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Participation in health in the Americas: Bibliometric mapping of production, impact, visibility and collaboration

Frederico Viana Machado (https://orcid.org/0000-0002-8884-1124) [1]
Carla Michele Rech (https://orcid.org/0000-0001-6749-885X) [1]
Rodrigo Silveira Pinto (https://orcid.org/0000-0003-1053-9926) [2]
Wagner de Melo Romão (https://orcid.org/0000-0003-3725-2861) [3]
Manuelle Maria Marques Matias (https://orcid.org/0000-0001-6474-8139) [4]
Gabriele Carvalho de Freitas (https://orcid.org/0000-0002-2610-3003) [5]
Fernando Antônio Gomes Leles (https://orcid.org/0000-0002-3891-0443) [6]
Henrique Kujawa (https://orcid.org/0000-0001-9990-9414) [2]

Abstract *Participation in health has generated a large number of publications around the world. In order to know the specificities of this production in the Americas, a bibliometric analysis of articles in English, Spanish and Portuguese was carried out. Searches were carried out in the VHL, PubMed, SCOPUS, WOS and SciELO, consolidating a database with 641 references. With the help of the VOSviewer software, we analyzed citation patterns, co-authorship and the chronological distribution by countries and languages. It was possible to verify the growth of production, the quantitative relevance and the impact of the different countries. The analysis indicated that the USA concentrates the largest number of citations and Brazil, despite being the first in number of publications, is the third in number of citations. The same occurs with Brazilian journals that, with the largest number of articles, fall in the ranking of the most cited. The co-authorship analysis indicated that the University of Toronto, Fiocruz and Harvard University have the most formal collaborations with other organizations. We conclude that there are inequalities of impact, visibility and internationalization in this field, indicating obstacles to scientific development and health policies.*

Key words *Public health, Community engagement, Social participation, Bibliometric*

[1] Programa de Pós-Graduação em Saúde Coletiva, Universidade Federal do Rio Grande do Sul. R. São Manoel 963, Rio Branco. 90620-110 Porto Alegre RS Brasil. frederico.viana@ufrgs.br
[2] Centro de Educação e Assessoramento Popular, Passo Fundo, RS Brasil.
[3] Programa de Pós-Graduação em Ciência Política, Departamento de Ciência Política, Universidade Estadual de Campinas. Campinas SP Brasil.
[4] Departamento de Planejamento em Saúde, Instituto de Saúde Coletiva, Universidade Federal Fluminense. Niterói RJ Brasil.
[5] Programa de Pós-Graduação em Saúde Coletiva, Instituto de Medicina Social Hésio Cordeiro. Universidade do Estado do Rio de Janeiro. Rio de Janeiro RJ Brasil.
[6] Organização Pan-Americana da Saúde, Organização Mundial da Saúde. Brasília DF Brasil.

Introduction

Several organization have already pointed to participation of the community as essential to improve Health Care Systems (HCSs)[1,2]. These practices gained prominence after the Second World War, especially after the Alma Ata Conference held in 1978, although participatory experiences can be identified since the 1920s[3]. In the 1960s, there were already experiences of community participation in health in several countries, for example, all the federated units of the United States of America (USA) already had laws that provided for participation[4]. The reform of the Canadian health system[4] at the beginning of the 1970s, and of the Brazilian one at the end of the 1980s, included participation as a structural element foreseen in the legislation[5,6]. After Alma-Ata, each country implemented Primary Health Care (PHC) models with different levels of community participation in the systems, but following a growing importance and interest in management of the health services[7]. In the Declaration of Astana[8], which reasserts and updates the Alma Ata principles to the current reality, participation is one of the signed commitments[9]. The principles to foster participation in this context are in a specific document[10].

Participation of the community is a recurrent topic in research studies and governmental ventures, producing a significant number of publications at the global level. Dozens of papers sought to review the academic production on participation in health, with different approaches and objectives, providing relevant syntheses to understand the topic[11]. This evidences the diversity of approaches and experiences that meet each country's context.

In a bibliometric review, Yuan et al.[12] mapped the academic production on community engagement in public health, discussing the evolution and trends in the world literature. However, the authors only considered publications in English, which imposes limits for us to analyze the academic production of the American continent, with a strong presence of Spanish and Portuguese. In addition to that, they ignore the specificities of each continent and, by limiting their survey to the Web of Science index, they privilege studies in the biomedical areas to the detriment of the social sciences[13]. The HCSs of the American continent respond to the respective social, political and economic contexts that present different directions regarding Community Participation in Health. Consequently, there is diversity of study designs aimed at analyzing the social and health sciences. We can find literature reviews that discuss the understanding of participation as a tool to achieve the results of the health programs[14,15] and, in another perspective, they present the vision of participation from the point of view of strengthening democracy and as a right, approaches characteristic of the social sciences[16,17].

Seeking to know the specificities of this research field in the Americas and to respond to the gaps in the literature highlighted above, we carried out a study of the academic production on social participation and control in health, through bibliometric and scientometric analyses of articles in English, Spanish and Portuguese written by researchers who have studied the phenomenon in this continent. In this paper we will focus on citation and co-authorship analysis, with the objective of knowing the most relevant authors, journals and institutions, as well as the impact and patterns of collaboration, interaction and hierarchization.

The academic field established around the topic involves journals, institutions and researchers located at the interface between the health sciences and the social sciences, producing complex interaction patterns. These difficulties are especially related to the impact and visibility differences and inequalities that separate research areas, countries, journals, institutions and languages. Consequently, our intention is to spatially and geographically situate the actors, providing an understanding of the research efforts on participation in health in the Americas that can be a reference for future research studies.

Method

As part of the project entitled "Training for Social Control" of the National Health Council, financed by the Pan American Health Organization and carried out by the Center for Popular Education and Counseling, a bibliometric and scientometric analysis study was carried out, comprising scientific articles in English, Spanish and Portuguese that deal with social participation and control in the American continent published until August 12th, 2021. Metric studies about scientific publications allow understanding the content analyzed and its structure, identifying schools of thought and their evolution[18]. This analysis contributes to understanding the researchers' production and interaction in a given

scientific field, as it considers the institutions to which they are linked, the journals that publish their papers and their countries of origin.

Bibliometrics and scientometrics assess and measure the characteristics and development of topics and fields of knowledge, through statistical and mathematical methods that identify patterns, structures and relationships presented in a given sample of the literature. In addition to that, they identify the most active researchers and institutions, thus facilitating articulation of collaborative networks. In view of the growing volume of information currently recorded, this method is especially useful because it allows quantifying and organizing large samples of publications[18,19]. By means of metadata, Bibliometrics quantifies information production, dissemination and use. Scientometric analysis relates these quantitative aspects to social contexts to discuss scientific development in a given knowledge field. Using Bibliometrics to support strategic decisions on policies in Science and Technology is common in several countries, in which it has become an institutionalized practice[20,21]. We chose to employ the VOSviewer software, which is used to process and visualize bibliometric information and build maps with proximity networks, and which has a large data volume[19,21].

The bibliographic searches were conducted in the Portal of *Biblioteca Virtual em Saúde* (BVS), as well as in Medical Literature Analysis and Retrieval System Online (MEDLINE) via PubMed, SCOPUS, Web of Science (WoS) and Scientific Electronic Library Online (SciELO). Choice of the databases to carry out the searches was both due to relevance and to the possibility of extracting the necessary data to perform the analyses available in VOSviewer. We chose BVS and PubMed because they gather relevant publications in the Natural and Biomedical Sciences, as well as Scopus and WoS, the latter being currently considered the most commonly used database for bibliometric analysis, given its accessibility to bibliographic and citation data from 12,000 most influential journals worldwide[22]. However, these databases present relatively low coverage regarding the scientific production in the Social and Human Sciences[13]. In view of this limitation, the SciELO database was included, also with an international scope, including countries in Latin America and the Caribbean, and which houses scientific journals in all knowledge areas, with emphasis on health and on the Social and Human Sciences[13]. However, it should be noted that a limitation presented by the SciELO, BVS and PubMed databases is that they only have data on authorship, year, title and abstract, not allowing to process all the analyses provided by VOSviewer. As an alternative to perform the analyses in a more comprehensive way, the final database was processed, manually inserting diverse information about the abstracts and keywords, when found, and about the author's country, where there was no data on the authors' institution.

Given the diversity of expressions that define "Social Participation"[7,23] and "Social Control"[24], the first challenge was to elaborate a search strategy that would approach the literature on the topic in the Natural and Biomedical Sciences and in the Social and Human Sciences. The following search strategy was used in all three languages (Portuguese, English and Spanish): "Controle Social" OR "Participação Social" OR "Participação da Comunidade" OR "Participação Cidadã" OR "Participação Comunitária" OR "Participação Pública" OR "Participação Política" OR "Gestão Participativa" OR "Democracia Participativa" OR "Democracia Deliberativa" OR "Controle Social Formal" AND "Conhecimentos, Atitudes e Prática em Saúde" OR "Saúde" OR "Política de Saúde" OR "Políticas Públicas de Saúde" OR "Políticas Públicas em Saúde" OR "Políticas Sanitárias" OR "Política de Assistência à Saúde" OR "Conselhos de Saúde" OR "Conferências de Saúde", with no date limit.

After excluding duplicates, the screening, eligibility and final selection stages were conducted resorting to spreadsheets, by pairs of independent researchers, using the following eligibility criteria: publications in scientific journals in the form of articles, published by researchers linked to research institutions in American countries or that deal with experiences directly related to social participation and control in health developed in this continent.

Of the 9,487 references found in the searches, 5,640 duplicates were excluded, with 3,847 references remaining for the initial screening. Screening was performed by reading the titles and abstracts. The articles included were those published in English, Spanish or Portuguese, in any year up to the collection date on August 12th, 2021, resulting in a final sample comprised by 641 references. The next step was to assemble and fill in the database containing only the references selected for running in VOSviewer.

Two bibliometric analysis methods were applied: citation and co-authorship. Citation analysis is an important indicator in bibliometric studies, through which it is possible to estimate the

influence of certain documents, sources, authors, organizations and countries and measure their relevance, based on the number of citations in a given analysis corpus. Co-authorship analysis is considered a formal measure of collaboration, whose relationship between authors or their institutions is established when they publish a scientific document together. These analyses allow identifying the internationalization of the study agenda, the most influential scientific references and the research sources[18,19].

When the software is launched to perform some analysis, the first file generated is a Table which presents the data that will be shown visually. This Table presents the data arrangement by analysis unit (Countries, Institutions, Authors, Documents and Sources where the documents were published), together with the quantitative data (number of publications and citations) and the "linking strength" of that analysis unit. "Linking strength" is understood as the number of associations made by that analysis unit with the others. The connections are made by the number of links or mutual citations, which are represented by edges, where their width reflects the relationship strength between two items. The lower the distance between the items plotted in the bidimensional space, the higher the relationship between them. According to the intensity of these links, clusters are formed, that is, groups of items with common aspects that are represented by the same color.

Results

Chronological trend, language and origin of the authors

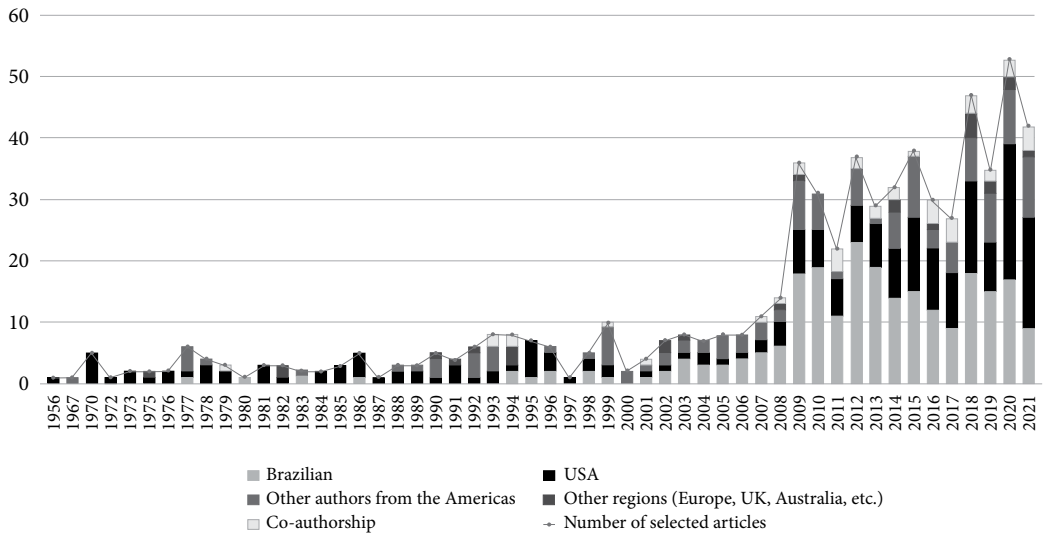
The oldest article selected on the topic dates back from 1956 and the publications show an increasing trend, similar to the one verified at the global level[12]. Community engagement in public health has attracted the interest of researchers around the world, with virtually continuous exponential growth over the last two decades[12]. This trend is repeated when limiting ourselves to the American countries. Graph 1 shows the chronological distribution of the publications selected in the sample, grouped as follows: strictly Brazilian production, production strictly made in the USA, production by other authors from the Americas, production by authors from other regions (Europe, United Kingdom, Australia etc.) and co-authored production, which gathers all the articles published in co-authorship by researchers from different countries.

According to the number of publications, the research on social participation and control in health can be divided into three consecutive stages. The initial period, from 1956 to 2002, was relatively stable, with a slight increase and a low number of publications on the topic in the clipping made in this research. From 2005 onwards, there is a gradual increase in publications and, in the last period, from 2008 onwards, we see an increase in the number of publications, reaching a peak of 53 articles in 2020. It should be noted that this growth trend follows the general panorama of the increase in scientific publications during the same period, as can be seen in the *Scimago Journal & Country Rank* portal (https://www.scimagojr.com), which gathers data from Scopus-indexed journals and performance metrics from 239 countries.

The production strictly made in the USA stands out up to 1990, when production by other authors from the Americas begins to gain strength. In turn, the strictly Brazilian production begins to grow and stand out from 2002 onwards In Brazil, increasing public investments in scientific research in the period from 2005 to 2015 resulted in a significant increase in publications on different topics[25], including the rise in production on social participation and control in health, at least in the best evaluated journals, characteristic of the clipping herein used. However, accounting for more than 1/3 of the sample, contrary to the general mean trend, we see that the Brazilian publications had an abrupt increase in 2009, but remained relatively stable until the current period, with a peak in 2012. Considering the exponential growth in the number of Brazilian publications during the period[25], proportionally, the topic had its frequency reduced during the last decade in this country.

When analyzing the distribution by language, among the 641 articles included in the databases, there are 350 (54%) in English, 178 (27.77%) in Portuguese, 85 (13.26%) in Spanish, 21 (3.28%) in English and Portuguese, 6 (0.93%) in English and Spanish, and 1 (0.23%) in all three languages.

The articles analyzed include contributions by authors from all five continents of the planet. Considering the profile of the productions according to the authors' countries, we find the following result: Brazil, in first place, with 257 authors and 582 citations; USA second, with 226 authorships and 2,057 citations; Canada third, with 66 authors and 713 citations; Co-



Graph 1. Time distribution of the publication of articles on social participation and control in health in the Americas.

Source: Authors.

lombia ranked fourth, with 28 authorships and 178 citations; and, in fifth place, Mexico, with 26 authorships and 43 citations. In the seventh and tenth place, respectively, Chile (21 authorships and 123 citations) and Cuba (10 authorships and 132 citations) offer significant contributions on the topic. The presence of English (6th position, 22 authorships and 404 citations), Spanish (8th position, 14 authorships and 29 citations) and Portuguese (9th position, 11 authorships and 16 citations) authors studying the topic in America also stands out. These results are similar to those found by Ming Yuan et al.[12], which argue that USA is the key region for research studies on community engagement in public health, and that developing countries such as Brazil have also contributed to a great extent to this field, whose advances are marked by historically important public health events and evolved from macro-regional strategies for meso-regional and micro-regional actions[12].

Analysis of the citations: relevance of the journals and publications

A total of 299 different journals were included in the sample. Table 1 shows a comparison between the number of publications and citations among the main journals. After each title, we included the number of documents published, followed by the number of citations and the mean of citations per article.

Inequality in terms of impact and visibility is observed across the journals when comparing the number of articles published and the mean of citations. When comparing the number of articles published and the most cited ones, using the case of the Brazilian journals, it can be seen that they occupy the first four places in the ranking of journals with the highest number of published documents, although they do not maintain this performance in the ranking of the most cited journals. *Revista Brasileira de Enfermagem*, fourth in terms of number of publications, disappeared from the ranking of the 20 most cited journals. In the other end, we see *The Lancet* journal, with only three articles selected totaling 343 citations. This inequality also affects the journals from the other Latin American countries, which do not even appear among the first 20 with most citations. If we take the *Scimago Journal & Country Rank*, we see that the Latin American journals do not appear among the first 2,000 at the global level.

Tracing the citation analysis by journals, presented in Figure 1, the connections between

Table 1. Articles and citations by journal about social participation and control in health in the Americas.

Journals with the most articles published				Most cited journals			
	Journal	n. of articles	No. of citations/ Mean of citations per article		Journal	n. of articles	No. of citations/ Mean of citations per article
1.	Ciência & Saúde Coletiva	48	148/3.08	1.	Lancet	3	343/114,3
2	Saúde & Sociedade	38	66/1,73	2	Social Science & Medicine	13	325/25
3.	Cadernos de Saúde Pública	17	54/3,17	3.	Health Policy	3	182/60,6
4.	Revista Brasileira de Enfermagem	15	3/0,2	4.	Academic Medicine	4	149/37,25
5.	Salud Pública de México	15	28/1,86	5.	Ciência & Saúde Coletiva	48	148/49,3
6.	Social Science & Medicine	13	325/25	6.	Plos Neglected Tropical Diseases	2	76/38
7.	Interface - Comunicação, saúde educação	12	2/0,16	7.	Information Technology & People	1	70/70
8.	Physis	11	0/0	8.	Saúde & Sociedade	38	66/1,73
9.	Revista Panamericana de Salud Pública	8	32/4,75	9.	Journal of Health Politics Policy and Law	6	61/10,1
10.	Boletin de la Oficina Sanitária Panamericana	8	0/0	10.	Biosecurity and Bioterrorism-biodefense strategy	1	61/61
11.	Journal of Health Politics, Policy and Law	6	61/10,16	11.	Cadernos de Saúde Pública	17	54/3,17
12.	Progress in Community Health Partnerships	6	12/2	12.	International Journal of Health Services	5	49/9,8
13.	Revista Espanhola de Saúde Pública	5	7/1,4	13.	Journal of Community Psychology	2	49/24,5
14.	International Journal of Health Services	5	49/9,8	14.	Medical Anthropology Quarterly	5	44/8,8
15.	Human Organization	5	40/8	15.	Implementation Science	2	43/21,5
16.	International Journal of Environmental Research and Public Health)	5	38/7,6	16.	Ecohealth	1	42/42
17.	Medical Anthropology Quarterly	5	44/8,8	17.	American Journal of Community Psychology	1	41/41
18.	Health Promotion Practice	5	3/0,6	18.	Human organization	5	40/8
19.	International Journal of Circumpolar Health	5	5/1	19.	Journal of Womens Health	1	40/40
20.	Revista de Salud Publica (Bogotá)	5	0/0	20.	Review of Communication Research	1	40/40
21.	Revista da Escola de Enfermagem da USP	5	15/3	21.	International Journal of Environmental Research	5	38/7,6

Source: Authors.

countries show a strong correlation with the language, as we can see by the proximity and connections between the Brazilian journals and those with titles in Spanish (most present in the blue cluster). In addition to that, in the red cluster it is possible to verify that the Brazilian journals are more interconnected and salient, which indicates the existence of a field with its own and consolidated characteristics on the topic in Brazil. This argument is grounded on the regulation of the graph by the strength of the citation connections, which reduces visibility of the journals that have many citations, such as *The Lancet* and *Social Science & Medicine*, for example, but that have weaker connections, as they tend to cite more articles that are not included in the sample. The connection strength between the Brazilian authors indicated in Figure 2 also adds force to this point, as we shall see in the next topic.

The ten most cited articles[26-35] can be categorized into three types: studies on social participation/community engagement and health (1[26], 3[28], 5[30] and 7[32]); propositional studies of public management models (2[27], 6[31] and 8[33]) or on teaching/research in health, focusing on social participation (4[29] and 10[35]) and studies that relate political contexts, cultural and structural factors to social participation (9[34]).

Of the first type, we have the most cited article[26], the result of research on the strategies to improve maternal and child health, whose conclusions show that, although community mobilization is not a feature of most large-scale primary health care programs, there is diverse evidence that this is an effective method for promoting participation and empowering the communities, in addition to other benefits; the third most cited article[28], the result of a public health surveillance survey carried out in Kansas/USA, which concluded that individuals from rural areas presented the highest community involvement but relatively low levels of community ratings, and in densely settled rural areas, they may face increased risks of poor health; the fifth most cit-

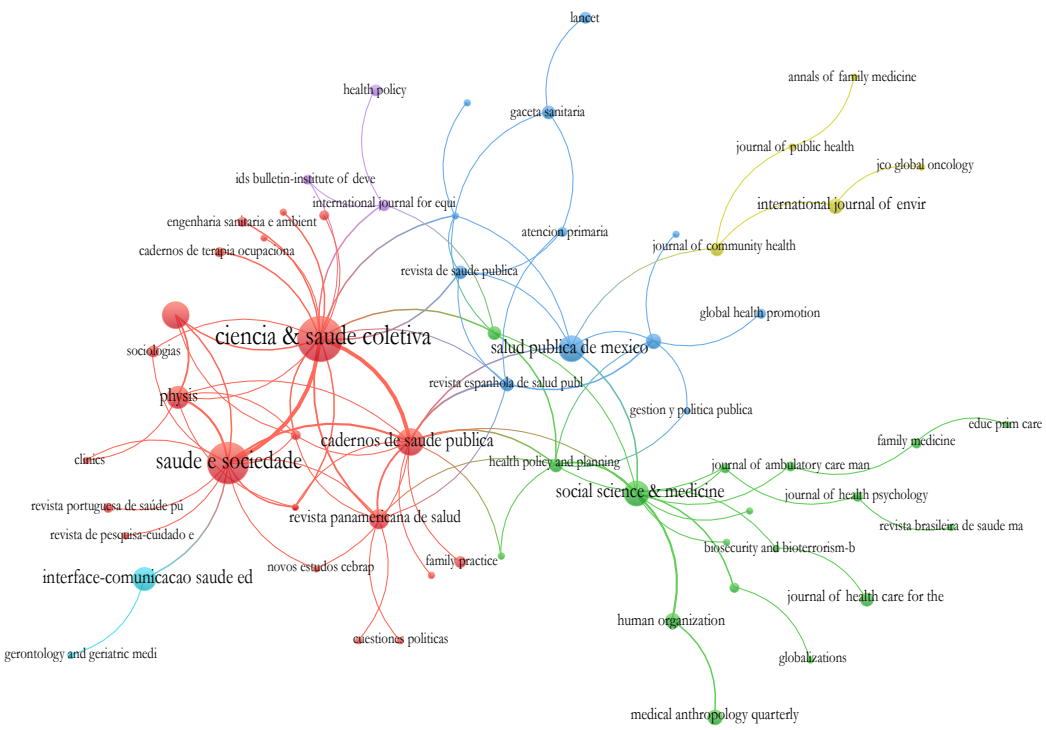


Figure 1. Citations among the journals that publish content about social participation and control in health in the Americas.

Source: Authors. Interactive version available from: https://app.vosviewer.com/?json=https://drive.google.com/uc?id=1_LFK9HAc5oGiMvJPj35iBkT1sc_tyFwt

ed article[30] presents case studies from four Latin American countries, whose results show that investment in managerial and political capacity, strong political and managerial commitment and state programs, not only limited governmental actions, have been crucial to sustain success of these policies; and the seventh most cited article[32], reporting the results of the research studies on interactions between social determinants, helminthic diseases and health promotion interventions with regard to community participation, intersectoral collaboration, gender and possibilities for scaling up helminthic disease control and eradication programs in the context of integrated and interdisciplinary approaches. The authors of the seventh most cited article conclude that, despite the belief that active community participation and based on control programs can lead to empowerment of the individuals in endemic communities, many of these communities lack institutional systems and structures to encourage people to participate in control strategies and, where they are present, they may not function properly.

Of the second type, we have the second most cited article[27], in which the authors offer a framework to promote public involvement in the evaluation of health technologies and policies, both for health policymakers in Canada and abroad, concerned with making health more public; the sixth most cited article[31] sought to understand how participation in an online health community provides direct benefits in the use of information and social support and the indirect influence on the user empowerment perceptions, recommending this approach. The eighth most cited article[33] highlights the contribution of community engagement to policymaking for mass disasters and health emergencies and recommends how the USA leaders at all levels can improve their ability to rule in a crisis and mitigate losses in the entire community by adopting this approach. The fourth most cited article[29] seeks to assist USA academic health centers in learning how to improve engagement with their communities and build an engaged research agenda. In the tenth most cited article[35] the authors develop a theoretical framework for understanding public participation in the context of regionalized health governance, based on Canadian experiences.

Of the third type, we have the ninth most cited article[34], which addresses how the cultural and structural influences are discussed in relation to community participation, concluding that situations of financial and economic crisis, economic restructuring and competition and individualization values affect generation and sustainability of participation, being cited and influencing studies that deal with this theme.

The publications from the USA and Canada stand out, with these countries' contexts as empirical environment. Results from research studies developed in other contexts, such as Brazil, end up not standing out at the top of the sample due to the lack of citations, despite the large number of productions on the topic. It was verified that most of them were published in journals with the highest number of citations (Table 1), with emphasis on the first[22] and fifth[26], published in *The Lancet* journal, which occupies the first place[26]; on the third[28] and ninth[34], published in the *Social Science & Medicine* journal, which ranks second, and for the second[23] and tenth[31], both published in the *Health Policy* journal, which ranked third[28].

Analysis of the citations: relevance of the institutions and authors

The institutional affiliation of the authors of the manuscripts was analyzed seeking to map the most productive institutions, their citation rates and their connections. The ten institutions with the highest production about the topic were as follows, signaling the number of articles and citations of each in between parenthesis: Oswaldo Cruz Foundation (29 articles – 249 citations), University of California (23 – 414), University of São Paulo (17 – 53), University of Toronto (14 – 121), University of Brasília (10 – 117), Federal University of Bahia (10 – 64), Harvard University (9 – 284), University of North Carolina (9 – 179), McMaster University (8 – 175) and Duke University (7 – 149). The institutions from the USA and Brazil stand out in this list. However, the proportion between published articles and citations confirms the greater impact of the production by USA and Canadian institutions, when compared to Latin American ones. Another interesting data is the fact that they are mostly public institutions, as only the Harvard and Duke universities are private.

As shown in Figure 2, the analysis of citations by authors generated 11 different clusters that demarcate relationships between them, highlighting the thematic proximity, but also the countries and languages of origin. Strong connections are noticed between the Brazilian authors and between the other Latin American authors. The most cited authors from the sample coincide with those than sign the most cited ar-

ticles, treated in the previous topic, although it is worth noting the most connected authors. We will see that, although the most cited authors are mostly from the USA and Canada, the Brazilian ones stand out when we analyze the most connected authors.

The first in the most connected list, José Patrício Bispo Júnior, from the Federal University of Bahia, with four articles, studies the health councils in Brazil and the effectiveness of participation; Pedro da Costa, Fernando de Paiva and Cornelis Van Stralen, linked to the Federal University of Minas Gerais, occupy the next positions, respectively, due to a systematic review on participation in health in Brazil. Then we have Poliana Cardoso Martins, Rosângela Minardi Miter Cotta, Fábio Farias Mendes, Sylvia do Carmo Castro Franceschini, Silvia Eloiza Priore, Glauce Dias, Rodrigo Siqueira-Batista, linked to the Federal University of Viçosa, also studying the experience of health councils.

Next we have Eugenia Delgado-Gallego and Maria Luisa Vazquez, with two articles in the sample and from *Universidad del Valle*, who study social participation mechanisms in Colombia. Mauro Serapioni, with three articles, linked to the University of Coimbra, but with ties to Brazilian researchers, studies from general topics on participation in health to specific issues about Local Health Councils in Brazil. Jennifer Cook, from the University of North Carolina, with three articles selected, studies community collaboration to improve quality of the services and reduce disparities in health. Helena Eri Shimizu, from the University of Brasília, with two articles selected, studies the advances and obstacles of institutionalized social participation and the mechanisms of social participation in health in Brazil. The analysis of the most connected authors reinforces the perception of a consolidated field with its own characteristics about the topic in Brazil.

Formal collaborations: co-authorship between authors, organizations and countries

Co-authorship analysis is considered a measure of formal collaboration[36], whose relationship between authors or their institutions is

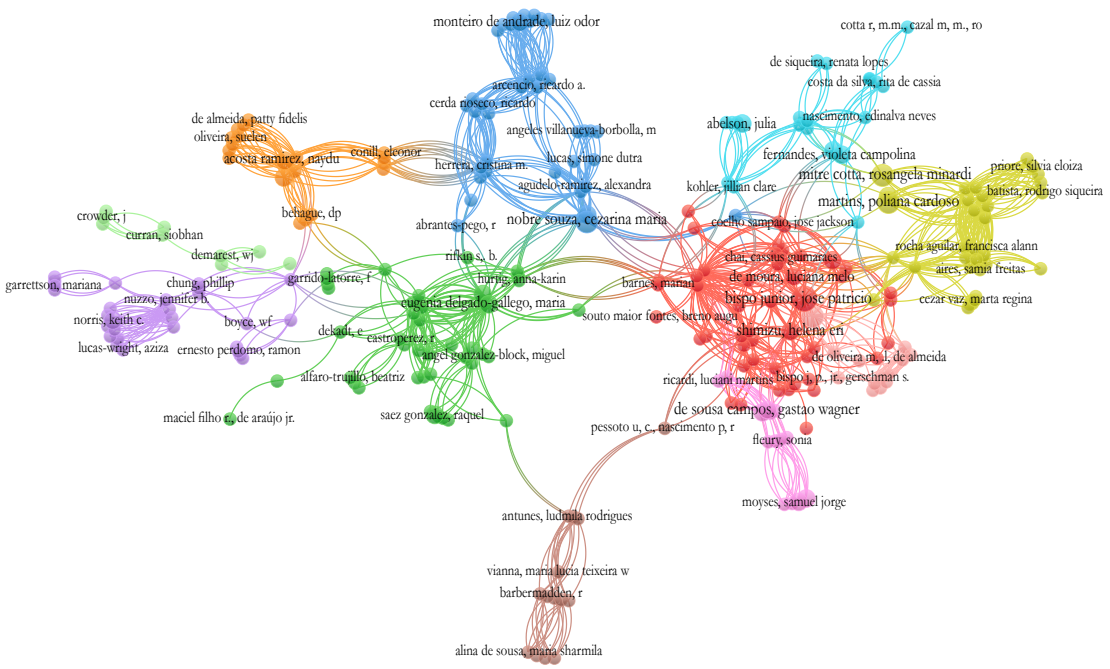


Figure 2. Analysis of citations among authors that publish content about social participation and control in health in the Americas.

Source: Authors. Interactive version available from: https://app.vosviewer.com/?json=https://drive.google.com/uc?id=1UYiJ4M1Iq8qn0QG0oC11rV4wr7mi4Vu_

established when they publish a scientific document together. This analysis shows the formal collaborations, and the connection is established through co-authorship of the articles selected, with the possibility of grouping them into organizations and countries. It is also possible to verify the type of co-authorship relationship based on the linking strength between the authors or their institutions. The advantage of this analysis is that it allows us to identify the academic collaborations and the social structure of the field, from the observation of the partnerships established between authors, between organizations or between the countries to which the authors are linked.

Considering the linking strength between the authors, the co-authorship analysis found 250 clusters with 3,379 connections between them in the set of authors that comprise the database. This shows the diversity of existing links in this field, largely due to thematic fragmentation and to the different uses and meanings that social participation acquires for these different research fronts. From this universe of authors who work together, it is possible to verify that some of them are more connected, with the following standing out in terms of formal collaboration, according to their connection strength: in 1st place, Mélanie Levasseur; 2nd, Sergio Aguilar-Gaxiola; followed by Yves Couturier, 3rd; in 4th place, Doriane Miller; and 5th, Luiz Odorico Monteiro de Andrade. When analyzing the 40 most relevant authors on the topic, only 4 clusters were formed, in which other authors stand out, as can be seen in Figure 3.

In these four clusters, it is observed that there is predominance of researchers in the biomedical areas, with a large part of the research studies focused on the development of health intervention strategies through community engagement, especially of social and ethnic minorities, with the objective of reducing inequality and better understand the distribution of morbidities among population groups, especially those that are socially vulnerable. In blue, Cluster 1 gathers researchers whose focus is community-based participatory research and community empowerment in health. In turn, Cluster 2 in red groups researches devoted to research and development of interventions in health aimed at chronic pa-

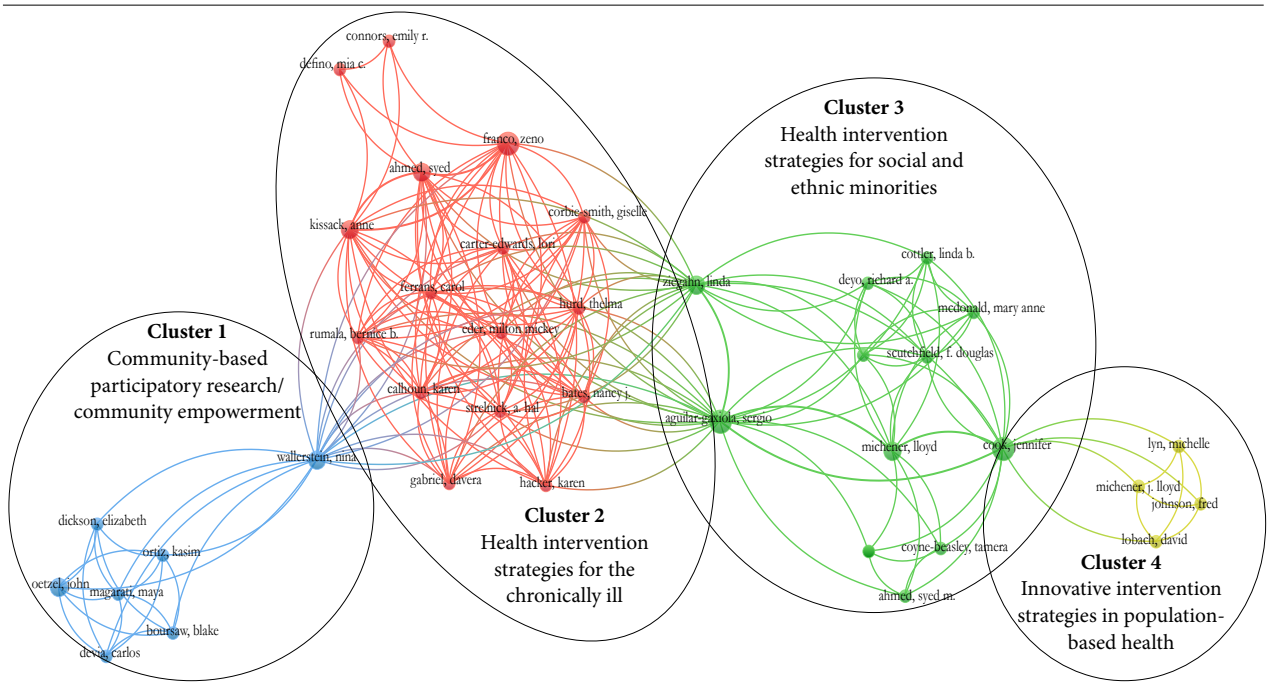


Figure 3. Co-authorship analysis among the most relevant authors that publish content about social participation and control in health in the Americas.

Source: Authors. Interactive version available from: https://app.vosviewer.com/?json=https://drive.google.com/uc?id=1qsRxevCpNSPfS0nJYUeA-PFYvx2WijBL

tients. In green, Cluster 3 brings together researchers focused on health interventions aimed at ethnic and social minorities, and Cluster 4, in yellow, gathers researchers devoted to research studies focused on innovative health intervention strategies.

When analyzing the 736 organizations present in the database, 418 organizations were found that published at least one document as co-authors, forming 88 clusters with 994 connections between them. The University of Toronto, Fiocruz and Harvard University are the three organizations that most have formal collaborations with other organizations, according to linking strength, number of documents and citations. The universities of Columbia, California and Sherbrooke follow in the ranking. Among the most connected with other organizations, the University of North Carolina, the University of Montreal, the Johns Hopkins University and the University of São Paulo also stand out. It should be noted that the 288 most relevant organizations form 13 co-authorship clusters, with 916 connections between them, in which other universities in the Americas and also in Africa, Europe, Asia and Oceania appear together with the aforementioned institutions, although with a preponderance of Brazilian and American organizations. Most of the organizations that maintain formal collaborations establish them with others located in the same country.

Finally, we also identified formal collaboration between the countries. We verified that, of the total sample, the 42 most relevant countries made up 3 clusters with 141 connections between them. These results show that, unlike the ranking of organizations that most have formal collaborations with other organizations, where the University of Toronto and Fiocruz occupy the first places, in terms of formal collaboration between countries, the United States is first, followed by Canada and Brazil. It is important to note the variation in terms of co-authorship according to the country. In the Brazilian case, for example, the vast majority of articles are the result of formal collaborations between researchers from organizations in the same country, with greater internal than external articulation between the researchers. Meanwhile, in the case of the United States and Canada, there is both internal and external articulation and greater diversity of collaborations with other countries, showing more internationalization. Analyzing the results, it is possible to assert that, to a large extent, language exerts an influence on the collaborations, as in the case of the collaboration between Brazil and Portugal and the other Latin American countries.

Final considerations

It was possible to verify not only the increase in the number of publications and of the relative frequency in the American countries but also the quantitative and impact-related relevance of the different countries. In addition to that, the co-authorship analysis indicated the groups of authors that establish formal collaborations among themselves and the internationalization degree of these cooperation works. However, even with the inclusion of indexers that sought to expand reach of the publications in the region and in the Social Sciences, North American countries had more visibility and impact in the sample surveyed. Consequently, new efforts to map and shed light in contexts that were out of the scope of this paper should be encouraged. We consider it relevant that future research studies can review books and the gray literature, including publications from governmental and non-governmental agencies and bodies, which contribute many productions that are equally relevant to understand this field of knowledge production, even if on the margins of the main journals.

When we look at the Americas as a whole in an expanded analysis, the inequalities in terms of visibility and impact of this scientific field give rise to discussions to overcome the obstacles to scientific and technological development and, consequently, of public policies and health care. To identify this inequality, we followed the recommendation proposed by Foratini[37] to consider the three *lingua francas*: English, Portuguese and Spanish. Appreciation of the local and less internationalized languagesin the scientific field is related to the formation of a "critical mass" and to recognizing the cultural achievements of each territory. This research identified several experiences of mechanisms, strategies and theoretical discussions on social participation that bring about important contributions to the topic and which, due to these inequalities, have their potential reduced. Non-inclusion of the French language is one of the limitations of this study, as it may have resulted in the exclusion of articles with metadata only in this language.

As we present throughout the text, the sample selected shows a large discrepancy between the national productions, whether numerical, as in the case of the USA and Brazil, or by relevance

in the strength of the connections and citations, such as the USA, Canada and foreign productions on the local contexts. For this reason, we consider important to perform new broad analyses with methodologies that allow delving into the specificities of the diversity of the countries of the Americas and drawing comparisons between them. Accumulation of these comparisons seems to us to be a necessary condition for advancing the debate on the continent, putting into dialogue the local traditions and knowledge with the global advances.

Collaborations

FV Machado worked on research design, data collection, treatment and analysis, writing and review of the final text of the article. CM Rech worked on research design, data collection, treatment and analysis, writing and review of the final text of the article. RS Pinto worked on research design, data collection, treatment and analysis, writing and review of the final text of the article. WM Romão worked on research design, data collection, treatment and analysis, writing and review of the final text of the article. MMM Matias worked on research design, data collection, treatment and analysis, writing and review of the final text of the article. GC Freitas worked on research design, data collection, treatment and analysis, writing and review of the final text of the article. H Kujawa worked on research design, data collection, treatment and analysis, writing and review of the final text of the article. FAG Leles worked on research design, data collection, treatment and analysis, writing and review of the final text of the article.

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