Report on Global Neuro-specialists
for the World Federation of Neurologists
WFN Task Force on Neurological Services
D Bergen MD, Chairman
15 May 2001

SUMMARY

The WFN has delegates from 84 of the 191 WHO member countries. Sixty-three of the 84 WFN delegates (75%) replied to the questionnaire and follow-up inquiries. Most physicians identifying themselves as neurologists had received full time training in neurology, but passed a special examination or board in neurology in only 41 (65%) countries. Comprehensive training in neurology was available in only 37 (59%), with some training abroad for the remainder. Although host countries commonly shared cultural, geographic, or linguistic ties to the trainee's country, the United Kingdom or United States were used by 85% (28 / 33) of countries taking advantage of foreign training. Continuing medical education was required for neurologists in only 33 / 63 (52%) countries. In 71% (45/63) of countries only a small proportion (0-25%) of neurologists worked full time in academic centers. A substantial majority (75-100%) of neurologists worked in private practice in many countries (17 / 63 or 27%). In 31/63 (49%) of countries, most neurologists worked in large cities. The population per neurologist ranged from 6,240 to 4,750,000, with the highest ratios in developing countries. Similar high population ratios were reported for psychiatrists and neurosurgeons.

INTRODUCTION

Disorders of the nervous system make up a large proportion of the global burden of disease (WFN Task Force, 2001). The distribution and availability of neurological expertise world wide is not known. The World Federation of Neurology (WFN) Management Committee appointed a Task Force on Neurological Services to compile a summary of the impact of neurological disorders world wide, and an estimate of the numbers, distribution, and training of neurologists. Because neurosurgeons and/or psychiatrists also provide care for those with neurological disorders in many countries, numbers of these physicians were also gathered.

METHODS:

In August, 2000, a survey (Appendix 1) was sent to delegates from all 84 member societies of the WFN. Repeated follow-up contacts were made, and all replies were received by early 2001.

In an attempt to validate replies about the numbers of neurologists, survey data were compared with the report of a workshop on post-graduate education in central and eastern Europe held in the Czech Republic (Bartos et al).

RESULTS:

Most data about the number of neurologists was drawn from specialist society or board lists, and is therefore thought to reflect the actual number of recognised neurological specialists in those countries (Table 1). The more precise data provided about numbers of neurosurgeons, compared to data about psychiatrists, suggested that the former data may be more reliable, or that the neurosurgical specialist is defined

more specifically. A 'neurologist' was defined differently in various countries, most passing a specialty examination or board, and others receiving specialty training in neurology (Table 2).

The reported number of neurologists in each country ranges from 4 to 10,516 (Spreadsheet). The ratio of population to neurologist ranged from 6 240 to 4,750,000 (Table 3), with the highest ratios in undeveloped countries (Tables 3 and 4).

In most countries (56%) neurologists receive training in their own country (Table 5). But in 69% of countries, training in carried out partly or entirely abroad, and one out of six countries has no neurology training programs at all. Many countries provide neurology training for physicians from other nations (Spreadsheet). While those who go outside their own country often choose countries with close geographical, historical, or political ties, the United Kingdom and the United States are the most common sites for training abroad. Not surprisingly, then, the most common language used for training abroad is English.

Although post-graduate specialty training in neurology is available in most countries (52, or 82%), continuing medical education for neurologists is required in only 33 (52%) [Spreadsheet].

In most countries, most neurologists are in private practice, or less commonly, working in the national health care system (Tables 5 and 6). In 17 countries (27%), 75-100% of neurologists are in private practice. In 45/63 (71%) of countries, fewer than 25% of neurologists work full time in university or teaching centers. In nearly half of the countries, it was estimated that 75% to 100% of neurologists work in large cities, with the rest in smaller cities or less commonly in rural areas.

The numbers of neurologists reported in this survey from central and eastern Europe were compared with those reported at a recent workshop in the Czech Republic (Table 7). This revealed major differences in the numbers reported from some countries.

Table 1. Sources of data about neurologists

	Neurologists
Delegates' estimates	7
Specialist society lists	41
Specialist boards	15
National statistics	3
Other	0
No reply	0

Some used more than one source.

Table 2. Definition of a 'neurologist.'

	Number of countries
A generalist physician with a special interest in neurology	3
A physician with full-time training in neurology	24
A physician who has passed a board or exam in neurology	6
A physician who has training *and* passed a specialty board	35
A physician practising neurology & neurosurgery	3
A physician practising neurology & psychiatry	7

Some use more than one definition.

Table 3 . Population per neurological specialist. Population data from WHO 2000 p156-162

	pop/neurologist	/psychiatrist	/neurosurgeon
Established Market Economies			
Australia	51 900	9 090	163 000
Austria	14 700	7 080	75 700
Belgium	71 800	7 130	79 700
Canada	53 900	8 170	100 000
Denmark	26 400	5 280	176 000
Finland	20 200	n/a	n/a
France	39 300	n/a	n/a
Germany	41 100	27 400	164 000
Greece	21 200	5 300	70 700
Iceland	15 500	4 650	55 800
Ireland	285 000	14 800	462 000
Italy	22 900	9 550	95 500
Japan pop	63 000	25 200	50 400
Luxembourg	28 400	9 460	106 000
Netherlands	25 100	9 520	143 000
New Zealand	137 000	n/a	348 000
Norway	16 900	4 270	80 700
Sweden	30 500	6 080	92 700
Switzerland	22 600	7 340	105 000
United Kingdom	164 000	n/a	330 000
United States	26 200	n/a	n/a
Formerly Socialist Economies			
Bulgaria	8 280	11 800	43 600
Czech Republic	20 600	12 900	103 000
Estonia	8 810	6 130	128 000
Hungary	16 000	12 300	95 200
Latvia	23 400	9 450	59 800
Lithuania	6 240	9 200	50 400
Poland	194 000	n/a	n/a
Russia	18 400	36 800	98 000
Yugoslavia (Serbia)	18 300	11 800	118 000
Latin America			
Bolivia	220 000	138 000	120 000
Chile	120 000	37 500	250 000
Costa Rica	123 000	65 500	151 000
Dominican Republic	125 000	55 700	226 000
Guatemala	444 000	247 000	1 110 000
Honduras	395 000	137 000	333 000
Mexico	298 000	69 600	244 000
Panama	165 000	n/a	82 600
Uruguay	30 600	6 140	103 000
Venezuela	98 800	n/a	n/a
Middle Eastern Crescent			

Bahrain	152 000	60 600	152 000
Cyprus	30 800	19 200	77 000
Egypt	134 000	84 000	269 000
Israel	20 000	7 620	76 200
Jordan	171 000	n/a	216 000
Kuwait	271 000	n/a	n/a
Morocco	558 000	140 000	324 000
Pakistan	4 750 000	1 270 000	1 920 000
Qatar	147 000	73 600	196 000
Saudi Arabia	836 000	697 000	522 000
Tunisia	210 000	94 600	315 000
Turkey	72 800	69 000	87 300
India	2 180 000	551 000	1 620 000
Other Asia and Islands			
Bangladesh	3 170 000	1 870 000	3 630 000
Philippines	556 000	204 000	1 160 000
Singapore	107 000	88 000	176 000
South Korea	90 100	30 400	58 100
Sri Lanka	1 160 000	664 000	3 100 000
Thailand	329 000	174 000	265 000
Sub-Saharan Africa			
Kenya	2 690 000	1 850 000	3 290 000
South Africa	399 000	200 000	399 999

Population data from WHO 2000.

Table 4. Average population per neurologist in each WHO region.

Established market economies	56 100
Former socialist economies	34 900
Latin America	202 000
Middle eastern crescent	613 000
India	2 180 000
Other Asia and islands	902 000
Sub-Saharan Africa	1 540 000

Table 5. Location of neurology training

Entirely in home country	35
Partly in another country	14
Entirely in another country	10
No reply	4

Table 6. Number of countries reporting work locations for neurologists

	0-25%	25-75%	75-100%
Large cities	2	18	31
Smaller cities	41	19	0
Rural areas	60	1	0

Table 7. Number of countries reporting practice patterns of neurologists

	0-25%	25-75%	75-100%
Full time academics	45	11	1
Part time academics	40	16	2
National health service	31	15	13
Private practice	24	18	17

[Some neurologists fit into more than one category.]

Table 8. Comparison of reports on numbers of neurologists in central and eastern Europe.

Country	WFN Survey	Workshop report
Bulgaria	1000	1270
Czech Republic	500	900
Estonia	160	147
Hungary	620	392
Poland	200	1413

DISCUSSION:

Limitations of the survey.

The most obvious, and the most serious, limitation of this survey are the lacunae. First, membership of the WFN is made up of national neurological associations, and only 84 of the 191 member countries of the WHO belong to the WFN and were surveyed. Some of the non-WFN countries may have no neurologists at all. This is the case in many African countries.

Active participation in other international neurological societies (e.g., the central and eastern European workshop cited in this report) suggests that solicitation for membership in the WFN might be welcome in these countries.

Second, WFN member countries do not include China, home to 21% of the world's population (WHO 2000), so China is not included in the survey. Taiwan's membership in the WFN may prove a problem, but other world bodies may provide models in surmounting this political obstacle.

Finally, only two thirds of the WFN delegates returned the survey, despite repeated inquiries not only from the authors of the survey but from the WFN president. In some cases, communication with the delegate seemed difficult due to faulty addresses; in other cases the delegate seemed simply to ignore the survey. In both cases the effectiveness of some delegates' full participation in the WFN seemed ineffective.

The reliability of some of the data is questionable. Despite the claim that numbers of neurologists were drawn from lists of boards or specialty societies, many of them were in round numbers (thousands, hundreds) that suggest personal estimates. The numbers from many countries varied considerably from the number of neurologists presented in WFN membership applications. In addition, estimates of neurologists provided in the WFN survey and those claimed at a recent regional eastern European workshop (Bartos) differ by up to 700%. Even recalling that the state of medical training and practice in some these countries may be in a state of change, such variability suggests that determining the true number of neurological specialists world wide will not be an easy task.

The estimates of population:neurologist ratios for many countries reveal many unfilled needs, i.e., in areas where there are many hundreds of thousands, or even some millions, of people per neurologist. Some countries have no neurologists at all. When neurological disease makes up a large proportion of the world's health problems, it seems self-evident that neurological expertise is needed everywhere, but the 'correct' number of neurologists for each country is by no means self-evident, and probably varies according to the health care system, disease profile, and socio-economic structure of each nation.

In addition, given the current numbers of neurological specialists, their most appropriate role should vary from country to country. The neurologist in Norway, for example, might reasonably be expected to provide clinical care for an unselected population of 17,000 (Table 3). But where there are over a million people for each neurologist (Table 3), providing direct clinical care to a small caseload of patients is arguably not the best use of his or her expertise. Such effects of such 'neurologist shortages' are exacerbated by the concentration of neurologists in private practices in large cities, so that neurological expertise is unavailable to much of the population. In

such situations, where most neurological care is given by others, the educational role of the specialist is a crucial one..

The 'brain drain'

Ironically, developing countries with the highest burden of neurological disease are the very ones with few neurologists, or none at all (Table 3; Global Burden, 2000). Although many countries send graduates abroad for neurology training, many of them do not return home to practice. Those who do may not be trained to cope with the endogenous neurological diseases of his or her home country. (Mejia, 1980), and may find that his or her training may not be suitable for the prevalent disease of the home country, or to the general circumstances and resources of medical practice. In addition, the trainee may be encouraged to divert health care resources into activities, equipment, and facilities ill-suited to local conditions. The need for more locally trained neurologists in developing countries, not only as practitioners but as educators and health policy advisors and advocates, is clear.

There is also an internal 'brain drain' as well, with relatively few neurological specialists working in a university setting. This makes the establishment of good domestic training programs less likely, and allows the scope and direction of local neurological research to be determined by others (e.g., multinational pharmaceutical companies).

Proposals for further discussion and action by the WFN:

Relevant results of this survey should be forwarded to:

1. Membership Committee
2. Research Group on Public Relations
3. Research Group on Continuing Medical Education
4. Research Group on Organisation & Delivery of Neurological Services
5. Education Committee
6. Research Group on Epidemiology

Data on global distribution and education of neurologists might be more effectively gathered by enrolling member societies to provide them, asking the help of appropriate WFN research groups.

WFN membership should be expanded, with particular attempts to achieve membership of or liaison with China. Regional neurological societies might be helpful in providing information about non-member states or those without neurologists.

The WFN could promote the expansion of continuing medical education, with special efforts towards further education of providers of primary health care.

The WFN could explore and articulate appropriate roles of formally trained neurologists in countries where the population : neurologist ratio is extremely large.

The WFN could encourage more neurologists to work in academic centers in countries where their expertise as teachers as well as practitioners is needed.

We thank the WFN for the use of its London facilities during the preparation of this report, and Keith Newton for his assistance.

Members of this Task Force are: Chairman: D Bergen (USA), Contributing authors: D Silberberg (USA), D Good (USA), F Garcia-Pedroza (Mexico), B Singhal (India); Supporting members: A Al-Khamlaichi (Morocco), L Csiba (Hungary), M Baker (UK), A Diop, R Eastman, R Forlenza, A Gil-Nagel (Spain), G Hankey, P Kalvach (Czech Republic), A Koeppen (USA), L Lim (Philippines), F Lolas, B Manyam, M Menken (USA), P Monro (UK), T Murray (Canada), S Shorvon (UK), A Soto (Venezuela)

Appendix 1.

WORLD FEDERATION OF NEUROLOGY
TASK FORCE ON NEUROLOGICAL SERVICES
SURVEY ON PHYSICIANS CARING FOR NEUROLOGICAL DISORDERS

In your country*:*

1. Number of neurologists: _____ Source of data (circle): a b c d
psychiatrists: _____ a b c d
neurosurgeons: _____ a b c d

Data derived from:
a. Your estimate
b. A membership list in specialist societies or academies
c. A list of those holding specialist boards or certificates
d. National health care statistics, date _____
e. other (please specify) _____

2. Most of the "neurologists" in your country:
a. are generalist physicians with a special interest in neurology
b. have received full time training in neurology
c. have passed a special exam or board in neurology
d. both (b) and (c)
e. practice both neurology and neurosurgery
f. practice both neurology and psychiatry

[Circle all that apply]

3. Most neurologists in your country receive specialty training *(circle one)*:
a. entirely in your country
b. partly in another country
c. entirely in another country

4. If specialty training is given elsewhere:
which countries give the training?
which languages are used for training?

5. Is formal specialty training in neurology <u>after</u> medical school available in your country?

6. Is continuing medical education required for neurologists?

7. What proportion of neurologists practice in these settings? *(Circle a, b, or c):*

full time at university or teaching centers a b c
part time at university or teaching centers a b c

national health service	a	b	c
private practice (fee for service)	a	b	c
in large cities	a	b	c
in smaller cities	a	b	c
in rural areas	a	b	c

a. 0-25% *b. 25-75%* *c. 75-100%*

References

WFN Task Force on Neurological Services. The global burden of neurological disease. Presented at the Congress of the World Federation of Neurology. London, June 2001-05-20

Bartos A, Kalvach P, Trost M et al. Post-graduate education in central and eastern Europe. Presented at the First European Cooperation Neurology Workshop. Czech Republic, April 2000.

A Mejia. International migration of professional health manpower. WHO Chronicle 1980;34:346-355