

PATTERNS OF SCIENTIFIC COMMUNICATION AMONG LATIN AMERICAN JOURNALS IN THE FIELD OF MEDICAL EDUCATION

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ABSTRACT

This work reports on the medical subject headings that build-up the medical education field in Latin America, through the content and citation analysis of "Educacion Medica y Salud" (EMS). An attempt was made to establish the articulations between the citing and cited countries in the region. It was generally found that EMS was built-up by subjects of Medical Education, Health Manpower, Water Supply, and Health Policy. Although strongly citing/ cited countries, Brazil, Mexico, and Colombia have not established significant information flows among them. Further research lines are proposed.

RESUME

Ce travail étudie la structuration du domaine de l'éducation médicale en Amérique Latine, à travers l'analyse des contenus et des citations des travaux publiés dans "Educacion Medica y Salud" (EMS). Les relations entre pays citant et cités sont analysées. Parmi les résultats on a trouvé que EMS s'est principalement développé autour des thèmes de l'éducation médicale, des ressources humaines dans le domaine de la santé, de l'approvisionnement en eau et des politiques de la santé. Le Brésil et le Mexique, bienque faisant partie des pays citant et cités de façon importante, n'ont pas significativement établi d'échanges d'informations entre eux. Des pistes de recherche sont proposées.

INTRODUCTION

Referencing behaviour constitutes the primary source of data in citation studies and needs to be understood in a comprehensive way as part of the total picture of scholarly communication (1). This paper presents the results of a research in progress related to the content and citation analysis of the Pan

American Health Organization's (PAHO) journal of medical education, "Educacion Medica y Salud" (EMS). Preliminary results have shown that (1) multiple authorship were quite frequent; (2) the use of books and grey literature are more frequent than journal articles; and (3) that Spanish predominated, rather than portuguese and English as language of communication.

Different disciplines have different rates of citation (3-5). The same specialties in different countries often have different citation rates. Lange (6) for example, studied nationally-produced citation habits and found that preferred language of the cited publication and absolute citation frequencies were dependent on discipline and country of publication. Indeed, there is considerable variation among disciplines, subdisciplines, and countries in citation patterns, and as more studies are undertaken, problems proliferate (7). Referring to Third World countries, Garfield (8) reported in 1983 the mapping of science. Data from journals not covered by ISI's databases however, is more difficult to obtain. This is the case of "Educacion Medica y Salud".

PURPOSE OF THIS WORK

The purpose of this work is to present the medical subject terms that participate in the building-up of EMS, and the specific articulations between citing and cited countries, with the aim of detecting the main information flow patterns among descriptors and among countries in the Latin American region.

METHODOLOGY

A retrospective, automated search on MEDLINE was performed to obtain the Medical Subject Headings (MeSH) of 257 documents, as indexed in EMS for the period 1979-1988. Each reference was numbered, accordingly. 13 x 21 cms. cards were used to capture data on each indexed MeSH term regarding (1) the reference number of each indexed article under that term; (2) the subheadings, as applied to each term and to each article; and (3) a unique identifier number for each MeSH term.

Following MEDLINE parameters, a difference between "ordinary" and "asterisked" terms also applied to this study. According to the U.S. National Library of Medicine (9) in the indexing process, the indexer assigns as many headings as necessary to characterize accurately the content of a journal article. Those that represent the most significant points are identified with an asterisk in the online citation. The remaining "ordinary" headings are used to identify concepts which have also been discussed, but are not the primary topics.

In this study, when a term applied to both, "ordinary" and "asterisked" descriptors, two cards were created with the same unique identifier number,

differentiating the "asterisked" descriptor with an "A". Check tags such as "human", "child", or "male", were excluded from the study.

A manual, alpha-numeric inverted file was thus created with all MeSH terms. The file was used to obtain information regarding (1) the total number of MeSH terms used throughout the period of study; (2) the number of "asterisked" terms; (3) the highly indexed terms; both, "ordinary" and "asterisked"; and (4) the geographical descriptors by country, and by region. Data was then manually processed and tabulated. Information regarding the subheadings was not processed at this time.

In order to obtain the information flows among the medical subject headings, the Annotated (9), and Tree Structured (10) MeSH were used. On the other hand, the geographical terms as indexed and captured in the inverted file, and the corporate sources of the citing-cited documents were used to obtain the information flow among the participating regional countries.

RESULTS

Excluding check tags, 1745 medical subject headings were used once or more to index all 257 original documents in EMS, during the period 1979-1988. An average of 6.8 descriptors per document were used to index all documents.

Table 1. Distribution of MeSH terms per indexed document, as published in "Educacion Medica y Salud", 1979-1988.

No. of MeSH terms (A)	No. of documents (B)	A x B	%
2	6	12	02.34
3	12	36	04.67
4	24	96	09.34
5	36	180	14.00
6	54	324	21.01
7	37	259	14.40
8	24	192	09.34
9	28	252	10.89
10	19	190	07.39
11	10	110	03.89
12	3	36	01.17
13	1	13	00.39
14	1	14	00.39
15	1	15	00.39
16	1	16	00.39
TOTAL	257	1745	100.00

Table 1, provides the distribution of MeSH terms per indexed document. The total amount of original MeSH terms used was 376 (100%). 138 (36.70%) were asterisked terms. A Bradford-like distribution of MeSH terms was found thus creating a core of "ordinary" and "asterisked" descriptors. Tables 2 and 3, show the overlaps and rank distributions, accordingly.

Table 2. Rank distribution of "ordinary" MeSH terms, as used to index original articles published in "Educacion Medica y Salud", 1979-1988.

RANK	MeSH Terms (ordinary)	Frequency	%
1	Latin America	65	04.71
2	Curriculum	44	03.19
3	Brazil	35	02.53
4	Education, Medical	32	02.32
4	Health Occupations	32	02.32
5	Public Health	27	01.96
6	Pan American Health Organization	23	01.67
7	Health, Manpower	22	01.59
7	Mexico	22	01.59
8	Health Services	21	01.52
8	Colombia	21	01.52
8	Socioeconomic Factors	21	01.52
8	Health Policy	21	01.52
9	Education, Nursing	19	01.38
10	History	18	01.30
10	History of Medicine, 20th. Cent.	13	01.30
11	Allied Health Personnel	17	01.23
11	Evaluation Studies	17	01.23
11	Health Resources	17	01.23
11	Sanitary Engineering	17	01.23
11	Teaching	17	01.23
12	Health Planning	16	01.16
12	Primary Health Care	16	01.16
12	United States	16	01.16
13	International Cooperation	15	01.09
14-27	Others (302)	792	42.66
1-27	327 MeSH Terms	1381	100.00

In general, it was found that EMS comprehends the following disciplines (in descending order): (1) Education, (2) Health Care, (3) Biological Sciences, (4) Information Sciences, (5) Physical Sciences, (6) Social Sciences; (7) Humanities, and (8) Analytical, Diagnostic and Therapeutic Technics and Equipment. More specifically, EMS is built-up by subjects of (1) Education; mainly medical,

nursing, continuing, curriculum, inservice training, and teaching. (2) Facilities, Manpower, and Services; mainly health manpower, allied health personnel, health services, and health education (3). Environment and Public Health; mainly public health, sanitation, sanitary engineering, and water supply. (4) Economics, Organizations, Control; mainly health planning, health services research, health resources, health policy, and PAHO. (5) Health Occupations. (6) Social Sciences; mainly international cooperation, and socioeconomic factors. (7) Humanities; mainly history, and history of medicine, 20th cent. (8) Information Science; mainly information services. (9) Physical Sciences; mainly research. (10) Miscellaneous technics; mainly evaluation studies; and (11) Health Services Administration; mainly primary health care.

Table 3. Rank distribution of "asterisked" MeSH terms, as used to index documents published in "Educacion Medica y Salud", 1979-1988.

Rank	MeSH terms (a) (asterisked)	Frequency	%
1	Education, Medical (4)	22	06.29
2	Health, Manpower (7)	16	04.57
3	Water Supply	13	03.72
4	Health Policy (8)	12	03.43
5	Health Services Research	11	03.14
5	Curriculum (2)	11	03.14
6	Health Ressources (11)	10	02.86
7	Health Planning (12)	9	02.57
7	Education, Continuing	9	02.57
8	Sanitation	8	02.30
9	Education, Nursing (9)	7	02.00
10	Public Health (5)	6	01.71
10	Health Education	6	01.71
10	Information Services	6	01.71
11	Inservice Training	5	01.43
11	Internahip and Residency	5	01.43
11	Research	5	01.43
12	Others (121)	189	53.99
1	138 MeSH TERMS	350	100.00

(a) MeSH Terms with a parenthesis and a number indicate that the same term was used as an "ordinary" term. The number indicates the rank, as given in Table 2.

In descending order, Brazil, Mexico, Colombia, U.S.A, Chile, Cuba, and Peru, were the most indexed countries in EMS, representing 74.39% of the 25 indexed countries. Table 4, provides a rank distribution of these results. As for the geographical regions, it was found that although there were nine regions in

Table 4. Rank distribution of indexed countries in "Educacion Medica y Salud", 1979-1988.

RANK	COUNTRY (as a MeSH term)	Frequency	%
1	Brazil	35	22.44
2	Mexico	22	14.10
3	Colombia	21	13.46
4	U.S.A.	16	10.26
5	Chile	9	05.77
6	Cuba	8	05.14
7	Peru	5	03.22
8	Venezuela	4	02.56
8	Panama	4	02.56
8	Costa Rica	4	02.56
9	Honduras	3	01.92
9	Guatemala	3	01.92
9	Dominican Republic	3	01.92
9	Canada	3	01.92
9	Argentina	3	01.92
10	Nicaragua	2	01.28
10	Jamaica	2	01.28
10	Bolivia	2	01.28
11	Others (7)	7	04.49
1-11	25 MeSH terms	156	100.00

Table 5. Rank distribution of indexed geographical regions in "Educacion Medica y Salud", 1979-1988.

RANK	REGION (as a MeSH term)*	Frequency	%
1	Latin America	65	63.11
2	Developing Countries	16	15.53
3	West Indies	9	08.74
4	Central America	6	05.83
5	North America	2	01.94
5	South America	2	01.94
6	Africa	1	00.97
6	Asia	1	00.97
6	Europe	1	00.97
1-6	Nine MeSH terms	103	100.00

*Both, "ordinary" and "asterisked" MeSH terms.

total, EMS is mainly focused to Latin America and Developing Countries. Table 5 shows these results.

An analysis of the relationships among citing/cited and indexed countries shows a similar ranking distribution. Table 6 illustrates such relation. A further specific analysis however, showed that, excluding WHO/PAHO citations : (1) Brazil was highly self-cited (87.84%), as compared to U.S.A (10.87%). (2) While Brazil was not significantly cited by any country (six or more citations), Mexico was cited by Venezuela, and Cuba. Argentina was cited by Venezuela, and Colombia. U.S.A. was cited by the top ten countries. Thus, (3) apart from Argentina and Mexico, all Latin American countries are mainly self-cited. Figure 1 illustrates the information flows among the top ten leading countries in the region.

Table 6. Comparison among citing, cited and indexed countries, as found in "Educacion Medica y Salud", 1979-1988. Order by rank of citing countries. (R=Rank; F= Frequency).

Country	Citing country			Cited country			indexed country		
	R	F	%	R	F	%	R	F	%
Brazil	1	45	17.50	2	255	11.27	1	35	22.40
Mexico	2	35	13.61	3	188	08.31	2	22	14.10
Colombia	3	24	09.34	5	91	04.02	3	21	13.46
U.S.A.	4	15	05.84	1	1002	44.26	4	16	10.26
Chile	5	10	03.89	8	64	02.83	5	9	05.77
Argentina	6	9	03.50	6	80	03.53	9	3	01.92
Cuba	6	9	03.50	10	55	02.43	6	8	05.14
Venezuela	7	7	02.72	7	71	03.14	8	4	02.56
Costa Rica	8	6	02.33	13	23	01.02	8	4	02.56
Peru	8	6	02.33	12	29	01.28	7	5	03.22

DISCUSSION AND CONCLUSION

No parameter was found to indicate whether 376 descriptors were adequate to cover the field of medical education and its related disciplines. As it was mentioned previously, MeSH assigned 95 descriptors under its "Education" category; however, both isolated indicators are not sufficient to evaluate, i.e. conclude on these findings.

According to Brooks (11) to some degree all bibliographic phenomena tend to cluster. In our study, a core of most indexed headings helped to identify the main subjects that constructed EMS. The outlying zones however, remained uncovered and need to be fully analyzed in order to comprehend its relationship with the

core zone. This is also true for the subheadings, as applied to both, "ordinary" and "asterisked" MesH terms.

The highly indexed countries as found in the content analysis of this study, corroborate our previous findings of the highly citing-cited countries in the field. This helped to select Brazil, Mexico, Colombia, and U.S.A, as the top four leading countries in EMS. Apart from the U.S.A., only Mexico and Argentina showed "some" information transfer in the region. Brazil and Colombia, although highly citing countries, were found to be mainly self-cited. Whether this is due to the language barrier (Portuguese in the case of Brazil), the accessibility of information sources, or to other factors, is not known. Further research needs to be conducted to fully understand this pattern.

This research has contributed to understand the structure of EMS, and to some extent, the information flows among subjects and among countries in the field.

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Figure 6. Information flows among the top ten leading countries in "Educacion Medica y Salud", 1979-1988. Order by rank of citing countries.

