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Analyzing the Scientific Evolution of Social Work Using Science Mapping

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Abstract

Objectives: This article reports the first science mapping analysis of the social work field, which shows its conceptual structure and scientific evolution. Methods: Science Mapping Analysis Software Tool, a bibliometric science mapping tool based on co-word analysis and h-index, is applied using a sample of 18,794 research articles published from 1930 to 2012 in 25 main social work journals indexed in the *Journal Citation Reports* of the *Web of Science*. Results: Published research social work field concentrated in eight main thematic areas: children, social services, health care, violence, women, HIV/AIDS, social workers, and education. HIV/AIDS and violence have recently attracted the interest of the social word scientific community, while the rest are classical thematic areas that still attract the interest and efforts of the researchers. Conclusion: This conceptual and empirical analysis shows how research themes have evolved in social work.

Keywords

bibliometrics, science mapping, h-index, social work, information discovering, thematic evolution

Bibliometrics is an important tool to assess and analyze the academic research developed in countries, universities, research centers, research groups, and journals (Holden, Rosenberg, & Barker, 2005a). It provides objective criteria to evaluate research developed by scientists, and, therefore, it is increasingly valued as a tool for assessing scholarly quality and productivity (Moed, De Bruin, & Van Leeuwen, 1995). Bibliometrics contributes to the progress of science in many different ways: allowing assessing progress made, identifying the most reliable sources of scientific publication, laying the academic foundation for the evaluation of new developments, identifying major scientific actors, developing bibliometric indices to assess academic output, and so on. Therefore, bibliometrics has become an essential tool in most scientific areas that aims to progress (medicine, mathematics, economics, computer science, physics, sociology, psychology, etc.), which is also the case with the social work area (Holden et al., 2005a).

In bibliometrics, there are two main approaches to explore a research field: performance analysis and science mapping (Noyons, Moed, & Luwel, 1999a; van Rann, 2004). The former is focused on the citation-based impact of the scientific production. For example, some popular performance metrics are the Journal Impact Factor (Garfield, 1972) and Hirsch index (h-index; Hirsch, 2005). The second approach is focused on the discovering of the conceptual structure of the scientific production by means of science maps. More particularly, it is focused on monitoring a scientific field and delimiting research areas to determine its conceptual structure and scientific evolution (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2011b; Noyons, Moed, & van Rann, 1999b).

Science mapping analysis aims to discover the structural and dynamic aspects of scientific research (Börner, Chen, & Boyack, 2003; Morris & Van Der Veer Martens, 2008; Noyons et al., 1999a). Science maps or bibliometric maps can be built by means of co-word analysis that uses the most important words or keywords of research documents of a field to study its conceptual structure (Callon, Courtial, Turner, & Bauin, 1983). Although an expert on a particular research field could discover and analyze its different subtopics, it is obvious that the high volume of research documents that are available makes this a difficult and daunting task to be carried out effectively and efficiently. For this reason, it would be helpful and necessary to have the support of intelligent techniques to make easier the analysis of a research area by automatically classifying its research outputs/results into different themes and topics. That

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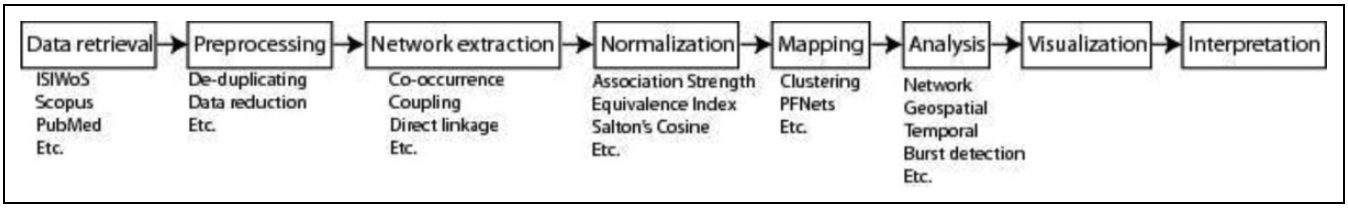

Figure 1. Work flow of science mapping analysis.

is, scientific support tools to uncover the conceptual structure of a research area of interest are worth and necessary. Science mapping tools play that important role within bibliometrics.

As aforementioned, there exists a great interest in developing bibliometric studies in the scientific field of social work to help the understanding of its scientific progress. Most of these bibliometric approaches are mainly focused on the performance analysis based on publication and/or citation analysis applied to journals (Hodge & Lacasse, 2011; Holden, Rosenberg, Barker, & Liol, 2010; Sellers, Perry, Mathiesen, & Smith, 2004; Spivey & Wilks, 2004; Thyer, 2010), researchers (Slater, Scourfield, & Sloan, 2012; Thyer & Bentley, 1986), articles (Blyth et al., 2010; Hodge, Lacasse, & Benson, 2012; Holden, Rosenberg, & Barker, 2005b), or faculties (Bloom & Klein, 1995; Green & Baskind, 2007; Lacasse, Hodge, & Bean, 2011). However, no science mapping analysis has been conducted in the social work field to complete those previous bibliometric studies. The use of science mapping tool could provide us new findings and important information on the dynamic of social work as a scientific discipline, for example, how the social work knowledge base has been formed, which are its scientific knowledge strengths and which topics could be the knowledge base of the social work discipline in the future. Therefore, the use of science mapping tools to analyze the social work field is still in need.

In this article, the first science mapping analysis of the whole social work research field is presented over time. This analysis discloses the field's structure and evolution. The results show which themes have attracted the interest of the social work scientific community from its origins, according to the articles published in the major social work journals, the themes with the highest impact, as well as potential themes for future research. Other relevant research questions that could be answered are what thematic areas have vertebrate the research conducted in the social work discipline, what were the key themes or marginal themes in the different periods of scientific development of the social work area, how different social work research themes are conceptually related in different time periods, what research themes have achieved the greatest impact and attracted the greater interest of the social work scientific community in different time periods, and what thematic areas have achieved the greatest impact and visibility. To do that, the social work research documents published during the period 1930–2012 in the most important social work journals, according to the Thomson Reuters's *Journal Citation Reports* (JCR) and *Web of Science* (WoS), are used. The science mapping analysis is performed using the science mapping software tool Science Mapping Analysis Software Tool (SciMAT; Cobo et al., 2012b) designed and developed by the SECABA Laboratory at the University of Granada (Spain).

Science Mapping Analysis

Science mapping or bibliometric mapping is a spatial representation of how disciplines, fields, specialties, and documents or authors are related to one another (Small, 1999). Science mapping analysis has been widely used to show and uncover the hidden key elements (documents, authors, institutions, topics, etc.) in different research fields (Bailón-Moreno, Jurado-Alameda, & Ruíz Baños, 2006; Cobo et al., 2012a; Gao-Yong, Ji-Ming, & Hui-Ling, 2012; López-Herrera et al., 2012; Peters & Van Raan, 1993; Porter & Youtie, 2009; Tang & Shapira, 2011; Van Eck & Waltman, 2007). The general work flow in a science mapping analysis has a number of different steps (Börner et al., 2003; Cobo et al., 2011a; Cobo et al., 2012b; see Figure 1): data retrieval, preprocessing, network extraction, normalization, mapping, analysis, and visualization. At the end of this process, the analyst has to interpret and obtain conclusions from the results.

There are several possible online bibliographic databases to retrieve data, the most important ones being the WoS (www.webofknowledge.com), Scopus (www.scopus.com), and Google Scholar (scholar.google.com). These databases do not cover the scientific fields and journals in the same way and have their respective advantages and limitations, which are somewhat discipline dependent (Bar-Ilan, 2010; Falagas, Pitsouni, Malietzis, & Pappas, 2008). WoS is the world's leading scholarly literature database in the sciences, social sciences, arts, and humanities, and it also contains proceedings of international conferences, symposia, seminars, colloquia, workshops, and conventions. It is a reference database that provides the most complete current and retrospective quality coverage in the sciences, social sciences, arts, and humanities, going back to 1900. Scopus has the second largest coverage, in terms of citations. Many authors argue that Google Scholar seems to offer greater access to relevant, citable content in the social sciences (Auffhammer, 2009; Harzing & van der Wal, 2008; Hodge et al., 2012; Jacobs, 2009). However, Google Scholar is less rigorous and captures more noise (e.g., nonacademic citations), and it is not adequate for our study mainly because as pointed out in Harzing and van der Wal (2008, p. 65), "Google Scholar does not perform as well for older publications as these publications and the sources that cite them have not (yet) been posted on the web."

Usually, science mapping analysis cannot be applied directly to the retrieved data from the bibliographic sources because they contain errors. Thus, to improve the quality of the data, a preprocessing step needs to be applied. Different preprocessing methods can be applied, among which it is worth mentioning those that detect duplicate and misspelled items, time slicing (it consists of dividing the data in different periods of time or slices of time, in order to analyze the evolution of the research field under study), and data reduction. Maybe the most important preprocessing method is deduplicating because it is usual to find items spelt differently that represent the same entity. For example, it is common to find the same author's name written in different ways (e.g., Smith, T. E.; Thomas E. Smith). Data reduction is carried out in order to select the most representative data for the analysis, so it is done after the deduplicating process.

Once the data have been preprocessed, a network is built using a unit of analysis, as for example, journals, documents, cited references, authors, author's affiliation, and descriptive terms or words (Börner et al., 2003). Usually, words are the most common. The words can be selected from the title, abstract, author's keywords, the body of documents, or some combinations of them. Furthermore, we can select the indexing provided by the bibliographic data sources (e.g., ISI Keywords Plus) as words to analyze. Several relations among the units of analysis can be established, such as co-occurrence, coupling, or direct linkage. A co-occurrence relation is established between two units (authors and terms or references) when they appear together in a set of documents, that is, when they cooccur throughout the corpus. A coupling relation is established between the documents when they have a set of units in common. A direct linkage establishes a relation between documents and references, particularly a citation relation. In addition, different aspects of a research field can be analyzed depending on the selected units of analysis. For example, using words a co-word analysis can be performed to obtain the conceptual structure of a discipline and the main topics researched in that knowledge field.

When the network of relationships between the selected units of analysis has been built, a normalization process is needed to correct the data for differences in the number of occurrences of units of analysis (van Eck & Waltman, 2009). In bibliometrics, the normalization process is carried out by using similarity measures (van Eck & Waltman, 2009), such as *Salton's cosine*, *Jaccard's index*, or *equivalence index* (Cobo et al., 2012b). Once the normalization process of the network is completed, different techniques could be applied to build science maps, such as *principal component analysis* or *clustering algorithms* (Börner et al., 2003).

Analysis methods of science maps allow the discovery of useful knowledge from data (Cobo et al., 2011b). For example, a *network analysis* (Cook & Holder, 2006) allows to perform a statistical study over the generated maps in order to show different measures of the relationship or overlapping of the different detected clusters, or *a temporal or longitudinal analysis* (Garfield, 1994) aims to show the conceptual, intellectual, or social evolution of a research field, discovering patterns, trends, seasonality, and outliers.

Visualization techniques are used to represent both science maps and the results of the different analysis applied. The visualization technique employed is very important in order to allow a good understanding and better interpretation of the output. For example, the networks resulting from the mapping step can be represented with *thematic networks*; the clusters detected in a network can be categorized using a *strategic diagram*; the evolution of detected clusters in successive time periods (temporal or longitudinal analysis) can be represented by means of *thematic areas.* Furthermore, visualization can be improved using the results of a performance analysis, which allows us to add a third dimension to the visualized elements. For example, a strategic diagram could show spheres where its volume could be proportional to the citations achieved by the documents of cluster. For more information on visualization tools, see Cobo, López-Herrera, Herrera-Viedma, and Herrera (2011a).

Finally, when the science mapping analysis is completed, the analyst has to interpret the results and maps using their experience and knowledge. In the interpretation step, the analyst looks to discover and extract useful knowledge that could be used to make decisions.

SciMAT

Science mapping analysis can be carried out with different software tools. A list of important science mapping software tools were analyzed in Cobo et al. (2011b) Bibexcel, CiteSpace II, CoPalRed, IN-SPIRE, Loet Leydesdorff's Software, Network Workbench Tool, Science of Science (Sci2) Tool, VantagePoint, and VOSViewer. SciMAT was presented in Cobo et al. (2012b). It is a powerful science mapping software tool that integrates into a single software tool the majority of the advantages of available science mapping software tools. SciMAT was designed according to the work flow shown in Figure 1 and also using the science mapping analysis approach presented in Cobo et al. (2011a). SciMAT can be freely downloaded, modified, and redistributed according to the terms of the GPLv3 license. The downloading of the executable file, user guide, and source code can be done via the following website (http://sci2s.ugr.es/scimat).

The science mapping analysis approach defined in Cobo et al. (2011a) is based on a co-word analysis (Callon et al., 1983) and the h-index (Hirsch, 2005), which are applied in a longitudinal framework. The construction of maps using co-word analysis in a longitudinal framework, on the one hand, provides information on the themes or topics of a research field and, on the other hand, enables to analyze and track the evolution of a research field throughout consecutive periods of time (Garfield, 1994). The h-index is used to measure the impact of the different identified themes and thematic areas. Four phases are established to analyze a research field in a longitudinal framework:

1. *Detection of research themes:* This phase summarizes the first five steps of the work flow of mapping science analysis presented in Figure 1. In each studied period of time, the corresponding research themes are detected by

applying the co-word analysis on raw data for all the published documents on the research field, followed by a clustering of keywords to topics/themes using the simple centers algorithm (Coulter, Monarch, & Konda, 1998). Formally, the methodological foundation of co-word analysis is based on the idea that the co-occurrence of keywords describes the content of the documents in a corpus (i.e., the set of documents belonging to the research field under study; Callon, Courtial, & Laville, 1991). These co-occurrence of keywords can be used to build co-word networks (Krsul, 1998) and these networks can be associated with research themes using clustering tools. The co-word analysis is based on the computation of the co-occurrence frequencies of keywords. The co-occurrence frequency of two keywords is extracted from the corpus of documents by counting the number of documents in which the two keywords appear together. Usually, when co-occurrence data are used, first a transformation function is applied in order to normalize data and, then, similarities from the data are obtained (van Eck & Waltman, 2009). Once the co-word network is built, each arc will have as its weight the co-occurrence value of the linked terms. Next, the weight of each edge is transformed in order to normalize it (extract the similarity relations between terms) using their keyword and co-occurrence frequencies. The similarity between keywords is obtained using the equivalence index (Callon et al., 1991; Michelet, 1988), $e_{ij} = \frac{c_{ij}^2}{c_i c_j}$, where c_{ij} is the number of documents in which both keywords i and j co-occur, and and c_i and c_j represent the number of documents in which each one appears. Note that when two keywords always appear together, the equivalence index equals unity; while it is zero when they are never associated. Research themes are identified by means of a process of clustering which locates the subgroups of keywords that are strongly linked to each other and which correspond to centers of interest or research themes that are the object of significant investment by researchers (Callon et al., 1991).

2. *Visualizing research themes and thematic networks:* In this phase, the detected themes are visualized by means of two different visualization instruments: strategic diagram and thematic network. Each theme is characterized by two parameters defined on its respective network (Callon et al., 1991): *centrality* and *density*. A strategic diagram is achieved by plotting themes using two dimensional spaces based on their centrality and density values. Centrality measures the degree of interaction of a theme with other themes, and it is defined as $c = 10 \times \sum e_{kh}$, with k a keyword belonging to the theme and h a keyword belonging to other themes. The centrality of a theme can be seen as a measure of the importance of that theme in the development of the entire research field analyzed. Density measures the internal strength of the theme, and it is defined as $d = 100\frac{\sum e_{ij}}{w}$, with i and j keywords belonging to the theme and w the number of keywords in the theme. The density of a research theme can be understood as a measure of the development of theme. For example, suppose a co-word network composed of 16 nodes as it is shown in Figure 2, in which three different themes were detected (nodes under a circular shadow) and 3 nodes were free, so that they might be associated with any theme. Density is computed using the intracluster edges, that is, edges linking nodes of the same theme (solid edges inside the circular shadow). For instance, the density values of Theme A, Theme B, and Theme C, shown in Figure 2, are 46.67, 30, and 40, respectively. On the other hand, centrality is computed using the extracluster edges, that is, edges that connect nodes of a specific theme with nodes that do not belong to it (dotted lines). In this sense, the centrality values of the Theme A, Theme B, and Theme C, shown in Figure 2, are 17, 4, and 2, respectively. Then, using a strategic diagram to represent the themes of a research field, a classification into four groups is obtained (see Figure 3; Callon et al., 1991; Cobo et al., 2011a; Coulter et al., 1998):

   a. *Motor themes:* The placement of the motor themes is the upper right quadrant and they present both strong centrality and high-density values. They are both well developed and important or central for the structuring of a research field.
   b. *Highly developed and isolated themes:* The placement of the highly developed and isolated themes is the upper left quadrant. They have well-developed internal ties but unimportant external ties and so are of only marginal importance for the field. These themes are very specialized and peripheral in nature.
   c. *Emerging or declining themes:* The placement of the emerging or declining themes is the lower left quadrant and they present both low density and low centrality. They are both weakly developed and marginal with respect to the research field, mainly representing either emerging or disappearing themes.
   d. *Basic and transversal themes:* The placement of the basic and transversal themes is the lower right quadrant. These themes are important for the development of a research field but internally they are not sufficiently developed.

Note that the addition of a third dimension can enrich the strategic diagrams as this will allow for the representation of further informative data (Cobo et al., 2011a). So, for example, the themes could be represented using spheres with volume proportional to another alternative measure, such as the number of documents associated with the theme or the total number of citations to the documents associated with the theme. On the

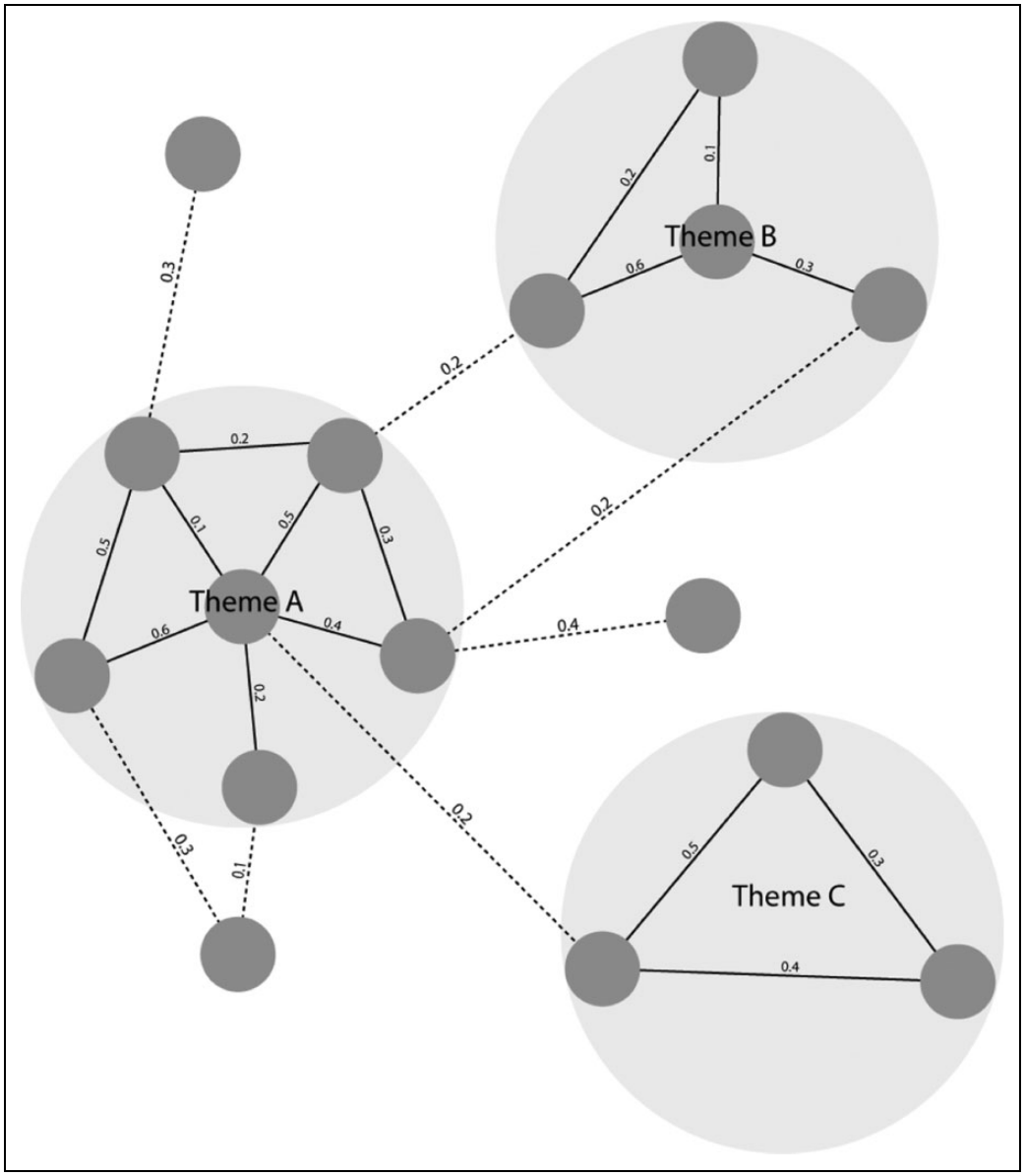

Figure 2. A co-word network to compute centrality and density.

other hand, the keywords of a detected theme together with their interconnections draw a network graph, which is called a thematic network. Each thematic network is labeled using the name of the most significant keyword in the associated theme (usually its most central keyword). An example of a thematic network representing a theme is drawn in Figure 4. Here, several keywords are interconnected, where the volume of the spheres is proportional to the number of documents corresponding to each keyword, the thickness of the link between two spheres i and j is proportional to the equivalence index e_{ij}. The whole network of interconnected themes can also be represented.

1. *Discovery of thematic areas.* In this phase, the evolution of the research themes is analyzed to detect the thematic areas of the research field, their origins, as well as their interrelationships. A thematic area is defined as a group of themes evolving across different periods of time. Note that, depending on the interconnections among them, one theme could belong to a different thematic areas, or could not come from any. An evolution map is built in order to detect the thematic areas. So, if the raw data are divided into different consecutive periods of years, the evolution of the research field could be analyzed in a longitudinal study. An inclusion index is used to detect conceptual nexus between research themes of different periods of time (Cobo et al., 2011a). Let T^t be the set of detected themes of period of time t, with $U \in T^t$ representing each detected theme in the period of time t. Let $V \in T^{t+1}$ be each detected theme in the next period of time $t + 1$. It is said that

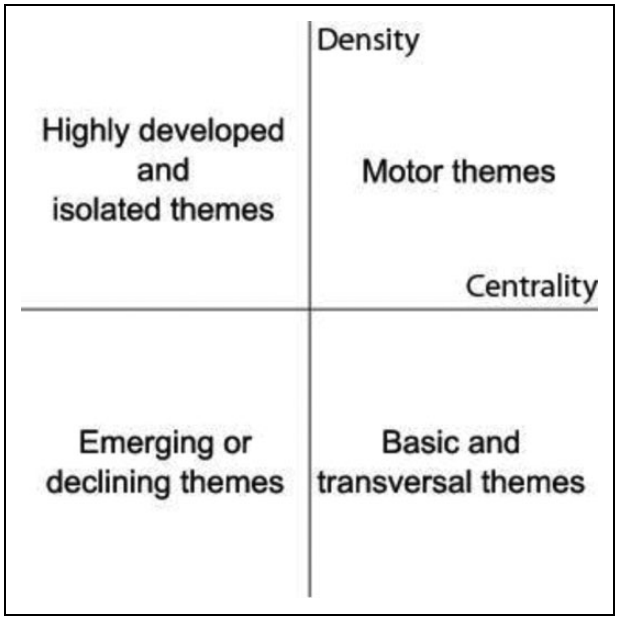

Figure 3. Meaning of a strategic diagram.

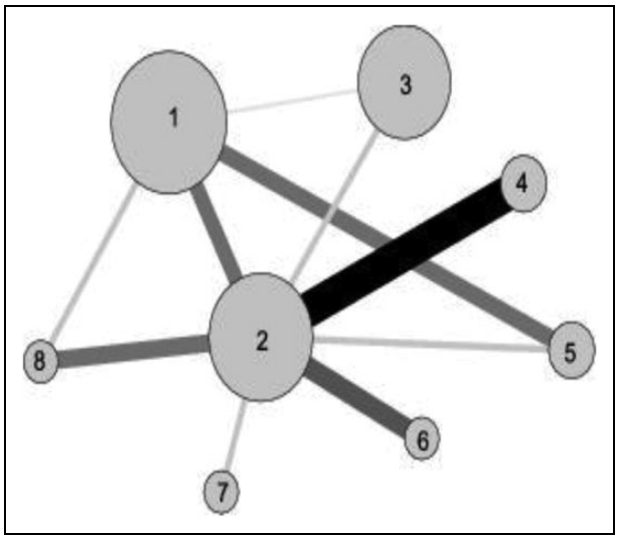

Figure 4. An example of thematic network.

there is a thematic evolution from theme U to theme V if there are keywords presented in both associated thematic networks and, therefore, V can be considered a theme evolved from U. Keywords $k \in U \cap V$ are considered a *thematic nexus*. This can be used to build evolution bibliometric maps by linking themes in T^t with themes in T^{t+1} through the thematic nexus. The importance of a thematic nexus can be weighed by the elements in common to the two themes. An inclusion index is used to carry out this task: Inclusion Index $= \frac{\#(U \cap V)}{\min(\#U, \#V)}$. The inclusion index will be equal to 1 if the keywords of Theme V are fully contained in the Theme U. For example, suppose that we have two different consecutive periods (Period 1 and Period 2) under study, with three detected themes in the first one and four in the second (together with their associated thematic networks). In Figure 5, an example of a thematic evolution bibliometric map is shown. The solid lines (Lines 1 and 2) mean that the linked themes share the same name, both themes are labeled with the same keywords, or the label of one theme is part of the other theme (name of theme $\in$ {thematic nexuses}). A dotted line (Line 3) means that the themes share elements that are not the name of the themes (name of theme $\notin$ {thematic nexuses}). The thickness of the edges is proportional to the inclusion index, and the volume of the spheres is proportional to the number of documents associated with each theme. Vertical lines separate the different periods of time. In Figure 4, two different thematic areas delimited by different color shadows can be observed, one composed of themes Theme A^1 and Theme A^2, and the other composed of themes Theme B^1, Theme B^2, and Theme C^2. Theme D^1 is discontinued, and Theme D^2 is considered a new theme.

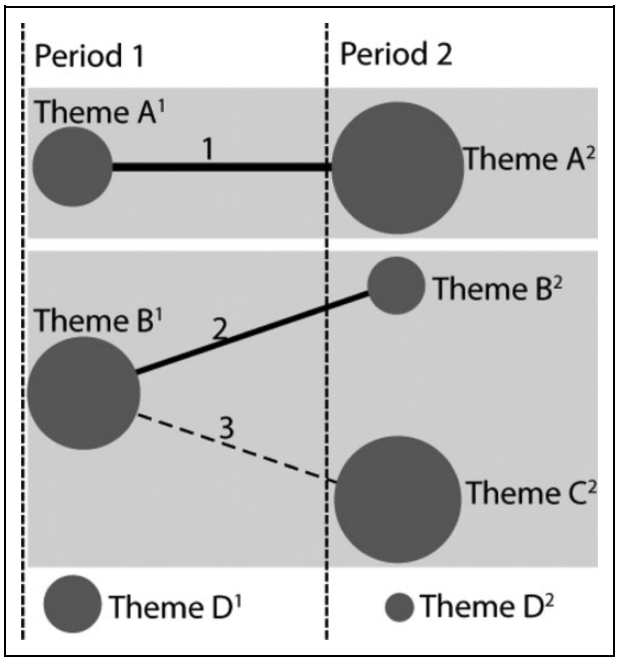

Figure 5. Thematic evolution map.

2. *Performance analysis:* In this phase, the relative contribution of themes and thematic areas to the whole research field is measured using bibliometric performance indicators. In such a way, the most prominent, productive, and highest impact subfields can be established. This performance analysis is developed as a complement to the analysis step of the science mapping work flow shown in Figure 1. Some of the bibliometric indicators to use are number of published documents, number of citations, and different types of h-index (Alonso, Cabrerizo, Herrera-Viedma, & Herrera, 2009; Martínez, Herrera, López-Gijón, & Herrera-Viedma, In Press).

SciMAT presents three different modules to develop the different steps of the science mapping work flow and also the previous science mapping approach: (i) a module dedicated to the management of the knowledge base and its entities (document, author, affiliation, keyword, reference, author of reference, source of reference, period of time, ... etc.), (ii) a module responsible for carrying out the science mapping analysis, and (iii) a module to visualize the generated results and maps. Knowledge base contains the information on the set of scientific documents of the research field under study, as for example, authors, keywords, journal, references, and so on. SciMAT allows importing the data from different bibliographical sources such as WoS and Scopus (RIS format), and cleaning and fixing the possible errors in the five analysis entities considered: author, keyword, reference, author of reference, and source of reference. In the knowledge base, the time slicing process is also established using the period of time entity. On the other hand, the module to carry out the science mapping analysis is implemented through a wizard, where the user can select the methods and algorithms to apply in each step. Although that wizard has been implemented according to the steps of the science mapping work flow described before, some steps are applied in a different order. For example, the deduplicating and time slicing preprocessing has to be carried out first, using the knowledge base manager. So, the work flow of the wizard can be divided into four main stages: (i) selection of the periods of time and unit of analysis, (ii) creation and normalization of the network, (iii) application of a cluster algorithm to get the map, and (iv) performing a set of analysis (e.g., network analysis based on centrality and density criteria, performance analysis based on documents or h-index, evolution bibliometric maps). For more information see Cobo et al. (2012b).

Method

Data Sources

The JCR, provided by Thomson Reuters, is used to construct an adequate list of the core social work journals. The JCR is the most important journal database and provides a yearly ranking of prominent journals in each scientific category, among which the social work category is listed. This ranking is based on the popular journal impact factor (Garfield, 1972). As it is pointed out by Hodge and Lacasse (2011, p. 580) ''Indeed, the JCR is widely recognized as the de facto standard for assessing journal quality across the sciences.'' JCR journals attract the most important contributions of the different scientific disciplines because JCR articles are highly weighted criteria in tenure, promotion, and other professional decisions (Hodge & Lacasse, 2011; Seipel, 2003). Thus, articles accepted in JCR journals are widely viewed as evidence of advances achieved in a scientific discipline. The latest update of the JCR (2012) listed 38 prominent journals in the social work category. However, it is clear that in social work academic circles there is a widespread impression that several JCR social work journals should not be considered true disciplinary journals because their mission and aims are not fully oriented to the social work discipline. For example, extradisciplinary journals like the *Journal of Community Psychology* or the *American Journal of Community Psychology* and interdisciplinary journals like *Family Relations* or *Child Abuse and Neglect* are not usually considered to be social work disciplinary journals. Following this search strategy (Hodge & Lacasse, 2011), a list of 80 disciplinary journals were defined. Within that list it is possible to identify 19 disciplinary journals that were indexed in the social work category of JCR published in 2008. All of them but the *Indian Journal of Social Work* are indexed in the social work category published recently in the 2012 JCR. We have completed that list with six new disciplinary journals indexed in the 2012 JCR social work category. Some of these new disciplinary journals indexed in the JCR 2012 (*Child and Family Social Work*, *European Journal of Social Work*, *Australian Social Work*, and *Social Work in Public Health*) were listed as disciplinary journals in Hodge & Lacasse, 2011), although at that moment they were not indexed in the JCR. Summarizing, 25 social work journals were used in the present study (see Table 1), which were indexed in the social work category of JCR and were selected following seminal articles on how delineating the social work journals (Hodge & Lacasse, 2011; Thyer, 2005, 2010).

To obtain the publications of these journals and their citations, the bibliographic database WoS is used. This bibliographic database provides access to current and retrospective information on the most prestigious, high-impact research journals in the world, and, therefore, it presents the most complete retrospective quality coverage of all scientific disciplines, including the social work discipline (Center for Research Libraries, 1949). A database with this property is appropriate for developing a rigorous science mapping analysis of social work with a longitudinal perspective.

Sample

The first social work articles indexed in the WoS appeared in 1930. Therefore, the sample for this study consists of articles published in the WoS during the period 1930–2012. This sample is further restricted to full-length articles, including literature review articles (e.g., book reviews, editorials, corrections, letters, and notes were excluded). An advanced search was performed on the WoS for articles published in the previous list of 25 social work journals for this period of time. The raw data include 18,794 documents and their citations up to June 2013. The distributions of the documents by years and social work journals are shown in Figure 6 and Table 1, respectively. Seven journals concentrate more than 60% of the scientific production considered in the present study: *Social Work*, *British Journal of Social Work*, *Social Service Review*, *Social Work in Health Care*, *Indian Journal of Social Work*, *Clinical Social Work Journal*, and *Research on Social Work Practice*. For each document, the complete information provided by the WoS was retrieved, that is, authors, affiliations, title, abstract, keywords, keywords plus, references, citations, source, and so on.

Table 1. List of Core Journals in the Social Work Field.

Journal	First Edition	Number of Articles Retrieved	Impact Factor (2012 JCR)
Research on Social Work Practice	1991	958	1.355
Journal of Social Work	2008	118	1.233
Health & Social Work	1994	537	1.178
Social Service Review	1956	1,559	1.140
British Journal of Social Work	1971	1,794	0.995
International Journal of Social Welfare	1991	532	0.956
Social Work	1956	2,997	0.867
Child & Family Social Work	2007	265	0.831
Social Work Research	1994	398	0.800
Social Work in Health Care	1975	1,407	0.698
Journal of Social Work Practice	1994	383	0.695
International Social Work	1995	722	0.653
Administration in Social Work	1980	817	0.566
Journal of Social Work Education	1985	852	0.548
European Journal of Social Work	2008	164	0.517
Australian Social Work	2009	124	0.500
Clinical Social Work Journal	1974	1,053	0.494
Journal of Social Service Research	1994	446	0.449
Families in Society-the Journal of Contemporary Social	2005	457	0.442
Affilia-Journal of Women and Social Work	1994	453	0.383
Smith College Studies in Social Work	1930	908	0.361
Social Work in Public Health	2009	155	0.354
Asia Pacific Journal of Social Work and Development	1995	242	0.107
Ljetopis Socijalnog Rada	2007	121	0.095
Indian Journal of Social Work	1975	1,332	0.014 (JCR-2011)

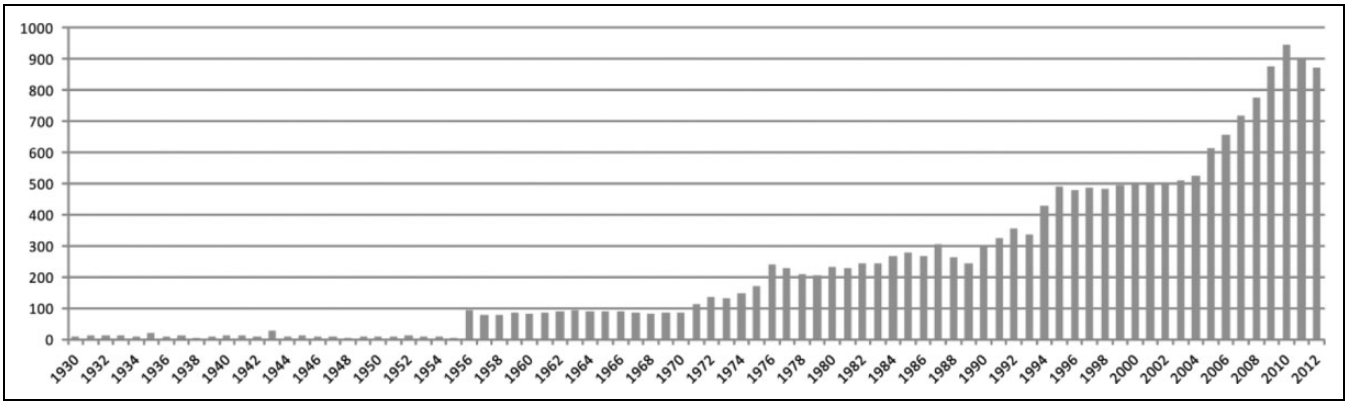

Figure 6. Distribution of documents retrieved by years.

Procedure

The raw data were downloaded from WoS as plain text and entered into SciMAT to build the knowledge base for further science mapping analysis. Thus, it contains the bibliographic information stored by WoS per each research document. For instance, title, abstract, keywords (both author keywords and ISI Keywords Plus), source, issue, number, pages, doi, citations count, authors, affiliations, references, and so on. To improve the data quality, a deduplicating process was applied (the author's keywords and the ISI Keywords Plus were used as unit of analysis). Those words representing the same concept were grouped. Because some documents did not contain any keywords, a manual addition of descriptive keywords matching title words with keywords present in the knowledge base was carried out for completeness purposes. Furthermore, some meaningless keywords in this context, such as stop words or words with a very broad and general meaning, for example, Social Work, were removed. A total number of 22,140 keywords were used in this study. Table 2 shows the top keywords with frequency in the corpus higher than 300.

Next, using the period manager of SciMAT, the periods of time of the longitudinal analysis were established. To avoid data smoothness, the best option would be to choose periods spanning only 1 year. In our case, in a span of 1 year it was found that there was not enough data for a good performance

Table 2. Top Keywords of the Study.

Keywords	Frequency
Health care	1,459
Children	1,242
Families	943
Women	829
Mental health	739
Services	729
Social workers	706
Perspective	505
Education	499
Adolescents	483
Policy	467
Social work education	399
Community	395
Stress	394
Welfare	386
Outcomes	354
Risk	348
Attitudes	335
Depression	329
Parents	325
HIV/AIDS	322
Poverty	317
Social support	315
Psychotherapy	311
Child welfare	301
Mothers	300

of science mapping analysis. Therefore, the whole time frame (1930–2012) was divided into the following three consecutive periods of time: 1930–1989, 1990–2002, and 2003–2012. In these periods of time, 5,725, 5,676, and 7,393 documents indexed in the WoS were found, respectively. The first period of time encompasses a greater number of years compared to the other two periods of time, but it was decided to make this distribution of years because (i) in the early years of research in the social work field there were few documents per year and, in order to detect correctly the themes of a discipline it is necessary to define more or less homogeneous periods of time with respect to the number of documents (Cobo et al., 2012a, 2012b; López-Herrera et al., 2012); (ii) experience from previous studies of science mapping analysis (Cobo, Chiclana, Collop, de Oña, & Herrera-Viedma, In Press; Cobo et al., 2011a, 2011b, 2012a, 2012b) indicates that an excessive number of periods of time hampers the mapping and interpretation of thematic areas; and (iii) although the three periods of time could be distributed in an alternative way, we believe that it would be interesting for the research community to have an analysis of how the social work discipline has evolved in the last two decades.

When the knowledge base is cleaned up and the groups and periods of time are defined, the next step is to configure the experiment. To perform the analysis, the following configuration in SciMAT was established: word as the unit of analysis, co-occurrence analysis as the tool to build the networks, equivalence index as the similarity measure to normalize the networks, and the simple centers algorithm as the clustering algorithm to detect the clusters or themes. The bibliometric measures chosen were the citation total and the h-index calculated for the documents mapped to each theme. For each period of time, two important parameters were also configured, the threshold of the keyword frequency and the threshold of the co-occurrence frequency: (6, 4), (10, 5), and (20, 7), respectively. The thresholds were increased in each period of time because the number of keywords managed in each period of time was growing significantly from 2,782 to 6,033 and to 13,325, respectively. Thus, the threshold values must be adjusted in order to find the appropriate thematic granularity to allow interpreting the results (Cobo et al., 2012a).

In what follows, the results of present study are shown: The social work research themes detected for each period of time and the thematic evolution of the social work field through periods of time.

Results

Social Work Research Themes

In order to analyze the most highlighted themes of the social work field for each period of time, a strategic diagram is provided. In each diagram, the sphere size is proportional to the number of documents associated with each research theme, and corresponding citations in brackets.

First period (1930–1989). According to the strategic diagram presented in Figure 7, during this period of time the social work research activity pivots on 12 themes, with the following 7 major themes (motor themes plus basic themes): children, social workers, services, patient, social services, administration, and women. The performance measures of the period themes are given in Table 3: the number of documents, the citations to those documents, and h-index of the documents. According to the performance measures, the following six relevant themes are highlighted: children, social workers, services, women, social services, and community. Children is a motor theme of this period of time and it represents the research conducted on children with mental illness, children protection, foster care, children of gays and lesbian, divorce (how to affect . . .), abuses/incest. It is the most important and developed research theme of the social work discipline during the period of time, with the largest number of documents, citations, and highest research impact (h-index = 28). On the other hand, social workers is a basic and transversal theme, and it is the second most important theme of this period of time, also presenting high scores in performance measures. This theme comprises research conducted on different aspects of the social workers, such as bureaucracy, elementary techniques, training, responsibility, how to prepare a good professional, and, moreover, how is the collaboration between social workers and physicians. According to the performance measures, the research achieved on the themes services, women, social services, and community is also very important in this period of time. Services refers to the research conducted on social work agencies

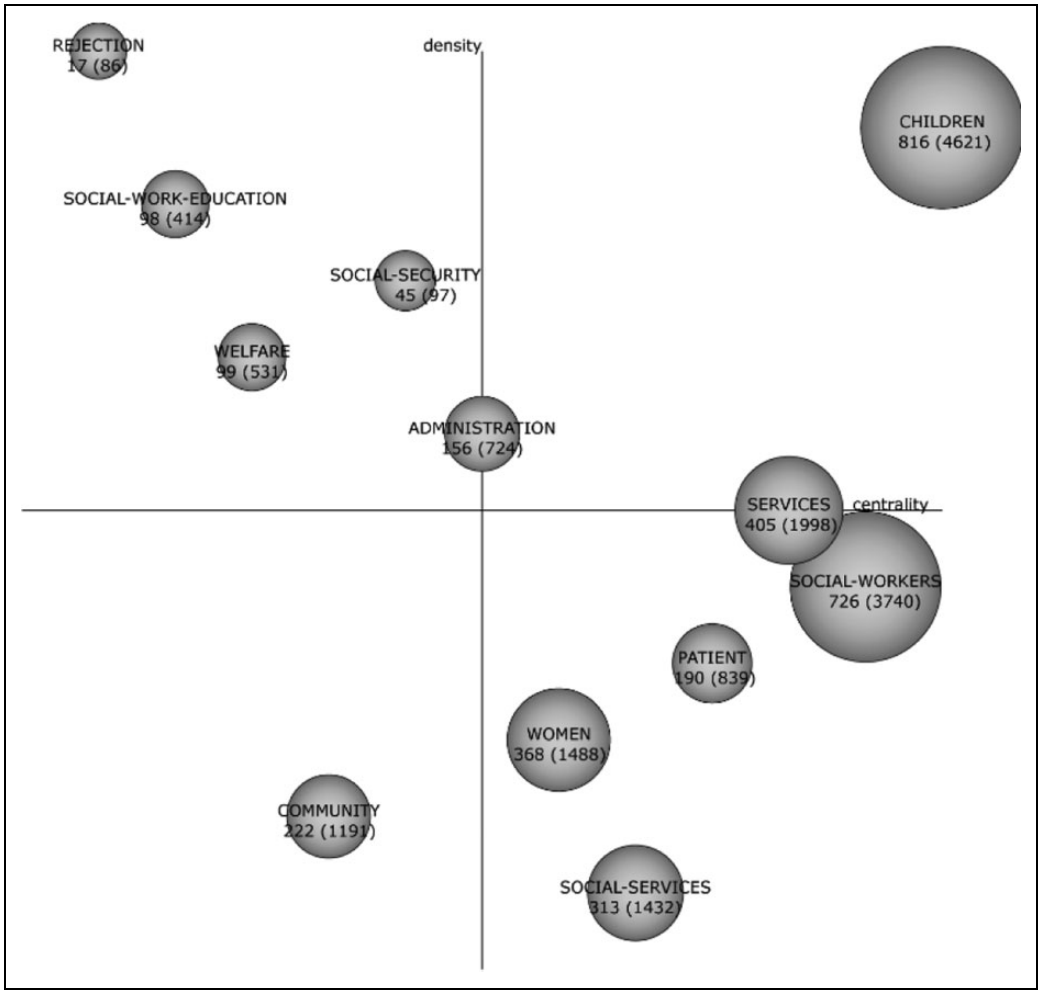

Figure 7. Strategic diagram for the period 1930–1989.

Table 3. Performance Measures for the Themes (1930–1989).

Themes	Documents	Citations	h-Index
Children	816	4,621	28
Social workers	726	3,740	23
Services	405	1,998	17
Women	368	1,488	18
Social services	313	1,432	16
Community	222	1,191	16
Patient	190	839	13
Administration	156	724	13
Welfare	99	531	13
Social work education	98	414	98
Social security	45	97	11
Rejection	17	86	6

and international agencies, activity of voluntary workers, different aspects of case work; women is related to the research conducted on women's liberation, therapist's attitudes, abortion, and the access to social services; social services refers to research conducted on social policy and management, urban problems (poverty in the city, lower class culture, the city's Black community, urban social policy), and the help with personal problems (personal construct theory); community is focused on research aspects related to Black community, the power of social work in the community, work programs for the community, and the power of social intervention in the community. It is worth mentioning that the research conducted on the emerging theme community is highlighted as having fewer documents but achieving a similar impact (measured by the h-index) to basic themes of discipline with more documents as is the case with social services.

Second period (1990–2002). The research was focused on 16 themes (see Figure 8). In this case, according to the strategic diagram, 8 major themes can be identified (motor themes plus basic themes): dementia, stress, violence, HIV/AIDS, children, health care, social workers, and community. However, the motor themes dementia, stress, violence, and HIV/AIDS are the most influential ones for the structuring of the social work research field because they are well developed and they are central to the social work research field during this period. With respect to performance measures, shown in Table 4, six themes stand out for the citation and h-index: the basic theme

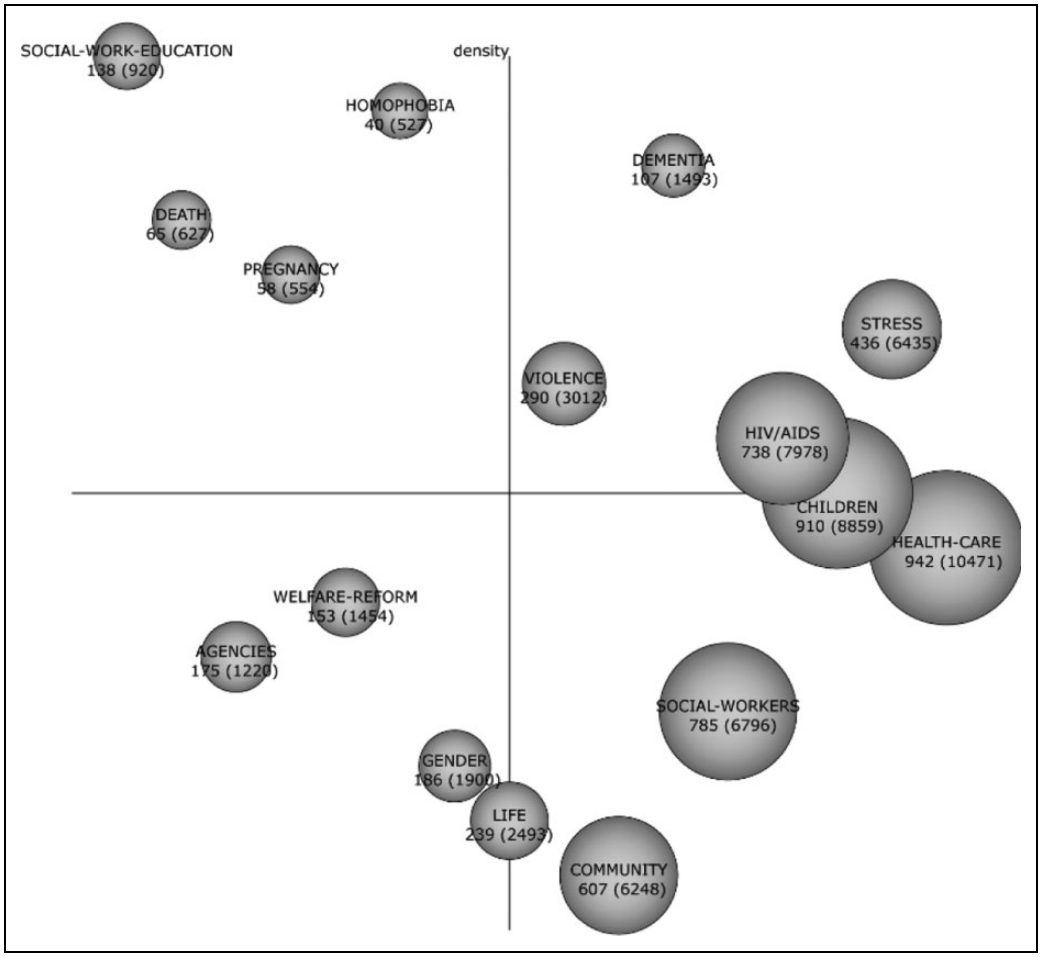

Figure 8. Strategic diagram for the period 1990–2002.

Table 4. Performance Measures for the Themes (1990–2002).

Themes	Documents	Citations	h-Index
Health care	942	10,471	40
Children	910	8,859	36
Social workers	785	6,796	33
HIV/AIDS	738	7,978	36
Community	607	6,248	34
Stress	436	6,435	37
Violence	290	3,012	26
Life	239	2,493	25
Gender	186	1,900	21
Agencies	175	1,220	19
Welfare reform	153	1,454	18
Social work education	138	920	16
Dementia	107	1,493	22
Death	65	627	13
Pregnancy	58	554	14
Homophobia	40	527	14

health care presents the highest performance scores (h-index = 40), and children, social workers, HIV/AIDS, community, stress are also important themes with citations above 6,000 and h-index greater than 33. Health care is focused on the social worker intervention in mental health problems (as depression), chronic health problems, collaboration between social workers and physicians, and older people health problems; children in this period refers to substance abuse such as alcohol or drug in children, early sexual activity, foster care, child mental health, kinship care, custody on divorces, families, foster care reentry, child protective services, children risk factor, and child abuse; social-workers, as in the previous period, represents the research developed on different aspects of the profession, such as, ethical and legal concerns, job satisfaction, therapists, and skills; HIV/AIDS is focused on HIV/AIDS and its relation with drug use and collective gay, prevention rules, and also on how it affects maternity and parenting; community refers to different social problems that affect to the community as substance abuse, poverty, policy, education, home care; stress deals with stress maltreatment, burnout, social and community support as a moderator of stress, social support networks, and stress and burnout in social workers. Notice that there is also a set of themes with acceptable performance indicators: motor themes violence (h-index = 26) and dementia (h-index = 22), and the four emerging themes life, gender, agencies, and welfare reform (h-index = 25, 21, 19, and 18, respectively). Violence is a theme related to the research conducted on violence child

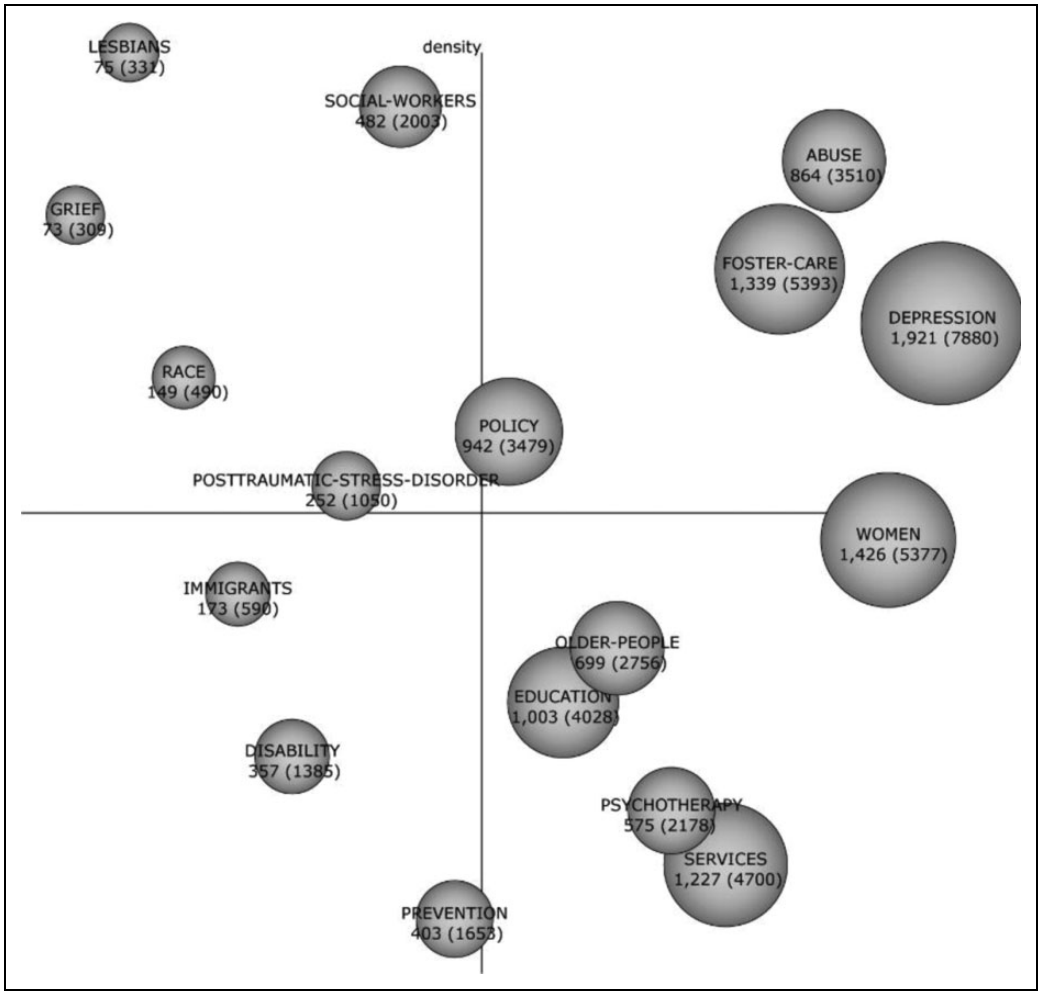

Figure 9. Strategic diagram for the period 2003–2012.

welfare, abuse, battered women, victims, sexual abuse, domestic violence, the posttraumatic stress disorder; dementia represents the research conducted on mental health problems as dementia or Alzheimer's disease, and also the family burdens that cause these mental health problems; life deals with studies on patients and how the illness affects their quality of life; gender refers to research conducted on social problems as racial differences, studies of gender differences in drug addiction and social support, and women problems related to the employment; agencies is a theme focused on social service agencies, administration and social work, and human service organizations (as services in the prior period); welfare reform is related to research conducted on the state of welfare and how the various implemented policies have affected such state. The theme social work education continues appearing as a specific theme like in the previous period, which is internally well structured, but it appears to be rather peripheral to the work being carried out in the research field. The relevance of the research conducted on the motor theme dementia is also highlighted as having few documents but achieving a high impact measured with a 22 h-index.

Third period (2003–2012). The research conducted in this period of time is distributed in 16 social work themes (see Figure 9), with 9 major research themes (motor themes plus basic themes): foster care, depression, abuse, women, education, policy, older people, psychotherapy, and services. In this period of time, the motor themes foster care, depression, abuse, and policy are the most influential ones for the structuring of the social work research field. With respect to performance measures (Table 5), a greater number of research themes (10 themes) stand out for the citation (over 2,000 citations) and h-index (over 19): depression, women, foster care, services, education, policy, abuse, older people, psychotherapy, and social workers. Depression is the leading theme of the period of time, with its research arousing great interest as evidenced by the 7,880 citations and h-index of 28. Depression is a theme that represents research conducted on mental health problems, as it happens with the theme dementia in the previous period of time, but in this case, depression is focused on the problems of depression. The research conducted on a group of four themes reaches significant impact with citation above 4,000 and h-index of 23 or 24: women, foster care, services, and education. Women

Table 5. Performance Measures for the Themes (2003–2012).

Themes	Documents	Citations	h-Index
Depression	1,921	7,880	28
Women	1,426	5,377	23
Foster care	1,339	5,393	24
Services	1,227	4,700	23
Education	1,003	4,028	23
Policy	942	3,479	22
Abuse	864	3,510	22
Older people	699	2,756	20
Psychotherapy	575	2,178	20
Social workers	482	2,003	19
Prevention	403	1,653	18
Disability	357	1,385	15
Posttraumatic stress disorder	252	1,050	15
Immigrants	173	590	11
Race	149	490	11
Lesbians	75	331	10
Grief	73	309	9

refers to both research conducted on HIV/AIDS and the women (e.g., mothers with HIV/AIDS) and studies on problems to solve during the pregnancy (e.g., depression problems); foster care is related to research conducted on children, home care, child welfare, and youth problems; services is focused on issues related to the management of social services and case management in hospital, in interdisciplinary collaborations, and in substance abuse; education deals with the research conducted on educational and training issues for social workers (challenges and trends). Research conducted on training and educational aspects of the social work discipline is consolidated as an important issue in this period of time, which is represented by the basic theme education. In previous periods, it was called social work education and was considered an isolated issue that concerned an active group of researchers. However, it appears to be rather peripheral to the work being carried out in the social work research field. Other themes of interest that capture good performance indices are policy, abuse, older people, psychotherapy, and social workers: policy deals with research on policies to maintain the welfare state, social protection, poverty reduction, and so on, and also on public funds being allocated to these policies; abuse includes research conducted on maltreatment, child maltreatment, prevention of child abuse, battered women, domestic violence, and child protection; older people refers to research conducted on these topics, caregivers, Alzheimer, home health care, long-term care, community care, and grandparents caring children; psychotherapy includes aspects of psychotherapy and social work and especially with its use to treat schizophrenia problems; social workers is similar to previous periods of time. Social workers is considered a peripheral and isolated theme in this period of time, while in previous periods, it was a basic theme of research in social work. However, social workers achieve good performance scores in the period of time with citations over 2,003 and h-index of 19. The research conducted on prevention, represented by the emerging theme prevention (related to violence prevention and HIV/AIDS prevention) arouses the interest of the community as it is shown by its 1,653 citations and h-index of 18.

Thematic Evolution of the Social Work Research Field

Using SciMAT, an analysis of the themes detected in each period of time by considering their keywords and evolution across time was developed. In such a way, the thematic areas that concentrate the research conducted in the social work discipline were identified. So, 10 thematic areas were detected: children, social services, health care, violence, women, HIV/AIDS, lesbian, gay, bisexual, and transgender (LGBT), social workers, education, and grief (related to chronic illness, hospice, assisted suicide, terminal illness, caregiver grief, and end-of-life decisions). They are shown in the thematic evolution map given in Figure 10. As aforementioned, in this map the solid lines mean a thematic nexus, a dotted line means that the linked themes share keywords different to the name of the themes, the thickness of the edge is proportional to the inclusion index, and the sphere size is proportional to the number of retrieved documents in each theme. Furthermore, the different shadows are used to group the themes that belong to the same thematic area.

Structural analysis of the evolution of the social work scientific field. According to Figure 10, the research developed in the social work field presents a great cohesion due to the fact that the majority of detected themes are grouped under a thematic area and they come from a theme appeared in the previous period of time. Furthermore, there are no gaps in the evolution of the majority of thematic areas. Six scientific areas have been present in the social work scientific discipline in the three periods of time analyzed, and, thus, they could be considered as the classical thematic areas: children, social services, health care, women, social workers, and education. Most of these thematic areas present a positive growth pattern, because since their origin they have been growing in the number of themes discussed. For example, this happens in the cases of children, social services, health care, women, and social workers. However, research conducted in the social work area was not limited only to explore questions in those six thematic areas. The social work scientific community is a dynamic community that has faced new challenges and problems posed by society. Four new research areas have aroused the interest of the social work scientific community: violence, HIV/AIDS, LGBT, and grief. All of them were born in the second period of time. Furthermore, in the third period of time the theme immigrants seems to be the germ of a new thematic area of interest, given that it is an emergent theme according to Figure 9. Regarding the evolution of the number of documents (see the size of spheres that make up each thematic area), most thematic areas show significant growth, except for LGBT and Grief. Therefore, scientific communication has grown consistently around eight thematic areas.

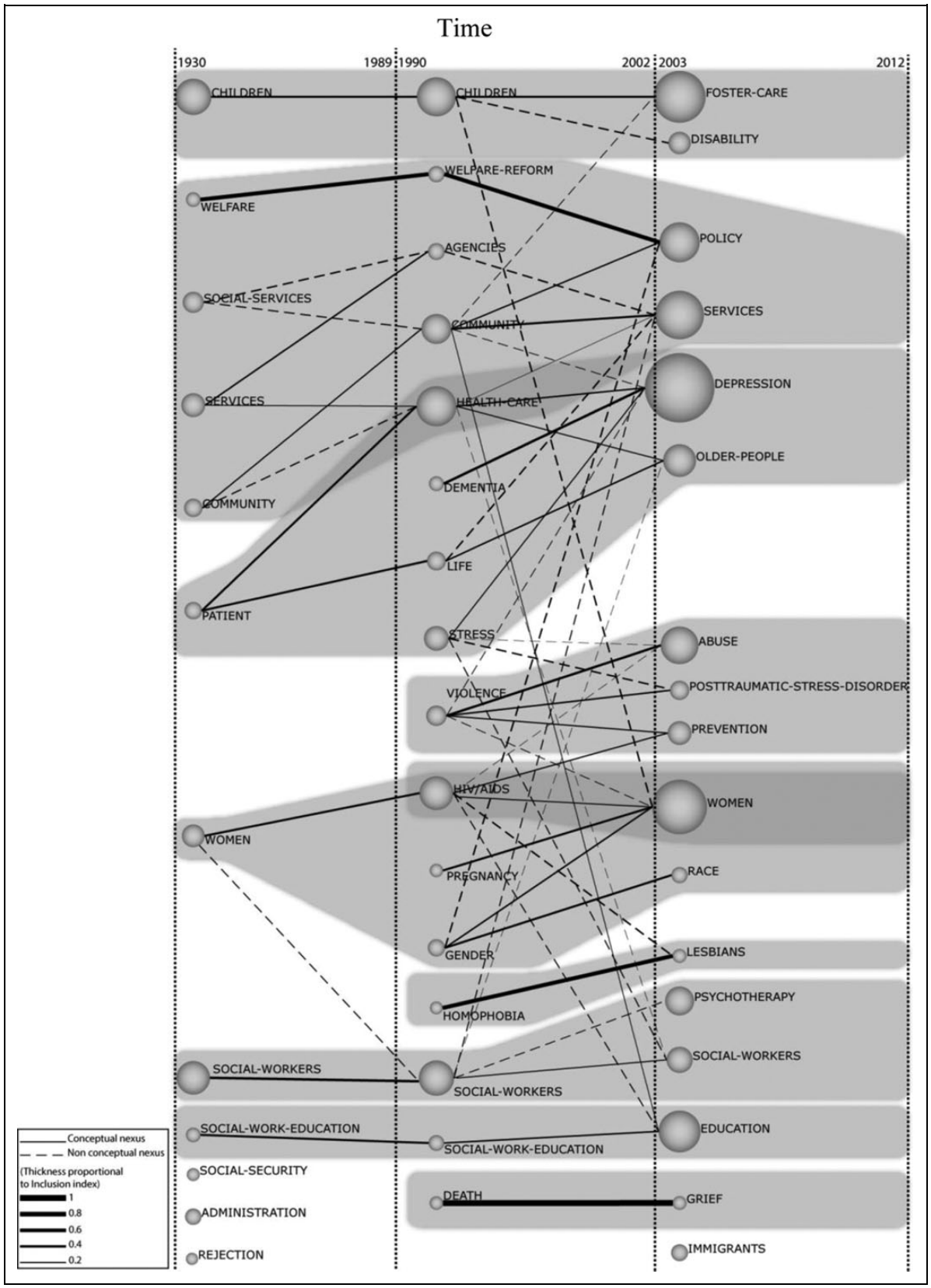

Figure 10. Thematic areas and evolution of the social work research field through periods of time.

Table 6. Performance Measures for the Thematic Areas.

Themes	Documents	Citations	h-index
Social services	4,651	29,183	49
Health care	3,879	26,335	48
Children	3,295	19,772	42
Women	2,800	16,516	39
Social worker	2,534	14,603	37
HIV/AIDS	2,164	13,355	38
Violence	1,564	8,003	31
Education	1,239	5,362	26
Grief	138	936	15
LGBT	115	858	16

Note. LGBT = lesbian, gay, bisexual, and transgender.

Performance analysis of the evolution of the social work scientific field. In Table 6, performance measures of the thematic areas are provided. Two areas stand out over the rest in terms of citation and h-index, social services (29,183 citations and h-index = 49) and health care (26,335 citations and h-index = 48). In both cases, the evolution of their impacts (h-index) shows a rising trend, that is, in the last periods of time the h-index of their themes put them at the group of leader themes of those periods of time, while this was not the case in the first period of time. Therefore, both themes continue to attract the interest of the social work scientific community according to citations and h-index. There is a second group of thematic areas with good performance scores: children, social workers, women, HIV/AIDS, and violence. However, the evolution of their impact (h-index) is quite different. Both children and women are thematic areas with a stable impact, that is, in all periods the h-index of their themes put them in the group of important themes. Therefore, the research conducted on children and women generated and continues to generate much scientific interest in the social work community. However, the impact of social workers presents a downward trend, that is, in the early periods the h-index of their themes put it at the group of leader themes of the period, while in the last period it does not. Therefore, the research conducted on social workers generated much scientific interest in the social work community, but in recent periods of time the interest seems to be fading. Both thematic areas HIV/AIDS and violence have their origin in the second period of time, and they show a rising impact according to the h-index of their themes associated in the last periods of time. The thematic area education presents an acceptable impact (h-index = 26). In fact, its impact has evolved very positively, especially in comparison with the research developed in the last period, since its h-index placed it in the group of important themes. Therefore, research conducted on education has aroused great interest in the social work scientific community in recent years. Both thematic areas LGBT and grief have the lowest impact values: h-index = 16 and h-index = 15, respectively. They are new social work thematic areas that originated in the second period of time, but they have not had a significant increase in their impact. They could be considered peripheral thematic areas. In fact, all their themes associated are peripheral and isolated according to the strategic diagrams shown in Figures 8 and 9.

Discussion, Limitations, and Application in Social Work

SciMAT was applied to analyze the conceptual structure of social work scientific field. How the research conducted on the social work field has evolved in its research themes between 1930 and 2012 was also analyzed. The coding phase of the analysis led to two interesting findings:

i. *The quality of the social work academic journalism has increased:* 25 social work core journals indexed in the database JCR of Thomson were found, which represents an increase in number compared to the 19 of previous studies (Hodge & Lacasse, 2011; Hodge et al., 2012). Therefore, the quality of social work academic journalism increased according to the hegemonic database JCR. We were surprised by the number (three more journals) of non-U.S. and non-U.K. social work core journals that were indexed in the JCR in comparison with previous studies: *European Journal of Social Work*, *Australian Social Work*, and *Ljetopis Socijalnog Rada*. This would indicate that in other countries, the social work scientific community was working according to the international quality standards and, as a consequence, they were developing quality social work journals that allowed a higher presence of social work scientific research carried out in other countries in the international social work context.
ii. *The quantity of social work scientific publications has increased considerably throughout the years:* The social work academic community increased through time, and the active researchers used the JCR scientific journals more to disseminate their work (see Figure 6). It is believed that this deviation was a result of the promotion policies followed in the social work scholarship (Green & Baskind, 2007; Seipel, 2003).

The study of the evolution of social work research themes led to the discovery of the research conducted on the social work field being focused on 10 main thematic areas: children, social services, health care, violence, women, HIV/AIDS, LGBT, social workers, education, and grief. Combining the science maps (strategic diagrams and evolution maps) with the performance indicators (citations and h-index), eight thematic areas were considered as core areas of social work scientific discipline: children, social services, health care, violence, women, HIV/AIDS, social workers, and education. Furthermore, six of these core thematic areas were identified as classical thematic areas, because they were present in all the time periods analyzed: children, social services, health care, women, social workers, and education. An overall analysis of all strategic diagrams clearly showed an increase in the number of themes over time and, thus, the emergence of a more diverse

and complex social work scientific discipline. However, the social work field presented a continuous, consistent, and cohesive growth, because there were no gaps in their thematic areas and the most of research themes were grouped in a thematic area.

On the other hand, analyzing the thematic areas in detail, results obtained indicate that research conducted in the social work scientific discipline was primarily focused on four fronts of research:

i. *Investigations on the most vulnerable beings in society:* Thematic areas such as children, women, LGBT, and research themes such as older people and immigrants supported this research front. The primary mission of social work, as articulated in the National Association of Social Workers (NASW, 1996, p. 1) Code of Ethics is "to enhance human well-being and help meet the basic human needs of all people, with particular attention to the needs and empowerment of people who are vulnerable, oppressed, and living in poverty." Therefore, the social work profession is characterized by maintaining its focus on advocating for the needs of the most vulnerable segments of society and improving their well-being. No doubt, in our society children and women are among the living beings considered vulnerable and very sensitive to social changes and life economic crises, and, consequently, they always are and will be of interest to the social work scientific community. For example, in the case of thematic area children, research theme foster care was an important topic because families frequently used foster care and, consequently, different social work research niching that affected children, families, and the public administration appeared (McBeath & Meezan, 2008; Schofield et al., 2011). But, in the 21st century, new big challenges that directly affect the children must be faced. For example, the impact of a population close to overwhelming the earth's natural resources (Newman, Todd, & Ploeg, 2011) or the impact of digital technology, which is transforming how we communicate, consume, learn, and engage (Sen & Broadhurst, 2011). On the other hand, LGBT was other thematic area that also represented a vulnerable segment of the society and thus, it also received the interest of the social work scientific community, although peripherally, as aforementioned. Older people and immigrants were important research themes that represented emergent problems of our society, that is, the challenge of aging populations and the problem of immigration, respectively. Clearly, both themes will have to be faced in the future too, and, therefore, both will continue being interesting for the social work scientific community (Allen & Glasby, 2013; Christie, 2013). Different social work associations, such as the NASW (www.socialworkers.org), the International Federation of Social Workers (http://ifsw.org), and the International Association of Schools of Social Work (http://www.iassw-aiets.org) highlighted the adoption of human rights as a foundation principle upon which all of social work theory and practice rest (Healy & Link, 2012). The existence of this research front, focused on the vulnerable agents of the society, showed that the social work scientific activity was also hardly linked with the defense of the human rights.

ii. *Investigations on the social services provided to the society:* The thematic area social services, which was characterized as the most important thematic area in the social work scientific discipline, supported this research front. This thematic area was also considered as a classical area and was related to the research conducted on the different private and/or public social policies and programs and services implemented to address various social problems that plagued the modern society during the 20th century. As it is noted by National Association of Social Workers (2013), "Social work practice consists of the professional application of social work values, principles, and techniques to one or more of the following ends: helping people obtain tangible services; counseling and psychotherapy with individuals, families, and groups; helping communities or groups provide or improve social and health services; and participating in legislative processes." Therefore, social workers implement the social services to improve the life quality of vulnerable people, but they are also responsible for recommending and helping politicians and managers to define social laws and instruments. In the first decade of the 21st century, much of the research conducted in this research front focused on the theme policy, which is related to the social protection policies, poverty reduction policies, and the use of public funds allocated to these policies. In the future, new forms of social work practice could also be likely to appear as a consequence of new state policies (state could finance the provision of services but delegates their delivery to other sectors; Tannenbaum & Reisch, 2001). Therefore, it is clear that this research front will continue to be a trending theme in the 21st century.

iii. *Investigations on important problems that affected the society:* health care, violence, HIV/AIDS, and grief are the thematic areas that supported this research front. Therefore, in this research front, social work research conducted on health problems (represented by thematic areas health care, HIV/AIDS, and grief) and on social problems (represented by the thematic area violence), was included. The thematic area health care was represented mainly by the health problems related to mental health, such as stress, dementia, and depression and, in early 21st century, also with older people health problems, such as Alzheimer. These health problems were a central research theme for the social work scientific community, and they required always the participation of social workers, sometimes together

with other experts as physicians, psychiatrists, and psychologists. As aforementioned, the aging populations will continue to be an important problem during the 21st century, and therefore, the social workers' activity will be necessary (Allen & Glasby, 2013). The social problems of the 1990s, such as drugs (crack cocaine epidemic), violence, unemployment, sexual abuse/assault, child abuse, rape, suicide, homelessness, substance abuse, domestic violence, the spread of HIV/AIDS and other social/emotional problems, caused the birth of new research areas of interest to the social work scientific community (as Violence, HIV/AIDS, and Grief). Both thematic areas violence and HIV/AIDS received a great interest from the social work scientific community according to their performance indicators, and both focused on different aspects related to the two vulnerable entities: children and women. Particularly, in the early 21st century, the research conducted on the thematic area HIV/AIDS was mainly focused on the analysis of the women living with HIV/AIDS, in different countries (Kenya, Uganda, Ireland, etc.; Foreman & Hawthorne, 2007; Hodge & Roby, 2010; Mweru, 2008).

iv. *Investigations on the own social work scientific discipline:* Both thematic areas social workers and education supported this research front, which represented the interest of social work scientific community on defining and updating the disciplinary knowledge base that characterized the social work scientific discipline and the activity of social workers and, also on the educational and training issues that affected the social workers. According to the internal dynamic that took place in both thematic areas during the 20th century, it should be pointed out that the social work discipline grew and reinvented itself in response to rapid economic and social changes occurred as a consequence of different events, as for example, two world wars and two economic crises. But, in a world that changes faster than we can learn, it is clear that the social work discipline will continue reinventing, and this research front will continue attracting interest from the scholarship. In the early 21st century, the modern social work required specific education and training for preparing social workers for their work in a global era, and by this reason, the thematic area education was considered as a topic of great interest in the recent research developed in the social work discipline. In this sense, the social work academic community was actively working in the design of international curriculum to ensure that professionals are prepared with requisite knowledge for social work practice in this globalized context (Gilin & Young, 2009; Lough, 2009).

It should be pointed out that this interpretation of the results requires caution because, in some cases, the growing interest on some thematic areas could follow policy interests and investment in certain fields. On the other hand, it is noticed that the social work field was intrinsically related to the main events that happened in our civilized society during the 20th century, since analyzing the thematic areas that were of interest to the social work scientific community, it is possible to identify many of the major problems, crises, and challenges that civilized society has faced: wars, financial crisis, gender inequality, racism problem, immigration, older people, and so on. And as it is noted by the National Association of Social Workers (2000), ''The appalling prevalence of wars, genocide, ethnic cleansing; discrimination and social exclusion, gender inequality, battering, rape, and the sale of women; sweatshops, child labor, and enslavement; and the suppression of human rights, demonstrates that the struggle for human rights remains a high priority for the social work profession in the 21st century.''

Since the h-index was actively used in our study to analyze the science maps, it is worth making some clarifications. The h-index was defined by the physicist Hirsch (2005) to assess the productivity of scientists from their publications and citations per publication. Despite all the criticisms leveled at the usefulness of the h-index as a performance indicator and quality of a scientist, the truth is that the h-index is being used widely by the scientific community because it is easy to calculate and understand (Alonso et al., 2009). Many bibliographic databases, such as the WoS, Scopus, and Google Scholar, include h-index among their utilities. Also many committees are using it during their employment and promotion decisions. The h-index has also been applied to evaluate scientific quality in others cases: journals, research groups, universities, countries, and even scientific topics (Alonso et al., 2009; Martínez et al., In Press). In SciMAT, the h-index is used to assess the impact and quality of research themes and thematic areas (Cobo et al., 2012b). The use of the h-index in this context led to several interesting findings. SciMAT calculates the h-index as if we were evaluating scientists, that is, the number of publications and citations per publication is used, but working on the publications associated with each theme and thematic area. However, the h-index is not interpreted as an indicator of productivity, but as a measure of interest in the immediate community to the research conducted on the research theme, and also as a quality measure of research carried out in the theme. A theme with a high h-index means that the research conducted on the subject is of quality and reflects a high interest of the scientific community. For example, this is the case of the theme children that presents an h-index of 28 and 36 in the early periods of time. Furthermore, this could be used to identify the emerging themes of a scientific discipline, as it was proposed in Banks (2006). In the last period of time, both themes depression and foster care present the highest h-index (28 and 24, respectively), and they could be considered as emerging topics in the social work research. Obviously, low values of h-index do not always mean low quality of the research undertaken. The h-index depends on the citation pattern of a scientific field and the size of the community working in the field. Thus, a theme with a low h-index could indicate an interest in a small

community of researchers and not necessarily a low-quality research. For example, this could be the case of themes lesbians and grief detected in the last period of time. This analysis is also valid for thematic areas. Now, in the case of thematic areas, the h-index provides a way to discover if the research conducted on the area presents an up or down trend. Analyzing the evolution of the h-index of the themes that composes a thematic area through all periods of time makes possible to detect whether the interest in the scientific community increases (trend up) or decreases (trend down). For example, the interest of the research community in the thematic area children was and is high (its theme foster care presents the second highest value of h-index in the last period). However, in the case of thematic area social workers, the interest was high in early periods of time but not in the most recent period of time. In the early periods of time, its theme social workers presented the second and third position by h-index, while in the last period of time its themes psychotherapy and social workers are in the intermediate positions. Many important applications of the h-index in the social work field were presented in Hodge and Lacasse (2011) and Lacasse, Hodge, and Bean (2011). In this article, an additional application was shown.

There are several limitations to this study. To choose the information sources for our experiment, we have used the international widely acknowledge prestigious databases by scientific community, that is, WoS and JCR produced by Thomson Reuters. There is a great debate on the coverage of WoS in comparison to Scopus and Google Scholar and their use to analyze social science disciplines (Auffhammer, 2009; Bar-Ilan, 2010; Blyth et al., 2010; Falagas et al., 2008; Harzing & van der Wal, 2008; Hodge et al., 2012; Jacobs, 2009). In the social work field, we find studies based on WoS (Green & Baskind, 2007; Holden et al., 2010; Jenson, 2005; Thyer, 2010), and others based on Google Scholar (Hodge & Lacasse, 2011; Hodge et al., 2012). We decided to use WoS because it presents the best retrospective coverage since 1900 (Harzing & van der Wal, 2008), and it provides quality data to develop our study. Similarly, many criticisms have been made about the usefulness of the JCR to assess the quality of the journals (Cameron, 2005; Hodge & Lacasse, 2011; Ligon & Thyer, 2005), although Hodge and Lacasse (2011, p. 580) noted "JCR are widely recognized as the de facto standard for assessing journal quality across the sciences ... including social work ... manuscripts accepted in journals indexed in a given JCR disciplinary category are widely viewed as evidence of publication in a top-tier journal." We have identified the group of most important journals in social work field using the JCR 2012 and using the recommendations to identify social work journals given in Hodge and Lacasse (2011) and Thyer (2005, 2010). Therefore, an alternative choice of databases would likely produce different results. On the other hand, it should be noted that the set of core journals is biased in favor of journals of British and U.S. origin, as it happens in other scientific fields and in the own WoS. Consequently, our study is also biased in favor of social work research published in English language.

Other limitations relate to our methodology. The analysis did not control for self-citations, since there exists bibliometric studies indicating that self-citations are not a great problem for the h-index (Bornmann & Daniel, 2007; Hirsch, 2005). However, the influence of self-citations is field dependent (Lacasse et al., 2011). Other methodological limitation is related to information sources chosen to describe the social work research field, since we use only those documents published in the most important social work journals indexed in JCR in the social work category. Therefore, we are missing the earliest research before the establishment of social work journals indexed in JCR. We are also missing the social work research published primarily outside of social work journals (in interdisciplinary or other disciplinary journals) or in social work journals that are not indexed in JCR/WoS and also those social work dissertations whose findings have not been published in social work journals indexed in JCR/WoS. Similarly, we are losing the research published in books that also are a usual mean to publish important findings in the social work field. Other methodological bias was introduced in the co-words analysis. Many articles published in the early period did not present any keywords; probably because it was not a common publication rule. We have found similar behaviors in other disciplines, for example, computer science (Cobo et al., 2011a). Therefore, we had to search manually those keywords that better described the content of those articles. With respect to the use of SciMAT, we have used our experience to configure it adequately. For example, to avoid the appearance of strategic diagrams too complex to analyze, we established for each period of time the following keyword and co-occurrence thresholds (6, 4), (10, 5), and (20, 7). However, it is clear that other configuration could result in more complex diagrams.

This article provides the first comprehensive examination of the conceptual evolution of the social work disciplinary knowledge base, offering insights to understand how the social work knowledge base has been formed. A study of this nature aims to understand how a scientific discipline has evolved and grown over time, and, therefore, it also helps in the process of professional self-reflection. In such a way, this bibliometric study complements works on social work knowledge base by others (Hodge & Lacasse, 2011; Hodge et al., 2012; Holden et al., 2005a, 2005b, 2010; Jenson, 2005; Lacasse et al., 2011; Sellers, Mathiesen, Smith, & Perry, 2006; Sellers et al., 2004; Spivey & Wilks, 2004; Thyer & Bentley, 1986; Thyer, 2005). As Hodge, Lacasse, and Benson (2012, p. 15) noted, "By understanding where we have come from and what we have accomplish, we are better positioned to address future challenges." Having said the above, it is clear that different science mapping analysis of social work field focused on its social structure (using authors and coauthors) or intellectual (using cocitations) structure are possible and pending.

The output of the science mapping analysis in the social work field enables to access and assess key data of the discipline to make decisions in different frameworks:

- Libraries: Librarians could identify new needs in the collection to be covered on specific important themes

and thematic areas of the discipline, and then, they could take into account that information in its investment/purchase policy.

- Editorials: Publishers could monitor the thematic evolution of a discipline to identify new publishing opportunities in the area.
- Journals: Editors could assess the effectiveness of topics covered by their journals, identify new research challenges (by organizing special issues), and make decisions on future editorial policy.
- Academic centers: Researchers could identify new and relevant challenges in their field to research as well as emerging topics and older topics. Furthermore, if they work in any of the major themes identified, then they could use that information as a value of their work in the promotion processes. On the other hand, a PhD student or undergraduate student could use the output of a science mapping to choose a master or PhD topic that could be relevant for their interest and future development. If the student would like to initiate research work, he or she could identify emerging topics to develop his or her thesis or research.

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