HEALTH MANPOWER PROBLEMS IN DEVELOPING COUNTRIES
AND APPROACHES TO THEIR SOLUTION

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1. INTRODUCTION

1.1 Health manpower

There are three types of resources for any activity: human, material and financial. Of these, the human resource is the most important. Human resources are essential for the effective utilization of material and financial resources to achieve the desired goals of an activity. In order that the manpower can carry out properly the functions of an activity, education and technical training are necessary. Health manpower may therefore be described as human resource trained to engage in health activity.

1.2 Importance of health manpower planning

Health manpower planning according to Baker\(^1\) is the process of providing enough doctors, nurses and other health personnel to meet, but not exceed, future economic demands for their services. Hall\(^2\) sees the fundamental purpose of manpower study as the anticipation of a future demand for human resources at a time when decisions can still be made to meet it. Taylor\(^3\) views health manpower planning as the employment of scientific analysis to permit prediction of shortages, systematic attention to high-priority activities and rationalization of services.

As long as health technology remains at a primitive level, the social costs of inefficiency are not readily apparent. It is becoming more generally recognized, however, that the proper development of human resources requires study and planning on a nation-wide scale. In countries with a favourable manpower supply and large private sector, poor manpower planning may not seriously affect health services output and the level of health. Developing countries, on the other hand, have no such margin of safety because of their limited resources. It is, nevertheless, in the developing countries where mistakes previously experienced in developed countries are being met.

/Health manpower ...
Health manpower development in the developing countries would consequently require careful planning in order to meet the expected rise in the future demand issuing from population increase, urbanization, improved standard of living and expansion of health services.

2. HEALTH MANPOWER PROBLEMS

2.1 Health manpower shortage

Shortage, especially of physicians and nurses, is a universal phenomenon. Shortages in these categories occur in both developed and developing countries.

Despite the high ratio of health manpower to the population in the United States of America, Kippel estimates that an increase by one million of the total health manpower will be required by 1975. The American Medical Association estimates that eight allied medical categories of health manpower are needed for each physician; the total required in 1975 would be 480 000.

The increased demand in the United States of America, is ascribed to population increase, changes in the age composition (hence changes in the disease pattern), better education, increase in per capita income, urbanization and industrialization, an upsurge of all forms of health insurance and highly complex diagnostic and therapeutic procedures (Baker, Goerke, Gerber and Kissick).

Developing countries in the Western Pacific Region are faced with problems connected with health manpower shortages in one way or the other. These problems may be met partly by learning from the experience of the developed countries avoiding thereby their mistakes. Table 1 shows the numbers comprising each of the main health manpower categories among countries and territories in the Western Pacific Region.

Hiestand cites four criteria in assessing shortage of physicians in the United States which may find applicability in other countries. These are: (1) low turn-over rate in the profession after graduation
(if the demand is high, very few will change jobs); (ii) high competition for admission to medical schools; (iii) high individual income in relation to other professions; and (iv) increased immigration of foreign physicians into the country.

2.2 Health manpower distribution

In almost all countries of the world, there is a high concentration of health manpower in the large cities.

The distribution of doctors in urban and rural areas in Europe and North America has been reported above a ratio of 2.5 to 1. In less developed countries, urban concentration is higher, e.g., in Ethiopia it is 48 to 11/1. In the Republic of Korea the geographical distribution of physicians in provinces which are predominantly rural, is one for every 10,000 persons, whereas in Seoul, the ratio is 1 to 100012/.

Taylor13 reports in the Turkey survey that 61% of all doctors were working in the three big cities where 5% of the population lived, whereas only 13% of them were working in rural areas inhabited by 68% of the population.

The high concentration of physicians in urban communities has been ascribed to the following factors: (a) attraction to the cities because of the general facilities and services available; (b) better access to medical knowledge; (c) convenience afforded specialists to practice in large communities; (d) more medical care demand due to higher individual income; and (e) city dwellers tend to consult more outside of the family physician.

Urban and rural demands for medical care vary according to country. Hall14 reports that Lima residents averaged fourteen times more visits per caput than residents of small communities. Baker's study in China (Taiwan), on the other hand, showed that physician visits per caput per year was 6.0 in the rural areas as against 3.6 in the cities; he reasoned that when high morbidity rates in rural areas were associated, as in Taiwan, with a better distribution of doctors, better economic condition /and a good ...
and a good transportation system, the rates of doctor usage in rural areas tended to be high.15/

2.3 Ratios between categories of the health manpower

It is now generally recognized that while physicians alone can perform certain health care functions, others can be undertaken by other categories just as well.

An index of the imbalance in the distribution of manpower categories in the developing countries is the higher ratio of physicians as against the lower ratio of nurses to the population. In some countries, e.g., China (Taiwan), Peru and Turkey, there are less nurses than physicians; this implies that certain health care services normally undertaken by nurses are performed by physicians.

2.4 Medical specialization

The trend for specialization in the medical and paramedical fields is world-wide. Functions originally done by the nurse are now being absorbed by allied professionals such as dietician, medical social worker, registered medical record librarian, recreation therapist, physical therapist, occupational therapist, operating room technicians, medical assistant, etc.

Gerber16/ observes that although medical education in the United States has recognized the importance of family doctors the educational programmes have not been sufficiently oriented to encourage general practitioner training. Of the 31,000 hospital residents in the United States under training in 1965, only 377 were in general practice.

Contrasting ratios may be observed between the general practitioner and the specialist in two groups of countries with different medical care systems. In countries with a national comprehensive medical care system (national health insurance schemes such as Norway, Sweden, United Kingdom and West Germany), the general practitioner serving as family doctor comprises about fifty per cent. of the total number of physicians. In countries having free medical care, such as the United States of America, Peru and Turkey, ...
Peru and Turkey, the specialist comprises the majority. An illustration of this contrast may be seen in Table 2.

It is interesting to note in the Turkey survey \(^{17,18}\) and from the observation of Gershon-Cohen \(^{19}\) that majority of the illnesses can be handled by the general practitioner, while only a small percentage of these illnesses need to be referred to the specialist.

In general, young medical graduates seek specialization for social and economic reasons including professional satisfaction, higher social status, higher monetary reward and public acceptance. On the other hand, measures calculated to attract young medical graduates for general practice should include: (a) changes in the medical curricula which would stress the patient apart from the disease (such as the inculcation of better appreciation of the physical, biological and cultural factors in the community and the teaching of the physician's responsibility in the maintenance and promotion of individual and family health); (b) establishment of a residency and board speciality for general practice; (c) adoption of national comprehensive health care programmes (which would help regulate the numbers engaged in general practice and the specialities according to the demand).

2.5 Utilization and productivity of the health manpower

Utilization of health manpower refers to the degree of effectiveness of the service of particular health workers as viewed from their functions and training. Productivity may be translated in terms of the health service output of a particular category per time unit.

Differences in the utilization of physician visits and hospital care have been observed in the cases of China (Taiwan), Peru and Turkey. The low utilization rate for hospital beds and high utilization rate for physician visits in Taiwan contrasts with the findings in Peru and Turkey. Factors to explain the situation in Taiwan are better access to medical care of the rural population, and the relatively better and more equitable individual income distribution. Another possible contributing factor is...
the greater emphasis given to high output and low cost ambulatory care in Taiwan instead of the more expensive hospital care.

Selected indices of hospital bed productivity may be cited in the experience of Peru during 1964. The bed occupancy rates in both public and private sectors were considerably below the generally accepted standard of 75% to 85%, depending upon hospital size. The short-stay bed discharge rate per year (16) is particularly indicative of low hospital bed productivity. The overall average of 14 discharges per bed-year if increased to the planning target of 20, would be equivalent to adding almost 13,000 additional beds operating in 1964 which would give a capital savings in cost of about $150 million in new constructions.

The time analysis in the functions of nurses and other health workers in health stations in Taiwan show that 30% of the working time of the average nurse was spent on non-professional jobs, such as statistical tabulation, preparing reports, etc., while other untrained health workers spent 20% of their time to nursing care. The under-utilization of professionals invites the assignment of new duties not necessarily compatible with their training. Over-utilization of professionals for functions which can be delegated to other health personnel under their direction tends to reduce the degree of their productivity.

### 2.6 Professionals and auxiliaries

Wright views the ideal structure of a country health manpower supply as being roughly like a pyramid in which a relatively small number of highly trained professionals are supported by a larger number of middle-level health workers, who in turn, rest on a still larger base of trained auxiliaries and other personnel. In many developing countries, the health manpower supply assumes the shape of an hourglass where there is a relatively abundant number of high and low level manpower and scarcity of manpower at the middle level (Figure 1).

/In the hourglass ...
In the hourglass pattern, medical care services are undertaken either by highly trained professionals or by the auxiliaries; the average consequence is low health services output and quality. For example, the shortage of technicians in hospitals in Peru was observed by Hall\(^22\) to contribute to longer hospitalization; lacking laboratory and radiological services, many hospitals were obliged to admit a large number of patients without preliminary assessment which could have been done on an ambulatory basis.

2.7 Brain drain

The brain drain may take place between developed countries, from developing to developed countries, and between developing countries.

The main problem of the brain drain lies in the fact that developing countries particularly are deprived of skilled manpower to provide the services and to assist in national development after a substantial amount of usually scarce resources have been spent for their education and training.

In the study of the PAHO Sub-committee on Migration\(^23\) the causes ascribed to the inflow to the United States of America of highly trained health manpower from Latin America were: (a) the lower level of professional and economic level in the home country; (b) political instability at home; and (c) better facilities for training and earning in the United States of America.

Adams and Dirlam\(^24\) have suggested the following measures to help control the brain drain: (a) raising salaries (citing that a 20% salary increase in one developed country would reduce emigration of its citizens to the United States of America to a "mere trickle"); (b) revising the salary structure (e.g., in Africa, highly trained professionals move to other occupations offering more promising returns); (c) increasing professional opportunities (suggesting that a country's traditional policy on and attitudes to the various professions should be modified to conform to its needs for socio-economic expansion and growth); and (d) re-structuring investments in education and rationalizing manpower policies ...
policies (i.e., supply must be adjusted to demand and, hence, investment decisions on the manpower capital must be made in the light of the effective demand as distinct from other needs).

3. APPROACHES TO THE SOLUTION OF HEALTH MANPOWER PROBLEMS

3.1 Health manpower planning as a component of national health planning

A health manpower unit should be part of the National Health Planning Office in the Ministry of Health. The unit's functions should be to carry out routine data collection, analyses of the current health manpower supply and demand, projection of the supply and demand, and to plan for health manpower development as part of the overall rational health planning exercise. In many countries national health planning is undertaken within the frame of the national socio-economic development plan.

3.2 Ensuring availability of vital and health statistics data

The establishment of registration and reporting systems is a fundamental prerequisite not only for routine data collection and evaluation of the health services but for undertaking health manpower analysis.

The collection of data should include, apart from vital events, information on the outputs of health services, the actual health manpower in the public and private sectors and the existing teaching institutions for the different categories of health manpower.

The registration system should provide for inclusion of the different health manpower categories. Information on vital events would include births, marriages, morbidity and deaths.

3.3 Supply and demand projection and its balancing

Methods for projecting the country health manpower supply and demand should be developed depending upon the data available. The feasibility of undertaking a national health manpower census or the conducting of household surveys on health in the country may be explored.

/There are ...
There are two types of demand; viz., "met demand" and "unmet demand". The former exists when the demand is satisfied by the existing supply; the latter, when the demand cannot be met by the existing supply.

3.3.1 **Balancing supply and demand where supply is short**

Cited below are possible approaches for balancing the supply and demand in the existence of supply shortage.

3.3.1.1 **Better utilization and increasing the productivity of the existing health manpower**

It is both practical and convenient for developing countries having limited human, material and financial resources to increase the productivity and utilization of their health manpower rather than to increase the supply. Gerber\(^{25}\), suggests three ways of increasing productivity and utilization, viz.:

1. **More use of paramedical professionals and auxiliaries**

   There is more thought being given to the re-assessment of the present pattern of rendering medical services with particular reference to the functioning of the various categories of the health manpower.

   Medical care output can be increased by delegating routine jobs to auxiliaries leaving physicians to purely professional activities. Based on the Turkey study, Taylor\(^{26}\) noted that the greatest hidden resource in health manpower planning is by increasing the utilization and productivity of the manpower especially by establishing a rational balance in the functioning of professionals and auxiliaries. In other words, professionals should perform work which only professionals can do and leave all routine activities to auxiliaries.

   Silver\(^{27}\) has reported a paediatric nurse-practitioner programme utilizing nurses for the provision of comprehensive care to well children in the offices of private paediatricians, and identifying, appraising, and temporarily managing certain acute and chronic conditions of the sick child: this procedure has resulted in improved patient care and the more efficient and ...
efficient and effective use of the skills and time of both the physician and the nurse.

The functions being carried out by the medical assistant\textsuperscript{28, 29/}, assistant medical officer\textsuperscript{30/} and feldsher\textsuperscript{31/} have been stressed in many quarters as having helped physicians increase their services output.

(2) Automation in medical practice

Services output can be increased by automated systems when feasible. Automation will undoubtedly find important application in the technical, research and administrative aspects of medicine, although it may still be a long way off for the use of the private practitioner. Automated analysis of various laboratory examinations and computerization of medical records will certainly promote savings in manpower in the operation of medical care systems.

(3) Reorganization of medical care facilities

Visible almost everywhere is the duplication of medical facilities (e.g., X-ray, ECG and other laboratory facilities within a circumscribal geographic area), which is uneconomical and contributes therefore to the wastage of resources. Pooling of medical care facilities may not only reduce costs in a hospital service but also promote better diagnosis by the employment of fewer but better qualified personnel.

One of the more significant developments of medical practice in the developed countries has been the rapid growth of group clinics. These clinics appeal to patients and to doctors alike because of the pooling of medical talent and resources and the sharing of personnel and expenses. Multi-specialty group clinics, providing comprehensive health care may be medicine's best answer to the declining use of the family doctor in some developing countries.

3.3.1.2 Increasing actual supply by reducing manpower losses

The second approach for balancing supply and demand is to reduce the losses without necessarily increasing the estimated supply. This measure is economically more reasonable than producing more but losing more, as
may be observed in some developing countries in the Region. Three ways
of reducing losses are (a) preventing young graduates from going abroad;
(b) preventing young graduates from becoming "inactive" or changing the
fields of their occupation; and (c) encouraging returning or inactive
professionals to practice their professions. Hiestand\(^{32}\) has reported
that nearly half of the trained nurses are not employed; many of them
do not work because incentives are not sufficient and hospitals and
other employers are unwilling to make adjustments in their working
hours to accommodate part-time workers.

The drop-out rates for nurses and midwives in the developing countries
of this Region are quite high\(^{33}\). Health authorities may be able to attract
them back by offering incentives such as higher pay, part-time employment,
and more opportunities for job satisfaction.

3.3.1.3 Increasing the supply

In the presence of marked supply shortage the first and second
approaches may be insufficient. In such a situation the supply may be
increased by: (a) reducing the drop-out rates in the schools and improving
the retention rate of students; (b) increasing the number of students per
class; and (c) increasing the number of schools. In the Turkey study
Taylor\(^{34}\) reported that of the 7006 students admitted to medical schools,
only 55% graduated; the drop-out rate was 44.3% of all admissions; only
23.7% of the registered students graduated from the prescribed six years,
while 58% required more than six years of study to graduate and of the
latter, 10% took more than ten years to graduate.

It seems apparent that the simpler and more economical way of
increasing the supply of doctors is to eliminate unnecessary waste of
school resources through strict screening of candidates for admission
to medical schools and improvement of the medical curriculum. Increasing
the enrollment per class, provided the quality of teaching is not sacrificed,
is more economical than establishing a new school. Schools should be
encouraged to increase enrollments provided that additional teaching posts
and facilities are also made.
3.3.2 Balancing supply and demand when there is surplus supply

In principle, demand can generate supply, hence the supply will increase if the demand is increased. Over-supply occurs when demand rises slowly or when the demand drops suddenly because of changes in government policy. Over-supply may also arise as a result of unplanned educational expansion which may be observed in some developing countries. Three approaches as indicated below may be employed to balance supply and demand.

3.3.2.1 Reducing the supply

Reduction in the supply may be accomplished through limiting enrollment per class or reducing the number of schools. In limiting the supply output, schools with poor teaching facilities but having large enrollments require priority attention.

Education authorities have to set up standards and requirements for professional schools as bases for screening the good from poor quality schools.

3.3.2.2 Increasing the demand in the presence of surplus supply

In principle, the demand for services increases with the rise of living standards and where the services are made more accessible to the population. Sometimes an existing demand for professional services may be met by less qualified personnel due to lack of legislative or regulatory measures or because incentives are lacking on the part of professionals to meet the existing demand.

While increased living standards can result only from economic growth, national programmes for health services expansion in the periphery can be stimulated in the private sector if this is accompanied by improvements in the national infrastructure (e.g., roads and communications). Opportunities for attracting the inactive health manpower to return to practice would be promoted by regulations governing enforcement of qualifications requirements as a condition for licensing to professional practice thus eliminating competition from the unqualified. Another
means would be the organization of courses for the re-training of the health manpower in new fields or areas where the demand may be on the rise.

3.3.2.3 Reducing the manpower supply by permitting losses

The supply may be reduced through emigration or by instituting strict qualifying requirements.

Brain drain is not always an economic loss. In Turkey, $70 million were sent home in 1965 by Turkish health workers working overseas; this amount was equal to 15.2% of the nation's export earnings or 12.1% of its import bills. While exportation of the manpower should not be the aim of planning, it nevertheless may be considered where there is an over-supply. Although national board examinations screen out poor quality graduates in situations where training standards vary widely, it is better policy to screen out candidates before enrollment rather than weed them out after they graduate.

3.4 Need for innovation in medical and paramedical education

In his book entitled "The Crisis in Medical Education", Evans has drawn attention to the transitional phase of contemporary medicine because of the rapid advances being made.

The aims and content of medical education would need a review and new orientation. The excellent curricula on the sciences and biological knowledge need to be complemented by introducing to existing department of the behavioural sciences. If the patient is to be regarded in the broad context of his social, cultural and biological make-up, the medical student's education should make him aware of the behavioural characteristics of man during his growth and development. The student should also be acquainted with the milieu in which people live and become ill and man's relationships with another human being, including the impelling spirit that sets him apart from other creatures.

The objectives of medical education, particularly in a developing country, should be directed towards meeting the health needs of its people and ...
people and consequently medical graduates should be familiar with and be able to cope with the health and medical problems that exist. A basic issue in medical education is whether to train the student for capability to render a reasonable quality of medical care to most of the people or to prepare him for the sophisticated care of only a small group of the country's population.

Another paramount contemporary issue is the changing nature and roles of the professional worker. The health professions are in the process of functional flux or evolution and the probability of changes must be recognized in the individual professions. Kissick has observed that complementary to establishing career mobility as an approach to effective utilization of the manpower is the downward transfer of functions resulting frequently in the creation of new disciplines; e.g., courses for "medical emergency technicians" at the Ohio State University; courses for "physician assistants" at Duke University; courses for "paediatric public health nursing practitioners" at the University of Colorado; and courses for "unit managers" at the University of Florida.

It is therefore incumbent upon medical and paramedical educators and administrators to re-evaluate the functioning of the various services and to consider means of meeting the manpower required including the creation of new disciplines best able to meet new needs.

3.5 Research in health manpower development and planning

Manpower research deals in the main with the economics of supply, demand and utilization. It also deals with non-monetary factors as well as motivations and institutional forces. Consequently, manpower research involves management, education, training, psychology, economics and sociology.

Research can be undertaken in three areas: (a) supply and demand, including the various factors and institutions influencing the development of potential and actual workers; (b) the utilization of workers, i.e., the particular duties which workers of different occupations perform and the
ways these duties change as a result of other changes in the economy, technology and society; and finally (c) medical and paramedical education.

3.5.1 Supply and demand

Demand and supply change over time. The former is influenced by the health and socio-economic condition of the population, advances in medicine and government action as regards the introduction of new medical services and/or their financing. New patterns of medical organization come into being as new technology is developed and new types of personnel are trained.

The aims of research in regards to demand according to Feldstein are: (a) to identify and estimate the relationships between the use of a product or service and the factors influencing its use and (b) to predict future demand. Since these influencing factors vary from country to country, the relationships between the variables and influencing factors should be clarified in each country.

Many reports have been concerned with the shortage of health manpower, especially the physician and the nurse. "Shortage" often has meaning primarily in relation to the norm and value systems of those in the leadership of each particular profession. Professional leaders use a variety of terms: minimum standards, necessary levels of care, desirable staffing practice or optimum standards. From the economist's point of view, shortage indicates a discrepancy between the actual level of manpower supply and that which is desired, given the existing structure and level of demands for service and health manpower. The primary problem is the lack of the means to evaluate the shortage and to assess its significance. One of the more important areas for health manpower study is to assess shortage scientifically.

Another area for study is to determine the underlying factors contributing to professional inactivity and the causes of emigration of some of the health manpower categories. Disclosure of the factors may lead to the formulation of administrative remedies which can help ensure /better manpower...
better manpower utilization and preventing their loss. Retirement of the health manpower in the private sector is usually based on assumptions or opinions; surveys will help throw light on why, how and when private physicians or other professionals in the private sector retire from active practice.

3.5.2 Utilization of the health manpower

The extent and means by which health manpower is utilized have a bearing on his choice to be inactive or to seek other occupations. To the extent that improved utilization increases the efficiency of an organization and the economy, the quantity and quality of services would also be raised. Necessary expenditures to help increase and improve staff performance may thus be made.

Most of the information available on utilization practices are really in the realm of opinion rather than established by research.

By looking at the contents of the activities of workers in their various tasks during a period of time it would be possible to assess whether other types of workers can perform those tasks more economically and satisfactorily. One realizes that major problems in making such assessments may be due to inadequate organization and supervision. Another apparently pervasive factor complicating such assessment is the frequent discrepancy between the training received and the functions being performed.
### TABLE 1 - POPULATION/HEALTH PERSONNEL RATIOS IN COUNTRIES AND TERRITORIES OF THE WHO WESTERN PACIFIC REGION (1967)

<table>
<thead>
<tr>
<th>Country or Territory</th>
<th>Population per physician</th>
<th>Rank-</th>
<th>Population per dentist</th>
<th>Rank-</th>
<th>Population per pharmacist</th>
<th>Rank-</th>
<th>Population per nursing personnel</th>
<th>Rank-</th>
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<td>1</td>
<td>3 350</td>
<td>4</td>
<td>1 309</td>
<td>2</td>
<td>150</td>
<td>1</td>
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<td>1</td>
<td>3 020</td>
<td>2</td>
<td>1 280</td>
<td>1</td>
<td>190</td>
<td>2</td>
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<tr>
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<td>1</td>
<td>1 700</td>
<td>4</td>
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<td>4</td>
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<td>8</td>
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<td>17</td>
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<td>Laos</td>
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<td>919 670</td>
<td>18</td>
<td>344 880</td>
<td>17</td>
<td>4 460</td>
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</table>

*Only 1966 data available.

**Only 1965 data available.

<table>
<thead>
<tr>
<th>Specialty</th>
<th>General Practitioner (%)</th>
<th>Clinical Specialist (%)</th>
<th>Others (%)</th>
<th>Total (%)</th>
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<tbody>
<tr>
<td>United States</td>
<td>24.6%</td>
<td>70.1%</td>
<td>5.3%</td>
<td>100.00%</td>
</tr>
<tr>
<td>of America(^a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey(^b)</td>
<td>24.1%</td>
<td>65.5%</td>
<td>10.4%</td>
<td>100.00%</td>
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<tr>
<td>Peru(^c)</td>
<td>27.4%</td>
<td>64.6%</td>
<td>8.0%</td>
<td>100.00%</td>
</tr>
<tr>
<td>West Germany(^d)</td>
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<td>39.7%</td>
<td>9.1%</td>
<td>100.00%</td>
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<tr>
<td>Norway(^d)</td>
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<td>40.2%</td>
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<tr>
<td>Sweden(^d)</td>
<td>54.1%</td>
<td>39.6%</td>
<td>6.3%</td>
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<tr>
<td>United Kingdom(^d)</td>
<td>48.5%</td>
<td>46.3%</td>
<td>5.2%</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Sources:

CLASSIFICATIONS OF HEALTH MANPOWER

1. Professional - health workers with bachelors degree or above, such as physicians, dentists, pharmacists, registered nurses, and medical technologists and sanitary engineers, etc.

2. Technical - health workers with educational background of junior college or vocational schools who work under the supervision of professionals, such as doctor's assistants, dental hygienists, laboratory technicians, assistant pharmacists, practical nurses, etc.

3. Auxiliary - health workers with a short-time training course who pursue simple unskilled or semi-skilled work under the supervision of professionals and technicians, such as nursing aides, laboratory helpers, special project workers.

REFERENCES


13. Taylor, C.E. et al. (1968) Health Manpower Planning in Turkey, Chapter 3, p. 51, Table 3-16.


17. Taylor, C.E. et al. (1968) Health Manpower Planning in Turkey, Chapter 3, Table 3-19, p. 53.


38. Ibid., p. 87.