Successful training concepts in Neurology in Latin America

World Congress of Neurology
Santiago, Chile
2015

Ricardo Nitrini
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Brazil

Conflict of interests

I declare that I have conducted clinical trials and spoken at conferences or served as a consultant to the pharmaceutical industry (Apsen, Bayer, Bristol-Myers-Squibb, Janssen-Cilag, Moksha8, Novartis, Roche and Wyeth) and received financial support to participate in medical congresses and events

Objectives

- To present data on training in Neurology in Latin America and to propose new strategies

(Personal ideas based on more than 40 years of experience in clinical practice as a neurologist and in teaching Neurology in a Latin American country)

A well-trained Latin American neurologist should be able to:

- Provide the best treatment for patients with neurological diseases
- Teach all medical doctors to treat the most common neurological diseases and to recognize diseases that should be referred to neurologists
- Do research aiming to improve prevention, diagnosis and treatment of neurological diseases, mainly those that are more frequent in LA countries

First step

- Attract the best graduate medical students to be neurologists
- Fight neurophobia during graduate course (avoid excessive techniques of neurological examination)
- Change the old idea: show that neurologists can do much for their patients and will do much more in the near future

Medical Schools

Country	N	Departments of Neurology
Argentina	28	8
Bolivia	20	0
Brazil	185	5
Chile	22	3
Paraguay	12	2
Peru	22	2
Uruguay	2	2

Teaching of Neurology by Neurologists vs. other Physicians

Country	Exclusively by Neurologists	Mostly by Neurologists	Both, equally
Argentina	X		
Bolívia		X	
Brasil		X	
Chile			X
Paraguay	X		
Peru	X		
Uruguay	X		

To attract medical students

- “The future of neurology in this country still depends upon its ability to attract, train, and provide satisfying work for neurologists of equal calibre to those to whom we owe the achievements of this branch of medicine and science in the past.”

Russell Brain. Neurology: Past, present, and future. BMJ 1958

To attract medical students

- Teaching of Clinical Neurology by neurologists
- Avoidance of neurophobia (too many signs, too much neurologic examination, in a short period of time)
- Departments of Neurology in Medical Schools in Latin America

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Neurology training programs worldwide: A world federation of neurology survey

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Table 2
National demographics and neurology residency training, by WHO region

Countries by WHO region	Population (10^3)	GNP per capita[a] (in $, 2003)	Life expectancy at birth	Neurology residencies	Neurology residents	Years of post-graduate training
Europe						
Austria	8111	26810	79.4	20	140	4
Azerbaijan	8287	820	65.8	2	100	2
Belgium	10296	25760	78.4	8	20	4
Croatia	4439	5370	74.8	1	–	4
Cyprus	796	–	77.3	0	0	N/A
Czech Republic	10246	7150	75.8	50	50	4
Denmark	5351	33570	77.2	4	–	5
Estonia	1338	5380	71.1	1	4	4
Finland	5197	27060	78.2	30	40	4
France	59850	24730	79.8	15	200	4
Georgia	5177	770	71.7	–	10	4
Germany	82414	25270	78.7	32	900	4
Greece	10970	13230	78.4	–	150	5
Hungary	9923	6350	72.6	4	50	4
Iceland	287	30910	80.1	0	0	N/A
Ireland	3911	27010	77.1	1	13	–
Israel	6304	16240	79.4	4	30	–
Italy	57482	21570	79.7	25	110	–
Latvia	2329	4400	70.3	2	17	4
Lithuania	3465	4500	71.9	2	12	4
Luxembourg	447	45740	78.8	1	2	4
Netherlands	16067	26230	78.6	15	175	–
Norway	4514	43400	79.1	50	50	–
Poland	38622	5280	74.7	40	210	–
Romania	22387	2260	71.4	–	202	–

Table 2
National demographics and neurology residency training, by WHO region

Countries by WHO region	Population (10^3)	GNP per capita[a] (in $, 2003)	Life expectancy at birth	Neurology residencies	Neurology residents	Years of post-graduate training
Africa						
South Africa	44759	2750	50.7	8	22	4
Total (millions)	45			8	22	
The Americas						
Argentina	37981	3810	74.4	5	20	4
Belize	251	3370	69.7	0	0	N/A
Brazil	176257	2720	68.9	35	242	3
Canada	31271	24470	79.8	16	28	4
Dominican Republic	8616	2130	68.0	1	2	3
El Salvador	6415	2340	69.7	0	0	N/A
Guatemala	12036	1910	65.9	1	9	3
Haiti	8218	400	50.1	0	0	N/A
Honduras	6781	970	67.2	1	7	4
Mexico	101965	6230	74.3	–	–	4
Nicaragua	5335	740	70.1	0	0	N/A
Panama	3064	7060	75.4	0	0	N/A
Paraguay	5740	1110	71.7	0	0	N/A
USA	291038	37870	77.3	117	1400	4
Uruguay	3391	3820	75.2	1	30	4
Venezuela	25226	3490	73.9	9	–	–
Total (millions)	722			186	1760	

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The global perspective on neurology training: The World Federation of Neurology survey

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2013

Table 3
Demographic data.

Country	Society	No. neurologists	Neurologists per 100,000	No. trainees
Albania	Albanian Society of Neurology	125	3.89	15
Argentina	Sociedad Neurologica Argentina	900	2.21	17
Australia and New Zealand	Australian and New Zealand Association of Neurologists	450	1.68	50
Austria	Austrian Society of Neurology	750	8.90	300
Bahrain	Bahrain Neurosciences Association	10	0.76	2
Belgium	Belgian Neurological Society	700	6.35	60
Bolivia	Sociedad Boliviana de Neurologia	50	0.50	6
Burkina Faso	Société de neurologie du Burkina (SONEB)	7	0.04	4
Chile	Sociedad de Neurologia, Psiquiatria y Neurocirugia, Chile	150	0.87	20
Croatia	Croatian Neurological Society	300	6.81	17.5
Czech Republic	Czech Society of Neurology	200	1.90	70
Egypt	Egyptian Society of Neurology, Psychiatry & Neurosurgery	1800	2.18	150
Estonia	Estonian Society of Neurologists & Neurosurgeons	130	9.70	13
Georgia	Georgian Society of Neurologists	600	13.37	200
Germany	Deutsche Gesellschaft fur Neurologie	5361	6.55	400
Greece	Hellenic Association of Neurology	1500	13.27	250
Hong Kong	Hong Kong Neurological Society	90	1.27	20
Iran	Iranian Neurological Association	700	0.94	120
Iraq	Iraqi Neurological Society	95	0.29	45
Israel	Israel Neurological Association	350	4.51	60
Jordan	The Jordan Neurological Society	50	0.81	6
Kazakhstan	League of Neurologists of Kazakhstan	1500	9.06	50
Korea, South	Korean Neurological Association	1800	3.62	400
Lithuania	Lithuanian Neurological Association	380	12.54	20
Macedonia	Society of Neurology of Macedonia	60	2.91	15
Myanmar	Myanmar Neurological Society	22	0.05	6
Netherlands	The Dutch Neurological Society	800	4.79	350
Norway	Norwegian Neurological Association	300	6.06	150
Paraguay	Sociedad Paraguaya de Neurogia	22	0.33	7
Poland	Polish Neurological Society	2000	5.19	300
Qatar	Qatar Neurological Club	13	0.70	3
Romania	Romanian Society of Neurology	800	3.74	300
Singapore	Clinical Neuroscience Society, Singapore	50	0.96	10
Slovenia	Slovenian Society of Neurology	100	4.87	20
Sri Lanka	Association of Srilankan Neurologists	30	0.14	12
Switzerland	Société Suisse de Neurologie/Schweizerische Neurologische Gesellschaft	440	5.56	45
Syria	Syrian society of neurosciences	400	1.92	35
Turkey	Turkish Neurology Society	1700	2.31	200
Yemen	Yemeni Neuroscience Society	15	0.06	35

Table 4
Training availability and responsibility.

Country	Residency selection criteria			Training availability [a]	Minimum number of years of postgraduate training in neurology	Is training in other medical fields necessary?
	Entrance exam	Interview by committee of university or hospital	Other			
Albania	Yes	Yes		More applicants	4	Yes
Argentina	Yes	Yes		More applicants	4	Yes
Australia and New Zealand			Assessment process involving structured interview, CV scoring, referee reports	More applicants	3	No
Austria			personal interview	More applicants	4	Yes
Bahrain		Yes		More applicants	4	Yes
Belgium		Yes		More applicants	4	No
Bolivia	Yes	Yes		More applicants	4	Yes
Burkina Faso			Training program is not yet available	Enough	4	Yes
Chile	Yes	Yes		More applicants	3	No
Croatia	Yes	Yes		More applicants	5	Yes
Czech Republic		Yes		Enough	5	Yes
Egypt	Yes			Enough	5	Yes
Estonia	Yes			More applicants	4	Yes
Georgia	Yes			More applicants	4	No
Germany	Yes			More positions	4	Yes
Greece			Waiting list	More applicants	5	Yes
Hong Kong	Yes			Enough	3	Yes
Iran	Yes			More applicants	4	Yes
Iraq	Yes			Enough	5	Yes
Israel		Yes		Enough	5	Yes
Jordan		Yes		Enough	5	No
Kazakhstan	Yes			Enough	2	Yes
Korea, South	Yes	Yes		More applicants	5	No
Lithuania	Yes	Yes		More applicants	4	Yes
Macedonia		Yes		Enough	4	Yes
Myanmar	Yes			Enough	3	Yes
Netherlands		Yes		More applicants	6	Yes
Norway		Yes		More applicants	4	Yes
Paraguay		Yes		More applicants	3	No
Poland	Yes			Enough	4	Yes
Qatar		Yes		More applicants	3	No
Romania	Yes			More applicants	4	Yes
Singapore			exit certification in Internal Medicine (e.g. MRCP, MMed) and interview	Enough	3	No
Slovenia			Formal application to Medical Chamber	Enough	5	Yes
Sri Lanka	Yes			Enough	3	Yes
Switzerland		Yes		More applicants	6	Yes
Syria	Yes			More applicants	4	No
Turkey	Yes			More applicants	4	Yes
Yemen			No residency program	No residency program	NA	Yes

Table 4
Training availability and responsibility.

Country	Residency selection criteria		Minimum number of years of postgraduate training in neurology	Is training in other medical fields necessary?
	Entrance exam	Interview by committee of university or hospital		
Albania	Yes	Yes	4	Yes
Argentina	Yes	Yes	4	Yes
Australia and New Zealand			3	No
Austria			4	Yes
Bahrain		Yes	4	Yes
Belgium		Yes	4	No
Bolivia	Yes	Yes	4	Yes
Burkina Faso			4	Yes
Chile	Yes	Yes	3	No
Croatia	Yes	Yes	5	Yes
Czech Republic		Yes	5	Yes
Egypt	Yes		5	Yes
Estonia	Yes		4	Yes
Georgia	Yes		4	No
Germany	Yes		4	Yes
Greece			5	Yes
Hong Kong	Yes		3	Yes
Iran	Yes		4	Yes
Iraq	Yes		5	Yes
Israel		Yes	5	Yes
Jordan		Yes	5	No
Kazakhstan	Yes		2	Yes
Korea, South	Yes	Yes	5	No
Lithuania	Yes	Yes	4	Yes
Macedonia		Yes	4	Yes
Myanmar	Yes		3	Yes
Netherlands		Yes	6	Yes
Norway		Yes	4	Yes
Paraguay		Yes	3	No
Poland	Yes		4	Yes
Qatar		Yes	3	No
Romania	Yes		4	Yes
Singapore			3	No
Slovenia			5	Yes
Sri Lanka	Yes		3	Yes
Switzerland		Yes	6	Yes
Syria	Yes		4	No
Turkey	Yes		4	Yes
Yemen			NA	Yes

Country	Member	Neurologists	Pre-requisite	Neurology Residency
Argentina	Daniel Zuin	1586 (342 Child neurologists)	1 year IM	3 years
Bolívia	Juan Carlos Duran	68 neurologists (12 Child neurologists)	1 year IM	3 years
Brazil	Ricardo Nitrini	2500 (350 Child neurologists)	1 year IM	2 years
Chile	Renato Verdugo	250	2 months IM	2 years and 10 months
Colombia	German Perez Romero	420	Six months in IM (but not in all programs)	4 years

IM: Internal Medicine

Country	Member	Neurologists	Pre-requisite	Neurology Residency
Dominican Republic	Guillermo Jiménez	91 (11 Child neurologists)	Residency in IM	3 years
Guatemala	Henry Stokes	102 (20 Child neurologists)	Residency in IM	3 years (plus one year for Master thesis)
México	Ildefonso Rodriguez	355	2-4 years IM	3 years
Nicaragua	Walter Diaz	18 (8 Child neurologists)	-	No residency program
Panama	Fernando Gracia	23 (7 Child neurologists)	-	No residency program
Paraguay	Gloria Meza	35	3 years IM	3 years
Peru	Nilton Custodio	640	-	3 years
Venezuela	Gladys Maestre		1 year IM	3 years

IM: Internal Medicine

Residency Programs in Latin America

- Minimum duration of residency in neurology is 4 years in most developed countries
- This contrasts with duration of residency programs in neurology in LA countries (minimum 2 years in Brazil and 3 years in the majority)
- To obtain a more successful training we need to have residency programs with longer duration to incorporate the enlarging field of neurology practice
- Include stages of training in other Latin American centers or abroad

NEUROLOGY ATLAS presents for the first time, the most comprehensive collection and compilation of information on neurological resources across 109 countries. The results confirm that the available resources including services for neurological disorders are markedly insufficient; in addition, there are large inequities across regions and income groups of countries. Urgent action is required to enhance the resources available to address the increasing burden of neurological disorders.

This report is the result of a collaborative effort between the World Health Organization and the World Federation of Neurology.

World Health Organization
Programme for Neurological Diseases and Neuroscience
Department of Mental Health and Substance Abuse
Avenue Appia 20
1211 Geneva 27
Switzerland
Website: www.who.int/mental_health

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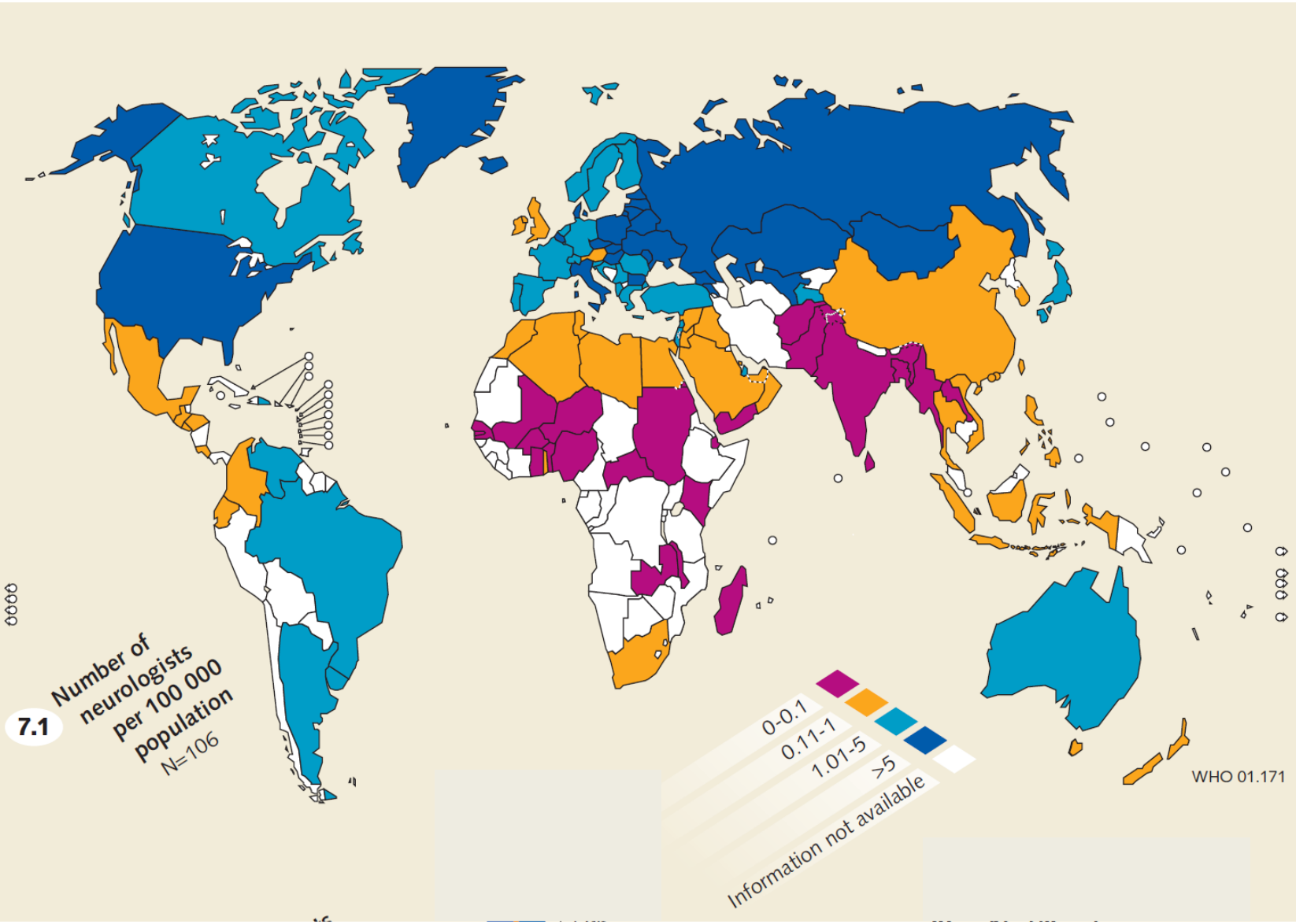
Atlas

COUNTRY RESOURCES FOR NEUROLOGICAL DISORDERS

2004

World Health Organization
Geneva

World Federation of Neurology
London



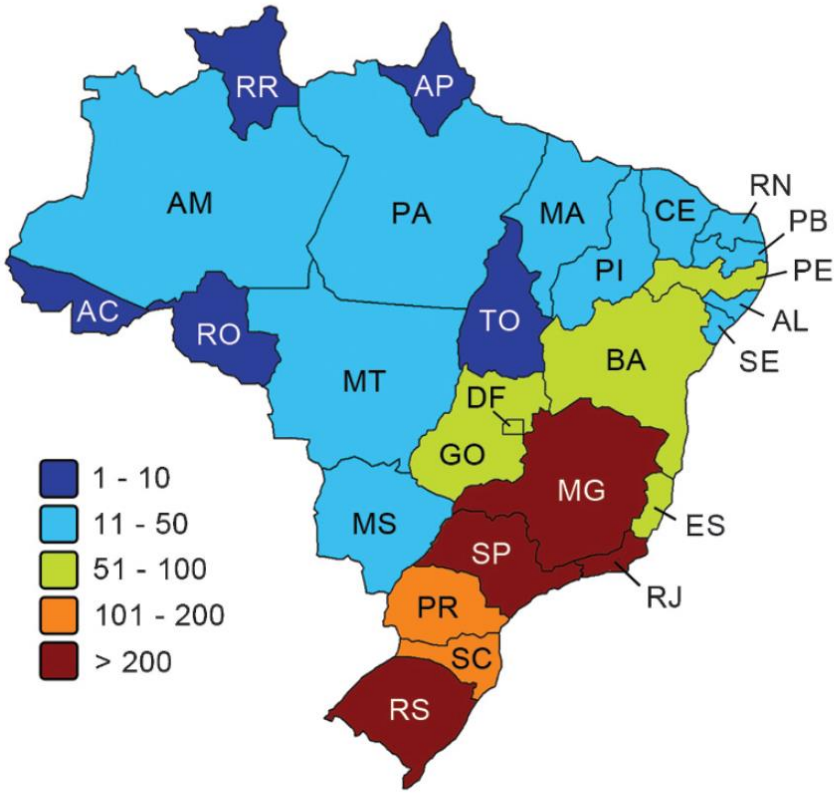
Neurology, Atlas, 2004, WHO

Country	Neurologists	Population (millions)	Neurologists/ 100.000 inhab.
Argentina	1586	42.6	3.7
Bolivia	68	9.6	0.7
Brazil	2500	203.7	1.2
Chile	250	17.4	1.4
Colombia	420	45.7	0.9
Dominican Republic	91	9.5	0.9
Guatemala	102	15.8	0.6
Mexico	355	118.8	0.3
Nicaragua	18	5.7	0.3
Panama	23	3.3	0.7
Paraguay	35	7.0	0.5
Peru	640	29.2	2.1

NEUROLOGY ATLAS presents for the first time, the most comprehensive collection and compilation of information on neurological resources across 109 countries. The results confirm that the available resources including services for neurological disorders are markedly insufficient; in addition, there are large inequities across regions and income groups of countries. Urgent action is required to enhance the resources available to address the increasing burden of neurological disorders.

Absolute number of neurologists in Brazil, 2011

Abbrev.	States	Nr.
AC	Acre	1
AL	Alagoas	21
AP	Amapá	2
AM	Amazonas	14
BA	Bahia	97
CE	Ceará	50
DF	Distrito Federal	83
ES	Espírito Santo	57
GO	Goiás	80
MA	Maranhão	13
MT	Mato Grosso	21
MS	Mato Grosso do Sul	27
MG	Minas Gerais	270
PA	Pará	22
PB	Paraíba	25
PR	Paraná	177
PE	Pernambuco	92
PI	Piauí	14
RJ	Rio de Janeiro	324
RN	Rio Grande do Norte	19
RS	Rio Grande do Sul	251
RO	Rondônia	6
RR	Roraima	1
SC	Santa Catarina	111
SP	São Paulo	828
SE	Sergipe	20
TO	Tocantins	3
	TOTAL	**2629**



Regions	Nr.	Percent
North	49	1.86%
Northeast	351	13.35%
Midwest	211	8.03%
Southeast	1479	56.26%
South	539	20.50%

Figure 1 - Absolute numbers of neurologists in Brazil; obtained from the Report of Medical Demography in Brazil - General Data and Descriptions of Inequalities, Volume 1 (Brazilian Federal Council of Medicine; Regional Council of Medicine of São Paulo, December 2011).

Amorim et al., 2013

We need more neurologists

- Large inequities across regions and income groups of countries
- Most countries have more applicants than positions for postgraduate training in Neurology
- We need more positions for residency in Neurology
- **More well-trained neurologists**

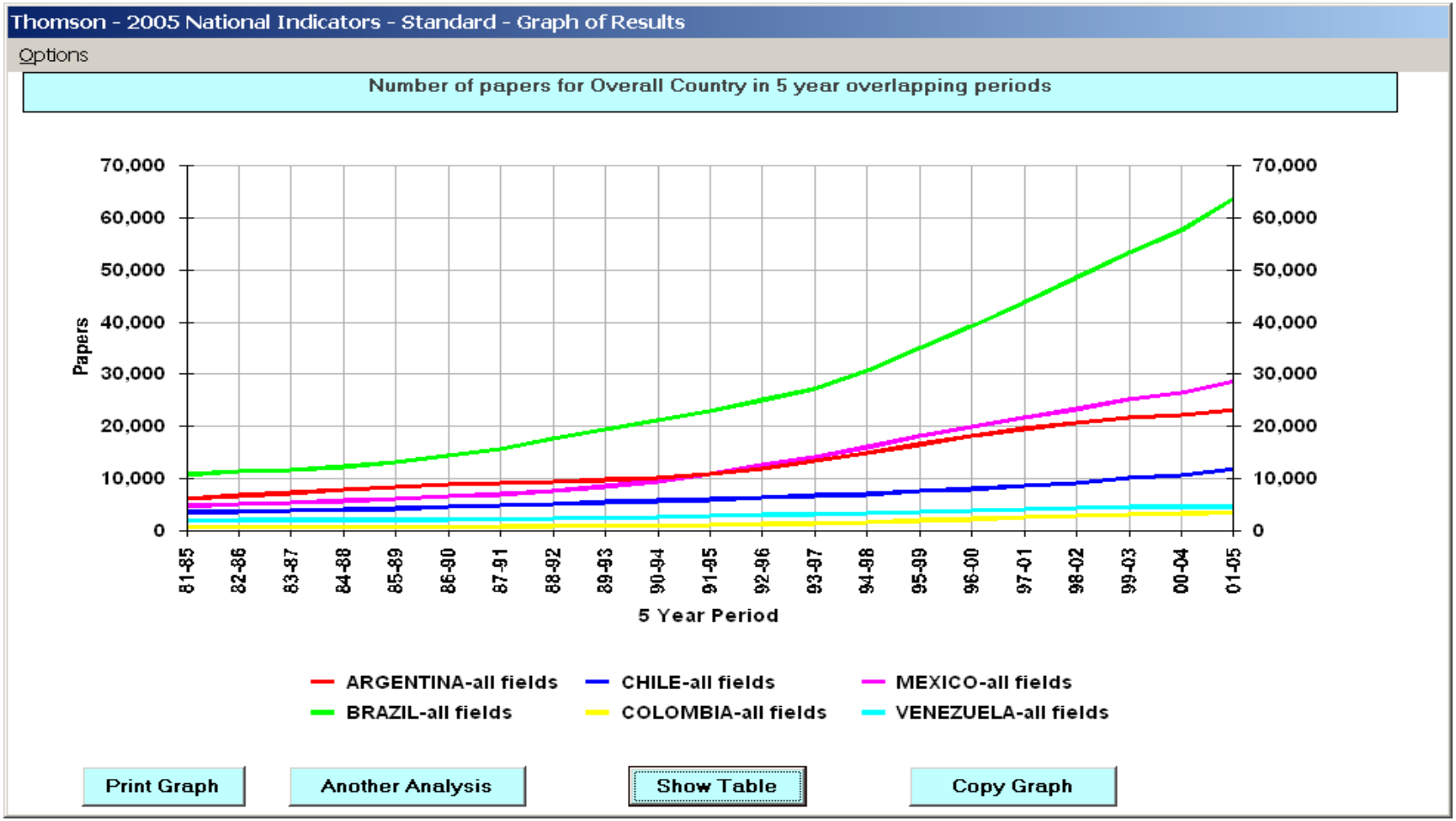
More well-trained neurologists

- Combined actions of local neurological societies and public health authorities
- Cooperation between LA countries
- Cooperation with other developed countries

Research on Clinical Neurology in Latin America

- Neurologists need to be trained to do research aiming to improve prevention, diagnosis and treatment of neurological diseases, mainly those that are more frequent in LA countries

Scientific Production in Latin America (1981 – 2005)



Arq Neuropsiquiatr 2006;64(2-B):538-542

THE SCIENTIFIC PRODUCTION OF BRAZILIAN NEUROLOGISTS: 1995-2004

Ricardo Nitrini[1]

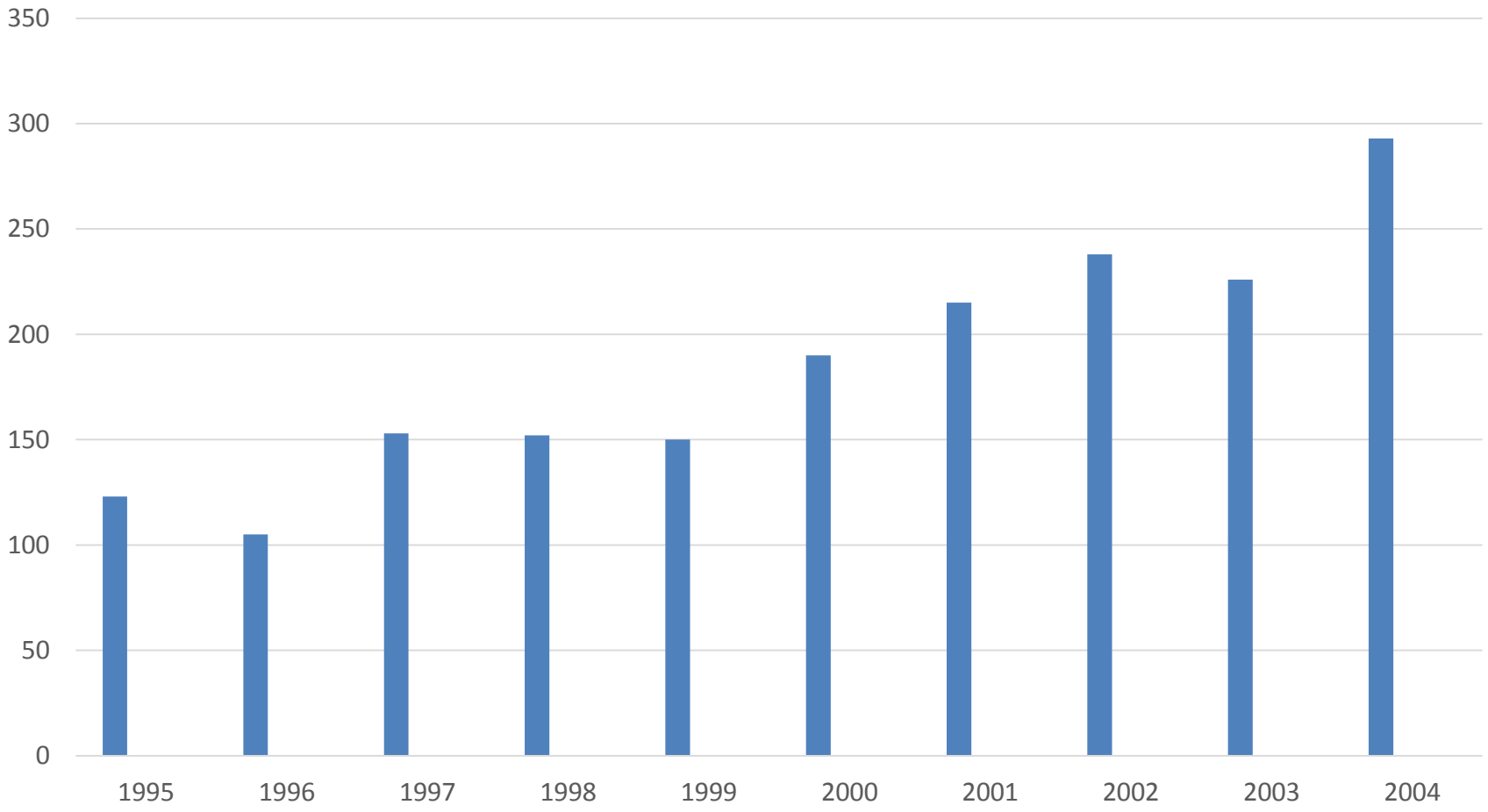
ABSTRACT - The Brazilian scientific production saw more than a four-fold increase from the 1990s onwards. The aim of this study was to evaluate the evolution of scientific production by Brazilian clinical neuroscientists over the last 10 years. A search in the PubMed identified 295 clinical neuroscientists and their publications. Brazilian production corresponded to 2.37% of the papers published by the 20 indexed periodicals that regularly publish clinical neuroscience research. If only the first and last two years are compared, there was a real growth of 75.1%. More than 40% of the Brazilian papers were published in Arquivos de Neuro-Psiquiatria, the official journal of the Brazilian Academy of Neurology. When only those periodicals with impact factor higher than one are considered, the percentage falls to 0.86% in the whole 10-year period, but attains 1.23% in 2004. Epilepsy and infectious diseases were the sub-areas with the highest scientific production.

KEY WORDS: Brazilian neurologists, scientific production, clinical neuroscientists.

Table 1. Scientific production by Brazilian clinical neuroscien - tists (PubMed; 1995-2004).

Year	Number of publications	%
1995	123	6.7
1996	105	5.7
1997	153	8.3
1998	152	8.2
1999	150	8.1
2000	190	10.3
2001	215	11.7
2002	238	12.9
2003	226	12.2
2004	293	15.9
Total	1845	100

Scientific production by Brazilian Neurologists (1995-2004)



SOUTH AMERICA
— by the numbers —

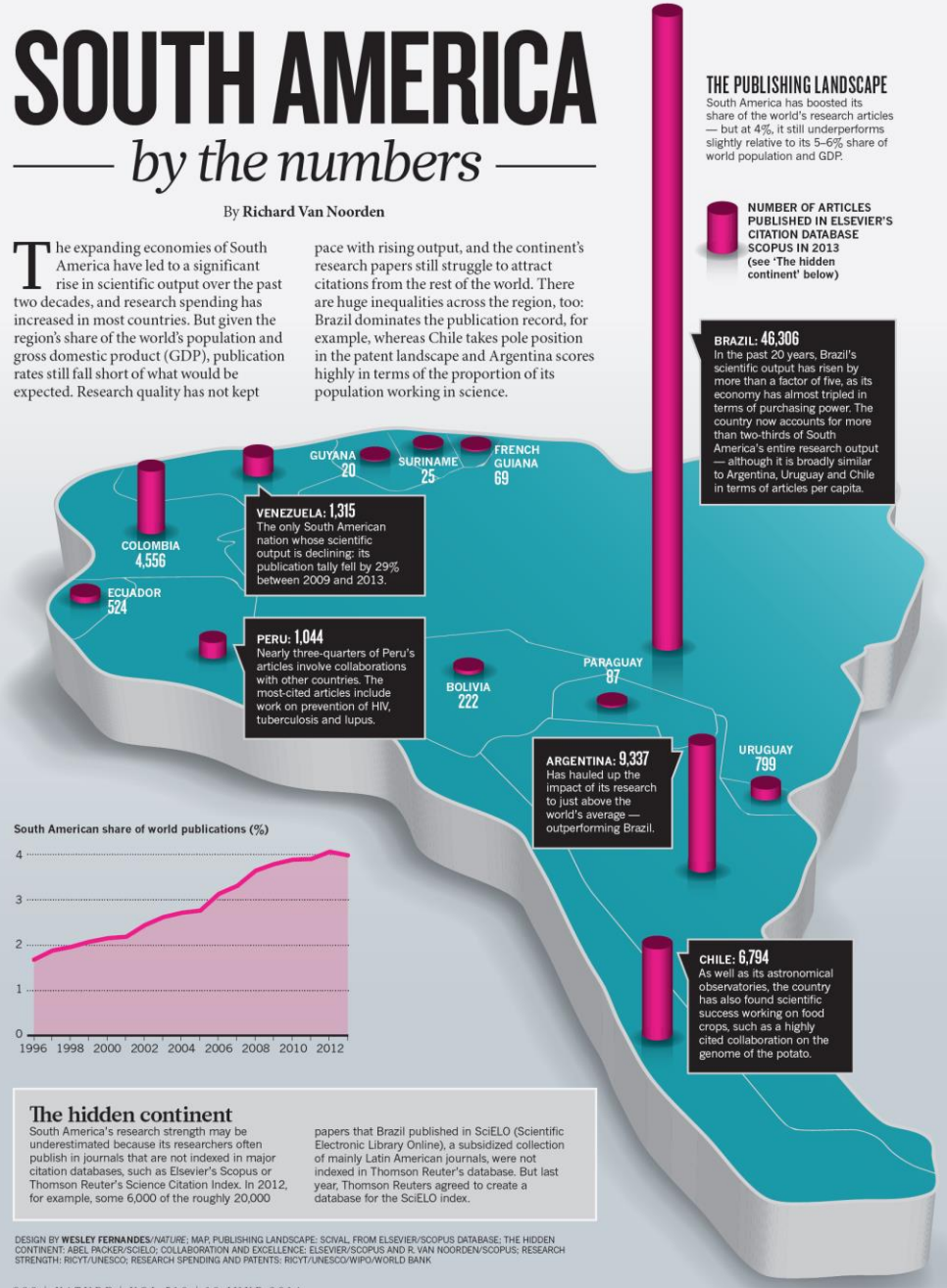
By **Richard Van Noorden**

The expanding economies of South America have led to a significant rise in scientific output over the past two decades, and research spending has increased in most countries. But given the region's share of the world's population and gross domestic product (GDP), publication rates still fall short of what would be expected. Research quality has not kept pace with rising output, and the continent's research papers still struggle to attract citations from the rest of the world. There are huge inequalities across the region, too: Brazil dominates the publication record, for example, whereas Chile takes pole position in the patent landscape and Argentina scores highly in terms of the proportion of its population working in science.

THE PUBLISHING LANDSCAPE

South America has boosted its share of the world's research articles — but at 4%, it still underperforms slightly relative to its 5–6% share of world population and GDP.

NUMBER OF ARTICLES PUBLISHED IN ELSEVIER'S CITATION DATABASE SCOPUS IN 2013 (see 'The hidden continent' below)

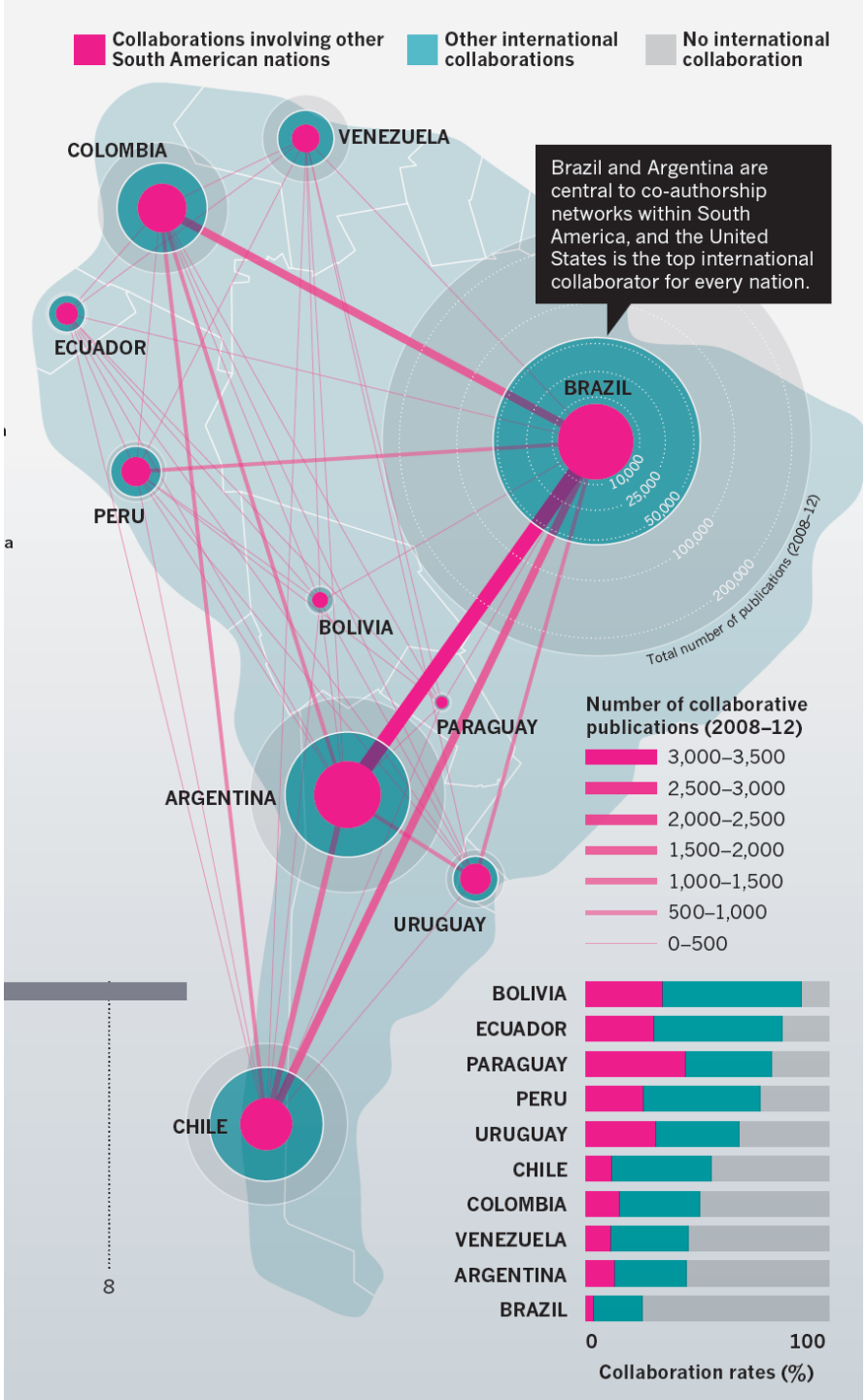


South American share of world publications (%)

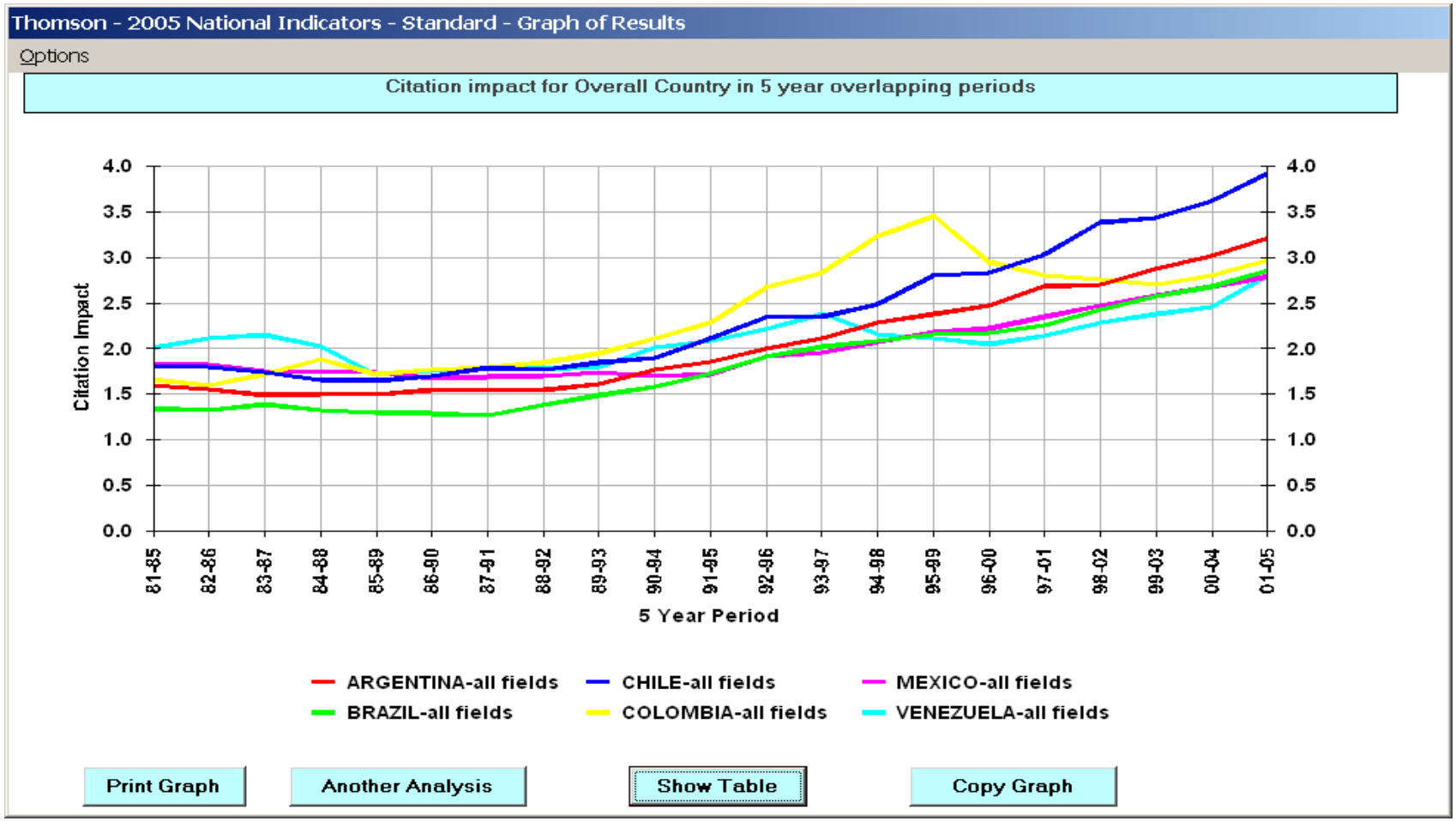
The hidden continent

South America's research strength may be underestimated because its researchers often publish in journals that are not indexed in major citation databases, such as Elsevier's Scopus or Thomson Reuter's Science Citation Index. In 2012, for example, some 6,000 of the roughly 20,000 papers that Brazil published in SciELO (Scientific Electronic Library Online), a subsidized collection of mainly Latin American journals, were not indexed in Thomson Reuter's database. But last year, Thomson Reuters agreed to create a database for the SciELO index.

DESIGN BY **WESLEY FERNANDES**/*NATURE*; MAP, PUBLISHING LANDSCAPE: SCIVAL, FROM ELSEVIER/SCOPUS DATABASE; THE HIDDEN CONTINENT: ABEL PACKER/SCIELO; COLLABORATION AND EXCELLENCE: ELSEVIER/SCOPUS AND R. VAN NOORDEN/SCOPUS; RESEARCH STRENGTH: RICYT/UNESCO; RESEARCH SPENDING AND PATENTS: RICYT/UNESCO/WIPO/WORLD BANK


Collaborations involving other South American nations
Other international collaborations
No international collaboration
COLOMBIA
VENEZUELA
ECUADOR
PERU
BRAZIL
BOLIVIA
PARAGUAY
ARGENTINA
URUGUAY
CHILE
Brazil and Argentina are central to co-authorship networks within South America, and the United States is the top international collaborator for every nation.
10,000
25,000
50,000
100,000
200,000
Total number of publications (2008–12)
Number of collaborative publications (2008–12)
3,000–3,500
2,500–3,000
2,000–2,500
1,500–2,000
1,000–1,500
500–1,000
0–500
BOLIVIA
ECUADOR
PARAGUAY
PERU
URUGUAY
CHILE
COLOMBIA
VENEZUELA
ARGENTINA
BRAZIL
0
100
Collaboration rates (%)
8

Impact Ranking in Latin America (1981 – 2005)



Latin American Journals in Web of Science

Web of Science: Regions	2002	2008	Growth	Variance
Asia Pacific	497	767	270	+54%
European Union	1684	2155	471	+28%
Middle East/Africa	54	109	55	+102%
Latin America	63	160	97	+154%

Successful training in Neurology in Latin America

During residency program every student need to learn (at least):

- ✓ Basic aspects of medical research to be able to interpret results and conclusions of papers
- ✓ To publish at least one case report in an indexed journal
- ✓ To learn to be aware of the papers of other Latin American researchers

Conclusions
What we need to do:

- To atract the best medical students to become neurologists
- To increase the residency program duration
- To increase the number of well-trained neurologists
- To develop combined actions of local neurological societies and public health authorities
- To teach basic aspects of research on neurology during residency program