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# CATASTROPHIC HEALTH EXPENDITURE: A BIBLIOMETRIC ANALYSIS

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**Abstract**

The aim of this study is to conduct a bibliometric analysis of the studies in the literature on catastrophic health expenditures. For this purpose, a bibliometric analysis of the articles on catastrophic health expenditure indexed in Web of Science (WoS) using VOSviewer (version 1.6.20) was performed. As a result of the analysis, 822 articles were found. The countries, institutions and journals with the highest number of research articles on catastrophic health expenditures are the USA, Peking University and The International Journal for Equity in Health, respectively. The countries most frequently mentioned with the keyword "catastrophic health expenditure" are "China", "India", "Iran", "Nigeria", "Ethiopia" and "Bangladesh", respectively. According to the research findings, it has been observed that studies on catastrophic health expenditures have increased continuously over time. Although the share of out-of-pocket health payments in total health expenditures has been decreasing worldwide in recent years, its share in the income of the population has not decreased. This indicates that catastrophic health expenditures will continue to exist in the future and therefore scientific studies in this field will remain important.

**Keywords:** Catastrophic Health Expenditure, Bibliometric Analysis, Universal Health Coverage, Out-of-Pocket
**JEL Classification**: H51, P36, I18

# KATASTROFİK SAĞLIK HARCAMALARI: BİBLİYOMETRİK BİR ANALİZ

**Öz**

Bu araştırmanın amacı, katastrofik sağlık harcamalarına ilişkin literatürde yer alan araştırmaların bibliyometrik incelenmesini yapmaktır. Bu amaçla VOSviewer (sürüm 1.6.20) aracılığıyla Wos'ta dizinlenen katastrofik sağlık harcaması ile ilgili makalelerin bibliyometrik analizi gerçekleştirilmiştir. Analiz sonucunda 822 adet makale bulunmuştur. Katastrofik sağlık harcamaları konusunda en çok araştırma makalesine sahip ülke, kurum ve dergi sırasıyla ABD, Pekin Üniversitesi ve The International Journal for Equity in Health olmuştur. "Catastrophic health expenditure" anahtar kelimesi ile en fazla adı geçen ülkeler sırasıyla "Çin", "Hindistan", "İran", "Nijerya", "Etiyopya" ve "Bangladeş" olmuştur. Araştırma bulgularına göre katastrofik sağlık harcamaları ile ilgili çalışmaların zaman içerisinde sürekli arttığı görülmüştür. Cepten yapılan sağlık ödemelerinin toplam sağlık harcamaları içindeki payı son yıllarda dünya genelinde azalmakla birlikte, nüfusun geliri içindeki payı azalmamıştır. Bu durum, katastrofik sağlık harcamalarının gelecekte de var olmaya devam edeceğini ve dolayısıyla bu alandaki bilimsel çalışmaların önemini koruyacağını göstermektedir.

**Anahtar kelimeler:** Katastrofik Sağlık Harcaması, Bibliyometrik Analiz, Evrensel Sağlık Kapsamı, Cepten Ödemeler
**JEL Sınıflaması:** H51, P36, I18

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## 1. Introduction

One of the most important objectives of a country's health system is to provide financial protection to the population against the costs of disease (WHO, 2000; WHO, 2010; Papanicolas et al. 2022). To this end, the World Health Organization has proposed a new strategy for universal health coverage (UHC) for countries and the United Nations has set 2030 targets for UHC for a safer, fairer and healthier world (WHO, 2010; Dorjdagva et al. 2016; Ghanbari et al. 2021; Papanicolas et al. 2022; UHC2030, 2024). In line with these developments, countries are striving to create universal financial mechanisms dominated by the state. However, it may not be possible to provide health services free of charge to all citizens in many countries, especially in less developed countries (Wagstaff and Neelsen, 2020). This situation requires households to participate in health service financing through out-of-pocket payments.

Catastrophic health expenditure (CHE) is simply defined as an index that expresses households' health expenditures in terms of their ability to pay (Kawabata, 2002; Lee and Yoon, 2019). In a broader sense, CHE is the situation where the financial independence of the household is jeopardized due to the health expenditures of the household exceeding the income of the person and thus the person faces poverty due to illness. In other words, out-of-pocket health payments that exceed a certain threshold of household income or family expenditures (exceeding 40% of income according to WHO) are called CHE. (Rashidian et al. 2018; Lee and Yoon, 2019; Paudel, 2019; Söyük, 2023).

As the definitions suggest, CHE is a relative concept as it depends on the household's ability to pay (Lee and Yoon, 2019). Therefore, a small out-of-pocket health payment may cause a low-income family to cut down on basic expenditures such as food, shelter, etc., while wealthy families exposed to high health expenditures may be driven to economic ruin and bankruptcy (Wagstaff et al. 2018; Söyük, 2023). On the other hand, CHE may not always be synonymous with high disease costs. It may not be catastrophic for households if a significant portion of the cost of providing a high health service is financed by third-party insurance or the government (Xu et al. 2003).

In national health systems, total health expenditures are financed mainly in two ways: Public expenditures and household expenditures (Tokatlıoğlu and Tokatlıoğlu, 2018). The main thing that needs to happen for UHC is to reduce catastrophic out-of-pocket health expenditures that impoverish households as much as possible. CHE are recognized as an important indicator of

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UHC in sustainable development (Thomas et al. 2022). In this framework, many scientific studies have been conducted on CHE. The aim of this study is to conduct a bibliometric analysis of the studies in the literature on CHE. In line with this purpose, answers to the following questions were sought:

1. Which journals publish the most research on CHE?

2. Which countries and organizations are the most productive in this field?

3. What are the co-authorship patterns of CHE researchers?

4. What are the most frequently used keywords and co-occurrence networks in CHE research?

5. What is the collaboration status of CHE research across countries?

6. What are the most cited research articles in CHE research?

## 2. Materials and Methods

Bibliometric analysis is to provide a general map of the research area by using mathematical and statistical methods to analyze scientific activities in a particular research area (Yiğit & Yiğit, 2023). The development of databases such as Web of Science and Scopus and bibliometric software such as VOSviewer, Gephi, Leximancer has led to a rapid increase in scientific publications in this field (Donthu et al. 2021).

Web of Science (WoS) is the most unique indexing and abstracting database in the world (Farooq et al. 2021). It is emphasized that WoS is the most important data source for bibliometric analysis of scientific research because it presents records in a more consistent and standardized manner compared to Scopus and other databases (Bettencourt and Kaur 2011; Chen et al. 2014). In this context, WoS was selected for the data set of this study.

This study aims to conduct a bibliometric analysis of studies on CHE. The search strategy followed to obtain studies on catastrophic health expenditure is given below:

Web of Science database was searched with topics (title, abstract and author keywords) ((TS=("catastrophic health expenditure$")) OR TS=("catastrophic health spend$")) OR TS=("catastrophic health payment$"). Different versions of the word were also searched by using the $ sign. In the search strategy, the language of publication was English, Document type: article, time interval: no start date was selected, and articles until the end of 2023 were

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included. The retrieved articles were exported in *Tab delimited* file format on 05.02.2024. VOSviewer (version 1.6.20) package program was used for bibliometric analysis.

## 3. Results

This section presents the findings obtained from bibliometric analysis in detail and provides assessments based on descriptive data in terms of countries, institutions, journals and research trends.

### 3.1. Descriptive Findings

General information about articles on CHE is presented in Table 1. In the bibliometric analysis, 822 research articles were published in 265 journals in 20 years (2003-2023). The articles were written by 3324 different authors in a total of 1227 different organizations in 105 countries. The number of articles per journal was 3.1 and the average number of authors per article was 4.04. The total number of keywords was 1357.

**Table 1. General Information on Articles on Catastrophic Health Expenditures**

| Research Data | Results |
|---|---|
| Time Period of Publication of Articles | 01.01.2003-31.12.2023 |
| Number of Articles | 822 |
| Annual average number of article publications | 39,1 |
| Publications (Journals) Number | 265 |
| Number of Articles per Journal | 3,1 |
| Number of Organizations | 1227 |
| Number of Articles per Organization | 1,5 |
| Number of Authors | 3324 |
| Average Number of Authors per Article | 4,04 |
| Total number of keywords | 1357 |
| Number of Countries | 105 |

**Source:** Author's own elaboration based on data retrieved from Web of Science

The increasing trend of 822 articles on CHE in the Web of Science database search by years is given in Graph 1. According to this, it is seen that the first article belongs to 2003. It is seen that the number of articles has increased over the years. The highest number of publications belongs to 2022. Since it may take a long time for published works to be seen in WoS, there is an increase in the number of documents from 2023.

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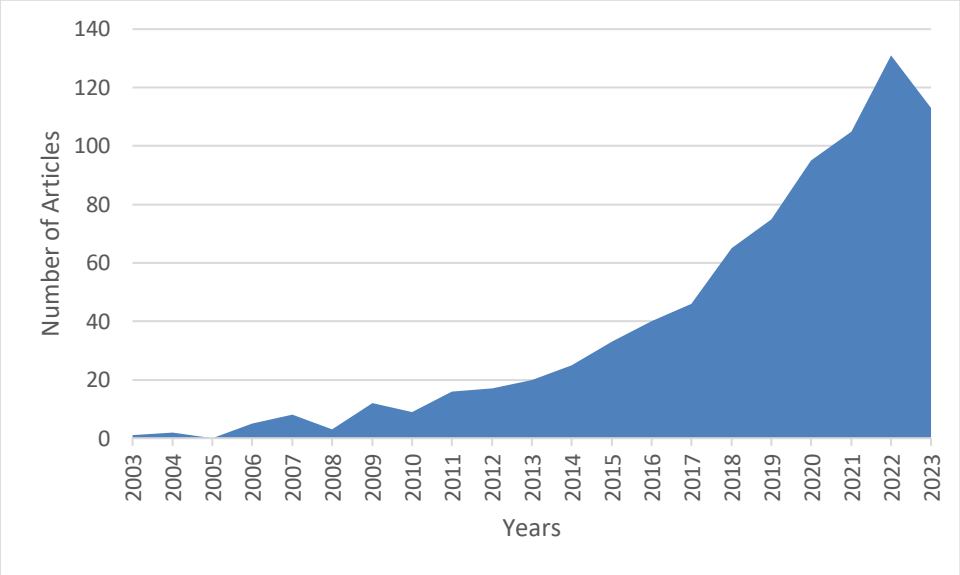
**Graph 1. Number of Articles on Annual Catastrophic Health Expenditure as Indexed in WoS**




**Source:** Web of Science Core Collection. Data retrieved and analyzed by the author

### 3.2. Most Productive Countries and Organizations

The most influential countries and organizations in the field of CHE are given in Table 2. Among the countries that produced the most publications in the field, the countries that produced more than 100 publications were the USA, China, India and the UK, respectively. The USA tops the list with 189 publications and 3436 citations, followed by China with 182 publications and 3318 citations. Among the top twenty institutions, Peking University, Harvard T.H. Chan School of Public Health, World Health Organization were found to have the highest number of research articles in the field of CHE. The most cited organization was the World Health Organization with 2422.

**Table 2. Top Twenty Most Influential Countries and Organizations in the CHE Literature**

| Rank | Country | TP | TC | Rank | Organizations (Country) | TP | TC |
|---|---|---|---|---|---|---|---|
| 1 | USA | 189 | 3436 | 1 | Peking University (China) | 35 | 576 |
| 2 | China | 182 | 3318 | 2 | Harvard T H Chan Scgool of Public Health (USA) | 26 | 274 |
| 3 | India | 130 | 2094 | 3 | World Health Organization | 26 | 2422 |
| 4 | England | 101 | 2476 | 4 | London School of Hygiene Tropical Medicine (England) | 25 | 774 |
| 5 | Australia | 70 | 1828 | 5 | MINIST HLTH | 25 | 882 |
| 6 | Iran | 58 | 616 | 6 | Tehran University of Medical Sciences (Iran) | 23 | 293 |
| 7 | Nigeria | 40 | 540 | 7 | Harvard University (USA) | 22 | 988 |
| 8 | Ethiopia | 38 | 471 | 8 | University of Bergen (Norway) | 21 | 259 |
| 9 | South Korea | 36 | 862 | 9 | Harbin Medical University (China) | 20 | 544 |
| 10 | Switzerland | 33 | 2697 | 10 | Duke University (USA) | 19 | 406 |
| 11 | Bangladesh | 28 | 866 | 11 | Addis Ababa University (Ethiopia) | 16 | 214 |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12 | South Africa | 25 | 414 | 12 | Nanjing Medical University (China) | 16 | 256 |
| 13 | Norway | 24 | 301 | 13 | Iran University of Medical Sciences (Iran) | 16 | 120 |
| 14 | Sweden | 23 | 643 | 14 | Huazhong University of Science Technology (China) | 16 | 325 |
| 15 | Vietnam | 23 | 480 | 15 | Shandong University (China) | 15 | 402 |
| 16 | Belgium | 22 | 578 | 16 | Harvard Medical School (USA) | 15 | 156 |
| 17 | Netherlands | 21 | 773 | 17 | Xi'an Jiaotong University (China) | 14 | 261 |
| 18 | Thailand | 21 | 446 | 18 | University of Washington (USA) | 14 | 206 |
| 19 | Germany | 20 | 467 | 19 | University of Melbourne (Australia) | 14 | 302 |
| 20 | Japan | 20 | 477 | 20 | World Bank | 13 | 346 |

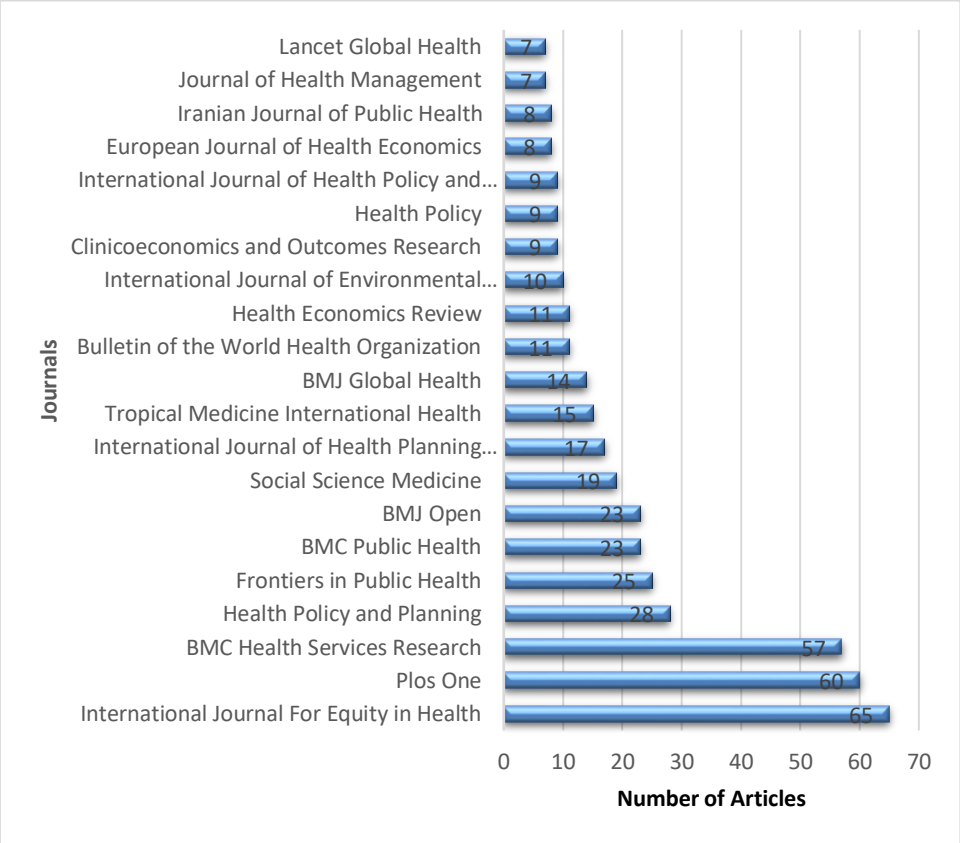
TP=Total Publications, TC=Total Citations

**Source:** Author's own elaboration based on data retrieved from Web of Science

### 3.3. Influential Research Journals

Graph 2 shows the journals that produced the most publications in the field of CHE. Among these journals, International Journal for Equity in Health ranked first with 65 articles, Plos One ranked second with 60 articles and BMC Health Services Research ranked third with 57 articles.

**Graph 2. Journals Producing the Most Articles on CHE**




**Source:** Web of Science Core Collection. Data retrieved and analyzed by the author

Table 3 shows the top 10 most cited research journals on CHE. Of these, nine journals received more than 500 citations. The Lancet ranked first with 1472 citations despite

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producing only two publications. The International Journal for Equity in Health, which produces the most publications, ranked second with 1446 citations and Plos One ranked third with 1442 citations.

**Table 3. Most Influential Research Journals on CHE**

| Rank | Source | TC | TP | H_index | Impact Factor | Quartile |
|---|---|---|---|---|---|---|
| 1 | Lancet | 1472 | 2 | 855 | 168,9 | 1 |
| 2 | International Journal for Equity in Health | 1446 | 65 | 71 | 4,76 | 1 |
| 3 | Plos One | 1442 | 60 | 404 | 3,70 | 1 |
| 4 | BMC Health Services Research | 958 | 57 | 133 | 2,90 | 1 |
| 5 | Bulletin of the World Health Organization | 901 | 11 | 184 | 11,10 | 1 |
| 6 | Health Policy and Planning | 683 | 28 | 103 | 3,34 | 1 |
| 7 | Tropical Medicine International Health | 618 | 15 | 126 | 3,91 | 2 |
| 8 | Health Policy | 594 | 9 | 103 | 3,3 | 1 |
| 9 | Social Science Medicine | 533 | 19 | 270 | 5,4 | 1 |
| 10 | Health Economics | 437 | 4 | 123 | 3,5 | 1 |

TC: Total Citations; TP: Total Publications

**Source:** Author's own elaboration based on data retrieved from Web of Science

Figure 1 shows the distribution of the total link strengths of the journals in which articles on CHE were published. [2]The minimum number of articles was chosen as 2 and the minimum number of citations as 75. Accordingly, 29 out of 265 journals were mapped into 6 clusters. The size of the element indicates the total link strength of the journal with other journals. The journals with the highest linkage strength were Lancet in cluster 1, BMC Health Service Research in cluster 2, Bulletin of the World Health Organization in cluster 3, International Journal for Equity in Health in cluster 4, Plos One in cluster 5 and Health Policy in cluster 6.

[2] These thresholds were applied to enhance the readability of the clusters and to prevent the graphs from appearing overly complex.

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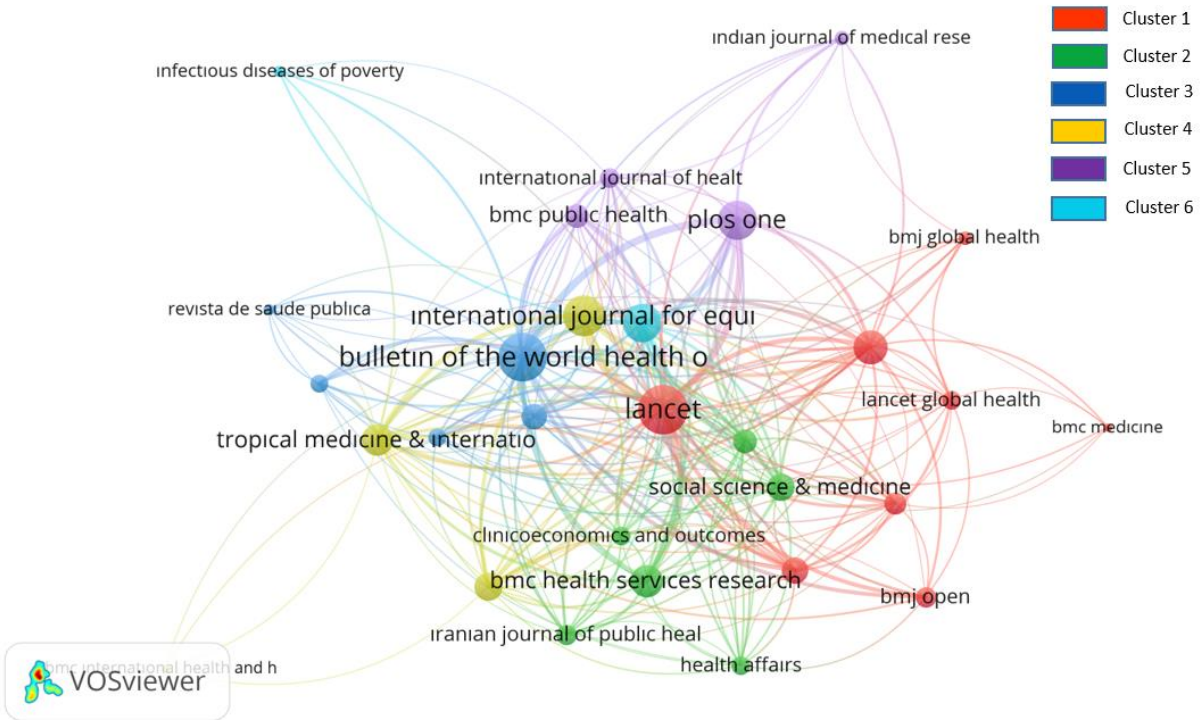
**Figure 1. Distribution of the total link strength of the journals in which the documents are published (minimum number of citations 75). Larger items represent more link strength.**




**Source:** Author's own elaboration based on Web of Science data using VOSviewer

### 3.4. Most Cited Articles

Top ten most cited articles on CHE are shown in Table 4. The most cited article is the first published article not surprising. This article is "Household catastrophic health expenditure: a multicountry analysis" published in The Lancet in 2003. Apart from this article, all other articles received less than 400 citations.

**Table 4. Top 10 Most Cited Articles by Researchers on CHE**

| Title | First Author | Year | Source | TC | TC per year |
|---|---|---|---|---|---|
| Household catastrophic health expenditure: a multicountry analysis | Xu, K | 2003 | Lancet | 1.333 | 66,6 |
| Catastrophic payments for health care in Asia | Van Doorslaer, E | 2007 | Health Economics | 392 | 24,5 |
| Factors affecting catastrophic health expenditure and impoverishment from medical expenses in China: policy implications of universal health insurance | Li, Y | 2012 | Bulletin of the World Health Organization | 273 | 24,8 |
| Catastrophic household expenditure for health care in a low-income society:: a study from Nouna District, Burkina Faso | Su, TT | 2006 | Bulletin of the World Health Organization | 242 | 14,2 |
| Understanding the impact of eliminating user fees: Utilization and catastrophic health expenditures in Uganda | Xu, K | 2006 | Social Science Medicine | 205 | 12,1 |

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| | | | | | |
|---|---|---|---|---|---|
| Out-of-pocket health expenditure and debt in poor households: evidence from Cambodia | Damme, W | 2004 | Tropical Medicine International Health | 184 | 9,7 |
| Catastrophic health expenditure and impoverishment in Turkey | Yardim, MS | 2010 | Health Policy | 174 | 13,4 |
| Insured yet vulnerable: out-of-pocket payments and India's poor | Shahrawat, R | 2012 | Health Policy and Planning | 160 | 14,5 |
| Physical multimorbidity, health service use, and catastrophic health expenditure by socioeconomic groups in China: an analysis of population-based panel data | Zhao, Y | 2020 | Lancet Global Health | 156 | 52 |
| Assessing the effect of the 2001-06 Mexican health reform: an interim report card | Gakidou, E | 2006 | Lancet | 139 | 8,2 |

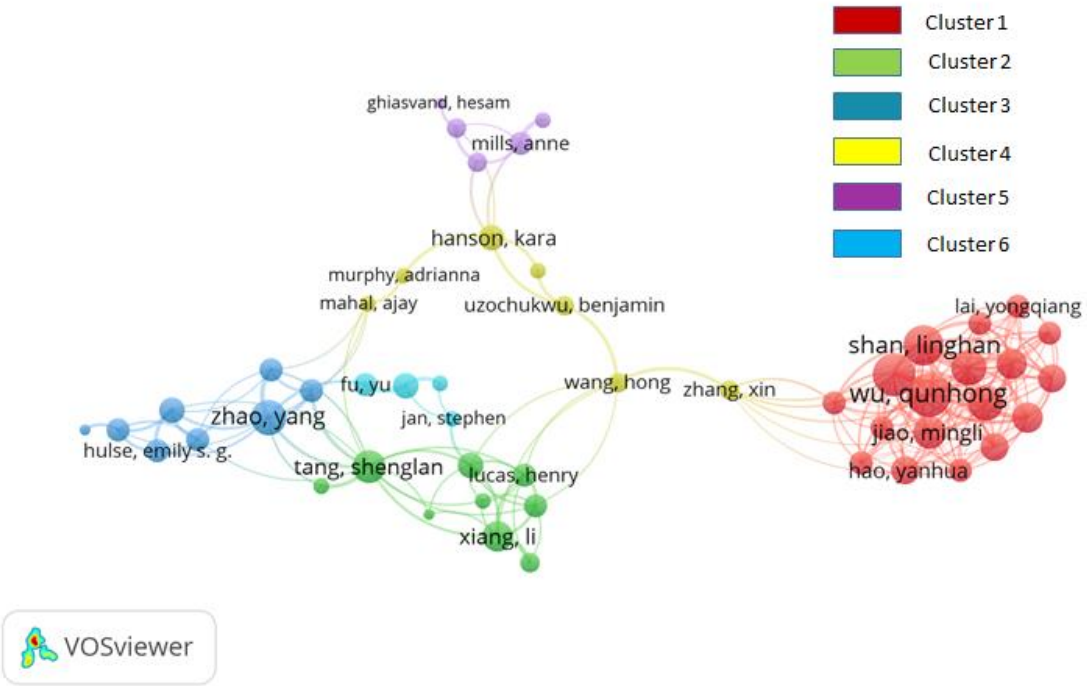
TC: Total Citations

**Source:** Author's own elaboration based on data retrieved from Web of Science

### 3.5. Co-Authorship Analysis

The total link strength of co-authorship of authors publishing in the field of CHE is shown in Figure 2. [3]When mapped so that an author has at least 4 documents, 6 clusters were formed with a total of 51 items. Accordingly, Wu, Qunhong co-authored 18 times in cluster 1, Tang, Shenglan 13 times in cluster 2, Zhao, Yang 10 times in cluster 3, Hanson, Kara 6 times in cluster 4, Mills, Anne 4 times in cluster 5 and Chen, Mingsheng 3 times in cluster 6.

**Figure 2. Co-authorship density network analysis (minimum number of documents by an author: 4).**




**Source:** Author's own elaboration based on Web of Science data using VOSviewer

[3] The restriction on the minimum number of documents per author was used to improve the clarity of the visualization and avoid excessive complexity

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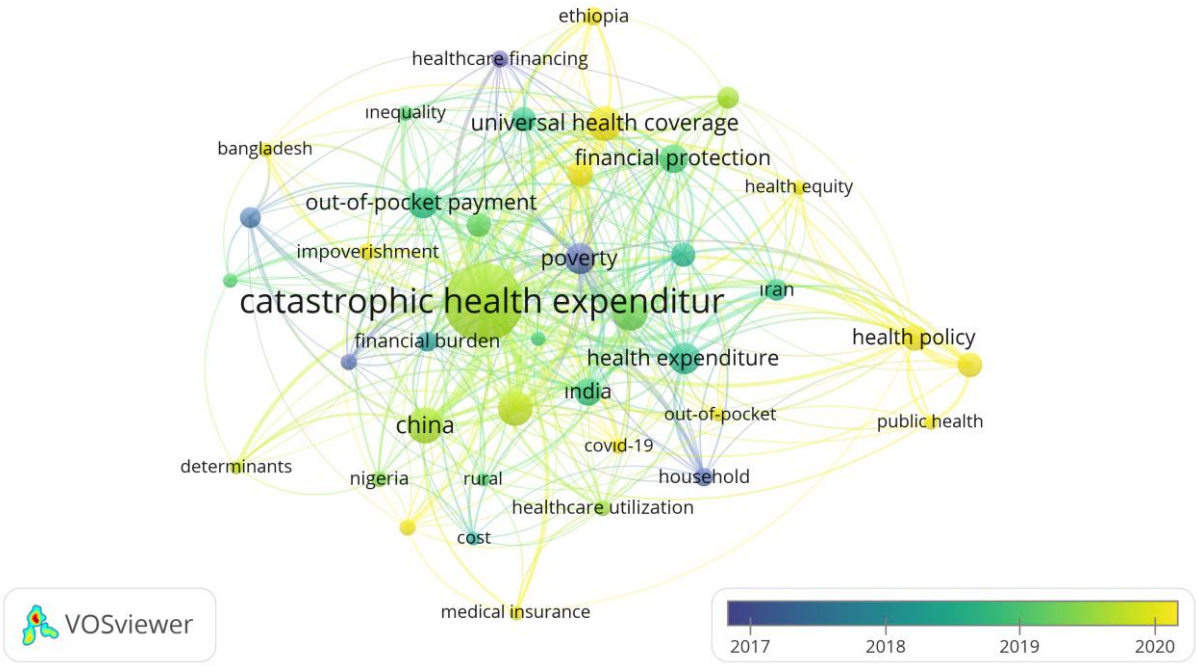
### 3.6. Keyword Analysis

When the co-occurrence of keywords is analyzed in Figure 3, it is seen that the keyword "catastrophic health expenditure" is the most important word forming a cluster. When we look at the occurrence of keywords according to the average year of publication, it is seen that the keywords "universal health coverage", "health policy", "financial protection", "covid-19", "impoverishment" are more recent, while catastrophic health expenditure was used together with the keywords "poverty" and "household" in the past. In addition, the keywords "China", "India", "Iran", "Nigeria", "Ethiopia" and "Bangladesh" are the most frequently mentioned countries in this field.

**Figure 3. Concurrent keyword network in the catastrophic healthcare expenditure literature (minimum number of occurrences: 10). Larger items represent a greater number of co-occurrence links with other terms in the overall network.**




**Source:** Author's own elaboration based on Web of Science data using VOSviewer

### 3.7. Country Collaboration Analysis

Figure 4 presents the country collaboration map for the CHE literature. [4]The minimum number of articles of the countries was chosen as 5. Accordingly, 45 out of 105 countries

[4] The country-level threshold was determined to ensure that the collaboration map would be more interpretable and visually accessible.

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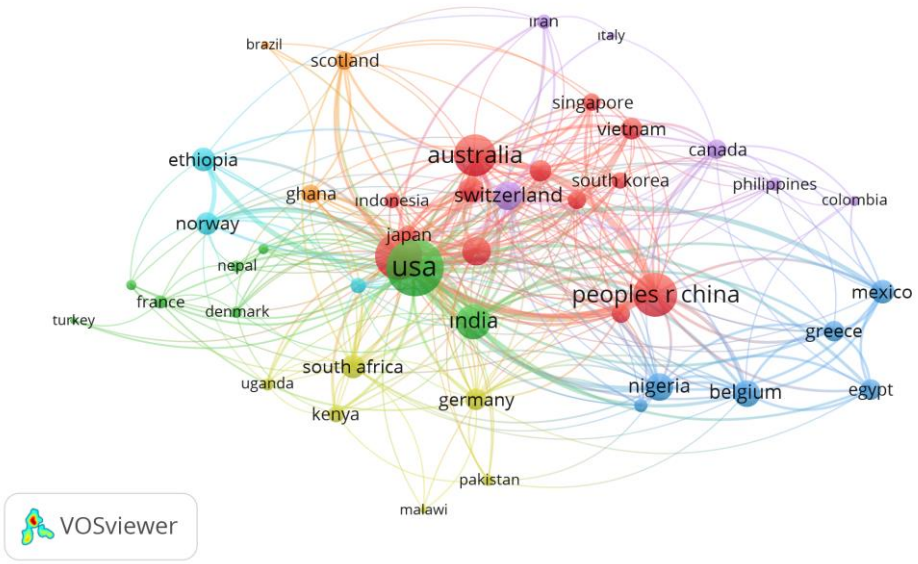
formed a total of 335 links in 7 clusters. The most collaboration was between China and the USA with 34 links. There were 30 collaborations between China and Australia and 21 collaborations between the UK and Australia.

**Figure 4. Country Collaboration Map for CHE Literature (Country minimum number of articles 5)**




**Source:** Author's own elaboration based on Web of Science data using VOSviewer

## 4. Discussion and Conciusion

In this study, the publication trend on CHE is quantitatively analyzed. The first study on CHE in the WoS database dates back to 2003. After 2003, although there was not a significant increase in the first few years after 2003, there was a very rapid increase in publications in this field after the World Health Organization set a goal to provide financial protection to the population against disease costs within the scope of universal health in 2010 and the United Nations set a vision 2030 within the scope of national health in 2015. One of the main indicators of the success of countries within the scope of universal health is the elimination of CHE. The main issue emphasized by the countries that make efforts in this context is to prevent CHE that cause impoverishment of the population.

The three countries that produced the most publications on CHE were the US, China and India, respectively. The most cross-country collaboration has been between Chinese and US scientists. Collaboration between scientists from China and Australia and the UK and Australia has also been quite common. Peking University, Harvard T. H. Chan School of

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Public Health and the World Health Organization published the most research papers respectively. It is noteworthy that although the most productive country is the USA, the most productive organization is a university in China. It is not surprising that WHO is one of the leading organizations in research on CHE due to its institutional structure and in line with the UHC targets of the WHO, especially after 2010.

The International Journal for Equity in Health, Plos One and BMC Health Services Research were the journals that produced the most publications on CHE. Although The Lancet produced only two publications in the field, we can say that it is the most influential journal as it is the most cited journal. These journals also showed themselves as the journals with the highest total link strength.

Ghanbari et al. (2021), in their bibliometric analysis on UHC in the period covering the years 1990-2019, stated that the most publications were made by scientists from the USA, the United Kingdom and Canada. They also stated that the journal that published the most articles was Lancet.

In this study, the keyword "catastrophic health expenditure" was the most used keyword, while the words "poverty" and "household" were used in the first years, the words "universal health coverage" and "health policy" have become more preferred in recent years. "China", "India", "Iran", "Nigeria", "Ethiopia" and "Bangladesh" are the countries most frequently mentioned as keywords in the field of CHE. The fact that these countries are underdeveloped and developing countries does not come as a surprise.

The results of this study show that research on CHE has made significant progress since 2010. Articles and journals were identified to help researchers who intend to conduct research in this area. The most cited articles and the most influential countries and organizations were identified. Keywords associated with CHE and their co-occurrence were identified. Although the share of out-of-pocket health payments in total health expenditures has been decreasing worldwide in recent years, its share in the income of the population has not decreased (Wagstaff and Neelsen, 2020, Söyük, 2023). This situation indicates that CHE will continue to exist in the future and therefore scientific studies in this field will remain important.

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