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Original article

A bibliometric study of the *Journal of School Health*: 1965–2014[☆]Chi-Chen Zhang^{a,*}, Xiao Zheng^a, Chun-Hui Su^b, Huang Huang^c, Feng-Ru Yan^a,
Xiao-Jie Pan^b, Hui-Ning Zhao^a, Zhen-Zhen Jin^a^a School of Management, Shanxi Medical University, Taiyuan, Shanxi 030001, China^b School of Public Health, Shanxi Medical University, Taiyuan, Shanxi 030001, China^c Yale University, New Haven, CT 06510, USA

ARTICLE INFO

Article history:

Received 5 January 2017

Received in revised form

18 February 2017

Accepted 25 March 2017

Available online 8 June 2017

Keywords:

Journal of School Health

Bibliometric

Visualization

Scientific knowledge map

CiteSpace III

ABSTRACT

Background: As an important international journal in the field of school health, the *Journal of School Health* has drawn wide attention from researchers and readers around the world. Therefore, it is important to conduct a systematic retrospective study of the journal. With the aim of understanding the development of the journal and the evolutionary process of cooperative study of this field comprehensively, we employed bibliometric analysis using the articles published in the *Journal of School Health* from 1965.

Methods: Using bibliometrics, 5242 articles published in the journal were extracted and then analyzed using the visualization software CiteSpace III.

Results: The annual published amount of literature showed a declining tendency; however, the frequency of citation displayed an increase year by year. Among prolific authors, the number of reports published by JH Price, L Kann and RJ McDermott are at the top. Among the high frequency keywords used in the research journal, “adolescents”, “children” and “programs” have become popular in the journal's vocabulary. CDCP, Univ Texas and Univ Calif are positioned in the forefront of the involved institutions when ranked by degree of contribution.

Conclusions: The *Journal of School Health* provides an important platform for sharing research achievements and promoting cooperation in this field. The amount of articles published in the journal is continually improving; its cooperative research network promoted by famous scholars and institutions is forming. As more researchers and institutions join, the network will grow and relationships will become increasingly close. However, limitations to cooperation at the regional or interagency scope remain.

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1. Introduction

As a core journal in the Web of Science, the *Journal of School Health* was first published in 1930, and it has attained an impact factor of 1.659 to date. The major research fields that the *Journal of School Health* concentrates on are Education Scientific Disciplines, Education & Educational Research, Health Care Sciences & Services, and Public Environmental & Occupational Health. The *Journal of School Health* is published 12 times per year on behalf of the

American School Health Association (ASHA). Journal readership includes administrators, educators, nurses, physicians, dentists, psychologists/counselors, social workers, nutritionists/dieticians, and other related health experts. These individuals work cooperatively with parents and social communities to achieve the common goal of providing youths with the programs, services, and environment necessary to promote health and improve learning. Many well-known experts or scholars, taking McDermott et al^{1–9} for instance, have published high quality articles in the journal, which has made great contributions to its development. The *Journal of School Health* celebrated its 85th anniversary in 2015; based on this, the present article analyzes data informed by the article in this journal, using the information visualization software CiteSpace and the perspective of bibliometrics. Therefore, the aim of this article was to congratulate the journal and provide reference for readers to further understand the journal, as well.

[☆] The study was supported and funded by MOE (Ministry of Education, China), the research projects of Humanities and Social Sciences (No. 13YJZH239) and the National Natural Science Foundation of China (No. 71403155). It is also supported by Shanxi Federation of Social Science Circles (No. SSKLZDKT2014084).

* Corresponding author.

E-mail address: zhangchichen@sina.com (C.-C. Zhang).

Peer review under responsibility of Shanxi Medical Periodical Press.

2. Methods

2.1. Data source

In this article, the article was collected from the scientific article database Web of Science. The Retrieval Period is “1965–2014”. The Search Formula is “Publication Name = *Journal of School Health*”; there were in total 5242 related articles shown after the retrieval. The Retrieval Date was April 30, 2014.

2.2. Data processing and analysis

Authors, keywords and institutions were extracted and merged from the 5242 original pieces of data, which meant that multiple words with the same meaning were merged into one relevant word. For example, the keywords “children” and “child” were merged into “children”; “cigarette”, “cigarettes” and “tobacco” were merged into “cigarettes”; and “teacher”, “teachers” and “school teachers” were merged into “teachers”. The institutions “Ctr Dis Control & Prevent”, “CTR DIS CONTROL & PREVENT”, “CDCP” and “CTR DIS CONTROL” were merged into “CDCP”; “UNIV CALIF”, “Univ Calif San Diego”, “UNIV CALIF LOS ANGELES” and “Univ Calif Los Angeles” were merged into “Univ Calif”; and “UNIV TEXAS” and “Univ Texas” were merged into “Univ Texas”. In this article, we make a distinction between authors from different institutions but with the same name, for example, JS Greenberg at Univ Maryland was marked as JS Greenberg 1, JS Greenberg at BOSTON UNIV was marked as JS Greenberg 2. Meanwhile, the article unified the spelling of authors' names, as well, such as L Kann, L KANN and Laura Kann were merged into L Kann; Robert J McDermott and RJ McDermott were merged into RJ McDermott.

2.3. Instruments and procedure

After the data were merged, we drew a knowledge map of the *Journal of School Health* using the visual software CiteSpace, Vision 3.8.R3, which was researched and developed by professor Chen of

Drexel University.^{10–12} CiteSpace is an available Java application intended for visualizing and analyzing trends and patterns in scientific article. Through analyzing and processing scientific article data, CiteSpace could show trends and frontiers in the field of scientific development as a form of knowledge map. This software analyzed the selected relevant nodes according to different criteria, i.e., authors, keywords and institutions. In this study the analysis period extended from 1965 to 2014 with a time interval of 1 year, from which 49 time slices were formed, displaying the top of the figure. The threshold level was set to (2, 2, 20), (4, 3, 20), (4, 3, 20) Top N per slice = 50.^{13–16}

3. Results

3.1. Analysis of number of annual published articles

The annual published articles refers to the total number of article about the related subject the journal published each year, and it reflects the information content of the journal to some extent. Fig. 1 shows the annual distribution of published articles in the *Journal of School Health*, which was gathered from the Web of Science. From the figure, we can see that the annual number of published articles basically presents a declining trend, in which the earlier stage shows a fluctuation whereas the later stage was relatively stable. The number of annual published articles in 1981 was more than 170, representing the peak of the whole timeline. In addition, the number of annual published articles in the journal can be divided into three stages: the first stage was 1965–1975, during this stage the number of article began increasing, then it reached its maximum in 1970 and began to drop; the second stage was 1976–1988, the amount of article first increased then decreased, reaching the maximum amount for all years in 1981; and the third stage was 1989–2014, during which the amount of article was relatively stable, with a fluctuation of less than 120 items. As the collected article data's terminal date is April 30, 2014, the data statistics for that year are incomplete.

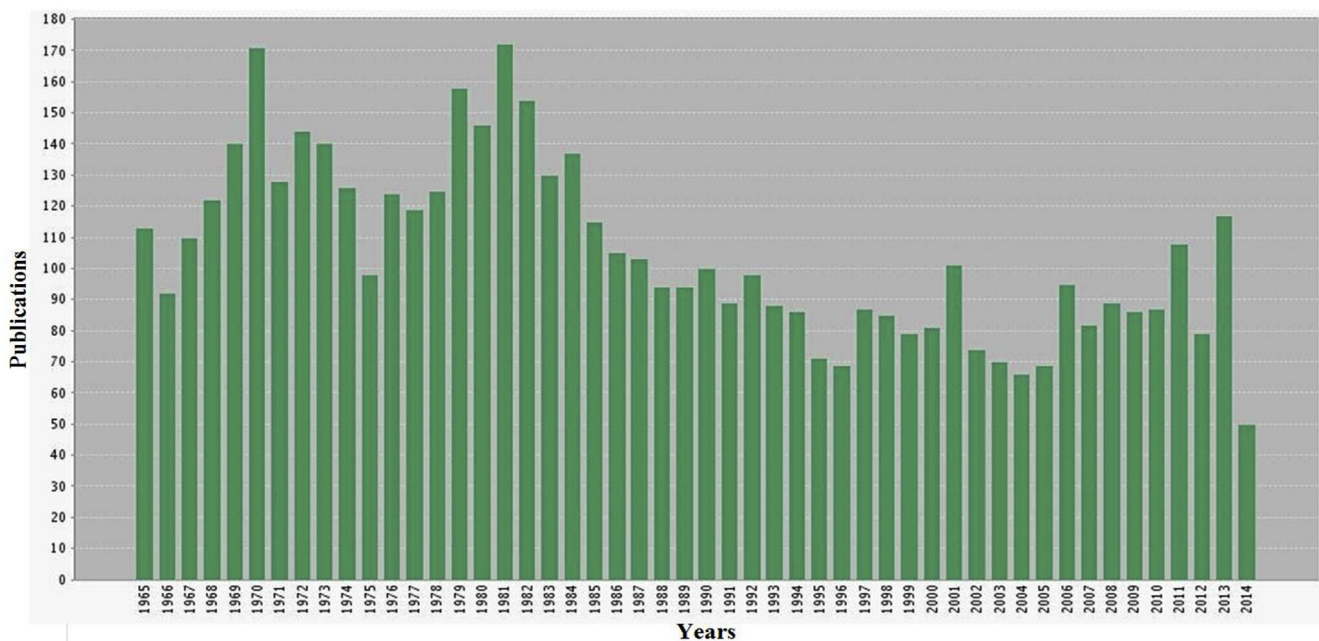


Fig. 1. Annual distribution of published articles in the *Journal of School Health*.

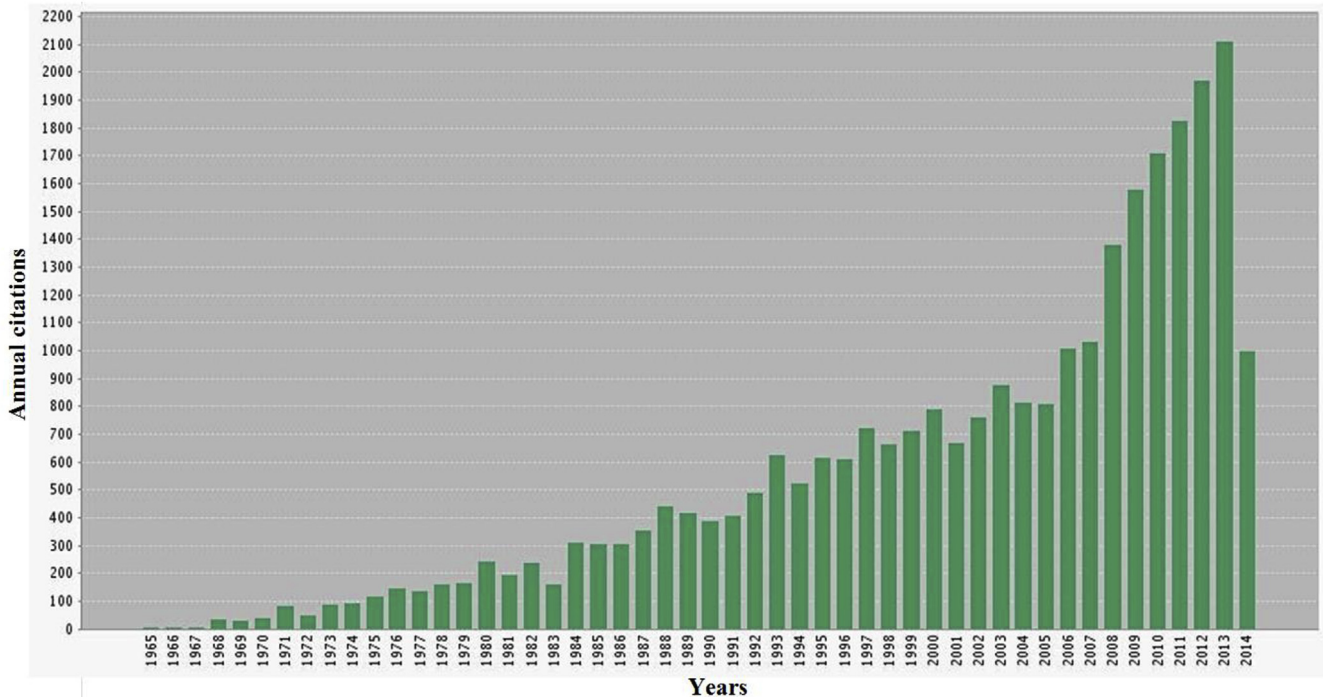


Fig. 2. Annual distribution of article citations in the *Journal of School Health*.

3.2. Analysis of article cited

Fig. 2 shows the annual distribution of article citations of the *Journal of School Health*, which comes from the Web of Science. The citation of article rises continually from 1965. The article's citations increased slowly before 2007 and then increased faster. The same trend applies to the annual published articles of the journal in Fig. 1; as the collected article data's terminal date is April 30, 2014, the article citations of that year are incomplete.

Table 1 shows the statistical overview of the top 50 articles distributed by year. The total number of citations of the top 50 most cited articles was 4971, with an average of 99.4 citations. In 1989 and 2004, the cumulative number of highly cited articles reached an all-time high (4 for each), and the total number of citations reached its peak, as well (421 times in 1989 and 453 times in 2004, respectively). In 1985, the average number of citations (156.5 times) its peak for the whole timeline.

Because of space restrictions, the top 30 most cited articles are listed in Table 2. The highest number of citations of a single article appeared in 1989, when cumulative frequency reached 188 for an article which was titled "Essential elements of school-based smoking prevention programs" and was written by TJ Glynn. The second-highest cited article was DB Connell's "Summary of findings of the school-health education evaluation-health promotion effectiveness, implementation, and costs". The third was "Promoting school connectedness: Evidence from the national longitudinal study of adolescent health", written by CA McNeely.

3.3. Analysis of authors' cooperation network

We selected authors as the network node for analysis; there are altogether 1931 nodes, correlated with 711 connecting lines. Fig. 3 shows the cooperative relationship among authors based on the threshold level. Each node represents an author, and the circle size demonstrates the amount of article published by each author. The

circle's color represents the publication year of the article in question. The connecting lines between the circles display direct or indirect cooperation between different nodes, and their color represents the first year of cooperation.^{17,18} There are two typical teams that cooperated closely and published more article than all other authors. One is a large cooperative team with a complex organization of scientific research, comprising JH Price, SK Telljohann, ND

Table 1

Annual distribution of the top 50 cited publications and their citations in the *Journal of School Health*.

Publication year	Article number	Total citations	Average citations per paper
1980	1	70	70.0
1981	1	76	76.0
1985	2	313	156.5
1986	3	294	98.0
1987	2	258	129.0
1989	4	421	105.3
1990	1	156	156.0
1991	3	297	99.0
1993	2	195	97.5
1994	1	110	110.0
1995	3	295	98.3
1996	3	217	72.3
1998	1	72	72.0
1999	1	68	68.0
2000	2	148	74.0
2001	2	196	98.0
2002	3	405	135.0
2003	3	188	62.7
2004	4	453	113.3
2005	1	88	88.0
2006	2	164	82.0
2007	3	290	96.67
2008	1	124	124.0
2009	1	73	73.0
Total	50	4971	99.4

Table 2
Top 30 cited publications and their information in the *Journal of School Health*.

Rank	Title	Author	Publication year	Total citations	Average citations
1	Essential elements of school-based smoking prevention programs	TJ Glynn	1989	188	7.27
2	Summary of findings of the school-health education evaluation-health promotion effectiveness, implementation, and costs	DB Connell	1985	187	6.23
3	Promoting school connectedness: Evidence from the national longitudinal study of adolescent health	CA McNeely	2002	182	14.00
4	The comprehensive school-health program-exploring an expanded concept	DD Allensworth	1987	171	6.11
5	Self-report measures of children physical-activity	JF Sallis	1991	160	6.67
6	School-based cardiovascular health promotion – the child and adolescent trial for cardiovascular health(CATCH)	CL Perry	1990	156	6.24
7	Substance-abuse prevention research-recent developments and future-directions	GJ Botvin	1986	147	5.07
8	The importance of bonding to school for healthy development: Findings from the Social Development Research Group	RF Catalano	2004	140	12.73
9	Gender and developmental differences in exercise beliefs among youth and prediction of their exercise behavior	AW Garcia	1995	133	6.65
10	Television viewing and its associations with overweight, sedentary lifestyle, and insufficient consumption of fruits and vegetables among US high school students: Differences by race, ethnicity, and gender	R Lowry	2002	131	10.08
11	Physical education and physical activity: Results from the school health policies and programs study 2006	SM Lee	2007	128	16.00
12	Measuring student relationships to school: Attachment, bonding, connectedness, and engagement	HP Libbey	2004	127	11.55
12	Cigarette-smoking as a predictor of alcohol and other drug-use by children and adolescents evidence of the gateway drug effect	MR Torabi	1993	127	5.77
14	High-school students perceptions and misperceptions of aids	JH Price	1985	126	4.20
15	Extending the school grounds? Bullying experiences in cyberspace	J Juvonen	2008	124	17.71
16	Relationships matter: Linking teacher support to student engagement and achievement	AM Klem	2004	110	10.00
16	Correlates and consequences of early initiation of sexual intercourse	AL Coker	1994	110	5.24
18	Physical education and activity: Results from the School Health Policies and Programs Study 2000	CR Burgeson	2001	114	7.43
19	Youth risk behavior surveillance – United States, 2005	DK Eaton	2006	102	11.33
20	Eleven components of effective drug abuse prevention curricula	L Dusenbury	1995	100	5.00
21	Nutrition services and foods and beverages available at school: Results from the school health policies and programs study 2006	TP O'Toole	2007	98	12.25
22	Youth risk behavior surveillance – United States, 2001	JA Grunbaum	2002	92	7.08
22	Food service and foods and beverages available at school: Results from the School Health Policies and Programs Study 2000	H Wechsler	2001	92	6.57
22	Black and white adolescents' perceptions of their weight	SM Desmond	1989	92	3.54
25	Obesity and student performance at school	H Taras	2005	88	8.80
26	School promotion of healthful diet and exercise behavior – an integration of organizational-change and social-learning theory interventions	GS Parcel	1987	87	3.11
27	Youth risk behavior surveillance – United States, 1999	L Kann	2000	82	5.47
28	Gender differences in physical activity and determinants of physical activity in rural fifth grade children	SG Trost	1996	79	4.16
28	The efficacy of peer leaders in drug-abuse prevention	KI Klepp	1986	79	2.72
30	Perceived barriers to exercise among adolescents	MK Tappe	1989	78	3.00

Brener, LJ Kolbe, JG Ross, RS Gold, RJ McDermott, etc. Membership of this team was intensive, and there was a wide network allowing close cooperation between each member. The total amount of published article produced by this group topped the list, as well. This suggests that the team played an important role in the *Journal of School Health* with a high volume of contribution. The members of the other team included TW Orourke, RM Pigg, MR Torabi, DL Kerr, etc. The number of members of this team was relatively larger, and the cooperation between authors was also comparatively closer.

The frequency of an author reflects the number of pieces of published article he/she participated in. This frequency includes various author orders, for example, the first author, the second author and corresponding author. Due to space restrictions, 27 authors whose frequency was ≥ 15 were listed in Table 3. It is worth paying attention to the existence of a big limitation on the degree of centrality held by each author in the whole cooperative network. In this study, there were 5242 articles published which involved 4468 authors, indicating an average of 1.17 articles per author. Scholars JH Price, L Kann and RJ McDermott are at the top of the list in terms of the number of articles published. The initial publishing year of the articles that had a frequency ≥ 15 was 1985 on average.

3.4. Analysis of high frequency keywords and their co-occurrence network

Keywords were selected as the network nodes for analysis. There are 410 nodes and 1014 connecting lines in total. This suggests a high frequency of the co-occurrence of related keywords. An author's research focus in this field can be found through keyword analysis. Fig. 4 shows the relational network between keywords. To clearly render the relationships of co-occurrence between keywords, Fig. 4 shows the high-frequency keywords whose frequency ≥ 28 . The keywords “adolescents” and “children” are found in the center of the map, and form connecting lines with other keywords in a complicated and intensive manner. The high-frequency keywords can be divided into 4 classes: research objects such as “adolescents”, “children” and “health”; behaviors and influencing factors such as “behaviors”, “obesity” and “smoking”; intervening measures like “physical activity”, “education” and “prevention” for instance; and other aspects such as “prevalence”, “impact” and “population”. Furthermore, there is only one country, “united-states”, shown in the figure, which means that the United States is highly active in the *Journal of School Health*. School health in the United States is becoming a research hot spot.

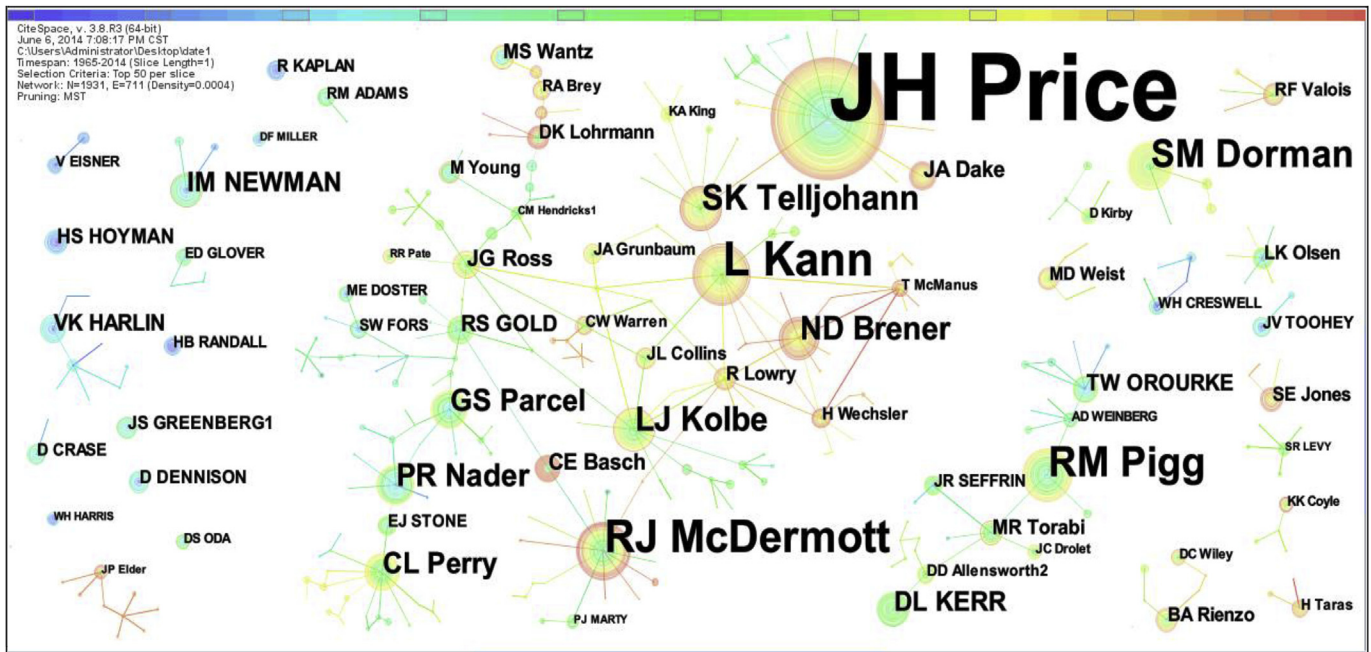


Fig. 3. Cooperation network map of high frequency authors in the *Journal of School Health*.

Table 4 lists the keywords that have a frequency ≥ 50 , after being catalogued. Combining Table 4 with Fig. 4, we can conclude that the frequency of “adolescents” tops the list, appearing as many as 429 times. Keywords “children”, “programs”, “health” and “behaviors” are at the forefront of high-frequency keywords, as well.

3.5. Co-occurrence network analysis of the institutions

Institutions were selected as network nodes for analysis. There are altogether 1268 nodes and 459 connecting lines according to

Table 3
Authors with published articles that occur ≥ 15 times in the *Journal of School Health*.

Rank	Frequency	Original Publication Year	Author
1	78	1978	JH Price
2	39	1995	L Kann
3	37	1982	RJ McDermott
4	34	1980	RM Pigg
5	31	1989	SM Dorman
6	29	1995	SK Telljohann
7	28	1986	LJ Kolbe
8	27	2001	ND Brener
9	26	1972	PR Nader
10	25	1975	GS Parcel
11	24	1982	CL Perry
12	22	1970	IM Newman
12	22	1988	DL Kerr
14	18	1972	VK Harlin
14	18	1983	RS Gold
14	18	2003	JA Dake
14	18	1973	TW Orourke
14	18	1991	JG Ross
14	18	1983	CE Basch
20	16	1979	MS Wantz
20	16	1985	MR Torabi
20	16	1965	HS Hoyman
23	15	1973	LK Olsen
23	15	1998	R Lowry
23	15	1987	DK Lohrmann
23	15	1981	BA Rienzo
23	15	2001	SE Jones

the statistical results produced by CiteSpace III. Due to space restrictions, institutions with a frequency ≥ 10 were selected as network nodes to produce the visual map of institutions' cooperation, as seen in Fig. 5. It shows close cooperation among the selected institutions, based on the arrangement and condition of the connecting lines. The legend color represents the research field in which the institutions were involved at different stages (early phase, mid phase and recent period). The study produced by the most institutions presents a consecutive approach from the early phase to recent period. In this study, it is possible that there are articles that contain several authors who may belong to the same institution or a single author who has published several articles as a member of the same institution. In addition, given that the same author might work at different institutions during different times, institutional frequency would be different from the number of institution members who have participated in research. Therefore, institutional frequency cannot reflect an institution's research strength accurately enough, but it can be deemed an evaluation of the creativity of the researchers belonging to related institution in the field of school health.¹⁹

Given the large variety in the names of institutions, this study integrated the names of institutions to systematically show the contributions of institutions directly and clearly. Table 5 shows the top 10 institutions sorted by the amount of article they have published after classified integration. The amount of published article from CDCP tops the list, and its research on school health was also conducted earlier. The second-ranked institution is Univ Texas, with a frequency of 96. The third is Univ Calif, with a total frequency of 87.

3.6. Visualization analysis of country cooperation

Though analyzing the distribution of research achievements across countries, it is possible to understand the regional distribution of research power related to a certain subject area, which could help people to understand the contributions of a region/country to this research area. Fig. 6 shows the countries with the highest levels of contribution and their cooperation with other

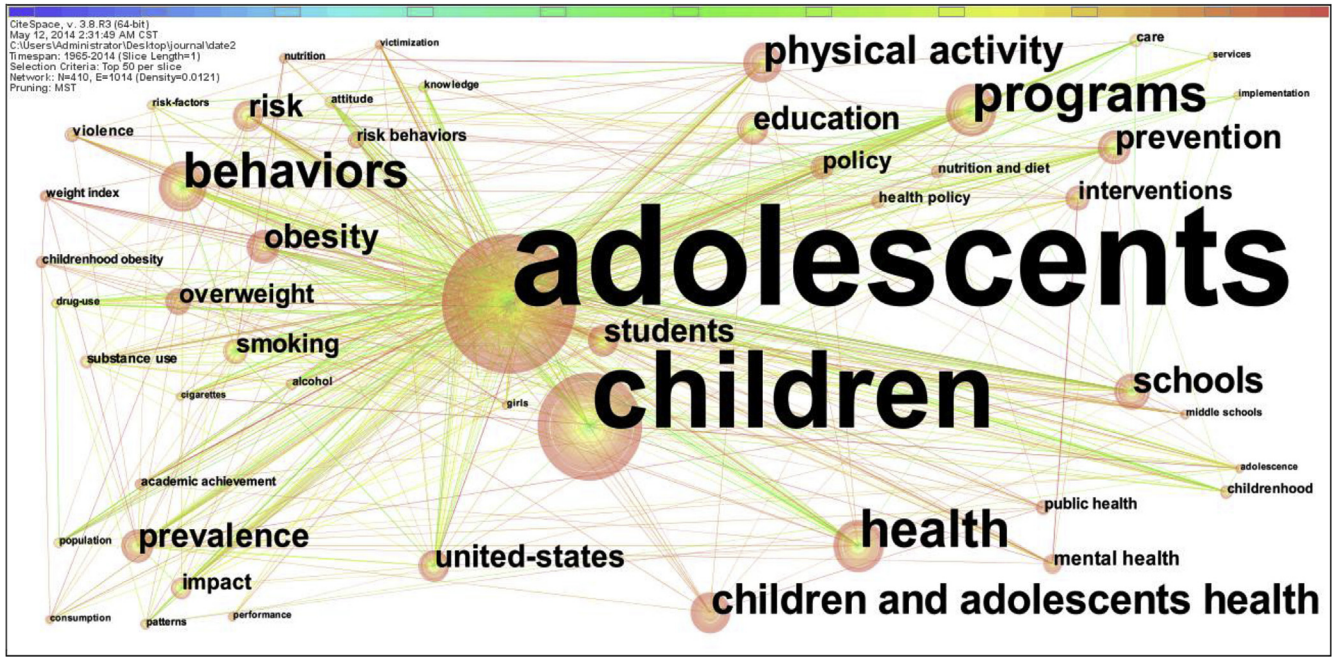


Fig. 4. Network map of keyword co-occurrence in the *Journal of School Health*.

Table 4
Keywords that occur ≥ 50 times in the *Journal of School Health*.

Rank	Frequency	Original Publication Year	Keywords
1	429	1990	adolescents
2	331	1991	children
3	162	1990	programs
3	162	1990	health
5	152	1991	behaviors
6	128	2007	children and adolescents health
7	122	1995	physical activity
8	112	1991	schools
9	104	1991	obesity
10	103	1991	prevalence
10	103	1992	prevention
12	99	1991	education
13	98	1996	students
14	97	1992	united-states
14	97	1994	risk
16	81	2004	overweight
17	79	1991	smoking
18	78	2002	interventions
19	73	2003	policy
20	66	1992	impact
21	60	2002	mental health
22	52	1996	risk behaviors

countries among the 44 countries that participate in the creation of such research. Table 6 lists the countries and districts that produced an amount of published article ≥ 6 . Considering the figure and table together, we can see that the United States is the country that has made the biggest contribution, having published 3128 articles. Following the United States are Canada and Australia; the centrality of Australia is 0.02. Compared with institutions and authors, scientific research cooperation between countries is relatively limited. Cooperative relationships occur with a low degree of frequency and only between a few countries; cooperation is also mainly concentrated in the recent period.

4. Discussion

The *Journal of School Health* is committed to providing an information communication platform for schools and their related staff, with an aim of promoting the health growth of adolescents and of building a healthy environment for school development. The journal mainly takes students as the objects of study to facilitate corresponding research from different perspectives, such as the promotion of health education, physical education, health services, nutrition services, counseling services, and family/community involvement.

The evolution of the number of annual published articles in the *Journal of School Health* since its inaugural editorial can be divided into three stages. The amount of published article in the first two stages increased at first, and then decreased, reaching its maximum in 1981 at more than 170 articles. The amount of published article fluctuated between 70 and 120 after a significant decline. Compared with the number of annual published article, the annual number of citations of the journal's article was generally on the rise throughout the whole timeline, and the volume citations underwent a dramatic increase after 2007. The decreasing number of publications followed by an increase in citation frequency suggests that the journal is switching its focus from the quantity of publication to the quality of each single article. With improvement of the quality of journal articles, the influence of the journal has enhanced, as reflected by the impact factor's elevation from 1.495 to 1.659. Furthermore, 12 articles of the 30 top cited articles involved the study of adolescents' physical activity, nutrition and diet. Aside from these, there were 5 articles about smoking and substance abuse. The other 5 articles focused on the theme of the role of schools in students' health. Obviously, adolescent behavior problems became the most prevalent current research area in the *Journal of School Health*.

By analyzing cooperation among authors, one could identify the core scholars and their related research teams, as well as their relationships.^{20,21} As shown in Fig. 3, among authors with high



Fig. 6. Cooperative research network visualization map of countries in the *Journal of School Health*.

Table 6

Top countries and districts with ≥ 6 published articles in the *Journal of School Health*.

Rank	Frequency	Centrality	Original publication year	Countries and districts
1	3128	0	1966	United States
2	74	0	1967	Canada
3	37	0.02	1973	Australia
4	13	0	1990	Taiwan of China
5	12	0	2003	South Korea
6	9	0	1999	Japan
6	9	0	1990	China
6	9	0	1970	England
9	8	0	1993	Netherlands
10	6	0	1966	Israel

the journal offered by each institution, country or district and the intercommunication between these entities.^{24,25} By combining Fig. 5 with Table 5, it can be found that the institutions, such as CDCP, Univ Texas, Univ Calif, Univ Illinois, Univ Florida and Univ Minnesota were responsible for a large amount of the publications, and they contributed a large part of the journal. This suggests that most of the researchers from those institutions have joined into school health research work. Further analysis found that high contribution institutions are usually major universities, which are the main force behind article publishing. Meanwhile, a certain level of relevance was indicated between the amount of the publications produced by an institution and its economic and technological development levels. The institutions with a high amount of published article are mainly located in the eastern United-states, especially the Great Lakes region, and on the west coast where economy and technology are highly developed; these regions host a high density of scientific research colleges and universities. Additionally, not only is there cooperation between institutions located in the same states, such as the cooperation of Univ Florida and Univ S Florida in Florida, but there is also interstate cooperation, such as the cooperation of Univ Texas in Texas and Univ Minnesota in Minnesota. International cooperation between institutions is still limited, even though cooperation among institutions is relatively close. This phenomenon also reflects the fact that school health research has a certain regional imbalance.

5. Limitations

As our source of data, the Web of Science serves the purposes of this study due to its wide recognition by the scientific community and its ability to accurately reflect the general situation and trends in the development of the *Journal of School Health*. However, due to the required database permissions and the functional limitations of CiteSpace, use of Web of Science might lead to partial descriptions of cooperative relationships that are not comprehensive, which would affect the adequacy of this study.

6. Conclusions

The *Journal of School Health* has experienced rapid development since 1930, when it was first published. As one of the international journals in this field, the *Journal of School Health* has drawn wide attention from researchers in the field of school health, which focuses on addressing the practice, theory, and research related to the health and well-being of school-aged youth. Under the direction of the current editor-in-chief RJ. McDermott, the *Journal of School Health* continually meets the needs of different readers such as administrators, counselors, dentists, health educators, physical educators, school nurses and school physicians. At the same time, the journal is developing

towards a higher level and providing an important platform to promote the deepening of research. From the perspective of the article published in the journal, research in this field is showing a steady trend of development, and a wide network of scientific research cooperation has gradually formed, although international cooperation is still relatively limited. We strongly expect the *Journal of School Health* to become a platform for information exchange and display of achievements for researchers and readers in the field of global school health and to further promote scientific research cooperation and communication between different institutions and regions, to further enhance the comprehension and development of the study of the theory and practice of school health.

Conflicts of interest

All contributing authors declare no conflicts of interest.

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How to cite this article: Zhang C-C, Zheng X, Su C-H, et al. A bibliometric study of the *Journal of School Health*: 1965–2014. *Chin Nurs Res*. 2017;4:75–83. <http://dx.doi.org/10.1016/j.cnre.2017.03.011>