

## Editorial

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### CITATION ANALYSIS IN THE FIELD OF TROPICAL MEDICINE

There are several methods for the evaluation of journals. One such method consists in counting all journal references cited in textbooks or monographs dealing with the subject under investigation. Journals may then be ranked in order of citation frequency. This method has a few drawbacks: the scope and approach of the textbooks often are divergent, the language bias is obvious, and emphasis will be on essential and classical papers. Nevertheless, if a well-balanced selection of textbooks is made and the data statistically adjusted, this method will result in an interesting sequence of cited journals.

Another method consists in counting the entries listed in appropriate abstracting or indexing services (1). It is obvious that journals which are frequently cited by these services will be more important for the subject covered than less cited journals. For the sake of comprehensiveness, however, these bibliographic services generally include mediocre journal articles indiscriminately along with pioneering papers. This detracts greatly from the value of this method for journal evaluation.

A method which combines both quantity as well as quality of journal articles is provided by the Journal Citation Reports (JCR) of the Science Citation Index (5). JCR is published annually by the Institute for Scientific Information in Philadelphia. It contains for about 4,000 leading international science journals statistical data on papers published, citations made, citations received, impact factor, etc. For each category of data all journals are ranked in descending order of importance (3, 4).

One of the most original features of JCR is the ranking of journals according to 'impact factor'. This factor is calculated by dividing the number of citations which a particular journal received in a particular year to the papers it published during the two previous years, by the *total* number of papers it published during the same two year period. The impact factor tends to discount the advantage of large journals over smaller ones, of frequently issued journals over less frequently issued, and of older journals over newer ones (5). In 1985, which is the last published annual index of JCR, *Annales de la Société Belge de Médecine Tropicale* occupies, on a total of 4,072 journal titles, rank 2,706 for number of papers published, rank 2,162 for number of times cited, and rank 1,729 in terms of impact factor.

A list of the major tropical medicine journals ranked by impact factor is reproduced in Table 1. The journal hierarchy it shows is useful as it gives an immediate idea of how the journals listed compare to each other in terms of quality of published papers, i.e. if being cited is accepted as a standard of value. The ranking of our *Annales* is rather satisfactory, but the leading *American Journal of Tropical Medicine and Hygiene* and *Transactions of the Royal Society of Tropical Medicine and Hygiene* are well beyond reach.

TABLE 1  
General tropical medicine journals ranked by impact factor, 1985

1 Am. J. Trop. Med. Hyg.	1,936
2 Trans. Roy. Soc. Trop. Med. Hyg.	1,727
3 Acta Trop.	1,225
4 Ann. Trop. Med. Parasit.	0,824
5 Trop. Med. Parasit.	0,807
6 Ann. Soc. Belge Méd. Trop.	0,761
7 Trop. Geogr. Med.	0,489
8 J. Trop. Med. Hyg.	0,425
9 Rev. Inst. Med. Trop. S. Paulo	0,371
10 Bull. Soc. Path. Exot.	0,299

This list, however, does not provide sufficient insight in the total literature of tropical medicine, which is not only covered by specialised tropical medicine journals but also by other journals, irrespective of their specialisation. In order to determine which journals publish papers relevant to the field of tropical medicine and to what extent, I considered the group of tropical medicine journals listed in Table 1, as "nucleus journals" (2). For each of these ten journals, all citations to other journals (and to themselves) were counted for the year 1985. This was done with the help of JCR. As JCR lists only 6 or more citations per title, the sum total for lowly cited journals may slightly be underrepresented. The results of this study are shown in Table 2, listing the 50 most frequently cited journals.

Journal titles are ranked by the total number of times they were cited by the 10 nucleus journals. The leading journals are the same as those in Table 1. However, they are followed by a mixture of other journals with different fields of interest: tropical medicine, general and experimental medicine, parasitology, public health, natural science, etc. Next to their titles the corresponding impact factors are given. Some have extremely high impact factors (*New England Journal of Medicine*, *The Lancet*, *Nature*, *Science*,...) and may be expected among the leading titles in many such listings for other subject fields.

The citation counting method for journal ranking suffers from the fact that sometimes considerable self-citing occurs (1). Therefore, the number of self-citations by the 10 nucleus journals and their ratio to the total number of citations they made, are mentioned in Table 2. Although these ratios vary from 2.5 to 15.1%, subtraction of self-citations from the number of times cited would only slightly affect the rank-order of the nucleus journals. Besides it seems to me plain logic that high-quality journals cite themselves proportionately more often than lower-quality journals do.

Finally, a journal ranking is given according to the number of times 198 and 1984 papers *only* were cited by the 10 nucleus journals in 1985. This ranking is useful to determine the *current* value of the journals listed. Here again, the same two titles are leading the field, but *The Lancet* now occupies the third place and a few other shifts in ranking catch the eye.

Citation analysis is a useful tool for journal evaluation. It has become standard technique for:

- selection and deselection of journals by libraries
- estimating the value of published papers (and of their authors...)

TABLE 2  
Citation pattern in the field of Tropical Medicine, 1985

Rank	Title	Number of times all years were cited by 10 core journals in 1985	Impact factor 1985	Number of self-citations by each core journal in 1985	% of total number of citations made by each core journal in 1985	Number of times 1983 and 1984 papers were cited by 10 core journals in 1985	Rank
1	Am. J. Trop. Med. Hyg.	1,046	1.93	534	15.1	208	1
2	Trans. Roy. Soc. Trop. Med. Hyg.	930	1.72	418	11.4	195	2
3	Ann. Trop. Med. Parasit.	436	0.82	141	10.2	56	4
4	Bull. Wrlld Hlth Organ.	390	1.79	—	—	41	7
5	Lancet	377	12.16	—	—	108	3
6	J. Parasit.	263	0.77	—	—	34	10
7	Trop. Med. Parasit.	211	0.80	120	11.2	42	6
8	Nature	201	12.86	—	—	18	17
9	J. Immunol.	199	6.63	—	—	37	8
10	Exp. Parasit.	195	1.43	—	—	30	13
11	Infect. Immun.	193	3.44	—	—	48	5
12	Rev. Inst. Med. Trop. S. Paulo	163	0.37	76	9.6	17	20
13	J. Infect. Dis.	159	4.01	—	—	37	8
14	Parasitology	156	1.59	—	—	32	11
15	Science	134	10.90	—	—	16	21
16	Brit. Med. J.	122	3.02	—	—	10	25
17	Ann. Soc. Belge Méd. Trop.	120	0.76	67	4.6	22	15
	Bull. Soc. Path. Exot.	120	0.29	59	6.2	18	17
19	J. Exp. Med.	95	11.23	—	—	20	16
20	Acta Trop.	89	1.22	35	4.6	24	14
21	J. Med. Entomol.	88	0.79	—	—	18	17
22	J. Protozool.	85	1.44	—	—	14	23
23	Am. J. Epidem.	84	2.78	—	—	5	29
24	New. Engl. J. Med.	82	19.15	—	—	13	24
25	J. Trop. Med. Hyg.	77	0.42	11	2.8	4	30
	Mol. Biochem. Parasit.	77	2.85	—	—	31	12
27	E. Afr. Med. J.	68	0.10	—	—	7	27
28	Clin. Exp. Immunol.	61	2.96	—	—	—	—
29	Proc. Nat. Acad. Sci. USA	59	9.37	—	—	16	22
30	Trop. Geogr. Med.	58	0.48	22	2.5	6	28
31	Bull. Entom. Res.	57	1.07	—	—	—	—
	J. Clin. Microbiol.	57	2.41	—	—	8	26
33	J. Biol. Chem.	45	6.19	—	—	—	—
34	Z. Parasitenk.	44	0.99	—	—	—	—
35	WHO Techn. Rep. Ser.	42	5.60	—	—	—	—
36	J. Helminthol.	41	0.48	—	—	—	—
37	Am. J. Pathol.	39	3.88	—	—	—	—
	Ind. J. Med. Res.	39	0.37	—	—	—	—
	S. E. Asian J. Trop. Med.	39	—	—	—	—	—
40	Ann. Intern. Med.	34	9.53	—	—	—	—
	Gastroenterology	34	6.66	—	—	—	—
	Int. J. Parasit.	34	1.04	—	—	—	—
43	JAMA	31	4.20	—	—	—	—
44	Gut	30	4.92	—	—	—	—
45	Cah. Orstom Ser. Ent. Méd. Parasit.	29	—	—	—	—	—
	J. Clin. Invest.	29	6.88	—	—	—	—
	Paras. Immunol.	29	1.82	—	—	—	—
48	Adv. Parasit.	27	2.70	—	—	—	—
	Am. J. Clin. Nutr.	27	2.70	—	—	—	—
50	Méd. Trop.	26	—	—	—	—	—

- choosing suitable journals for submission of manuscripts by authors
- evaluating journal performance by sponsoring bodies
- identifying key journals, key papers, key authors and key organizations in particular subject areas
- investigating the structure of scientific information transfer.

The effort of compiling rank-order lists of journals in particular subject areas, such as tropical medicine, should be repeated at regular intervals. Fluctuations of impact factors do occur, in some cases maybe because editors have failed or succeeded in doing a better job ...

However, the bare figures produced by citation indexing should always be interpreted with care and caution. Although the overall picture certainly is reliable, special circumstances or singularities may affect the outcome in individual cases.

One should also bear in mind that, for a variety of reasons, some 50,000 science journals are *not* covered by JCR. Many of these are equally important and often indispensable for the dissemination of information on national or regional level.

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