

The modest but growing Brazilian presence in psychiatric, psychobiological and mental health research: assessment of the 1998-2002 period

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Abstract

The objective of the present survey was to assess the Brazilian scientific production in psychiatry, psychobiology, and mental health during the 1998-2002 period. The universities' graduate programs concentrate the vast majority of the scientific production in Brazil. We assessed the annual reports from the graduate programs to the Brazilian Ministry of Education concerning master's and doctoral theses and the articles published in journals indexed by the Institute of Scientific Information (ISI). There are nine Master's and Doctoral graduate programs dedicated to research in psychiatry, neuropsychiatry, psychobiology, and mental health in the country, seven being located in southern states. During the 5-year period, from 1998 to 2002, 186 students received their doctorate degree (37/year). The programs published 637 articles in journals indexed by ISI, the majority of them in journals with an impact factor higher than 2. The research advisors' productivity varied among graduate programs, ranging from 0.6 to 2.0 articles per year in ISI-indexed journals. Despite the substantial barriers faced by the Brazilian scientific community (mainly financial and writing difficulties), Brazil's scientific mental health production is on the rise. The number of articles published in ISI-indexed journals has doubled without a significant increase in the number of graduate theses, suggesting that there was an improvement in both the quality of the scientific production and the productivity of the graduate programs. Based on these data, it is reasonable to predict a tendency to an increase in production over the next few years.

Key words

- Mental health
- Scientometrics
- Bibliometric analysis
- MSc and PhD students
- Publish or perish
- Public and private universities

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Introduction

At the beginning of the 19th century, an important change occurred in some American and European universities. These insti-

tutions expanded their interests from strict dedication to teaching and academic staff development to the production of scientific knowledge and the development of technology (1). Leading universities all over the

world have followed this tendency and consequently numerous graduate programs (GPs) have been created to produce scientific knowledge and to train researchers. In Brazil, GPs were inaugurated in 1951 by CAPES (Coordenadoria de Aperfeiçoamento de Pessoal de Nível Superior), an Agency of the Brazilian Ministry of Education. These programs were called *stricto sensu* GPs and were designed to carry out research and train investigators to obtain their Master's and Doctoral degrees. The Master's degree corresponded to the Master of Arts (M.A.), while the Doctoral degree corresponded to the Doctor of Philosophy (Ph.D.) of the North American universities (1).

After this beginning, many other GPs were created and have spread throughout Brazil. In 2001, there were 1,489 master's programs and 857 doctoral programs approved by the Ministry of Education, and the number of scholarships was 13,467 for master's degrees and 10,181 for doctoral degrees (2). The vast majority of the science produced in Brazil is developed in *stricto sensu* GPs, leading Brazil to annually produce about 13,000 papers in journals indexed by the Institute for Scientific Information (ISI) (2). CAPES has played an important role in Brazilian scientific growth by implementing policies that have contributed to the training of high school and university personnel. CAPES audits and assesses the quality of the Brazilian GPs and formulates the National Graduate Plan.

Emerging countries produce a small proportion of the scientific publications in psychiatry. Patel and Sumathipala (3) have shown that the "rest of world" (South America, Eastern Europe, Africa, and Asia) accounted for only 6% of the research published in 6 leading psychiatry journals during the 1996-1998 period. The reasons for this trend are related to the scarcity of research in these geographical areas and also result from poor methodology designs, writing style difficulties, along with a certain

amount of stigma and lack of credibility. In addition, researchers from developing countries often claim that their papers receive unsympathetic treatment from the Editorial Boards of leading journals. Saxena et al. (4) have shown that there is an under-representation of researchers from developing countries on the Editorial Boards of leading psychiatric journals. The lack of international representation on these boards could adversely affect the dissemination of knowledge generated in developing countries.

The objective of the present paper is to provide an overview of Brazilian scientific production and productivity by GPs dedicated to research in psychiatry, mental health and psychobiology using CAPES assessments over a five-year period (1998-2002) as a good estimate of the total Brazilian scientific production in these fields. These data may provide conclusions that will contribute to the development of strategies to improve Brazilian psychiatric and psychobiological research.

All GPs registered and evaluated by CAPES that are dedicated to research in psychiatry, psychobiology and mental health were included in this study.

Scientific production indexes

CAPES appraisal. CAPES receives annual reports from the GPs concerning the number of research advisers, courses taught, and publications. CAPES evaluates these GPs according to the content and proposal of the program, the extent and distribution of articles produced by its research advisers, the number of theses and the time to complete them, and the publications by students and researchers. CAPES classifies each GP with a grade ranging from 1 to 7. A grade 5 is considered to indicate a good program, and grades 6 and 7 are considered to indicate programs that are equivalent to international standards in different areas of knowledge.

CAPES developed a system to grade scien-

tific production based on the journals in which the papers were published. Journals indexed in the ISI, with impact factors above the average for the area (standardized as 1.0 for psychiatry and mental health), are considered to be International A. ISI journals that are a fraction below the average are qualified as International B. Journals which are indexed by the National Library of Medicine (MEDLINE, Bethesda, MD, USA) but not by ISI are qualified as International C. Brazilian journals not indexed by ISI or MEDLINE are qualified as high-quality (National A) when they are indexed in the Scientific Electronic Library Online (SciELO) (5). SciELO evaluates the journal's regularity, production of original articles and formal structure.

Publications

The papers published in ISI-indexed journals between 1998 and 2002 were selected to assess the quality and relevance of scientific production. The impact factor of the journals where these articles were published was obtained from the Internet site of the Journal of Citation Report (JCR, 6). The ISI publications were chosen as an index of scientific production because they can be reliably traced and represent one of the best markers of scientific impact. The papers indexed by the MEDLINE were also included in the study. The Regional Pan American Health Organization/World Health Organization Library for Latin American and Caribbean countries (Biblioteca Regional de Medicina, BIREME) has generated a list of journals that were indexed in MEDLINE between 1997 and 2002. It is known that there is an overlap between MEDLINE and ISI journals, i.e., the journals indexed in the ISI are generally indexed in MEDLINE; however, not all MEDLINE journals are indexed in the ISI. Graphs for publications by year were generated. To obtain an estimate of the research content and the methods employed, we accessed the abstracts of the articles pub-

lished in MEDLINE-indexed journals in the last year of the period evaluated, i.e., 2002.

Scientific productivity

To measure the academic efficiency of the GPs we developed indexes taking into account the number of research advisers calculated by the average master's and doctorate research advisers during the 1998-2002 interval (the indexes of the Psychiatry GP - Federal University of Rio Grande do Sul were calculated based on the 2000-2002 period). A thesis/research adviser index was calculated by dividing the total number of theses produced (master's and doctorates) over the 1998-2002 period by the average number of research advisers for each GP. A productivity index was calculated by dividing the number of ISI papers by the average number of research advisers in each GP by five to estimate annual productivity.

Financing

Health research is funded by a variety of institutions: a) the Health Section of the Brazilian Ministry of Science and Technology, the Brazilian Research Council (CNPq, Conselho Nacional de Pesquisa); b) the health section of CAPES, the Ministry of Education; c) the Department of Science and Technology in Health, Brazilian Ministry of Health; d) state research funding agencies (the most important being FAPESP, the State of São Paulo Research Council).

A questionnaire evaluating the research funding for mental health for the year 2002 was sent to the Ministry of Health, the Ministry of Education (CAPES), the Ministry of Science and Technology (CNPq), and the four most important State Research Funding Agencies (São Paulo: FAPESP, Minas Gerais: FAPEMIG, Rio Grande do Sul: FAPERGS, and Rio de Janeiro: FAPERJ). All of these institutions were contacted via regular mail and e-mail.

ISI database

We have accessed the JCR, 2004, available at <http://esi3.isiknowledge.com/rankdatapage.cgi> via the Internet to obtain a general estimate of Brazilian performance. The site was accessed on March 17, 2004 (7).

Subjects

Nine GPs dedicated to psychiatry, neuropsychiatry, psychobiology, and mental health were identified in Brazil: Neuropsychiatry - Federal University of Pernambuco (UFPE); Psychiatry - Federal University of Rio Grande do Sul (UFRGS); Psychiatry, Psychoanalysis and Mental Health - Federal University of Rio de Janeiro (UFRJ); Psychobiology - Federal University of São Paulo (UNIFESP); Psychiatry and Psychological Medicine - UNIFESP; Psychiatry - University of São Paulo (USP); Medicine (Mental Health) - USP, Ribeirão Preto Campus (USP/RP); Psychobiology - USP/RP, and Psychobiology - Federal University of Rio Grande do Norte (UFRN; Table 1). The name of the GP does not necessarily describe its research production. For instance, psychobiological research is carried out in psychobiology, psychiatry or even in mental health GPs. The

same is true for epidemiological and clinical research. All but two GPs are based at state universities located in the south and south-east regions of the country. The first GPs in the field were inaugurated and recognized by CAPES in the 70's (Psychoanalysis and Mental Health - UFRJ, and Psychiatry - USP), and Psychiatry - UFRGS was most recently inaugurated in 2000. All GPs have doctoral and master's programs recognized by CAPES, with the exception of Neuropsychiatry - UFPE that has only a master's program. The number of GP research advisers ranged from 6 to 29, with the average number being 13, thus demonstrating differences in the sizes of the GPs.

The 1998-2000 CAPES evaluation of the GPs allocated grades ranging from 3 to 7 (see Table 1). Three of the GPs dedicated to psychiatry, neuropsychiatry, psychobiology, and mental health were scored as grade 5, implying a good performance by Brazilian standards, and one psychobiology GP scored as grade 7, i.e., at the same level as the leading world institutions.

Researcher training

During the 1998-2002 period, 226 students received a master's degree and 186

Table 1. Characteristics of Brazilian graduate programs in Psychiatry and related areas.

University	Acronym	Graduate program	Inaugural year		Number of research advisers	CAPES evaluation (1998-2000)
			Master's	Doctoral		
Federal University of Pernambuco	UFPE	Neuropsychiatry	1994	-	6	3
Federal University of Rio Grande do Sul	UFRGS	Psychiatry	2000	2000	9	3
Federal University of Rio Grande do Norte	UFRN	Psychobiology	1985	1998	11	4
Federal University of Rio de Janeiro	UFRJ	Psychiatry, Psychoanalysis and Mental Health	1972	1975	13	3
Federal University of São Paulo	UNIFESP	Psychobiology	1986	1986	8	4
Federal University of São Paulo	UNIFESP	Psychiatry and Psychological Medicine	1984	1984	14	5
University of São Paulo	USP	Psychiatry	1974	1979	29	5
University of São Paulo - Ribeirão Preto Campus	USP/RP	Medicine (Mental Health)	1991	1991	12	4
University of São Paulo - Ribeirão Preto Campus	USP/RP	Psychobiology	1984	1989	18	7

CAPES evaluation scale is 1 to 7, with 7 being international level. CAPES = Coordenadoria de Aperfeiçoamento de Pessoal de Nível Superior.

students received a doctoral degree (see Table 2). A total of 445 theses were published during the five-year period, approximately 37 doctorates per year. The number of theses published has remained stable over the 5-year period (see Figure 1). The research advisers' productivity varied among GPs, ranging from 0.5 to 1.38 theses per year, with the average being 0.82 theses per research adviser per year (see Table 2).

Research production

Over the five-year period (1998-2002), 1719 articles were published in regular journals, 637 of them in ISI journals and 680 in MEDLINE journals (Table 3). The mean impact factor of the ISI journals where the articles were published was 1.9 (range: 0.1-30.0). More than 50% of the ISI papers were published in journals with an impact factor higher than 2. Approximately 10% of the articles (63) were published in journals with an impact factor of 4, and 10 articles (1.6%) reached journals with an impact factor higher than 8. Table 3 shows the number of articles published by each GP and the average impact factor for the articles published in ISI journals. The GPs that produced more ISI papers over the 5-year period were Psycho-

biology - USP/RP (N = 151) and Psychiatry - USP (N = 144). The number of MEDLINE and ISI articles progressively increased over the five-year period from 1998 to 2002 (see Figure 2). Interestingly enough, the number of articles published in journals not indexed by MEDLINE has declined from 2000 to 2002 and was lower than the number of articles indexed by MEDLINE.

The psychiatry/psychobiology GPs published 178 articles indexed by MEDLINE in 2002. Table 4 shows the areas of research and the general methodology employed in these articles. There was a predominance of research on anxiety disorders (22%) and organic disorders (12%). A large percentage of the articles involved laboratory animals (24%), followed by cross-sectional assessments of symptoms and psychiatric patients' side effects (22%).

On average, the research advisers from all GPs published 5.5 ISI-indexed papers during the 5 years evaluated, and the productivity index was 1.1 ISI articles per year (see Table 3). The productivity index varied among GPs, ranging from 0.6 to 2.0 ISI articles per research adviser per year. The GPs with the highest productivity index were Psychobiology - UNIFESP (2.0), followed by Psychobiology - USP/RP (1.7).

Table 2. Productivity of the graduate programs in Psychiatry and related areas during 1998-2002.

University acronym	Graduate program	Master's	Doctoral	Total	Thesis/research adviser	Thesis/research adviser/year
UFPE	Neuropsychiatry	15	0	15	2.5	0.5
UFRGS	Psychiatry	5	1	6	0.7	-
UFRJ	Psychiatry, Psychoanalysis and Mental Health	47	43	90	6.9	1.4
UFRN	Psychobiology	33	3	36	3.2	0.6
UNIFESP	Psychobiology	28	27	55	6.9	1.4
UNIFESP	Psychiatry and Psychological Medicine	50	24	74	5.3	1.1
USP	Psychiatry	41	40	81	2.8	0.6
USP/RP	Medicine (Mental Health)	27	16	43	3.6	0.7
USP/RP	Psychobiology	49	32	81	4.5	0.9
Total		295	186	481	4.0	0.8

University acronyms are defined in Table 1.

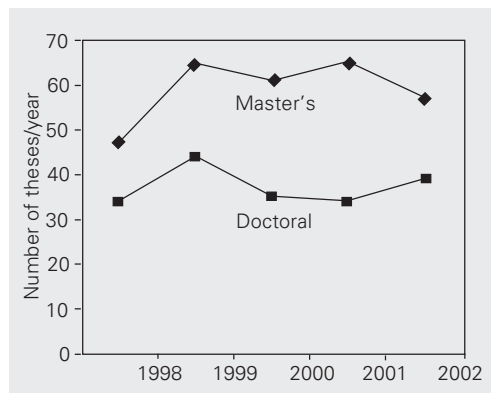
Financing

The only State Research Funding Agency that did not reply to the financing questionnaire was FAPERJ from the State of Rio de Janeiro. The total allocation to health research was R\$303,751,116.00 (~US\$101 million) and the total allocation to mental health research was R\$10,238,344.00 (~US\$3.5 million), corresponding to 3.37% of the total (1US\$ = ~R\$3.00).

Dissemination of the scientific production

As can be seen in Table 5, Brazil ranks 28th in the Psychology/Psychiatry classification

Figure 1. Total number of theses from all Brazilian graduate programs in Psychiatry and related areas by year.



of the JCR (7). Brazil has 5 citations per scientific paper, a figure that is better than those for some developed countries. It is worth noting that the number of Brazilian citations has increased steadily over the past few years, suggesting that there has been an improvement in the quality and quantity of its research publications. In 2002 the number of ISI papers for the health area was 3,302 and as there were 125 ISI papers in psychiatry, the percentage of psychiatry related to the health area was 3.79%, a figure close to the financing of the mental health research area (7). The number of scientific papers in the Psychology/Psychiatry section of the JCR during the period 1999-2003 was 496, a lower number than that found in the present survey (637), probably because some papers were classified in the neuroscience section of the JCR.

We have provided an overview of psychiatric and psychobiological research in Brazil based on the GPs' production over a period of five years (1998-2002) and shown that the number of articles published in ISI journals has almost doubled during this period, with a tendency to increase even further over the next years. The growth in scientific production reflects the growth in health

Table 3. Number of articles published in Psychiatry and related areas covered by MEDLINE and ISI and related to research adviser productivity during 1998-2002.

University acronym	Postgraduate programs	Articles			ISI impact factor (average)	ISI/research adviser	Productivity index (ISI/research adviser/year)
		Total	MEDLINE	ISI			
UFPE	Neuropsychiatry	119	37	28	1.3	4.7	0.9
UFRGS	Psychiatry	104	35	31	2.0	3.4	0.7
UFRJ	Psychiatry, Psychoanalysis and Mental Health	319	68	64	2.4	4.9	1.0
UFRN	Psychobiology	55	27	32	1.3	2.9	0.6
UNIFESP	Psychobiology	113	75	78	1.4	9.8	2.0
UNIFESP	Psychiatry and Psychological Medicine	201	65	52	2.0	3.7	0.7
USP	Psychiatry	443	157	144	2.2	5.0	1.0
USP/RP	Medicine (Mental Health)	149	60	57	1.9	4.8	1.0
USP/RP	Psychobiology	216	156	151	1.9	8.4	1.7
Total/(average)		1719 (191)	680 (75)	637 (71)	(1.9)	(5.3)	(1.1)

University acronyms are defined in Table 1. MEDLINE = The National Library of Medicine; ISI = Institute for Scientific Information.

research in Brazil. Scientific production in the medical area has grown proportionally more than Brazilian scientific production as a whole during the last twenty years (8). The total number of publications in the medical area accounted for 11% of the 2,930 Brazilian ISI publications during the biennial period of 1981/1982 and has increased to 19% of a total of 13,282 publications during the year 2000 (a 7.6-fold increase) (8,9). Regarding Psychiatry and Mental Health, there was a 3.2-fold increase compared with the 1981-1985 and 1996-2000 quinquennia, an important growth rate, although smaller than that observed in other health areas. Psychiatric publications still represent a reduced fraction of the total percentage of medical publications in Brazil (1.9% in Brazil as opposed to 6% worldwide) (10). For the year 2002, and using the CAPES reports, psychiatric publications were found to represent 3.79% of the total health publications (10). Although the criteria used may not be exactly the same, it is plausible to suppose that there has been a larger contribution by psychiatry.

Leta et al. (11) compared the 1981-1985 ISI psychiatric publications with the 1991-1995 ones and found that 41 were published

during the first period and 110 during the second, a 168% increase in the number of publications. Comparing these data with the Psychology/Psychiatry publications section of the JCR during 1999-2003 (496), there had been a greater than 400% increase in the number of publications. We believe that this improvement in ISI article publications is, at least in part, a consequence of CAPES evaluation of the GPs, whose essential criterion is the relevance of intellectual production, which is determined by the quality of the scientific journals. The present data suggest that the proportion of psychiatric publications in ISI journals has tended to increase over the medium to long term.

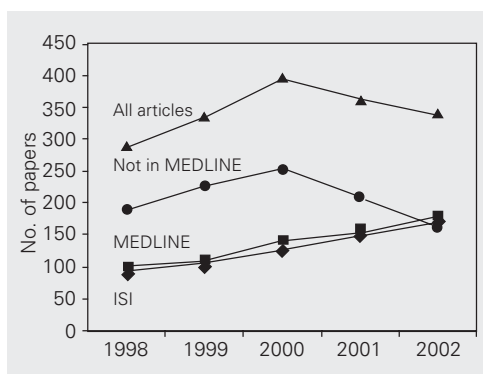


Figure 2. Total number of published articles in graduate programs in Psychiatry and related areas by year and citation by major indexing services. MEDLINE = The National Library of Medicine; ISI = Institute for Scientific Information.

Table 4. Content and methodological design of the articles published in Psychiatry and related areas during 2002.

Research area	Number of articles	%	Methodological design	Number of articles	%
Neurotic, stress and somatoform (anxiety) disorders	39	21.9	Laboratory animals	42	23.6
Organic disorders	22	12.4	Cross-sectional assessment of clinical symptoms/side effects	40	22.5
Neurophysiology/neuropsychopharmacology	19	10.7	Cross-sectional assessment of biological markers in humans	34	19.1
Affective disorders	15	8.4	Review	15	8.4
Schizophrenia and non-affective psychosis	12	6.7	Clinical trial	11	6.2
Child and adolescent mental health	11	6.2	Case report	10	5.6
Sleep	11	6.2	Not identified	21	14.6
Old age psychiatry	10	5.6	Total	178	100
Substance abuse disorders	9	5.1			
General psychiatry	6	3.4			
Ethics	4	2.2			
Psychotherapy	1	0.6			
Not identified	19	10.7			
Total	178	100			

Data were obtained from MEDLINE (The National Library of Medicine).

The increase in medical research production has been followed by an increased number of citations of Brazilian papers. The number of citation of Brazilian articles in Psychiatry/Psychology has been rising steadily in the last decade; it was 320 during the 1993-1997 period and increased to 740 during the 1998-2002 period (7). Brazil leads scientific production in Latin America and ranks twenty-eighth in the ISI Psychiatry/Psychology section (7). Although Brazil's leading position in Latin America is evident, countries such as Mexico and Chile seem to be more efficient regarding the investment they receive for research (12). Chilean and Mexican per capita investment in science and technology is lower than the Brazilian investment, so the per capita cost of a high-quality article is lower, suggesting that these investments are more cost-effective (11). In our study, the variability of productivity indexes among GPs suggests that there is room for improvement in terms of research adviser productivity. Data regarding grant resources would allow calculations of the cost-effectiveness of the GPs' scientific production, providing a better overview of the system. Accreditation of graduate research advisers has changed during the last few years. There is now a more stringent criterion based on the quality and quantity of the scientific production. As a consequence, the GPs are

more research oriented and this results in improved performance (greater scientific production) with similar numbers of graduate students and theses.

In our survey, ISI articles were published in journals with a very wide range of impact factors (0.1-30.0). Ten percent of the articles were published in the top psychiatric journals (impact factor >4), and 10 articles (1.6%) in journals with impact factors higher than 8, showing that part of the research production goes even beyond the psychiatric journals to reach prominent medical and scientific journals such as the *Lancet* and *Nature*. This suggests that part of the scientific production of the GPs is achieving the same level as that of leading international research groups.

The data reported here suggest that there is growing scientific production in the country in the psychiatry/psychobiology area. It is also known that research is an important indicator of a country's overall development. Funding in Brazil has been relatively stable during the last decade, but the annual growth of the GPs has almost reached 15%. Thus, as pointed out by Meis et al. (13), the shortage of funding in Brazil and the pressure to attain international standards may lead Brazilian scientists to leave the academic world and undergraduates not to choose a scientific career. In this respect, "Brazilian science may go from growth to decay without ever having fully realized its potential" (13).

International journals

A constant argument in the Brazilian milieu is that certain research topics may only be of local interest. However, the present study shows that Brazilian scientists can produce scientific knowledge of international level. Articles originating from adequately designed research should be translated into English in order to facilitate their international publication, and this seems to be the current trend in Brazil.

Although Brazil has an increasing pres-

Table 5. Number of papers and citations at the Psychology/Psychiatry Journal of Citation Report site^a from 1998 to 2002.

Ranking	Country	Papers	Citations	Citations/paper
1	USA	113,174	1,075,874	9.51
7	France	4,510	25,194	5.59
18	Spain	3,310	10,388	3.14
25	South Africa	979	2,786	2.85
28	Brazil	496	2,492	5.02
29	India	556	2,296	4.13
31	South Korea	376	1,801	4.79
34	Mexico	880	1,510	1.72
40	Portugal	203	859	4.23

^aJournal of Citation Report - JCR (2004). Available at <http://esi3.isiknowledge.com/rankdatapage.cgi>. Accessed March 17, 2004.

ence in worldwide health science, there are few ISI-indexed medical journals in the country, none of them with an impact factor higher than 1.0. In Brazil, the most prestigious journals include the Brazilian Journal of Medical and Biological Research (IF(2003) = 0.802), the Memórias do Instituto Oswaldo Cruz (IF(2003) = 0.635), the Revista de Saúde Pública (IF(2003) = 0.260), and the Arquivos de Neuropsiquiatria (IF(2003) = 0.257), which conquered international recognition, although with a relatively low impact (6). The Revista Brasileira de Psiquiatria, the official journal of the Brazilian Psychiatric Association, has recently been indexed in MEDLINE. Although publication in indexed journals is the most reliable criterion for a scientific paper's quality, indexation in itself should not be considered the only criterion.

Lack of availability of full text articles has limited the citation of scientific articles in Brazilian journals. Indexation in databases increases the chances that someone will retrieve and reproduce the article and consequently cite it. The above named journals have been published on the Internet by SciELO (5) in a program developed by the Regional Medical Library (Biblioteca Regional de Medicina, BIREME, São Paulo, Brazil) in association with Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), the Pan American Health Organization (PAHO), and the World Health Organization (WHO). SciELO has made an important contribution to the visibility, accessibility and development of local scientific research journals through wide dissemination of the Latin-American scientific production via free access to complete articles, which can be measured by the recent increase in the impact factor and total citations of the above journals and several others.

Comparisons between graduate programs

The GPs vary widely in the number of

research advisers, indirectly reflecting the size of the programs. Large GPs such as Psychiatry - USP with 24 research advisers have produced more ISI papers than the majority of other programs, but their productivity is average (1.0 ISI paper per year). The psychobiology GPs of UNIFESP and USP/RP have the highest productivity (2.0 and 1.7 ISI papers per year, respectively). This may reflect a higher concentration on laboratory animal studies, which tend to be completed more rapidly than clinical studies. The GPs with the highest number of theses per research adviser were UFRJ and Psychobiology - UNIFESP, each with 1.4 theses per year.

CAPES evaluates the UFRN and USP/RP psychobiology GPs in the psychology domain and Psychobiology - UNIFESP and the other GPs in the medical domain. The criteria to evaluate GPs in these domains are different. This may be the reason why Psychobiology - UFRN achieved grade 5 with the lowest article production/productivity and lowest number of doctorate theses during the study period. Psychobiology - USP/RP also benefited from different evaluation criteria, receiving grade 7, the highest score among the GPs, while GPs with similar productivity such as Psychobiology - UNIFESP received grade 5. Although the CAPES criteria are more complex than production and productivity, it seems logical to suggest that CAPES should evaluate these programs with similar criteria so as to avoid heterogeneity and unfair distribution of resources.

Methodological considerations

The data reported in this article do not reflect the entire scientific production of Brazil in psychiatry and psychobiology. A proportion of the research on neurophysiology, neuropathology, psychopharmacology, genetics, and molecular biology of psychiatric disorders has been carried out in basic research GPs and was not included here. For example, some members of the Departments of Psychiatry of

the State University of Campinas (UNICAMP) and the Federal University of Bahia (UFBA) work in the General Medicine GPs and their production was not included in this survey. There are also two epidemiological groups that perform research on mental health in the city of Pelotas (Federal University and Catholic University) which were not included. Furthermore, the total number of articles evaluated here was based on the number produced by each GP individually. We believe that there is collaboration between GPs and cross-authorship is expected, and therefore it is possible that some articles have been counted twice. This would introduce an overestimate of the total number of publications, which may well increase the total by as much as 10%. On the other hand, poor registration of the publications in the CAPES reports has led to the loss of articles. Approximately 10 articles were missed each year. As this investigation clearly demonstrates, CAPES audits are a very important instrument for evaluating Brazilian scientific production. Consequently, GPs should carefully produce their documents to minimize bias and misclassification. Although there was some imprecision, we believe that the data presented in this investigation provide a good indication of the direction of Brazilian psychiatric and psychobiological research production.

Educational impact

The Brazilian Psychiatry/Psychobiology scientific production in ISI journals was mainly directed towards investigating anxiety and organic mental disorders. The under-representation of mental health policy and service evaluation is worth noting. Figueira et al. (14) have assessed the content and the design of the articles published in the main psychiatric Brazilian journals from 1981 to 1995 and found that important disorders such as bipolar affective disorder and cocaine addiction were under-represented in these publications. The majority of the papers used

a cross-sectional design. The research content evaluation conducted here was centered on MEDLINE papers, which may well reflect the best research produced in Brazil. Although examining different types of publications, our data are similar to those reported by Figueira et al. (14) since there was a large number of cross-sectional studies and an under-representation of clinical trials.

The investment channeled towards graduate and human resource educational programs by means of grants and other forms of research support has secured the country a modest but continuous insertion in the international production of knowledge in the health area (15-17). The growing scientific health production in Brazil is closely linked to the expansion of the graduate courses in the country. There are more than 300 Master's and more than 200 Doctoral courses in the health area. There are 120 medical schools and approximately 10,000 medical students graduating each year. However, there are only eight medical schools that are identified as outstanding centers for the generation of scientific research in the health area, and which concentrate 115 of the 128 researchers qualified as level I by the National Council of Research (Conselho Nacional de Pesquisa) (8). The data from the mental health area presented here are not different. Although there was an expressive number of students receiving master's and doctoral degrees in psychiatry and psychobiology, the GPs are concentrated in universities located in the south and southeast regions of the country. As a result, several medical schools do not participate in the process of knowledge production, preventing the integration of research and education within such schools. In view of the fundamental educational role that research and scientific methodology play in the physician's education, we can conclude that a significant percentage of Brazilian physicians are educated on the margin of this system and are not prepared to keep up with and absorb break-

throughs in the health area, which are closely linked to scientific development (8).

Conclusion

Between 1998 and 2001, the number of mental health and psychiatric ISI papers has doubled, without a significant increase in the

number of graduate students or academic theses, suggesting that GPs are more research oriented, resulting in greater scientific quality and productivity. Based on these data, it is plausible to predict a tendency to an increase in production over the next few years, although further sustained investments are essential to maintain this growth (18).

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