PARTIAL ASSESSMENT OF MEXICAN HEALTH SCIENCES RESEARCH 1982-1986

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ABSTRACT

The paper provides a picture of Mexican health sciences research for the years 1982-1986, measuring, bibliometrically, the size of its scientific activity. The most widely used bibliometric indicators for research evaluation, publication count and citation analysis, are combined to determine the degree of production, productivity, and impact. The study also highlights the role of leading research institutions.

RESUME

Cette communication propose un panorama de la recherche médicale Méxicaine pour les années 1982-1986 à partir de l'analyse bibliométrique de sa production scientifique. Les indicateurs bibliométriques les plus communément utilisés pour évaluer la recherche (nombre de publications, analyse des citations) sont combinés pour déterminer le niveau de production, de productivité et d'impact. L'étude met également en lumière le rôle des institutions de recherche leaders.

INTRODUCTION

Mexico, with its pathologies of 'poverty' in which nutritional and infectious diseases predominate among a comparatively young population and its intense epidemiologic transition, characterised by a further decline in the incidence of infectious diseases and a rapid increase in the incidence of chronic illnesses and accidents, expects that research should bridge the gap between imbalances and development. Therefore, health sciences research, i.e. research that covers not only biomedical and clinical research, but also research in the social, environmental, and alimentary sciences that is associated with health, should be intimately related to the society of which it is part and an essential component of the development process.

Although it has been said that health sciences research is in a 'healthy' condition because '. . . health sciences research account for 40% of the articles published by Mexicans in foreign journals' (1), policy makers and science planners need reliable indicators for science planning. However, since Mexico has a research infrastructure (institutions, manpower, and limited investment to acquire equipment) there are some questions to be asked: what is the size of the research effort? What type of research is being attacked? We attempted in this paper to shed some light on the condition of Mexican health sciences research for the years 1982-1986.

MATERIALS AND METHODS

In order to evaluate Mexican health sciences research performance, we assembled data on research activity in the Mexican health sciences research by counting the items retrieved from four major online databases covering the field and counting citations retrieved from printed citation indexes. The following steps were taken:

1. We searched on: a) 'Mexico' in the address field of BIOSIS PREVIEWS, CAB ABSTRACTS, EMBASE, and MEDLINE; b) CODEN or ISSN numbers of Mexican journals scanned by the databases; c) titles of Mexican journals indexed by each database; d) Mexican states; e) Mexican institutions acronyms; f) relevant subject areas, or descriptors; g) specific type of documents; and h) year of publication. For convenience, in our study, institutional affiliation was equated with Mexican nationality. Also, our searches were confined to primary research articles, and review articles, which are the most common forms of communication in the health sciences. A total of 8,124 journal articles was retrieved across the four databases, using MEDLINE as the point of reference for weeding. A total of 5,060 unique articles authored by Mexicans was identified.

2. The journals in which Mexican authors had published were classified into field, using the JOURNAL ASSIGNMENTS & INFLUENCE MEASURES list compiled by Computer Horizons, Inc. (CHI) (2), into field. The list was used to overcome variations in the quality of journals where Mexican authors publish, which are indexed regularly or randomly by the four online databases. The list permitted a total of 1,720 articles to be classified. The list also facilitated the identification of mainstream journals indexed by the Institute for Scientific Information (ISI).

3. To further refine our population of papers we matched the 1,720 articles against both the Science Citation Index (SCI) and Social Sciences Citation Index (SSCI) for the period 1982-1987, and a subset of 1,062 articles which had been cited at least once was identified. Although only one Mexican journals was indexed by ISI, the identification of mainstream research which have had some impact was considered essential.

4. An Activity Index (AI) (3) was used to give a graphic picture of the activity profile of leading institutions characterising, at the same time, the relative activity of two fields. An Attractivity Index (AAI) (4) was also used to distinguish the relative impact of Mexican papers produced by the most active institutions in seven fields as reflected in the citations they attracted.

RESULTS

A comprehensive coverage of the output produced by Mexican health sciences researchers was obtained by searching four online databases: BIOSIS PREVIEWS, CAB ABSTRACTS, EMBASE, and MEDLINE. Using MEDLINE as the bench-mark, 5,060 unique articles were recognised. Over the five year period (1982-1986) there is little apparent variation in the level of research activity among Mexican health researchers, with an annual average of approximately 1,000 papers. The distribution of articles across the year of publication and the breakdown in terms of Mexican and non-Mexican source journals showed that 36.8% were published in foreign journals (5).

On the assumption that it is in general terms more difficult to publish in a foreign than a domestic journal because of language barriers, larger pool of candidate authors, higher rejection rates for authors from less developed nations (6), we might expect penetration of foreign journals by Mexican authors to decrease as cut-backs in the science and technology budget begin to take their toll. However, on the basis of the present figures, there is not yet evidence to support this view, though the competition for space in prestigious journals is such that authors may be forced to lower their sights and accept publication in less highly ranked journals. Our figures seem to suggest that Mexican authors prefer to publish in mother-tongue journals which include Latin American and Spanish journal titles.

Although the number of articles published in foreign vs. domestic journal titles could be used as an indicator of the progress or decline in the quality of research, our findings suggested that Mexican authors tend to publish in Mexican journals because:

1. Mexican journals, in general, do not conform to the standards of most foreign journals, hence, there are better chances to have papers accepted.
2. Language barrier does not exist.
3. Domestic journals are conveniently located for being reached.

However, it could also mean an excessive degree of self-centredness. Mexican authors published in a wide range of journals. A total of 649 unique journal titles were identified. Of these, 621 were foreign and twenty-eight were domestic. Thirty two percent of the foreign journals carried three or more articles. When we looked at the institutions where research was carried out, we found that research in the area is performed mainly by the government. Public health institutions carried out 65.64% of the research followed by public institutions of

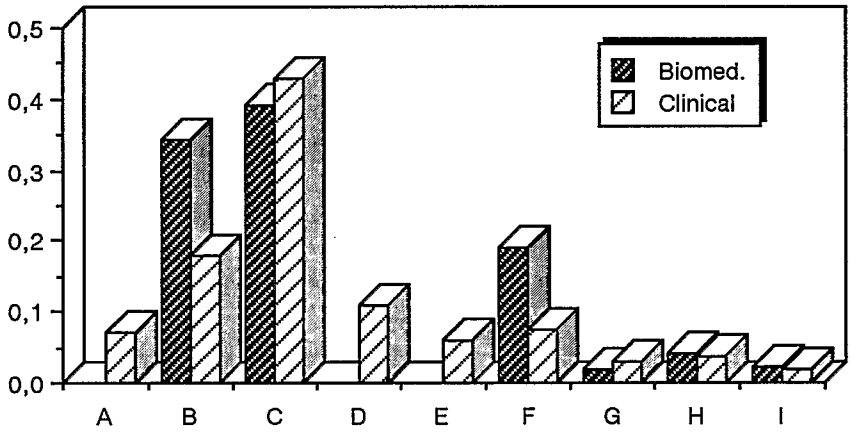
higher education (26.8%). The residual 7.56% was spread across private institutions of higher education, international organisations, private sector companies, public sector agencies, decentralised agencies, and a miscellany of other organisations.

The country's research output was produced in the Federal District, also known as Mexico City, and six states (Jalisco, Nuevo Leon, Puebla, Morelos, San Luis Potosi, and Yucatan), while 16 states out of 27 producer states originated 20 or fewer papers not counting the five zero producers (7). It is evident that Mexico needs a policy towards decentralisation. Science planners have undertaken some actions during the last 20 years to prevent centralisation, however, the Federal District is still the centre of all aspects of political, economic and cultural activity in the country. Concentration of research has positive aspects: the possibility to share equipment as well as the possibilty to enhance collaboration among researchers or institutions, thus reducing costs, in particular, the high costs of original biomedical research. The geographical distribution of researh topics, neverthless, requires attention since there are some types of research which can only be effectively carried out in those areas where the research may be expected to be of benefit.

The use of different data sources to gather Mexican health sciences research output was necessary. Items retrieved from the online databases accessed (BIOSIS PREVIEWS, CAB ABSTRACTS, EMBASE, and MEDLINE) gave an approximation of the total Mexican output in the health sciences, but as the quality of the nation's research effort cannot be gauged accurately using unweighted output measures, we matched data obtained from online searches against mainstream journals in order to identify Mexican mainstream research. We used the CHI's list to distinguish mainstream from peripheral journals. We found that a small proportion of papers (1,720, i.e. 33.99%) of the unique articles retrieved form the online databases (5,060) were published in mainstream journals listed by CHI. Source journals were classified using the CHI's list to obtain overall country activity by field.

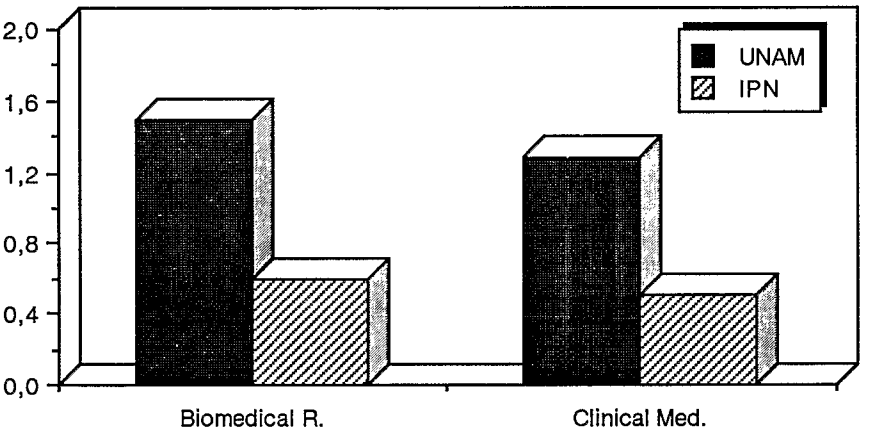
Both strong and weak areas were identified, on the basis of the number of papers published in each field. The fields were, in descending rank order: Clinical Medicine, Biomedical Research, Biology, Psychology, Chemistry, Engineering & Technology, Mathematics, and Physics. Since estimating the level of scientific activity in research institutions is not an entirely straightforward matter because of variations in the size of subject fields and the resource base of institutions, we used the Activity Index (AI) formula developed by CHI to distinguish the relative research effort in Biomedical Research and Clinical Medicine of two groups of comparable institutions (Figs. 1-2). We found that the research effort at the National institutes of Health is lower-than-average in both fields, while the research effort at two of the most prestigious higher education institutions showed that research activity at the National University of Mexico (UNAM) is higher-than-average in both fields. The National Polytechic Institute (IPN) was lower-than-average, also in both fields (8).

Fig. 1 Activity Index of the National Institute of Health



A = Children's Hospital; B= Institute of Cardiology; C= Institute of Nutrition; D = Institute of Neurology and Neurosurgery; E = Institute of Respiratory Diseases; F = Institute of Paediatrics; G = Institute of Perinatology; H = Institute of Psychiatry; I = Institute of Cancerology.

Fig. 2 Activity Index of two higher Education Institutions in Biomedical Research and Clinical Medicine



Publication counts say something about activity and quality, but should be combined, ideally, with other partial indicators such as citation counts. Therefore, we attempted, through citation counts to describe the impact of Mexican health sciences research. To further refine our population of papers, the 1,720 articles that were published in the journals included in the list compiled by CHI, were matched, manually, against both the SCI and SSCI, and a subset of 1,062 papers which had been cited at least once was identified.

Cited papers attracted a total of 5,292 citations. Since it was considered essential to identify the relative impact of cited papers published by the six most active institutions (UNAM, IPN, Social Security Institute (IMSS), national institutes of Cardiology, Neurology, and Nutrition) we calculated their Attractivity Index (AAI). We found that the UNAM's AAI was higher than average in six fields: Biomedical Research, Psychology, Chemistry, Biology, Mathematics, and Engineering & Technology, while in Clinical Medicine it was lower-than-average. The IMSS was higher-than-average only in two fields: Clinical Medicine, and Psychology. The IMSS was lower-than-average in three fields: Biomedical Research, Biology, and Chemistry.

Our findings suggested that the impact of Mexican research groups is closely associated with the quality of their research. From a research policy viewpoint it is not only required that researchers produce scientific results of some quality, but also that they generate impact, though factors such as the visibility of journals, visibility of authors, and the pertinence of the research topics influence the impact.

DISCUSSION

The use of bibliometric data, publication and citation counts as tools for the evaluation of Mexican health sciences research performance was the central issue of this paper. In undertaking this assessment, we developed a number of 'informatory' indicators (9) of research performance. The indicators gave a picture of scientific research in Mexican health sciences, although the small numbers make interpretation difficult and generalisation almost impossible. The publication and citation 'informatory" indicators which we developed suggested that they are straightforward measures of research performance, and they are not susceptible to ambiguities although, it is difficult to know exactly what a citation measures. With regard to the relevance of the construction of indicators based on publication counts and citation analysis through bibliographic and citation sources, it was apparent that at face value there are marked differences among bibliographic and citation sources, mainly because the latter register what is called 'mainstream' research. We could not argue that Mexico was underrepresented in the citation databases but only say that research results were not reported in the world's most central journals.

Mainstream journals are quality output measures, because of the criteria for selection of journals by ISI. Although selection criteria are also applied to bibliographic databases, the choice of journals for inclusion in these databases is based on the fact that included journals are not necessarily superior to those not included.

Our findings suggested that there are marked differences among bibliographic databases and citation sources. It became clear that data sources for bibliometric analysis have different objectives. Publication counts may say something about the scientific effort of entities being assessed, but citations highlight mainstream research, hence the need to combine publication counts with other partial indicators such as citation counts (10). Our results confirmed that publication counts do not provide an assessment of the quality of research. On the other hand, citation analysis revealed the extent to which Mexican research is used. From the research policy viewpoint, citations constituted the proof that Mexican researchers are carrying out, though modest, mainstream research published in core journals. Acceptance of a paper by a prestigious journal is usually an indication that the article has fulfilled certain standards: quality, significance of results, originality, readability (11). Nevertheless about 38% of the papers published in mainstream journals 'died', i.e. they were not cited. Although the great bulk of 'live' papers (70.35%) were cited less than five times, the principle of 'publish or perish' may be assumed to apply in Mexico, since institutions appear to place considerable emphasis on publishing activity and citations. Institutional policies encourage and even require publication in foreign journals, probably as a way to improve the quality of research, or to gain institutional prestige and visibility. However, our results showed that as far as quantity and impact measures are concerned, these are modest.

Yet, if researchers are forced to publish their best work in foreign journals, it follows that what appears in Mexican journals has lower standards. Mexican journals then should overcome their deficiencies and become valid publications in order to guarantee that quality research is published in them. In our analysis, we found that publication and citation practices differed from field to field, partly because of the institutional research size. Clinical Medicine, the field that addresses most directly human health, accounted for the largest number of papers and citations, while Biomedical Research, the field that indirectly addresses health, was behind. Fields such as Biology, Chemistry, Engineering & Technology, Mathematics, Physics, and Psychology did not show high activity. Our results, although limited in scope and limited by the size of the research effort might, if combined with other indicators such as input measures and peer assessment, give an approximation to the real condition of Mexican health sciences research.

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