Article

Bibliometric analysis of production on public health nursing: Evidence of specialization and crucial role in the future of the health systems

Gregorio Jesús Alcalá-Albert[1,*], Jorge Guerrero-Martín[2], Raquel Macías-Montero[3], Miriam Leñero-Cirujano[4], Marta Araujo-Blesa[5]

[1] Department of Health and Biomedical Sciences, Loyola Andalucia University, 14004 Córdoba, Spain

[2] Department of Nursing, Faculty of Medicine and Health Sciences, University of Extremadura, 06006 Badajoz, Spain

[3] Department of Biomedical Sciences, Faculty of Medicine and Health Sciences, University of Extremadura, 06006 Badajoz, Spain

[4] Department of Nursing, Autonomous University of Madrid, 28029 Madrid, Spain

[5] Department of Health and Biomedical Sciences, Loyola Andalucia University, 41704 Seville, Spain

* Corresponding author: Gregorio Jesús Alcalá-Albert, gjalcala@uloyola.es

Abstract: Background: In an increasingly globalized world, public health is a challenge in the future of health systems. Nursing is a fundamental profession in health systems and the purpose of the study is to quantify the scientific production in global public health carried out by nursing to demonstrate its competence, capacity and specialization in this subject. **Methods:** A bibliometric study was carried out to understand the scientific production of public health nursing in WoS. A total of 17,545 documents were analyzed using Bibliometrix software in version 4.0.5. **Results:** A notable increase in production is observed over time, a sign of specialization and capacity. The theme focuses on three stages: hygiene and sanitation, infectious diseases and quality, prevention and non-communicable diseases coinciding with the real social needs of each moment. Most of the production is in English and produced by countries with developed economies. Nursing is aligned with current public health needs. **Conclusions:** Bibliometrics is a good method to quantify scientific production. The results show extensive scientific production in public health nursing, which translates into extensive knowledge of public health by nursing. There is a growth in production in accordance with time as well as an adaptation to the most current themes in accordance with population needs. Public health is an area of concern to countries and nursing can actively participate in studies, planning and leadership of health systems. Public health nursing should not be considered relegated to medicine but independent and of crucial importance to the "Onehealth" concept. Public, private and educational administrations must promote and support nursing research in public health, and it is not advisable to reduce the teaching load of global public health in nursing studies, in favor of the family and community environment.

Keywords: bibliometric; global health; leadership; nurse; nursing; public health; research; specialty

1. Introduction

In 1986, the Ottawa Charter was introduced as a response to the need to find a new approach to address multiple public health problems, which currently remain important due mainly to the biomedical nature of the health system and the limitations of educational strategies (World Health Organization, 1986). Public Health is a shared responsibility for equitable access to essential care and collective defense against transnational threats (General Director World Health Organization, 2020).

The implementation of the principles of the Ottawa Charter by public health professionals has been a challenge in health systems and services, mainly due to the

lack of health professionals specialized in this field with the capacity to identify, plan and implement activities to achieve objective (Towne and Chaudry, 2017) in a global extension beyond the community scope itself.

From a historical point of view, nursing has had a very relevant role in the field of Public Health. For example, in 1980, Public Health Nursing accounted for 39% of US activity. However, in 2000, this number fell to 17%; in 2004, it was 15%; in 2008, it was 7.8%; In 2012, it was less than 2%, which represents a downward trend in this activity (Drevdahl and Canales, 2018) that is increasingly focused on the community level. In Europe, Public Health Nursing began more than 100 years ago focused on disease prevention and health promotion, although with a purely community vision focused on the individual and the family (Alstveit et al., 2022; Critchley et al., 2009).

Throughout history, nursing has made great contributions to Public Health, such as that of Florence Nightingale, considered the "mother of nursing" (Karimi and Masoudi Alavi, 2015). Nightingale's Environmental Theory created concepts in public health that continue to be a reference for studies today (Madeiros et al., 2015). However, the evolutionary trend in nursing has been to focus on Family and Community specialization, moving away from specialization in public health itself, sometimes promoted by a notable gender gap (Bernabeu-Mestre et al., 2013).

The global actions of public health nursing have been evident over the years, and although in recent times they have focused on the community level, they once again take on great prominence and significance in the COVID-19 pandemic, where they carried out work of epidemiological surveillance that, among other aspects, contributed significantly to the decrease in hospital admissions in the face of overwhelmed health systems (García-Gómez et al., 2021).

The attempt to improve public health, from the most global point of view, recommends the participation of the entire health sector, as well as a wide range of stakeholders with social, economic, political and environmental concerns. The necessary participation of nursing in Public Health activities beyond the community sphere is evident (Jarvis et al., 2020).

The World Health Organization, the Food and Agriculture Organization of the United Nations and the World Organization for Animal Health originated the One Health initiative with an integrative approach to Health based on the relationship between human health, animal health food, animals and ecosystems from a global perspective, something that is closely related to public health beyond the community level (Atanes, 2023).

Following the criterion of specialization, in medical science many countries have the Preventive Medicine and Public Health specialty that UNESCO itself includes in several sciences such as epidemiology, professional medicine, preventive medicine and public hygiene. This specialty is clearly differentiated from Family and Community Medicine, which emerges as a more advanced stage extracting knowledge from Public Health to care for the patient in a comprehensive manner with a great difference that consists of the participation of the community in the process (Gestal and Romaní, 1990).

Taking the case of Spain as a reference, studies and consensus have been carried out to establish what training competencies in Public Health students of the Degree in Nursing should have (Lana-Pérez et al., 2018). In February 2024, the intention of some

universities to reduce the credits of the Preventive Medicine and Public Health specialty to allocate them to the Family and Community Medicine specialty was published in the media. This information provoked the displeasure of the Spanish Society of Preventive Medicine, Public Health and Health Management, who defended that, to satisfy the needs of society, medical professionals and nurses with adequate training in this field are required, making it necessary to maintain both specializations differentiated (Sociedad Española, 2024).

The planning of Nursing studies in different countries must combine their efforts to establish similarities in matters of public health, although notable differences between the study plans, organization and contemplation of public health. In most countries, the Public Health specialty is exclusively medical and differentiated from Family and Community Medicine, and in the nursing field it usually appears within Family and Community Nursing (Bekemeier et al., 2015; Cabrera et al., 2005; Canales and Drevdahl, 2014; Gómez and Domingo, 1999).

The analysis of scientific production constitutes an essential element in the different disciplines, and more specifically in the health sciences. Scientometric and bibliometric indicators are of vital importance for making political, scientific and technological decisions. The development of scientometrics makes it possible to analyze the literature, indicate its importance and quantify production, allowing us to know its scope and establish future processes (Arencibia et al., 2008; Kokol et al., 2021; Michán and Muñoz-Velasco, 2013).

There are various bibliometric studies on nursing specialization, such as Valencia-Contrera and Rivera-Rojas (2023) on occupational nursing or Santafé-Madueño et al. (2023) on health in children and adolescents but acquire special relevance in the COVID-19 pandemic with public health studies such as that of Zhang and Liping (2022) on status of Covid-19 in nursing.

One of the fundamental pillars of nursing is health administration and management, so nurses must have knowledge of global public health (health policies, epidemiological profile...) that goes beyond the community sphere itself. Nursing management and leadership are necessary to promote the growth and strengthening of the profession (Tumbaco-Quimiz et al., 2021). On occasions, the suitability of nurses to carry out health management in management positions has been questioned, referring exclusively to their "non-specialized" training (COENFBA, 2016), although it has been demonstrated that they have sufficient capacity to be able to do so, and important scientific roles they play in health systems (Allen et al., 2023). There are also bibliometric studies on nursing leadership, such as that by Kantek et al. (2023) that highlights the role of nursing in health and public health systems.

After all of the above, knowing the scientific production of Public Health Nursing will provide useful data on its quantification, impact and evolution to know the current level of specialization, the social contribution and its impact on health systems that will help us to join international efforts in establish a common training system and a different specialization between family and community nursing and public health nursing, establishing synergies between the two.

Also, it will avoid being overshadowed by other health professions and will seek to have a significant impact in leadership and administration roles due to its high knowledge in public health.

2. Materials and methods

A descriptive bibliometric study has been carried out using the methodology typical of scientometric studies (Glänzel, 2012).

A search was carried out for the descriptors "public health" and "nursing" in the "nursing" categories in The Web of Science (WoS) database, specifically selecting "article" type content that covered from the first entry to December 2023, providing greater rigor with the use of the "and" connector.

For the scientific review, the PRISMA matrix protocol was used **(Figure 1)**, widely recommended for scientific review Studies (Varndell et al., 2021).

Once the search results were obtained, analytical techniques of scientific mapping and quantification of bibliometric indicators such as language, area of knowledge, type of document, organization, authors, sources, citations and country were carried out.

The R-Studio software version 4.0.5 and its Bibliometrix extension were used to analyze the data obtained.

The data search was carried out in the month of February 2024, checking compliance with Price's Law, Lotka's Law, Bradford's Law and impact indicators as in other studies of similar scientific rigor (Parra-González and Segura-Robles, 2019).
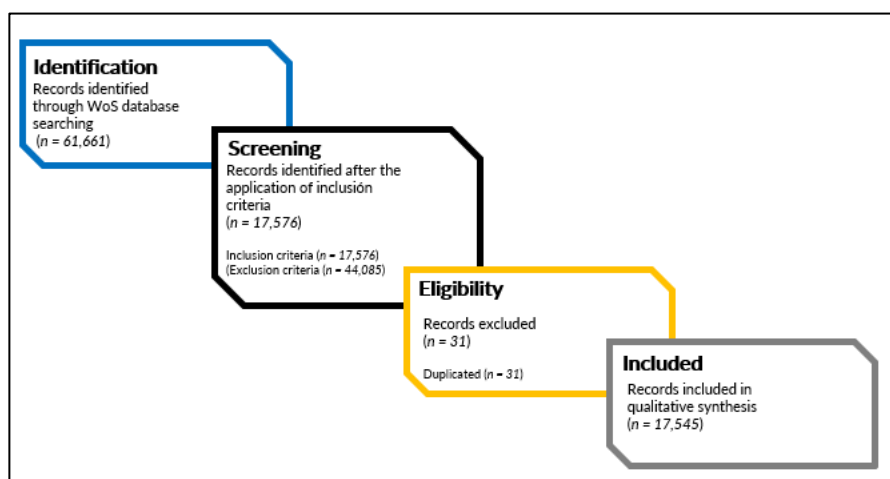

Figure 1. PRISMA flow diagram.

3. Results

The first refined search returned a total of 17,576 articles, of which 31 were discarded due to duplicity. The first appearance dates back to 1975 and the most recent ones to 2023. All the results obtained cover 1844 sources with an average citation of 11.67 citations per document.

3.1. Production indicators

3.1.1. Diachronic production

Analyzing the WoS data, a significant annual growth is observed consistent with compliance with Price's Law Price (Price, 1963) as can be seen in **Figure 2**.
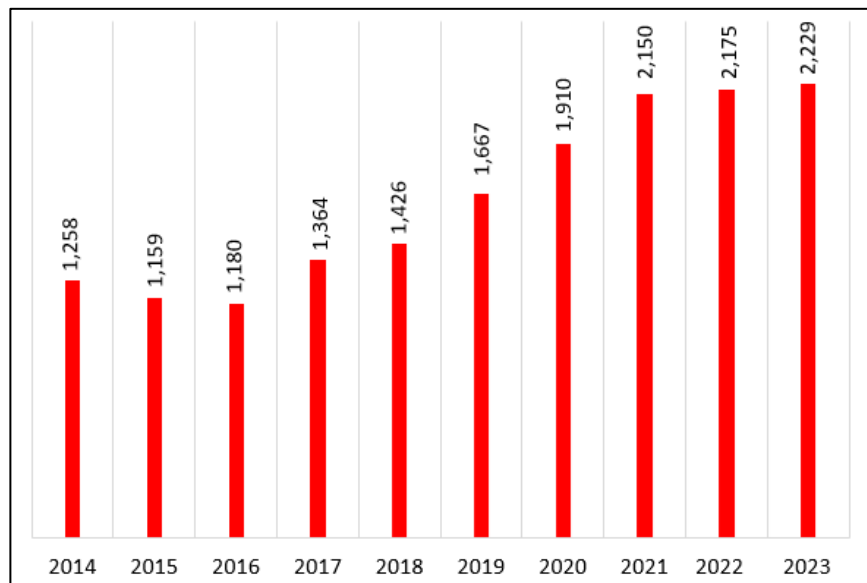
Figure 2. Graph of compliance with Price's Law in the last 10 years.

3.1.2. Individual production

The most relevant authors, according to the number of articles published, are shown below in **Table 1**.

Table 1. List of most relevant authors by number of articles produced.

Author	Number of articles
Mody Lona	29
Mor Vincent	29
Willett Walter C.	24
Glavin Kari	23
Monsen Karen A.	22
Bjorvatn Bjorn	20
Stone Nimalie D.	20
Palese Alvisa	19
Pallesen Stale	19
Manias Elizabeth	18
Wang Jing	18
Yoshioka-Maeda Kyoko	18
Deliens Luc	17
Hu Franck B.	17
Werner Rachel M.	17

In compliance with Lotka's Law (Lotka, 1926) we observe that only two authors have published 29 articles while 64,705 have published only one (**Figure 3**).
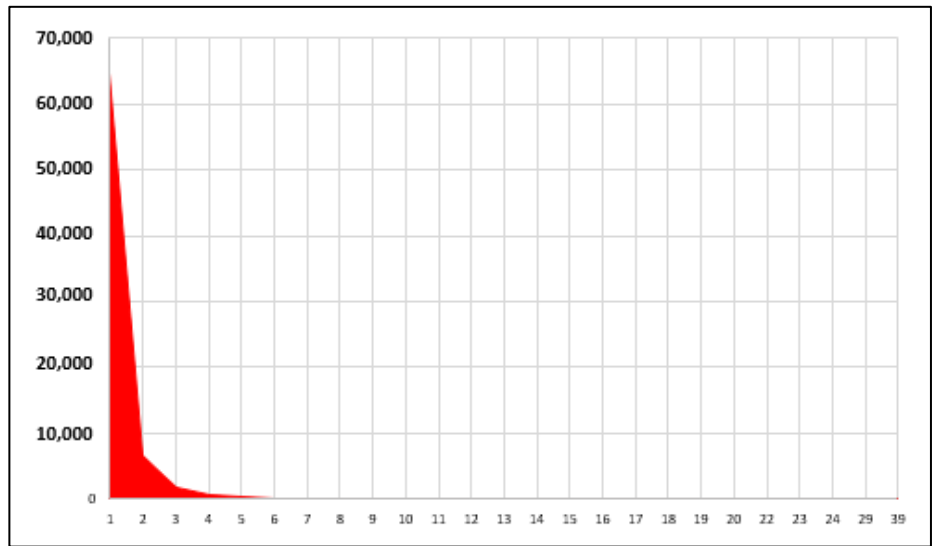
Figure 3. Representative graph of Lotka's law.

The analysis of the Pearson correlation coefficient shows results of $r = -0.33$, which indicates an inversely proportional relationship. The coefficient of determination showed results of $R2 = 0.11$ indicating weak correlation.

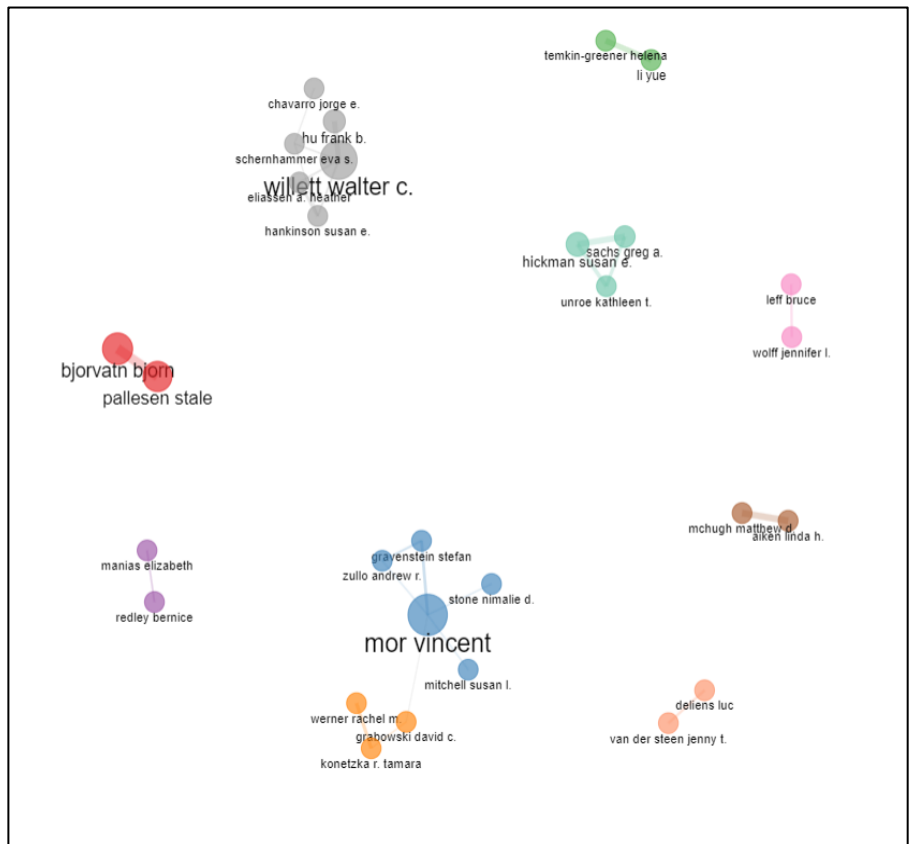There are also collaborations between relevant authors reflected in **Figure 4**.

Figure 4. Collaboration graph between most relevant authors.

Regarding the affiliation of the authors, American universities occupy the first posi-tions of belonging, although those from the United Kingdom, Canada and especially Brazil are also relevant, as seen in **Figure 5**.
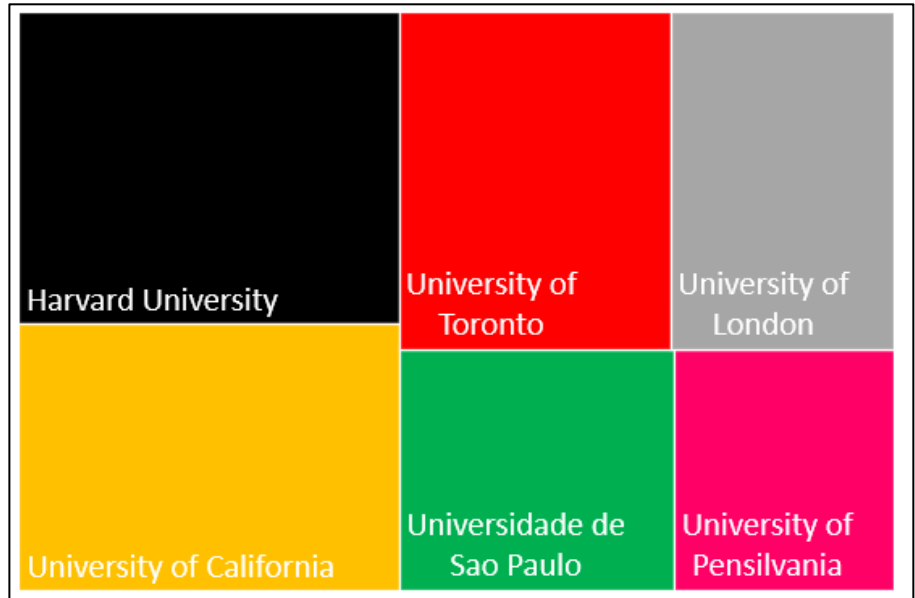
Figure 5. Representative graph of author affiliation.

3.2. Dispersion indicators

Bradford's Law (Brookes, 1985) is the model that affirms the existence of similarity between the number of articles from a considerable number of sources grouped by areas of greater dis-persion and those concentrated in a reduced nucleus, something that can be extrapolated to other studies (Pinheiro and De Almeida, 2020).

The search analysis yielded the results shown in **Figure 6**.

Figure 6. Bradford's law graph.

3.3. Impact indicators

3.3.1. Production by language and country
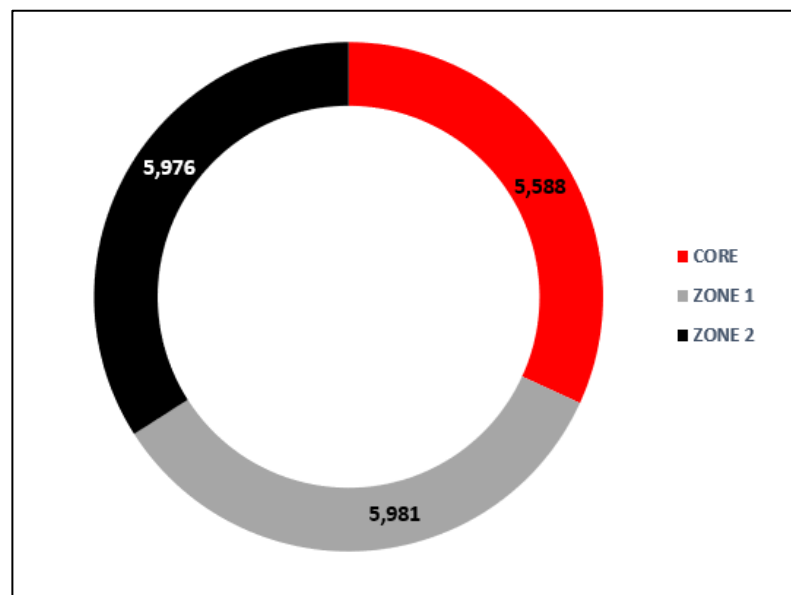
Considering the language (**Figure 7**), the results obtained show that English covers 97% of all productions. It is followed, with a considerable difference, by Portuguese as the second language with the most production with 5.2% to continue with Spanish with 2.8%.
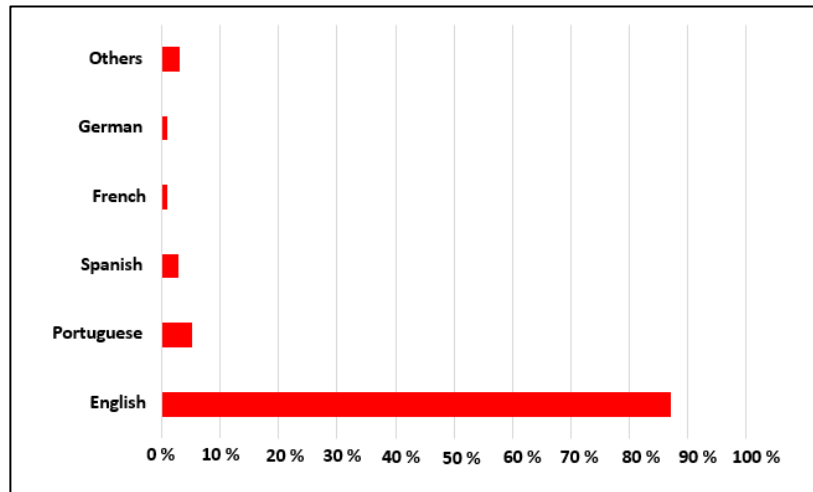

Figure 7. Graph of scientific production by language.

Regarding production by country, the country with the most scientific production is the United States, followed by the People's Republic of China and, very closely, Brazil. This is consistent with the fact that the second language of scientific production in the study is Portuguese.

Table 2. Production indicator by country.

Number of Articles	Country
5531	United States of America
1467	People's Republic of China
1352	Brazil
1119	United Kingdom
1134	Australia
886	Canada
632	Spain
538	Germany
468	Netherlands
465	Japan

The peculiarity of public health in each region means that international collaborations may be limited (Allcott et al., 2020). In this case, the notable collaborations are led by the United States with different countries in Southeast Asia, as shown in the map in **Figure 8**.

Figure 8. Collaboration frequency map between countries.

3.3.2. Bibliometric map

The network map shows the relationships between the keywords of the different texts studied. In **Figure 9**, and **Table 3** we can see, grouped by color, a group of six descriptors. The font size of the different concepts is directly proportional to the frequency of appearance and the number of connections with other descriptors (Shen et al., 2021).

Table 3. Most ocurrences of relevant nursing words in bibliometric map.

Occurrences	Words
1233	Hospital
775	Qualitative
627	Community
511	Mental
537	Experiences
412	Women
304	Workers
270	Violence
244	Stress
220	Rural

The pink group deals with hand hygiene with its two main terms; The orange group includes terms about primary patient care; green on types of study, where words such as "systematic review" and "analysis" stand out; purple is based on quality and patient care; the blue on "Nursing and Covid"; and finally the red on Nursing studies. The degree of relevance can be seen in **Figure 10**.
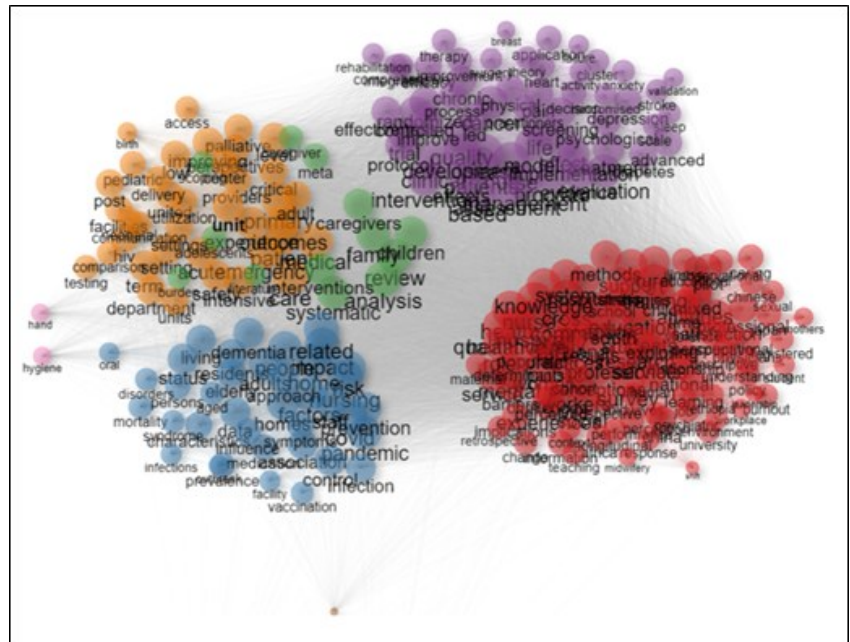
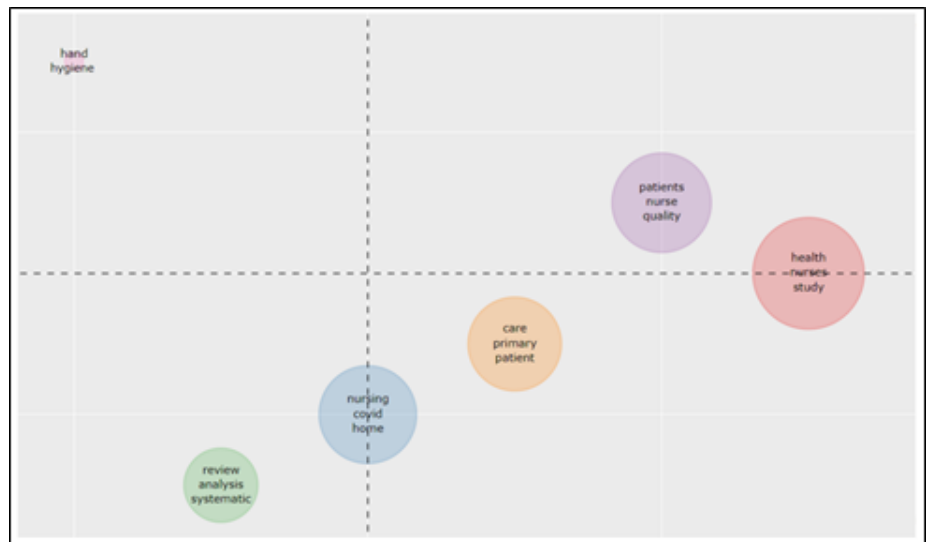**Figure 9.** Bibliometric map.

Figure 10. Degree of relevance.

The evolution of the subject of the study (**Figure 11**) has been measured by the grouping of three base conglomerates. The first from 1975 (first publication) to 2010, the second from 2011 to 2020 and finally the third from 2021 to 2024.
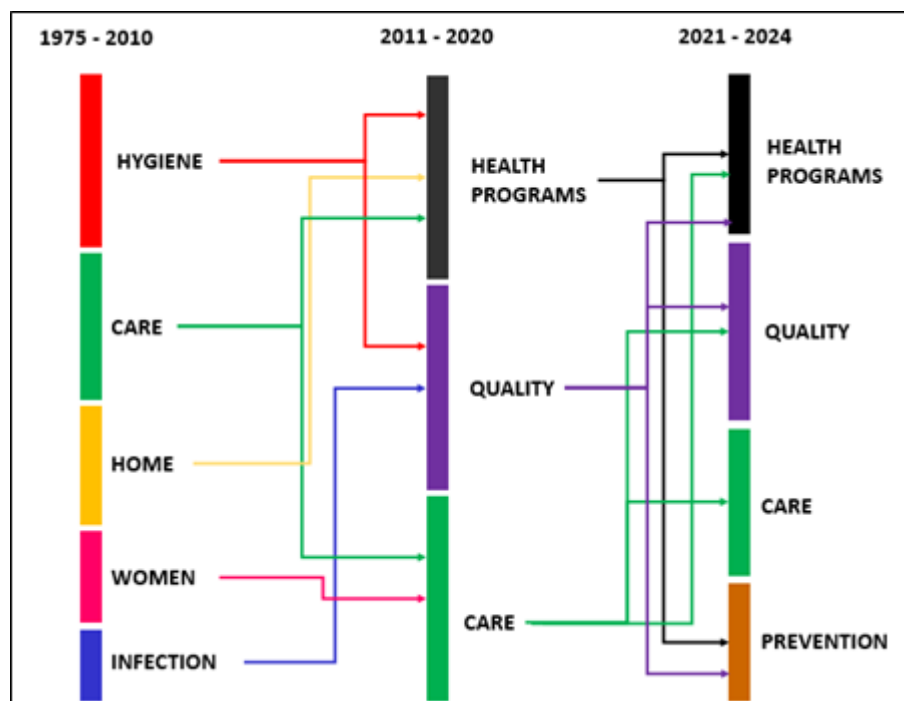
Figure 11. Evolution in research areas between 1975 and 2024.

The results may correspond to the historical evolution of public health, moving from a stage focused on hygiene and sanitation to another focused mainly on the control of communicable diseases. Finally, an evolution towards health programs and quality of care focused on the control and prevention of non-communicable diseases, although finally and due to the COVID-19 pandemic, the prevention of this infectious agent also becomes relevant (Bernabeu-Mestre and Gascón-Pérez, 1999; Cabrera, 2001; Palacios-Cruz et al., 2021; Romaní and Cabezas, 2018; Salaverry, 2012).

From a more detailed point of view, the evolution by cluster of years of the words can be seen in **Table 4**.

Table 4. Thematic evolution based in words.

From	To	Words	WIX	ID	Occurrences	SI
children—1975–2000	health—2002–2021	children; women	1.00	0.50	2	0.02
decision—1975–2000	health—2002–2021	support; survey	0.50	0.25	3	0.02
disability—1975–2000	health—2002–2021	study	0.25	0.25	2	0.02
home—1975–2000	health—2002–2021	child	0.09	0.13	2	0.02
home—1975–2000	nurse—2002–2021	nurse	0.18	0.13	4	0.04
home—1975–2000	nursing—2002–2021	home; effects; life	0.36	0.13	4	0.03
care—2002–2021	care—2022–2024	care; primary; patient; medical; term; acute; intensive; safety; palliative; association; unit	0.38	0.07	3197	0.02
care—2002–2021	review—2022–2024	adults	0.08	0.08	263	0.04
care—2002–2021	study—2022–2024	challenges	0.01	0.07	156	0.02
covid—2002–2021	nursing—2022–2024	covid; impact; pandemic	0.82	0.33	501	0.06
health—2002–2021	care—2022–2024	risk; children; hiv	0.05	0.02	410	0.01

Table 4. (*Continued*).

From	To	Words	WIX	ID	Occurrences	SI
health—2002–2021	nursing—2022–2024	students; education; experience	0.15	0.07	500	0.01
health—2002–2021	review—2022–2024	family	0.07	0.08	270	0.01
health—2002–2021	study—2022–2024	health; nurses; study; public; hospital; practice; factors; community; cross; qualitative; healthcare; knowledge; sectional; mental; survey; experiences; related; role; women; hospitals; emergency; services; attitudes; perceptions; social; development; research; school; practices; assessment; workers; support; national; professionals; violence; service; system; perspectives; rural; child	0.93	0.02	2529	0.01
nurse—2002–2021	care—2022–2024	nurse; based; clinical; management; intervention; trial; program; evaluation; randomized; outcomes; controlled; training; prevention; implementation; protocol	0.33	0.05	821	0.02
nurse—2002–2021	nursing—2022–2024	infection	0.02	0.07	187	0.03
nursing—2002–2021	care—2022–2024	patients; quality; life; cancer; effect; effects; disease; model; treatment; chronic	0.25	0.04	1153	0.01
nursing—2002–2021	nursing—2022–2024	nursing; home; homes; residents; staff	0.46	0.07	3241	0.03
nursing—2002–2021	review—2022–2024	analysis; review; people; systematic; dementia; caregivers; living; interventions	0.75	0.08	551	0.03

There is an appropriate relationship between thematic clusters and word clusters. In this sense, we can observe how nursing has participated in the evolution of public health, according to the trends and needs of each era. Its beginnings focused on the care of children and women, seeking to reduce infant mortality; subsequently an application based on hygiene and the avoidance of the spread of communicable diseases and later, after a real professionalization of nursing, focusing on increasingly complex dimensions (Gómez-Robles and Domingo-Pozo, 1999), until reaching current situation where nursing based on evidence, research and quality of care take on the relevance of the main themes, although it is still a field to expand (Rivera-Rojas et al., 2023).

4. Discussion

Bibliometrics dates back to the 19th century where studies of bibliographic references were already carried out. At first it was called "statistical bibliography" (Sanz-Valero, 2022). Today, it has become a very effective tool for evaluating scientific activity, this being of great importance to understand scientific production, see its impact, perfect it and draw conclusions (Solano-López et al., 2009).

Public Health was defined by the Institute of Medicine (IOM) as what society aims to promote collectively so that people are healthy (Savage and Kub, 2009). In this line, nursing has played an explicit part in the planning, evaluation and implementation of actions to achieve the objectives and goals set in the field of Public Health. The history of nursing and Public Health dates back to the founder of the nursing profession Florence Nightingale, who was recognized as a pioneer in preventive nursing and public health, a precursor to the design of a training system that changed nursing towards a professionalization of its nature labor (Breigeiron et al., 2021).

Public health trends and models have evolved throughout history in a non-linear manner. In the 19th century there was a classic medical model, focused on the biological field, which sought to provide a solution to the disease from a biological emphasis, excluding sociocultural causes. At certain moments in history, it coexists with the "hygienist" model until the new reality of public health reaches the 20th century, reinforcing the biopsychosocial definition of health (Franco, 2006).

Public health nursing has "departed" from the traditional conception of the medical model, to focus on the needs of the patient, the development of their autonomy, their care and their evolution. We can affirm that, in this sense, it has gone one step ahead with respect to medical discipline and has played a fundamental role, not only in the control and spread of diseases in the Institutions, but also in the hygienic-sanitary care of individuals, health education and its promotion and its contribution to the improvement of health services, playing a very important role in aspects as relevant as infant mortality, the spread of communicable diseases, quality of life and nosocomial disease (Kuss et al., 2007).

However, nursing evolution in Public Health has not been equitable worldwide since it is closely related to social and economic factors (Prah Ruger et al., 2011). While countries with high purchasing power enjoy health policies that are better in number and impact, in countries with low economic level it remains a pending task. A clear example is the relationship between the country's GDP and the scientific production it has in the field of public health nursing, which can be seen in **Table 5**.

Table 5. Countries with the highest scientific production in relation to their GDP 2022 (Diario Expansión, 2023).

GDP per capita 2022	Country
72,440	United States of America
12,022	People's Republic of China
8972	Brazil
43,594	United Kingdom
62,685	Australia
52,223	Canada
28,280	Spain
48,750	Germany
54,150	Netherlands
32,123	Japan

Public health spending is an important element in a country's economy and has a direct impact on its GDP. Health spending has a positive impact on economic growth (Rubio-Vidal and Reyes-Santías, 2008). Brazil's GDP is significant since it is low despite being among the highest producers in public health. This may be due to its consideration as a developing country, since an evolution of 30% in GDP is observed between 2021 and 2022 (Diario Expansión, 2023), but also to the efforts of the Administration to promote research, nursing and public health.

Another striking case is that of the People's Republic of China, which, being the epicenter of the COVID-19 pandemic, has significantly favored its number of publications (Belli et al., 2020).

The recent COVID-19 pandemic is a clear example of the key importance of nursing interventions and their role in the field of Public Health worldwide (Huang et al., 2020; Rodriguez-Arrastia et al., 2022). These include strengthening the training of professional nursing talents, expanding the field of nursing experience, and carrying out education and training on public health emergencies. Furthermore, compassionate care involves humanistic care from the isolation of mild patients to the care of severe patients, and healthcare personnel must be concerned about their own physical and mental health. There is a need to form a team to respond to public health emergencies, conduct training, regular drills and reserve technical personnel to respond to public health emergencies (Zhang et al., 2020).

The evolution of nursing leads us to evidence-based nursing, the result of the contrasted studies and trials. Nursing interventions are scientifically proven and positively influence health from a holistic point of view, making the nurse a qualified and independent profesional (Connor et al., 2023). In recent decades, the nursing profession has experienced significant progress not only in the clinical field, but also in the academic and managerial fields (Blau et al., 2023).

Various studies have evaluated the effectiveness of nursing interventions in the field of public health. However, the recognized limitations of the available studies and the diversity of the interventions carried out pose a challenge to generalizing the conclusions (Schaffer et al., 2022; Swider et al., 2017). In addition, the responsibilities of the nurse are also evolving with the emergence of new challenges, such as facing emerging infectious diseases. In this sense, nurses play a crucial role in the fight against these diseases through the use of technology, strengthening health systems and promoting teamwork, supporting health equality, involving communities and providing support in mental health and well-being (Sharkiya, 2023).

Therefore, the importance of nurses being adequately trained in epidemiological aspects and resources based on scientific evidence to provide the best care to the global population is evident. As noted above, while in most countries Preventive Medicine and Public Health is considered a medical specialty differentiated from Family and Community Medicine, in nursing this specialization is usually joint, despite the fact that the real needs could require addressing these specialties independently. Not only infectious diseases are important to rethink the conception and training of Public Health Nursing, but also those of a chronic nature related to lifestyle habits, among others, whose prevalence has increased significantly in recent years and sometimes require interventions beyond the community setting (Campbell et al., 2020; Kalanlar,

2022; Lahtinen et al., 2014; Peik et al., 2016; Sanchez González, 2023; Yardimci et al., 2017).

Nurses are ideal for health care management activity, which is why their leadership training, development and implementation of quality systems, patient safety as well as prevention are important, areas closely related to Public Health (Duffy, 2022).

Another point of nursing development that we have seen in this analysis is patient safety, where experience, knowledge and nursing evidence make an excellent professional field for its performance, as demonstrated by other analyzes such as that of Doyon and Raymond. (2024).

In the 21st century we are immersed in the process of converting the concept of "one medicine" to that of "One Health", which proposes a global approach between human, animal and environmental health, seeking interdisciplinary joint work to defend a single health. That is why public Health requires the work of nurses as fundamental agents in health teams, due to their experience and training in care, health and illness (Zinsstag et al., 2011).

5. Conclusion

In bibliometric analysis, it is a valid tool to quantify and analyze scientific production in different fields and demonstrate the participation, evolution and future projection of different disciplines and themes. However, it has certain limitations in the biomedical field (activity and impact) since it usually only tends to be quantified.

It is concluded from the bibliometric analysis that the evolution of public health nursing has been in accordance with the evolution of the concept of public health itself, and it has been adapting to the needs of each moment. In addition, the scientific production of public health nursing continues to be active, has been essential during the Covid-19 pandemic and continues to be projected on topics of interest such as health programs, patient quality and safety, and prevention.

Nursing scientific production in public health reaffirms it as a "scientific profession" with the use of the scientific method, the epidemiological method and evidence-based nursing, being highly trained professionals to perform various functions within the field of public health.

The vast majority of countries are concerned about their public health and nursing participates in this. Although most of the scientific production comes from developed countries with high GDP, there are other developing countries, such as Brazil, that have a large scientific production, possibly the result of scientific promotion and development policies. It is also clear that scientific production contributes to the good development of the country, both economic and social. Another of the countries with high scientific production is China, due to the Covid-19 pandemic, although it should continue to be studied in the coming years if the same production volume is maintained.

The scientific production deduces that the presence of the nurse in health management significantly improves the planning and conception of the "patient-centered health system", promoting, according to current research topics in public health nursing: the quality of care, safety of the patient and focusing on prevention, promotion and health education.

The results obtained support that nursing science constitutes a fundamental axis in public health worldwide. It is an obligation of public, private and educational administrations to guarantee the participation of nurses within the field of public health, prevention and epidemiology as qualified and independent or interdependent professionals, it being an error of conception to understand public health nursing as a science relegated to medicine.

Bibliometrics in Public Health nursing, in a global manner, shows that, as it exists in the medical profession, specialized training in Preventive and Public Health Nursing separated into Family and Community Nursing competencies is viable. Official nursing education and training plans should be agreed upon to combine standardized criteria across different countries and educational systems. It is not appropriate to reduce the training load in the public health specialty with respect to that of the community field or medicine or nursing since there are still topics of interest for study far from the community field and focused on the field of global public health.

The knowledge demonstrated in their scientific production by public health nurses places them as a necessary vector to achieve the Onehealth concept. It is necessary to establish more international collaborations in public health nursing, giving a broader vision of its importance.

Finally we can affirm that the advancement of public health nursing is a real concept, that continues to work in research studies and publications, that requires international participation and institutional support, that is independent and, seeing the globalization of the world, a profile of utmost importance.

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