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Review Paper

Integrating social determinants of health in medical education: a bibliometric analysis study

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ABSTRACT

Objectives: Social determinants of health (SDH) are the prevalent enablers of health among populations, and integrating them in medical education will advance clinical care by integrating social and economic risk data into medical diagnosis and treatment. Despite the numerous publications on SDH and medical education, the publication trends are not known. The study aims to analyse publication trends in integrating SDH into medical education and the corresponding thematic areas.
Study design: This was a bibliometric analysis study.
Methods: Bibliometric was used. Data from Scopus databases from January 2006 to June 2023 were retrieved with no language restriction. VOSviewer software was used for analysis. Bibliographic coupling was used to identify the clusters of published literature on the integration of SDH into medical education, followed by the analysis of annual distribution and growth trends, authors and co-author relationships and collaborations.
Results: A total of 1047 articles were retrieved. The annual research publication exhibited a swift surge in the studies conducted during the reviewed period. Five clusters of information were derived: relating to curriculum development, community engagement and service-learning, stakeholder collaborations, development of assessment methods and tools for SDH, and the impact of integrating SDH into medical education.
Conclusion: Bibliometric analysis has revealed a growing trend in the field of integrating SDH into medical education, and the study has highlighted the research impact through bibliographic coupling by identifying the five thematic areas. This study lays a foundation for advancing knowledge on what has been published and possible areas for improvement in the integration of SDH into medical education.

Introduction

The World Health Organisation defines social determinants of health (SDH) as peoples' non-medical conditions that influence health outcomes and quality of life, such as where they are born, grow, live, work and age.[1] Recent studies have noticed the significant contribution of social, economic and behavioural factors in promoting or altering population health outcomes.[2–4]

Socio-economic factors have demonstrated significant contributions to disparities in health and well-being among populations. For instance, within the socio-economic scale, those at the top are likely to have better health outcomes compared with the middle class. Similarly, those at the lower scale are likely to experience worse health outcomes compared with those at the middle.[5]

Integration of the SDH in medical education and the healthcare system will advance clinical care by integrating social and economic risk data into medical diagnosis and treatment. With socio-economic factors being barriers to the delivery of high-quality care, this integration will guide community partnerships and clinical encounters in improving health outcomes.[6]

Studies have demonstrated that apart from gaining broad perspectives on health disparities, medical students will obtain satisfaction and self-efficacy when engaging with the communities they serve.[7] Not only does this amplify their engagements but also enhances their skills in addressing emergent health needs within the communities. However, for medical education to address the SDH, a multidimensional and multifaceted approach that incorporates

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traditional didactic teachings, community-based learning opportunities and decisively conventional role modelling is needed. In addition, the curricula content should also integrate experiential learning and an enhanced SDH-oriented clinical learning environment.[8]

Previous studies spanning from 2006 have focused on various models, strategies and frameworks applied in teaching, assessment and evaluation of the medical curriculum.[9] Over that period, substantial progress and trends in SDH incorporation into medical education can be noticed. For a clear demonstration of this progress, a bibliometric analysis was deemed the most suitable method for the present study.

Bibliometrics analysis was initially introduced in 1989 by Alan Pritchard,[10] and since then, it has received broader attention particularly due to the advancements in evidence science, access to computers, availability of the internet and availability of bibliometrics software, such as VOSviewer, CiteSpace and Biblioshiny.[11,12] Outstanding advancements have also been made in the development of scientific databases that work with bibliometric software packages, such as the Web of Science, Scopus and PubMed.[13]

In bibliometric analysis, statistics from available databases are used to demonstrate the distribution of contributions, hotspots and projected trends of a particular field. As a vital tool for analysis, bibliometrics helps to investigate researchers' findings and how they integrate or make sense in the broader academic and intellectual fields.[12]

VOSviewer is among the bibliometric software used for data analysis and visualisation.[14] This software can posit knowledge domains by generating and visualising co-occurrence network maps of co-authors, keywords and co-citation networks of cited authors based on the bibliographical archives gathered from a particular database.[15]

Although studies on integrating SDH into medical education have gained worldwide attention, there are no published bibliometric studies related to this topic. To bridge this gap, we used Scopus databases to perform a bibliometric study of the documents published in the field of integrating SDH into medical education. The study applied VOSviewer for data analysis and visualisation. Bibliographic coupling was used to cluster the documents into various thematic areas.

Methods

Study design

Bibliometric was applied in analysing trends of the published literature on integrating SDH into medical education.[14] VOSviewer was used for data analysis and visualisation[16,17] The bibliometric analysis was carried out using documents retrieved from the Scopus database (https://www.scopus.com/). Scopus database has wider coverage with over 25,100 journals and access to 1.7 billion citations.[18,19–21] Scopus data (January 2006 to June 2023) were abstracted on 4 May 2023. All retrievals were done in 1 day to steer clear of variations due to daily updates, and the following search strategy was applied: "social determinants of health" OR SDH OR sdh AND teaching OR "medical education" OR "medical curriculum" OR "educational model" OR "medical school." The search excluded studies that were undertaken before January 2006, and we limited our search to publications that were only carried in the English language. Manual search from the references of the retrieved documents was done to ensure that all relevant references were included in the study.

Data analysis

Co-authorship analysis, co-occurrence analysis, citation analysis, bibliographic coupling and co-citation analysis of the Scopus data were done using VOSviewer software. Bibliographic coupling, which is the measure of an object's connectedness based on the number of references they share, was used to highlight the parallels between the two works' subjects in terms of documents, sources, authors and organisations.

Results

Yearly distribution and growth trend

A total of 1047 documents were retrieved. The first article on SDH in medical education was published in 2006,[4] and since then, there is a steady increase in the number of publications, which is a probable demonstration of the significance of the research topic (Fig. 1).

Distribution of publications on a country-by-country basis and total link strength

Articles from 40 countries were retrieved, with the United States having the highest volume of published manuscripts ($n = 644$), followed by the United Kingdom ($n = 95$) and Canada ($n = 90$). Cumulatively, at least 15 countries published at least 10 articles in the research field, and in terms of the total percent of published articles, the United States, the United Kingdom, Canada, Australia and India had a cumulative percentage of 78% of all the articles published. In terms of the number of citations per country during the period under review, the United States was leading ($n = 8249$), followed by Canada ($n = 2949$) and Sweden ($n = 2137$). Regarding the average citation per document, Sweden was leading with an average of 164.38 citations per document. The United States ranked first in terms of total link strength ($n = 221$), followed by Canada ($n = 134$) and the United Kingdom ($n = 78$).

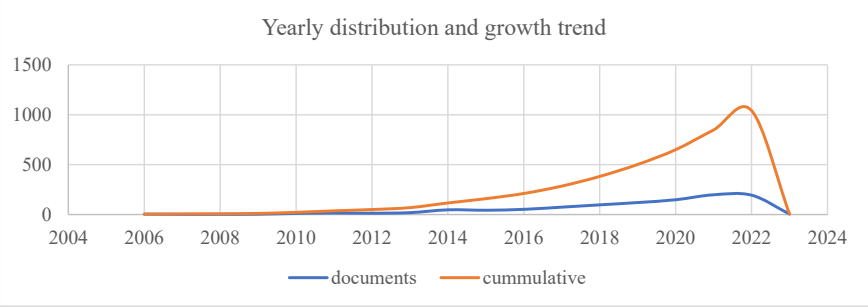

Fig. 1. Annual changes in the number of publications and the total number of publications.

Table 1
Leading organisations/institutions with over three publications.

S/No	Organisation	Country	Documents	Citations	Average citation per document	Total link strength
1	Harvard Medical School, Boston	USA	9	75	8.3	1
2	Yale School of Medicine, New Haven	USA	7	142	20.3	2
3	Penn State College of Medicine, Hershey	USA	4	107	26.6	1
4	Boston University School of Medicine	USA	3	10	3.3	0
5	The University of Nebraska Medical Centre	USA	3	9	3	2
6	University of Toronto, Toronto	Canada	3	36	12	0
7	Oregon Health and Science University	USA	3	29	9.7	0
8	University of Ottawa, Ottawa	Canada	3	61	20.3	0
9	Icahn School of Medicine at Mount Sinai	USA	3	3	1	1
10	University College London, London	UK	6	39	6.5	0

The organisation with the most publications were the Harvard Medical School ($n = 9$), the Yale School of Medicine ($n = 7$) and University College London ($n = 6$). Regarding the total number of citations, Yale School of Medicine was leading ($n = 142$), followed by Penn State College of Medicine ($n = 107$; Table 1).

Authors and co-author relationships

The cumulative number of articles published and the citation metrics achieved by the authors were used to classify the most engaged researchers in the field of SDH and medical education. Klein had the highest number of documents ($n = 10$), followed by Serwint ($n = 8$) and Gonzalo ($n = 6$). The following authors had the highest citations: Klein ($n = 201$), Simon ($n = 189$), Gonzalo ($n = 137$) and Kaufman ($n = 109$).

Journals publishing articles relating to SDH and medical education

The journal that had the largest number of documents on the research topic was Academic Medicine Journal. A total of 53 articles were published in the period under review, with a sum of 1181 citations. The second journal was the BMC Medical Education Journal, with 29 articles and 254 citations, and the third was MedEd Portal: The Journal of Teaching & Learning Resources, with 24 documents and 146 citations. The average number of citations per document suggests the significance of articles published in the journal. In the present study, the Lancet had the highest average total citations per document (documents: 11, average citation per document: 197.2), followed by the New England Journal of Medicine (documents:13, average citation per document 44.8) and the Academic Medicine Journal (documents: 53, average citation per document:22.3; Table 2).

Documents, citation relationships and collaboration network between countries

The association between the published articles and citations attained is a significant marker of the quality of the published articles. Improved citation count is a characteristic of the outstanding quality of the published document, resulting in a better number of citations by other researchers in the same field. In the present study, documents that had been cited more than 30 times were selected. Publications that had the highest citations were authored by Bozorgmehr, 2011 ($n = 121$), Klein, 2011 ($n = 91$), Colvin, 2016 ($n = 90$) and Mangold, 2019 ($n = 79$). Regarding the collaboration network between institutions and organisations, Harvard School of Medicine had the highest network of research collaborators, whereas the other institutions collaborated on a small scale (Table 3).

The analysis of bibliographic coupling

The potential association between SDH and medical education was assessed using bibliometric coupling. Through VOSviewer, 51 articles were selected from the original data according to their coupling strength (the selected articles received at least 40 citations each). As demonstrated in Fig. 2, a total of five clusters were identified and presented with different node colours. The articles aligned to each coloured node were analysed independently to align them to correct thematic areas related to the integration of SDH into medical education. The first cluster

Table 3
Top cited articles in the research topic.

S/No	Document	Citations	Links	References
1	Bozorgmehr K. (2011)	121	0	22
2	Klein M.D. (2011)	91	2	23
3	Colvin J.D. (2016a)	90	1	24
4	Mangold K.A. (2019)	79	0	25
5	Dharamsi S. (2010)	62	0	26
6	Kasper J. (2016)	61	1	27
7	Klein M.D. (2014)	58	2	28
8	Sartorius B.K.D. (2014)	44	0	29
9	Gonzalo J.D. (2017)	41	0	30
10	Knight S.E. (2016)	37	0	31

Table 2
Top 10 journals published most articles on the research topic.

S/No	Source	Documents	Citations	Average citation per document	Total link strength
1	Academic Medicine	53	1181	22.3	85
2	BMC Medical Education	29	254	8.8	46
3	MedEd Portal: The Journal of Teaching & Learning Resources	24	146	6.1	6
4	Journal of General Internal Medicine	22	245	11.1	32
5	Medical Teacher	19	283	14.9	33
6	International Journal of Environmental Research & Public Health	18	69	3.8	1
7	Academic Paediatrics	17	270	15.9	23
8	New England Journal of Medicine	13	582	44.8	10
9	Education for Primary Care	11	39	3.5	11
10	The Lancet	11	2169	197.2	1

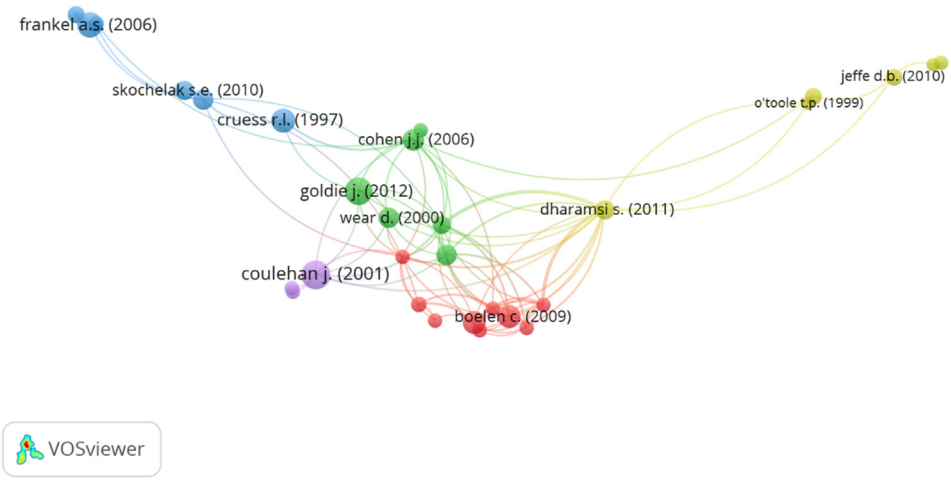

Fig. 2. Bibliographic coupling.

(yellow nodes) focuses on curriculum development so that medical schools can teach topics, such as health disparities, health equity, and the impact of social factors on health, such as education, housing and discrimination. The second cluster (green nodes) focuses on community engagement and service-learning. In this thematic area, the emphasis is to inspire medical students to engage with underserved communities and participate in service-learning experiences. The third cluster (red nodes) focuses on partnerships and stakeholder collaboration with key players in the health sector to increase the understanding of the need for integrating SDH into medical education. The collaboration will provide valuable insights into community health initiatives and policies that are addressing the integration of SDH into medical education. The fourth cluster (purple nodes) focuses on the development of assessment methods and tools that are used to measure the attitudes of students, faculty, stakeholders and the community towards the incorporation and implementation of the concept of integrating SDH into medical education. The last cluster of articles (blue nodes) focuses on the impact of integrating SDH into medical education. The reviewed articles indicated several positive impacts, including improved patient care through community engagements, reduced health disparities and improved collaboration between the medical school and other stakeholders (Fig. 2).

Discussion

Bibliometric analysis of the studies on the integration of SDH into medical education was conducted by use of VOSviewer software, and the authors preferred Scopus database, as it has more benefits compared with other scientific databases.[13]

Most published literature were from the United States, and the top organisations publishing more than three articles were from the United States, Canada, and the United Kingdom. Given the extensive influence of SDH, developed countries have embarked on teaching modules that inform trainee physicians about SDH and how they impact health. As demonstrated by numerous studies, partnerships and collaborations between academic medical centres and community-based organisations have the potential to create a feasible, effective and sustainable platform to prepare medical students for SDH.[32] The studies have also established the role of educational technologies and pedagogies in facilitating internationally interconnected styles in the medical curriculum, which emphasise the mobility of learners and educators across borders.[33]

The growing number of published literature and the citation metrics drawn by the authors were categorised based on the most involved researchers in the field. Klein had the highest number of publications, and in all his work, he has demonstrated the need to train physicians on SDH and develop their skills to assess for social and environmental risks within divergent populations. Klein also noted that the educational intervention would enhance applicable knowledge among physicians and improve the traditional medical curricula, which do not specifically address families' social, economic and environmental needs.[23]

A comprehensive analysis of the institutions working on the integration of SDH into medical education was given. This finding is significant, particularly to upcoming researchers, as this would guide them by presenting a strong background knowledge of the study topics that have been covered in the research field and practicable research gaps. This knowledge also presents a base for networking with peers who have significant proficiency in the field of study, while interdisciplinary work may provide an effective approach to address the identified research gaps.[34]

Another substantial finding in this study includes the five thematic areas identified through bibliographic coupling. The five thematic areas include curriculum development, community engagement and service-learning, stakeholder collaborations, the development of assessment methods and tools for SDH, and the impact of integrating SDH into medical education. This finding is in line with the existing SDH frameworks, which demonstrate similar strategies of SDH integration, such as community partnerships, service-learning and curriculum development.[35]

The main study limitation was the dependence on the Scopus database, which is subject to continuous change and updating in the number of indexed articles. Similar to all other scientific databases, there is a likelihood of discrepancies in the results after a short period, as more researchers are exploring the research topic. The VOSviewer tool would only undertake comprehensive analysis using Scopus data set. VOSviewer is unable to provide other types of visualisation beyond network graphs. Therefore, the developers of VOSviewer should consider reviewing the software to accommodate all functions when analysing other scientific databases just like the Scopus data set. These may include simple line charts showing the growth of paper by keywords to more complex network trend topic analysis visualisations to temporal trend analysis. The software can be improved to offer a thematic analysis option that plots clusters of keywords along two dimensions (density vs centrality).

This will be crucial in spotting emerging clusters and the degree of importance of each cluster.

Conclusion

This was the first bibliometric study on SDH and medical education. There is a steady increase in the number of published articles since 2006. The publications are mainly in five thematic areas, focusing on curriculum development, community engagement and service-learning, stakeholder collaborations, development of assessment methods and tools for SDH and the impact of integrating SDH into medical education. This study lays a foundation for advancing knowledge on what has been published and possible areas of improvement in the integration of SDH into medical education, such as investing in stakeholder collaborations, experiential learning and community participation in the identification of the priority health needs that the medical schools can attempt to resolve.

Future research direction

The study's findings indicate the importance of exploring ways to integrate the SDH curriculum into broader educational programs, making it universally accessible. It is also imperative to consider how to seamlessly incorporate the SDH curriculum into clinical education across all training sites. This approach will significantly enhance the educational impact by providing trainees with essential integrative skills that validate the training program's value.

Finally, there is a need to research on specific competencies needed in the identification and mitigation of SDH. This may include the recognition of implicit and explicit biases, advocacy skills, development of a basic awareness of healthcare financing and payment structures and communication skills needed to unravel the socio-economic barriers to effective clinical care.

Author statements

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Ethical approval

Ethical approval was not required, as there was no primary data collection.

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Competing interests

None declared.

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