

An Investigation of International Journal usage by Iranian Medical Researchers

Ali Rashidi

Doctoral student, Department of Computing, London Metropolitan University,
2-16 Eden Grove, London N7 8EA,
E-mail: a.rashidi@londonmet.ac.uk.

Bob Gilchrist

Professor of Statistics and Director of The Statistics, O.R. and Mathematics Research
Centre of London Metropolitan University,
2-16 Eden Grove, London N7 8EA, E-mail: r.gilchrist@londonmet.ac.uk

Farhi Marir

Reader in Computer Science. 2-16 Eden Grove, London N7 8EA, E-mail:
f.marir@londonmet.ac.uk

Abstract

Knowledge of the extent to which information sources are used allows library managers to evaluate a library's collection and to make holding, archiving and purchasing decisions. The major objectives of this study were to identify a) the format of materials used in Iranian medical research, b) the age of cited items, c) the most frequently used journal titles which are critical to maintaining the core collection; and d) the half-life of the most cited journals. The results show the pattern of citation by type of media cited to have remained constant over the three years of the study, with journals being the most preferred format, accounting for 77.34% of all citations, followed by books (18.67 %) and theses (1.5%). The results show that the age of cited materials varied from one type to the other. However there is a slight tendency to cite more recent issues within each type of media except web resources. The citation half-life of non- Iranian journals was 9 years whilst, on average, 50% of Iranian journals were cited within the last 6 years; however, the trend tends towards more recent issues. Web resources have the lowest half-life of three years. The 108 most cited internationally published journals (zone 1), providing 33% of Iranian medical researchers information needs, were extracted on the basis of their citation frequency. These can be used by Iranian medical libraries as a baseline for subscription. Their corresponding quartiles of usage can be a criterion for storage policy.

Keywords: bibliometric indicators, core journal-subscription criteria and decision-making.

Introduction

Evaluation of citation patterns can help librarians to assess the extent to which information sources are used at the micro (obligations to librarians in specific libraries or librarians in specific difficulties) and macro (within a field) levels. These can be measured through performing library collection usage studies, by a user survey method or by checking library holdings against lists of core journals or other standardised reference sources.

Library collection usage studies require that data be collected regarding the number of times a particular resource has been accessed. Different libraries employ different methodologies for determining the rate of usage of a particular resource. However, all

of these methods are labour-intensive, time-consuming and consequently draw precious resources away from other tasks. For example, in a closed system, access to resources would need to be requested explicitly with the data collected regarding the number of such requests can be used for usage analysis. Alternatively, in an open system, users are asked not to return resources to the shelves so that the number of times that the resource has been taken off the shelf can be monitored. With regard to checking of library holdings, an example is the use of the guide to reference books and journals (e.g. Brandon & Hill, 1997; Balay, 1996) which suggest that a university medical faculty should hold, at least, a specific set of resources, including standard reference texts and journals.

In user survey methods, questionnaires or interviews with users or suggestion boxes can be employed to obtain data regarding the level of satisfaction of users and their specific requirements. Despite their high cost, being purely quantitative, the methods described above are limited in their evaluative scope. In other words, it is not possible to determine whether a borrowed or consulted item has been beneficial in any way. Therefore, there is a growing interest amongst libraries in the use of citation data as a decision making tool. Such information is particularly important in the case of expensive resources. At present, Iranian medical libraries purchase international journals at relatively high cost, in particular, after placing sanctions on Iran for its nuclear program by the Western countries which comprise subscription to electronic information resources such as Science Direct, Ovid and Web of Sciences. In this study, citations drawn from Iranian medical articles were used to evaluate the usage rate in Iran of internationally published journals.

Literature Review

Studies ranking the use of journals at many libraries have long been reported as aides in purchasing, cancellation, and storage decisions. Gross and Gross (1927) revealed that very few journals were cited often in the Journal of the American Chemical Society, whereas many journals were only cited once. Their findings coincide with Zipf's Law, which states that while a few items occur often, many items occur rarely (Wyllys, 1981). Libraries should be able to supply most of the information needs of their users with a small number of journals. Reviewing the rate of journal use is a known way of studying the effectiveness of the most expensive resources of the libraries, although it remains controversial. This process is routinely carried out in the libraries of developed countries (Masjedi, Kaykha, Chamyani & Emami 2004). In the third world, however, the absence of bibliographic databases makes it impractical to measure the exact usage rate of information sources at the national level.

Citation analysis is now commonly used to determine what titles to buy, to cease, or to weed. Since the costs of journal subscriptions rose in the 1970s (Smith, 1981) the use of citation analysis was extended to determine the ratio of serials versus monographs that should be purchased (White, 1981). This use of citation analysis was employed by Kriz (1978) and has been followed by others, covering a broad range of subjects from Theology to Geology Devin & Kellogg, 1990). An analysis of the bibliographic citations of research papers by Sylvia (1998) was used as one basis for Psychology journals selection and deselection in academic libraries. The findings confirmed that the most cost-effective and the most used materials were usually held by libraries. Titles that met these criteria and were not held were good candidates for

new subscriptions. Likewise, the least cost-effective and least-used titles were candidates for cancellation.

In Iran, each year about \$10M is spent on purchasing scientific journals for the country's medical universities by the Undersecretary of Research and Technology of the Ministry of Health and Medical Education (Masjedi, et al., 2004). Globally, each year, the subscription fee of medical journals increases by an average of 10 %. A study by Kean (2005) confirms that the price for U.S. periodicals increased by an average of 10.4 % since 1999. This figure is higher in Iran because of currency restrictions, American trade embargos (approximately 40 % of core medical journals are published in the United States) and bureaucracy prohibiting direct purchase, resulting in much higher costs.

The Publishers Communication Group Inc. (PCG) (2005) who provide a detailed example of trends influencing journal subscription, cancellation and renewal for scholarly publishers, also studied trends in journal subscription renewal and cancellation. The findings show that between July 2004 and June 2005, 56 % of the subscriptions included in the sample were cancelled. The PCG study highlighted a number of factors that influence an institution's decision to cancel a subscription. The PCG investigated why the specific subscription in question was cancelled in place of another subscription. When the topic was explored in greater detail, the librarians who had been contacted explained that because of reductions in collection budgets, they were forced to apply a number of cost-cutting exercises including usage studies, faculty surveys and the elimination of duplicate subscriptions. The tally of responses clearly demonstrated that, of the cancellations identified in their sample, 22 % were motivated by low usage, 22 % were due to electronic availability of the content and the library's budget prevented a renewal of 15 % (Publishers Communications Group, Inc. 2005).

A study by Masjedi et al. (2004) showed that about two-thirds of the journals present in four educational and research centers in Tehran were used less than three times per month. In a similar library collection usage study performed on the international journals held at the libraries of Shaheed Beheshti University Medical School between 1990 and 1992, Sooresrafil (1993) found that over 31 % of the journals were only consulted once in 3 months and 67 % were not even used once in the same period.

Forouzi (1995), studied the internationally published journals usage rate in Tehran, Amir Kabir and Elm-o-Sanat universities in Iran and found that the maximum usage was 4 times for a time period of three months and the minimum cost per use was \$29.6. Meanwhile about 60 % of the journals in Tehran University, 75 % in Amir Kabir and 80 % in Elmo-Sanat Universities were not even used once. In another study Kiani (1998) conducted in the libraries of Biomedical and Biophysical Research Centers of Tehran and Tarbiat Modarres Universities in Iran, and found that the average cost per use for each international journal was \$43.75 and \$60.37, respectively. Another survey performed on the libraries affiliated to the Medical School of Tehran University, Iran, showed that during the time period of 1994-1995 around 68.07 % of international journals were not even used once (Sulaimani, 1999).

The literature on Iranian journal usage has centered on "off the shelf" studies. This method is unreliable since taking a resource off the shelf, or even borrowing, is not

necessarily an indication that the resource has been used or useful. In addition, each of these studies is limited to one or two libraries, which may be informative at the individual library level, but do not provide a national picture.

In the present study, data have been collected and presented that allow citation criteria to be applied to investigate the usage rate of international journals cited by medical faculties. One such criterion is what is known as the journal half-life. This is the number of journal publication years, going back from the current year, that account for 50% of the total citations received by the cited journal in the current year. The data collected here facilitate the calculation the half-life of the most cited journals between 2002 and 2004. For decision-making purposes, the half-life is a further useful measure, as it provides an indication of the expected frequency of usage. As the literature ages, it receives fewer and fewer citations. The measure of half-life as the median age of cited sources has also been used to study the obsolescence of literature (Earle & Vickery, 1969; Line, 1970). This phenomenon is known as “aging” or “obsolescence” Ya,sar Tonta and Yurdagül Ünal (2006).

The age of materials is useful in developing guidelines for retrospective collection development and storage. Whilst the half-life is a useful measure for helping with archiving decisions, ‘citation frequency’ is used as a decision making tool for journal acquisition. Such analysis is also made possible by the data collected in this study. Another useful measure includes material allocation formulae which often include a factor for the relative importance of journals versus monographs. Awareness of medical scholars’ citation patterns may assist in developing such formulae.

The main aims of this study are to determine, a) the formats of materials used in Iranian medical research b) the age of cited items c) high use journal titles which are critical to maintaining the core collection d) the half-life of the most cited journals and to rank them accordingly.

Method

Raw data from an Iranian medical citation database, compiled mainly from printed sources, which was being developed by the author for the purpose conducting bibliometric studies such as this, were transferred into a spreadsheet and each record was tabulated on the basis of the consistent contextual elements of bibliographic information, such as (;) or (,). However, in many cases, due to the lack of consistency, many of the records were tabulated manually. The usage for each journal was then counted and tabulated according to frequency.

The citation half-life for each of the most cited titles was then calculated by working out the time taken to receive 50 % of the total number of citations from the current publication year backwards. The 140,000 bibliographic citations in around 10,000 articles that appeared in the 90 Iranian medical journals published between 2002 and 2004 were analyzed and journals were grouped according to Bradford’s Law (1948) of Scattering¹. By applying Bradford’s categories to foreign journals cited by the

¹ Also known as the Pareto principle, the law of maldistribution, the law of the vital few and the principle of factor sparsity, the vital few and the trivial many, the 80/20 rule states that for many phenomena, 80% of the consequences stem from 20% of the causes. The principle was first suggested by management thinker Joseph M. Juran, who named it after the Italian economist Vilfredo Pareto, who observed that 80% of income in Italy was received by 20% of the Italian population. Source:

Iranian medical scholars, journals are grouped into three zones. Zone 1 consists of a few journals which have received the largest number of citations (the core cited journals), the second, larger group (Zone 2), has journals cited somewhat less frequently and Zone 3 contains a much larger set of journals cited relatively infrequently (candidates for substitution or cancellation).

Results

The result section begins with analyzing the age of cited materials from 2002 to 2004 followed by the investigation of different media usage by Iranian medical researchers. Internationally published medical journals having essential contribution in Iranian medical researchers' scientific production was then extracted along with their corresponding percentiles to help librarian for storage policy.

Material Age

Understanding the extent to which library users rely on older materials can be useful in determining which materials can be moved to remote storage (Ackerson, 2001). In this study for each year of the investigation, different types of cited media based on publication date were analyzed. The data in Tables 1, 2 and 3 show the age of media for different formats according to 25, 50 and 75 percentiles. Materials were grouped into 8 format categories for analysis: journals, books, reports, conference papers, web resources, theses, research projects and patents. Tables 1, 2 and 3 illustrate the age of different materials present from 2002 to 2004.

Table 1: Age of Materials in 2002

	Valid	25th Percentiles	50th Percentiles	75th Percentiles	Half-life
Foreign journals	21922	1988	1994	1998	10
Farsi journals	1152	1995	1998	2000	6
WWW	136	1999	2001	2001.75	3
Foreign books	5501	1991	1996	1999	8
Farsi books	1109	1992	1996	1998	8
Foreign reports	104	1990	1995	1999	9
Farsi reports	59	1995	1998	1999	6
Foreign conferences	93	1989	1994	1998	10
Farsi conferences	400	1995	1998	2000	6
Foreign thesis	25	1990.5	1995	1998	9
Farsi thesis	458	1992	1995	1998	9
Foreign projects	26	1991.75	1997	1999	7
Farsi projects	115	1994	1997	1999	7
Patent	1				

Trueswell, R. (1969). Some behavioral patterns of library users. The 80/20 rule. *Wilson Library Bulletin*, 46, 458-461.

Table 2: Age of Materials in 2003

	Valid	25th Percentiles	50th Percentiles	75th Percentiles	Half-life
Foreign journals	32127	1989	1995	1999	9
Farsi journals	1366	1996	1998	2000	6
WWW	274	1998	2001	2002	3
Foreign books	6763	1992	1997	2000	7
Farsi books	1340	1992	1996	1999	8
Foreign reports	129	1989.5	1996	1999	8
Farsi reports	60	1996	1998	2000	6
Foreign conferences	149	1988	1997	2000	7
Farsi conferences	425	1996	1999	2000	5
Foreign thesis	34	1987	1995	1997.25	9
Farsi thesis	502	1993	1996	1998	8
Foreign projects	19	1994	1997	1999	7
Farsi projects	125	1992.5	1998	2000	6
Patent	7	1951	1962	1985	

Table 3: Age of Materials in 2004

	Valid	25th Percentiles	50th Percentiles	75th Percentiles	Half-life
Foreign journals	41929	1990	1996	2000	8
Farsi journals	1588	1997	1999	2002	5
WWW	370	2000	2001	2003	3
Foreign books	7528	1993	1998	2000	6
Farsi books	1013	1993	1997	2000	7
Foreign reports	178	1991	1995.5	1999	8.5
Farsi reports	72	1997	1999	2001	5
Foreign conferences	221	1994	1999	2001	5
Farsi conferences	356	1997	2000	2001	4
Foreign thesis	52	1986.75	1996.5	1999.75	7.5
Farsi thesis	647	1993	1996	1999	8
Foreign projects	32	1992.25	1997.5	2000	6.5
Farsi projects	111	1995	1998	2000	6
Patent	9	1986	1991	1999.5	

The results show that the age of materials cited varied from one type to the other. However there is a slight tendency to be published more recently within each type of material from 2002 to 2004 except web resources. Fifty percent of foreign journals cited were published within the previous 9 years whilst 50% of Farsi Journals on average were cited within the previous 6 years. As may be expected, the youngest items cited were web resources with an average of 3 years. Half of the foreign books cited ranged from 8-6 years old, while 50% of the Farsi books were cited over a

seven-year average. Half of the cited Farsi and foreign reports were published within the last 5 and 7.5 years, respectively. The half-life of cited conference papers tended to be more current than books, however there is a slight difference between the age of usage of foreign and Farsi conference papers (more than 7 years to 5 years, respectively). Half of Farsi and foreign theses cited were more than 8 years old. The practical application of these findings is that individual libraries could benefit of such information for archiving decisions depending upon the availability of space.

Usage of information resources by Iranian medical researchers

To investigate the types of information sources used by Iranian medical researchers and their preferred information formats several queries were written to extract relevant information. The data in Table 4 show the number and percentage of each type of information format cited by Iranian medical researchers between 2002 and 2004.

Table 4: Number and percentage of each type of information source usage between 2002 and 2004

Years	2002	2002(%)	2003	2003(%)	2004	2004(%)	Average percent
Foreign journals	21922	70.5	32127	74.2	41929	77.5	74.07
Farsi journals	1152	3.7	1366	3.2	1588	2.9	3.27
WWW	136	0.4	274	0.6	370	0.7	0.57
Foreign books	5501	17.7	6763	15.6	7528	13.9	15.73
Farsi books	1109	3.57	1340	3.09	1013	1.87	2.84
Foreign reports	104	0.33	129	0.3	178	0.33	0.32
Farsi reports	59	0.19	60	0.14	72	0.13	0.15
Foreign conferences	93	0.3	149	0.34	221	0.41	0.35
Farsi conferences	400	1.29	425	0.98	356	0.66	0.98
Foreign theses	25	0.08	34	0.08	52	0.1	0.09
Farsi theses	458	1.47	502	1.16	647	1.2	1.28
Foreign projects	26	0.08	19	0.04	32	0.06	0.06
Farsi projects	115	0.37	125	0.29	111	0.21	0.29
Patent	1	0	7	0.02	9	0.02	0.01
Total	31101	100	43320	100	54106	100	100

The data in Table 4 show that more than 77% of the total citations were to Journals (74% to foreign journals and 3.3% to Iranian journals), more than 19% to books, 0.6 % to web resources, 0.5% to reports, more than 1 % to conference papers, and 1.3 % to theses, 0.30% to research projects and just 0.01% were made to Patents. Of 9400 Foreign journals, 4532 (more than 48%) occurred as one citation, the mean number of citations per article was 12 of which 75% were journals, 3.4% were conference proceedings and 6.4% were other formats such as books and electronic resources.

The internationally published leading scientific medical journals cited in Iranian medical researchers papers

In this study the half-life index is used to determine international journals' archiving policy. To this end, the publication dates of each cited journal were transferred to SPSS to divide the total of each title publication dates into four quartiles.

Investigation based on the records of Iranian medical universities of their foreign journals subscriptions, available from the Ministry of Health and Medical Education in Iran, showed that 15% of Iranian medical universities libraries, all of which are based in Tehran, have very large collections as they are also responsible for supporting other libraries through such mechanisms as interlibrary loans. The database showed that 95% of the remaining 85% of medical libraries subscribed to 150-180 international journals. When all of the foreign journals that were cited by Iranian medical researchers were ranked in order of the number of citations received, Bradford's (1984) criterion was used to categories the journals into 3 zones. The top third most cited journals (zone 1) constituted the 108 journals that received 141 or more citations. Therefore 141 citations per three-year period served as the threshold to determine the international core journals set in medical sciences in Iran. However this threshold can be adjusted to meet the needs of individual universities, depending upon factors such as budgets.

The data in Table 5 lists the first twenty of the most cited non-Iranian journals and their corresponding percentiles.

Table 5: The 20 most cited journals and their corresponding half-life

Rank*	Journal	N	Mode of publication date	25th Percentiles	50th Percentiles	75th Percentiles	In shelf	Active archive	Passive archive
1	N ENGL J MED	1401	1995	1987	1993	1998	6	11	17
2	LANCET	1121	1999	1985	1992	1997	7	12	19
3	JAMA	803	1999	1987	1994	1998	6	10	17
4	BMJ	769	2000	1985	1994	1998	6	10	19
5	FERTIL STERIL	703	2001	1989	1996	1999	5	8	15
6	AM J CLIN NUTR	625	2000	1988	1995	1999	5	9	16
7	AM J OBSTET GYNECOL	615	1998	1987	1994	1998	6	10	17
8	J CLIN ENDOCRINOL METAB	605	1998	1988	1995	1999	5	9	16
9	CIRCULATION	579	1998	1990	1995	1999	5	9	14
10	OBSTET GYNECOL	566	1998	1990	1996	1999	5	8	14
11	HUM REPROD	543	1998	1995	1997	2000	4	7	9
12	DIABET CARE	537	1998	1994	1997	2000	4	7	10
13	J UROL	528	1997	1988	1994	1998	6	10	16
14	PEDIATR	512	1998	1986.25	1994	1999	5	10	17.75
15	J PEDIATR	484	1994	1985	1993	1998	6	11	19
16	ANN INTERN MED	462	1992	1985	1992	1997	7	12	19
17	J BONE AND JOINT SURG	435	1990	1976	1987	1994	10	17	28
18	CANCER	409	1998	1981	1990	1996	8	14	23
19	J CLIN MICROBIOLOGY	395	1998	1991	1996	1999	5	8	13
20	GASTROENTEROLOGY	378	1998	1991	1996	1998	6	8	13
21*	...								

*Ranked by number of citations.

* The remaining titles are shown in Appendix 1.

These journals account for 12% of the total number of citations to non-Iranian journals. Appendix 1 contains a list of all 108 of the top third journals accounting for 33% of the total number of citations. These can be used for classification of the three chronological steps in weeding and archiving decisions. Again this threshold can be adjusted to meet the needs of individual universities, depending upon factors such as available space.

Over the course of the 3 years under investigations, 134,536 citations representing almost 100 % of the total number of references have been analyzed from the 90 journals whose bibliographic data has been entered into the database. The majority of cited items were non-Iranian journal articles (95978 citations).

From the data in Table 5, the top 108 most cited journals are ranked in descending order. The table also lists first, second and third quartiles for each title. The 108 journals were able to provide for more than 33% of the information needs of Iranian medical researchers from 2002 to 2004.

The New England Journal of Medicine was the most cited journal, having been referenced a total of 1401 times. The second most-used journal, *The Lancet* was cited 1121 times.

As may be expected, the publication frequency might be related to the citation frequency. Therefore it is not surprising to see that the three weekly-published journals are ranked the highest, whereas monthly journals tend to be cited less frequently. It seems that the half-life of journals in a specific clinical discipline is relatively lower than those belonging to the general medicine.

Archiving and preservation refer to the processes and procedures required to ensure the content of journals remain accessible well into the future. Since library shelves run out of space, academic and research libraries of all types and sizes have to make decision on storage possibilities. To this end, based on quartiles of usage, the three steps “in shelf” (first quartile), “active archive” (second quartile or half life) and “passive archive” (third quartile) are proposed to preserve journals. In accordance with 25, 50 and 75 percent of quartiles libraries could decide for how long each journal could be kept in shelf or transferred to active or passive archive.

Conclusion

Evaluation of journals usage is a difficult but necessary task considering the wide range of choices available. Limited funding and space, as well as other factors, dictate the need for a carefully planned strategy of journal selection. Citation frequency can help deal with the series of decisions involved in the establishment and maintenance of an effective library collection.

In summary, although, publication strategies differ according to country and to scientific discipline, the Iranian medical sciences rely mostly on journal articles for research, as over 77% of all references were to journals. This number is slightly lower than the commonly used number of 80 percent for the sciences in general (Bowman,

1990; Devin & Kellogg, 1990). However the results support Haigh (1982) who indicates that third world scientists cite references primarily (78%) from mainstream scientific literature. If the Iranian medical libraries decide to give priority to their funding situation, this figure can be used to determine the serials budget.

The pattern of citation by media remained constant over the three years of the study, with journals being the most preferred format of citation over the relatively short period under investigation. The results with regard to the age of cited materials show variations across the different types and there is a tendency to get younger within the age of each type of media from 2002 to 2004, except for web resources (see Tables 1, 2 & 3).

The citation half-life of foreign journals is 9 years whilst 50% of Farsi journals on average were cited within the previous 6 years. These results are approximately in accordance with the study of Musser and Conkling (1996) and Kushkowski, Parsons & Wiese (2003) who found the majority of materials cited were less than eight years old. The lowest half-life belongs to web resources with 3 years old. Further investigation might also determine the patterns of use of electronic resources, such as Internet sites or eBooks.

The 108 most cited internationally published journals, providing 33% of Iranian medical researchers information needs, can be used by Iranian medical libraries as a baseline for subscription; along with their corresponding quartiles as a criterion for storage policy.

The list of internationally published journals belonging to the second zone consisting of 630 titles providing around a further 33% of information needs of Iranian medical researchers for the time frame under investigation.

References

Ackerson, Linda G. (2001) Is Age an Appropriate Criterion for Moving Journals to Storage. *Collection Management* 26 (3) 63-76.

Balay, R. (Ed.) (1996) *Guide to reference books* (11th Ed.) Chicago: American Library Association.

Bowman, M. S. (1990) Format citation patterns and their implications for collection development in research libraries. *Collection Building* 11(1) 2-8.

Bradford, S. C. (1948) *Documentation*. London: Crosby Lockwood,

Brandon AN, Hill DR (1997) Selected list of books and journals for the small medical library. *Bulletin of the Association of Medical Librarians*. 85 (2) 111–135.

Devin, R. B. & Kellogg, M. (1990) The serial/monograph ratio in research libraries: Budgeting in light of citation studies. *College & Research Libraries*, 51, 46-54.

Earle, P. & Vickery, B. (1969) Social science literature use in the UK as indicated by citations. *Journal of Documentation*, 25, 123-141.

Forouzi, S. (1995) *Determining the relationship between the price and usage rate of periodical Latin journals of 1993 in the universities of Tehran, Amir Kabir and Elm-o-Sanat*. MSc Thesis in library and Information Sciences. Tehran. Tarbiat Modarres University.

Gross, P. L. K. & Gross, E. M. (1927) College libraries and chemical education. *Science*, 66, 385-389.

Haigh MJ. (1982) Citation analysis of foreign sources in Japanese geographical serials. *Scientometrics*, 4 (3), 195-203.

Kean, G. (2005) 18th Annual Study of Journal Prices for Scientific and Medical Society Journals: 2005 Pricing Trends for U.S. Society Journals and Ten Recommendations for Pricing 2006 Volumes. *JP, The Newsletter for Journal Publishers*, 3. 15 July 2007: <http://www.allenpress.com/static/newsletters/pdf/JP-2005-03.pdf>

Kiani , T. (1998) *Studying the cost-usage of periodical Latin journals of biochemistry and biophysics in the library of IBB Institute of Tehran and Tarbiat Modarres Universities*. MSc Thesis in Library and Information Sciences. Tehran. Tarbiat Modarres University.

Kriz, H. M. (1977) Citation counting and the future of engineering libraries. *Engineering Education*, 67, 707-710.

Kushkowski, D., Parsons, K.A., & Wiese, W.H. (2003) Master's and Doctoral Thesis Citations: Analysis and Trends of a Longitudinal Study. *Portal: Libraries and the Academy*, 3(3), 459-479.

Line, M.B. (1970) The half-life of periodical literature: Apparent and real obsolescence. *Journal of Documentation*, 26, 46-54.

Masjedi M., Kaykha M., Chamyani F., & Emami H. (2004) Evaluating the rate of international scientific journal use in the libraries of 53 four educational and research centers. *Journal of Medical Education*, 4(2), 53-57.

Musser, L R. & Conkling, T.W. (1996) Characteristics of Engineering Citations. *Science and Technology Libraries*, 15 (4), 41-49.

Publisher's Communications Group, inc., 2005. 19 June 2008 : <http://www.pcgplus.com/Resources/Trends2004.2005.pdf>

Smith, L.C. (1981) Citation analysis. *Library Trends*, 30, 83-106.

Sooresafil B. (1993) *Determining the cost effectiveness of the main periodical journals in the central libraries of Shaheed Beheshti Medical University in 1990-1992*. MSc Thesis in Library and Medical Information Sciences, Medical University of Iran.

Sulaimani. (1999) *Evaluation of non-Persian journals in the libraries affiliated to Tehran Medical University*. MSc Thesis in Library and Medical Information Sciences. Medical University of Iran.

Sylvia, M. J. (1998) Citation analysis as an unobtrusive method for journal collection evaluation using psychology student research bibliographies. *Collection Building*, 17 (1), 20 - 28.

White, H. S. (1981) Strategies and alternatives in dealing with the serials management budget. In S. H. Lee (Ed.), *Serials collection development: choices and strategies* (pp. 31-32). Ann Arbor, MI: Pierian Press.

Wyllys, R. E. (1981) Empirical and Theoretical Bases of Zip's Law. *Library Trends*, 30 (1), 53-64.

Ya, sar T. & Ünal, Y (2006) Scatter and Obsolescence of Journals Cited in Dissertations of Librarianship. *Library & Information Science Research*, 28(2), 281-296.

Appendix 1

The 108 most cited journals and their corresponding quartiles

Rank*	Journal	N	Mode of publication date	25th Percent iles	50th Percent iles	75th Percent iles	In shelf	Active archive	Passive archive
1	N ENGL J MED	1401	1995	1987	1993	1998	6	11	17
2	LANCET	1121	1999	1985	1992	1997	7	12	19
3	JAMA	803	1999	1987	1994	1998	6	10	17
4	BMJ	769	2000	1985	1994	1998	6	10	19
5	FERTIL STERIL	703	2001	1989	1996	1999	5	8	15
6	AM J CLIN NUTR	625	2000	1988	1995	1999	5	9	16
7	AM J OBSTET GYNECOL	615	1998	1987	1994	1998	6	10	17
8	J CLIN ENDOCRINOL METAB	605	1998	1988	1995	1999	5	9	16
9	CIRCULATION	579	1998	1990	1995	1999	5	9	14
10	OBSTET GYNECOL	566	1998	1990	1996	1999	5	8	14
11	HUM REPROD	543	1998	1995	1997	2000	4	7	9
12	DIABET CARE	537	1998	1994	1997	2000	4	7	10
13	J UROL	528	1997	1988	1994	1998	6	10	16
14	PEDIATR	512	1998	1986.25	1994	1999	5	10	17.75
15	J PEDIATR	484	1994	1985	1993	1998	6	11	19
16	ANN INTERN MED	462	1992	1985	1992	1997	7	12	19
17	J BONE AND JOINT SURG	435	1990	1976	1987	1994	10	17	28
18	CANCER	409	1998	1981	1990	1996	8	14	23
19	J CLIN MICROBIOL	395	1998	1991	1996	1999	5	8	13
20	GASTROENTRO LOGY	378	1998	1991	1996	1998	6	8	13
21	CHEST	371	1997	1988	1993	1998	6	11	16
22	ARCH INTERN MED	370	1997	1988.75	1994	1998	6	10	15.25
23	AM J MED	365	1999	1983	1991	1998	6	13	21
24	NATURE	359	1970	1976	1985	1994	10	19	28
25	ANESTH ANALG	350	2000	1990	1995	1999	5	9	14
26	PROC NATL ACAD SCI USA	345	1996	1988	1993	1997	7	11	16
27	BRAIN RES	325	1995	1987	1993	1997	7	11	17

28	AM J EPIDEMIOLOG	318	1998	1986	1993	1998	6	11	18
29	ANN THORAC SURG	315	1996	1991	1995	1998	6	9	13
30	AM J CARDIOL	314	1998	1988	1994	1998	6	10	16
31	AM J GASTROENTEROLOGY	312	1999	1993	1998	2000	4	6	11
32	SCIENCE	298	1998	1982	1990	1996	8	14	22
33	ANESTHESIOLOGY	282	1992	1986	1992	1996	8	12	18
34	AM J PHYSIOL	270	1992	1986	1993	1997	7	11	18
35	INFECT IMMUN	270	1995	1988	1993	1998	6	11	16
36	J INFECT DIS	269	1991	1987	1993	1998	6	11	17
37	RADIOLOGY	265	1991	1985	1991	1996	8	13	19
38	ARCH DIS CHILD	264	1994	1984	1992	1997	7	12	20
39	BLOOD	263	1998	1991	1995	1998	6	9	13
40	KIDNEY INT	256	1999	1990	1995	1999	5	9	14
41	BR J OBSTET GYNECOL	253	1998	1988	1995	1999	5	9	16
42	J IMMUNOL	250	2000	1988	1995	1999	5	9	16
43	DIABETES	247	1991	1985	1991	1996	8	13	19
44	SPINE	246	1995	1989	1994	1997	7	10	15
45	CLIN ORTOP	245	1996	1982	1989	1995.5	8.5	15	22
46	GUT	233	1999	1991	1996	1999	5	8	13
47	J BIOL CHEM	228	1993	1983	1992	1998	6	12	21
48	J CLIN INVEST	227	1997	1983	1991	1995	9	13	21
49	Am J Psychiatry	224	1998	1986	1992	1998	6	12	18
50	CLIN INFECT DIS	223	1997	1995	1997	1999	5	7	9
51	J NEUROSURG	223	2002	1983	1991	1998	6	13	21
52	AM J TROP MED HYG	220	1999	1981.25	1992	1997	7	12	22.75
53	J ENDODON	220	1992	1986	1992	1996	8	12	18
54	PAIN	213	1995	1989	1993	1997	7	11	15
55	TRANSPLANTATION	213	2000	1994	1997	2000	4	7	10
56	LARYNGOSCOPE	211	2000	1986	1994	1999	5	10	18
57	J NUTR	210	2000	1994	1998	2000	4	6	10
58	OSTEOPOROSIS INT	209	2001	1996	1999	2001	3	5	8
59	STROKE	206	1999	1990.75	1997	1999	5	7	13.25
60	NEUROLOGY	201	1996	1989	1995	1998	6	9	15
61	J ADV NURS	197	1998	1994	1998	2000	4	6	10
62	BR J ANESTH	196	2000	1987	1993	1998	6	11	17

63	J PROSTHET DENT	193	1989	1982.5	1988	1994	10	16	21.5
64	J AM COLL CARDIOL	192	1998	1993	1997	1999	5	7	11
65	EUR J PHARMACOL	191	1999	1988	1995	1999	5	9	16
66	J TRAUMA	191	1998	1986	1993	1997	7	11	18
67	VACCINE	188	2001	1994	1997.5	2000	4	6.5	10
68	J THORAC CARDIOVASC SURG	185	1995	1984	1992	1996	8	12	20
69	TRANSACTION S OF THE ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE	185	1995	1985	1992	1997	7	12	19
70	Anaesthesia	185	1992	1988	1992	1997	7	12	16
71	J PHARMACOL EXP THER	184	1997	1984	1990.5	1997	7	13.5	20
72	AJR	184	1992	1986.25	1993	1998	6	11	17.75
73	J Periodontol	184	1992	1982	1990	1996	8	14	22
74	AM J PUBLIC HEALTH	180	1994	1988	1994	1997	7	10	16
75	PEDIATR INFECT DIS J	179	2000	1992	1997	2000	4	7	12
76	CLIN ENDOCRINOL	175	1995	1990	1994	1998	6	10	14
77	CANCER RES	173	1990	1986	1991	1997	7	13	18
78	HEPATOLOGY	172	2000	1995	1998	2000.75	3.25	6	9
79	ACTA PEDIATR	167	1999	1994	1997	1999	5	7	10
80	CLIN CHEM	166	1972	1982	1990	1996	8	14	22
81	ARCH GEN PSYCHIATR	165	1994	1983	1991	1996	8	13	21
82	AM J SURG	165	1996	1982	1992	1996	8	12	22
83	INT J PHARM	163	1995	1991	1996	2000	4	8	13
84	J ETHNOPHARMACOL	162	2000	1992.75	1998	2000	4	6	11.25
85	ORAL SURG ORAL MED ORAL PATHOL	161	1994	1983.5	1989	1992	12	15	20.5
86	BR J PSYCHIATRY	160	1990	1985.25	1991.5	1996	8	12.5	18.75
87	DIABETOLOGI	160	1992	1985	1993	1997	7	11	19

	A								
88	BR J SURG	156	1992	1982	1990.5	1996	8	13.5	22
89	LIFE SCI	155	1992	1985	1993	1999	5	11	19
90	BURNS	154	1998	1995	1998	2000	4	6	9
91	ANN SURG	153	1998	1974.5	1988	1997	7	16	29.5
92	ARCH PHYS MED REHAB	152	1992	1988	1992	1998	6	12	16
93	J PEDIATR SURG	152	2001	1990.2 5	1997	2000	4	7	13.75
94	OPHTHALMOL	152	1999	1988	1995	1999	5	9	16
95	METABOLISM	152	1998	1986	1994	1998	6	10	18
96	NEPHROL DIAL TRANSPLANT	152	1999	1995	1998	2000.7 5	3.25	6	9
97	ARCH SURG	149	1996	1983	1991	1997	7	13	21
98	ATHEROSCLER OSIS	149	2000	1991	1996	1999	5	8	13
99	DIABET MED	149	1998	1995	1998	2000	4	6	9
100	ANN N Y ACAD SCI	149	1998	1990	1997	1999	5	7	14
101	AM HEART J	149	2000	1989	1994	1999	5	10	15
102	J RHEUMATOL	148	1997	1991	1995	1998	6	9	13
103	J EXP MED	148	1992	1982.2 5	1992	1998	6	12	21.75
104	AM REV RESP DIS	146	1989	1981	1987.5	1991	13	16.5	23
105	J AM ACAD DERMATOL	146	1996	1990.7 5	1995	1998	6	9	13.25
106	UROLOGY	146	2002	1989.7 5	1995	1999	5	9	14.25
107	ENDOCRINOLO GY	144	2001	1984	1992	1998	6	12	20
108	ACTA OBSTET GYNECOL SCAND	141	1997	1992	1997	2000	4	7	12