

## ◆ Definitions

- ◆ In this context, a **neurosurgeon** is a medical graduate who has completed at least two years of recognized post-graduate training in neurosurgery.

## ◆ Salient Findings

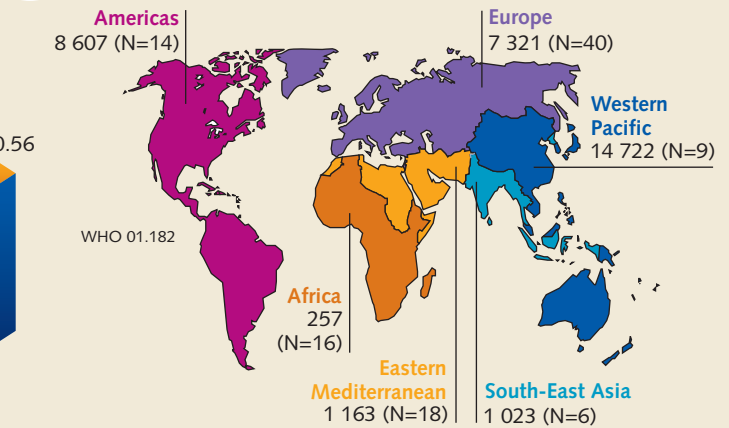
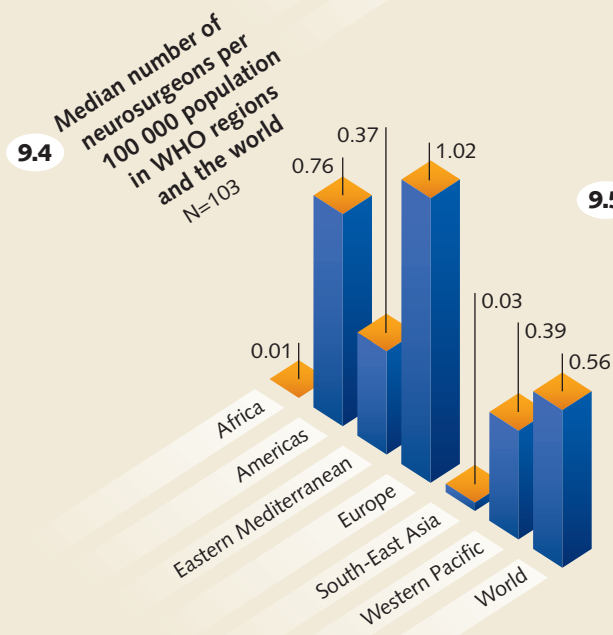
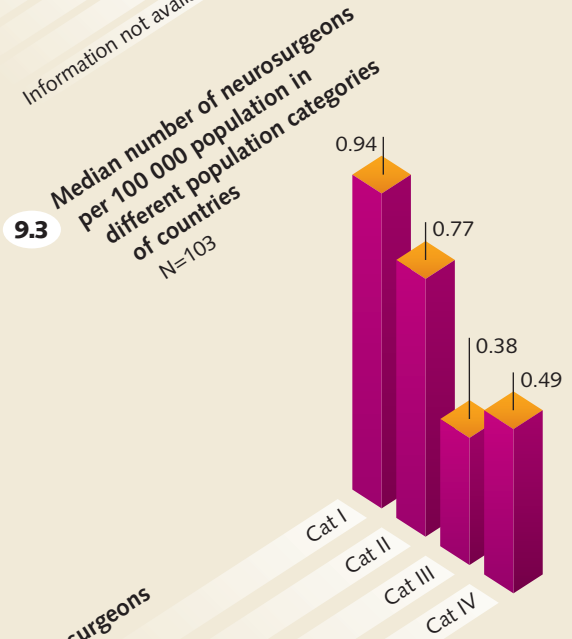
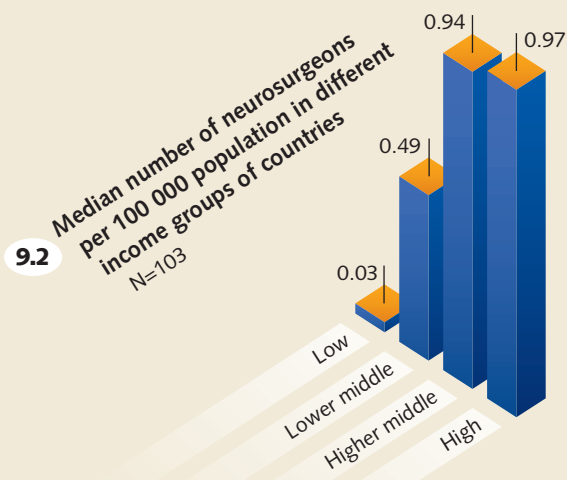
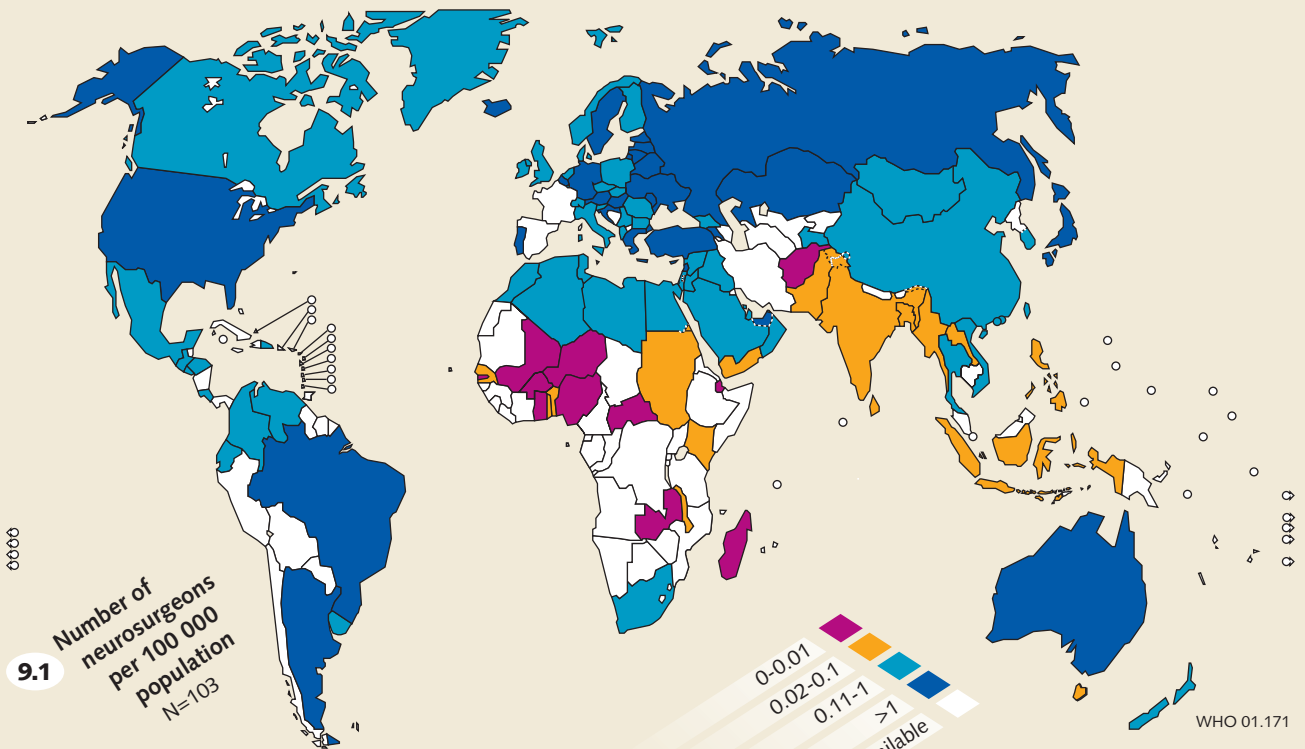
- ◆ A total of 33 193 neurosurgeons are reported to be available in 103 countries. The median number of neurosurgeons in the responding countries is 0.56 per 100 000 population (interquartile range 0.07–1.02).
- ◆ The distribution of neurosurgeons across regions is variable. The median number of neurosurgeons per 100 000 population is 0.01 in Africa, 0.03 in South-East Asia, 0.37 in the Eastern Mediterranean, 0.39 in the Western Pacific, 0.76 in the Americas, and 1.02 in Europe.
- ◆ Of the responding countries, 26% have access to more than one neurosurgeon per 100 000 population. In terms of population covered, more than one neurosurgeon per 100 000 population is available for 20.3% of the population.
- ◆ The median number of neurosurgeons per 100 000 population across different income groups of countries varies. It is 0.03 for low-income countries and 0.97 for high-income countries. Half of the high-income group of responding countries have access to less than one neurosurgeon per 100 000 population.
- ◆ The median number of neurosurgeons per 100 000 population is 0.94 for countries in population category I, compared with 0.49 for countries in population category IV.

## ◆ Limitations

- ◆ Because the source of information in most countries was the professional association, it is possible that neurosurgeons who are not members of these associations were not counted.
- ◆ Information about the geographical distribution of neurosurgeons in countries is not available but, as reported by some respondents, the majority are concentrated in urban areas.

## ◆ Implications

- ◆ Neurosurgeons complement the services provided by neurologists, most importantly to provide surgical services for neurological conditions. They provide expert care at secondary and tertiary level for neurosurgical emergencies such as head trauma and haemorrhage and also surgical care for conditions such as space-occupying lesions. In some places, neurosurgeons also provide medical care for people with neurological disorders. They also provide training, support and supervision to primary health-care providers in care of neurological conditions, especially emergencies.
- ◆ Training of general surgeons in neurosurgical emergencies is important in settings where it is not possible to have enough neurosurgeons at primary and secondary levels.
- ◆ The inequity in the number of neurosurgeons observed in countries in different income groups, population categories and geographical areas needs to be specifically studied and tackled.



## ◆ Definitions

- ◆ A **neuropaediatrician** is a specialist (neurologist or paediatrician) who has at least one year of recognized subspecialist training in child neurology.

## ◆ Salient Findings

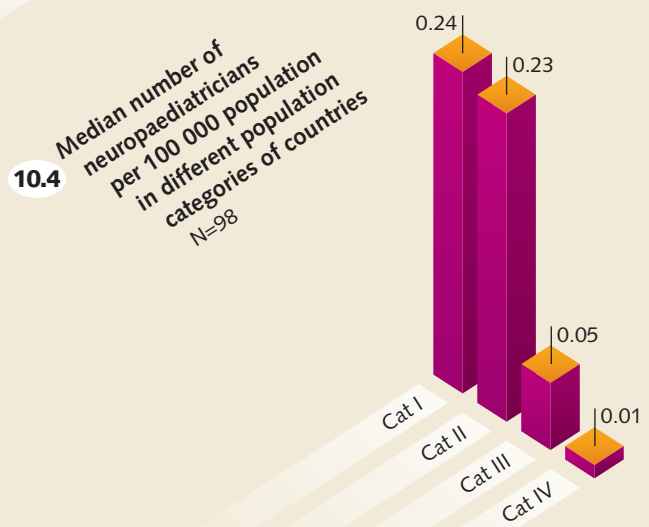
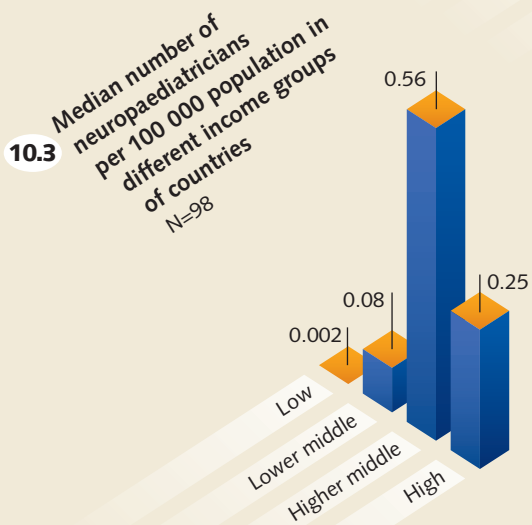
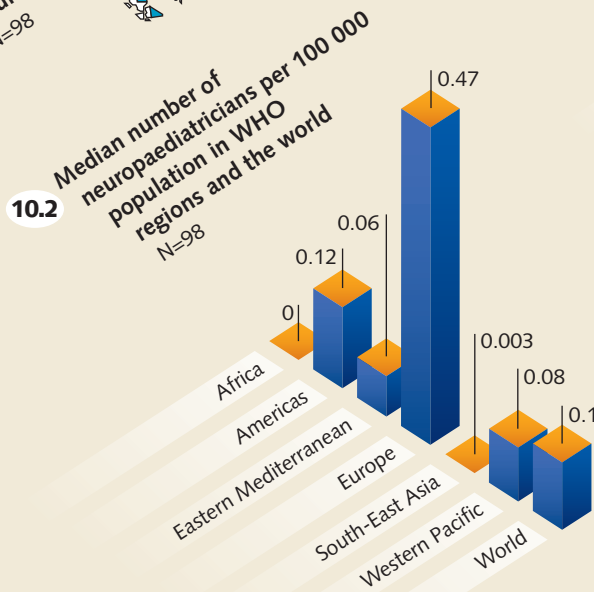
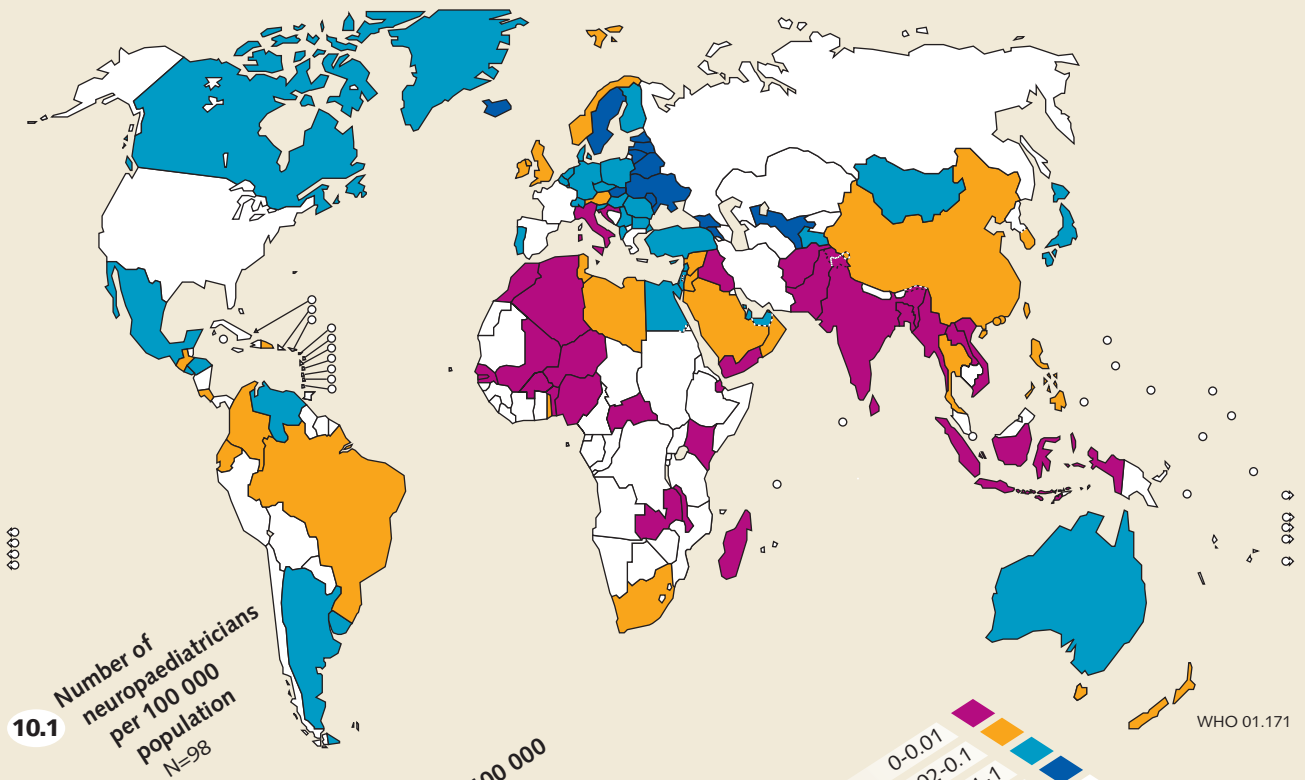
- ◆ A total of 5733 neuropaediatricians are reported to be available in 98 countries. The median number of neuropaediatricians in the responding countries per 100 000 population is 0.10 (interquartile range 0.01–0.42). Since neuropaediatricians are specialists catering only for children, the median number of neuropaediatricians in the responding countries per 100 000 under-18 population is 0.33 (interquartile range 0.02–1.55).
- ◆ The median number of neuropaediatricians per 100 000 population varies widely across regions. It is 0 in Africa, 0.003 in South-East Asia, 0.06 in the Eastern Mediterranean, 0.08 in the Western Pacific, 0.12 in the Americas, and 0.47 in Europe. The median number of neuropaediatricians in the responding countries per 100 000 under-18 population is 0 in Africa, 0.007 in South-East Asia, 0.06 in the Eastern Mediterranean, 0.25 in the Americas, 0.26 in the Western Pacific, and 2.07 in Europe.
- ◆ Of the responding countries, 87.8% have less than one neuropaediatrician per 100 000 population. In fact, 23.5% of the responding countries do not have any neuropaediatricians. In terms of population covered, more than one neuropaediatrician per 100 000 population is available for only 2.4% of the population.
- ◆ The median number of neuropaediatricians per 100 000 population across different income groups of countries also varies. It is 0.002 for low-income countries, compared to 0.25 for high-income countries.
- ◆ Even among high-income countries, only 7.7% of them have access to more than one neuropaediatrician per 100 000 population.
- ◆ The median number of neuropaediatricians is higher for countries with smaller populations (0.24 for countries in population category I) compared with 0.01 for countries in population category IV.

## ◆ Limitations

- ◆ In many countries, neuropaediatrics as a specialty does not exist; children with neurological problems are seen by neurologists or paediatricians with a special interest in neurology. This is true not only for developing countries but also for some developed ones.
- ◆ In some countries children with neurological disorders are also seen by child psychiatrists, and these are not included.
- ◆ Because the source of information in most of the countries was the national association of neurologists, it is possible that the neuropaediatricians who are not members of these associations were not included.
- ◆ In countries where neuropaediatricians exist, information about their distribution is not available. It is possible that the majority of them are concentrated in urban areas.

## ◆ Implications

- ◆ Children form a large proportion (40% or more in many countries) of the total population. Certain neurological disorders are also unique to children. Neuropaediatricians are therefore required at the tertiary level to provide specialist care. They are also needed to provide training, support and supervision to primary health-care providers involved in the neurological care of children.
- ◆ The inequity in the number of neuropaediatricians observed across income groups, population categories and geographical areas needs to be specifically studied and tackled. Often the regions with the lowest resources are those with the greatest proportions of children and no neuropaediatricians.
- ◆ It is also important to build the capacity of paediatricians who have a special interest in neurology so that they can manage neurological diseases more effectively.



## ◆ Definitions

- ◆ This theme refers to **postgraduate specialist training in neurology** for medical graduates from a recognized institution.

## ◆ Salient Findings

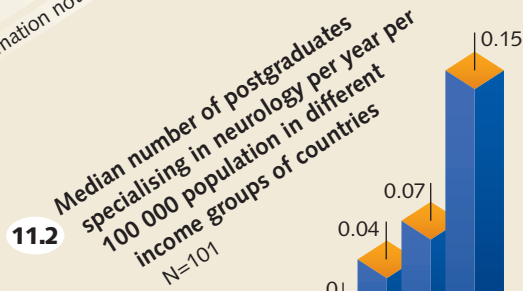
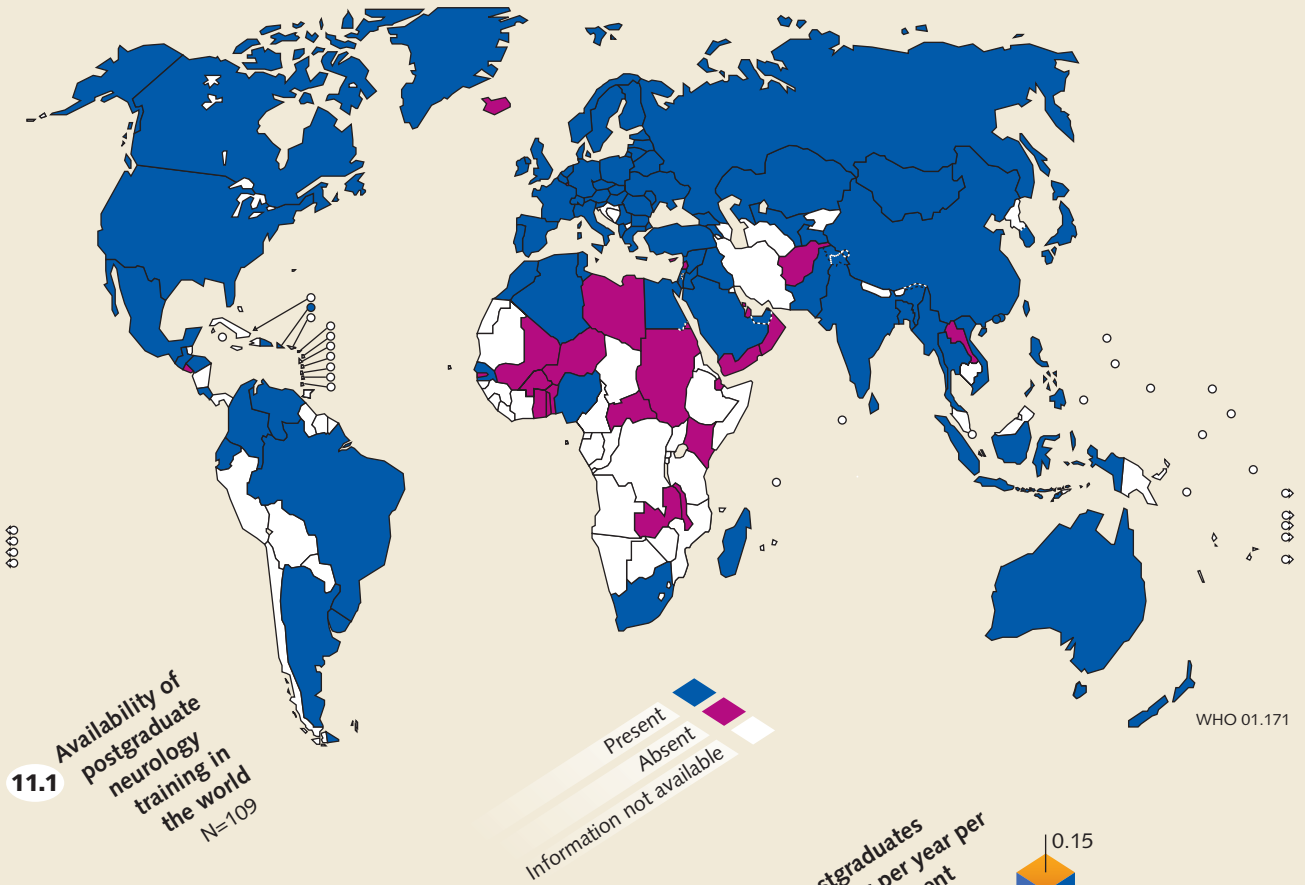
- ◆ Postgraduate training facilities in neurology are available in 76.2% of the responding countries. No facility for postgraduate training in neurology exists in 51.7% of low-income countries.
- ◆ Regionally, facilities for postgraduate training in neurology are variable. They exist in 31.3% of the responding countries in Africa and 47.4% in the Eastern Mediterranean. The facilities for postgraduate training are present in 88.9% of the responding countries in the Western Pacific, 92.9% in the Americas, 93% in Europe, and 100% in South-East Asia.
- ◆ The mean duration of training in neurology is 4.19 years (Standard Deviation (SD) 1.20). While the mean duration of training in neurology in low-income countries is 3.5 years (SD 1.3), it is 5.0 (SD 1.0) in high-income countries.
- ◆ A median number of 12 (interquartile range 5–30) students obtain a specialist degree in neurology every year in the responding countries. However, the median number of students obtaining a specialist degree in neurology every year per 100 000 population is 0.04 (interquartile range 0–0.19).
- ◆ The number of postgraduate students obtaining a specialist neurology degree per year per 100 000 population varies across different income groups of countries. The median number is 0 in low-income countries, while it is 0.15 in high-income countries.
- ◆ Regionally, the median number of postgraduate students obtaining a specialist degree in neurology per 100 000 population also varies. It is 0 in both Africa and the Eastern Mediterranean, 0.01 in South-East Asia, 0.04 in the Americas, 0.08 in the Western Pacific, and 0.20 in Europe.
- ◆ In 67.9% of the responding countries, students join postgraduate courses in neurology directly after medical graduation; in the rest, they join after a postgraduate course in internal medicine. Even in countries where students join postgraduate courses in neurology directly after medical graduation, some training in internal medicine is included in the neurology course.

## ◆ Limitations

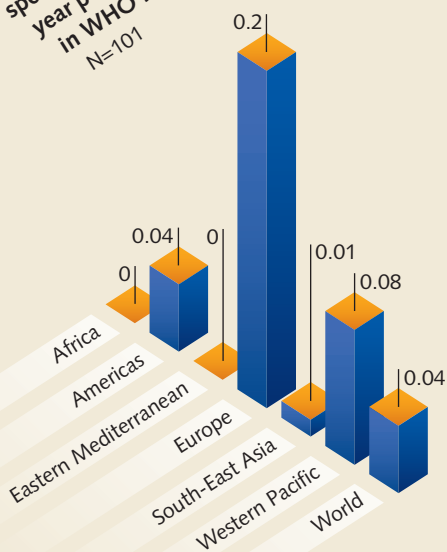
- ◆ Data regarding the structure of training or the training curriculum are not available.
- ◆ Many countries send medical personnel abroad for training in neurology. Some of these graduates do not return to their countries of origin. The figures on trained specialists, therefore, may not reflect the number of specialists who remain available to work in the country.
- ◆ Within regions also, specialists trained in one country may go and work in other countries.
- ◆ Data regarding the content of neurology courses provided in medical undergraduate and internal medicine postgraduate training curricula was not obtained.

## ◆ Implications

- ◆ Education in the field of neurology is important for the continuous improvement of the delivery of neurological care. Although training facilities are available in a large number of countries, the number of postgraduates who obtain a specialist degree is clearly inadequate.
- ◆ An important component of neurological training concerns “brain drain”, where graduates sent abroad for training do not return to practise in their countries of origin.
- ◆ Postgraduate neurological training facilities may not be needed in some smaller countries because of the high cost of establishing training facilities and the small number of trained professionals required. All regions, however, should have adequate facilities.
- ◆ A neurologist trained abroad may find it difficult to work in the home country because of differences in the epidemiology of neurological diseases as well as the availability of facilities. Thus there is a need to establish relevant training centres.
- ◆ The training content also varies, with some countries offering a greater emphasis on internal medicine as graduates join only after a specialization in internal medicine.



**11.3** Median number of postgraduates specialising in neurology per year per 100 000 population in WHO regions and the world  
N=101



**11.4** Number of postgraduates specializing in neurology per year in WHO regions

