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Nursing in Epidemiology: A Specialized Role and its Impact on Public Health and Health Systems

Gregorio Jesús Alcalá-Albert[1], Gloria Marlen Aldana-De Becerra[2], Jaime López-Alcalá[3], María Elena Parra-González[4]

Abstract

Nursing and Epidemiology share the common purpose of their concern for human health. The aim was to analyse the scientific production of Nursing in Epidemiology from 1958 to 2023 in the WoS database, obtaining a total of 1032 articles. The results show a thematic adaptation to the different stages of Epidemiology with a growth throughout history and increasing significantly since 2019, production that has been maintained in subsequent years due to the COVID-19 pandemic. Most of the authors are affiliated to US universities, being the first country in scientific production, followed by China with a growing trend in cooperation between the two. Nursing demonstrates its capacity to carry out epidemiological research, overcoming the usual conception of being a health care profession and contributing a leading role in management and leadership, as well as in research. The relevance of nursing and its scientific contributions in the field of public health and epidemiology in an increasingly globalised world must be recognised.

Keywords: *Bibliometrics, Epidemiology, Nurse, Nursing, Scienciometrics, Specialised, Public Health*

Introduction

The concern of human beings for their own health and that of the rest of the species that make up the planet has led to the need to measure and assess the health of populations and their relationship with different factors such as human and animal health and the environment (Green, 2012) . The Nursing, as a specific field of knowledge, not subrogated to other disciplines, sometimes considered 'more appropriate', participates in the attention of relevant health situations, such as humanitarian crises and public health, to which is added Epidemiology Nursing, considered as a field of knowledge in charge of studying the distribution, frequency, control and conditioning factors of the problems (Frérot et al., 2018) .

The professional and training profile of the epidemiologist varies greatly from country to country. It ranges from a university degree to postgraduate training for different professional profiles in the health and scientific fields, especially biologists, veterinarians, pharmacists but above all doctors specialising in Preventive Medicine and Public Health, sometimes forgetting other health professionals involved in epidemiological knowledge (Augsburger et al., 2007; Chapple-McGruder et al., 2017; López-Moreno et al., 2000) , such as nurses.

The trajectory of Nursing in Epidemiology is evidenced in an important scientific production throughout history, which has been in line with the different periods of science, giving rise to the relevance of nursing knowledge and this professional as essential in the field of public health. However, for decades nurses have played a leading role in epidemiology and public health (Perdomo-Sandoval & Villamil-Camacho, 2022) , as in the case of Florence Nightingale in the mid-19th century. Nightingale elaborated a work that established certain criteria for data collection and analysis by nurses, resulting in her Environmentalist Theory, which has served as the basis for other current theories and practices (Pereira Marinelli, 2020)

Over time, the training and specialisation of Nursing has advanced and with it its capacity to design epidemiological studies, analyse the data obtained and establish conclusions that contribute significantly to

[1] Department of Health and Biomedical Sciences, Loyola Andalucia University, 14004 Cordoba, Spain, Email: gjalcala@uloyola.es, (Corresponding Author)
[2] Psychohomophilic Research Group, Ministry of National Education of Colombia, 111321 Bogotá, Colombia.
[3] Center for Integrative Genomics, Faculty of Biology and Medicine, University of Lausanne, CH1015 Lausanne, Switzerland.
[4] Department of Research and Methods and Diagnosis in Education, University of Granada, 51001 Ceuta, Spain

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the management and understanding of public health problems (Cabrera E., Yagüe C., Gallart A., 2005; Fountouki et al., 2022; Salihu, 2024; Yanbing et al., 2021; Zabalegui & Cabrera, 2009) . Since 2020, public health nursing, which has often been overshadowed by medical science, regained its prominence and recognition. During the COVID-19 pandemic, it became a key player in its health management, with contact tracing, prevention techniques and other contributions, helping to alleviate the collapse of healthcare centres (Estalella et al., 2021; Giri et al., 2021; Motaharian et al., 2022)

Thus, the objective of the present research was to analyse the production of Nursing in Epidemiology, during the period between 1958 and 2023, for its relevance and specialisation, for which bibliometrics was used as an objective technique for the analysis of publications in scientific media (Ávila-Toscano et al., 2018; Michán & Muñoz-Velasco, 2013) .

Materials and Methods

A bibliometric analysis was performed, using the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) methodology (Figure 1) as the recommended methodology for this type of study (Morales, 2022) . The analysis was carried out in June 2024, verifying the procedure by means of compliance with the three main laws of bibliometrics (Lotka, Price and Bradford) (Bailón-Moreno et al., 2005)

The search was carried out using the descriptors "Epidemiology" and "Nursing" in the categories related to health sciences in The Web of Science, using the connector "and" and filtering exclusively on the type "article", in a time frame that spans from the first entry until December 2023. In addition, the scientific mapping technique PRISMA, typical of scientometrics (Waltman et al., 2010) , was used to identify the aforementioned descriptors. R-Studio software version 4.0.5 and its extension Bibliometrix were used for data analysis.

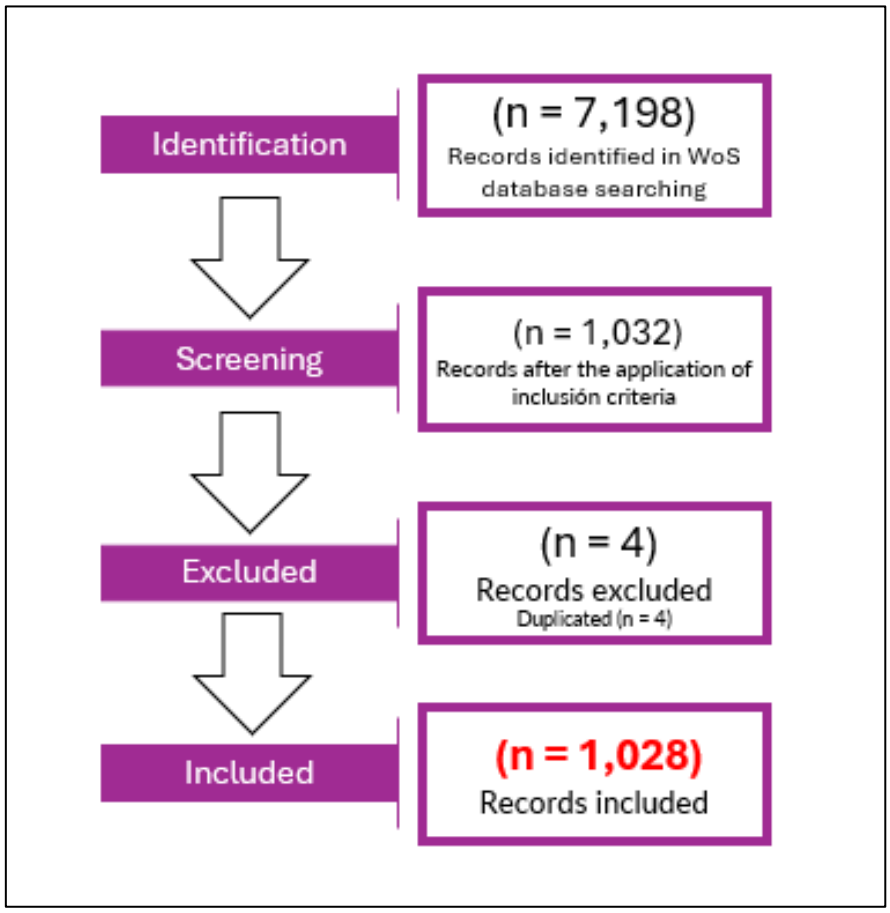

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Figure 1. PRISMA Diagram

Results

Please always refer to the object of study as Nursing Epidemiology throughout the document, especially in tables and graphs of results.

In a first search, 1032 articles were obtained, of which 4 had to be excluded as they were duplicates, resulting in a first entry from 1958 and the last from 2023, with an average number of citations of 12.39 per document.

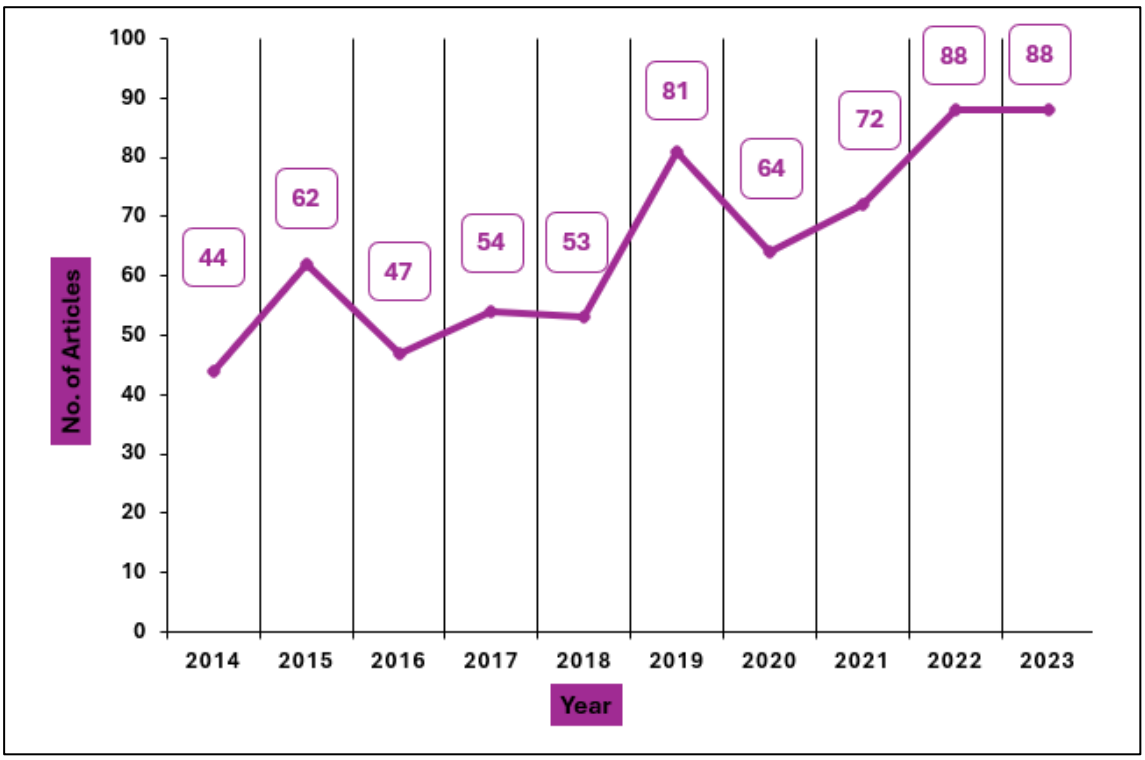

Figure 2. Scientific Production 2014-2023

In Figure 2, an oscillating variability was observed in the scientific production of the last ten years, growing significantly in 2019 and maintaining an increasing trend in the last four years as stated by Price's Law (Price, 1963) .

The scientific production of the most relevant authors is shown in Figure 3, where the author with the highest production subscribes a total of 7 articles, as most authors only publish a single article. This fulfils the criterion of Lotka's Law (Chen, 1989) where a small number of authors produce a large amount of work and a large number only publish one.

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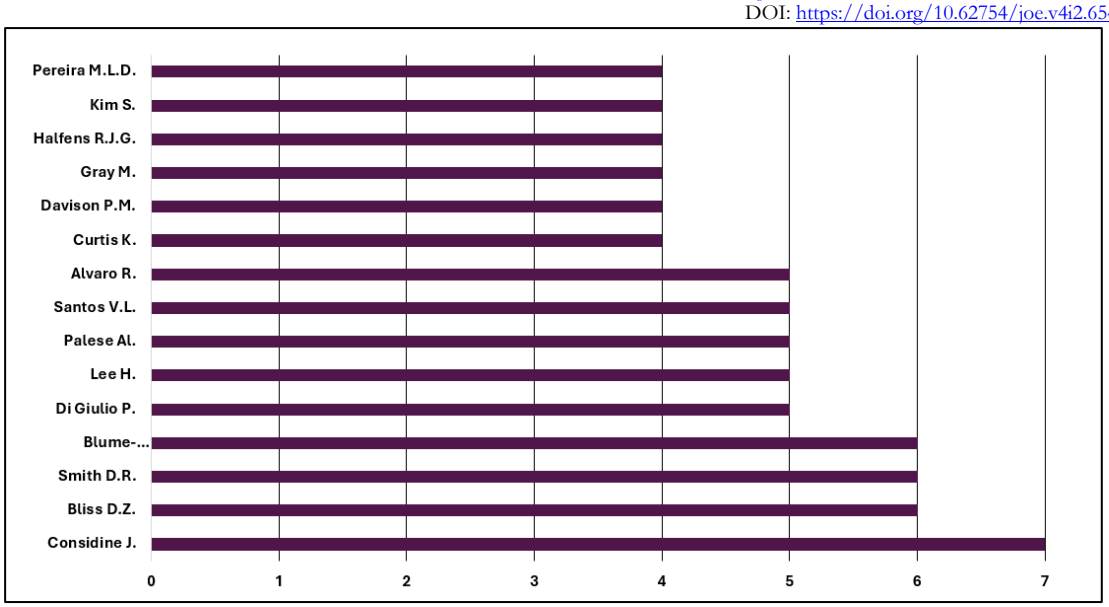

Figure 3. Number of Articles Produced by the Most Relevant Authors

The affiliation of the authors is centred on US universities, with the presence of the University of São Paulo in Brazil being very striking, a sign of empowering nursing development (Figure 4).

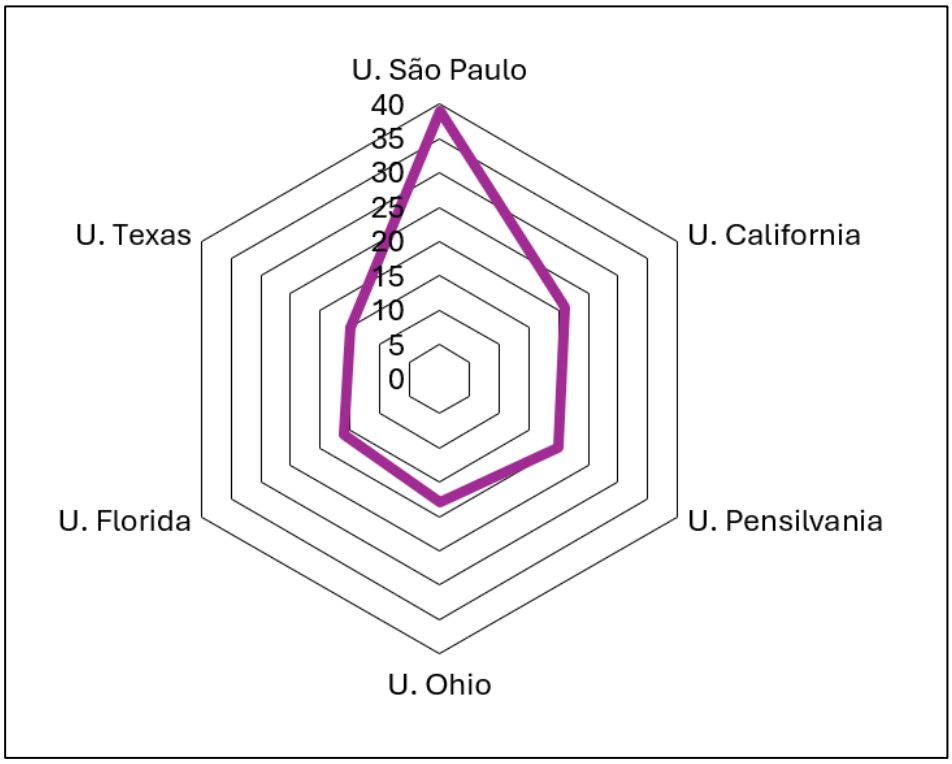

Figure 4. Affiliation of Lead Authors

The most relevant authors establish collaborations of all types and not only with other important authors, a characteristic that gives rise to an unusual map of collaborations, mainly focused on double or triple authorship collaborations without the presence of collaborations of more than three authors (Figure 5).

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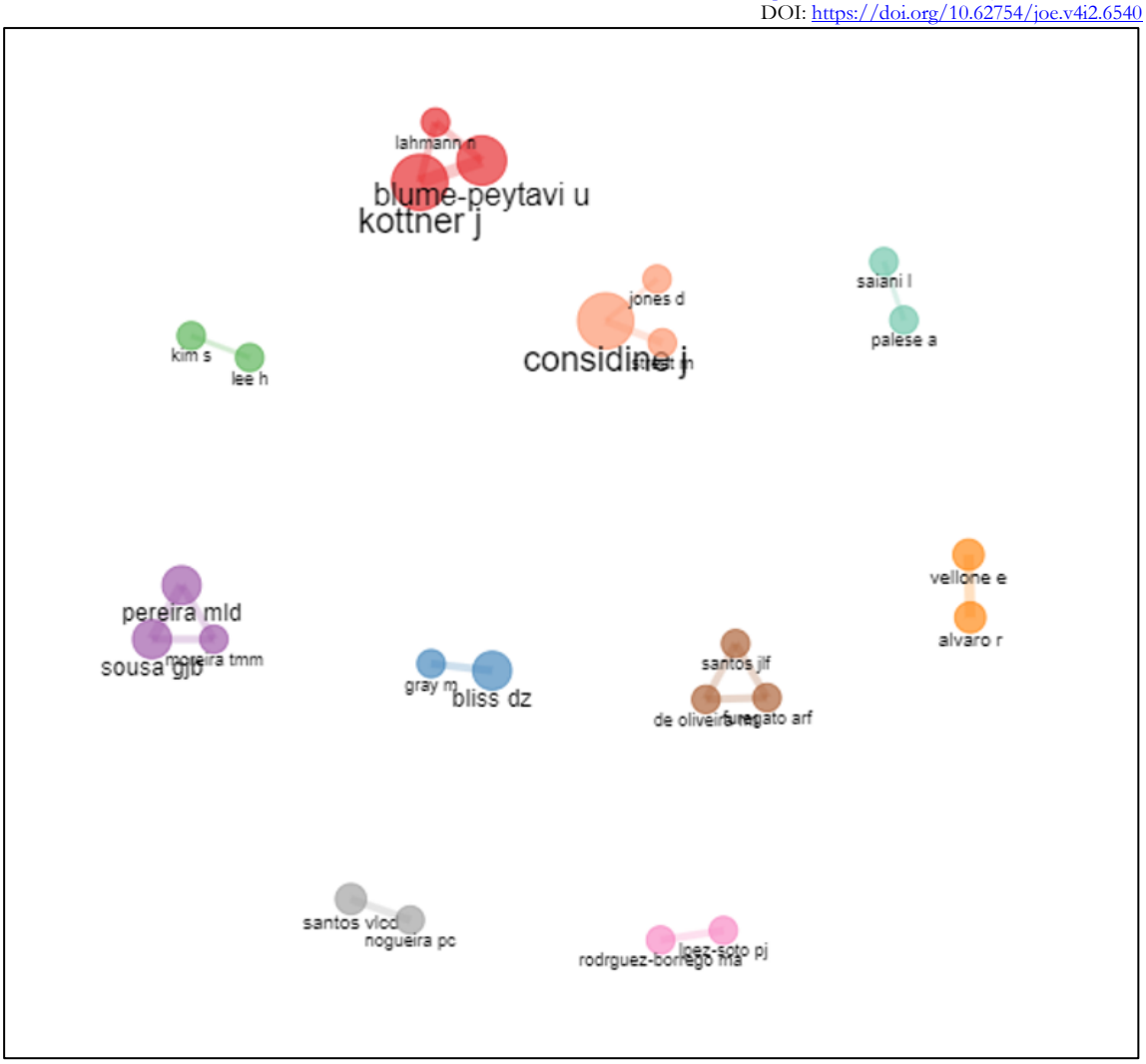

Figure 5. Author Collaboration Map

This study also shows compliance with Bradford's Law (Brookes, 1985) , as there is similarity between the number of publications with the greatest dispersion and those in the core (Figure 6).

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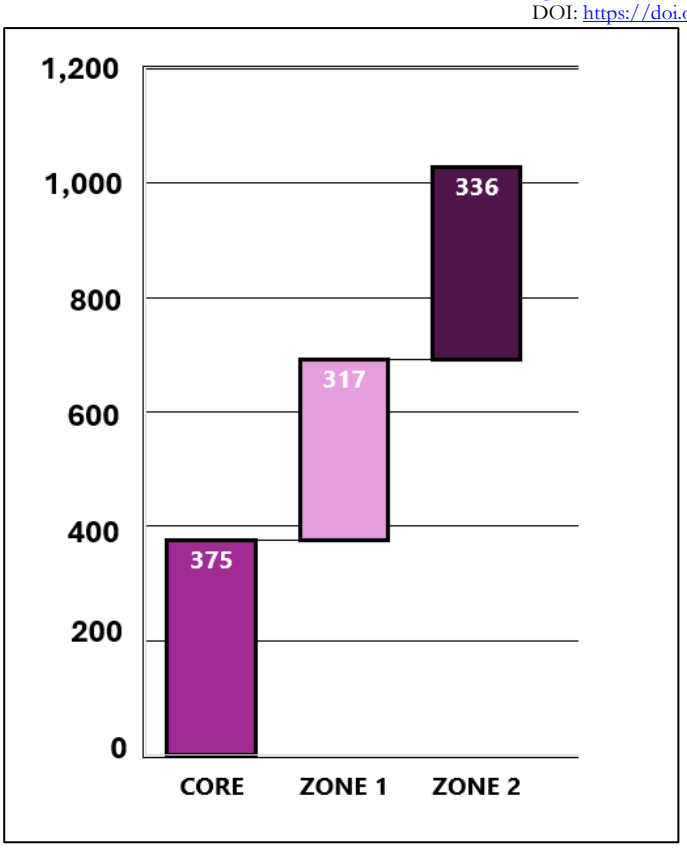

Figure 6. Scatter plot: Bradford's Law

In relation to the language of publication, English is absolutely predominant, followed by Portuguese (mainly due to Brazilian influence) and other languages of low significance (Table 1). These results are consistent with other similar studies, as English is considered the majority language in scientific production worldwide.

Table 1. Percentage of Production by Language

Language	% of production
Español	95.8
Portuguese	1.65
Spanish	1.18
French	0.09
German	0.3
Others	0.1

In scientific production by country of affiliation of the authors (Table 2), the United States tops the list, followed by China, which has increased its scientific production significantly compared to other countries.

Table 2. Scientific Production of Nursing in Epidemiology by Country

Country	No. of Articles
USA	351
PR China	122
Brazil	69
Australia	67
Spain	39
Canada	29

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Republic of Korea	28
United Kingdom	28
Italy	26
Turkey	26
Others	247

Countries have different territorial, meteorological, geographical and other characteristics that have a significant influence on the epidemiology of pathologies. This diversity means that there are very strong global collaborations in epidemiology, with the United States and China leading the way (Figure 7).

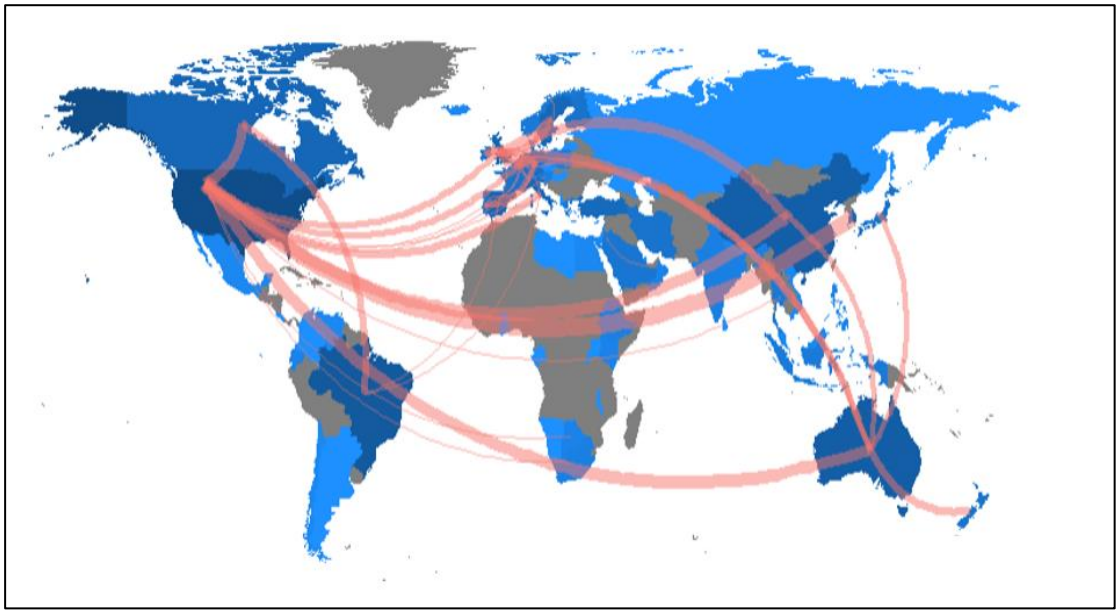

Figure 7. Collaboration Map

Following on from the above, the network map results from the connections between the keywords in the different documents, with the size of the letter being directly proportional to the number of repetitions of the term.

In Figure 8 and Figure 9, three main groups can be observed: the blue one corresponds to Nursing in relation to stress and health care; the red one to Epidemiology and leadership in care; and finally the green one to health risk factors.

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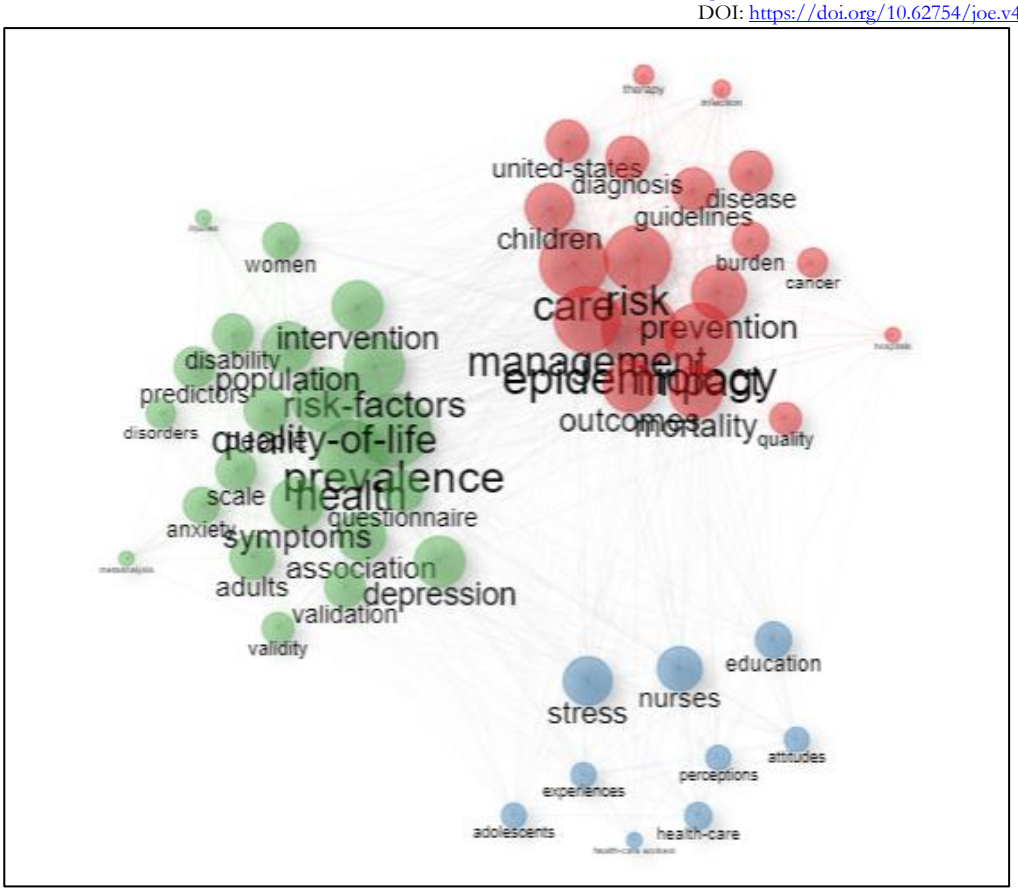

Figure 8. Bibliometric Map

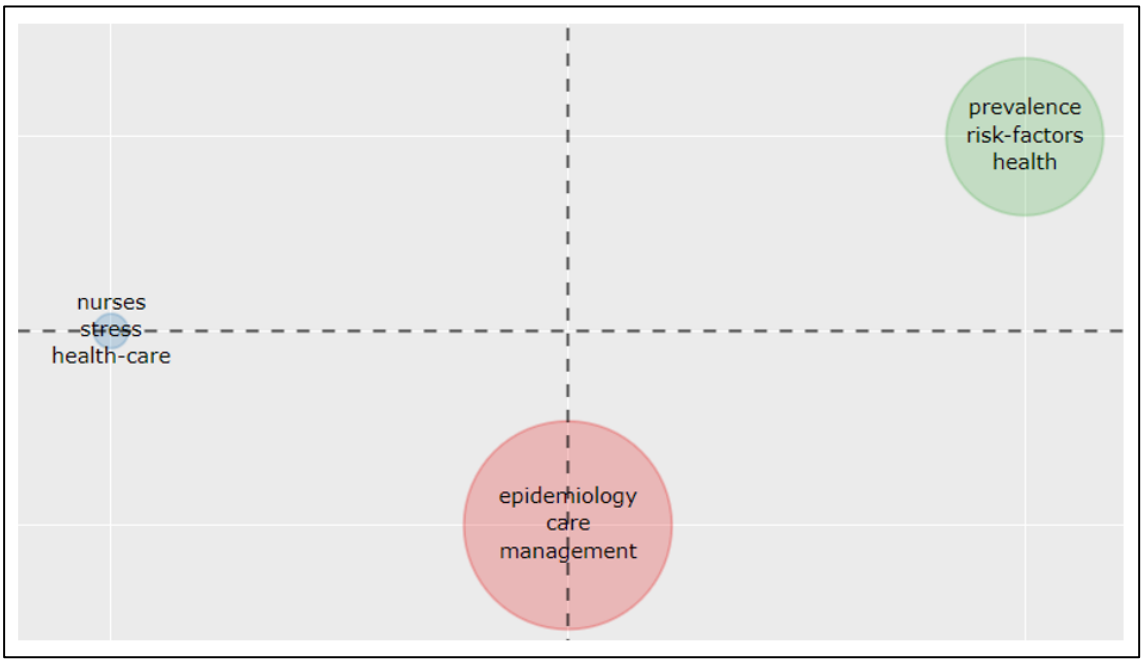

Figure 9. Degree of Relevance

For the analysis of the thematic evolution, three-time clusters were carried out: the first from 1958 to 2010; the second from 2011 to 2020; and the last from 2021 to 2023. An evolution was observed from a first stage focused mainly on communicable diseases, to the latest trends marked by infection control in the

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hospital setting and above all risk factors and their impact, mainly associated with adult behaviours and lifestyles (Figure 10).

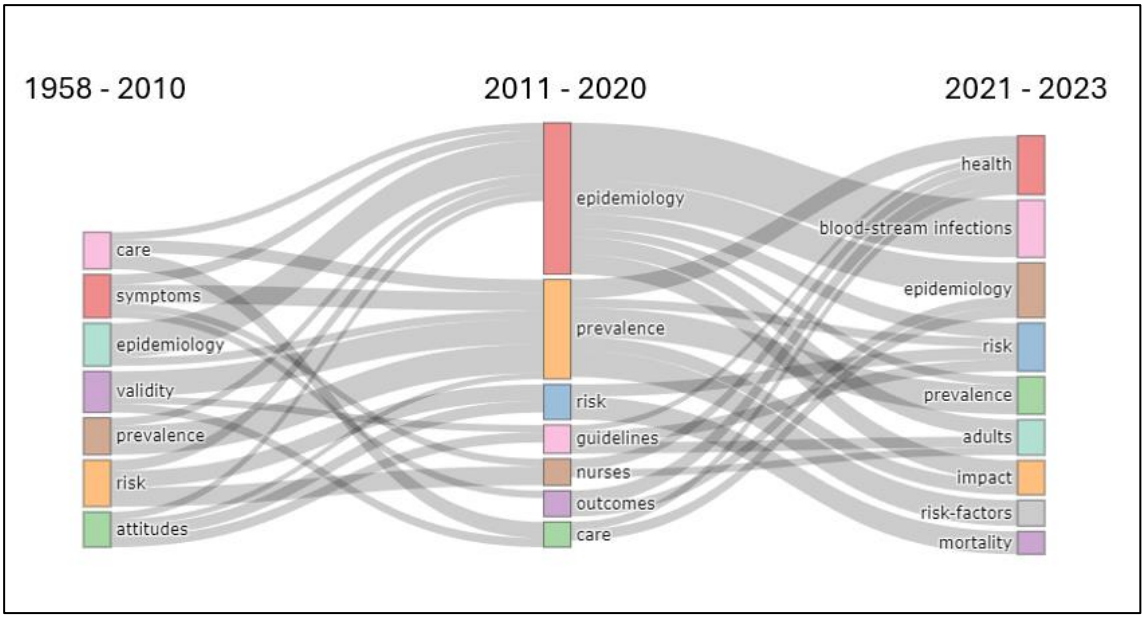

Figure 10. Evolution of Nursing Production in Epidemiology

Discussion

The objective was to analyse the scientific production of Nursing in Epidemiology from 1958 to 2023 published in the WoS database. The results showed that Nursing and Epidemiology have a common goal focused on improving the health of individuals through the care of pathology and its prevention (26,27) . The advance of information technologies has had a notorious influence on the analysis and processing of data in an efficient and reliable manner. In this sense, bibliometrics provides the facility to analyse the knowledge production of different disciplines and identify quantitative and qualitative links (Verbeek et al., 2002) .

In the present study, we found consonance between the scientific production in Nursing during the different stages of evolution of Epidemiology. A first period focused mainly on physical care and disability, which coincides with the historical phase of Epidemiology focused on infectious diseases; a second phase, of transition, with the decline of the infectious axis as the focus of attention and the emergence of new epidemiological models and, finally, a third period that studies risk factors and non-communicable diseases (Gómez, 2001) . There is also concordance between the bibliometric map with the evolution of Nursing with the epidemiological focus on the care of the individual, the community and risk factors.

This provides a knowledge base for the management and leadership of health services (Ruiz & Deodato, 2020) , a fact that was demonstrated during the COVID-19 pandemic when, despite difficulties in their managerial roles, nurses took the crisis as an opportunity to identify gaps in health systems and support decision making (Ozmen & Arslan Yurumezoglu, 2022) , while one of the most important roles of nurses in public health is epidemiological surveillance, which allows for planning interventions, designing campaigns and prioritising priorities. Arslan Yurumezoglu, 2022) , while one of the most important roles of nurses in public health is epidemiological surveillance, which allows for planning interventions, designing campaigns and prioritising resources (Carrasco et al., 2018) .

Nurses played an essential role in the COVID-19 pandemic through contact tracing and monitoring with a very significant increase in scientific production during 2019 (Sintes & Pina, 2020) . The magnitude of the pandemic, the progressive increase in the number of patients and the needs of nurses in hospitals and

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health centres (Moreno et al., 2023) meant the majority performance of Nursing in the care field, decreasing its scientific production during 2020 until the improvement and stability of the health systems, which has re-established the research performance of Nursing and consequently the increase in scientific production in Epidemiology during the following years, as a result of the results obtained during its care practice (Loyola da Silva et al., 2021; Sihvola et al., 2022) .

With regard to the language of the scientific production of Nursing in Epidemiology, it is worth highlighting the presence of English as the majority language, in line with research that states that 90% of the scientific production of natural sciences and 75% of social sciences are written in English, following a hegemonic model at an international level that facilitates scientific dissemination (Hamel, 2007) . From the above, Nursing and Epidemiology publications are framed within the scientific production standards of this language. It is necessary to point out the presence of Portuguese as the second language in the results, related to the presence of Brazil as the third country with the highest scientific production, despite the challenges of dissemination, it has been able to maintain its commitment to scientific research (Mendes et al., 2023; Palucci Marziale et al., 2004) , as reflected by the presence of the University of São Paulo as a major producer of scientific content in the search analysed.

In recent years there has been a notable increase in scientific publications in all disciplines. According to a report by the Japanese National Institute of Science and Technology Policy, in the year 2024 the scientific production of the People's Republic of China (PRC) will surpass that of the United States (Amy Hawkins, 2024) . This is not the case in Nursing Epidemiology where the United States continues to lead in scientific production and the PRC is in second place, possibly due to a lower development of Chinese Nursing, although after the COVID-19 pandemic, an increase in research production has become evident (Oh & Kim, 2020; Smith & Tang, 2004) .

For the progress of science, it is essential to establish international collaboration networks that facilitate research from a global point of view. The situation of the USA as the largest scientific producer occupies an important role in the map of collaborations as does China after the COVID-19 pandemic, although the internationalisation of production should be encouraged (Çiçek Korkmaz & Altuntaş, 2022) .

Recent years have seen the emergence of the One Health concept, which aims to link human health with animal health and the environment. The COVID-19 pandemic and climate change have led to concern among international experts who advocate collaboration between professionals, scientists and healthcare professionals for the sake of a new approach for the 21st century (Pitt & Gunn, 2024) , where the participation of Nursing as a scientific, clinically rigorous, teaching, management and research profession must be guaranteed.

Conclusions

The results indicate that there is an important trajectory of Nursing in Epidemiology which is demonstrated by the scientific production throughout history. This production has been in line with the different periods of the discipline and has adapted to them, making explicit the relevance of nursing knowledge, a fact that makes this professional essential in the field of public health, recognised as a manager and teacher-researcher, in addition to his or her role as a clinician.

The first phase was focused on physical care and disability, which coincides with the historical phase of infectious diseases; the second phase was characterised by the decline of the infectious axis as a focus of attention and the transition towards new epidemiological models; finally, a third period focused on risk factors and non-communicable diseases. The COVID-19 pandemic marked a turning point in the appreciation of the role of nursing in epidemiological surveillance

In summary, the scientific production of Nursing Epidemiology, for the most part, is currently led by Western countries, including the United States, Brazil, Spain and Canada. Although there has been a significant increase in production in Eastern countries such as China and South Korea, possibly due to international collaboration networks to improve the health of an increasingly globalised population.

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Likewise, the relationship with the animal environment and the environment is prioritised as one of the challenges of health systems, where the nurse must play a key role in responding to the needs of biopsychosocial care.

Use of AI Tools Declaration

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

Acknowledgments (All sources of funding of the study must be disclosed)

The study has not received any funding.

Conflict of Interest

The authors declare that there is no conflict of interest.

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