



Revista da ASSOCIAÇÃO MÉDICA BRASILEIRA

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Editorial

Ranking of the scientific production in Brazilian universities in the health science area – 1996 to 2011

Ranking de produção científica das universidades brasileiras na área de ciências da saúde – 1996 a 2011

The development of rankings or classifications of colleges or universities is a common procedure, particularly in English-speaking countries. These classification rankings are objectively used:

- for comparative analysis inter- and intra-institutions;
- for the analysis of improvement policy or economic investment results made by the administration;
- to provide subsidies for investment by public and private initiatives;
- to subsidize the choice of university by the future student.

Within the different areas of knowledge, health sciences are the ones that have experienced in recent years the greatest and most remarkable growth in scientific production. Although there are world rankings where some Brazilian institutions are represented, there are specific rankings for scientific production in the field of health sciences among our major institutions. The development of this ranking can provide important support for investment in research and to guide the development of academic institutions. The Brazilian Medical Association Journal (Revista da Associação Médica Brasileira – RAMB) asked Elsevier to help carry out this research through the SCOPUS database and instructed its editor-in-chief and an undergraduate student from the School of Medicine of Universidade de São Paulo (USP) to perform it. The objective of the research was to establish a ranking of scientific production classification among Brazilian institutions in the area of health sciences.

Based on the SCOPUS database (Elsevier) information was collected regarding the 1996 to 2011 period (including the latter). For this research, which was carried out during this

time interval, the term “Brazil” was inserted after “affiliation” and data on the first 200 Brazilian institutions classified by descending order of the h-index were collected in the area of Health Sciences (Medicine, Biochemistry, Genetics and Molecular Biology, Immunology and Microbiology, Pharmacology, Toxicology and Pharmaceuticals, Neuroscience, Dentistry, Nursing, Psychology and Health Profession). The collected variables and their definitions were:

H-index – The h-index was developed by J. E. Hirsch to qualify the impact and amount of scientific publication by an individual author. An h-index of a group of certain documents or certain authors with an h-index value = 12 means that, of the total number of documents selected to construct the graph, 12 of them were cited at least 12 times. Documents published with fewer citations than h, in this case fewer than 12, are considered, but not accounted for in the h-index. Despite receiving some criticism, the h-index has been used to classify groups of authors and institutions. For this study, we calculated the h-index of the institution as the sum of all publications of authors affiliated to it at that time.

Self-citation count – How often the institution cited its own scientific production in other articles published by affiliated authors.

Institutional collaboration count – number of collaborations with other institutions in scientific publications of the institution.

Field weighted relative impact – Calculates the impact of scientific production in citations, of the institution in the area of performance and can be calculated by the ratio between the mean number of citations obtained by articles published by the institution and citations obtained by articles from all institutions worldwide. Thus, a relative impact of less than

Table 1 – Top 10 Brazilian institutions in health sciences (1996-2011).

| Institution | City | State | Country | Institute h-index | Article count | Citation count | Mean citations | Self citation count | Self citation% | Institutional collaboration count | Collaboration% | Field Weighted Relative Impact |
|---|----------------|-------|---------|-------------------|---------------|----------------|----------------|---------------------|----------------|-----------------------------------|----------------|--------------------------------|
| Universidade de São Paulo | São Paulo | SP | Brazil | 176.00 | 86642 | 715297 | 8.3 | 188237 | 26,3% | 55976 | 64.6% | 0.82 |
| Universidade Estadual de Campinas | Campinas | SP | Brazil | 121.00 | 33498 | 272783 | 8.1 | 69105 | 25,3% | 20715 | 61.8% | 0.82 |
| Universidade Federal do Rio de Janeiro | Rio de Janeiro | RJ | Brazil | 121.00 | 29056 | 231611 | 8.0 | 61020 | 26,3% | 19835 | 68.3% | 0.75 |
| Universidade Federal do Rio Grande do Sul | Porto Alegre | RS | Brazil | 103.00 | 19896 | 157685 | 7.9 | 44421 | 28,2% | 13601 | 68.4% | 0.85 |
| Universidade Federal de Minas Gerais | Belo Horizonte | MG | Brazil | 100.00 | 19104 | 146202 | 7.7 | 36611 | 25,0% | 12538 | 65.6% | 0.79 |
| Universidade Federal de São Paulo | São Paulo | SP | Brazil | 97.00 | 15320 | 129936 | 8.5 | 27997 | 21,5% | 9791 | 63.9% | 0.75 |
| Fundação Oswaldo Cruz | Rio de Janeiro | RJ | Brazil | 87.00 | 10802 | 101541 | 9.4 | 26484 | 26,1% | 8227 | 76.2% | 0.80 |
| Universidade Estadual Paulista | São Paulo | SP | Brazil | 86.00 | 27618 | 162716 | 5.9 | 48280 | 29,7% | 17908 | 64.8% | 0.66 |
| Universidade do Estado do Rio de Janeiro | Rio de Janeiro | RJ | Brazil | 72.00 | 7960 | 58452 | 7.3 | 17464 | 29,9% | 5931 | 74.5% | 0.76 |
| Centro Brasileiro de Pesquisas Físicas | Rio de Janeiro | RJ | Brazil | 71.00 | 3292 | 38939 | 11.8 | 13447 | 34,5% | 2883 | 87.6% | 1.04 |

1 indicates a mean number of citations below the world's average.

The ranking of the 200 Brazilian institutions designed with the previously defined variables of interest can be viewed at the link:

Table 1 shows the ranking of the top 10 institutions classified by h-index. One can observe a large number of publications and reasonable rates of self-citation and collaboration with other institutions in the 1996-2011 period, with the first being Universidade de São Paulo, with the highest number of publications (86,642) and citations (715,297). On the other hand, it can be observed that the weighted relative impact on the area is below the world's average, even for the universities at the top of the list: Universidade de São Paulo (0.82), Universidade de Campinas (0.82), Universidade Federal do Rio de Janeiro (0.75). This finding can be explained by at least two factors:

- Lower quality of publications: typically, publications in journals with lower impact factor are associated with lower rates of citation. Therefore, it is reasonable to assume that an institution that has a large scientific production, but field weighted relative impact lower than the world's average, must have a significant portion of its publications published in journals with lower impact factor.
- Low collaboration count: collaboration is part of the international integration process. It is this strategy that will make researchers from a scientific community to have their work acknowledged, warranting a flow of ideas and influencing the generation of new knowledge. Due to the magnitude and tradition, the international scientific community is the ideal environment to further increase the visibility and influence of scientific production. Brazilian institutions have a collaboration count > 60%, higher than the world's average (48.7%) and similar to the average of the top 20 institutions worldwide in number of citations, which is 67.1%.¹ This fact, however, analyzed together with the weighted relative impact on the area lower than the world's average, allows us to suppose these collaborations are predominantly national or regional and therefore, have less power to influence the international community.¹

These data represent only one of many aspects of the scientific production in the field of health sciences in the

recent past of Brazil. Institutions that generate them are complex and the involved processes are even more complex. Health researches often involve the human being as an object of study, which requires caution and has unique features and often more difficult than in the case of basic research. The methodology used in this study, particularly the h-index for institutions, is subject to criticism and should not be interpreted as the only way to evaluate institutions. On the other hand, it is an objective tool that is being used worldwide and allows vertical comparisons (progressive over time) as well as horizontal ones (between institutions). For this reason, at this point, it is very important that these results be interpreted and used as a reference for the institutions themselves as a guide, a temporal reference for goals in the middle and long term. Based on them, we can conclude that the Brazilian institutions in the area of health sciences should consider the development of strategies that aim to increase international visibility through implementation of strategies for collaboration with leading worldwide institutions.

Appendix. Additional material

Additional material for this article can be viewed in its electronic version, available at doi: 10.1016/j.ramb.2013.10.001.

R E F E R E N C E

1. Gazni A, Sugimoto CR, Didegah F. Mapping world scientific collaboration: Authors, institutions, and countries. *J Am Soc Inf Sci Technol.* 2012;63(2):323-35.

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0104-4230/\$ – see front matter
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<http://dx.doi.org/10.1016/j.ramb.2013.10.001>