THE RURAL HOSPITAL

Its Structure and Organization
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INTRODUCTION

It is hard to say exactly what is meant by "rural hospital" because of the many different forms the institution may take. Looked at from the socio-biological standpoint, the rural hospital is the smallest curative unit serving a rural community, and its structure varies with the basic features of country life. In western countries the rural hospital has retained the impress of a fairly lengthy past when its sole function was to provide hospital care for the sick.

At present there is a strong tendency to expand the scope of the hospital to cover the whole community, through out-patient care and preventive measures. The rural hospital may also cover health education in rural communities and serve as a demonstration centre for general hygiene work.

Countries which do not as yet possess a system of rural hospitals can introduce this concept of combined health activities by creating hospital/health-centres responsible for safeguarding all aspects of the population's health. This is a course which will be enlarged upon in the following pages. Although apparently simple, it can take a wide variety of forms. The hospital/health-centre must not be regarded as an isolated unit. What has to be avoided at all costs is that the development of a network of rural institutions should lead to a twofold health system, thus accentuating the distinction between town and country. In some countries this twofold system is gradually dying out, owing to general development of the economy and the growth of communications; country dwellers are within easy reach of town, and urban services are being extended to the country. It would be highly inappropriate, therefore, to encourage a hospital system which emphasizes a twofold concept, existing less in reality than in words.

The hospital/health-centre in its most comprehensive form should provide the surrounding district with preventive and curative services and, at the same time, should serve as an outpost for the hospitalization of confirmed cases of disease. Such is the definition which this study will endeavour to justify. One should not be taken in, however, by its apparent simplicity. A host of questions immediately arises. How many confirmed cases are accounted for by endemic disease? Where are infectious patients to be placed? What provision is made for maternity? What is to be done with social cases and convalescents? These questions alone indicate the
complexity of the problem. Throughout this study the idea of the “restricting” factor will constantly recur. Thus, for example, in-patient care in the rural hospital meets with obstacles, such as disproportionate running costs due to the small number of beds occupied and problems of staffing and of technical equipment. A hospital with from 25 to 30 beds can never provide composite diagnostic or therapeutic services, owing to its very limited facilities. In western countries where communications are easy and the density of population is high, many former rural hospitals will have to be converted into rest or convalescent homes.

Care must be taken not to advise countries as yet insufficiently developed to establish a system of rural hospitals which may prove to be obsolete, over-equipped, and over-costly, as well as insufficiently centralized, once communications and the general economy reach a more advanced stage. This is why we have broadened the concept of the rural hospital to include establishments whose sole function is to provide treatment and preventive care for out-patients. Rural areas should be recommended to establish a whole series of health institutions, ranging from the centre for treatment and preventive care without beds to the comprehensive rural hospital of remote areas, and taking in the intermediate types with beds reserved for special categories.

In the first chapter of this study a description is given of the salient features of rural life, from the point of view of organized health services. The succeeding chapters study the rural hospital from the theoretical angles: its administrative structure and limitations, its internal organization, its architecture, requisite equipment, and, lastly, the necessary staff. The last chapter attempts to outline a number of schemes related to particular social and economic conditions.

Proposals for cut-and-dried formulae or rigid recommendations have been purposely avoided. It is hoped that, in spite of their occasionally abstract nature, these pages may serve as a practical guide to those responsible for providing the best possible medical care in rural areas, with the object of improving health and living standards.
CHAPTER 1

FACTS ABOUT RURAL AREAS

For over 20 years the health facilities of rural communities have been
the subject of numerous studies which point to an infinity of ways of dealing
with the problem. The reason for this is the extreme diversity of rural
civilization. Geographers and statisticians are far from being in agree-
ment on the definition of the term "rural civilization", since it applies to
many more varied ways of life than does "urban civilization". Whether
it is a still undeveloped or a modern town, a western capital or an oriental
city, there are many powerful features common to all: ease of transport
within the city; a complicated system of social relations, ensured by the
existence of administrative and technical machinery; and industrial and
commercial resources, which both justify and call for a large concentra-
tion of men and material. Such are the characteristics of urban life. In
these centres, where so many human beings live at close quarters, where
financial means are generally considerable, and where intellectual and
other amenities of life attract and retain the élite of a nation, the problem
of health appears only in its technical aspects, which are certainly encom-
passed with difficulties, but can be successfully tackled. Rural life is a
much harder concept to define.

Definition of Rural Environment

Economic and demographic aspects

The accepted distinction between urban and rural environment has
made exact definition necessary, and geographers as well as statisticians
have made a study of the features that enable us to appreciate the nature
of this distinction despite the extreme complexity of the facts. In the
USA the Bureau of the Census adopted the following definitions:

"urban": all sectors consisting of towns and built-up areas with not
less than 2,500 inhabitants;

"rural": all districts or localities with less than 2,500 inhabitants,
including groups of built-up areas having a total of more than 2,500 in-
habitants but not constituting an administrative unit.
It was found necessary to supplement the definitions by laying down that a metropolitan district is an area corresponding to a city of at least 50,000 inhabitants, as well as surrounding areas provided the population density is higher than 150 inhabitants per square mile (60 per km²). The term “farm” covers communities deriving a livelihood from pursuits allied to farming; persons in this group mostly live in rural areas, but farms may also be located in towns. Finally, the term “rural non-farm” applies to persons who live in the country but are not employed in agriculture.

In 1880 the Brazilian Census Department established the statistical division between a rural and an urban district at 8,000 inhabitants, but this figure was found to be too high and was reduced to 4,000 for the period 1890-1900, and finally to 2,500 for the period 1930-40.

The findings of international conferences have brought out finer shades of difference. In 1938 the International Statistics Institute, meeting in Prague, decided to consider as rural the population of districts whose nucleus possessed a number of inhabitants below a certain limit (to be established), and whose farming population represented more than 60% of the total active population.

Finally, the “Recommendations on the principles governing the organization of medical assistance, the public-health services and sanitation in rural districts”, adopted by the European Conference on Rural Hygiene in 1931, contain the following definition: “The term ‘rural’ refers to an area or a district where agriculture is the chief or even the sole industry, and where all other industries are of small importance and, in the main, dependent on agriculture.”

The health aspect

Before we can proceed to study the problem of the hospital services that should be provided for rural populations, some further remarks must be made. What is the actual end in view? It is to draw up a scheme for the organization of hospital services that will provide rural communities with the best possible medical care, in the light of all the known economic and technical factors. Now, modern medicine embraces a series of supplementary aspects: sanitation, prevention of social diseases, and treatment of confirmed cases of disease; these, too, must be put into practice for the rural community. Difficulties of all sorts—economic, geographic, and cultural—which hamper the spread of modern health techniques in country districts, make joint action necessary, however, and this we will discuss at length later. The rural health system must be flexible and energetic in action, and must be in the closest possible touch with an urban centre, well-equipped in staff and material. The question of communications is
consequently one of cardinal importance. It matters little if the area surrounding a town is rural in character and sparsely populated so long as it is possible to remove patients to the town hospital in less than an hour, or for health technicians from the town itself to reach a threatened hamlet quickly. This is not uncommon, for the spread of large suburban areas tends to leave typically rural districts among densely populated zones. There are villages around Paris, farms in the London suburbs, and farming activities at the gates of Rome, that retain all the characteristics of rural life save one: the city can be reached in less than an hour. Such districts are not rural areas for the purposes of the hospital problem with which we are dealing.

The existence of a large town may even encourage the development of purely rural occupations in its immediate vicinity. The needs of a large city lead to an increase in milk production and market-gardening. The rural character of the Paris Basin, like that of the Weald not far from London, has been intensified by cattle and poultry breeding. By the very nature of their work, however, market-gardeners and cattle-breeders come into the city every day; when illness arises, they will naturally take themselves there for treatment.

There are ancient capitals, such as Istanbul or Peking, where even today the urban limits set by the city walls still take in wide spaces reserved for gardens, orchards, and small stock-farms, and these have all the features of rural life although located within an urban centre. What is more, an examination of hospital maps reveals that the large cities have created a vacuum around themselves. Paris and its immediate suburbs have a dense network of hospitals. It is only beyond a wide radius, however, containing but a few secondary hospitals, that one finds any provincial institution of importance, whose links with the capital are weakened by distance.

Inhabitants of such rural areas in close proximity to large urban centres are served by the urban facilities and can attend town hospitals. Hence, it is unnecessary to build establishments to provide medical and surgical services and hospital beds; health-centres in the outer suburbs, too, can often be reduced to clinics for treatment of out-patients and case-finding of social diseases. With these considerations in mind, therefore, we shall adopt the following definition of a rural zone: any area such that the time of transport to a built-up area of urban character would exceed one half-hour, and the life of whose population is essentially linked with the working of the soil.\(^a\)

This definition is merely intended to provide a formula for the geographical distribution of rural hospitals, and applies solely to the organization

\(^a\) The line which connects all points whose distance from the centre corresponds to half-an-hour's journey is known as a "30-minute isochrone". This idea comes up again in a later section (see page 45).
of a system of health services. We accordingly do not offer it as a substitute for the excellent general definitions quoted at the beginning of this section.

It now remains to define the terms "urban character" and "transport". For "urban character", Sorre's definition\(^8\) may be adopted:

"A town is ... a permanent, closed community, more or less extensive and concentrated, largely or completely independent of its land for subsistence, the life of which involves active relationships, and which shows in general a high degree of organization".\(^b\)

The term "transport" denotes all means which can normally be used for the moving of the sick. The automobile is the more general form, but suburban trains duly bring numerous ambulant cases to hospital outpatient departments. Transport may be by boat in regions where there are large rivers or islands bordering the shore, or even by air (tropical Africa, Australia, Canada, and Siberia). The latter at once gives the isochrone a considerable average radius, but at the same time brings in difficult problems of finance. At the other extreme, transport in some countries may be by bullock-cart, sledge, or human portage, in those places where meteorological conditions and topography have a profound effect on the life of the community.

After thus outlining in a somewhat negative fashion the areas regarded as truly rural from the point of view of organized hospital services, we must examine more closely the different types of settlement, since this will have an important bearing on the plan of organization.

**Types of Rural Settlement**

The type coming closest to the small town is the large village, consisting of a considerable number of houses. Such villages are often separated from each other by large tracts of arable land. An extreme case of this kind is represented by the villages of Sicily that house peasants whose land is sometimes from 20 to 25 km (12½-15½ miles) away. When work in the fields is in progress the men cannot come back to the village in the evening; they do so only on Saturdays.

In southern Italy, where latifundia abound, the coefficient of dispersion falls almost to zero: 99.3% of the inhabitants of Murgia d'Altamira live in villages with a population of over 5,000. The same is true of the Guadalquivir basin in Andalusia, where enormous villages have existed for

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\(^b\) "Une ville est ... une agglomération fermée, permanente, plus ou moins considérable et dense, en grande partie ou totalement indépendante de son terroir pour sa subsistance, impliquant une vie de relations active et traduisant dans son aspect général un haut degré d'organisation."
centuries. German writers apply the term “Stadtdorf” to settlements of this kind that have a population ranging from 1,800 to 7,000.

The same features, with some slight variation, are met with in villages that have grown up around industries set down in country districts for various geological or topographical reasons (mines and quarries, and hydro-electric dams), or for some other cause (strategic towns, railway-workers’ settlements, and aerodromes). Settlements of this type are not, however, exclusive to industrialized countries. Tropical Africa knows such large villages, where the inhabitants are constantly enlarging their working area (lumber camps, and primitive bush-fire farming of savanna land with rotation of crops and intervening fallow periods). A similar situation prevails in densely populated countries: the Egyptian Delta has villages of 15,000 inhabitants, but the distances between them are not great because each family cultivates a garden rather than a field (in 1937, 0.71 feddan per inhabitant in Lower Egypt and 0.51 feddan per inhabitant in Upper Egypt). The large village “huddling together” is the traditional form, but the introduction of irrigation systems and the increased density of the population have split up the villages into smaller units and led to the creation of hamlets consisting of a few houses or “nugas.” Moreover, the concentration of tracts of arable land in the hands of large landowners was what led to the building up of the “esbeh” or large estates, where farm buildings and dwellings for agricultural labourers are grouped together.

In many other areas the groups of homes forming the village represent but a modest population unit, for instance, some 500 to 1,000 inhabitants. This is the case in the country districts of France, England, and central Europe, old lands whose history has been troubled by invasions and where the people have endeavoured to reconcile proximity to the fields with the need for protection against sudden attack. The average dispersion of villages may vary within a fairly wide range, but it is nevertheless dependent upon the density of population required for working the arable land. This type of settlement is also found in a special form in mountain valleys where villages are scattered along the thalweg, with extensions on the mountainside for use when the cattle are moved up and fodder is gathered in.

Then there is a mixed form of settlement constituting an intermediate type. This consists of medium-sized villages surrounded by hamlets and farms, each containing a few score inhabitants. This type of settlement has a chief centre, the village, where a group of elementary social services is concentrated: repair shops for agricultural machinery, retail shops, a pharmacy, a veterinary surgeon, and a Justice of the Peace. It is here, too, that the periodic fairs and markets are held.

c This was the “milpa” system practised by the Mayas of the Yucatan.
d The feddan corresponds approximately to the English acre or roughly 0.3 hectares.
Lastly, the maximum type of dispersion is represented by farms of all sizes, scattered over the countryside. The great American plains offer the most remarkable example of this, where the settlers of the 19th and early 20th centuries set up their farmsteads in the middle of land plots which the Government had divided up into regular rectangles. Here the idea of rural community disappears altogether and community services such as schools, churches, workshops, and supply centres are far removed from one another, being situated usually at some cross-roads. This type of scattered settlement can be observed in older countries too. Isolated houses and very tiny hamlets are spread throughout the wooded districts of western France, mostly with no relation to the road system.

Obviously the distribution and capacity of rural hospitals will both have to be decided in accordance with the pattern of rural settlement.

Psychology, Religion, and Customs

The mode of life, which is an expression of the economic and cultural structure of a country, varies completely from one region to another. In areas where general farming is carried on and the peasant is self-sufficient, journeys to town are rare, because the town, in developing its activities, has managed to extend the range of its commercial and banking services over a considerable distance. Normandy is a good example of this type of interrelationship. The land produces wheat, potatoes, and green vegetables of all kinds, while the pastureland supports an abundant livestock. Farm production, aided and organized by the milk co-operatives, assures the peasant of an income such that he has no hesitation in consuming a part of his produce. He has but few occasions for travelling, and going into hospital in a distant town is for him an adventure that arouses certain fear and hostility complexes. He will consent to go only when his doctor assures him that the town hospital alone can provide the treatment he needs. On the contrary, in areas of industrialized single-crop farming (Beauce, Holland, the USA, and Canada), the farmer is obliged to do his buying and selling in town. On retiring, his relatives often settle in the town, so the journey to the town hospital does not alarm him unduly, assured as he is of visits from family and friends. In under-developed areas, however, reluctance to leave the native village is much greater, for obscure psychological reasons are here coupled with religious and cultural prejudices. In the first place, many of the peasants of such areas still place confidence in the methods of their own healers, who continue to enjoy considerable authority and who view with disfavour the departure of a patient whose cure affected at home would bring them prestige and gifts. Furthermore, the fear exists that in the event of death—and, unfortunately, the death-
rate among such cases is high because hospitalization is accepted only when the patient is seriously ill—there may be serious obstacles to the celebration of funeral rites and the return of the corpse. To this is added the fear that a patient removed to a distant institution may not be able to follow the dietary taboos which he has observed practically from birth. It is quite common in tropical Africa for patients to refuse hospital food and surreptitiously consume dishes prepared for them clandestinely by their families, who camp in the vicinity while the patient is in hospital.

Again, the customary seclusion of women in the Moslem countries may cause hospital treatment to be rejected unless it is firmly explained that the sexes are strictly segregated in hospital and that male nurses and students never attend female patients. It can well be imagined how delicate such matters are, for the judgements of these rural communities are based on fleeting impressions and gossip exchanged during visits. Similar difficulties stand in the way of the hospitalization of children. In some countries, the mother will never agree to leave a child under four years of age alone in hospital; she will insist on remaining with him throughout his stay, going so far as to refuse treatment for him if her request be not granted. This is a custom that may offer certain advantages in a paediatrics department. It prevents the children from developing a frustration or neglect complex, which is a factor that makes the running of such departments so difficult. In addition, the mother may be counted on to give practical help to the nurses, who are still too few in number. Such a practice also affords an excellent opportunity for developing health education and showing women correct methods of child care and training, and hygiene. But to ensure that it fits into the discipline requisite to a hospital department, staff of a high quality are essential; otherwise, the dire result may be that the nurses pick up bad and careless habits.

These problems arise in full degree in maternity services. By using local nursing staff and properly trained indigenous midwives, a considerable improvement in the rural hospital's relations with the local population may be effected. It should be possible for the religious rites which sometimes accompany the birth of a child to be carried out in the usual way where they do not include unhygienic practices. Sometimes, too, dangerous customs can be successfully overcome. For instance, in some parts of Turkey, mothers are not allowed to drink for three days after delivery. It is easy, however, to prescribe a so-called "potion against fever" to be taken daily and consisting of a litre of water to which is added some lemon juice and sugar. Provided this mixture is made up by the pharmacist of the health-centre, it will be readily accepted.

Nevertheless, it is interesting to note the striking rapidity with which an uneducated population becomes accustomed to hospital services. Hospital
attendance would increase rapidly if hospital capacity permitted. In Southern Rhodesia, the rural hospitals have an attendance of 14 inhabitants per thousand. In Egypt, hospitals have clearly become popular, and bed requirements seem to correspond to standards generally accepted for western hospitals. This points to the fact that a hospital system, correctly planned, would very soon be utilized by populations hitherto badly provided with health services.

**Rural Pathology**

Rural pathology and urban pathology are frequently fundamentally different, at least as regards the relative proportions of the different diseases. An intimate knowledge of these variations is essential in order to determine the type of rural hospital required. In the under-developed countries, at a time when general health measures are barely beginning to be adopted, more or less serious pathological conditions are the rule among the great majority of the population. Systematic surveys show that most of the people constantly harbour more than one pathogenic species of parasite.

In Egypt, out of a population of 20 million, there must be at least 17 million people suffering from bilharziasis. This parasitic disease developed considerably after the introduction of perennial irrigation, a measure, by the way, that has ensured a remarkable increase in the output of the land. The working capacity of the fellah, however, has probably decreased by 25%-30% since 1918.\(^{48}\) Several large areas of the Delta and of Upper Egypt are still infested by malaria, and its eradication is rendered difficult by the expansion of rice cultivation to the point where legislation has had to be passed prohibiting the growing of rice within a radius of 3 kilometres (some 2 miles) around the towns.

The co-existence of several diseases in one person is a common phenomenon. Throughout the tropics all women suffer from gynaecological infections; frequent sexual relations, childbirths in close succession, and also prolapsus uteri, caused by the habit of carrying loads on the head from an early age, contribute to these. Uterine cancer is also frequent and its early diagnosis almost impossible. Intestinal parasitoses are the rule: ascariasis, amoebiasis, and lambliasis are the varieties that do not interfere with everyday life, since their effects are, so to speak, partially offset by the extreme frugality of the diet; ancylostomiasis, however, is often added to these. This affection is particularly common in Indonesia and is one of the worst social scourges owing to the chronic loss of blood entailed.

In this same tropical zone, which holds a considerable portion of the world’s population, gastro-intestinal infections and nutritional deficiencies are widespread. They are probably responsible for the alarming number
of infant deaths, they cause serious disorders in young children and adolescents, and they sap the vitality of adults. In India, almost half the total number of deaths occur among children under 10 years of age, and deaths occurring during the first year of life account for half this figure. In Egypt, the mean infant-mortality-rate was 152 per 1,000 in 1944; children under one year of age represented 30.3%, and children under three accounted for more than 50% of the total number of deaths. The main causes of infant deaths were diarrhoea and enteritis (55.86%) and congenital debility (29.69%).

Turning to the problem of the great pandemics, the picture nowadays is less sombre. In the Near East and in Africa, typhus, plague, cholera, smallpox, and relapsing fever are no longer the dominant factors in mortality, and communicable infectious diseases are becoming more and more confined to infantile eruptive fevers, cerebrospinal meningitis, and typhoid, whose gravity and duration are being considerably reduced by the use of antibiotics. In some African districts, however, hospitalization of such cases becomes a problem when an epidemic is at its height.

These facts must obviously have a very important bearing on the structure of the rural hospital. To cater for cases of bilharziasis, very simple shelters will suffice, since such patients require only a substantial diet and can remain out of bed a good part of the day. Provision should consequently be made for very simple dormitories, gardens, and dining-halls which can also be used as meeting-rooms.

In countries where infant mortality is high, wards for infants should be provided and the rural hospital should include a proper paediatrics department. In places where epidemics are frequent and serious, there must be rapid means for doubling or trebling the capacity of a hospital, possibly by using tents set up on cement platforms prepared in advance, or better still by constructing temporary premises out of local materials which can be burned down when the epidemic has died out.

Maternity

Normal childbirth is a special problem of medical care calling for separate consideration. It is a physiological act which, in general, requires no more than simple equipment and good hygiene habits; nevertheless it can occasionally give rise to a drama involving the lives of two human beings, in particular, that of the mother. In the under-developed countries, rural housing conditions are inadequate and as a result serious complications may often follow a relatively normal childbirth. Only too many cases are seen where a woman gives birth to her child on the bare ground, or on bedding shared by other children and even by animals. The lack
of boiled water, linen, or furnishings, and the presence of other people and of swarming insects are conditions which only the village midwife, with her meagre traditional remedies, is accustomed to withstand. In such surroundings umbilical tetanus—the cause of so many deaths among newborn babies in India and in Northern China—is rife. Anaemia due to dietary deficiencies and post-partum haemorrhage also cause many deaths. Lastly, the obstetrical practices of those in attendance on the mother are bound to aggravate any previous uterine infections.

Fortunately, however, the rural scene sometimes offers a happier picture. In Finland and the Baltic countries, the scrupulously clean wooden houses, suitably furnished and with clean linen and pure water at hand for boiling, offer a setting in which a normal confinement becomes an occasion for family rejoicing. When we come to discuss guiding principles for developing rural hospitals, these examples of advanced populations, where confinement at home is clearly preferable to systematic hospitalization, must be kept in mind. The latter, moreover, is by no means generally acceptable. During the Ting-Hsien experiment, in Northern China, the medical teams made only three deliveries in ten months from among a group of 50,000 inhabitants, which is an insignificant figure in proportion to the 5,840 treatments given in the dispensary. In Egypt, on the other hand, delivery in the home or at health-centres has been tried very successfully through social services set up in the rural villages by the Ministry of Social Affairs. During the year 1949/50, 81 social centres serving 810,000 inhabitants followed up 21,550 pregnancies, a figure proportionate to the particularly high birth-rate of the country; 18,072 confinements were assisted by the medical services in these centres, 7,806 taking place in the maternity departments and 10,266 (or five-ninths of the total) in the home. Knowing the extremely primitive living conditions of the Egyptian peasant, one cannot but stress the success of this system which, in replacing the practices of the "dayas" (village midwives), certainly represents a remarkable improvement as compared with previous conditions.

In primitive societies, the average post-partum rest period is very short. In many districts of French tropical Africa, confinement cases spend on the average not more than three days in the local hospital. All these considerations must be borne in mind when we come to discuss the standard rural hospital.

**Domiciliary Care**

Some organizations, concerned at the steady rise in medical and hospital costs, have studied and put into practice a system of domiciliary care to be given when the condition of the patient permits. Montefiore Hospital, a private institution in the USA, has applied this method in
New York and the scheme has been studied in detail elsewhere, for example, in France, by the Paris Public Assistance Department. The method consists of sending a team of doctors and nurses to the patient's home where, in his normal surroundings, he is given treatment up to hospital standards, as a result of permanent contacts maintained with the diagnosis services. The system has also been applied in rural districts; it had already been adopted in a special form in Great Britain where, for example, the High Wycombe Health Centre provides a home help for patients and is also empowered to supply them with ordinary nursing requisites (blankets, couches, bedpans, etc.). Mention should also be made of the experiment conducted in Cattaraugus County in the USA, with the support of the Research Division of the Milbank Memorial Fund. Rural public-health nurses made domiciliary visits to study the social level and living conditions of the population; they took advantage of this opportunity to look after children suffering from physical infirmities, to recommend diphtheria vaccination, and to give nursing care to the patients without interfering in any way with the work of medical practitioners.

Finally, mention should be made of another ingenious scheme which is being developed in, so far as we know, three countries for the benefit of chronic tuberculous patients. In Hungary, India, and New Zealand, certain health-centres have available a number of small huts, prefabricated in light materials, which are set up in gardens near the homes of the patients. Patients live in these shelters and visiting nurses combine supervision of the medical treatment with teaching of the requisite hygiene measures to the women of the household, to ensure that patients do not constitute a danger to those around them. This system has been tried out in India by the Provincial Tuberculosis Association of Delhi. All tuberculous patients have to attend for consultation once a month and in the interval receive at least one domiciliary visit from the doctor in attendance. This experiment has met with difficulties arising out of deplorable housing conditions and the poorness of the patients' diet, which is aggravated by religious taboos. In Hungary, before the second World War, there were Green Cross health-centres that had wooden shelters with room for a bed and a chair, and there the patient could be treated and fed by his family under the supervision of the centre's doctor.

Sanitation

As a rule, rural communities in under-developed and densely populated areas present sanitation problems of such magnitude that, at first sight, there seems only one possible solution: to burn down the villages and rebuild them differently. Water is supplied by wells, cisterns, or streams
that are constantly contaminated by animal and human excreta. Waste matter and excrement are thrown into the streets for the dogs, birds, and pigs to dispose of. Manure is sometimes collected and kept inside or immediately outside the village, and periodically transported to the fields in baskets or carts which are far from leak-proof.

The lay-out of the villages often appears to have been left to chance. For example, in the region which, before 1950, constituted the United Provinces of India, the villages are compact but the individual houses are scattered about haphazardly, leaving mere twisting alleyways between them. In the province of Delhi, village streets lack any form of planning. In the province of Orissa, the houses have been built without the slightest attention to any possibility of communication between them. In Egypt, the village resembles an ant-hill where, at night, men and beasts are huddled together in a labyrinth of alleys; there, the houses are occasionally two-storied.

Other countries possess villages of a very different and much more orderly kind. On the Ionian coast of Turkey, an observer standing on a minaret balcony would gaze on an urban scene apparently without method or order, with greenery occupying as much space as the housetops. This is because the streets are mostly covered over by intertwining hops or vines, and each house has a small garden where fruit-trees and vegetables grow. Sometimes, as in China, the village pattern is determined by geomancy and the houses, with their large square courtyards, are turned to face the points of the compass. In a rectangular design of this kind the lanes are straight, with right-angled intersections. Here, the sanitary engineer would have less difficulty in installing piping, drains, and sewers. In central Europe, villages can be divided into two sorts: the kind built in length along a main road, which forms the natural axis of the village; and the concentric type, with a central square from which streets radiate, with circular ones running more or less parallel with the village’s ancient ramparts.

Although this may seem to be more a matter of rural town-planning, we have dwelt on the different types of villages because the best possible siting for the rural hospital must depend on the type of village. In the case of an agglomeration huddled together with no apparent order, the only course is to choose a sufficiently isolated site outside. In the more spread-out and better planned type, on the other hand, the site for the rural hospital may be found within the village, on an open space hitherto used as orchard or garden.

In conclusion, it may be pointed out that the confusion of the Indian or Arab hamlet has the advantage of providing shade, whatever the height of the sun, and of protecting the passer-by from burning, dusty winds. It would be advisable, therefore, for sanitary engineers responsible for modify-
ing the lay-out of such villages to be careful not to open them up unduly with straight, broad roads. How many Mediterranean cities have suffered from this Haussmannian zeal and have changed from the tranquil, shady shelters they once were into rectangular trenches at the mercy of the capri-
cious sun and wind. According to Tacitus, the Romans began to complain, after the fire of A.D. 64, that Rome had been made uninhabitable by the creation of large open spaces without shade or shelter, that were more exposed to the fierce heat.

Medical Staff

Perhaps the most formidable obstacle to the setting-up of a comprehen-
sive system of medical care in the rural communities of under-developed
countries is the small number of medical practitioners who will agree to
settle in such regions.

A certain disproportion between the medical density of urban and of
rural districts is, of course, quite normal. A town possesses specialized
hospital services and a health administration justifying the presence of more
doctors. Cases requiring specialist care are much rarer than the ordinary
disease, so that it is not surprising that specialists practise in towns where
they are accessible to their patients. We shall see further on that a grouping
of 100,000 persons is necessary to keep a neurologist or a cardiologist fully
occupied; for the full-time practice of neurosurgery at least one million
people are required. Again, since the average wage is higher in the town
than in the country, the urban population is more ready to undergo treat-
ment; and finally, the townspeople’s relative lack of loyalty to the family
doctor results in a certain movement among patients and a higher number
of medical consultations per head of the population, all of which is a
source of work and revenue for the profession.

Nevertheless, the inequality in distribution is often too marked. Accord-
ing to approximate estimates, three different zones of medical density may
be distinguished as follows: a northern zone, comprising North America,
Europe, and the USSR, with an average of one physician per 1,200 of the
population; a southern zone, comprising Latin America, the Union of
South Africa, Australia, New Zealand, and Japan, with one physician per
1,700 of the population; and finally, a central zone, comprising Asia
(Japan and the USSR excluded) and Africa (except for the Union of South
Africa), with a much smaller number of physicians, namely, one per
12,000 of the population. There are, however, considerable differences
among countries in one and the same zone. In Latin America, it is reckoned
that there is one physician per 895 of the population in Argentina, and
one per 13,018 in Guatemala. Finally, within a given country there is
frequently too high a disproportion between the medical density in the town and in the country.

In France, there is approximately one physician per 1,000 inhabitants in the towns and one per 2,000 in the country. In the USA, in 1942 there were 120 physicians per 100,000 of the population for the country as a whole; this figure varied from 153 per 100,000 in "metropolitan" cities to 59 per 100,000 in areas classed as rural (less than 2,500 of a population). In Great Britain, it was believed possible to limit the number of patients for a general practitioner under the National Health Service to 2,500. This figure was raised to 4,000 at the request of the doctors themselves, but it represents a ceiling which is hardly ever reached in practice.

This inequality in distribution would have been still greater in some countries, however, if special measures had not been taken. In Sweden, the country doctor is at the same time the medical officer of health, and as such draws a fixed basic salary. Puerto Rico, the Virgin Islands, and the West Indies have organized a socialized health service with the distribution of physicians controlled. The British Parliament grants the Health Department of Scotland a certain sum to finance the Highlands and Islands Medical Service. Practitioners receive an annual payment, plus an allowance for visits to remote families, for which they are also entitled to charge a higher fee. Nurses are trained and paid by subsidized associations. In Western Canada, local authorities subsidize physicians in country districts. Since 1921, the municipalities of Saskatchewan have undertaken to levy a special tax so as to be able to pay country doctors a salary. In 1948, some 100 municipalities and 600 villages, comprising 203,000 inhabitants, operated a system of this kind. In Mexico, medical training is financed entirely by the Government, and this enables young men from country districts to study medicine, while at the same time the State can require every young doctor who qualifies to undertake a period of "social service" in a rural community. In the Ukraine, the majority of medical students come from the collective farms, and hence have no objection to returning to the country. Every three years, too, they attend refresher courses of three months' duration in a medical faculty, during which they are paid their salary, plus a special allowance.

In some countries, no special measures are taken to keep doctors in country districts. In Turkey, they gravitate to Istanbul, Ankara, and the west-coast towns; in the east, the ratio up to a short time ago was as low as one doctor per 100,000 of the population. In Bengal, where there are 4,586 qualified physicians and 7,690 licenciates (assistant physicians), i.e., an average of one practitioner per 4,913 inhabitants, the medical density is probably three-and-a-half times higher in the towns than in the country. In Sind, there are reckoned to be 155 fully qualified practitioners and 323 licenciates, i.e., one per 9,487 of the population, but the ratio of
density as between town and country is 49 : 1. It is estimated that three-quarters of the physicians practise in the towns, whereas the rural population is eight to nine times as great as the urban population.

The reasons for this highly unequal distribution are easy to understand: the high proportion of students from the towns; the desire in the case of doctors of rural origin to rise to a higher social position; intellectual isolation; and disruption of the family when the children reach secondary-school age. Consequently, a number of governments depend upon young doctors to provide rural medical services through measures promoting two or three years' rural practice. One cannot help but feel that this is not a pleasing makeshift for the rural people who are constantly having a change in their family doctor, and the latter regards his stay as a temporary one with no future to it. The psychology of this measure is not adapted to the rural mind, which is slow to form attachments but knows how to plan well ahead.

**Paramedical and Auxiliary Staff**

Among other obstacles, the rapid development of a comprehensive health system comes up against a lack of qualified physicians. Some countries have tended to solve this problem by training auxiliary physicians by means of shortened and simplified courses. This system has certain advantages, for these auxiliary physicians speak the local language and can do excellent pioneer work under the supervision of a qualified practitioner. The system is in use in French tropical Africa, where health officers complete a four-year course of studies at the medical schools of Dakar and Tananarive. The USSR has long possessed a corps of auxiliary physicians (feldshers); they are trained in the same schools as midwives, nurses, assistant dentists, and assistant pharmacists, and they give signal service in rural areas.  

The same does not hold good in countries such as India and Cambodia, where qualified physicians and licenciates generally work independently in private practice. It is here that the system is likely to entail disadvantages. As a rule, the auxiliary physician lacks sufficient theoretical grounding and intellectual training to enable him to see beyond the instructions for treatment given in his textbooks. The fact that such physicians can manage quite well when in charge of fairly simple units does not prove that they are capable of holding an executive post. They do not have the general training for this, either morally or scientifically. This category of auxiliary physicians or licenciates should form a temporary corps of "health technicians", working full-time under the control of public-health physicians. Moreover, all of them in turn should be given a thorough scientific training, such as would enable them to meet the responsibilities confronting a physician
working on his own. This brings up the point of what the future of those among the auxiliaries who prove incapable of taking fresh courses and passing further examinations will be, when fully-qualified physicians begin to pass out of the medical schools in adequate numbers.

When we come to the traditional healers and medicine-men found in many rural villages, the situation is quite different. All those in Africa and a certain number practising in the monsoon regions of Asia are medicine-men whose knowledge is full of gaps and errors and whose treatment is a form of magic. They can be turned into a kind of working nurse for the pioneer health work in a region, and in the initial stages it would be stupid to antagonize them. They can carry out disinsectization and vaccination work as laboratory assistants; it does not matter very much in the beginning if their operations are accompanied by incantations and propitiatory gestures, provided the work is well done. But the monsoon countries of Asia also possess a class of traditional healers whose training and attitude are on a much higher level. Applying principles which go back to the Ayurveda in the Hindu world and to Hoang Ti Nei Ching in the countries influenced by Chinese civilization, they practise an art which, two centuries ago, had little cause to envy European medical science of the time. Unfortunately this art has greatly degenerated and most of these healers now hardly understand the systems laid down in these remarkable works of the past. The social rank of these traditional healers has fallen, in line with the degeneration of their science, and it must be recognized that, nowadays, in spite of their honesty and moral worth, they are good for nothing but to relieve, for a trifling fee, the minor ailments of their compatriots. Here again, it would be a sound health policy to train and utilize them, since this is their only hope of being able to make a living in the future from the art handed down to them. In Ceylon even now, the Ayurvedic healers are required to report all cases of contagious disease to the health authorities.

In some countries, almoners and social workers can play an important part in the field of health, provided they extend their functions to include care of the sick and work as visiting nurses. At any rate, they contribute to the success of prevention campaigns by seeking out contacts in the homes and persuading the people to attend the rural-hospital/health-centre.

Making due allowance for the difference in status, the previous remarks concerning physicians likewise apply to nurses and midwives. Even in advanced countries where large hospitals exist, there is obviously a serious shortage of qualified nurses. In Great Britain, there are roughly 180,000 nurses for a population of slightly less than 50 million, but 50,000 more are deemed necessary. In the under-developed countries, the problem is much more difficult. On the one hand, there are few girls with the requisite standard of education, and on the other, there are prejudices
against a young girl’s leaving her home or carrying out tasks considered to be menial. Nevertheless, it is possible to educate the village midwives, and they must be given suitable instruction and utilized in rural hospitals and health-centres. Some of these village midwives are intelligent women with an admirable understanding of the often elusive psychology of their fellow womenkind; they can be turned into allies and to win them over to the modern system would be a step towards more rapid progress in the spreading of rational ideas of hygiene and medical care. In this connexion, attention should be drawn to the excellent scheme in force in Egypt: the village midwives (dayas) have to attend a six-month course in order to obtain a licence, without which they are not authorized to attend confinements. As a rule, they are attached to a maternal- and child-welfare centre run by the Ministry of Public Health and under the local control of the provincial or district health-inspector. In Thailand, auxiliary midwives attend a six-week lecture course. In Indonesia, the “doeken-beranak” attend normal deliveries after receiving elementary training in hygiene. Nevertheless, it is clear that, as in the case of auxiliary physicians, these local workers must gradually be replaced by properly qualified midwives.

**Climatology of Rural Areas**

Climatic data may have a very important bearing on the problem we are considering. Deep down, traditional rural activities are patterned after the seasons. In many countries, the farmer has periods of intense labour (sowing, harvesting, ploughing), alternating with months of inaction. Mixed farming and the combining of agriculture with stock-breeding have helped to even out the work. Where this is not the case, slack periods are spent in building houses and barns, cutting wood, or deepening irrigation channels. In Egypt, before dams and perennial irrigation were introduced, the fellah patiently awaited the Nile floods which fertilized and softened the parched soil. In the plains of Manchuria, the intense cold imposes the rhythm of life of the Chinese settler described long ago in the Book of Verses. In southern Italy, the six or seven rainless months between the spring-time sowing and the harvesting and ploughing are periods of almost total inactivity in non-irrigated regions.

Any health programme must take this rhythm of work into account. During periods of intense activity, accidents are frequent and the hospital will be used mainly for curative purposes, the treatment of chronic or long-term diseases having to be left till later on. For the same reason, systematic case-finding or vaccination campaigns are likely to reach a high proportion of country-dwellers only when the season and the rhythm of agricultural work consign the people to inactivity.
Modern civilization, with its industrialization of the countryside, its good communications, and its social revolutions, has partly changed this traditional calendar of activities.

Knowledge of climatology is also important, however, in determining the type of rural hospital and the quality of the technical equipment to be utilized (stainless-steel, and “tropicalized” electrical, appliances). Finally, it is necessary to find out to what extent the rainy season, with its hurricanes and floods, will hinder transport between rural centres and the town.

Factors Influencing Rural Problems

We have glanced rapidly at the basic facts of human geography, taken in its widest sense, that define rural environment, with special reference to the under-developed countries. After this review of the existing situation, however, we must enquire into the disturbing influence of civilization, which may radically alter conditions in many countries that have hardly changed over thousands of years.

Political history has often led to the enforced dispersal of long-established villages. After the first World War, the influx of Greeks from the Smyrna region made it necessary to build 779 villages in eastern Macedonia (Drama, Kavala, Seres). The general plan adopted was the compact type of village customary in Ionia. The Dalmatian farmers uprooted in 1923 and transferred to Serbian Macedonia (Skoplje, Kumanovo), however, built small villages and hamlets with no systematic arrangement, such as are found on the Adriatic coast. Political redistribution of property (dividing up of the latifundia) led to the replacement of the larger village, imposed in former times by the lord of the manor for purposes of supervision, by new types such as the “masserie” and “cascinati” of southern Italy, and the “casierios” and “cortijos” of Andalusia.

Land improvement, with an accompanying betterment of the road system, also tends towards disintegration of old rural centres. The Spanish conquest of Latin America had the opposite effect of promoting the grouping of Indians around the “haciendas” of the conquerors whereas in the pre-Colombian period they had tended to be widely scattered. The abolition of slavery and the agrarian crises in Mexico also had a profound effect on the structure of rural peoples.82

Still more recently, long-distance transport facilities have enabled large groups to move from one part of a country to another and sometimes even from one country to another. The rice season in Piedmont draws tens of thousands of workers, mostly from southern Italy. In September, sugar-beet in the north of France and in Belgium attracts a large number of agricultural workers who may have already spent three or four weeks in Beauce for the wheat harvest. This seasonal labour force
sometimes comes from outside the country, from north Africa, Germany, Italy and, some 15 years ago, from Poland and Slovenia. Up to a few years ago the onion harvest in Alexandria attracted about 20,000 workers from upper Egypt for a few weeks every year; many of these workers suffered from a number of different diseases. In the USA, the migratory labour force amounts to no less than 300,000 persons, and often their material situation is very precarious.

Modern agricultural techniques which have upset the rhythm of life and the economy of rural communities have not brought improvements in public health; very much the contrary. Women workers for the rice season are housed in improvised premises, where indifferent hygienic conditions enable tuberculosis and venereal disease to spread without restraint. A deterioration in general behaviour associated with the ruthless destruction of traditional moral values is also inevitable. Today, the Egyptian fellah suffers from a much more aggravated form of bilharziasis than was the case when the sun, by drying up the irrigation canals for several months each year, kept down the number of snails (Bulinus and Planorbis) which are the carriers of this dreaded parasitosis. The floating population of casual workers recruited for the sugar crop or grain harvest are not readily open to preventive medical treatment, and over-work during the longest days of the year leads to serious disorders. It might have been hoped that systematic medical examination on recruitment could be organized, equivalent to the regular examination of the working population. Too much should not be expected of the manner in which such examinations are carried out, in view of the haste in which workers have to be assembled, and the private character of this industry.

In the partly empty villages health work becomes difficult and the effectiveness of the health-centre is reduced to the people left behind.

Again, we have the case where an industry is suddenly planted in a rural area. It may be motor works, an extractive industry (mines or quarries), or construction of a hydro-electric dam or an aerodrome with its ground services. Farmland is requisitioned to build hangars, roads, or runways and in a few months several thousand workers from the town settle around the villages, bringing with them their habits and diseases. Profound changes thus take place in rural life. Under the term “acclimatization” or “transculturation” (Ortiz), social ethnologists have taken as one of their main subjects of study the phenomena which arise when groups of individuals of differing cultures are brought together, and the comparison of their moral values. The works of Malinowski deal with the contacts of primitive peoples with western civilization; he broaches the problem in its most dramatic aspect.

In the simpler case which we are considering, the village directs its production towards foodstuffs likely to be purchased by the new working-
class community, abandoning the careful system of crop-rotation, the fruit of centuries-old experience. The young men and girls are absorbed by the factory and their abrupt transplantation from one environment to another causes family difficulties and a weakening of the traditional links of affection in favour of the companionship of the factory. To this is added a change in moral standards due to alcoholism and sexual licence. Indeed, an industrial revolution is invariably accompanied by new social and economic problems. The municipal council of the old village gives way before the influx of new inhabitants who exert a strong influence upon opinion in the rural community. Local schemes, adopted after lengthy consideration, are swept away by decision of the ruthless and all-powerful management of the company or camp. Where a hospital or health-centre has to be built, most often it is done in haste and in accordance with standardized plans, without safeguarding the real needs of the community as a whole. Often, the hospital is open only to employees of the new organization. Frequently, other members of the family cannot be admitted. Worse still, it is sufficient for a person to be out of work or to go back to his usual rural occupation for the doors of the hospital to be closed to him. This twofold type of medical care widens still further the gap between the traditional life and the newly introduced industry.

The development of iron mining, followed by the introduction of the iron and steel industry, upset the population structure in Lorraine. To the small villages and townships were added working-class settlements with from 2,000 to 4,000 inhabitants; it should nevertheless be noted that industry alone is not sufficient to create a real town. None of the mining communities with from 5,000 to 10,000 inhabitants and over has managed to acquire a truly urban character. As Vidal de la Blache wrote in 1916, "the motive to which these quasi-urban formations owe their origin lies outside them". A simple decision by the board of directors of the industrial group is sufficient to cause the decline of a centre which is fundamentally quite artificial. The most famous examples of this phenomenon are the mushroom towns of the Yukon and California which declined with the exhaustion of the gold reefs. It sometimes happens that a series of circumstances encourages the transformation of an industrial centre into a real town. This has occurred in Eindhoven (Netherlands), around the Philips factories. Between 1891 and 1935 the population rose from a few hundreds to 100,455, after absorbing six formerly independent municipalities. It would appear to be a common phenomenon in the USSR, where town-planning is now organized entirely around industry. This is the country to which we must look for the mushroom towns of our era. Novosibirsk rose from 5,000 inhabitants in 1891 to 406,000 in 1939, and this is only one example among many both in Siberia and in older regions such as the Donetz basin. It is interesting to note that in Egypt, a country con-
sidered to be essentially rural, two small towns, Kafr-el-Dawar and Mehallah el-Kobra, have acquired the status of industrial towns following the construction of big factories for the ginning and spinning of cotton. Mehallah el-Kobra has grown rapidly and is now considerably larger than the neighbouring town of Mansurah. This has altered the balance of hospital distribution in the area completely; the public-health services, however, have not been adjusted by the expansion of existing facilities. In each of these two towns a special hospital has been built for workers who before recruitment were country people; their families still remain dependent on the public hospital. In 1951, the world cotton-crisis led to the dismissal of 9,000 out of 25,000 employees in Mehallah el-Kobra and these again came under their former hospital, on returning to work in the fields. This example demonstrates the fluctuating and violent nature of social changes brought about by industrial development, and shows how co-ordination of hospital facilities is indispensable to avoid overlapping.

Conditions of work in agriculture call for close study. We have already referred to the mountain valleys where the population periodically scatters, the young people going to work in the down-stream factory while the shepherds climb to the Alpine pastures in the summer.

We have also seen how the quality of rural housing affects the capacity of hospitals. Where houses are without the necessary amenities, recourse to hospitalization will be more frequent. This applies in particular to certain classes of farmworkers who are responsible for looking after the livestock and sleep in a stable or cowshed. In the advanced countries this outmoded practice is forbidden by law, but it will take a certain lapse of time before dying out altogether. As a consequence, the cowherd suffering from a minor ailment must be hospitalized, whereas a person with proper housing can be treated at home for the same complaint.

**Future Prospects of Rural Demography**

The economic development of a country involves a profound change in the balance between town and countryside. Progressive industrialization attracts individuals formerly bound to the soil, populating industrial cities at the expense of the rural areas. This is so self-evident that there is hardly any need to compare the countries of south-east Europe—Hungary, Yugoslavia, Romania, and Bulgaria—where the agricultural population is 76%-80% of the total population, with countries such as Belgium and the USA, with present-day agricultural populations amounting to 17% and 10% respectively. Much was said about the exodus from the land and the need for getting back to it before the economists showed that this was an understandable and generally healthy phenomenon. Indeed, it is sufficient
to note that the output of cereals per hectare in the first-named group of countries varies between 10 and 11 quintals whereas, in the Netherlands and Denmark, where the rural populations amount to 20% and 33% respectively, the output is 28 quintals.40

Although methods for the exploitation of the agricultural areas vary considerably from one country to another, under the influence of many different factors (dividing-up of estates, types of crops, etc.), there is no doubt that mechanization increases output. Despite all his obstinacy and courage, the peasant who digs his garden with a spade or uses a sickle for reaping cannot compete on the international market for agricultural products.

Consequently, it is possible to enunciate the following law.41 “The economic development of a country is inversely proportional to the percentage of the population engaged in agriculture.”

The implementation of plans for economic aid and technical assistance to under-developed countries will therefore inevitably result in the movement of part of the rural population to the towns. This phenomenon, moreover, is rather complex because it entails on the one hand a change in the make-up of the age-groups—the older people stopping on the farm and the younger ones going to the factory—and, on the other, a slowing-down owing to the lowering of mortality and the increase in the population following the spread of modern hygiene. Finally, the setting-up of self-contained industries and workshops in the rural areas will keep back workmen who, although no longer agricultural workers, nevertheless live in the country.

However, the spread of modern methods of soil treatment and harvesting cannot fail to result in rural depopulation in a greater or lesser degree.

Between 1935 and 1939 the agricultural population of the USA amounted to 15% of the total population. In 1953 it represented 10% and it is believed that within a generation it will reach an asymptotic level, corresponding to 8% or 9%. This goes hand in hand with increased output since today, with 33% less agricultural workers, the production is double that of 1935. In Montana, for example, one man can cultivate about 600 hectares (1,500 acres) of cornland, with the aid, for a few days in the year, of itinerant workers and harvesting contractors. In Vermont, three people alone, without being overworked, run a 45-hectare (100-acre) farm with 40 milch cows. In Indiana, each hectare of maize calls for only 10 hours’ work per year, or, in other words, 15 minutes’ work per quintal per year. The industrialization of the USSR has produced the same phenomenon, the percentage of the rural population having fallen from 77% in 1913 to 60% in 1939.

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40 “Le développement économique d’un pays est inverse du pourcentage de population ensoibée dans l’agriculture.”
Clearly, similar trends are to be expected in the countries which are still under-developed, although conditions may vary within broad limits.

Turkey, for example, can develop the Anatolian plateau through agricultural mechanization, but since the density of population in the central provinces varies around 26 inhabitants per km$^2$ (67 per square mile), it cannot fall much lower. Large over-populated deltas with more than 1,000 inhabitants per km$^2$ (2,590 per square mile) and a horticultural type of agriculture could stand a more pronounced rural exodus.

These are circumstances that have considerable repercussions on the pattern of rural-hospital organization, since the concentration of the network of hospital institutions naturally depends on the density of the population to be served. Consequently, any scheme settling the distribution and number of rural-hospital beds should give prior consideration to the country's general plan of industrialization and the nature of the reforms required in its agricultural methods. These data should make it possible to evaluate the extent and the nature of the population movements that will result from an economic and technical evolution of this kind.

Political and Administrative Organization

Finally, the administrative and political structure of rural communities has due bearing on the course to be adopted. Four main types can be discerned:

(1) In some countries, long-standing practice in the conduct of municipal affairs has led to every commune having considerable freedom of action, laid down more or less precisely in the legislation. Thus the French Act of 1884 on local government (communes) granted every municipality the power to organize public services which, in the field of health policy, led to the establishment of local health offices responsible for environmental sanitation (Act of 15 February 1902, on the protection of public health). In many parts of the country, however, the communes have organized preventive-medicine centres which have grown (in the suburbs of Paris, for example) into comprehensive health-centres with treatment clinics. As regards hospitals, the Act of 21 December 1941 relating to hospitals and public hospices—which applies also to rural hospitals—has entrusted the running of each establishment to a board of managers, the chairman being invariably the mayor and two-thirds of its members belonging to the municipality. The hospital system is thus largely dependent on local initiative, and the Minister of Health can take action in the matter of hospitals only after obtaining the agreement of the individual communes concerned. The same applies to Switzerland, where the cantonal hospitals are largely independent.
(2) Countries such as Great Britain, Czechoslovakia, and Yugoslavia have nationalized, and subsequently regionalized, their hospital systems. In England, hospitals in large towns and rural-hospital units with a total bed capacity of about 1,000 enjoy a certain degree of autonomy in management. All the hospitals in a given region, however, with the exception of teaching hospitals, are controlled by the regional hospital board in which local authorities can express views but have no power of decision as regards broad policy lines.

(3) Other countries have a hospital system placed entirely in the hands of the central government, with no participation or representation of local authorities. The siting, financing, and staffing of rural hospitals are decided in the country's capital.

(4) Lastly, there is a type of organization of which a special feature is the degree of private participation. Great Britain before the Act of 5 July 1948, Belgium, Holland, and the USA, provide well-known examples. In the under-developed countries, too, private societies, foundations and endowments, or religious bodies with substantial financial means are found. This is a system that has produced admirable results, mostly in large towns. Nowadays, in view of the cost of hospital care and the growing importance of sickness insurance and social security, this type of organization is losing ground. It has often proved a failure when aiming to equip rural areas in advanced countries, where voluntary efforts of this kind have never succeeded in establishing themselves on a sound and effective basis. The exact opposite is true of certain eastern countries and of Africa, where mission hospitals have been the pioneers of rural-hospital organization.

It will thus be realized how much the organization of hospital services in rural areas depends on the general economy of a country, its stage of advancement, and the administrative and legislative measures in force, some of which have little connexion with public health. There can be no question of applying a standard formula, but rather the relative importance of a large number of factors must be weighed up before deciding on the form which rural-health policy should take in a given country.

Trends in the Organization of Rural Hospitals

For several decades now, different countries of the world have been making a start, varying in degree, towards providing country districts with hospitals.

The results achieved vary considerably from one country to another, and a careful analysis of existing conditions is necessary. This calls for a

1 This restriction does not apply to Scotland.
considerable effort in sifting documentation, as well as an intimate knowledge of the various systems, which show a wide divergency due to the many political and administrative bodies concerned.

Nevertheless, some common features can be discerned among the schemes of hospital organization developed over the past 20 years.

(1) Co-ordination between rural centres and urban hospitals stands out as a primary necessity. As a rule, such co-ordination is attained through a graded administrative organization which leaves the implementing and financing of the system, wholly or in part, in the hands of the government. Health inspectors are empowered to supervise and co-ordinate the different types of health services.

(2) There still remain many traces of the concept recommended by the Health Organisation of the League of Nations, namely, that two types of centre with purely preventive functions should be introduced:

(a) primary centres for practical work among rural populations;
(b) secondary centres whose role is mainly one of co-ordination.\(^{52}\)

(3) This approach is clearly giving ground, however, before the concept of generalizing and combining preventive and curative medicine in a single establishment which has the characteristics both of a rural hospital and of a health-and-prevention centre.

(4) The size of the community covered by these services varies considerably from one country to another. On the average, however, it is in the region of from 40,000 to 50,000 inhabitants where the health-centre is purely preventive in function, dropping to 20,000 where the hospital/health-centre idea is dominant.

(5) A certain indecision is noticeable as regards the curative functions to be entrusted to a rural health-centre; some countries do not hesitate to provide for a wide range of activities, including maternity services, emergency care, in-patient treatment for common and contagious diseases, and out-patient clinics. Others realize the difficulties which may result from excessive decentralization of rural hospitals, and prefer to limit the curative functions of such establishments to out-patient clinics. In these countries, hospitalization begins at the level of small-town hospitals where proper facilities and qualified medical staff can be assembled. There is general agreement, however, on the need for transport and communications facilities between town and country.

(6) As regards the implementing and financing of the general health plan, two trends can be observed. Some prefer complete centralization under the health ministry, while others call for local, municipal, or provincial authorities to participate, according to the political and administrative structure of the country in question. Lastly, the government may come
to an arrangement with voluntary efforts, originated by charity or employers or social insurance.

(7) The problem of staffing rural centres has also been tackled in various ways. Some countries do not hesitate to leave the day-to-day responsibility for rural health-work (subject to supervision from above) to an auxiliary official, a health officer, a non-qualified nurse, or a village midwife. Other countries prefer to organize mobile clinics making regular tours, with staff belonging to the urban centre and consisting of qualified doctors and nurses.

The many experiments that have been made justify an attempt to work out a theory of rural hospitalization based on concrete achievements that have been tried and tested. In spite of its title, therefore, the following chapter is largely based on applied theory and, in fact, owes very little to abstract speculation.
CHAPTER 2

THEORY OF THE RURAL HOSPITAL

In describing the standard hospital/health-centre and its integration into the general system of the country, we shall avoid treating it as a whole from which no part can be cut out. To allow for its adaptation to the very diverse conditions prevailing throughout the world, we shall rather describe it in terms of a construction game, composed of pieces which can be fitted together, thus emphasizing the flexibility which must be the essential quality of the rural-hospital/health-centre.

Again, it is important that the functions which we feel ought to be assumed by this type of establishment should be clearly defined from the outset. Throughout this study we have envisaged the sphere of action of the hospital/health-centre as covering three distinct sectors:

(1) hospitalization proper, where the patient is given a bed in hospital for a certain length of time;

(2) out-patient clinic, where curative treatment is given;

(3) public-health services, whose object is to improve the general health position and take preventive action against the so-called social diseases.

When we speak of "hospital", we shall mean any establishment which fulfils all three functions or the two last-named only.

Concept of Regionalization

Integration of rural medical services in the general health system

Hospitals cannot be regarded as completely autonomous unless they are, for geographical reasons, situated in remote areas which are so far from any large urban hospital that the transport of patients would meet with considerable difficulty. Small islands with from 10,000 to 20,000 inhabitants at the most, mountain valleys isolated for the greater part of the year, African and Asian oases, and ports and trading centres set down in inhospitable coastal regions with no hinterland (Red Sea, Arctic Ocean, etc.), should have an independent system of medical assistance through which the population can be assured of the best possible care. In these
areas, it is the exception for a patient to be sent to an urban hospital-unit at the cost of a long and possibly expensive journey. In all other cases, the rural hospital should be incorporated in the general system. Over the past 10 years, the idea of regional organization of hospitals has gained ground in most western countries alive to the necessity of reforming their health systems. This development has taken place as a result of contemporary advances in medical science.

To understand the advance represented by the idea of regionalization, we must analyse the salient features of the former system.

(1) Going back to the end of the last century, there can be no contesting that specialization in medicine was barely in its infancy. For centuries, it is true, a distinction had been made between physicians, surgeons, and obstetricians. There was hardly any subdivision of these various branches, however, and in small towns and country districts physicians were general practitioners in the fullest sense of the word—a quality which they still partially retain. Neurology had just come into being through the work of Charcot, and cardiology, gastro-enterology, and paediatrics had given rise to fundamental studies by professors of world renown; nevertheless, outside the great capitals, each physician practised every branch of internal pathology, and every surgeon used all the techniques known to his day. Let us remember, too, that a great many of the early radiologists were electricians or physicists with no basic knowledge of medicine.

(2) The second feature is that patients were transported at the speed of the horse, and it took two hours to travel seven or eight miles in conditions of some discomfort.

(3) Hospitals were charitable institutions, financed wholly or partly by private donations, accounts and the use of funds being subject to check. Questions of efficiency and cost per bed did not have to be considered.

The first feature explains why hospitals were planned as independent, general institutions for the treatment of all diseases. The second helps us to understand the dispersion of hospital institutions and the large numbers of small hospitals. The third accounts for the fact that these hospital institutions were intended to give shelter to a variable number of chronic cases, invalids and elderly people, and hence, that adjustment of the number of beds to the population served did not constitute a problem. In fact, the presence for a very lengthy period of chronic patients capable of assisting the staff in the kitchen and in the garden meant a corresponding reduction in running costs.

A hospital system could therefore be conceived in a very simple manner. It was made up of institutions situated at the intersecting points of a
network whose links were about 12½ miles (20 km) long (see fig. 1 A). Each institution endeavoured to meet all needs within its geographical sector; it possessed medical, surgical, maternity, and infectious-disease departments in a proportion dictated by experience. The number of beds was, in practice, determined by the funds available at the time the hospital was built.
The profound changes which have taken place over the past 50 years in all realms of intellectual and social activity have completely upset the simple concept we have just described.

(1) The two fundamental branches of pathology have each split up into specialized fields. In a growing number of cases, a physician is obliged to confer with his specialist colleagues before he can reach a diagnosis and decide on treatment. Often he cannot undertake the treatment himself and will refer the case to an institution with special facilities. This idea of specialization, however, needs closer examination. The incidence of the different diseases calling for specialized treatment is far from being comparable. Various checks of the relevant figures in several regions of France have led to the establishment of the following proportions:

<table>
<thead>
<tr>
<th>Branch</th>
<th>Average number of persons providing full employment for a practitioner</th>
</tr>
</thead>
<tbody>
<tr>
<td>General medicine</td>
<td>1,500</td>
</tr>
<tr>
<td>General surgery</td>
<td>20,000</td>
</tr>
<tr>
<td>Urology, otorhinolaryngology, ophthalmology, gynaecology, radiology</td>
<td>40,000</td>
</tr>
<tr>
<td>Cardiology, gastro-enterology, radiotherapy, specialized paediatrics</td>
<td>100,000</td>
</tr>
<tr>
<td>Neurosurgery, pulmonary surgery, specialized treatment of cancer</td>
<td>2-4 million</td>
</tr>
</tbody>
</table>

In other countries, this distribution varies for certain special branches, in particular for paediatrics. In the USSR, for example, most children are examined by paediatricians, while in France the latter deal only with difficult problems which the family doctor is unable to solve. Furthermore, it is considered that the general practitioner is able correctly to diagnose and treat nine cases out of ten in his practice. One patient out of every ten has to be referred to a specialist, a distribution which is in accordance with a statistical law illustrated by the above tabulation in another form.

It follows that the distribution of specialists in various branches cannot be as regular throughout the country as that of general practitioners, and that a concentration in the urban centres is inevitable. The degree of concentration of specialists is itself highly variable. The most frequently consulted specialists may practise in the smaller towns. Surgeons, ear, nose, and throat specialists, and ophthalmologists are found in municipalities with from 10,000 to 20,000 inhabitants. On the other hand, neurosurgeons and specialists in advanced chest surgery practise in the principal towns of large areas, with a population of from one to two million. Lastly, when a new technique is developed, the rare experts who have mastered it will be found in the chief centres. Thus for ten years, surgery of the large heart vessels has been practised only in a few large cities.
throughout the world, and at the present time is not available in many important countries.

The teaching of medicine and scientific research also play a decisive part in the distribution of specialized services, and they have a profound influence on hospital planning of today. The few specialists of the past passed on their learning and conducted their research within the medical schools. Today, specialized training necessarily comprises a very large part of the curriculum of medical studies, and, in all, a student spends more time in the specialized departments than in the general hospitals for patients suffering from common ailments. This applies with even greater force in specialized diploma courses, and post-graduate teaching. Now, the rarity of certain diseases tends to favour the concentration of patients in urban centres possessing medical schools. The planning of a hospital system at the government level after consultation with various ministries (including the education ministry) is bound to be profoundly affected by these considerations.

(2) There is no need to dwell on the ease of transport in modern countries and the considerable enlargement of the radius of action of the urban centre permitted by rail, road, and air transport systems. It is sufficient to note that the distance that can be covered in two hours has risen from some 8 miles (12 km) to at least 50 (80 km). By limiting the distance which ordinary patients can reasonably be expected to travel to some 20-25 miles (30-40 km), the area served by urban hospitals has been considerably increased on the one hand, and, on the other, the time taken in transporting patients has been reduced. It must be recognized, however, that the extension of the ambit of the large hospitals is partially offset by the growth of the urban and suburban population.

(3) Finally, the charitable nature of the hospital of the past has gradually given way to the principle of universality in the present-day institution, to which in many countries nowadays every social class is admitted. The introduction of sickness-insurance and social-security schemes has been a determining factor in this tendency. In most of the under-developed countries, the economic structure has not as yet permitted the large-scale application of this principle, but the hospital system—which, as we shall show, can only achieve full development when the industrial and commercial structure supporting it has reached a certain degree of maturity—has to take account of this fact, which is decisive in the social history of every country.

For all these reasons, the idea of regionalization has taken root and grown in the USA, Great Britain, France, Italy, Portugal, and Czechoslovakia, and, to a greater or lesser extent, it forms the basis of hospital organization in most countries. It consists in replacing the elementary
structure described above by a co-ordinated and graded system in which all the health institutions become members of a carefully articulated whole (see fig. 1B, page 39). This system, however, has two drawbacks: the isolation of the regional centre whose activity is centred around the most specialized of its functions; and the successive stages through which a patient from a rural hospital must pass before admission to the regional centre. The country is divided into public-health regions whose size is determined by the minimum population needed to justify the existence of services for the more uncommon specialities. In the advanced countries, each such region has a population of at least two million. This figure and those given below may be much larger in the under-developed countries where communications are still difficult and hospital attendance is too low.

*Regional hospital-centre (RHC)*

This is found in the largest towns of a region, where the most complex elements of modern social life are co-ordinated. It consists of a hospital group, composed of institutions and services fulfilling three basic functions (see fig. 2).

(1) *Regional function.* One or more hospitals have a complete range of specialized departments where patients suffering from the rarest diseases can be admitted. These are, in particular, the cancer department which includes radiology and nuclear-physics laboratories, departments of neurosurgery and advanced chest surgery, and the research and teaching centres where specialists in the different subjects carry out special operations, such as corneal grafting in ophthalmology, fenestration of the inner ear in otorhinolaryngology, vectorgraphic examinations in cardiology, electroencephalography, and so on. Co-ordination with all branches of medicine is ensured by nearby large psychiatric hospitals, tuberculosis and paediatric centres, etc. Patients attending the highly specialized departments of the RHC come from all parts of the region. It should be noted that a population of 1.5-2 millions will justify the setting up of separate departments having 50-60 beds each, with work enough to enable teams to be formed comprising professors, departmental heads, assistants, and students.

(2) *Sub-divisional function.* This is characterized by the existence in the RHC of departments for the common specialities, e.g., paediatrics, gastro-enterology, gynaecology, dermatology, surgical obstetrics, cardiology, otorhinolaryngology, ophthalmology, urology, etc. These departments

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9 *Regional hospital-centre* is the translation of a term used in the French. It corresponds to the *base hospital* of USA administration, while *sub-divisional hospital-centre* corresponds to the USA *regional hospital*. In Great Britain, the word *region* bears the same meaning as in France, but the hospitals of the chief towns of the British regions are *university hospitals*. 
normally admit patients from a sub-division of the region, with a population of between 300,000 and 500,000. Each of these departments would have one or more wards with 20-30 beds.

**FIG. 2. MODERN REGIONALIZED HOSPITAL SYSTEM**

![Diagram of modern regionalized hospital system]

- **Regional hospital-centre (RHC)**
- **Sub-divisional hospital-centre (SHC)**
- **Local hospital**
- **Rural hospital**

(3) *Local function.* This is represented by additional services or hospitals undertaking the diagnosis and treatment of common diseases occurring among inhabitants of the town and of its immediate vicinity. These services cover general medicine, general surgery, maternity, communicable diseases, and the admission and classifying of patients suffering from tuberculosis, or social or endemic diseases.

The size of the population served varies according to the town within a fairly wide range, but does not fall below 60,000. The RHC ensures
the co-ordination of all these services together with fulfilment of the three different functions through one or more institutions, according to the total number of beds required. As the optimum capacity of a large hospital is approximately 600 beds, a regional centre to be set up in a local area of more than 100,000 inhabitants will call for at least two institutions: one to include all the specialized services covering the regional and the sub-divisional functions, together with clinical teaching departments for medicine, general surgery, and obstetrics; and the other containing the services intended to cope with diseases endemic to the local area. All requirements of medical teaching and scientific research can be satisfied by such a hospital group.

Sub-divisional hospital-centre (SHC)

The region taken as a starting point can be sub-divided into two or three areas, each with a population of from 300,000 to 500,000. We have just seen that cases needing highly specialized services are referred to the RHC, but it should be possible for the SHC’s to treat cases coming under the common specialities in any sub-division other than that in which the RHC is situated. These centres fulfil a dual function:

1. A sub-divisional function which comprises all or part of the common specialities listed above in connexion with the similar function performed by the RHC. It should be remembered that a population of 300,000 to 500,000 is covered by this.

2. A local function for the town and surrounding area where the sub-divisional hospital is situated. This covers at least 60,000 people for general medicine, surgery, maternity, and communicable diseases.

Local hospital

Since each sub-division is divided into from two to four local areas, local cases coming within the local function in areas which possess neither an RHC nor an SHC have to find accommodation in a simple hospital institution. This institution will fulfil the function already described above, in the fields of medicine, general surgery, maternity, and the isolation of communicable diseases. According to this system, the local hospital will cater for a population of from 50,000 to 60,000.

The pattern network which we have briefly described appears to cover all needs. In theory, within this graded and co-ordinated system, every case will find a hospital institution to which it can be admitted. Anyone suffering from an exceptional disease may be compelled to make a long journey within the region, but the ordinary case will find a suitable service at a distance in no instance exceeding the radius of the local area.20
Rural hospital

Notwithstanding, a detailed analysis of health needs shows that in many cases the theoretical plan outlined above will not be sufficient. Clearly, the system is too loosely knit to serve as a rallying point for setting up simple preventive and curative medical services. Without entering into detail brought out by numerous earlier studies, it is obvious that maternal- and child-welfare centres, case-finding services for social diseases, and out-patient clinics should be decentralized so as to be brought within reach of the community. In the town, the hospital is supported by a number of health, preventive-medicine, and treatment clinics, established in the various urban districts and suburbs. In the country, one comes across the same elements in the centres of population: the villages, the market towns, and the chief towns of the smaller administrative divisions. Again, on referring to the first chapter where a definition of a rural area from the angle of hospital organization was suggested (see page 11), it

FIG. 3. ILLUSTRATION IN TERMS OF ISOCHRONES

- Sub-divisional hospital-centre (SHC)
- Local hospital
- Rural hospital

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60-minute isochrone
30- to 45-minute isochrone
will be seen that in most countries the towns where SHC's and well-equipped local hospitals can be erected do not, taken together, constitute a sufficiently dense network over the whole territory for isochrones to intersect without leaving areas unprovided for.

Fig. 3 represents a hilly region where rivers and mountains constitute natural obstacles to transport. A study of it shows that the hospital requirements of patients living in rural areas covered by 60-minute isochrones around the large town A, and by 30- to 45-minute isochrones around the towns B and C, can quite easily be met by the institutions of the towns in question. Town D, less than one hour's travel time from A and roughly half an hour from B, does not require a comprehensive hospital institution. On the other hand, the rural areas including the villages m and n, each containing a scattered population of more than 20,000, are too far removed from treatment centres, and have to be provided with some form of organized medical assistance, including hospital care. This is where rural hospitals could be developed, to provide basic treatment for the populations of these districts. On the other hand, the village p, situated in flat country, has not a population large enough to be provided with an institution containing beds for hospitalization. Its inhabitants need only undertake an additional 10-15 minutes' journey to reach either city A or town B. Nevertheless, if the population of village p so warrants, it should be provided with a health-centre with facilities for out-patient care. This is even more true of town D which, although regarded as dependent on A and B for hospitalization properly speaking, must nevertheless have one or more centres for curative and preventive treatment. In this case, there is a separation of the functions of hospital and of rural health-centre.

In the USA, a study of the distribution of rural hospitals in sparsely-populated areas gave the following results: the 1,455 most remote counties each has an average population of about 13,000 and a population density of about 13 per square mile (5 per km²). A circular belt with a radius of approximately 22 miles (36 km) will thus take in 20,000 persons, which is the minimum number required for a hospital with 40 to 50 beds. Taking two beds per 1,000 inhabitants as a basis, a hospital with 100 beds could be envisaged for a community scattered over an area with a radius of approximately 35 miles (56 km), according to the above density of 13 per square mile (5 per km²). Under normal transport conditions, a circular belt with a radius of about 22 miles (36 km) will roughly correspond to an isochrone of 45 minutes, and one of about a 35-mile radius (56 km) to an isochrone of 60 minutes. At the Fourth International Hospital Congress, Distel of Hamburg advocated a radius of action of 30-35 km (about 19-22 miles) for ordinary hospitals, which is equivalent to a transport time of 30 minutes. (This estimate appears somewhat optimistic
if account is taken of the passage through suburbs and the poorness of
country roads.)

To summarize, all that is within the isochrones can normally be served
by the town hospitals. Everything outside will require a special hospital
organization. It should be clearly stated, however, in order to avoid any
misunderstanding, that the health and preventive-medicine system should
be decentralized within the zone covered by the isochrone so that these
services are within easier reach of the population. In the peripheral urban
areas served by urban hospitals, this dual system still retains its full value;
health- and treatment-centres without in-patient facilities can be distributed
throughout. Everything outside the isochrone will be regarded as rural,
and to this we can apply a single system comprising a standard hospital/
health-centre with hospitalization facilities.

The idea of regionalization, however, is not limited to a static distri-
bution of this kind, with the grading of hospital functions requiring removal
of patients. The plan described allows for a dynamic concept of hospital
services. Since administrative and technical co-ordination is possible, the
specialists attached to the RHC's and SHC's can travel to the local and
rural hospitals for consultations or special examinations. The decentralized
institutions may receive a weekly or monthly visit from an ear, nose, and
throat specialist and a paediatrician, and these specialists will be able
to advise patients and local physicians, thanks to having premises placed
at their disposal and the light set of instruments they bring. Certain types
of physiotherapy, for example, can be carried out locally. This concept
may take in emergency treatment of patients who cannot be moved. In
certain rural industries—tree-felling, saw-milling, and threshing—
labourers are exposed to the risk of extremely serious accidents. To
remove a patient to the nearest hospital is hardly possible, and it is out
of the question to take him to a distant centre, although the gravity of
his injuries would in theory require this. Temporary immobilization and
treatment for shock can be ensured at the scene of the accident itself—the
best solution—by an emergency team, comprising a surgeon, an anaes-
thesiologist, and nursing staff from a hospital-centre. Within a few hours,
the patient, recovered from the first shock and with his injuries provision-
ally dressed, may be transported to a specialized traumatology department
where he will receive the care which his serious condition requires. This
system seems preferable to transporting the injured person without any
preliminary care to a small rural institution, where the right treatment
cannot be given precisely because of the serious nature of the injuries.
It is, moreover, well known that clumsy methods of transport from the
scene of an accident to a first-aid post often result in an aggravation of
the original injury, e.g., opening of a fracture, rupture of an artery or
nerve, damage to the spinal cord, or collapse.
Furthermore, the regionalization plan adopted in Rochester, N.Y., and Boston, Mass., in the USA, provides for travel of laboratory technicians and pathologists able to carry out post-mortem examinations and to interpret histological slides prepared on the spot by local hospitals. An attempt has even been made to transmit electro-cardiographs and radiography films by telephotography to the specialized departments of hospital-centres in order to obtain the correct interpretation by telephone; but this is still in the nature of a scientific curiosity. Finally, the concept of regionalization makes it possible to organize purchase co-operatives for hospitals, which can procure supplies and merchandise for the hospitals in a region, bought at wholesale prices and carefully inspected by modern methods. A central co-operative service is particularly valuable for ordinary materia medica, such as syringes and needles, rubber articles, linen, and glass-ware. A special feature among its activities would be the distribution of preserved human blood and of all types of plasma, the preparation and conservation of which can reasonably be undertaken only at the regional level, although it may be urgently required by all classes of hospital. In Great Britain and France, particular emphasis has been laid on adapting the idea of regionalization to a special blood-transfusion service. This service provides for the collection of blood in the different local banks, its dispatch to the central regional service, and the distribution of preserved blood and its derivatives right down to the rural level.

Co-ordination with Preventive Medicine

On considering the idea of regionalization, it becomes clear that the integration of the rural hospital in the general hospital system is urgently needed in the present state of hospital organization. Attention must also be paid, however, to the links which have to be established between the rural hospitals and the various parts of the preventive-medicine machinery.

In advanced countries, the organization of preventive medicine and the hospital system have developed independently, along dual lines. This dual pattern was approved by the Health Organisation of the League of Nations, but as far back as 1931 the European Conference on Rural Hygiene took up the question of hospital care in rural districts and recommended the building of hospitals with at least 50 beds to serve 20,000 to 30,000 of a population, in accordance with a standard ratio of two beds per 1,000 inhabitants. The fusion of the preventive centre and the hospital had not yet clearly emerged, although it was recommended that medical assistance should be considered in its widest sense. As medical assistance has both a preventive and a curative purpose, its hospital facilities should meet both these requirements. The Conference on Rural Health Centres,
held at Budapest in 1930, also under the auspices of the Health Organisation of the League of Nations, considered that, in making available the resources of specialized establishments for prevention on the one hand and in-patient care and treatment on the other, the multi-purpose centre, combined and co-ordinated with the other health activities, represented the type best adapted to local rural conditions.\textsuperscript{65} 

The European Conference on Rural Hygiene\textsuperscript{52} concluded that a distinction should be made between primary and secondary centres. As regards the former the Conference declared:

"In areas where the absence or insufficient number of physicians prevents the adequate provision of medical treatment, and in the case of patients unable to receive proper treatment elsewhere, the health centre should undertake this work."

Provision of medical care was also discussed, and the Conference recognized that "one of the first responsibilities of a governmental health agency was to make provision for the treatment of the sick where such provision did not exist or was inadequate". The Conference was less explicit about the secondary centres. These should, apparently, be concerned chiefly with administrative and technical co-ordination and liaison. There was no question of the secondary centres undertaking curative work, but the Conference recognized that medical assistance had both a preventive and a curative purpose, and that diagnostic and preventive centres did, in fact, exist in nearly all European countries, except Germany and France.

Moreover, an inquiry held by the Association Professionnelle Internationale des Médecins\textsuperscript{69} led to similar conclusions, inasmuch as the replies received from Austria, Great Britain, and Norway confused the secondary public-health centre with the local hospital. In Norway and Sweden, the medical officer of health for a rural district is also required to treat patients. In Alberta (Canada)\textsuperscript{61} the public-health services organize general medical consultations.

The report of the Preparatory Committee of the Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene which took place in Bangdoeng in 1937\textsuperscript{63} explains in unexceptionable terms the reasons why the unitary system, under which medicine and public health are combined in a single administrative unit with a bivalent personnel, is preferable, especially for under-developed countries. It is true that in the former Straits Settlements (now the Federation of Malaya) where the separation of the two branches is complete (under single control), good work is accomplished, due to the fact that the density of the population is high and the administration has ample funds at its disposal. Results are not so good in India where, because of limited funds, the public-health service
is less advanced than the medical service. Indo-China and Thailand have adopted the combined system and the results are in no way inferior.

At the Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene, Dorolle pointed out that curative medical services and public health cannot be separated in rural areas; the first, to be successful, must come after and be supported by the second.

It is principally in Africa that one finds the marked tendency to break down the dividing wall between the two branches. In 1932, the Rural Hygiene Committee, set up by the first Pan-African Health Conference held at Cape Town under the aegis of the League of Nations, declared:

"The experience of all members of the Committee [Angola, Bechuanaland, Gold Coast, British India, Kenya, Mozambique and the Union of South Africa] definitely points to the advisability of separating preventive and curative functions in the rural areas of most of the countries under consideration."

Hazemann, in his report "The Recent Trend of Medico-Social Policy in Europe", points out that in countries such as Denmark and Sweden, where health-centres are relatively rare, the special equipment of the hospitals is used for purposes of diagnosis. He also remarks that the hospital problem is a twofold one, entailing both a territorial and a functional division of labour, as well as co-ordination, not only internally but also externally, with the health-centres and corresponding dispensaries.

De Barros Barreto remarks that the work and aims of hygienists and medical practitioners differ in many respects, but that co-operation between the two types of action would always be necessary in order to direct them to a common end. There should be a single control so as to ensure the carrying-out of a balanced programme, thus avoiding over-development of curative medicine at the expense of public health. If the goal of the latter, however,

"is properly appreciated, and if there is a competent staff available, the work will not suffer very much when lack of funds compels its amalgamation with curative medicine . . . Mountin . . . takes the view that . . . there is no serious objection to the amalgamation in rural areas of the preventive and curative services. C. E. Walter goes so far as to say that "the most important activity of the health department of the future will be in the medical care field"—in industrial medical services . . . One of the best forms of public health organization outside the big towns is that which consists in dividing up a region into sectors or districts, the areas, population, general conditions and available resources of which allow of their efficient administration."

This approximates to Davis and Ross's scheme for a county hospital health-centre.

During the past 10 years, the arguments in favour of combined curative and preventive services have been strengthened. First of all, the undeniable
economy in equipment and staff has been stressed. Preventive medicine requires the same apparatus as therapeutic medicine: radiology for detecting pulmonary tuberculosis, laboratory instruments, and equipment for gynaecology, paediatrics, and maternal and child welfare. Secondly, it is not easy to draw the line between curative and preventive medicine, the more so since the latter is really a type of early diagnosis. Claims have been made that preventive campaigns against tuberculosis or venereal or endemic diseases encroach on the curative programme. Mountin & Hoenack 62 classify the four main patterns along which health-centres are developing in the USA as follows:

1. those designed exclusively for use by public-health agencies;
2. those that provide space for public-health functions to be performed in the hospital;
3. those that furnish accommodation for the health department and the practising physicians (this is what we describe elsewhere as the "group-practice offices");
4. those that bring together in one building or in a group of related buildings, the health department, the hospital, and offices for practising physicians.6

This concept has received the approval of the American Hospital Association and the American Public Health Association 1 in a joint statement stressing the theoretical and practical advantages resulting from the close co-ordination of hospitals and health departments. The health department may be attached either to a teaching hospital, as in Louisville, Ky, or to a private hospital in a large town, as in Niagara Falls, N.Y., or to a rural hospital where the director of the hospital may at the same time be the health officer, as in Hastings, Mich.23

Over a 25-year period the USSR 78 has built up a network of rural medical centres which provide both in-patient and out-patient treatment and preventive and general health services. These centres are usually staffed by doctors representing all specialities. The rural centres are simpler. For a collective farm with from 800 to 1,000 workers, there is generally one doctor, one dentist, a few nurses, two midwives, and a dozen beds for patients needing hospitalization. These centres are naturally in close touch with the nearest town hospital.

Full uniformity has not been attained, however, inasmuch as countries have followed the most diverse tendencies, depending on whether country doctors are private practitioners or officials, or whether a rural-hospital network, with or without a system of preventive medicine, exists. The

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6 For a detailed study of this system, see the chapter dealing with architecture, page 91.
technical discussions which took place at the Fifth World Health Assembly in May 1952 were sometimes conflicting on this point. A glance at the report of these discussions shows that a combination of preventive and curative medicine is definitely recommended, while at the same time it is recognized that the relationship between the curative and preventive aspects "would vary according to social and economic conditions", and that in the rural areas there is "a tendency toward a combination of preventive and curative programmes in a single unit". On the other hand, it is clear that a good many experts hesitated to give full support for fusion of the health-centre and hospital: "On the whole, it was felt that a close co-operation between the hospital and the health centre without rivalry, and a unified control from the higher level, were the ideals at which to be aimed".

We feel that this solution would indeed be an ideal one where the two services already exist side by side, as occurs in the densely populated areas of the advanced countries. On turning to the under-developed countries, however, financial and staffing difficulties are encountered, because a co-operation of this kind without rivalry cannot prevent duplication of equipment and of qualified staff.

It is true that in the under-developed countries the situation is complicated, and priority has sometimes to be given to public health in the strict sense, i.e., environmental sanitation, control of insect vectors, and mass immunization of the population. In the regions subject to the great epidemic and endemic scourges, the first thing to be done is to evolve modern public-health techniques to reduce general morbidity to a stable level, before a comprehensive plan for curative medicine and hospital installations can be contemplated. In other words, it seems quite useless for the time being to set up a cholera hospital in a region where nothing is being done as regards waste-matter disposal and drinking-water supplies. During the last century many well-meant schemes came to nothing on this account. It is, in fact, impossible to ascertain the number of beds required for a given population where the population as a whole is exposed to a complication of infections so powerful and so numerous that every single person can be considered ill at a given moment. This is one reason why curative action in such countries has to come after preventive and public-health measures. On the other hand, while it may be thought that the population can be won over by curative measures which alleviate their troublesome ailments, it should be remembered that such measures can reach full development only when preventive campaigns have reduced general morbidity to a more or less normal level.

Consequently, as regards the subject under consideration, three successive stages might be described that will follow one another gradually:
(1) No public-health measures have been applied to a rural population which is exposed to periodic decimating epidemics. This is the situation among primitive peoples whose social development is continually jeopardized by smallpox, plague, cholera, and yellow fever, which strike savagely in any growing townships—a state of affairs which prevents the development of stable communities of more than a few hundred individuals. It is a stage which, happily, has been passed by most peoples of the globe; it calls for well-known measures, easy to carry out and highly effective (vaccination, disinsection, and rudimentary care).

(2) Once this stage is passed, the people remain subject to infestation and chronic infections (parasitoses, trachoma, malaria, and gastro-enteritis). Their health seems less directly threatened, but their vitality is nevertheless seriously sapped and their working capacity remains moderate. This is a stage where the eradication of epidemics leads to a considerable increase in the population, in spite of a still excessive infant-mortality-rate and an average expectation of life of less than 40 years. India, Indonesia, and the Near East are in this stage, and their populations are increasing very rapidly. Owing to the low standard of health, however, they are unable to produce sufficient to achieve a minimum economic level. It is the stage of the vicious circle caused by poverty and disease—a stage particularly difficult to pass because the public-health measures needed to break this circle represent a financial outlay for the governments of these countries which can only be met in part, because of the still elementary stage of the national economy. The action to deal with this situation, however, is no longer limited to vaccination and disinsection campaigns, as in the first stage. It is an unrelenting struggle, backed by a solid system of health-centres, and this is a much more costly programme than travelling public-health teams. This is the time for the permanent organization of sanitation and health education, of regular, plentiful drinking-water supplies, and of the control of mosquitoes, flies, and snails. Curative medicine cannot yet be fully applied because of lack of exact knowledge of the volume of work to be done. What kind of long-term programme should be planned for a country where almost the entire population flocks to the out-patient department of the rural hospital? Care has to be limited to the most urgent cases, to give the people a feeling of security and confidence in the treatment, and encourage them to take advantage of the newer facilities.

(3) It is only in the third stage, when the most serious groups of diseases have been eliminated from the original pathological pattern and the latter has been reduced to unforeseeable illnesses, that a plan of action can be drawn up and a network of institutions organized which accurately correspond to the needs of the community. A certain period of observation will have to elapse before further building-up becomes possible, to allow
of evaluation on the basis of reliable age, mortality, and morbidity statistics.

In practice, it is obvious that the three stages we have described inter-penetrating and overlap and that all stages in the development of the public-health service involve an extension of curative medicine. Moreover—and especially in this field—there can be no prevention without treatment, and to treat is to prevent.

When the way is clear for extensive and effective curative action, the health-centre/hospital has an important role to play. In short, the health-centre/rural-hospital is a type of combination suitable for under-developed countries, in areas where the ordinary diseases cannot readily be taken care of by urban hospitals, and where a health service is already firmly installed and has succeeded in reducing the incidence of the great epidemic or endemic diseases.

Administrative Structure in Regionalization

After describing the concept of regionalization in somewhat abstract terms, we must now consider how it can be adapted to the structure of the public-health administration. Some countries have a health ministry with representatives in the different regions and territorial sub-divisions. These representatives are invariably, at least at the regional level, whole-time medical officials specializing in health administration. They are either the direct representatives of the minister of public health, and have similar status to colleagues representing other ministers, or else they are attached more directly to the representative of the minister of the interior in his capacity as governor of a region or territorial sub-division (for example, the prefect in France, the mudir in Egypt). However this may be, the director of public health is responsible for the administrative work connected with the hospitals of the region or sub-division. Regionalization has therefore to be superimposed on the existing administrative structure, and where the two do not conform they must be brought into line. All administrative and technical questions governed by legislation or executive regulations applicable to the public fall within the purview of the director of public health. That is to say, he is responsible for settling matters relating to administrative staff, for confirming the appointment of physicians and nurses, for attending to supply problems, and for controlling finance from the viewpoint of both expenditure and income. Finally, he plays an essential part in transmitting requests for the constructing, equipping, and modernizing of hospitals in his area to the ministry which draws up the national hospital-programme. This work calls for co-ordination at the regional and sub-divisional level with the director's colleagues respon-
sible for employment conditions, finance, and possibly social security, as well as other departments which have to do with health problems, such as the departments of national education (school medical inspection), defence (military hospitals), and public works (public buildings and works throughout the country). Where the political structure allows, the health director has an advisory regional hospital-board for consultation, composed of members interested in all aspects of the organization of hospital care: mayors of villages and towns, medical practitioners, nurses, social workers, and possibly teaching staff in the medical schools and social security staff. Depending on financial and administrative procedure, the board may also include members of important regional and district committees representing general interests of the population (local finance, trade unions, etc.). At the top level, a national hospital-board advises the minister on broad policy for organization of the health services. The national hospital-programme based on the concept of regionalization thus possesses features to which the political and administrative machinery for its supervision and development has to be adapted.

In countries where hospitals have retained a large measure of autonomy, either owing to their private nature or because their administrative structure is limited to the commune, serious difficulties are encountered in developing the idea of regionalization, inasmuch as it demands a partial sacrifice of this independence. Nevertheless, either the general adoption of free medical assistance and of social-insurance or social-security systems, or the taking-over of hospital budgets by the general State budget, is gradually reducing the obstacles and paving the way to regionalization. This is what took place in Great Britain, where it was possible to include private hospitals under the nationalization act because a large part of their resources were derived from the State. In the USA, the State is intervening in a steadily increasing number of cases and, moreover, private sickness-insurance schemes of nation-wide scope are assuming an increasing proportion of medical costs. Many private hospitals, too, have realized the advantage of joining a regionalization plan and have set up co-ordinating bodies as, for example, in New York, Rochester, and Boston. So, if the means are different, the result may be the same in practice.

**Proposed Standards**

*Bed/population ratio*

The determination of the bed requirements of a given area has been the subject of numerous studies in western countries, particularly in the USA. If, in an area served by hospitals of various kinds, the total number of beds is divided by the population of the area expressed in thousands, we obtain the number of beds per thousand inhabitants. This is the bed/population
ratio which we shall designate by the symbol \( R_{b/p} \). This statistical unit can be used to compare regions and countries, provided certain basic considerations are taken into account.

(1) First, the types of hospitals included in the survey must be known with exactitude. When Great Britain recommends a \( R_{b/p} \) of 9.97, this includes all the hospitalization facilities listed in the following tabulation:

<table>
<thead>
<tr>
<th>Department</th>
<th>( b/p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicine</td>
<td>2.7</td>
</tr>
<tr>
<td>Surgery</td>
<td>2.2</td>
</tr>
<tr>
<td>Maternity</td>
<td>0.6</td>
</tr>
<tr>
<td>Contagious diseases</td>
<td>0.5</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>1</td>
</tr>
<tr>
<td>Neuro-surgery</td>
<td>0.03</td>
</tr>
<tr>
<td>Cancerology</td>
<td>0.04</td>
</tr>
<tr>
<td>Convalescent and chronic cases</td>
<td>1.4</td>
</tr>
<tr>
<td>Mental disorders</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9.97</strong></td>
</tr>
</tbody>
</table>

France possesses 5.2 beds per 1,000 of the population, not counting tuberculosis and mental patients and the old and infirm. The Master Plan of Greater New York recommends a \( b/p \) ratio of 5.1, to embrace hospitals for acute diseases only, according to the following tabulation:

<table>
<thead>
<tr>
<th>Department</th>
<th>( b/p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicine and surgery</td>
<td>2.4</td>
</tr>
<tr>
<td>Maternity</td>
<td>0.6</td>
</tr>
<tr>
<td>Specialities</td>
<td>1</td>
</tr>
<tr>
<td>Non-resident patients</td>
<td>0.2</td>
</tr>
<tr>
<td>Acute communicable diseases</td>
<td>0.1</td>
</tr>
<tr>
<td>Patients with tuberculosis, before transfer to sanatorium</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5.1</strong></td>
</tr>
</tbody>
</table>

In Sweden, similar studies have led to findings that are deemed “a minimum which should be met in the first stage”. The communal hospitals have to provide 0.4 beds per 1,000 inhabitants, and the non-specialized primary hospitals 0.24, while the general hospitals have the following \( b/p \) ratios:

<table>
<thead>
<tr>
<th>Department</th>
<th>( b/p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery</td>
<td>1.48</td>
</tr>
<tr>
<td>Medicine</td>
<td>1.38</td>
</tr>
<tr>
<td>Ear, nose, and throat</td>
<td>0.24</td>
</tr>
<tr>
<td>Ophthalmology</td>
<td>0.13</td>
</tr>
<tr>
<td>Paediatrics</td>
<td>0.21</td>
</tr>
<tr>
<td>Gynaecology</td>
<td>0.18</td>
</tr>
<tr>
<td>Obstetrics</td>
<td>0.53</td>
</tr>
<tr>
<td>Dermato-venereology</td>
<td>0.09</td>
</tr>
<tr>
<td>Radiology</td>
<td>0.02</td>
</tr>
<tr>
<td>Orthopaedics</td>
<td>0.24</td>
</tr>
<tr>
<td>Neuropsychiatry</td>
<td>0.31</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4.81</strong></td>
</tr>
</tbody>
</table>
The total hospital facilities are thus equivalent to an overall $b/p$ ratio of 5.45 ($4.81 + 0.4 + 0.24 = 5.45$).

The US Public Health Service, in its Regulations, Part 53, lays down the standard to which State hospital plans must conform in order to receive financial aid from the Federal Government under the Hill-Burton Act. The distribution of general hospitals for acute diseases (not including tuberculosis, chronic diseases, and mental disorders) is dependent upon the demographic and social structure of the local areas which are divided into three categories, defined as follows:

(a) Base area: any area which shall contain a teaching hospital of a medical school; or has a total population of at least 100,000 and contains one general hospital which has a complement of 200 beds or more and which furnishes internships and residencies in two or more specialties.

(b) Intermediate area: any area which has a total population of at least 25,000 and contains one general hospital which has a complement of 100 or more beds.

(c) Rural area: any area which constitutes a unit, no part of which has been included in a base or intermediate area.

The distribution of general-hospital beds has to correspond to the above requirements, as follows:

(a) In States having 12 or more persons per square mile (4.5 per km$^2$): 2.5 beds per 1,000 population in rural areas, 4.0 beds per 1,000 in intermediate areas, and 4.5 beds per 1,000 in base areas.

(b) In States having less than 12 but more than 6 persons per square mile (2.5-4.5 per km$^2$): 3 beds per 1,000 population in rural areas, 4.5 beds per 1,000 in intermediate areas, and 5 beds per 1,000 in base areas.

(c) In States having 6 or less persons per square mile (2.5 per km$^2$): 3.5 beds per 1,000 population in rural areas, 5.0 beds per 1,000 in intermediate areas, and 5.5 beds per 1,000 in base areas.

These figures reflect a situation characterized by a very high economic and cultural level; they imply a large hospital attendance, ample financial resources, and a network of good roads. As these standards recommend hospital facilities which are more extensive in proportion to the greater dispersal of the population (logical from the demographic point of view, but almost paradoxical economically), they are difficult to apply in most European countries and even more so in the case of the underdeveloped countries. It should be added that they correspond to a "ceiling" above which the Federal Government will not grant subsidies, and, though presented as an optimum, they are, in fact, a maximum which it would seem unnecessary to exceed.
(2) It is essential to take into account the average length of stay in hospital, which is the factor causing the \( b/p \) ratio to vary considerably from one country to another. This is an item which itself depends on a series of factors. The hospital system in the USA is intended principally for paying patients who have to meet high daily fees. Again, good housing conditions make it generally possible for convalescents to return home as soon as the acute phase of an illness is over. Thus, the average length of stay in 1949 for all hospitals was 11.5 days. In France, the development of medical assistance has enabled indigent persons to get free hospital treatment; social security meets at least 80% of the cost of hospitalization for insured patients; and housing conditions have considerably deteriorated since the second World War. As a result of these factors taken together, the average hospital stay is usually 12 days for maternity cases, 20 days for surgical cases, and 25 days for medical treatment. The two last figures are sometimes inflated by the presence, especially in the medical departments, of chronic patients whose place should really be elsewhere.

In Egypt, where hospitalization is free and housing conditions generally bad, one would expect the average hospital stay to be long. It seldom exceeds a fortnight, because daily admissions are so high in relation to the number of beds available that the hospital physicians are obliged to send patients home as soon as they become convalescent.

The conditions under which medicine is practised in hospitals, as well as the technical equipment available, also plays an important part. In institutions where whole-time physicians have at their disposal technical apparatus on a liberal scale, biological and radiological examinations are not held up and there is no risk of a bottle-neck in the circulation of patients. When these conditions do not obtain, the average length of stay inevitably increases in proportion to the delay in diagnosis and in commencing treatment. Obviously, a hospital system under which the average stay can be reduced to 12 days will be able to provide the same services with half the number of beds—that is to say, with the \( R_{b/p} \) reduced by 50%—as a system where the average stay is 24 days, assuming an equal morbidity-rate.

(3) Finally, after taking these factors into account, there remain important differences among areas in the same system, caused by the attitude of the population towards the hospital. A searching inquiry carried out in France from 1947 to 1952 showed that the \( b/p \) ratio 5.2 expresses an average only, and that the range is from 3.4 in predominantly rural areas to 8.2 in the urban zone comprising Paris and its suburbs. The reason for these variations becomes apparent when the rate of hospital attendance is calculated, i.e., the number of persons hospitalized each year per 1,000 of the population. 

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\( ^{i} \) This rate of hospital attendance is expressed by the formula \( H_a = A/P_s \) where \( A \) is the number of annual admissions and \( P_s \) the population served by the hospital system; the definition of this last term will be given later; see page 61.
This rate usually varies between 40 and 80 in the Paris region, but it is not uncommon to find a wider range in the provinces where the habit of hospital attendance is much less regular. In general, urban populations will readily attend the big hospitals, and this tendency is encouraged by an effective preventive-medicine service, whereas in mainly rural communities it is less common for patients to entrust themselves to the small and less well-equipped hospitals at their disposal.

An interesting analysis by Sinai & Paton of the distribution of hospital patients from two counties in the State of Michigan (USA) shows that between 1940 and 1945 there was an increasing demand for hospitalization on the part of the rural population. The rate of hospital attendance rose from 50 to about 80 during these five years, the increase mainly affecting women (for whom the rate rose to 311 in respect of the age-group 20-24), as a result of the growing habit of having confinements in hospital.

The attitude of medical practitioners must also be taken into account. Where a large proportion of these do not take part in hospital work, the number of patients referred to the hospitals is relatively lower. In towns in the USA where the majority of practitioners have some kind of hospital function, hospitalization is much more frequently advised. It is a fact that the National Health Service in Great Britain, by guaranteeing the payment of per capita fees on a contractual basis, has encouraged doctors to send their patients to hospital; as a consequence, the $R_{b/p}$ ratio has had to be substantially raised.

Mott & Roemer have analysed the effect of economic conditions on average duration of hospital stay and average hospital occupancy in the USA, where hospitals are mainly fee-charging. Although the rate of hospital attendance of families with limited means (under $1,200 per year) is lower than that of families whose income exceeds $5,000, the average stay of patients in the lower-income group is double that of well-to-do patients (16.3 days and 7.8 days, respectively). This is proof that patients with small means enter hospital only for a serious illness, the treatment of which naturally takes longer than for a minor ailment. The effect of housing conditions on the period of convalescence is also very considerable both in town and country; an agricultural labourer with no fixed residence has to remain in hospital until he is able to resume work.

The occupancy of hospitals in the USA, the resources of which are derived from private funds, is proportionate to the purchasing power of the population. In hospitals where less than 10% of the income comes from private patients, the occupancy is high, amounting to more than 70%. It drops to below 50% when the hospital receives 90% of its income from private sources. Nevertheless, account must be taken of the fact that wealthy communities tend to build large hospitals whose occupancy is
necessarily lower than that of establishments where capacity has been limited by the modest nature of local resources. This is a characteristic that can be confirmed by comparison with other countries. Whereas in the USA the rural hospitals, which are mainly private, are used to the extent of 0.65 hospital days per inhabitant per year (1940), the attendance at Swedish hospitals, where the running costs are covered by insurance schemes, is higher, since 90% of the beds are the property of the Government or of the local authorities. Thus, in Sweden, the rate of hospitalization is 1.02 to 1.63 hospital days per inhabitant per year. In Denmark, where hospitals are also financed out of insurance funds controlled by the State, the average attendance is 2.12 hospital days per inhabitant per year. Likewise, the State of Saskatchewan (Canada), whose population is covered by a sickness-insurance scheme, provided hospital treatment in the year 1947 for 156 patients per 1,000 inhabitants.

(4) The general morbidity and progress in therapeutics will obviously also have an effect on the $R_{b/p}$. In former times the average stay in western psychiatric hospitals was calculated in years. Modern shock techniques and occupational therapy have suddenly reduced this period to about six months. In the countries of the Middle East, the organization of psychiatric treatment has not attained the same general degree of efficacy. Nevertheless, the average stay is relatively short, as many patients suffer from mental disorders resulting from pellagra which can frequently be improved in a few weeks by a suitable diet.

(5) Lastly, a particularly difficult problem to solve is that of geriatrics, and long-term diseases other than tuberculosis and mental disorders. For a long time, little attention was paid to these problems in the USA, as the best hospitals are private, fee-charging establishments. It was found necessary in New York, however, to reserve the very fine Goldwater Hospital, situated on Welfare Island, for such patients. In the underdeveloped countries, this problem is as yet far from having reached its full magnitude, since the average expectation of life is still under 40 years. The results of the application of modern medicine, however, are bound to make themselves felt within a few decades, and in these, as in other countries, an increase in the average span of life will result, which, by increasing the number of the aged, will bring up the problem of geriatrics. Whenever hospital facilities approach their optimum, the tendency for lingering and geriatric cases to invade hospital beds makes its appearance. In French tropical Africa, Dr. Ferrand's hospital surveys and the documentation of the Ministry of Overseas France attest to the fact that, in certain hospital units, chronic cases occupy one-third of the beds and that, owing to their prolonged stay, not more than one-third of the total number of beds remains available for acute cases. This encumbering by chronic patients and old people shows itself principally in the smaller hospitals. It is a factor that
will have a profound influence on conclusions relating to the decentralization of general medical services.

**Calculation of the population served by a hospital**

After an examination of all aspects of the problem, a \( b/p \) ratio corresponding to the conditions obtaining in a given area can be adopted, and from it can be calculated the total number of beds to be provided by construction or addition. Attempts to apply this method in calculating the optimum capacity of a particular hospital are frequently hampered by the difficulty of estimating the population to be served. From here onwards, we shall express this by the symbol \( P_s \) which represents the total population served, divided by 1,000. The problem is a simple one in the case of an oasis or an island with only a single hospital. It is also simple where there are administrative rules forbidding admission of patients from outside the hospital’s administrative area. And, lastly, where the population density is low and hospitals are far apart, the area served by each hospital is clearly defined as a result of the difficulty of transporting patients. In all these cases, the hospital clientele would be determined by the results of population censuses, and once the factor \( P_s \) is known, the number of beds to be provided will be given by the formula \( B = R_{b/p} \times P_s \).

Where hospital establishments are close to each other, however, and where the population is dense and communications good, patients spread themselves among the hospitals of the region according to personal preference and convenience; in this way, the concept of hospital area disappears. Furthermore, the regionalization concept analysed earlier makes the calculation of \( P_s \) extremely difficult. On what population are we to base our calculation of the \( b/p \) ratio of an RHC with its three distinct functions? We are obliged to resort to statistical methods which reveal the law governing the distribution of these patients.

Let us take two health regions (see fig. 4, on which only the part common to both regions is shown), comprising the RHC’s A and B, the SHC’s L, M and N, and the local and rural hospitals \( p, q, r, s, t, u, x, y, \) and \( z \). The size of these local areas allows of easy transport to the hospital situated in each. It is self-evident and has been proved by experience that, for ordinary treatment, the population of the village \( a \) will be apportioned among the local and rural hospitals \( p, q, r, \) and \( s \). Patients inhabiting the small town \( \beta \) and suffering from ailments which cannot be treated in hospital \( u \), will proceed to one of the SHC’s L, M, or N, or to one of the RHC’s A or B, as the case may be. Statistical analysis of the distribution of patients takes the form of a series of vectors going off in all directions, and the concept of health area disappears completely. In such circumstances, how are we to assess the \( P_s \) factor for every hospital? The inquiry carried out in France by the Ministry of Public Health and Population solved this
problem, by starting from the existing conditions. It should be noted that these are remarkably stable since they express social morphology consisting of preferential population trends towards commercial and industrial markets, as well as towards the towns, where the institutions necessary to modern social life are to be found (banks, courts of law, and educational institutions). The following operations were carried out in succession:

(1) Every hospital establishment was asked to state the number of patients admitted during a given year from each local administrative area. This provided a series of first data. (For the sake of simplicity, we shall assume that the local administrative area coincided with the average hospital area. In fact, the administrative unit chosen was a canton much smaller in extent, its average population being approximately 6,000.) Tables I, II, and III give an example of the information supplied by hospitals; the figures are, of course, purely theoretical. In tables IV-VII the number of patients coming from other hospitals is not indicated, for the sake of simplification, and is replaced by a dash.

(2) The basis data were re-arranged to show the distribution by administrative area (tables IV, V, and VI).

(3) Having the total number of patients per area who were admitted to the various hospitals, the basic data were finally re-arranged by hospital
### TABLE I. NUMBER OF PATIENTS PER AREA — RHC: A*

<table>
<thead>
<tr>
<th>Area of origin</th>
<th>Number of patients admitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8,500</td>
</tr>
<tr>
<td>2</td>
<td>800</td>
</tr>
<tr>
<td>3</td>
<td>600</td>
</tr>
<tr>
<td>4</td>
<td>1,000</td>
</tr>
<tr>
<td>5</td>
<td>200</td>
</tr>
<tr>
<td>6</td>
<td>150</td>
</tr>
<tr>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>9</td>
<td>100</td>
</tr>
<tr>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>11</td>
<td>40</td>
</tr>
<tr>
<td>12</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11,900</strong></td>
</tr>
</tbody>
</table>

* See fig. 4, page 62, for explanation.

### TABLE II. NUMBER OF PATIENTS PER AREA — SHC: L*

<table>
<thead>
<tr>
<th>Area of origin</th>
<th>Number of patients admitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>1,000</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>500</td>
</tr>
<tr>
<td>8</td>
<td>3,000</td>
</tr>
<tr>
<td>9</td>
<td>800</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,395</strong></td>
</tr>
</tbody>
</table>

* See fig. 4, page 62, for explanation.

### TABLE III. NUMBER OF PATIENTS PER AREA — HOSPITAL: q*

<table>
<thead>
<tr>
<th>Area of origin</th>
<th>Number of patients admitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>300</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>40</td>
</tr>
<tr>
<td>8</td>
<td>50</td>
</tr>
<tr>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>520</strong></td>
</tr>
</tbody>
</table>

* See fig. 4, page 62, for explanation.
(table VII). Column 5 shows the ratio of patients selecting institution A to the total number of hospital patients in each area. The product obtained on multiplying each ratio figure by the total population of each area represents the population which will tend to select institution A in case of illness requiring hospitalization. The sum total of all the portions of populations served represents the normal clientele of hospital A.

**TABLE IV. DISTRIBUTION OF AREA-1* PATIENTS AMONG THE VARIOUS HOSPITALS**

<table>
<thead>
<tr>
<th>Type of hospital *</th>
<th>Number of Area-1 patients (population: 150,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHC A B</td>
<td>8,500</td>
</tr>
<tr>
<td>SHC LM N</td>
<td>10</td>
</tr>
<tr>
<td>H pqr stuxyz</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Total 10,000</td>
</tr>
</tbody>
</table>

* See fig. 4, page 62, for explanation.

**TABLE V. DISTRIBUTION OF AREA-2* PATIENTS AMONG THE VARIOUS HOSPITALS**

<table>
<thead>
<tr>
<th>Type of hospital *</th>
<th>Number of Area-2 patients (population: 40,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHC A B</td>
<td>800</td>
</tr>
<tr>
<td>SHC LM N</td>
<td>30</td>
</tr>
<tr>
<td>H pq</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Total 1,000</td>
</tr>
</tbody>
</table>

* See fig. 4, page 62, for explanation.
TABLE VI. DISTRIBUTION OF AREA-3* PATIENTS AMONG THE VARIOUS HOSPITALS

<table>
<thead>
<tr>
<th>Type of hospital *</th>
<th>Number of Area-3 patients (population : 50,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHC A B</td>
<td>600</td>
</tr>
<tr>
<td>SHC L</td>
<td>30</td>
</tr>
<tr>
<td>H p q</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Total 1,500</td>
</tr>
</tbody>
</table>

* See fig. 4, page 62, for explanation.

TABLE VII. POPULATION SERVED BY RHC: A *

<table>
<thead>
<tr>
<th>Area of origin</th>
<th>Population</th>
<th>Number of patients admitted to RHC: A</th>
<th>Total number of patients admitted to all hospitals</th>
<th>Ratio of (3) to (4)</th>
<th>Population served (2) x (5) = Ps</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>1</td>
<td>150,000</td>
<td>8,500</td>
<td>10,000</td>
<td>0.85</td>
<td>127.5</td>
</tr>
<tr>
<td>2</td>
<td>40,000</td>
<td>800</td>
<td>1,000</td>
<td>0.80</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>50,000</td>
<td>600</td>
<td>1,500</td>
<td>0.40</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 190</td>
</tr>
</tbody>
</table>

* See fig. 4, page 62, for explanation.

Ps can be reckoned by this method and, with the number of beds in the RHC A known, the b/p ratio is obtained by means of the formula:

$$R_{b/p} = \frac{B}{P_s}$$

Indices of operation—average occupancy and duration of stay

It still remains to assess whether the b/p ratio as calculated is satisfactory or not. To this end, a study is made of the occupancy rate for each hospital, as obtained from the formula:

$$O_a = \frac{D}{365 \times B}$$  \hspace{1cm} (1)
and the average length of stay according to the formula:

\[ S_a = \frac{D}{A} \quad (2) \]

where \( D \) represents the annual number of patient-days,
\( A \) represents the annual number of admissions, and
\( B \) represents the number of beds.

Where \( O_a \) is in the neighbourhood of 70%-80% and \( S_a \) lies within the range considered normal for the country, the \( b/p \) ratio laid down is regarded as satisfactory and the hospitals in the region will be fulfilling their purpose.

Where \( O_a \) is above 90% and \( S_a \) is particularly low, it is obvious that the existing \( b/p \) ratio is too low and that the number of beds will have to be increased so as to bring it within normal bounds.

On the other hand, if \( O_a \) is below 60% and if \( S_a \) is too high, it is certain that the \( b/p \) ratio is too high and that the hospital in question has too many beds. By taking the optimum values of \( O_a \) and \( S_a \) for the rate of occupancy and the length of stay, it is possible to calculate the number of beds, \( B \), necessary for a given number of annual admissions, \( A \). On substituting in equation (1) the value of \( D \) from equation (2), we obtain:

\[ O_a = \frac{S_a \times A}{365 \times B} \]

hence

\[ B = \frac{S_a \times A}{365 \times O_a} \]

This method of calculation is certainly long and complicated. It calls for the co-operation of all existing hospitals, but it has the advantage of replacing a static estimate by a live evaluation which takes into account all the factors involved. Moreover, it makes it possible to forecast the exact number of additional beds called for when an industrial undertaking is established in a particular area, bringing a known addition to the local population.

The optimum value of the average rate of occupancy must also be determined. It can be shown mathematically that this value, used to determine how far the \( b/p \) ratio is adapted to actual conditions, varies with the capacity of the hospital under consideration.

Let \( N \) be the average number of patients for a hospital. It is equal to the average number of patient-days, i.e.,

\[ N = \frac{D}{365} \quad \text{or} \quad N = \frac{A \times S_a}{365} \]
The number of patients present on a given day varies around $N$ according to Gauss's law, and it is known that the most probable values lie within the limits $N - 3\sqrt{N}$ and $N + 3\sqrt{N}$; the validity of these variations has been proved by a great many checks carried out both in the USA and in France, in city hospitals and in institutions of tropical Africa. It is obvious that this theory does not apply to the communicable-disease wards whose occupancy varies widely owing to epidemics, while the occupancy of surgical wards always drops during Christmas and New Year. It is remarkably exact, however, in the case of maternity wards. To cope with the peak periods, the hospital must have $N + 3\sqrt{N}$ beds. Its average rate of occupancy is thus equal to

$$O_a = \frac{N}{N + 3\sqrt{N}}$$

Now, $O_a$ increases asymptotically to 1 when $N$ is given values increasing up to infinity.

When $N = 25$, $O_a = \frac{25}{25 + 3\sqrt{25}} = 0.625$

When $N = 625$, $O_a = \frac{625}{625 + 3\sqrt{625}} = 0.89$

Consequently a small hospital cannot have a high rate of occupancy if it wishes to cope with rush periods without overcrowding or premature discharge.

In respect of maternity services, the $b/p$ ratio can be confirmed by a different method. In a population of 20,000 where the birth-rate is 20 per 1,000, there would be 400 births per year. If four-fifths of these confinements take place in a maternity ward, and if the average length of stay is 10 days, then the average number of confinement cases in the ward will be:

$$\frac{320 \times 10}{365} = 9$$

The number of beds should therefore be equal to

$$B = 9 + 3\sqrt{9} = 18$$

and the $b/p$ ratio $= \frac{18}{20} = 0.9$

It should be noted that the average rate of occupancy of a maternity ward of this kind is only

$$O_a = \frac{9}{9 + 3\sqrt{9}} = 0.50$$
The average length of stay is a variable which depends essentially on two factors: the type of patient admitted to the hospital, and the effectiveness of the diagnosis and treatment units. As regards the first, it is obvious that if the hospital admits chiefly social cases, invalids, and elderly people, the average length of stay will be considerable; it will on the other hand be very small if the institution consists only of a maternity ward and rest-beds for small specialized operations. The second factor is of no less importance. In many countries, the hospital does not obtain all the technical equipment it requires and consequently the medical staff is kept waiting for the results of biological and radiological examinations, held up by pressure of work in the technical departments. In the same way, too few operating-theatres will cause considerable delay and a longer average length of stay. It is unnecessary to linger over this last factor, which can be observed chiefly in large urban hospitals.

To these two principal factors we must add two others which can also affect the average length of stay, namely, medical and surgical technique and certain administrative practices. It is clear that the early-ambulation technique has led to a shorter average length of stay, especially in maternity and surgical departments. A maternity case can leave hospital earlier where she is allowed to walk from the fourth day than if she were kept in bed for about 10 days. The same applies to operation patients; they can leave earlier for a convalescent home. As to the last-named factor, it is peculiar to countries where hospitals are subject to legislation which has taken more account of administrative routine than of technical considerations. In these cases, certain administrative rules sometimes lead to an increase in the average length of stay, where cost per hospital-day is the chief criterion used by the controlling authorities in judging the efficiency of an institution. When the number of patients decreases, the management of the hospital tends to keep them longer in order to maintain a high rate of occupancy, which ensures that the cost per hospital day will be a minimum.

In conclusion, the above table of average $b/p$ ratios (table VIII) may be applied to a hospital system which offers the following facilities:

(a) A public hospital admitting patients of whom some or all are covered by a sickness-insurance or medical-assistance scheme.

(b) A staff which is adequate in quantity and quality, i.e., roughly one physician to 30 beds, one qualified nurse to 8 patients, and one auxiliary nurse or attendant to 3 patients, plus administrative, ancillary, and technical personnel in suitable proportions.

\[\text{f For explanation of this term see pages 136-137.}\]
TABLE VIII. AVERAGE BED/POPULATION RATIOS

<table>
<thead>
<tr>
<th></th>
<th>RHC</th>
<th>SHC</th>
<th>Local hospital</th>
<th>Rural hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special services</td>
<td>0.08</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Medicine:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>specialities</td>
<td>0.15</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>general</td>
<td>2.2</td>
<td>1.8</td>
<td>1.5</td>
<td>1</td>
</tr>
<tr>
<td>Surgery:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>specialities</td>
<td>0.15</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>general</td>
<td>2.4</td>
<td>2</td>
<td>1.5</td>
<td>0.7</td>
</tr>
<tr>
<td>Maternity</td>
<td>0.6</td>
<td>0.6</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Communicable diseases</td>
<td>0.3</td>
<td>0.3</td>
<td>0.1</td>
<td>0</td>
</tr>
<tr>
<td>Tuberculous patients awaiting transfer to sanatorium</td>
<td>0.8</td>
<td>0.6</td>
<td>0.4</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>6.68</td>
<td>5.5</td>
<td>3.9</td>
<td>2.0</td>
</tr>
</tbody>
</table>

(c) Adequate technical equipment for the diagnosis and treatment of most cases, organized in such a way that the results of biological and radiological examinations are known in less than 24 hours and the operating theatres available within 24 hours of the decision to operate.

(d) A hospital concerned exclusively with general medicine, general surgery, common specialities, and maternity, and not including basic treatment for pulmonary tuberculosis, mental disorders, cancer, or any other long-term or chronic disease. Bearing in mind the reservations mentioned above, average occupancy often lies between 60% and 80% and the average length of stay is 12 days in maternity, and 15-20 days in medical and surgical wards.

(e) Out-patient services for the treatment of patients whose condition does not call for hospitalization.

The number of beds necessary would be calculated as follows:

(a) For local and rural hospitals, the \( R_{b/p} \) is multiplied by the population coming within their radius of attraction (local function).

(b) For the SHC the same procedure is followed in respect of general medicine, general surgery, maternity, and communicable diseases (local function). To this number must then be added the product obtained on multiplying the \( R_{b/p} \) for medical and surgical specialities by the population of the sub-division served by the SHC (sub-divisional function).

(c) For the RHC the same procedure is followed as for the SHC and the hospitals; to the result is added the product obtained on multiplying the \( R_{b/p} \) for the special services (cancer-control centres, neurosurgical and psychosurgical departments, etc.) by the population of the entire region (regional function).
The value $R_{b/p} = 2$ in respect of the rural hospital corresponds to that proposed by the European Conference on Rural Hygiene in 1931.52

**Mobile Health-Units**

With the rural hospital as a base, mobile health-units may be organized, through which modern medical techniques can be taken to the villages in sparsely populated countries with poor communications. This service may be organized using the regular means of transport at the disposal of the hospital/health-centre. In most cases this will consist of an ambulance which provides communication with the town. In others, it will be a river launch, by which the riverside population can conveniently be served in countries with important waterways. In some districts of Sweden and in Australia, Canada (Co-operative Commonwealth Federation of Saskatchewan), and Scotland (Highlands and Islands Scheme), a service of air ambulances has been organized. The staff of the health-centre, working in rotation, set up treatment clinics where preventive examinations take place. This regular contact makes patients more ready to accept removal to hospital when their condition so requires.

**Scope of the Rural Hospital**

The idea of the rural hospital has seemed so attractive that in several countries there has been a definite tendency towards maximum decentralization. Very often this movement has been supported by country doctors who realize their isolation and the difficulty of obtaining the requisite installations. We must now examine the bounds to such decentralization and the economic consequences of a hospital policy of this kind. It is common knowledge that small hospitals are relatively more costly than establishments with 200-500 beds. The reasons for this are as follows:

1. Calculation of the $R_{b/p}$ ratio in rural maternity-hospitals has shown that an establishment serving 20,000 of a population, with a birth-rate of 20 per 1,000, where four-fifths of confinements take place in hospital, should have 18 beds to accommodate an average of nine confinement cases, i.e., an occupancy-rate of 50%.

If a similar calculation is made, assuming a daily average of 36 confinement cases in hospital, the number of beds necessary would then be $36 + 3\sqrt{36} = 54$ and the average rate of occupancy would be $\frac{36}{54} = 0.66$. Starting from the same assumptions, it may be reckoned that such a mater-
nity hospital could serve 82,000 inhabitants. The $R_{b/p}$ ratio would then drop to $\frac{54}{82} = 0.65$, instead of 0.9.

The low rate of occupancy which is the penalty of small institutions is reflected in the fact that expenditure on staff, services, and maintenance is spread over a small number of patient-days, and this leads to an increase in the cost per hospital-day.

(2) Statistical calculations cannot express the full complexity of human institutions, and careful discussion of the findings is required. In small establishments, the average occupancy of which is necessarily low, the tendency is to keep patients longer wherever financial control is based on the cost per hospital-day so as artificially to increase the average rate of occupancy. Thus, in the formula $O_a = \frac{D}{365 \times B}$, the rate $O_a$ can be raised through increasing $D$ by keeping patients longer than necessary. The financial effect is obvious: the hospital-day figure falls but the average cost of sickness increases, and in the long run it is the State and society which have to defray the cost of unnecessary additional days spent in hospital.

(3) The construction and installation of small hospitals is costly when the cost is calculated in terms of the number of beds. A moment's reflection will demonstrate this. A hospital has to have minimum technical and administrative facilities, consisting of an operating-suite with sterilization equipment, a laboratory for simple analyses, an X-ray unit, general services (kitchen and laundry), and a reception and accounts section. Such an installation will give the maximum return only when there are some 100 or more beds. With that capacity, the ratio between the cost of technical installation and the cost of wards for patients is about 1:4. This minimum installation therefore represents one-fourth of the value of the beds. If the hospital has only from 25 to 30 beds, the ratio will be close to one, and the technical installation will demand a considerable financial effort for an inadequate return.

(4) One final consideration of a professional and moral nature must be frankly discussed. In an average-sized hospital where five or six physicians are practising, an atmosphere of mutual aid and scientific emulation will be created, which, in our opinion, is calculated to ensure a high order of medical care. In rural districts, the nature of the work in general calls for rapid decisions and a sense of responsibility, and this has a profound effect in forming the general practitioner's character. The day-to-day problems ranging over the whole field of medicine make for a widespread intellectual effort such as cannot accompany the patient and methodical discipline of the great diagnostic centres. In rural districts clinical diagnosis, so attractive as a mental exercise, is unable to avail itself of the confirmation of
biological and radiological tests, so that the quality of the treatment inevitably suffers.

An upper limit must now be established for the functioning of the rural hospital. A study of the regionalization concept enables us to treat this point briefly in so far as curative medicine is concerned. Specialized diagnosis and treatment are the business of hospital-centres where the equipment and staff make it possible to undertake complicated research and difficult operations with every chance of success. The rural hospital has to restrict itself, therefore, to common medicine and surgery. The same applies to obstetrics; serious abdominal operations should be left to the big hospitals.

Having thus analysed the scope and functions of the rural hospital, we can now undertake a study of its functional and material structure. We shall describe what we have called the comprehensive rural-hospital/health-centre, and will leave until the last chapter the question of how to ensure its adaptation to varying conditions.