Coverage of Google Scholar, Scopus, and Web of Science:

A Case Study of the H-index in Nursing

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Abstract

Purpose: This study compares the articles cited in CINAHL, Scopus, Web of Science (WOS), and Google Scholar and the *h-index* ratings provided by Scopus, WOS, and Google Scholar.

Methods: The publications of thirty College of Nursing faculty at a large urban university were examined. Searches by author name were executed in Scopus, WOS, and POP (Publish or Perish which searches Google Scholar) and the *h-index* for each author from each database was recorded. In addition, the citing articles of their published articles were imported into a bibliographic management program. This data was used to determine an aggregated *h-index* for each author.

Results: Scopus, WOS, and Google Scholar provided different *h-index* ratings for authors and each database found unique and duplicate citing references.

Conclusions: More than one tool should be used to calculate the *h-index* for nursing faculty, as one tool alone cannot be relied upon to provide a thorough assessment of a researcher's impact. If researchers are interested in a comprehensive *h-index*, they should aggregate the citing references located by WOS and Scopus. Because *h-index* rankings differ between databases, comparisons between researchers should only be done within a specified database.

Introduction

Researchers often track citations to determine the impact of their publications. Many institutions examine the number of publications produced by an individual in addition to the number of citations those publications received when making decisions related to employment and promotion and tenure. Administration may also examine the publications and citations of individual faculty to assess collectively, the college's or department's impact. The *h-index* is one measurement that has been developed to evaluate an individual's impact in his/her field and/or the department's rankings.[1] Calculating the *h-index* requires access to resources that list not only an individual's publications, but also indicate the literature citing these publications. Until recently, Web of Science (WOS) was the only resource for obtaining information about citation counts. However, in 2004, databases such as Scopus and Google Scholar (GS) offered additional citation analysis tools. Since that time, several articles have been published comparing citation counts, the *h-index*, and other variations between Scopus, WOS, and GS. [2-7] However, within the discipline of nursing, little research has been done comparing citation counts and the *h-index* between these databases.

Some disciplines, such as nursing, have not been covered equally in databases such as Scopus, WOS, and GS. For example, Thomson Reuters' Journal Citation Reports (JCR) (which includes the same journals as WOS) indexed only 35 nursing journals in 2004 although that had increased to 74 in 2009.[8] In 2010, there were 95 journals in the nursing category for JCR.[9] However, Ulrich's Web Global Serials Directory, a periodicals directory, indicated there were 524 peer-reviewed active journals with the subject, "Nurses and Nursing".[10] In comparison, JCR includes 140 allergy and immunology journals in 2010, while Urlich's indicates there are 385 active peer-reviewed journals for the subject, "Allergology and Immunlogy." According to a list of journal titles indexed in Scopus, 472 of the over 18,500 indexed journals were categorized as “nursing" journals[11] while Ulrich's listed over 880 active nursing journals (not specifically peer-reviewed). In comparison, the list of medicine journals indexed in Scopus was 5,807, while Ulrich's listed over 5,260 active "Medical Sciences" journals. Of the 2,943 journals indexed in CINAHL (Cumulative Index to Nursing and Allied Health Literature), 1,723 were also indexed in Scopus.[12] As Google does not specify its sources of data, the comprehensive coverage of the nursing literature is unknown in Google Scholar.[13] These findings suggest there would be variability in citation counts and the *h-index* among these databases when examining the impact in nursing publications.

This paper examines the number of times nursing researcher publications were cited by other publications in Scopus, WOS, GS, and CINAHL. In addition, this article compares the *h-index* rating for individual nursing researchers provided through Scopus, WOS, GS, and an aggregated *h-index* calculation. While CINAHL does not calculate *h-index*, it was included in this study to determine if it may have any significant impact on an individual's aggregated *h-index*. How different are the *h-index* results in these databases? Could the lack of nursing coverage in any of the databases downplay the potential impact of nursing faculty research?

Literature Review

What is the h-index?

The *h-index* was first proposed in an article by physicist, J.E. Hirsch, as an alternative to the impact factor. While the impact factor focuses on a journal’s importance, Hirsch believed the number of articles written by a researcher in combination with the citation record were useful for evaluating an individual’s impact. Hirsch noted “a scientist has index h if h of his or her N_p

papers have at least *h* citations each and the other ($N_p - h$) papers have $\leq h$ citations each".[1] For example, if an author has published only 1 article and it has been cited only once, the author's *h-index* will be 1. If the author publishes a second paper, the *h-index* would become 2 only when both articles have been cited at least 2 times. If, in the future, he/she has published 15 articles and 9 of those articles have been cited at least 9 times each and the remaining 6 have been cited 9 or less times each, then her/his *h-index* is 9. Alternatively, an author who writes 9 articles and each was cited 9 or more times, the *h-index* would also be 9. The *h-index* is dynamic and can change as new citations emerge and as Hirsch points out, "not all papers will eventually contribute to *h*. Some papers with low citations will never contribute to a researcher's *h*, especially if written late in the career, when *h* is already appreciable".[1]

The use of the *h-index* to assess an author's impact is not without criticism. As Bornmann and Daniel argue, a key issue with the *h-index* is how informative it is as a measure of a researcher's performance because a researcher's "publication record usually contains a few highly cited papers and many rarely cited papers".[14] Conn warned the *h-index* could not be used to compare authors from different disciplines nor was it an accurate indicator for new authors.[15]

The h-index in Nursing

Nursing researchers have begun to comment on the use of the *h-index* in nursing. A study of 16 nursing professors in the United Kingdom examined the *h-index* from the WOS. The authors suggested that an *h-index* of 10 would be an appropriate indicator of success in nursing at that time but that the *h-index* was lower in nursing compared to other disciplines, and further investigation was required to determine improved impact measures for nursing.[16] Hack, et al conducted a citation analysis of 737 nursing academics at 33 Canadian universities and schools of nursing through Scopus. One of the indicators measured was the Scopus *h-index*. The authors proposed as a rough rule of thumb that a paper published by nursing academics and cited 10 times or more is a “good paper”, cited 50 times or more a “very good” paper, cited 100 times or more an “excellent’ paper” and over 150 citations an “exceptional” paper. The authors also proposed that an individual who had an *h-index* of 5–9 (or 3–4 if considering only first-authored papers) had a “well-established” publication record, that an *h-index* of 10–14 (5–7 for first-authored papers) indicated an “excellent” publication record, and that an *h-index* of 15 or higher (8 or higher for first-authored papers) indicated an “exceptional” publication record.[17]

Comparison of the databases

Several studies have examined and compared the coverage of GS, Scopus, and WOS in different health sciences disciplines. Falagas, et al compared the strengths and weaknesses of WOS, Scopus, and GS for retrieving biomedical information. The authors found that Scopus listed 20% more articles than WOS since Scopus included a more “expanded spectrum of journals.” GS was helpful in locating hard-to-find items but was hindered by "inadequate, less often updated, citation information".[18] Kulkarni, et al examined a sample size of 328 articles in Scopus, WOS, and Google Scholar from the top three medical journals by impact factor. GS, followed by Scopus, returned a greater number of citations than WOS. Scopus retrieved a greater proportion of non-English and review citations while WOS retrieved more citations from articles, editorials, and letters. WOS retrieved more citations to group-author articles when compared to Google Scholar. Overlap between these three databases was not examined in this study.[19] Bakkalbasi et al studied 11 randomly selected journals from the oncology and condensed-matter physics disciplines in 2003. While Scopus was stronger in providing citing literature for published oncology articles, WOS was stronger in providing citing literature for published condensed matter physics articles. When the authors examined GS, Scopus, and WOS for citing articles, they concluded that all of these databases would not stand alone as a comprehensive resource for citing articles.[20] Harzing has noted that although GS usually provided a higher citation count than WOS, it was not true of all fields.[21] The social sciences, arts and humanities, and engineering typically saw broader coverage in GS, and thus better citation counts. Conversely, the natural and health sciences are typically well covered in WOS and some specific disciplines within are not well covered in GS, often leading to better citation counts in the WOS.

Variability in the coverage of health sciences disciplines, including that of nursing, in WOS, Scopus, and GS advocates for the importance of understanding the variability in citation counts and the *h-index* when examining the publications of nursing faculty in these databases. This article examines the *h-index* rating provided through Scopus, WOS, GS, and an aggregated *h-index* and examines the variability of the cited references retrieved from Scopus, WOS, GS, and CINAHL.

Methodology

Selection of Nursing Faculty

All tenured and tenure-track College of Nursing faculty from a public institution in the Midwest were included in this study. This College of Nursing was ranked 7th in NIH funding for 2011 among colleges of nursing and number 11th (out of over 450 nursing graduate schools) according to *US News and World Report.*[22] Thirty-three tenure-track faculty who had the rank of Assistant, Associate, and Full Professor were originally included in the study. Three tenured/tenure-track faculty with ambiguous names (i.e. Jane Smith) were dropped from the study after attempted searches of the authors' names. Clinical and Emeriti faculty were not included in the study.

Databases Used in Study

Web of Science (WOS) is a multidisciplinary database known for its cited reference coverage from Thomson Reuters. Records include the affiliation of all authors, when that information is supplied in the journal article.[23] The *h-index* is obtained from the publications retrieved from the inputted author name, either using an Author Finder feature or by putting in the author name in the author field. It indexes over 10,000 journals in 256 categories in arts and humanities, sciences, and social sciences. Journals included in WOS must meet specific criteria that are both qualitative and quantitative including the journals' publishing standards, the editorial content, and the citation data.[24] The journals indexed in WOS are the same journals found in Journal Citation Reports (JCR) and JCR is probably considered the premiere source by many to consult when looking for journal impact.

Scopus is a multidisciplinary database with 44.5 million records (as of January 2012) and over 18,500 peer-reviewed journal titles in the life sciences, social sciences, health sciences and physical sciences. In addition to journal articles, there are also conference papers, trade publications, book series, records from the scientific web search engine, Scirus, and patent records. Although records in the database go as far back as 1823, references do not appear in those records until 1996. Seventy-nine percent of the content comes from Western Europe and North America. "Scopus aims to be the most comprehensive scientific, technical, medical, social science and arts & humanities point of access containing all relevant literature".[25] Continuous review of additional journals for inclusion in Scopus is always ongoing and the aim is for Scopus to "to include all journals that conform to academic quality norms and specifically require that publications are peer reviewed and published in a timely manner". The number of citing references from the publications identified by a selected author is used to calculate the *h-index* in SCOPUS. SJR (SCImago Journal & Country Rank) is a rank of journals using information found in Scopus.[26] Examining SJR, it can be seen that journals are ranked into quartiles, with a rating of Q1 being high ranked journals and Q4 being low ranked journals.

Google Scholar (GS) is a search engine which searches the scholarly literature, including the full-text of many journals. It primarily searches academic papers from most major academic publishers and repositories worldwide, including both free and subscription sources. As mentioned, Google does not specifically list the sources of its data but it is designed to be as comprehensive as possible.[13] Content found in GS includes journal articles, proceedings, theses, dissertations, books, book chapters, reports, manuscripts, newsletters, encyclopedia entries, government documents, and patents.[27] Vaughan and Shaw found that " almost 92% of the citations identified through Google Scholar represented intellectual impact – primarily citations from journal articles." Harzing notes that GS “sometimes includes non-scholarly citations, such as student handbooks, library guides or editorial notes" but also points out "incidental problems in this regard are unlikely to distort citation metrics.”[2] GS has also been found to include duplicate citations, due in part to inclusion of both the preprint of an article and the final journal publication in GS and also as a result of incorrectly cited articles.[28] Search results in GS include the number and links to articles/ items citing articles indexed in GS. Although GS itself does not provide the *h-index*, a free software program called Harzing’s Publish or Perish (POP) was used to obtain each author’s *h-index*.[29] POP calculates the *h-index* for researchers based on their publications and cited references included in GS.

CINAHL (Cumulative Index for Nursing and Allied Health Literature) contains over 2.3 million citations and indexes over 3,000 journals in disciplines such as "nursing, biomedicine, health sciences librarianship, alternative/complementary medicine, consumer health, and 17 allied health disciplines."[30] While CINAHL does not calculate *h-index*, its focus is on nursing literature and it includes the citing literature for certain articles. It was included in this study to determine if it may have any significant impact on an individual's aggregated *h-index*.

Obtaining the H-index

Several types of data were collected for this study in order to examine individual researchers' *h-index* by database, calculate an aggregated *h-index*, and examine the variability of citing references between the databases. The data collection is described in more detail below. (In addition, a list of faculty publications was developed. See Appendix A for more information).

Database Supplied H-index

The *h-index* for each author from each database (WOS, Scopus, and GS using POP) was obtained and recorded. (See Appendix B for information on searching and obtaining the *h-index* from each database.)

Aggregated H-index

Although WOS, Scopus, and POP each provide an *h-index*, it was not possible to use this information to calculate an aggregated *h-index* because each database indexes its own specific set of journals. In some cases, a journal title could be indexed in WOS, Scopus, CINAHL, and also included in GS meaning the citing references found in each database and used to calculate the *h-index* would include both unique and duplicate citations when compared across databases.

To determine what the overall *h-index* would be for each author independent of the *h-index* calculated by the studied databases, the citing references for each faculty publication were retrieved from Scopus, WOS, GS (only for 10 researchers♦), and CINAHL and imported into a bibliographic management program. A separate database, using the bibliographic management software, was created for each publication written by each of the faculty authors. The citing articles from each faculty publication in each database were imported into the separate databases; the citing articles were examined and the following information was recorded for each article:

- The number of citing articles found in each database for each article.
- The total number of citing articles for each faculty publication (excluding duplicate counts) in aggregate for each of the database combinations below. These numbers were used to calculate the faculty author's aggregated *h-index*.
- Aggregated database combinations used to determine *h-indexes* were: using citations found in all four databases (WOS, Scopus, CINAHL, and GS); using citations found in the three indexing and abstracting databases (WOS, Scopus, and CINAHL); and using citations found in just WOS and Scopus.

Coverage of Citing Articles in Each Database

♦ A test pilot of the study revealed that downloading citations from Google Scholar for all publications would be problematic, thus only ten of the thirty nursing faculty were randomly selected to study citing articles in Google Scholar. Because Google Scholar has the permission of publishers to search for journal content found on the publishers' websites only if users are not permitted to download significant amounts of content from Google Scholar, access to Google Scholar is cut off for a period of approximately 12 hours after downloading multiple citations (300+). This meant the authors would only be able to retrieve citations for a limited number of nursing faculty author articles each day, resulting in a very tedious task. It was determined that a random selection would suffice because for most individuals, doing this would be impractical.

In order to determine the uniqueness and duplication of citing articles between each of the databases examined (Scopus, WOS, GS, and CINAHL), 100 articles (or approximately 37% of the total articles) were randomly selected from the publications of the 10 randomly selected nursing faculty where GS data has also been obtained. The citing references for each of these articles were examined and the following information was recorded for each article:

- The total number of citing articles found in each database for each article.
- The total number of unique citations found in each database (Scopus, WOS, GS, and CINAHL) not found in any of the other three databases.
- The total number of citing articles for each faculty publication (excluding duplicate citations).

Results

The *h-index* ratings determined by WOS, Scopus, and POP are provided in Table 1. The number of publications found in each database and the total number of unique publications identified for each author are also included in Table 1. Scopus typically identified the largest number of faculty publications. POP (which searches GS) typically provided the highest *h-index* for nursing faculty, followed by Scopus. However, there were instances when a nursing researcher's *h-index* was highest in WOS and in other cases it was highest in Scopus. The aggregated *h-index* ratings for the faculty are provided in Table 2. Not surprisingly, the *h-index*es were always the highest when they were based on aggregated citing references from all four databases. The aggregated *h-index* of all four databases (M=13.10), which included GS data, was often double the rating provided by WOS (M =7.17). The aggregated *h-index* of the three indexing and abstracting databases (WOS, Scopus, and CINAHL; M = 11.30) and the aggregated *h-index* of just Web of Science and Scopus (M =10.87) typically was a little higher than GS's *h-index* (M =10.53). Although CINAHL may have located many unique citations not found in the other databases, it provided only a modest impact on the *h-index* of about a third of the researchers.

Table 3 provides a correlation of all *h-index* results. All variations of the *h-indexes* obtained were found to be strongly correlated suggesting for relative ranking purposes, any of the *h-index* calculations would be sufficient. However, the fact that some are more strongly correlated than others suggest it does matter what database (or combination of databases) you use to calculate the *h-index* to assess an individual's impact. The strongest correlations were found between all 4 databases and the 3 indexing and abstracting databases ($r(10) = .991$, $p<.01$), between the 3 indexing and abstracting databases and just WOS and Scopus ($r(30) = .993$, $p<.01$), and between all 4 databases and just WOS and Scopus ($r(30)=.978$, $p<.01$). This suggests that if an aggregated *h-index* was desired, it would be sufficient to obtain the aggregated content of just WOS and Scopus to obtain a fair assessment of an individual's aggregated *h-index*. However, the independent *h-indexes* from GS should also be obtained due to the unique content also found in Google Scholar.

Table 4 provides the number of citing references and the number of unique citations retrieved for each of the 100 randomly selected articles by database. Examining the number of citing references found between databases within each of the articles examined demonstrates the variability of the results that can be provided by each database. For example, in one article, Scopus provided 174 cited references, GS provided 263, and CINAHL found 117 while WOS didn't even index the article. In another example, WOS found 117 cited references, Scopus found 110, GS found 138, and CINAHL found 2. Scopus (2187) and GS (2185) found the most citing references retrieved by each of the other three databases as reflected in the duplicate citations found in common with at least one of the other databases examined. This demonstrates that GS is capable of retrieving the same scholarly content that the other databases find. GS typically retrieved the most citing references and the greatest number of unique citing references not found in the other databases. It was noted by the authors that GS would include some duplicates and it appeared that much of the unique material retrieved by GS was to journal articles, books, and theses/dissertations. WOS retrieved the fewest number of unique citing references. Although CINAHL is not providing cited references for all indexed articles, CINAHL retrieved more unique citing references than WOS or Scopus.

Discussion

All three of the databases proving an *h-index* ranking (WOS, Scopus, and GS) resulted in different *h-index*es for the examined authors. Scopus indexed the greatest number of nursing publications although GS, followed by Scopus produced the highest *h-indexes* and found the most citing references for nursing faculty. Each tool had imperfections - WOS had the least number of nursing journals, SCOPUS included a greater number of nursing journals, but some journals may be lower ranked, and Google Scholar while thorough also included unscholarly content. Thus *h-indexes* for nursing faculty should be calculated using each of tools studied, as one tool alone cannot be relied upon to provide a thorough reflection of citing articles.

Not all databases indexed all the nursing faculty publications examined in this study, and although there were duplicate citations found among all the databases, each database also found unique cited references. Variations in the years in which references were included in the databases and differences in the subject coverage of the databases contribute to different results between databases. For example, for nursing faculty with articles published before 1996, Scopus would not be able to show the impact of those articles as well if the articles were cited prior to 1996. Other factors contributing to the observed variances may be the result of differences in the research focuses of nursing faculty which likely influences the selection of the journal where the article was published which in turn is impacted by the journal coverage of the databases, the date of coverage of indexed journals in the databases, and the type of non-journal material indexed and citing references recorded.

GS found similar citing references to those found in WOS, Scopus, and CINAHL in addition to other citations not found by the afore mentioned databases. The noted flaws of GS included some duplicate citations and capturing non-scholarly content. As a result, some researchers may be less likely to embrace GS as a tool to measure scholarly output. However, one could argue the non-scholarly content is valuable in demonstrating the broader impact of a work beyond the scope of WOS or Scopus, and as Harzing notes, even non-scholarly citations "show that the academic has an impact on the field."[2]

While aggregated *h-index* results can assist with providing a more comprehensive view of an individual's impact, correlations of the aggregate results demonstrated that downloading and aggregating citations from multiple databases is not necessary, unless one desires a more comprehensive view of all citing references. Downloading and examining citations from CINAHL did not always increase an individual's *h-index* and the strong correlation with just Scopus and Web of Science suggests the activity is unnecessary. The tediousness of downloading GS citations and its strong correlation with just WOS and Scopus also suggests this would be an unnecessary and unwanted task for most (although unique citations found only in GS are not included). On the other hand, manually aggregating citations from the various databases does mean that non-scholarly content could be excluded from aggregate calculations if that is a concern. GS contains non-scholarly content and Scopus contains some lower tier journals that could also be a concern to some researchers.

Harzing & van der Wal noted that health sciences journals were generally well indexed in WOS and therefore, GS might not provide higher citations counts than WOS. In addition, Harzing noted user feedback related to POP indicated that for some disciplines in the natural and health sciences, GS's journal coverage was not exhaustive.[2] These findings were not reproduced in the current study, likely due to the limited coverage of nursing journals in WOS. This suggests that not all health sciences disciplines are equally covered in the databases examined in the current study. Although nursing has made some progress in recent years, resulting in more nursing journals in JCR/ WOS, further lobbying efforts are necessary. This also suggests if institutions were to compare *h-indexes* between departments, it would matter what tool was used because some tools (Scopus, GS) are more comprehensive in nursing journal coverage.

Because each database used in this study indexes and covers content in varying ways, different disciplines are represented differently in the various databases. Future research should compare articles retrieved from these databases and the *h-index* ranking of faculty publications in other health sciences disciplines. There are two new products that could potentially impact future citation analyses that were not available to the authors at the time the research was conducted. Thomson Reuters has released a new index, The Book Citation Index, in WOS. This index will cover over 30,000 editorially selected books…with 10,000 new books added each year.[31] In November 2011, Google released Google Scholar Citations to all users, which assists scholars in tracking their citations. On an individual level, Google Scholar Citations may be the tool scholars prefer to use to calculate their *h-index*, instead of POP.

Conclusions

More than one tool should be used to calculate the *h-index* for nursing faculty, as one tool alone cannot be relied upon to provide a thorough assessment of a researcher's impact. If nursing researchers are interested in the most comprehensive individual *h-index*, several databases should be searched to obtain the most comprehensive list of citing articles. Because of the variability in results between databases providing *h-index*es, comparisons of author *h-index* ratings between researchers should be compared within a specified database. If a specific nursing department is considering requiring nursing faculty to report their *h-index*, perhaps as part of the yearly review or for promotion and tenure considerations, the department should specify which resource(s) should be used to calculate the *h-index*. The *h-index* reported by the various databases examined in this study are variable enough that the source of the *h-index* is just as important to report as the *h-index* number.

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Table 1: *H-index* and Number of Articles by Database for each Nursing Faculty.

	Number of Articles retrieved by Database			***H-index* by Database**			
Faculty	**WOS**	**Scopus**	**GS (POP*)**	**WOS**	**Scopus**	**GS (POP)**	**Faculty Tenure Status**
1	40	66	62	16	20	23	Full
2	66	60	54	17	19	19	Full
3	97	76	67	18	14	16	Full
4	59	61	64	15	10	20	Full
5	45	62	59	10	14	19	Full
6	53	46	46	13	14	12	Full
7	35	35	36	7	9	13	Full
8	23	41	45	8	10	15	Full
9	32	43	45	9	9	12	Full
10	35	45	47	7	7	12	Full
11	14	35	37	4	6	13	Full
12	41	55	51	6	9	11	Full
13	6	21	18	4	7	8	Full
14	37	41	40	12	14	14	Associate
15	20	32	20	5	12	9	Associate
16	30	31	32	4	7	13	Associate
17	17	31	22	7	11	9	Associate
18	33	43	43	7	9	13	Associate
19	13	19	16	7	8	9	Associate
20	4	12	13	3	8	10	Associate
21	10	24	22	6	10	10	Associate
22	16	17	17	4	7	7	Associate
23	10	12	12	3	4	4	Associate
24	5	7	7	3	3	4	Associate
25	27	29	22	12	12	11	Assistant
26	10	9	8	0	5	0	Assistant
27	8	10	10	3	4	4	Assistant
28	1	4	5	1	4	3	Assistant
29	3	3	3	2	3	2	Assistant
30	5	4	4	2	2	1	Assistant
Total	795	974	927	215	271	316	

WOS = Web of Science; GS = Google Scholar, POP = Publish or Perish
* POP calculates the h-index for researchers based on their publications and cited references included in Google Scholar.

Table 2: Aggregated *H-index* and the Total number of Citations for each Nursing Faculty

	WOS, Scopus, Google Scholar, & CINAHL		WOS, Scopus, & CINAHL		WOS & Scopus			
Faculty	**Aggregated *H-Index***	**Total Citations***	**Aggregated *H-Index***	**Total Citations ***	**Aggregated *H-Index***	**Total Citations***	**Total Articles**	**Faculty Tenure Status**
1	30	4756	27	3425	27	3015	72	Full
2			21	1751	21	1700	70	Full
3			19	1163	19	1155	107	Full
4			20	1214	19	1051	75	Full
5			20	983	19	810	66	Full
6			14	782	14	766	49	Full
7	14	722	11	534	11	453	38	Full
8			14	513	13	425	48	Full
9	13	497	10	359	10	332	45	Full
10	15	574	11	353	10	315	48	Full
11	14	627	12	392	11	298	36	Full
12			11	315	10	266	62	Full
13			8	151	7	117	24	Full
14			15	854	15	764	48	Associate
15			12	471	12	458	32	Associate
16	14	574	12	451	12	346	37	Associate
17			12	347	12	325	35	Associate
18	15	589	13	406	10	317	45	Associate
19			9	326	9	301	21	Associate
20			10	390	9	282	14	Associate
21			11	263	10	229	26	Associate
22			7	133	7	131	18	Associate
23	5	116	5	71	5	62	13	Associate
24	5	82	4	43	4	37	7	Associate
25			13	760	12	752	30	Assistant
26	6	112	5	88	5	86	10	Assistant
27			4	61	4	61	10	Assistant
28			3	65	3	60	5	Assistant
29			3	29	3	27	3	Assistant
30			3	8	3	8	3	Assistant
	131	8649	339	16699	326	14949	1177	

* Total citations cited at least once - duplicates not counted
WOS = Web of Science

Table 3: Correlations of H-index for each databases and aggregated

		WOS	Scopus	GS/POP	ALL 4 databases (GS, WOS, Scopus, CINAHL)	All 3 indexes (WOS, Scopus, CINAHL)	WOS & Scopus
	Mean *h-index*	7.17	9.03	10.53	13.10	11.30	10.87
WOS	Pearson	1	.869**	.835**	.906**	.879**	.889**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	30	30	30	10	30	30
Scopus	Pearson	.869**	1	.830**	.949**	.914**	.925**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	30	30	30	10	30	30
GS/POP	Pearson	.835**	.830**	1	.952**	.958**	.941**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	30	30	30	10	30	30
ALL 4 databases	Pearson	.906**	.949**	.952**	1	.991**	.978**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	10	10	10	10	10	10
All 3 indexes (WOS, Scopus, CINAHL)	Pearson	.879**	.914**	.958**	.991**	1	.993**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	30	30	30	10	30	30
WOS & Scopus	Pearson	.889**	.925**	.941**	.978**	.993**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	30	30	30	10	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4: Citing References & Unique Citations For Randomly Selected Article by Database

Random Article	WOS Citations	WOS Unique Citations	SCOPUS Citations	SCOPUS Unique Citations	GS Citations	GS Unique Citations	CINAHL Citations	CINAHL Unique Citations	Total Citations (No Duplicates)
1	N/A	N/A	9	0	17	8	5	0	18
2	N/A	N/A	174	23	263	107	117	35	329
3	40	1	46	6	38	13	0	N/A	63
4	117	3	110	0	138	25	2	1	151
5	123	2	136	2	180	58	30	3	197
6	N/A	N/A	20	5	35	16	17	8	48
7	27	0	38	1	52	13	37	13	67
8	29	3	33	3	43	17	N/A	N/A	49
9	35	0	38	2	44	15	9	0	47
10	1	0	2	0	3	1	0	N/A	3
11	21	0	24	1	27	5	10	3	36
12	9	1	9	0	13	9	0	N/A	15
13	4	0	4	0	8	3	0	N/A	7
14	65	7	102	5	144	50	N/A	N/A	160
15	350	28	378	39	618	230	225	67	787
16	10	0	17	3	25	8	7	0	27
17	42	5	54	8	66	29	3	1	91
18	5	0	7	0	14	8	3	0	16
19	N/A	N/A	84	16	94	26	0	N/A	110
20	N/A	N/A	51	26	32	9	0	N/A	59
21	N/A	N/A	4	0	7	3	N/A	N/A	7
22	14	0	15	0	15	5	N/A	N/A	20
23	2	0	5	1	13	9	1	0	14
24	N/A	N/A	3	0	7	6	4	3	10
25	N/A	N/A	7	3	13	8	1	0	15
26	N/A	N/A	3	1	5	3	0	N/A	6
27	N/A	N/A	11	5	18	9	13	6	28
28	8	2	0	N/A	20	11	7	0	20
29	6	0	9	0	21	17	0	0	26
30	N/A	N/A	6	1	6	1	4	1	8
Total Citing References	1406	93	2437	250	3497	1312	966	273	
Duplicates with other Databases	1313		2187		2185		693		

Sample of 30 of 100 randomly selected articles. Totals include results from all 100 randomly selected articles.
WOS = Web of Science; GS = Google Scholar

Appendix A : Creation of Faculty Publication List

Few up-to-date Curriculum Vitae (CVs) were located on the Internet for the nursing faculty. It was unknown if a satisfactory number of CVs would have been received if requests for CVs had been sent to faculty. Therefore, it was decided to create as complete a list as possible of faculty-authored articles by compiling publications retrieved from searches in PubMed, CINAHL, WOS, and Scopus. Searches by author name were executed within each database. In WOS and Scopus, the author disambiguation tools were used to retrieve articles for a particular author. These tools identified unique authors based on the authors' full name and affiliations (past and present). In PubMed and CINAHL, author affiliation was used when needed to disambiguate researchers with identical last names and initials. Doing so potentially increased the chance of missed articles in PubMed and CINAHL because author affiliation of only the first author was included in the record. However, accuracy was more important than obtaining a complete publication list that might also included erroneous articles not written by the selected author. The publications were imported into a bibliographic management program and separate databases were created for each author. Each database was used to create a list of publications for each author. The publication lists did not differentiate when the authors were a first author or a secondary author on the articles.

Appendix B: Obtaining the *h-index* from each databases

Web of Science

WOS has an Author Finder feature that allows one to increase or focus their results, to select a relevant subject category and/or institution, and to disambiguate authors. If more than one distinct author set appears for an author, the sets can be merged into one list of publications. The *h-index* is obtained from the publications retrieved from the inputted author name, either using the Author Finder feature or by putting in the author name in the author field. Once a set of publications is displayed either as the results of an author search or using the author disambiguation tool, the "Create Citation Report" link can be selected. The numbers of citing references for each article retrieved are used to calculate the *h-index,* and the *h-index* appears on the Citation Report page. This study used the WOS edition that included the Science Citation Index Expanded (1970-present), Social Sciences Citation Index (1970-present), and Arts & Humanities Citation Index (1975-present).

Scopus

Scopus has an affiliation identifier which will automatically identify and match an organization.[28] In Scopus, when an author name search is executed, a list of all authors fitting the parameters of the search strategy is retrieved. The author's last name and if known, first name and/or affiliation are also provided. If more than one distinct author set appears for an author, multiple sets can be selected and merged. The number of citing references from the publications identified from the selected author (or selected author sets) are used to calculate the *h-index* and the *h-index* appears on a profiles page.

Google Scholar: Publish or Perish

To retrieve the *h-index* in POP, searches were done by the author's name. In POP, only articles selected from the list of retrieved articles are including in the *h-index* calculation. In this study, the POP search results were checked off only if the publications retrieved were also included in the publication list generated from the searches in PubMed, CINAHL, WOS, and Scopus. Once each author article was selected, the POP *h-index* calculation was recorded. The *h-index* is displayed at the top of the search results page, which is calculated based on the number of citing references found within the articles selected following a search. Since POP is searching Google Scholar, which is not a database that uses controlled vocabulary, indexing, or defined fields, author searches were more difficult to narrow by author affiliation in situations where the results of multiple authors were retrieved. The additional term of "nursing" was added to help narrow results in these cases.