



Review article

Health literacy in childhood and adolescence. A bibliometric analysis of scientific publications and professionals' involvement

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ABSTRACT

Background: Health Literacy (HL) is a powerful tool to empower children and adolescents in their own health. School nurses are the professionals who, with their expertise in health promotion and education, can facilitate this literacy throughout the educational process.

Purpose: To analyze the scientific production in HL in childhood and adolescence in the last two decades, and to determine the involvement of professionals in this field, with emphasis on nursing professionals.

Methods: A bibliometric analysis of the scientific literature (from 2000 to 2021) of articles retrieved from the Web of Science database was carried out. Original articles in all languages were considered as inclusion criteria. Bibliometrix 3.1.4 package from RStudio and VOSviewer were used to analyze publications and explain main results about citations, authors, countries, keywords trends, evolution, clusters of related terms, and professionals' involvement.

Results: A total of 2032 articles were included in the analysis. The results of the analysis showed that both publications and citations increased substantially since 2014. The most prolific authors in this field are not the most cited so far. The countries that published the most during the period evaluated were the United States, Australia and Canada. The keyword clusters identified in this scientometric study made it possible to determine hotspots in the study of HL in childhood and adolescence, with "mental health" being one of the main terms identified. There are different health-related professionals who are publishing in this field; in spite of this, nurses are not visible as authors in the publications.

Conclusion: The scientific literature on HL in childhood and adolescence is a growing field in which different professionals are involved. Despite the increase in the number of publications, and despite the role that nurses play in schools regarding HL, their presence in scientific production is practically nonexistent.

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1. Introduction

At present, there is a need to promote health to encourage a healthy life, well-being, and primary prevention from early ages. In this sense, the [1] defined the concept of Health Literacy (HL) “as the cognitive and social skills which determine the motivation and ability of an individual to gain access to, understand and use information in ways which promote and maintain good health” [2]. In this sense, HL means understanding the information received on health subjects, interpreting it, and adapting it depending on what the situation requires [3-5].

HL is closely associated with school, as it is way to promote good health among children and adolescents from early ages, so that they understand it and are able to make decisions in their everyday life. This information must be adequate to their level of comprehension, so that it improves their present and future health [6,7]. Thus, HL can play a fundamental role in the interventions dedicated to the prevention of illnesses, by promoting skills such as critical thinking, self-awareness, and self-knowledge [8], although another study [9] indicate that the majority of students between 6 and 18 years old do not have adequate HL. In this manner, education centers can become good scenarios for favoring early awareness and promoting specific interventions associated with school health [10,11].

Likewise, it is necessary to note that after more than two years of a pandemic, mental health problems have increased in childhood and adolescence [12,13], and this has created a great concern in society. A great part of the mental health disorders throughout life starts before the age of 14 [14], and this is the reason why mental health problems that are not treated correctly can extend into adulthood and lead to severe consequences in the future [15].

1.1. The importance of the school nurse in the promotion and prevention of health

To teach students about subjects associated to health promotion and prevention, the presence of a health professional who is trained and able to address specific topics is needed, which will allow the children and adolescents to acquire the necessary skills for self-care. This health professional is the school nurse. This person can address a wide range of subjects, which can be adapted to the needs of the youth, and their level of educational maturity as well.

A school provides us with a key environment for implementing adequate health habits among the students and the education community in general [16,17]. The need to promote the figure of the school nurse is essential if we want to address the health challenges that appear during life at school, and for this, it is essential for school nurses to be able to not only provide health care to children within their workday, but to be recognized as a key figure in the area of education [18,19].

Lee et al. [20] and the Spanish Scientific Association of School Nursing and Health [21] define the role of the nurse as a primary care professional whose aim is to address health at education centers, covering the needs of the school children and the education community, in order to transmit the information necessary according to their level of comprehension. Aside from their main functions [22,23], school nurses must also perform functions associated to providing advice on health promotion, ensuring that the education community acquires an adequate HL to make decisions in their day-to-day life that would have an effect on their optimum state of health, through the promotion of self-care [16].

Understanding how HL in childhood and adolescence has been addressed from the area of research, and determining the role played by nurses in publications in this area, can be useful for identifying the strengths and weaknesses of the nurse collective in this context. Thus, a bibliometric analysis was performed to achieve The objective of to analyze the scientific production in HL in childhood and adolescence, and to determine the involvement of nurses on this subject. The novelty of the present study is that it analyses which professionals are related to and involved in the publication of studies on HL in children and adolescents. On the other hand, some of the limitations of the study are that some authors identify HL as Health Education (HE) and do not carry out more specific HL analyses, such as HL in mental health [13] or nutritional health [24].

2. Materials and methods

2.1. Data source, data extraction and study selection

For the bibliometric analysis, the Web of Science Core Collection (WOSCC) database, as part of the Web of Science, was utilized, as it contains articles from the highest impact factor journals worldwide, and it also maintains deep interconnections between the different areas of research, which allows the identification and analysis of links between authors, keywords, and citations, among others. The keywords utilized in the present study were: health literacy, childhood and adolescence, which were combined in parallel through TS = (“health literacy” AND child*) and TS = (“health literacy” AND adolescen*). The article search for our analysis was conducted on April 11th, 2022. The inclusion criteria were: a) original articles, b) articles published between January 01, 2000, and 12/31/2021, c) articles in any language. The exclusion criteria were: d) any type of article that was not original (i.e., any type of review, meta-analyses or other documents not considered as an original research article).

The articles found after the search were screened with the filters included in the database to select the articles to be included in this analysis. Then, they were selected according to the title to discard those that did not include the keywords utilized in the WOSCC search. For the selection of titles, authors N.S-M and L.S-P screened the titles of articles found. Any disagreement in the selection of an articles was resolved by consensus with a third author (A.R-P).

2.2. Data analysis and visualization

For the statistical analysis, the following variables were considered: top authors' production over time, historical direct citation network (historiography with maximum 20 nodes), source growth (occurrences cumulate, >5 number of sources), source local impact by H index (>5 of sources), most local cited sources, country of scientific production, most relevant affiliations, most cited countries, countries' collaboration networks and most relevant words and trend topics (KeyWords Plus and author's keywords, with three words per year and ten words minimum frequency). For the bibliometric analysis, two specific programs were utilized: "Bibliometrix 3.1.4" package [25] of RStudio (version 2021.09.1, RStudio Team, Boston, MA, USA) and VOSviewer (version 1.6.17, Leiden University Center for Science and Technology Studies, Leiden, The Netherlands) [26]. Specifically, the package "Bibliometrix 3.1.4" for RStudio software program evaluates the distribution of each component analyzed in the bibliometric analysis through the application of Machine Learning, and it allows the quantitative calculations of the items included in the analyzed articles. Thus, aside from the specific analyses with respect to the number of citations, index of occurrence of the keywords, or the most cited authors, a Multiple Correspondence Analysis (MCA) was also performed with categorical data through the use of keywords from the authors and limiting the number of keywords to 50, to obtain different relationship clusters. VOSviewer was used to identify and visualize bibliometric networks from the author's keywords and KeyWords Plus (50 keywords with a frequency of more than 20 occurrences). In parallel,

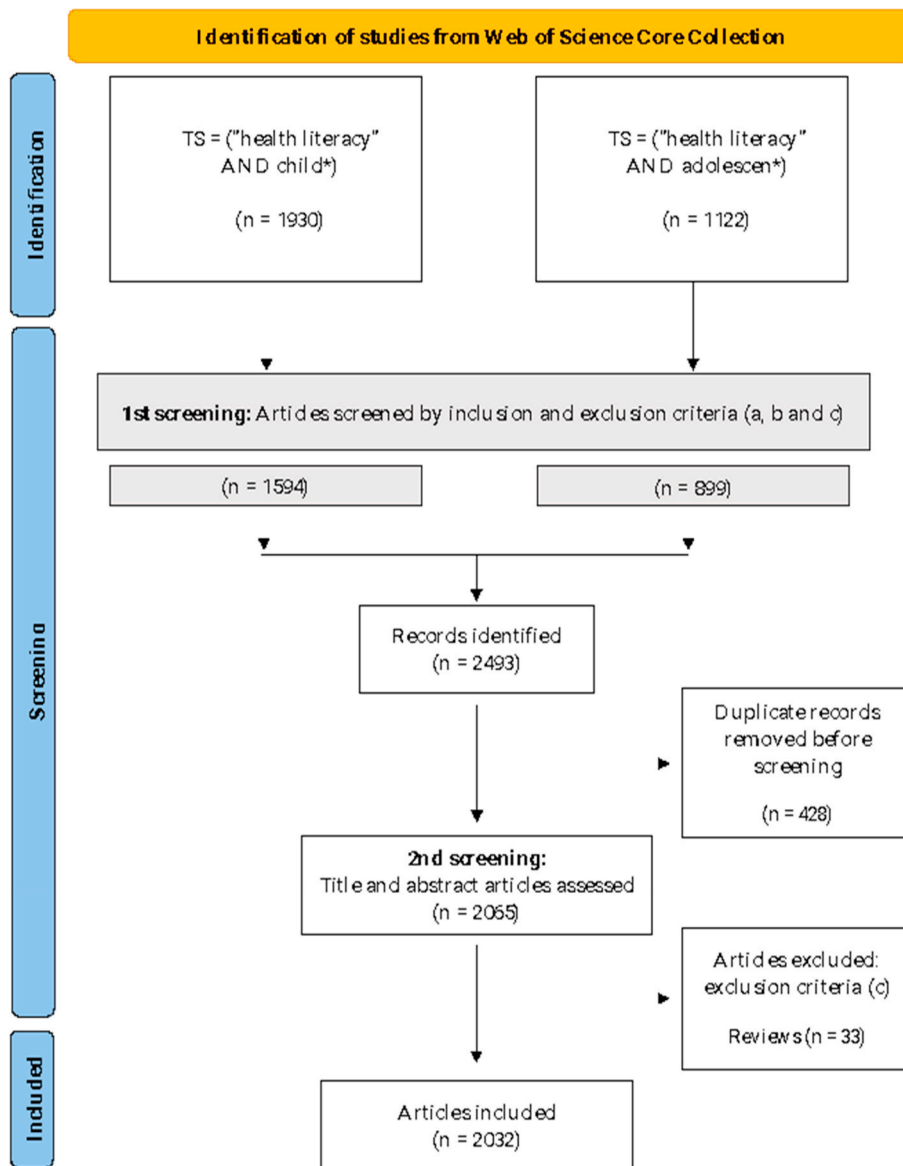


Fig. 1. Flowchart of the results of the search according to PRISMA standard (adapted version). a, b, c: inclusion and exclusion criteria (See Data Source, Data Extraction and Study Collection section).

both software programs allow the construction and visualization of bibliometric networks, facilitating the interpretation of these types of studies.

3. Results

3.1. Search results

The parallel search of the articles provided 2493 articles. After the application of the inclusion and exclusion criteria, the resulting articles were combined into a single database. The filtering by title and article resulted in a final selection of 2032 articles for the analysis. To show the protocol utilized for the selection of the articles to be included in the study, a flowchart adapted from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [27] was created (Fig. 1).

3.2. Publication year and citation count

During the first years analyzed, the number of publications related with this subject was scarce, not exceeding the barrier of 50 publications until 2011. It was only in the last 8 years analyzed (i.e. 2014-2021), where a constant exponential growth was observed in the number of publications, with the maximum reached in the last two years analyzed, with 349 publications in the year 2020, and the same number in 2021. The evolution in the number of citations followed the same trend as that of the publications, with a clear exponential growth observed during the entire period analyzed (Fig. 2).

As for the number of citations, the articles analyzed were cited a total of 25,283 times (21,104 excluding self-citations), with a mean of 12.44 times per article. Of the five most-cited articles, three were directly related with the area of adolescence, while the other two were associated with childhood. As a group, these five articles obtained a total of 1037 citations (mean = 207.4 citations per article), with the most cited article being the one by C. M. Kelly, with 251 citations (Table 1).

3.3. Authors and affiliations

As for the authors, the top five most prolific authors of articles in this area were H.S. Yin with 31 articles and an H-index of 20, A.F. Jorm with 26 articles, and an H-index of 16, B.P. Dreyer and L.M. Sanders with 20 articles and an H-index of 15, and finally, M.S. Wolf with 19 articles and an H-index of 14. Of these five authors, L.M. Sanders was identified as having the longest trajectory, with the first publication in 2004, and H.S. Yin and M.S. Wolf with more recent trajectories, starting in 2007 (Fig. 3).

As for the citations accumulated by the first five authors, a total of 1197 citations were found for H.S. Yin, 1025 for A.F. Jorm, 883 for B.P. Dreyer, 491 for L.M. Sanders, and 956 for M.S. Wolf.

With respect to the author's affiliations, the top five were the University of North Carolina, University of Melbourne, University of Sydney, Vanderbilt University and University of Maryland, all of them located either in the USA or Australia.

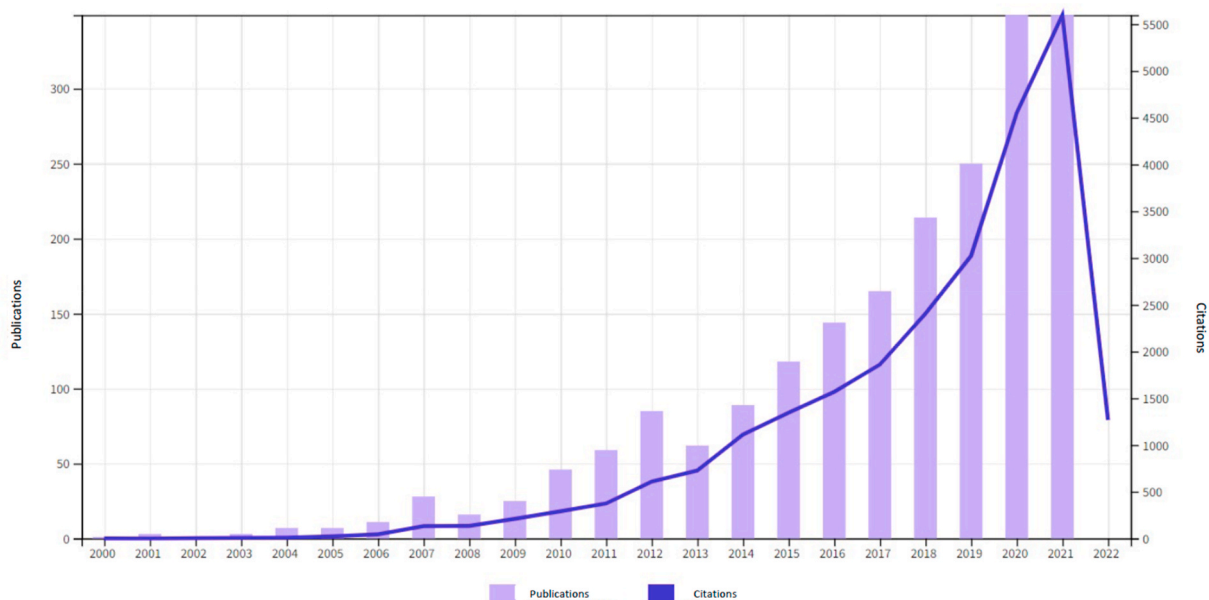


Fig. 2. Number of publications and citations per year. Source: web of science.

Table 1
Most cited papers on health literacy in childhood or adolescence in web of science core collection. Source: web of science.

Title	First author	Year	Journal	Subject Area/Category	Citations (n)
Improving mental health literacy as strategy to facilitate early intervention for mental disorders	C. M. Kelly	2007	Medical Journal of Australia	Medicine, General & Internal	251
A pandemic of the poor social disadvantage and the U.S. HIV epidemic	J.A. Pellowski	2013	American Psychologist	Psychology/Psychology, Multidisciplinary	238
Health literacy and adolescents: a framework and agenda for future research	J. A. Manganello	2008	Health Education Research	Education & Educational Research/Public, Environmental & Occupational Health	205
Adolescent mental health literacy: young people's knowledge of depression and help seeking	J. R. Burns	2006	Journal of Adolescence	Psychology, Developmental	182
Low parental literacy is associated with worse asthma care measures in children	D. A. DeWalt	2007	Ambulatory Pediatrics	Pediatrics	161

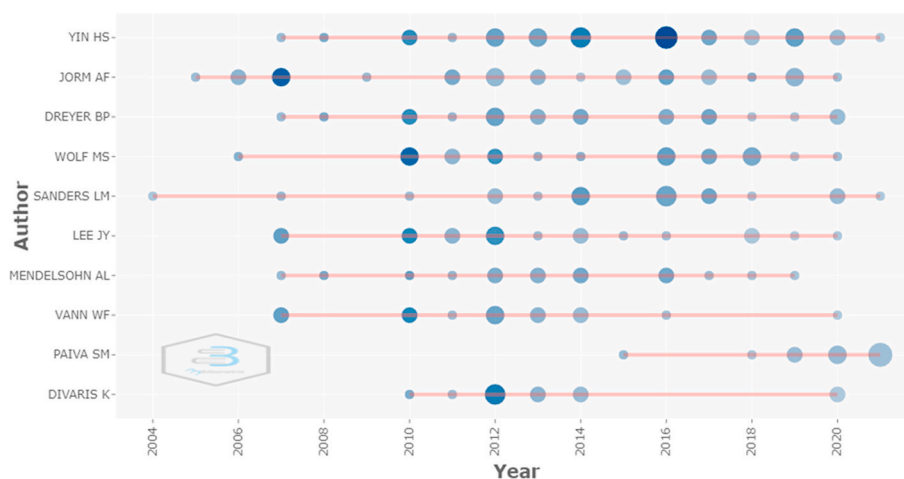


Fig. 3. Top Author's production over time.

3.4. Journals and research areas

As for the journals with the most publications about HL in childhood and/or adolescence, we highlight: International Journal of Environmental Research and Public Health (3.34% of the publications), BMC Public Health (2.26%), PLOS One (2.16%), Pediatrics (1.67%), and Academic Pediatrics (1.52%) (Table 2). The first to publish on this subject was Pediatrics, with the most publications in 2003 and 2019. Starting in 2019, the International Journal of Environmental Research and Public Health experienced a great growth in the number of publications on the subject, becoming the journal with the most publications in HL in childhood and adolescence (Fig. 4). According to the Journal Citation Report, the impact factor of the five journals with the most publications ranged between

Table 2
Characteristics of the five journals with the most publications, according to the web of science core collection.

Journal	JIF (2020)	JIF without SelfCitations (2020)	Subject Area & Category	Edition	JIF Quartile (2020)	Number of Articles
International Journal of Environmental Research and Public Health	3.390	2.819	Public Environmental and Occupational Health	SSCI	Q1	68
			Public Environmental and Occupational Health	SCIE	Q2	
BMC Public Health	3.295	3.144	Environmental Health	SCIE	Q2	46
			Public Environmental and Occupational Health	SCIE	Q2	
PLOS One	3.240	3.116	Multidisciplinary Sciences	SCIE	Q2	44
			Biology	SCIE	n/a	
Pediatrics	7.125	6.793	Pediatrics	SCIE	Q1	34
Academic Pediatrics	3.107	2.755	Pediatrics	SCIE	Q1	31

n/a: not applicable on 2020.

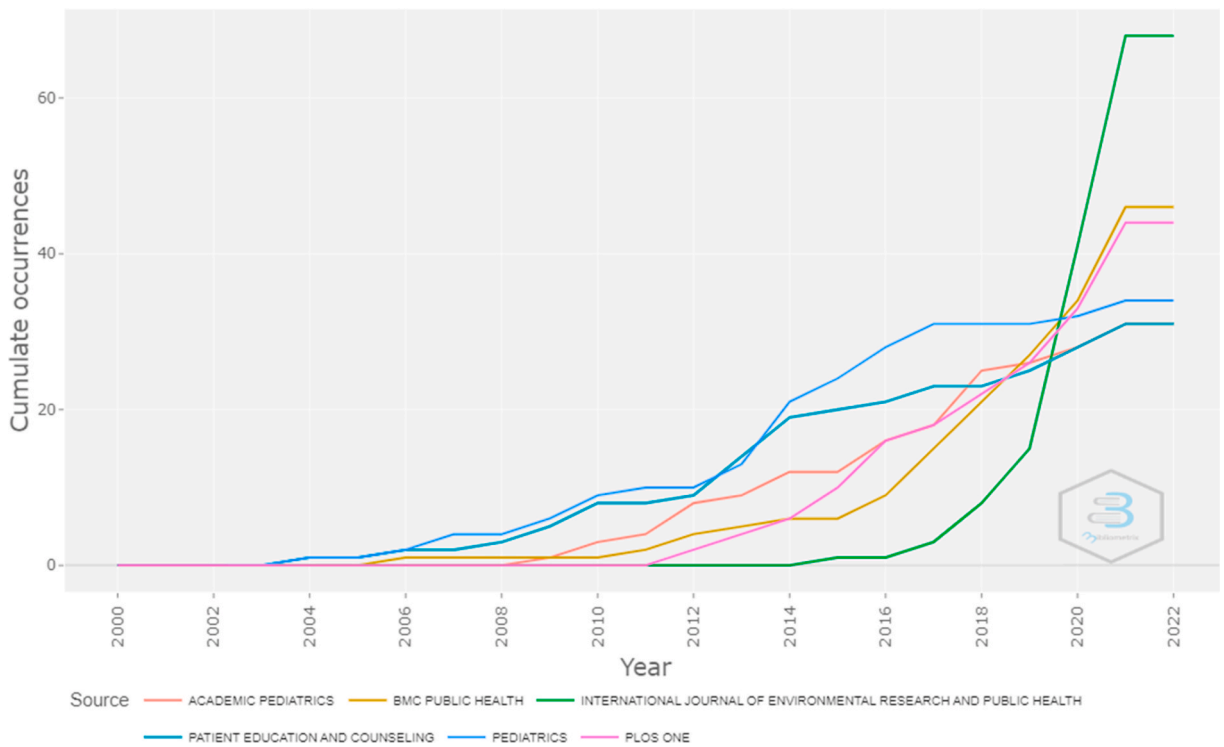


Fig. 4. Growth of publications in the analyzed journals.

3.140 and 7.125, and encompassed five different areas of knowledge, all of which were classified as Q1 or Q2, with the exception of an area, which was not indexed in any quartile, according to the last update available.

The five journals with the most citations on this subject were not the same journals with the most publications. In decreasing order of number of citations, the main journals were: Pediatrics with 2493 citations, BMC Public Health with 1,157, Patient Education and

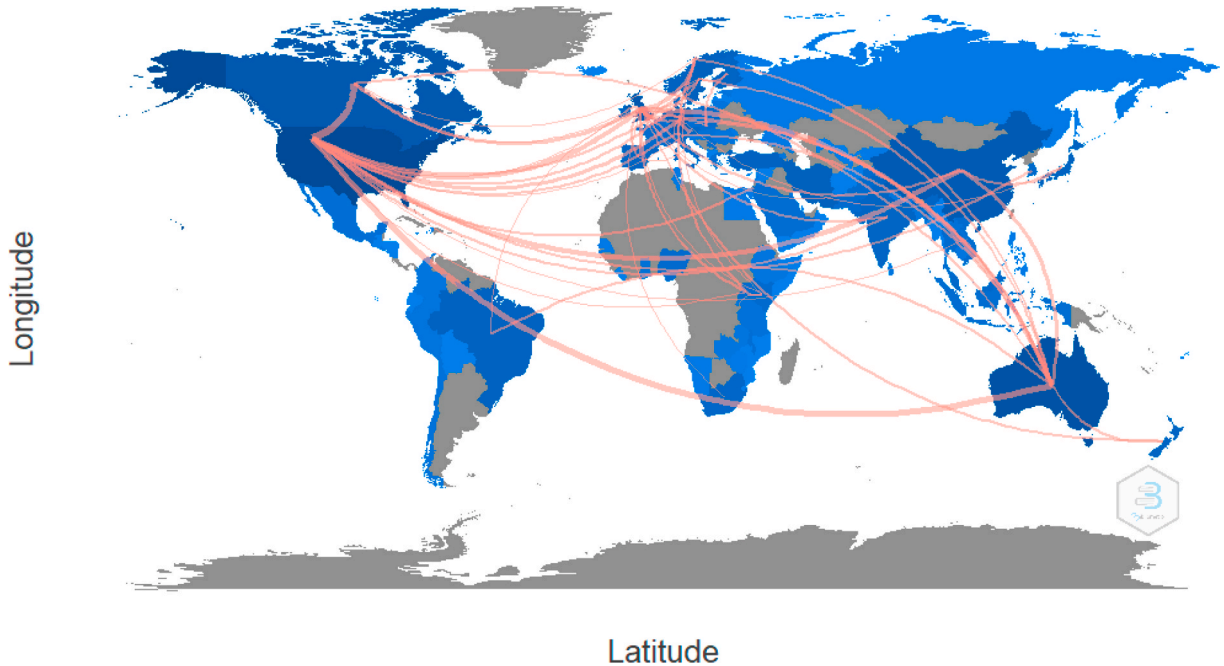


Fig. 5. Countries with the highest scientific production in HL in childhood and adolescence. Intensity in blue color indicates greater contribution to scientific production. Grey color indicates no scientific production on this topic. Red lines indicate collaboration between countries.

Counseling 1,103, Journal of General Internal Medicine 909, and The Lancet with 752 citations.

As for the five areas of research with the most publications on HL in childhood and adolescence, we found: Public Environmental Occupational Health (32.13%, n = 653 articles), Pediatrics (14.49%, n = 293), Health Care Science Services (10.18%, n = 207), Psychology (8.56%, n = 174) and Psychiatry (8.26%, n = 168). Lastly, with respect to the citation indices, the Social Sciences Citation Index (SSCI) recorded the highest number of citations (72.04%, n = 1464), followed by the Science Citation Index Expanded (SCIE) (65.50%, n = 1331) and the Emerging Sources Citation Index (ESCI) (13.97%, n = 284).

3.5. Countries, collaborations and languages

The countries with the highest number of publications were: the USA with 910 publications (44.78%), Australia with 288 (14.17%), Canada with 129 (6.34%) the UK with 128 (6.29%), and Germany with 103 (5.06%). The USA received the most citations (13,052 with a mean of 15.86 citations per article), followed by Australia (4005 with a mean of 16.85), Canada (1216 and a mean of 12.94), the UK (1160 and a mean of 13.65), and China (651 and a mean of 8.04).

As for the collaborations established between the different countries, a higher number of collaborations was observed between the countries with the most publications. These were: the USA, Australia, Canada, the UK, and China (Fig. 5).

An in-depth analysis of the collaborations between countries identified four collaboration clusters, three of which (one composed by European countries, and two by different countries worldwide) with collaborations amongst themselves, and a fourth (composed by four Northern European countries) exclusively related with the cluster of European countries (Fig. 6).

Lastly, with respect to the languages that were most utilized in the publications, we found English (96.75%, n = 1966 publications), followed far by German (1.77%, n = 36), and percentages lower than 1%, by languages such as Spanish, Portuguese, French, Chinese,

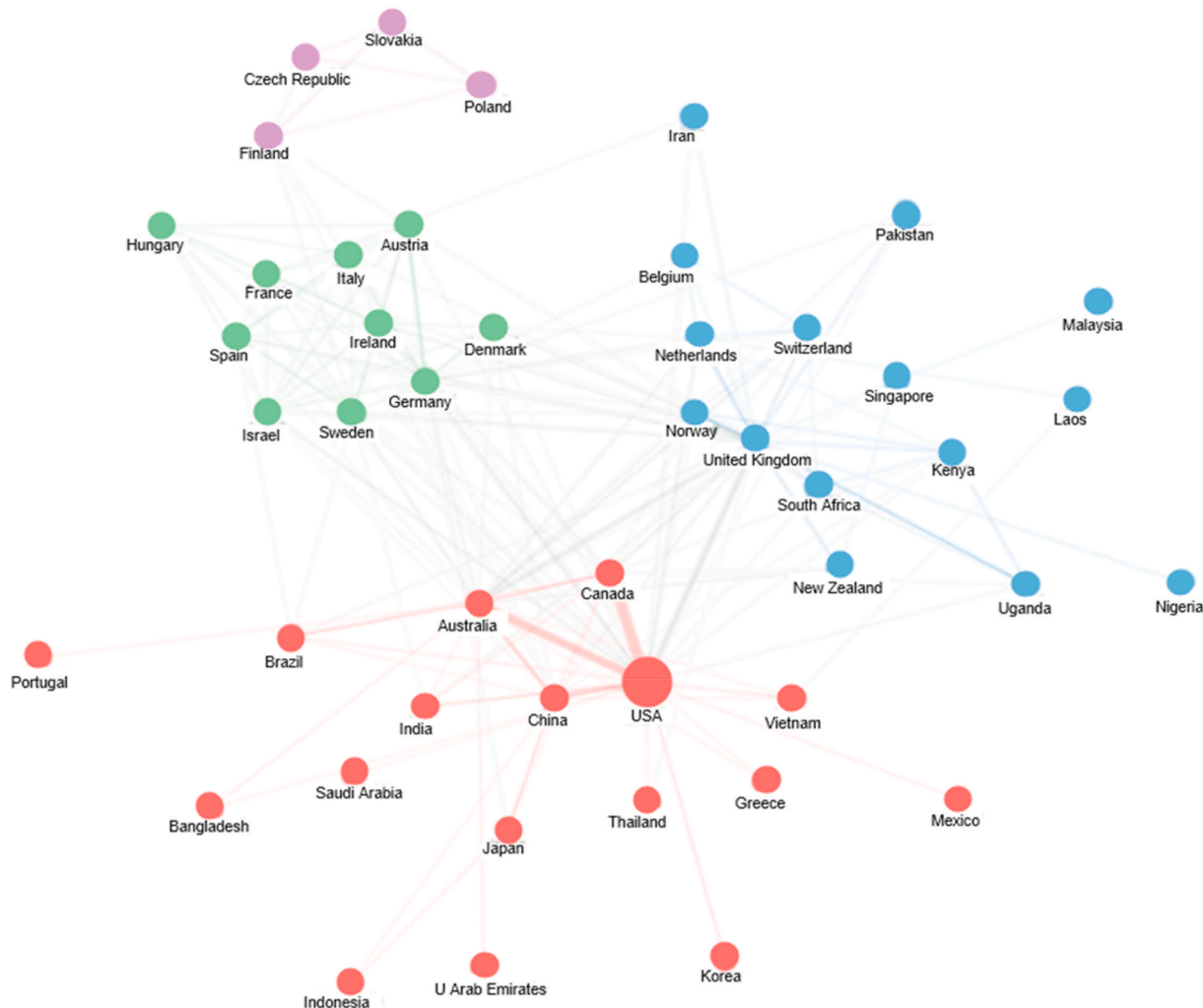


Fig. 6. Country collaboration network. Each color indicates a specific group of countries and their relationship between those countries or with other clusters of countries.

or Turkish, among others.

Keywords and Evolution of Trends; Focusing the analysis on the KeyWords Plus and Author's keywords, and considering the ten keywords that were most utilized, including those used for the article search in the bibliometric analysis (i.e., health literacy, child* and adolescen*), we found KeyWords Plus such as: care (n = 290), knowledge (n = 220), disorders (n = 164) or education (n = 141), while for the author's keywords, we found: mental health literacy (n = 135) mental health (n = 109), health education (n = 81) or depression (n = 67) (Table 3).

The analysis of the usage trends for each of these terms, with respect to the KeyWords Plus terms, showed that words such as parent, emergency, or functional health literacy, appeared in a recurrent manner during periods of ten years, with parent being a keyword that is still currently identified as a KeyWords Plus term. At the same time, from all the KeyWords Plus identified in this analysis, those that were most common were: children, health literacy, and care, which appeared in 2018, adolescent and disorders in 2019, and finally, communication, beliefs, and risk, in 2017. Words such as adolescent health or social media started to become trendy in the last years analyzed (Fig. 7).

With respect to the author's keywords, the longest running terms were internet, asthma, and attitudes, with their presence lasting for periods of eight years. The most utilized throughout the period analyzed were, in first place, health literacy, followed by mental health literacy, and children, in 2018, and adolescent/s and health in 2019. In the last few years, terms such as covid-19, teachers, nutrition literacy, school, or anxiety, have also been utilized as author's keywords (Fig. 8).

The MCA analysis of KeyWords Plus with the highest occurrence showed two differentiated clusters; one of them (in blue) was more concise, with the keywords: attitudes, depression, mental health literacy, young people, stigma or beliefs standing out. The other cluster was more extensive and heterogeneous, and included words such as: childhood, obesity, physical activity, internet, disparities, communication, adolescents, parents, or intervention/s, among others (Fig. 9).

Taking a step forward in the analysis of keywords, and after a co-occurrence analysis, using all the keywords (KeyWords Plus and author's keywords) as the unit of analysis, with a minimum of 10 occurrences, and selecting up to 50 keywords, a network map was created with VOSviewer, which identified 4 specific clusters (Fig. 10).

The four clusters identified in the map included the following groups of items a) Cluster 1 (red, 24 items): health literacy, children, adolescents, care, education, impact, behaviors or parents, among others; b) Cluster 2 (green, 19 items): literacy, disorders, depression, youth, adolescence, stigma, help-seeking, anxiety or attitudes, among others; c) Cluster 3 (blue, 5 items): health education, school, students, child and adolescent; d) Cluster 4 (yellow, 2 items): knowledge and perceptions.

The four clusters had a common node between HL, children, and adolescents, which acted as a link between the terms from each sub-field represented by each cluster. Delving into each of these clusters, tendencies were observed in the keywords from clusters 1, 2, and 3. Thus, cluster 1 contained more general and broad terms related with HL, childhood, and adolescence; cluster 2 was more oriented towards terms focused on the mental health of adolescents. Lastly, cluster 3 contained words that were more oriented towards formal education.

Lastly, a three-field plot was created to observe the relationship between the countries with the highest number of publications, the keywords that were most utilized in these countries, and the journals that published the most in this area. The variables were limited to five items per column (Fig. 11).

3.6. Professionals publishing in HL in childhood and adolescence

By observing the affiliation of the authors, it can be seen that among the professionals who have published in this field and who have generated the most citations are mainly authors from the fields of psychology and medicine.

With regard to the presence of authors from the nursing area, if we look at the publications analyzed (by means of related affiliations, scientific journals specific to the nursing field, areas of research, or keywords that included the term nurse/nursing) its presence in HL in childhood and adolescence is practically null. None of the five most-cited articles included the concept or keyword nurse/nursing in their title. As for the affiliations, despite the authors included in the first ten publications indicating affiliations to health centers (hospitals, medicine departments, etc.), none of the affiliations indicated an explicit relationship with the area of nursing (i.e., department of nursing, nursing care center, etc.). It was only in the categories indexed by the Web of Science where the area of Nursing appeared in fourth place, and in sixth place when the areas of research were analyzed, with a total of 147 (7.23%) articles published in

Table 3
Most relevant KeyWords Plus and author's keywords.

KeyWords Plus	Occurrence, % (n)	Author's keywords	Occurrence, % (n)
children	20.96 (426)	health literacy	31.93 (649)
health literacy	14.46 (294)	Adolescents	7.82 (159)
care	14.27 (290)	mental health literacy	6.64 (135)
adolescents	13.82 (281)	Health	6.20 (126)
knowledge	10.82 (220)	Adolescent	5.56 (113)
literacy	9.0 (183)	children	5.41 (110)
impact	8.61 (175)	mental health	5.36 (109)
outcomes	8.36 (170)	literacy	5.01 (102)
disorders	8.07 (164)	health education	3.98 (81)
education	6.93 (141)	depression	3.29 (67)

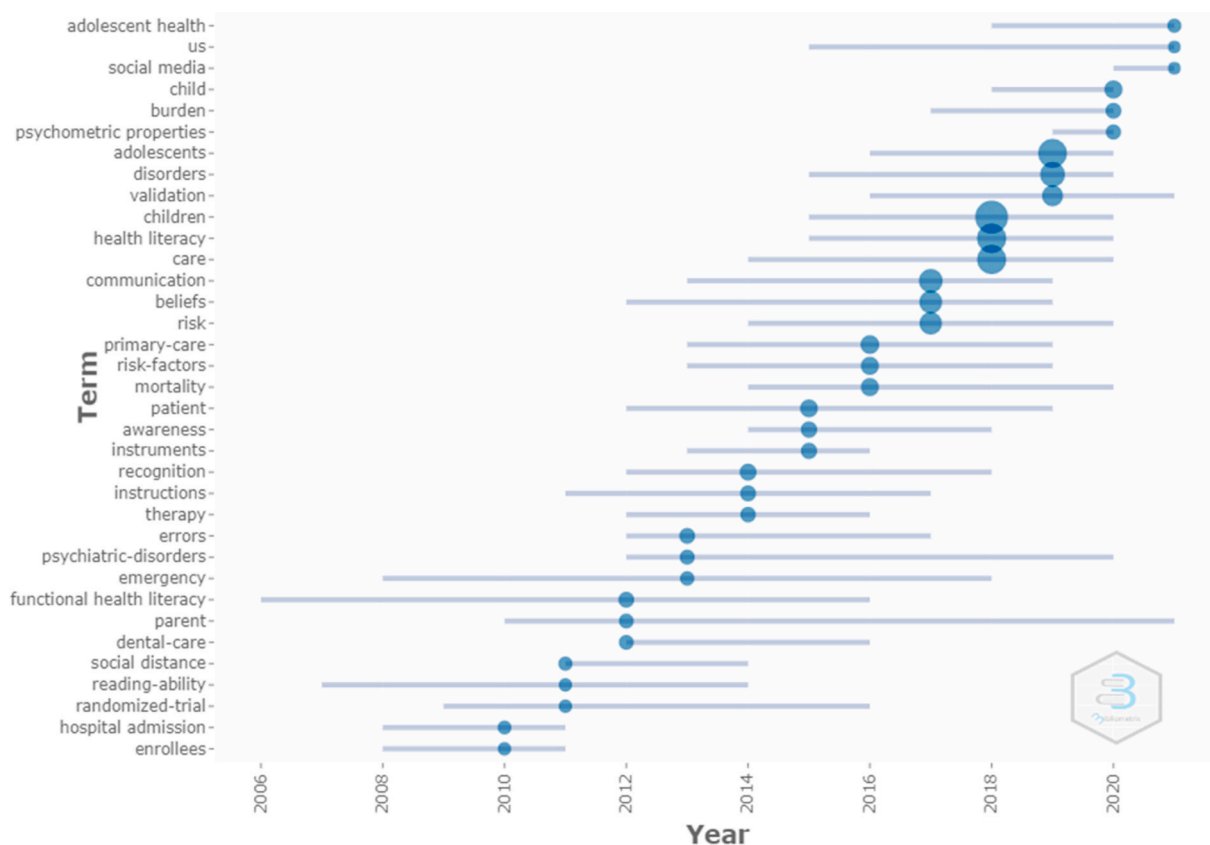


Fig. 7. Trend topics author's keywords plus.

this category and area. As for the keywords, the terms nurse/nursing did not appear, either as KeyWords Plus, or author's keywords.

4. Discussion

The aim of this bibliometric analysis was to analyze the evolution and trends in scientific publications on HL in children and adolescents over the last two decades. The scientometric study covers the Web of Science database and allowed us to know if the number of publications has increased and in what way, if the trends in the different topics covered have evolved, and also to know what type of professionals directed their scientific work to this field. Previous studies, one at the European level [28] and one at the international level [5], analyzed scientific production in the area of HL, but until now, this had not been done in a manner that focused on the area of childhood and adolescence, and without analyzing the approach from the authors affiliation area.

4.1. Knowledge base

With respect to the number of publications, as also observed in the study by Selva-Pareja, the number of publications on the subject of HL strongly increased, in general terms, in the last eight years. This is evidence of the growing interest in this field of study. However, contrary to the findings from Selva-Pareja, in which an increase and decrease were observed in the number of publications in the last ten years, in the present analysis, a constant and exponential increase was found in the last eight years (i.e., 2015) [5]. The finding that 2020 and 2021 had the most publications, exceeding 250 publications since 2019, could be directly associated with the worldwide emergency situation experienced due to the COVID-19 pandemic. Given that children and adolescents were the main population groups affected by the restrictive measures and the home confinement phases, their mental health and physical and emotional well-being were strongly affected, which would explain the greater need to approach health through HL [29].

As for the number of citations, these also experienced a growth that was proportional to the number of publications, which could indicate that the subject of HL is garnering increased attention, either through the citations in publications in the same area, or those that deal with related subjects. In this sense, the most-cited article was the one published by Kelly in 2007, related with mental health and adolescents [30]. Even though the number of citations is not to be ignored (251), it is still far from the two most-cited articles in the general area of HL and health education, in which Nutbeam, the main author, accumulated more than 1800 and 1100 citations in both

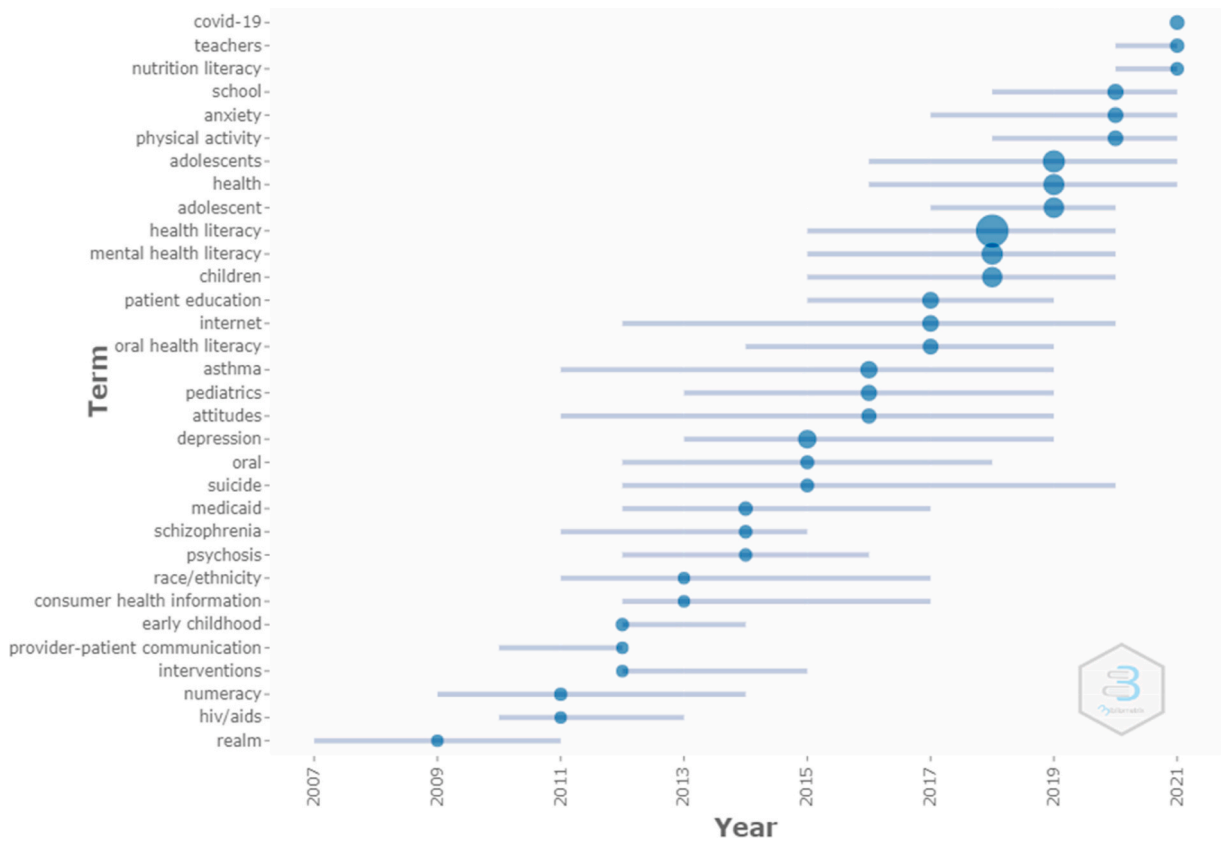


Fig. 8. Trend topics author's keywords.

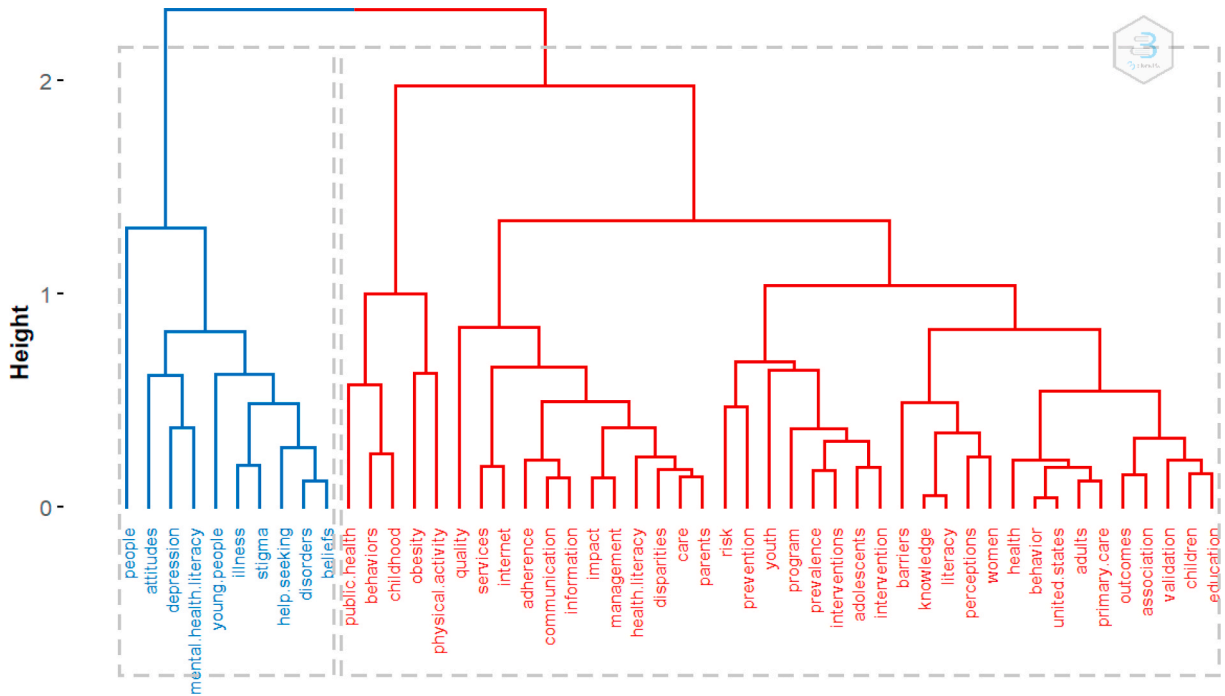


Fig. 9. Topic dendrogram of keywords plus from the multiple correspondence analysis.

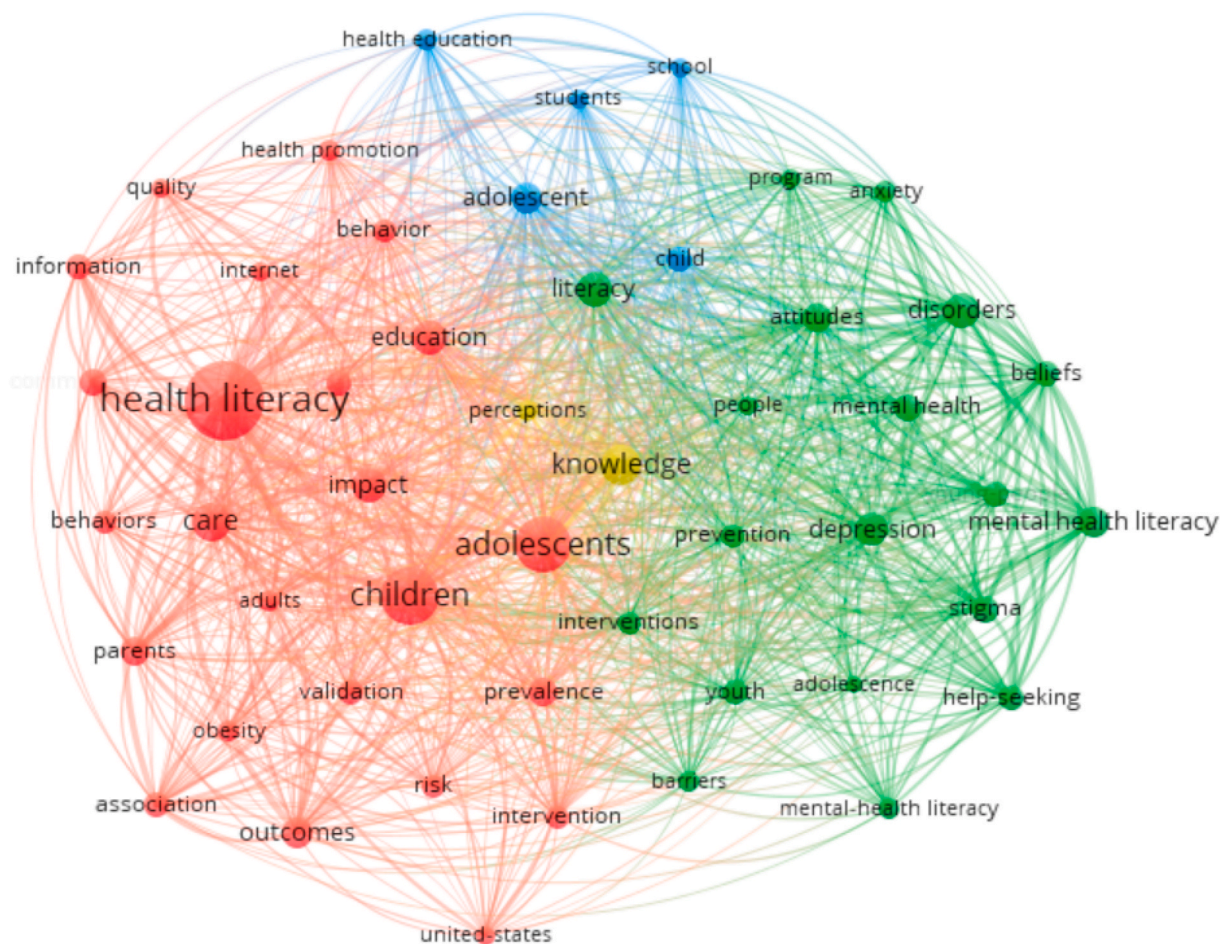


Fig. 10. Network map of 50 keywords with a frequency of a minimum 10 occurrences.

articles. The main explanation for this great difference in the number of citations between Kelly and Nutbeam cannot only be explained by the age of the publications (the two articles by Nutbeam were published in the year 2000 and 2008, respectively), or the subject matter of the article (the Kelly article was focused on mental health of adolescents, while those from Nutbeam dealt with more general HL concepts), but the notoriety of the authors as well, given that Nutbeam is a worldwide leader in the area of HL, being the pioneer in the publication on the subject [5].

As for the journals with the largest number of publications in this area, we underline the International Journal of Environmental Research and Public Health, followed by BMC Public Health and PLOS One. These three journals are found within categories that are not directly associated with the area of children's or adolescents' health, although they are found within the area of public health or multidisciplinary sciences.

As for the countries that contributed the most with scientific publications, the USA exceed Australia, the next country, by more than 30% points, and Canada by more than 38 points. This trend was maintained in the number of citations recorded for each country, but a smaller distance was observed in the number of publications according to affiliation.

As for the publication language, the fact that virtually all the analyzed articles were published in English is not only due to the English being the language of choice for science, but because the first three countries with the most publications were also English-speaking.

4.2. Research hotspots

The evolution of keywords included in this scientometric study is significant. Although it was true that in the first years analyzed the most recurrent terms did not include terms such as adolescent/s, it was in 2014 and 2015 that these started to be utilized as keywords related with HL. These two years coincided with the start of the exponential growth in the number of publications in this area; this indicates that until then, the articles that included HL concepts in childhood and adolescence were perhaps not dedicated exclusively to this subject, but these were articles that in some manner, included these terms without them being the central focus of the publication.

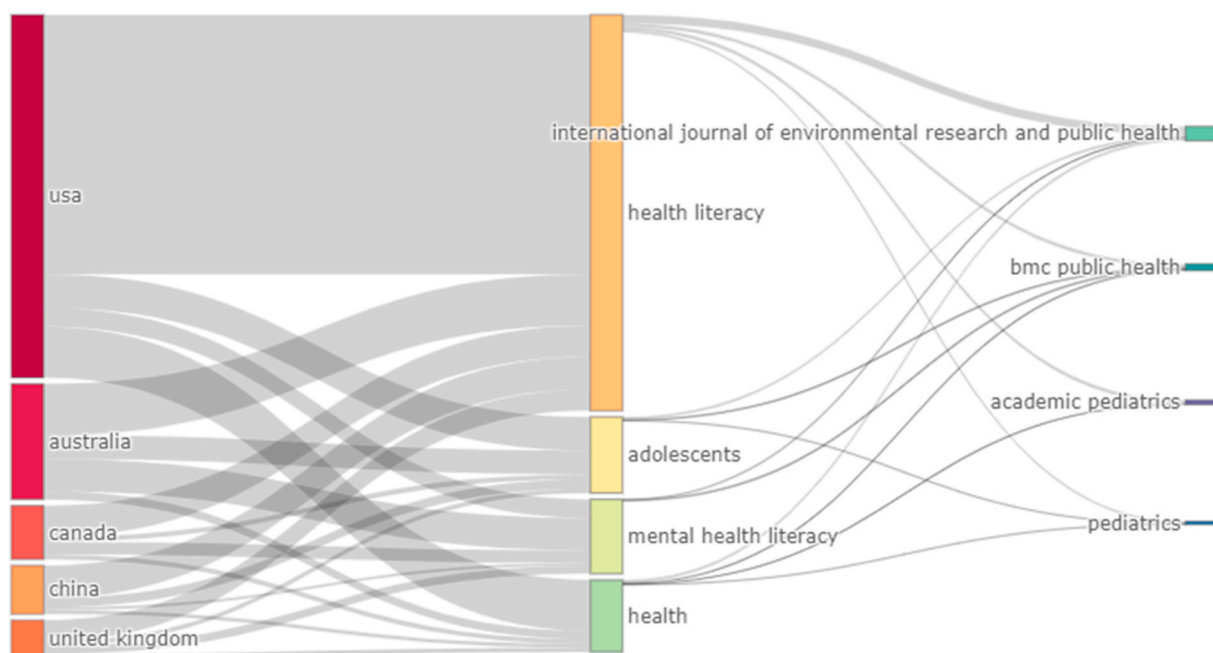


Fig. 11. Three-field plot of interactions between the most productive countries (left), the most relevant author's keywords (center) and the most relevant sources (right).

At the same time, the bibliometric analysis showed that in the last years analyzed, keywords that were directly related with mental health and adolescents began to appear, such as: mental health literacy, anxiety or depression. In parallel, other keywords began to be utilized, such as: internet, social media, school or COVID-19, which would be directed related with the former, as possible causes of the alterations in mental health, as described by different authors [31, 32]. Moving forward with the analysis, the dendrogram showed that indeed a clearly defined cluster was observed (see Fig. 10) in which concepts related with young people, depression, illness, stigma, attitudes or beliefs were clearly associated. This set of keywords was also observed in the network map, in which one of the clusters (in green) contained words related with this sphere of concepts. Also, aside from this set of concepts, another more heterogeneous cluster (in red) was found, which contained keywords that were more related with HL in childhood, such as: childhood, physical activity, obesity or behaviors, although at the same time, other concepts were observed a priori, that were not linked with the subject of childhood or adolescence, such as: women, adults, validation or primary care, among others. This same pattern was also observed in the network map (see Fig. 11), in which a large cluster composed of 24 keywords was found, encompassing different terms which were indirectly related to each other. All these findings together leads us to think that in this area of research, the authors who investigated HL and adolescents did so within the context of mental health, while when research on HL and childhood was conducted, the subjects studied were more heterogeneous. This claim is backed by the fact that in the five most cited articles in this area of research, three focused on adolescents, with two of them especially centered on the subject of mental health and adolescents. It is corroborated once again that mental health is one of the hotspots of HL when it focuses on the study of adolescents.

4.3. Professionals' involvement

One of the objectives of this bibliometric analysis was to analyze the type of professionals involved in the area of HL in childhood and adolescence. The results showed that a heterogeneous group of author affiliations is detected, with psychology and medicine being the main ones involved in this area of study. Nurses are not present in the principal evaluated parameters, making invisible the potential work that many of them perform in educational centers [33].

These results lead us to think that even though articles are being published that in some manner are part of the area of nursing, the visibility in terms of authors and affiliations, or the use of nurse/nursing as a keyword is not frequent. This could result in the work that could be conducted from the area of nursing becoming relegated to the background, rendering the tasks that the nurse could perform in the area of HL in childhood and adolescence, invisible.

Due to the COVID-19 pandemic that began in the year 2020, the need for the nurse to play an important role in the youngest population group was made clear. The school nurse should not only be relegated to providing care to the students when an emergency occurs in the education center, or to monitoring of students with chronic diseases. The school nurse must also be someone who takes the lead in aspects such as the promotion and prevention of health among the youth. HL is a strong tool within reach of nurses, whom once trained to develop and perform their tasks in the area of education, can and must implement it at elementary schools and high schools [34]. Without a doubt, the role of the school nurse is evolving as the situation against COVID-19 progresses [35]. For this

reason, the nurse becomes a key figure for the improvement of the health and well-being of school children through health promotion and empowerment [36].

4.4. Limitations

Among the main limitations of the study, we find that some authors identified HL as health education, which could have resulted in not finding all the articles in this area. Given that HL is a concept with its own identity that was described more than 20 years ago, and is registered as a MeSH term, we opted to search for articles that specifically included the HL concept in this bibliometric study, although HL and health education share some similarities, but are not synonymous concepts.

Another of the limitations of the present study was the non-calculation of the m-Quotient, and the lack of track citation and collaboration analysis. Given the great and varied number of keywords identified in this analysis, we considered the possible results that could be obtained from these calculations. As we also observed a great variability in the number of different countries and institutions that had published in the area of HL in childhood and adolescence, we opted to only perform a bibliometric analysis of the different items included in the present work, leaving more in-depth analyses of more specific concepts, such as HL in mental health, for future studies, for which the calculation of the m-Quotient or the track citation and collaboration would make more sense.

5. Conclusions

This bibliometric analysis identified, for the first time, the scientific production with respect to HL in childhood and adolescence, by encompassing the studies published in the last two decades. The number of publications has increased exponentially in the last eight years coinciding with the COVID-19 pandemic. The publications in this area come from multiple countries worldwide, with the USA and Australia being the most prolific and having the greatest collaboration networks.

The most-utilized keywords were many, but a cluster of terms related with mental health and adolescents was clearly identified.

The main professionals involved in the publications belong to the fields of psychology and medicine. The figure of nurses and their relation with the area of HL in childhood and adolescence, in terms of scientific production, was practically imperceptible, and it was not clear in what manner these health professionals were involved in the research in this field at the level of health education.

Having this information could be useful for knowing at what point research on this subject is currently found, to guide future studies towards less-explored fields or fields that could be more useful to society. At the same time, starting with these results, nurses who are interested in school nursing or educational nursing could find a starting point from which to start exploring and increasing their involvement in this particular area.

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Data availability statement

Data will be made available on request.

Declaration of interest's statement

The authors declare no conflict of interest.

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