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TOWARDS AN APPROPRIATE HEALTH CARE TECHNOLOGY

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It has taken many years for today's industrialized countries to advance to their present state. Not surprisingly, the countries of Africa, Asia and Latin America also aspire to create technologically advanced societies. Clearly, this task ought more easily to be accomplished now than in any earlier period, the major reason being the existence of the sophisticated technologies which are flowing from the advances in science to be seen in Europe and North America. It would seem to be a relatively simple matter for countries in the Third World to utilize already existing techniques, many of them highly productive, for purposes of development.

Unfortunately, the mere existence of advanced techniques does not assure the possibility of their application to the problems of developing countries. The technologies which are being developed and utilized in the advanced countries are, as would be expected, suitable for the resource base of those countries. Many of them require a relatively abundant supply of capital, and a scarcity of labour is generally assumed. By contrast, virtually all developing countries are suffering from severe shortages of capital and a vast oversupply of available labour, particularly of the unskilled variety. What is required in countries of the latter kind is a technology designed to take advantage of their large supplies of labour and to minimize the need to draw upon their scarce pool of available capital.

Just as the new technologies of Europe or North America are likely to have only limited applicability to the problems of the Sudan or Malaysia, so too with many of the exciting new discoveries in the various areas of pure scientific research now being carried out in

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the industrialized countries. Because 98 per cent of all research and development activity is being carried out in the developed countries and only two per cent in the developing countries (excluding the Socialist countries from the calculation), the developed countries must inevitably determine the 'frontiers of science' on which scientific workers will prefer to be engaged. And, just as inevitably, the frontier problems which will be of interest to scientific workers in developed countries will be those that stem from the socio-economic conditions of those countries. As such, they will be of only limited usefulness in those parts of the world with very different socio-economic conditions.

All of this is not to argue that new scientific and technological advances have no relevance to the situation of developing countries, at least in the long run; however, it is fair to say that their usefulness - particularly in the short run - is likely to be limited. One important proviso to the above is the possibility of creating new technologies (or reviving old ones) which are specifically geared to the resources and capabilities of the less developed countries. Most important in this respect is the need to adapt existing knowledge in the interests of development.

One important technological area in which sufficient knowledge either already exists or need only be adapted for specific conditions is that of medical care. The conditions of morbidity and mortality in developing countries are such that no new medical discoveries are necessary in order to reduce the incidence of disease and death to orders of magnitude which may be only a quarter (eg., infant mortality) or even a tenth (eg., childhood mortality) of their present levels.

There exists increasing agreement among those connected with the 'creation' and 'delivery' of health care that future improvements in these areas will be achieved primarily through innovations in health delivery systems in both developed and developing countries. Although many of these necessary innovations could only be accomplished in conjunction with very far-reaching social, economic and political change, very many others could be accomplished even in the absence of sweeping reforms. There would be need for changes and adjustments, in any event, but none need be totally unacceptable to existing political, social, economic, professional or bureaucratic interests. Any proposals designed to reorientate as complex a system as that employed for the delivery of health care must inevitably meet with numerous resistances, but there is no reason to assume that these obstacles cannot be overcome.

The concept of an appropriate technology for health care recognizes that all countries are subject to limitations in their ability to provide care. No country in the world makes available, or can make available, all of the existing, most advanced medical techniques to all of its citizens. Even in those countries in which access to care is most equitable, such as the Soviet Union and the United Kingdom, there are still differences in the treatment available to, say, those who live in London or in Moscow and those in the far reaches

of Scotland or Siberia. The answers to the problems of developing improved health care systems are not to be found, either, simply in the expenditure of larger and larger sums for health purposes. The example of the United States, with its vast expenditure on health care and relatively poor morbidity and mortality statistics, is evidence of this.

The realization that unlimited health care cannot be achieved even in highly industrialized countries has given support to the concept of an appropriate, intermediate health care technology. This concept is even more suitable in countries which may be spending as little as a hundredth part of the amount being spent in Britain for the health care of each inhabitant.

Appropriate technologies are intermediate in nature; that is, they will fall somewhere in the midst of those which use most capital, those which use most skilled manpower, those which are most difficult to maintain, and those which are completely traditional in character. This very wide range of possibilities must be narrowed down in keeping with the requirements of individual countries at specific times. Clearly, what is a suitable intermediate technology for Britain will not be so for Nigeria.

Intermediate health care technologies in developing countries will take advantage of the supply of labour available and conserve capital. One particularly important by-product of such an approach will be to help decrease the catastrophic political, social and economic effects which very high levels of unemployment are having on developing countries.

HEALTH PLANNING IN DEVELOPING COUNTRIES

There are three basic reasons why planning for health care must be radically different in rich and in poor countries.

First there are the different levels of resources - money as well as skilled manpower - available to rich and to poor countries.

In 1969 the United Kingdom spent about £40 per head of population to keep its National Health Service operating. The United States spent almost £125 per head for health services in that same year. By contrast, Ethiopia spend around 20p for the health care of each of its 22 million people. The expenditure for health in Britain represented about five per cent of the country's Gross National Product. Ethiopia's expenditure represented perhaps 0.6 per cent of its GNP. Even if the Ethiopian expenditure for health care were to be multiplied to a figure equivalent to Britain's, the total outlay would then only be around £1.25 per head.

Differences in the availability of financial resources are also reflected in the statistics for hospital beds in rich and poor countries. While there are 10 beds for every 1000 of the population in the United Kingdom, there are fewer than two per 1000 in Mexico and only 0.4 per 1000 in India.

The disparity in the number of available medical workers is no less great. In the United Kingdom there is one doctor for every 860 people, but there is one for each 5000 in India, one for each 13,000 in Haiti, and only one for every 30,000 in Nigeria. Also to be taken into account is the fact that doctors are much more evenly spread, relative to population, in a country like Britain than they are in such countries as India, Haiti or Nigeria.

A second basic reason for the need for different types of health planning in rich and poor countries is the differing structure and location of their populations. In a developing country a third of the population will be under 10 years of age - two or even three times the percentage to be found in most industrialized countries. Another basic factor will be their rates of increase. In most wealthier countries population is increasing at between 0.5 per cent and two per cent per annum. In developing countries the increase is more likely to be nearer 2.5 per cent or even three per cent.

Distribution of population is also very different in developed and developing countries. Rural areas are likely to hold 50 per cent to 90 per cent of the population of developing countries, but in the United Kingdom only 5 per cent and in the United States only 10 per cent of the population is classified as rural. In addition, the rapid rate of urbanization in poor countries presents special problems. With urban areas increasing at around 6 to 8 per cent a year, the growth of shanty towns is of particular importance.

The third basic reason for approaching health planning differently in rich and poor countries is the drastic difference between existing disease patterns in the two types of nation. In the developing countries there are so many children, and their disease patterns are so inadequately cared for, that half or more of all deaths occur among children under five. In the United States, by contrast, over half of all deaths are caused by diseases of the heart and blood vessels, primarily among people between 50 and 70 years old.

In developing countries infant mortality (0 to 1 year) may be four or more times as high as in industrialized countries, whereas childhood mortality (1 to 4 years) may be more than 40 times as high. Children in poor countries typically die from diarrhoea, pneumonia and malnutrition. The diseases of the developing countries are largely those of poverty.

Resources: Facilities

How then should a country with perhaps 50p a head to spend on the health care of its population (a not untypical figure) ultilize its limited financial resources?

In rich countries the focus of health care has been shifting gradually away from the family doctor/general practitioner to the hospital and hospital-based specialist. This process has not been an easy one and its desirability has been called into question. Desirable or not,

it must be recognized that the massive shift to hospital-based medical care is of fairly recent origin and coincides with other aspects of change associated with economic development.

In most low-income countries the same sort of hospital-based medical care systems are being established, or at least attempts are being made to establish them. However, in the absence of substantial economic development, such hospital-based systems are making impossible the spread of essential health services to the mass of the population. It is not unusual for the capital costs of a large city or regional teaching hospital in Africa to be greater than the entire annual health budget of the country. The cost per bed in such circumstances may very well run upwards of £5000, and that in countries with incomes as low as £30 per head of population.

In principle, teaching hospitals in the capital city function not only as the teaching base for the medical school (as well as being a centre of research) but also as the peak of a medical care referral system. That is, patients from all parts of the country are sent upwards along a health care chain which starts with aid stations or dispensaries or health centres, then moves up through rural and district hospitals, and finally ends with the capital city teaching hospital. Hospital-based medical care and the hospital referral system are, however, likely to work only to a very limited extent. For instance, in Ghana it is estimated that fully two-thirds of the population are not effectively covered by government curative health services, which are primarily available only at hospitals. The inadequacy of the hospital-based referral system may be illustrated by data drawn from the Mulago Hospital in the Uganda capital of Kampala.[1] In 1964, of all admissions to Mulago, 93 per cent came from the Mengo District in which Kampala is located; even if we exclude obstetrics and gynaecological admissions, 98 per cent of which were from Mengo, the figure only comes down to 88 per cent. Clearly then, Mulago Hospital - at least in its curative work - is primarily serving as a district hospital. The same is true of most others of its kind. They are not truly national health centres.

Rural and district hospitals need not be as expensive as teaching hospitals. A bed in a teaching hospital in Africa will cost about £5000, and a bed in a district hospital perhaps £2000. A rural hospital bed will generally cost half to three-quarters of that figure, and sometimes even less than half.

The cost of equipping and running hospitals are related to their capital costs. But the larger, more expensive hospital will not only have a higher running cost owing to its size, the cost will also be proportionately higher than for the small institution. One major reason for this is that a teaching hospital will have more specialists on its staff, more general duty doctors, more registered nurses, and so on, than a district hospital, and a district hospital in turn

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[1] P.J.S. Hamilton and A. Anderson: An Analysis of Basic Data on Admissions in 1963 and 1964 to Mulago Hospital, Kampala.

will have more than a rural hospital. The more capital-intensive a hospital is, the more skill-intensive it is likely to be.

Poor countries (if not rich ones as well) concerned with reaching the whole of their population with a health service must find an alternative to a system which depends upon hospital beds costing from £1000 to £5000 'or more' each. That alternative is a health delivery system which reaches the population at the lowest possible level. The accepted way of reaching a large rural population is through the health centre with its outlying aid stations or dispensaries. The health centre aims to provide the entire health requirements of a family except those which can only be provided in a hospital. A health centre in Africa can be built for somewhere around £20,000 - the cost of four beds in a teaching hospital - and can provide most of the health care requirements for roughly 20,000 people. In a country such as Zambia, 250 health centres, enough for the entire population, could be built at the cost of the new teaching hospital in Lusaka.[2] The recurrent costs of such a health centre are not likely to be more than £10,000 a year, or 50p for each of the 20,000 people covered by the centre. Thus a country with only 50p per capita to spend for health care could still provide basic health care services for its entire population.

Properly staffed, a health centre can supply at little cost much of the medical care required by the people of a developing country. This is because so many of the diseases from which these people suffer are what might well be termed 'health centre diseases': conditions which health centres are particularly well able to prevent or treat. Typical functions might include the prevention through immunization of measles (one of the most important killing diseases in many developing countries), tuberculosis, poliomyelitis, smallpox and whooping cough, and, through the health education of mothers, the prevention of the widely prevalent malnutrition in childhood. Most cases of many common diseases can also be readily treated in these centres; among them are leprosy, tuberculosis, pneumonia, gonorrhoea, diarrhoea and dehydration (especially in childhood), malaria and hookworm infection. Health centres can provide family planning services, antenatal care, care of the normal delivery, child welfare facilities, school clinics, advice on environmental sanitation, and curative clinics for a wide range of important diseases. Health centres do not have operating theatres, X-ray plants, or more than minimal laboratory services, nor can they provide a doctor's opinion, so one case in 100 has to be referred to a district hospital; common among such cases are the abnormalities of labour and the consequences of trauma, particularly from accidents on the road. A district hospital in its turn has to refer about one per cent of its cases to a regional or national hospital for specialist opinion or special facilities.

This account of health centre services is, of course, oversimplified in that it assumes an evenly (and conveniently) spread popu-

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[2] M.H. King: A Teaching Hospital for a Developing Country.

lation so that each health centre can cover its required number of people. Many countries, however, have very low population densities with people either scattered in small villages or perhaps even nomadic. Such situations are usually best met with systems of aid stations and mobile clinics run from health centres.

Assuming that the generalized health centre service does cover a country fairly well, it is still necessary to provide certain specialized hospital services in addition; these necessary services do not include radiotherapy, neurosurgery, cardiac surgery, artificial kidneys and organ transplantation.

The kind of hospital services required in poor countries must be provided in what are usually known as district hospitals, even if such hospitals have to be built in large cities where a number of them can be located in order to provide sufficient scope for teaching and many research purposes. A crude 'guestimate' would indicate that for 50p per head it would be possible to run a network of such hospitals so as to cover an entire population. However, this would mean spending £1 per person (50p for health centres plus 50p for hospital services) for health care instead of the 50p now being spent generally in Africa or Asia. The choice would then be either to reduce health centre or hospital coverage, or to raise expenditure on the health services. For a country with a per capita income of, say, £40 to spend £1 per head or 2.5 per cent of the nation's GNP would not be unreasonable for health expenditure. (Developed countries spend twice that figure, and underdeveloped countries are spending considerably more on, for example, education.)

Resources: Manpower

The kind of facilities employed for delivering health care are critical in determining the type of manpower employed. Large capital city hospitals, of the type discussed earlier, require specialist and other highly qualified manpower if they are to do their proper jobs, namely, specialized medical research, teaching of highly qualified manpower, and the care of patients suffering from the 0.1 per cent of health problems which cannot be handled adequately in smaller, simpler institutions. In many developing countries there is not sufficient staff to man the existing large hospital facilities. Ethiopia, for example, has built a large new hospital for teaching purposes without any immediate prospects of staffing it. In this connection it is worth noting that in Africa the number of doctors per head of population actually declined between 1962 and 1965, as a study of two groups of 13 francophone and 13 anglophone countries has shown.[3] In 1965, among these countries, there were three with one native born doctor for less than 20,000 inhabitants, nine with one to 20,000 to 50,000, eleven with one to 100,000 and more, and two countries with not one indigenous doctor at all.

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[3] J. Vysohlid (1968): Health Manpower in the African Region. Economic Commission for Africa Working Party on Manpower and Training, Addis Ababa. UN Economic and Social Council (mimeo E/CN 14/WP 6/19).

These figures, however, do not show the real situation because of the concentration of medical personnel in the capital cities. In eleven African francophone countries in 1965, about 60 per cent of the indigenous and 50 per cent of the expatriate doctors were located in the capital cities.

Health centres, in contrast to hospitals, can be operated by a variety of men and women with middle level skills, even in the virtual absence of anyone with a university education. The variety and scope of auxiliaries, as well as paramedical staff, has been outlined elsewhere.[4] Here it will suffice to say that, in general, the various types of auxiliaries make up a skill continuum which extends from those with very little education and training (say, six years of schooling and virtually no training) to those with complete secondary education plus a number of years of training.

Paramedical staff should not be confused with auxiliaries; they include registered nurses, pharmacists, laboratory technicians, health inspectors and other staff who are fully qualified professionals. They usually do not, however, have the university education required of doctors, although their international status is usually recognized.

The medical assistant is the key auxiliary. He is the major provider of primary medical care in many African and Asian countries. For example, in Kordofan Province in the Sudan there were 2.1 million inhabitants in 1969. This population was served by 36 doctors located in 12 hospitals; there were also 81 medical assistants in 81 dispensaries, and 126 qualified nurses in 126 dressing stations. It is these medical assistants and qualified nurses who were providing the bulk of the health care for the people of Kordofan Province.

At present the Sudanese medical school in Khartoum is producing 30 graduates per year. It is proposed to raise that number to 160 by 1975. Is it then reasonable to expect that, given time, doctors will gradually replace medical assistants in the Sudan?

The education received by medical students in the Sudan is virtually indistinguishable from that of medical students in, say, Britain; that is, medical education which is very much in tune with hospital-based practice and entirely consonant with employment in a large city. At present over a third of all Sudanese doctors work in the capital city, where about five per cent of the population live. In future the increased output from the medical schools is likely to find itself concentrated in the capital city to an even greater extent than is the case at present. This phenomenon can be seen clearly in other countries in the Middle East and Asia (eg., India, Pakistan, Iran) which have been increasing rapidly their output from medical schools but can still show no very significant increase of doctors outside the capital cities and other large towns.

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[4]See, for example, M.H. King (1966): Medical Care in Developing Countries, Chapter 7.

In time, as the larger cities become saturated with medical men, some will have to move to the smaller centres. But perhaps an even greater number will escape the burden of excessive competition in the cities by emigrating to another country altogether.

In the United States there are already 25,000 medical graduates from schools in developing countries, and in Great Britain there are close to 10,000 doctors who were born in Asia and Africa - primarily in the Indian subcontinent. Canada, Australia, Germany and France have also become the beneficiaries of medical personnel born (and usually trained) in the Third World.[5]

The medical 'brain drain' from the developing countries is an extension of the general problem of providing medical education and health manpower planning which is suitable for the conditions of poor countries. If doctors are trained in postgraduate specialties, of which poor countries can support relatively few practitioners, it is inevitable that numbers of them will emigrate. The crux of the problem is whether to train doctors for the needs of the mass of the population who are rural dwellers with low effective economic demand, or for those relatively few urban dwellers who have a high effective economic demand. If the increasing numbers of medical graduates in developing countries are all to enter into urban competition with each other, some of them must necessarily emigrate; they cannot all practise successfully among the relatively small urban middle and upper classes.

It is clear that careful attention must be paid to the likely effects of a particular kind of medical education and further specialization. If international emigration of doctors is 'only' an extension of the rural-urban migration problem, the type of medical education that will forestall international emigration is also likely to increase the number of doctors working in the countryside.

Medical education has to be geared to the type of health problem experienced by a given country's entire population. If 80 per cent of the population is rural, then 80 per cent of the medical students should be educated accordingly. Because the causes and prevention of illness, disease, and death vary in rural and urban areas, the 80 per cent or so of doctors who should be preparing for work in rural areas must come to know the causes that are connected with rural life, and the consequent methods of prevention of illness, disease, and death in those areas. Successful medical education, intended to produce doctors for rural areas, should be orientated towards work in those areas, and new curricula must be designed for such purposes.

Two corollaries which follow from the above discussion are: first, the desirability of producing a doctor with the minimum and therefore the least expensive training necessary to fulfill his duties;

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[5]The discussion about medical 'brain drain' which follows is drawn from Oscar Gish: Medical Education and the Brain Drain, British Journal of Medical Education, Vol. 3, No. 1, pp. 11-14.

and second, the need for at least part of that man's medical training to be carried out in a district or rural hospital in the countryside.

The solution to the problem of how to retain doctors in their own countries, and in rural areas, is to be found in their training. Those who are chosen to study medicine must be committed to the health requirements of the mass of their country's population. Their education must then reflect their commitment. It is too late after medical education has been completed substantially to change the pattern of a doctor's life. That pattern has already been set by the nature of the training he has received. If medical training has prepared a doctor only for medicine as practised in a modern teaching hospital, he must then either practise in his country's capital city or go abroad.

Tax and housing incentives might be among the means for drawing doctors to the countryside. Still more desirable are active health centres and good and interesting professional conditions in the rural areas. Travel, promotion and honours should go to rural medical workers in recognition of their important work. Needless to say, the national health budget should be allocated fundamentally in keeping with the nation's population distribution.

It is, however, suitable medical education that can lay the foundation for keeping doctors usefully employed in their home countries. Part of the process of suitable medical education is a selection process. The likelihood of a given medical student remaining at home upon completion of his studies is one key element in a properly organized medical selection process.

In a developing country one of the doctor's main roles is to act as teacher, supervisor and consultant to a team of auxiliaries. He is most often required to fill this role by supervising a series of health centres in the rural areas or by running a district hospital, and this not only for a year or two after qualification, but for the majority of his professional life. There is an increasing realization that the best way of achieving this state of affairs is not to train him in a lavish, thousand-bedded, chromium-plated, multimillion-pound teaching hospital which accustoms him to facilities that cannot be reproduced elsewhere in the country, and which therefore dissuades him from working subsequently in a district hospital. Rather, it is to train doctors under conditions which are much closer to those in which they will later have to work, particularly in district and rural hospitals. This is indeed the policy of the new medical school in Zaria, Northern Nigeria, which is breaking away from the traditions set by earlier medical schools in Africa with their inappropriate if otherwise excellent patterns of training.

What is required then is a sufficiency of suitably trained doctors equipped to lead teams of medical auxiliaries. These teams should be part of a health centre service (under a director of health centre services) which acts as the basic carrier of health services in the country. Such a health centre service should be the base upon which

all other health care in the country rests. The focus of medical attention must be shifted from the big teaching hospital on the capital city hilltop to the unobstrusive health centre in the village.

Population: Structure, Location and Growth

The populations of developing countries are young, fast-growing and still primarily rural in spite of rapidly increasing urbanization. All of these demographic imperatives give rise to special health care considerations.

The diseases of children in developing countries are particularly amenable to prevention in contrast to cure. The major killing diseases in poor countries are the group of childhood diarrhoeas, pneumonia and protein calorie malnutrition (PCM). Following behind this 'big three' are tuberculosis, intestinal helminth infections (worms), measles, whooping cough, malaria and accidents.

The nature of these diseases, coupled with the age structure and rural domicile of the population, supports the view that the health centre and the medical assistant are the basic instruments upon which the health services must rest. Not only can health centres fit more closely into the rural health as well as the general rural environment, they can also offer an appropriate base for family planning work within the context of maternal and child care activities.

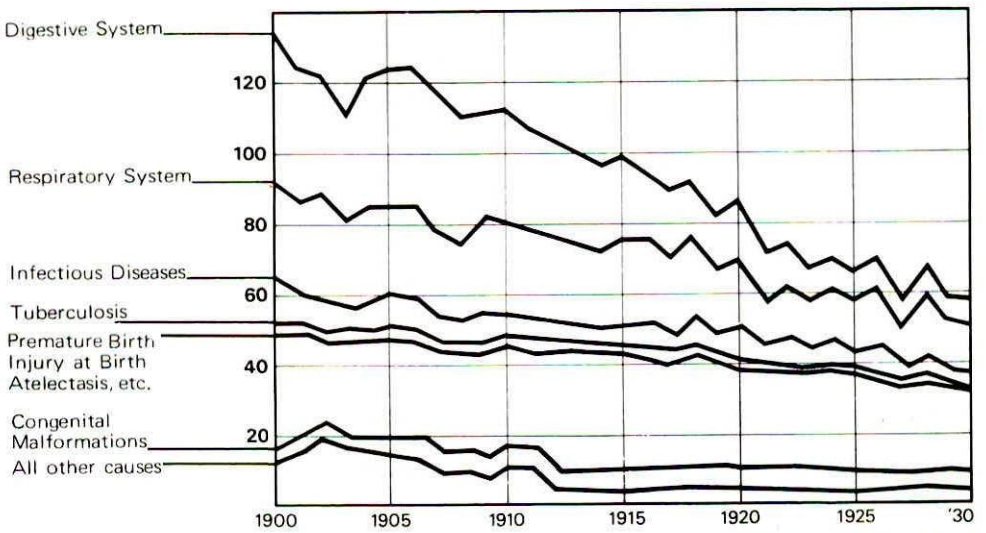
Maternal and child health care can be best, if not only, carried out close to or within the home environment of the woman and her child - that is, mainly within the village. An exhibition of slides showing the dangerous diseases borne by mosquitos or snails, which is seen in a two-room mud dwelling belonging to 'one of us', takes on a significance which cannot be achieved in the context of a large impersonal hospital building which belongs inevitably to 'them'.

The special problems connected with rapid urbanization must also be kept in mind. The crowding together of large numbers of people into small, insanitary areas has placed intolerable strain on health and social services in the towns and cities of developing countries. Probably no other measures could do more to improve the situation in these urban slums than the provision of fresh water in adequate quantities and the installation of proper sewage disposal systems together with a general improvement in sanitary and hygienic conditions. Beyond these, there are all the social services necessary to deal with conditions which are making for increasing venereal disease, mental illness and other social illnesses in the growing slum areas which threaten to engulf many towns and cities in Africa, Asia and Latin America and more than a few in Europe and North America as well.

Disease Patterns and the Road Ahead

It has already been indicated that the types of diseases to be found in tropical countries are in the first instance to be treated as aspects of poverty rather than of the tropics. This point can be nicely

illustrated by data drawn from the medical history of New York City.[6]



Infant mortality by prominent causes in New York City (rates per 1000 births)

Throughout the 19th century the death rate in New York remained constant at about 30 per 1000. A substantial part of that death rate was due to a level of infant mortality which was not unlike that which is to be found in developing countries today. As shown in the graph, the first three decades of this century saw a dramatic decline in infant mortality in New York City from 140 per 1000 to less than 60 per 1000. Of that fall, two thirds occurred in the diarrhoea-pneumonia complex of childhood diseases.

This striking decrease was accomplished by a series of measures taken early this century. Some of the specific public health developments of the period included an improved water supply, better control over and distribution of foodstuffs, and the inauguration of visiting nurse services and well baby clinics. This period also saw the growth of paediatrics and, perhaps particularly important, major campaigns against illiteracy and a substantial increase in primary schooling.

It is not possible to argue that a specific set of measures taken in the particular circumstances of New York City at the turn of the century are necessarily relevant to all, or indeed any, of the countries in Africa, Asia or Latin America today. What is clear is that the road leading to the reduction of morbidity and mortality is not necessarily paved with advances in medical science. In fact, the

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[6]The discussion which follows is based on material presented by W. McDermott in Manpower for the World's Health, a report of the Institute of International Health Education (1966), ed. H. van Zile Hyde.

technological possibilities inherent in already existing knowledge about the causes, prevention and cure of disease are far greater than our social and political (not to mention economic) ability to utilize those possibilities fully.

The same road is more likely to be paved with social and political advances, reflected in an improved system for the distribution of health services, rather than with further scientific advances as such. This last is probably not only true for poor but for rich countries as well.

INTERMEDIATE TECHNOLOGY IN MEDICINE

Kenneth R. Hill*

In Northern Nigeria there is one doctor to 150,000 people, and the problem of how to deliver medical care both in quantity and in quality to such a populace requires urgent solution. The conditions found in Northern Nigeria are similar to those in many of the developing countries.

In 1965 the World Health Organization laid down a minimum target for the next decade of one doctor for each 10,000 of the population. Throughout Africa (excluding Egypt and South Africa) the average doctor/patient ratio was then 1:20,000. To meet the WHO target, an increase in the number of doctors in Africa from 10,000 to 24,000 was needed immediately. This was roughly equivalent to the complete 10-year output from all the medical schools in Britain. Northern Nigeria alone would have required 17 times as many doctors to look after its 30 million people as it then had, 3000 instead of 175! In 1965 no local medical school existed, and the first 30 doctors from the new medical school in Zaria will qualify only in 1973. At this rate it would need 100 years to provide 3000 locally trained doctors to look after the people of Northern Nigeria, and the population there is expected to double by the year 2000...

Recruits for physician training must already have received a high level of secondary school education. Most developing countries are handicapped by gross deficiencies in the primary and secondary school infrastructure. In East Africa out of 1000 children attending primary school, only 10 go to secondary school and only one continues training after leaving secondary school. Educational priorities in developing countries may have to be slanted towards increasing the supply of primary and secondary schools rather than establishing more centres for higher education in the form of universities. But physicians can only be trained at university level. The medical school has to compete with other equally important disciplines such as agriculture, engineering and education among students eligible for university places.

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To this handicap is added the phenomenal cost of producing a doctor. It is estimated that the cost of training a physician is £15,000 in the UK and £22,000 in the USA. In his recent book Health and the Developing World, J.H. Bryant estimates that in medical schools in the developing world it costs at the moment up to 65 per cent more to train a student than the £22,000 this costs in the USA. The new African medical schools, such as Lusaka, Zaria and Addis Ababa, hope to bring their cost per student down to below even the British level, but they all have yet to graduate their first new physicians. In any event, teaching hospitals are very expensive, and Mr Gish shows elsewhere in this publication how maintaining a university teaching hospital can 'milk' the slender resources available for health care in a developing country to the detriment of other services, especially rural health.

Even if the countries concerned could afford the high cost of training large numbers of physicians, too little thought has so far been given to what type of doctor should be trained. In the West the modern medical school curriculum demands a high level of education in the basic sciences, is highly specialized, and uses sophisticated equipment and techniques; it is almost entirely hospital-orientated. There is little emphasis on community and preventive medicine, on public health and health education. This type of training does not prepare the student for the pastoral and general duties required in developing countries. The majority of the sick do not need the complex hospital facilities which are part of modern medical thinking and education; but the doctor has not been trained in selection and he tends to want to practise in the shadow of the hospitals which are in urban areas. The diseases of the masses, which are in the rural areas where perhaps 75 per cent of the people live, are ignored, whereas the outpatient and inpatient departments of the district general hospitals in the towns are swollen to gigantic size, cramming the hospitals with people in numbered anonymity. In India today, for example, roughly 80 per cent of the population lives in the rural areas, whereas approximately 80 per cent of the doctors are to be found in the towns and cities.

The test of any educational programme lies in what the person actually is able to do, not what he has been taught. Dr Rosa, after considerable experience in Ethiopia, has suggested some guidelines for the training of a doctor who is to work in a developing country.[7] He writes that where there is only one doctor for as many as 150,000 patients, Western methods of training, even if intended for general practice, are inapplicable. The doctor cannot himself cope with each individual case but must be trained as a leader in health programmes. This training should be designed within the context of local problems and should include the following:

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[7] F. Rosa (1964): A Doctor for Newly Developing Countries - Principles for Adapting Medical Education and Services to Meet Problems, Journal of Medical Education, vol. 39, No. 10, pp. 918-924.

1. Orientation towards the practice of preventive medicine and public health at community level. This means the development of health services within limits which the people can support locally.

2. Training in the instruction and leadership of auxiliary workers. These may be people such as nurses, laboratory technicians and sanitarians who are literate and will already have received some kind of formal training. Alternatively, the auxiliary worker may be indigenous and illiterate. The latter, however, given a brief training and modern tools, can often achieve a greater reduction in sickness than the best doctor managed to achieve 25 years ago.

3. Instruction in handling mass campaigns against, for example, smallpox, tuberculosis, syphillis, trachoma and malaria, together with a widespread health education programme.

4. The development of community self-help programmes, eg, better water supplies, improved drainage.

5. Knowledge of maternity and child health needs. In any developing country a large proportion of the population will be children, and improvement in nutritional standards, widespread immunization against communicable diseases and instruction in methods of family planning are vital.

6. A sympathetic appreciation of local culture and resources. Effective medication should be, as far as possible, cheap, simple, practicable and suitable for use in field or clinic rather than in a hospital.

Dr Rosa's proposals make use of intermediate technology in the form of intermediary medical personnel such as nurses, medical auxiliaries, sanitary workers who work as a team led by the physician. Dr Rosa's practical suggestions make good use of the delivery of medicine to large numbers of people and also emphasize the prevention of disease, a subject which receives too little attention. Nigeria spends six times as much on curative medicine as it does on preventive; yet it has been estimated that even a doubling of the expenditure on preventive medicine would transform the whole medical picture there.

Dr Rosa suggests using intermediary personnel in the delivery of health care, and to some degree his suggestions are already being accepted in the West. The identity and status of intermediary personnel must therefore be clarified so that they can be accepted as an essential part of the world health scene. It cannot but be admitted that objections are raised by the established corpus of doctors to the use of auxiliaries in medicine. The medical profession jealously guards its right to diagnose and to prescribe, yet in actual practice doctors are often forced to delegate this responsibility.

In the past, an auxiliary (or in this particular case a second tier doctor) was extensively used in India, where he was called the

licensed medical practitioner or surgeon's assistant; in other territories another intermediary grade was known as the medical assistant. These systems worked well, for in practice it was found that the environment conditioned the job rather than any particular scheme for medical education or any government's particular health policy.

As many newly emerging countries achieved independence, this well-tried form of medical practice was often discarded; but now even the more sophisticated countries are being forced to adopt a policy of delegation of responsibilities. This can be seen in both the USA and the UK. In the USA, owing to the lure of specialization in medicine, there is a dearth of general practitioners, of doctors of primary contact, and intermediary medical personnel being trained include the physician's assistant at Duke University in North Carolina, the nurse practitioner at Denver in Colorado, and the medexes in Seattle, Washington, and various other places. Altogether 28 such training schemes have received support from universities, state medical associations and government, and these practice assistants give primary medical care to thousands of people. In Britain, for similar reasons, general practitioners are in short supply, and health centres are being developed in association with the delegation of responsibilities to a host of intermediary personnel such as midwives, district nurses, health visitors and social workers. In the USSR the feldsher has been established for many years, especially in rural areas. The feldsher resembles a nurse but with extra training in diagnosis and treatment, and there are almost 400,000 (most of them women) in practice in the Union. Intermediate medical personnel like those already described, differing perhaps in skills but still part of the national medical team, have been used for years past in Sweden, in Spain (the practicante), and in France, where the druggist in a French pharmacy dispenses a considerable amount of advice and treatment and could well be compared with the English apothecary of an earlier age, who became the general practitioner. In New Zealand there is a newly established training school where medical receptionists receive a year's training to enable them to act as 'doctor assistants'. The first intake of students have recently completed the course and are being well received by the public.

Although the use of intermediary personnel is on the increase, resistance to their recognition continues, and this is often even stronger in the developing countries than it is elsewhere. It is hard to understand the rationale of such opposition. It is true there is a remote danger of people with less advanced training developing inflated ideas of their own capabilities, but such people can only be relatively few and they will be found at the fringe.

It must be obvious throughout the world, and particularly in developing countries, that we have not the resources or the educational infrastructure to produce the needed number of doctors through university training. Measured against the national incomes of developing countries, the financial burden of educating masses of physicians cannot be tolerated. It seems only logical that this vacuum, which has been created by the present methods of training and practice, must be filled by a well-trained and disciplined corps of intermediary personnel.

These team members must have status, and the responsibility which goes with that status, if well-balanced health teams are to be established. The doctor can no longer be an individualist and an authority in his own right. Instead increasingly, and particularly in hospital work, he is becoming the leader of a team in which auxiliary personnel have their rightful place. Such an attitude must now extend from the hospitals to the rural areas and to national health services throughout the world.

If doctors wish to preserve their own status, they have to remember their true role of service within and to the community by the application of scientific thought for the relief of man's estate. Medicine is to do with people. Although the practice of medicine today is so advanced that academic training is essential to a physician, rather than the old type of apprenticeship, the doctor of the future must not lose touch with the general practice of clinical medicine and the means of delivering health care to society. This will involve a new approach to medical education and the establishment of many more training schemes for intermediate medical personnel. The medical profession itself must be prepared to undertake the responsibility for planning the training and the use of medical auxiliaries throughout the world.

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These two articles are taken from a fascinating little volume, Health Manpower and the Medical Auxiliary, published by the Intermediate Technology Development Group and reproduced here with its permission. The complete book, which contains a foreword by Dr Maurice King and an excellent bibliography, is available from the Intermediate Technology Development Group Limited, 9 King Street, London WC2E 8HN, England, at the cost of £1.50.