, health status, etc. The subjects include students, residents, urban and rural residents, rural residents, middle school students, College students, adolescents, low health literacy, etc.The investigation contents of urban and rural

residents are mainly based on the three levels of "Health Article 66". The investigation contents of adolescents are mainly based on the "Outline of Health Education Guidance for Primary and Secondary Schools". Researchers agree that family, school, network and peers are the four major factors affecting individual health literacy from a systemic point of view[9].From an individual perspective, education level, professional/occupational characteristics, age and region are considered to be the main factors affecting health literacy. Second, health literacy evaluation index and connotation, the clustering keywords mainly include: reliability, validity, evaluation, connotation, model and other key words. The investigation of urban and rural residents is mainly based on the health literacy evaluation index system and questionnaire developed by China Health Education Center, and the level of adolescent health literacy cannot be comparatively analyzed because different researchers have different connotations on defining adolescent health literacy and different evaluation index systems. Third, disease prevention, intervention and health management. The clustering keywords include intervention, health education, health knowledge, health behavior, health skills, health attitudes, infectious diseases, chronic diseases, diabetes, etc.Research shows that improving health literacy plays an important role in preventing AIDS, diabetes, cancer, asthma and other diseases and improving their quality of life. Health literacy is significantly correlated with health status and health risk behaviors. The establishment of school health education courses can obviously improve students' health literacy and achieve good intervention effect [10].Fourth, electronic health literacy, the clustering keywords mainly include students, scales, status quo, influencing factors, behavior patterns, health information, etc., the existing research mainly focuses on the current situation investigation, influencing factors, evaluation and related research of electronic health literacy. Fifth, mental health literacy, the clustering keywords mainly include concept, connotation, measurement, evaluation, etc. At present, it is still in the early stage of research on concept, connotation, evaluation.

(5) Two research frontiers are highlighted in the field of health literacy. The evaluation of electronic health literacy and mental health literacy/mental health literacy is consistent with the hot spots and frontier conclusions of Yao Qiang and Liu Xiaoli on international health literacy research in 2011[11] which indicates that China is in line with the international standards in health literacy research.

The conclusions of this paper are partially consistent with those of Sun Guotao, Li Jing and Qiu Fengxia, [12] which indicates that the metrological analysis method adopted has good reliability. The significant change in research in the past three years is that more and more journals and fields begin to pay attention to and attach importance to health literacy research, and mental health literacy has become a new research direction.

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