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HEALTH PLANNING

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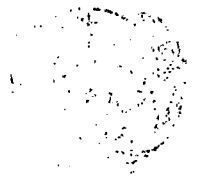
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HEALTH PLANNING

Problems of Concept
and Method



PAN AMERICAN HEALTH ORGANIZATION
Pan American Sanitary Bureau, Regional Office of the
WORLD HEALTH ORGANIZATION

1955

HEALTH PLANNING

PROBLEMS OF CONCEPT AND METHOD

*Prepared at the Center for Development
Studies (CENDES) of the Central University of
Venezuela, Caracas, in cooperation with
the Pan American Sanitary Bureau*

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PREFACE

With the progressive diminution of the prevalence of the quarantinable diseases in Latin America during the present century, the need to develop ways to enable health to play its part as a social function has arisen. This involves the creation of permanent institutions at the national and at the local level so that the territory of each country can gradually be covered and services provided according to the natural grouping of the population in families and communities, respecting their way of life and cultural characteristics. Accordingly, Government action has been directed toward the appropriate organization and administration of services, the education and training of professional and auxiliary personnel, the provision of essential facilities, and the application of modern scientific and technical knowledge to the prevention and cure of disease and the promotion of health.

Latin America has had considerable experience with programs for the control or eradication of specific diseases as well as with the organization of services, but not with the preparation of national health plans in which needs are systematically matched with human and material resources. Such plans result in a set of priorities and investments designed to meet the most common problems and benefit the greatest possible number of people.

The need for such plans has become more urgent in Latin America because the countries have decided to speed up their development by simultaneously promoting economic growth and a more equitable distribution of income so as to increase social welfare. The system they have adopted is that of over-all development planning and the planning of each of the component sectors.

Up to now, however, planning has not been taught as a separate discipline nor has any method been devised for programming investments in the health of the population of a country within the framework of total national activity. To meet this lack, the Pan American Sanitary Bureau, in collaboration with the Latin American Institute for Economic and Social Planning (Chile), has organized specialized courses in health planning. In addition, it requested the Center for Development Studies and the School of Public Health of the Central University of Venezuela to prepare, together with its own consultants, a report on problems of concept and method in health planning which could be used both for teaching and for operational purposes.

We take this opportunity to thank the authors of the present document, which we have the pleasure to submit to the health workers of the Americas and to all those interested in balanced development.

This report is the outcome of a dialogue between economists and specialists in various health disciplines, aimed at finding an approach that would satisfy the requirements of over-all development as well as those of the health sector—

this sector being measured in terms of specific mortality rates and the demand for services. If the report succeeds in stimulating an active exchange of ideas between members of the above-mentioned professions and those concerned with the various activities of social welfare, it will have accomplished one of the purposes for which it was produced. In Latin America there is an undoubted tendency among the institutions and persons whose ultimate goal is improving the level of living of individuals and communities to act alone and without effective coordination.

The authors of this report point out that "to date this field has been little explored in Latin America, and the proposals outlined in the Report are therefore but a first step on the long road that will have to be traveled before health policy can be framed in the light of the rich store of knowledge that mathematics and the social sciences offer us." As a matter of fact, the complicated techniques for the formulation of health plans are still in the process of being worked out. The increasing experience in Latin America is making it possible to improve methods and at the same time is revealing new problems. This document, then, is intended as a guide to health planning and as a stimulus to a further research and analysis of the concepts and methods governing it. The view that planning should be regarded as a continuous process to be incorporated into the administrative mechanism of each country, and that planning is "a state of mind rather than a method," is convincingly sustained.

While health is an end in itself for every human being, from the social standpoint it is a means—a prerequisite for development; it is essential if productivity and the capacity to invest and consume are to be increased, and the environmental changes necessary to the exploitation of natural resources are to be introduced. A certain proportion of the national income, whether domestic or foreign in origin, must be devoted to programs for the prevention and cure of diseases at each stage in the development of a country. Ministries of health will be in a better position to obtain the funds they need if they can give a rational and objective account of what they intend to do and how they are going to do it; that is, if they prepare a national health plan in which provision is also made for the periodic evaluation of the targets proposed, and, further, if the program is prepared in such a way that it can be incorporated into the general development plan of the country.

If this volume succeeds in making health authorities aware of the importance of planning as an instrument of progress; if they formulate national health plans and put them into practice; if continuous efforts are made to improve the organization and administration of services as well as statistical reporting in the countries of the Americas; and, finally, if the experience gained leads to further studies aimed at improving the method advocated, the authors and the Pan American Sanitary Bureau will have been amply rewarded.

ABRAHAM HORWITZ
Director, Pan American Sanitary Bureau

*Center for Development Studies, Central University of Venezuela
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Dr. Abraham Horwitz
Director, Pan American Sanitary Bureau
Washington, D.C.
U.S.A.

Dear Sir:

I take pleasure in sending you the Report on Health Planning, Problems of Concept and Method, the preparation of which you kindly entrusted to this Center.

We enthusiastically accepted the task when you first broached the question with us because we were certain that a systematic study of the social and economic problems of developing countries would be the shortest way of finding a solution to them.

To date this field has been little explored in Latin America, and the proposals outlined in the Report are therefore but a first step on the long road that will have to be traveled before health policy can be framed in the light of the rich store of knowledge that mathematics and the social sciences offer us. Not all that knowledge has been used in the present study; notable exceptions are the application of the input-output method for analyzing hospital facilities—a field in which Professor Walter Isard of the University of Pennsylvania has done pioneer work—or the systematic use of project analysis, which was introduced into Latin America by Mr. Julio Melnick, of the Economic Commission for Latin America. These aspects were not dealt with because we thought it best to prepare a document not of academic interest but of practical value, a document that would be useful to persons who by and large are unfamiliar with the concepts of planning. It seemed to us that such persons would find it much easier to first acquire a command of the simpler concepts of this new technique. When they had mastered them, they would be in a better position to make more effective use of the meager resources available in Latin America for protecting and restoring the health of the population, and to clear the way for new advances in the planning method.

Nevertheless, our Report contains some concepts that the mind trained in the biological sciences alone will not find it easy to assimilate. What is

more, some of these concepts may even provoke emotional reactions. Those persons who have made the Hippocratic Oath part of their personal code of ethics will not find it easy to accept that the very fact of preventing the premature death of one person involves allowing one or more other persons to die prematurely. It is remarkable how few people grasp this basic fact. Our Report is based largely on a recognition of that fact, and is devoted to the search for procedures that will minimize the social cost of preventing a single death.

The application of the ideas contained in the Report requires the quantification of a number of variables that have not as yet been sufficiently studied. For example, one basic concept we have used—the vulnerability of a given disease—cannot be applied rigorously right away because of the lack of quantitative data. Those of our group who had little experience in health matters were surprised to learn how little was known regarding the extent to which the application of certain measures will produce the desired results. However, we did not consider the lack of data on vulnerability and the other variables used in the study to be an insurmountable obstacle to the immediate application of the planning method, provided estimates were used. The same relationship exists between information and planning as between health and productivity. The more you have of the one, the more readily you can increase the other, and vice versa.

Naturally, in the health field there is a minimum of information without which there can be no planning. In fact, the very first time that a health diagnosis of a community or a nation is made, along the lines indicated in Chapter 2 of the Report, an inventory of available data and the evaluation of them form the basis of a program for producing health statistics.

It will take some time to produce all the quantitative data needed, and in the meantime it will be necessary to resort to “educated” estimates. The errors these estimates contain will, of course, be reflected in the quality of the programs. Nevertheless, a step will have been taken in the right direction because in framing health policy or any other kind of policy without the aid of a method, too many unfounded and contradictory suppositions are usually employed and many more estimates are used than would be the case if the technique of planning were applied. There is no great resistance to the use of suppositions and estimates as they are almost always implicit.

The adoption of the planning technique in health work also calls for a change in the administrative organization. Lines of responsibility will have to be altered, the accounting system will have to be adjusted, the budgetary system changed, and greater interdepartmental and interministerial coordination will have to be achieved. All these changes obviously cannot be made overnight. It will therefore be necessary to devise a strategy for the adoption of the planning method. Since one cannot generalize on this score, the sub-

ject will not be discussed in the present study. But we wish to make it clear that the adoption of over-all planning will take a considerable period of time during which those who subscribe to health planning may become discouraged. That risk must be avoided at all costs. Poorly planned efforts to introduce programming will only discredit that technique.

The fact that the adoption of planning requires a change in the attitude of those who participate in the activity being planned is a factor that is often overlooked. Furthermore, it may be said that planning is an attitude rather than a method, and that it is characterized by the ability to place the activity in which one is engaged in the context of all the national activities, to keep the goals being pursued clearly in mind, and to arrange them objectively in order of precedence. One must not confuse means with ends, and one must have an objective appreciation of the efficiency of the means. One must be able to recognize error and have the will to correct it. And, finally, one must know how to work in a team. There are only two ways to form such an attitude: one is by training, and the other by practicing planning even at its most modest level. We trust that the document we have prepared will be useful for both purposes.

Very sincerely yours,

JORGE AHUMADA
Director
Center for Development Studies
Central University of Venezuela

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CHAPTER 1

PLANNING AND PUBLIC HEALTH

A. THE NEED FOR PLANNING

Two-thirds of the world's population live in underdeveloped countries. Economic underdevelopment manifests itself in disease, premature death, poverty, insanitary housing, undernourishment, underemployment, meager schooling, illiteracy, and other conditions of life that are universally considered to be unsatisfactory.

The existence of these conditions side by side with economic underdevelopment is not a matter of chance. Health, sanitary housing, employment opportunities, education, scientific and technical knowledge, are all produced by resources taken from the common national fund. The resources comprise both skilled and unskilled labor, natural resources, buildings, laboratories, factories, roads, and hospitals inherited from the past. If the total resources are scanty, then health, food, housing, and employment needs can only be met to a very limited extent. Resources are in fact always inadequate *in relation to the needs to be satisfied*; one characteristic of resources is their scarcity.

Basically there are only two ways of improving average living conditions: one is to increase resources and the other is to make the best possible use of those available.

If the aggregate of natural resources is increased and more of them are used, if a larger proportion of the population is trained, and new

factories, roads, and hospitals are built more rapidly than population increases, then average living conditions will improve. But to do this, more resources will be necessary and they too will have to come from the common national fund.

On the other hand, it is possible to improve living conditions by making better use of the available resources, by trying, for example, to reduce the length of stay of patients in hospitals so that more persons can be cared for with the same number of beds, or to increase milk production per cow so as to have more milk from the same number of cows, or to reduce the area per occupant in each house built so that, with the same amount of building materials and the same number of laborers and professional workers, healthful housing can be provided for more families.

The two methods are not mutually exclusive because resources will always be relatively scarce and therefore will always have to be put to the best possible use. However, the more developed the country, the better the position it will be in to satisfy its growing needs by increasing its national fund of resources, because of its greater capacity for investment, research, and education, and *mutatis mutandis*, the less the need for the optimum use of resources. In the underdeveloped countries the reverse is the case, and herein lies one of the paradoxes of underdevelopment,

as this situation is generally accompanied by a tendency to attach little importance to the efficient use of the resources available.

What exactly do we mean by efficient use of resources? The reply usually given is as follows: a resource is efficiently used if the benefit obtained from its use is greater than that which would have been obtained if the same resource had been used for something else. In the health field one could say, for example, that the resources intended for the construction and installation of a hospital will be efficiently used if the benefits expected to be derived from the hospital are greater than the benefits that would have been obtained if those resources had been used to build, let us say, a water system, or to provide another hospital with better equipment, or to train more auxiliary personnel, or for any other imaginable use by which health would be benefited. Therefore, the only way to judge the efficiency of the use to which any resource is put is to compare that use with alternative uses to which it might have been put. In theory such a comparison is a simple matter, but in practice it is very complex and therefore requires a method. This method is programming, or planning.¹

B. BASIC PRINCIPLES OF PLANNING

1. Problems of Central Planning

In principle, planning is applicable to any activity in which the individual is faced with the need to make decisions on problems that could be solved in various ways, or faced with the need to choose between different objectives. The first of these is called the "problem of selecting techniques," and the second, the "problem of priorities." Both are at the core of planning.

An example of the first is the need for protein foods of animal origin, which can be met by producing more eggs or more fish, or more poultry or more beef. Moreover, meat can be

¹ In the following text, no distinction is made between the two terms.

produced by using intensive or extensive methods. An example of the second is the need to decide the extent to which it would be advisable to satisfy the demand for food rather than the demand for clothing, or the demand for housing rather than the demand for entertainment.

The problem of priorities has two other dimensions that increase its complexity. One is time, and arises from the fact that needs are recurrent, so that in satisfying current needs care must be taken not to overlook future needs. The more the resources used to satisfy some, the fewer there will be available to meet other needs. In essence this is the problem of consumption versus productive investment. The second dimension arises from the impossibility of completely satisfying the needs of every one and it must therefore be decided who should receive most benefits, i.e., who should be accorded the highest priority in the satisfaction of needs. In economics this is the problem of the distribution of income, and in general might be called that of equitable distribution.

In the field of health one also meets with the problems of the choice of techniques, of target priorities, of the present and the future, and of equitable distribution. In fact, if we wish to control gastroenteritis, for example, then preference may be given to a curative, or to a preventive technique, or to different combinations of the two. But it is not only a matter of controlling gastroenteritis; there are also typhoid fever, cancer, tuberculosis, industrial accidents, and many other conditions that have to be controlled. Since sufficient resources are not available to control them all to the maximum degree technically possible, an order of priorities has to be established.

Research exemplifies the problem of present and future in the matter of health. The more the resources devoted to research now, the fewer there will be available for obtaining health today, through services. But there may be greater benefits once the results of research have been applied. As to equitable distribution, decisions in the health field will in some cases be to the benefit of young children at the expense of

adults, or to women at the expense of men, or to the urban at the expense of the rural population.

It is therefore clear that the basic problems of planning involve decisions to choose one action rather than another. The choices are not necessarily diametrically opposed. It is not a matter of deciding whether only food or only clothing should be produced, or whether resources should be devoted solely to consumption or solely to investment, or to benefit only one population group and not any other. In the field of economics, as in that of health, such conflicts should be resolved within certain limits of proportionality or complementarity. In health, a certain amount of the resources must be devoted to the restoration of health and another part to the prevention of disease. It is necessary to control both gastroenteritis and cancer; to concern oneself with health both in the present and in the future; and to protect both the urban and the rural population. The essence of the problem of decision-making therefore lies in determining in what proportions these different objectives should be combined.

In some instances the possibility of choice between various proportions is very limited. In economics, for example, if the income level is very low, then everything must be devoted to consumption. When health resources are limited, it is possible that concentration is placed on restoration rather than on prevention. The amount of resources available is one of the many practical constraints that determine the proportions in which it would be most advisable to combine the different efforts. In the case of health, the age structure of the population is another limitation, owing to the relationship between age and disease. In a very young population the fields of choice, though not necessarily limited, are quite different from those of an adult population. There are, furthermore, resources that have very specific uses and therefore cannot be utilized for other purposes except at great cost and difficulty. For example, the resources already employed in a hospital building cannot readily be converted into another type of building; a specialist in chest diseases cannot

readily be used as a malarialogist; and, usually, a person working in a large city will resist being sent to a rural area, even though he may be far more useful there.

As indicated in Section A, the solution of the problems in planning rests basically on the concept of the efficient use of resources.

It is a matter of choosing that combination of efforts which provides the maximum amount of health with a given amount of resources; or, inversely, if the attainment of a given level of health is desired, the fewest possible resources to achieve that level. The preceding paragraphs suggest that the notion of efficiency must be applied within the limitations that a given situation may impose. One of the most difficult tasks in the elaboration of a program consists in identifying these limitations; if it is not well done, the program is unlikely to meet an essential requirement: feasibility.

2. Definition and Comparability of the Objectives

Since efficiency is a relationship between objectives and resources, the concept of efficiency requires that these terms be defined as clearly as possible. A clear definition of objectives is one of the basic principles of planning. For example, it is not enough to state that the objective is to fight malaria. One must specify the number of cases to be prevented and the time period in which that is to be achieved. An objective thus defined is called a *target*.

As previously stated, a reduction in the number of malaria cases, or of cases of any other specific disease, is not the only objective of health efforts. Actually there are various objectives, and one must be able to compare them in order to decide to which of them the highest priority should be accorded.

Economists have solved the problem of the comparability of needs for food, clothing, etc., by resorting to the notion of economic welfare, conceived of as a "higher" objective, with reference to which the satisfaction of any need becomes a means. The question is how to meas-

ure welfare and how to make food, clothing, and the other consumer goods comparable: the economists solve this problem by expressing the value of the most heterogeneous things in terms of money.

The contribution of the different goods to welfare is reflected in their prices, which makes it possible to add them up in terms of their money value. It reduces them to a common denominator, that is to say, it makes heterogeneous objectives comparable. That is why the objective of economic activity is measured by the value of production, since that in turn is the measure of economic welfare.²

By reducing them to a common denominator it becomes possible not only to compare two heterogeneous objectives, but also to decide how to distribute the resources among the various objectives. If the cost of food rises as the result of increased demand, then clearly the consumer is indicating a relatively higher preference for foods, and more resources will have to be devoted to their production.

In any other human activity in which the problem of choosing between various objectives arises, reduction to a common denominator is extremely difficult, although in theory not impossible.

Consider, for example, education. What is the economic-welfare product of all the efforts used in this activity? One might believe that one product would be to provide a given number of persons with a university education. But this is very vague, even if such education is classed as medicine, engineering, social sciences, etc., because it does not solve the question of how to establish equivalence between a physician and an engineer or an economist. If no comparison is possible, any decision to devote more resources to training the one rather than the other would have to be made on an arbitrary basis. It might be thought that the economic criterion is applicable in this case, because the cost of producing a physician or an engineer can be ascertained. If the cost relation were

² This is, of course, a simplification of the problem, and it is acceptable only because it represents the essence.

2 to 1, for example, and in practice the average income relationship between the two professional groups were 3 to 1, then it would be necessary to produce more physicians or fewer engineers, until such time as the greater supply of physicians or lesser supply of engineers made the income ratio 2 to 1.

Although this suggestion would make it possible to reduce the product of various university studies to a common denominator, it would still be necessary, for example, to make specialized university training and general education comparable. As far as we know, there is as yet no way of doing that, and in such cases, therefore, the solution lies in dividing the activity into subactivities that are not reducible to a common denominator but whose components are. By so doing one would at least narrow the field for arbitrary decisions. Education, for example, would have a subactivity called "specialized university training," and another called "general education." The distribution of resources among the subactivities would continue to be based on arbitrary criteria, but the distribution of resources among the components of each subactivity would be based on planning criteria, and resources would thereby be more efficiently utilized.

From this follows another important principle of planning, namely, that if one activity is directed at several objectives, then these objectives have to be reduced to a common denominator, and in the event that not all of them can be so reduced, then they must be grouped in classes so that each class constitutes a separate subactivity.

3. Planning Problems in the Health Field

Application of the principle described to health gives rise to several interesting problems. In the first place, what is the objective of this activity? To say that it is to maintain and improve health is obviously too vague a description of the objective, because it does not define what is meant by health or how it is measured.

To solve this problem, several health indicators have been proposed, some positive and some negative. Among the latter group are those indicators which measure health by the conditions that affect it (disease, death, etc.). And among positive indicators is the birth rate, which, particularly in Latin America, may be rejected as an indicator because its level seems to be linked to variable health levels expressed in the morbidity and mortality rates of the population.

Another indicator is life expectancy at birth or in the first year of life. The increase of this expectancy from one year to the next, it is said, is equivalent to an increase in health. Life expectancy is nothing more than the reciprocal of mortality by age groups. The lower the mortality, especially among the very young, the greater the average life expectancy. Consequently, to use life expectancy as a measure of health is to affirm implicitly that the purpose of health activities is to reduce the mortality rate, ignoring the harm caused by morbidity. Yet everyone knows that there are diseases that have a low fatality but that require prolonged and costly treatment and may have physical and mental disabilities as sequelae.

If it is accepted that health activities should attempt to reduce mortality and morbidity, it would be necessary to make both objectives comparable in order to be able to plan them together. In theory, this could be partly solved by introducing the concept of *potential productive capacity*, which would represent the number of man-years that a community as a whole has at its disposal, and that can be devoted to any type of activity, including leisure. This capacity could be measured by drawing up a life table and subtracting from the total years of the entire population's life expectancy the time that would be lost—according to the probabilities—as a consequence of morbidity. For example, a person aged 50, whose life expectancy was 240 months and who would normally lose 24 months due to disease, would have a potential productive capacity of 216 months. The objective in this case would be to increase the number of years of potential productive capacity

of the community, or the index YPC, as it is called in this study, either by increasing life expectancy or by reducing morbidity. The importance of each health activity would be judged by its effect on the YPC rate, and it would thus be possible to determine which would be the most advisable action.³

The concepts of YPC and life expectancy implicitly presuppose that the life of the very young is of more importance than the life of the adult or aged, since a reduction in mortality among them increases both their life expectancy and YPC to a greater degree.

Because the resources available are in short supply, the health authorities cannot escape the problem of assigning priorities or preferences to health activities according to the age of individuals. It will therefore be worth while to add some comments on the subject. Generally, it may be said that there are two views on the social importance of the health of individuals:

(a) that one person's life is of the same importance as that of any other; or

(b) that the life of certain persons is more important to the community than the life of others.

If the first view is adopted, decision on health would logically follow the corollary of the basic thesis, i.e., to reduce to the utmost every obstacle to health with the resources available, regardless of the age of the beneficiaries. Highest priority would be given to the diseases whose reduction required the fewest resources.

If the second view were adopted, it would be necessary to establish a yardstick for defining how much more one life was worth than another. As regards the previously mentioned indices, this would be represented by the additional contribution which saving a given life would make to life expectancy and YPC. It could thus be considered an economic norm, considering that society utilizes a certain amount of resources in conceiving, training, and main-

³ The various health activities do, of course, influence both morbidity and mortality, but this does not affect the essence of the argument.

taining the individual until he reaches the age when he begins to produce. Depending on the circumstances, the individual's contribution to society increases with his age until a point is reached at which the total worth of his contribution balances the amount of resources society used to make him a productive person. His net worth beyond that point will be very high, since it will equal the value of his gross contribution, less the current maintenance cost. Thus, if a person dies at age 5, the loss to society will be far less than if death occurs at age 15 or 20, but it will be greater than if death occurs during the first year of life.

If this purely economic criterion were adopted, then health activities would be chiefly aimed at reducing the health hazards for persons in the age group 15 to 55 years. For example, if the expense of raising a person to age 15 represented 15,000 monetary units, and raising him to age 5 would cost 3,000 units, and if the cost of preventing a death were, respectively, 300 units and 100 units, then it would be preferable to attend the health needs of persons aged 15, because each monetary unit invested would prevent the loss of 50 units, while in the case of the 5-year-old it would only prevent the loss of 30 units. On the other hand, if the criterion adopted were that one life has the same value as another, then it would be preferable to devote the 300 monetary units to reducing mortality among children aged 5, because with the same effort the result obtained would be three times greater than among those aged 15.

In this document it is not intended to propose a yardstick for measuring the social importance of health, or to solve problems of priority, because whichever one may be adopted in any given case should reflect the scale of values of the society concerned. From the planning viewpoint it does not matter which yardstick is used. What matters is that there should be a full awareness of the implications of the one adopted. Therefore, for the *sole purpose of facilitating the explanation of the method*, in this document we shall start from the premise that any life is equal to any other, and that

mortality and morbidity cannot be reduced to a common denominator, so that, in assessing the effects of a given health activity on any health hazard, *the yardstick used will be the number of deaths prevented through that activity, irrespective of the benefits arising in the form of a reduction in morbidity or disability*. Clearly, further research into these matters is needed.

So far we have examined the problem of the priority of health activities with illustrations drawn from mortality and morbidity and the priority of the persons subject to such activities. We shall now refer to the problem of priority in terms of time, which, as previously indicated, essentially implies making a choice between immediate and future objectives.

The solution that economists give to this problem is rather complex, but it is based on a simple idea. There is a price that people are willing to attach to the postponement of the fulfillment of their needs. This becomes clear when one asks a person whether he would prefer to receive 100 monetary units now, or in a year's time. The usual reply will be that he prefers to receive them now, unless he is compensated in some way. That compensation, expressed in relative terms, is the interest rate. Hence, the value of future production is made comparable with the value of today's production by discounting it at the going rate of interest.

In this document no consideration will be given to discounting in the health field; in other words, a one per cent reduction in mortality this year is considered to be of the same importance as a one per cent reduction in mortality in N years. The reasons for this simplification are obvious. However, for long-range projects such as hospital construction, the possibility of discounting the monetary costs to the present date should be considered. Otherwise it will always seem more advantageous to give preference to overly solid and long-lasting buildings, so that resources will be wasted.

4. Definition and Reduction of Resources to a Common Denominator

As in the case of objectives, resources must be clearly defined.

In economics, resources are anything that can be used to produce goods and services. They are usually classified as labor, capital, and natural resources, and each of these can be divided into subcategories with greater or less detail. For example, labor can be divided into skilled and unskilled workers; capital into fixed capital, comprising durable production goods such as machines, tools, buildings, furnishings, roads, etc., and working capital, made up of all goods or raw materials ready for use in production in a given period. Examples of working capital⁴ are: wheat in silos, yarn in textile factories, and the food and drugs kept in hospitals.

Natural resources include all those things which contribute toward the production of goods and services and which are not the product of human labor. Mineral deposits, agricultural lands, woods, and waterfalls are typical examples.

It can readily be understood that the resources to which the science of economics refers are the same as those employed in "production" of health. To produce health requires physicians, nurses, vaccinators, engineers, administrative personnel, and laborers; that is to say, both skilled and unskilled workers. Capital is needed in the form of hospitals, water systems, laboratory equipment, means of transport and even roads, and the natural resources incorporated into both fixed and working capital are used.

For the attainment of any objective, whether in economics or in health, use must be made of a combination or a complex of heterogeneous resources. The cases in which an objective can be reached by using labor alone, are the exception. That being the case, it is impossible to ascertain the total amount of resources needed

⁴ The reserve funds required by any organization to operate during the year are also known as working capital.

to produce a bushel of corn, for example, unless such resources can be reduced to a common denominator. The most that can be said is that so many man-hours, such and such machinery, and so many acres of agricultural land will be needed. If we use only one of the resources as an indicator, we may commit serious errors of comparison. For example: there are farms that produce 15 bushels of corn to the acre, while others produce 30. Can it be said that the productivity of the land in the former is half that of the latter? It cannot, because the higher production in the second case may reflect the fact that far more capital or labor is used. Many similar examples exist in the health field. Take the case of vaccinators. One vaccinator may be able to vaccinate 100 persons per day, and another only one half that number. The difference between them is not sufficient proof that the first vaccinator is more efficient than the second, because it is possible that the higher performance is due to the fact that the first vaccinator has more equipment at his disposal, or more helpers, or to some other cause.

In economics the problem of the comparability of resources is again solved by resorting to monetary values. If the production of a bushel of corn requires 2 man-hours and the price of each man-hour is 20 units, then the 40 units that represent the monetary value of that labor can be added to the value of the capital goods and of the land used in production. Thanks to this device it will be possible to say that the amount of resources needed to produce a bushel of corn is the equivalent of, say, 60 monetary units. That will be the cost of the bushel of corn.

To measure the cost of an appendectomy the same pattern is followed. It is possible to deter the number of man-hours, materials, and fixed capital that such an operation requires.

Cost measurements, however, meet with conceptual and practical difficulties. Most important among the former is the allocation of costs in the case of resources used to attain various objectives at the same time. In the case of an appendectomy, for example, the

capital used for the operation, which is represented by the surgical equipment and building, also serves for surgical interventions of other types as well as for performing other health activities, so that only a part of the total cost of those resources can be assigned to the appendectomy. There are various criteria for making such assignments, all of them conventional, and they will be discussed later on in this document.

5. Relationships between Objectives and Resources

The device of reducing heterogenous resources to a common denominator and of assigning a monetary value to each does not entirely solve the problem of comparability. To illustrate this difficulty, we again resort to the example of corn. Suppose there are two farms, and that on one of them it costs 60 monetary units to produce one bushel of corn, whereas in the other farm it cost only 40 monetary units. Suppose, further, that the difference is due to the fact that fertilizer is used in the farm where the cost is lower. A simple comparison of figures make it obvious that greater production is obtained with fertilizers than without them. Yet we cannot say by how much, nor can we ascertain whether the advantage is in the ratio of 2 to 3, until such time as we determine whether or not the more efficient farm uses the most suitable amount of fertilizer. It may happen that by using a little less, or a little more, fertilizer, the unit cost could be reduced even more. And this gives rise to a third basic principle in planning, which may be expressed as follows: to compare the efficiency of two different combinations of resources with respect to a single use, it is not enough to reduce them to a common denominator and give them a monetary expression; we must also establish the appropriate composition of each combination.

This principle may be illustrated by certain examples in the health field with which the health administrator is familiar. One hospital,

for instance, may show that the annual cost per bed is double that of another hospital. This does not necessarily mean that the resources in the second case are being used twice as efficiently. Before making a quantitative comparison, it is necessary to ascertain whether or not the services provided in one and the other hospital are the same, and if not, whether or not each hospital is using the best combination of resources for each technique.

The operation of combining the resources in proportions that correspond to a given standard or technique will henceforth be called the instrumentalization of resources. *An instrument is a combination of certain resources in certain proportions, according to certain standards, which is used to attain one or more specific objectives.* In economics it may be said that a highway is an instrument of transportation, provided one bears in mind that it is composed not only of the road but also of a system of signs and signals, some standards of utilization, and repair equipment. A hospital bed is an instrument for treating patients if it includes the physician-hours, auxiliary-personnel-hours, laboratories, and the other installations that necessarily support that bed and enable it to fulfill its purpose. A detailed explanation of how health resources can be instrumentalized and of the attendant problems will be given in Chapter 2, on diagnosis.

The reader may have noticed that it was suggested that the farm in which the production cost per bushel of corn was 40 monetary units might be more efficient, in its use of resources, than the farm where the cost was 60 units. In fact it is; because it produces one bushel of corn for every 40 units of resources, whereas the other farm, with another technique, produces only $\frac{2}{3}$ bushel. The comparison, therefore, refers to the advantages or disadvantages of two alternative techniques in attaining a given end—in this case the production of corn. The selection of the appropriate technique for attaining a given end is one of the planner's most important tasks.

But the fact that one farm is more efficient than another in producing corn does not nec-

essarily mean that it uses all the resources at its disposal more efficiently. Suppose, for example, that every year the first farm produces *corn and wheat* worth 110,000 monetary units (sales price of corn \times the amount produced, plus sales price of wheat \times the amount produced) with the aid of resources totalling 100,000 monetary units, whereas every year the second farm produces *corn and milk* worth 150,000 units, also using resources equal to 100,000 monetary units. The efficiency of the first farm is 1.1 and that of the second farm is 1.5. The difference is due to the fact that the second farm selected a better combination of products. This selection of the most favorable combination of products constitutes yet another most important task of the planner. These examples imply the fifth principle of planning, which deals with the selection of techniques and of combinations of products. It may be stated as follows:

Whenever a choice must be made between two or more alternative techniques, or between different combinations of products, preference should be given to the one that shows a higher percentage relationship between the effect obtained and the cost of the instruments used, since that is the way to obtain the maximum benefit from a given amount of resources.

The examples we have cited can readily be translated into the language of health. The control of typhoid fever, or of any other disease, is an objective that is attained by means of a number of concrete actions. Just as one can talk about agricultural technique, so one can talk about preventive or curative technique. Depending on the technique used, the cost of each death prevented will vary, and it is obvious that if preference is given to the technique that costs less it will be possible to prevent a greater number of deaths with a given amount of instruments.⁵

At this point we must return to a previous statement before going on. It was said that the economy needed to produce corn, wheat,

⁵ As previously indicated, any comparison of the cost per death prevented should be based on the cheapest technique available to combat each disease.

and milk. But the problem was not broached simply as a matter of corn, or wheat, or milk. And the same thing occurs in health, when speaking of the control of gastroenteritis or typhoid fever. The reference is not made to activities that exclude others. If the only purpose of health activities was to reduce mortality, it would no doubt be advisable to concentrate all efforts on the disease that would involve the lowest cost per death prevented until all available resources were exhausted, and to begin to control other diseases only if some resources were left over. In practice, it is necessary to act upon a number of diseases, partly because of considerations relating to the distribution of resources previously mentioned, and partly owing to the fact that in some cases in order to achieve results in one disease several diseases must be controlled at the same time. Factors such as these, therefore, require a certain minimum combination that must be respected.

If more resources are available than are needed for the minimum combination, then the possibility of choosing between alternative combinations exists. Strictly speaking, the problem of priorities is the problem of establishing the optimal combination.

For the time being we have no criteria for determining which is the minimum combination. A provisional formula will be proposed later on and may be of practical value until such time as more appropriate criteria are devised for the solution of this problem.

A second important aspect of this same question is that of the limitations on the transfer of the resources from one use to another. When we say that the use of resources in milk production is more efficient than in corn production, or in the control of gastroenteritis than in typhoid fever control, we imply that it would be advisable to transfer the resources from the less to the more efficient use. The shorter the period, the more restricted the possibility of transfer, since the period itself is determined by technical specificity of certain resources. For example, the resources represented by a corn shucker cannot be transferred

to the production of wheat, nor can the resources represented by a hospital be used to build water supply systems. Yet the hospital will deteriorate in the long run, and the time will come when a decision will have to be made as to whether it is preferable to build another hospital or to use the resources for producing any other health instrument. Consequently, if the period of time considered is short, let us say one year, there will be little possibility of improving the use of the existing resources by transferring them from one use to another. For a short period the best possibility lies in improvement of the way in which current techniques are used, and the elimination of the less efficient ones.

6. Time, Subject, and Space in Planning

The restrictions imposed by the specificity of the resources are very strict. Just how strict they are will be understood if we recall that those with the most specific use are usually capital goods, which have a long lifespan, and personnel that possesses the most complex skills. It is very unlikely that the capital goods used in such a broad activity as health increase at a rate of more than about 10-12 per cent per annum. Therefore, if in the past serious errors were committed in their allocation, it will take a long time to correct them.

In order to prevent a continuation of such errors, or at least to reduce them as much as possible, the planning technique works essentially for the future and attempts to foresee and prevent any problems that might arise. For this reason planning is prevention rather than cure. When it is applied to a government policy with respect to expenditure and income, for example, it consists in analyzing the probable financial needs year by year for the next five-year period, and the sources from which the funds may be obtained. By doing this, it will be possible for the government to take steps at the opportune time, the effects of which will be seen only at a later date. If a deficit is forecast for two years hence, then the current

year will be devoted to drawing up financing proposals to be submitted to the Congress at the end of the year so as to be able to implement those measures which will probably produce resources one year after they have been promulgated. Without such foresight, there will be no concern about financing until the deficits occur and the additional funds will then be received too late.

Depending on the nature of the decisions, planners have to foresee eventualities for varying periods of time. For example, once the decision is taken to build a hospital, the engineering plan must be drawn up, the building must be built, and the equipment and personnel provided. From the time the decision is taken until the opening of the hospital, three years can easily elapse, depending on how efficient the public administration is. That is one aspect of the matter. The other is the urgent need that will have been met. It may be that a delay of a few years from the original date proposed for the opening of the hospital will not greatly matter, but in other cases such a delay may have serious consequences.

If highly qualified personnel need to be trained long-term forecasts will have to be made. For example, it takes six or seven years to train a physician if one considers only university studies, but if there is a general shortage of professional personnel forecasts will have to cover 15 years at least. In the case of housing and public utilities programs, forecasts will have to cover 20 to 25 years.

In practice, almost all countries prepare long-range plans for 12-20 years, medium-term plans for 5-7 years, and one-year plans. Since the last-mentioned relate to activities of the public sector, they are implicit in the annual fiscal budgets. Long-term plans are of a general nature and only outline the general direction of an activity; medium-term plans contain more detail; and annual plans contain all the details required for action. In this document it is recommended that health plans be drawn up for 10, 5, and one-year periods, although the length of time will in each particular case

depend on the national plans that include every sector of the country.

Up to now we have referred to planning applied to a given activity and have cited examples from economics on several occasions. In the language of planning it could be said that in such a case economic activity is the field being planned.

In the case of health, a clear definition that will prevent confusion is required. In this document health activity will be understood to mean those actions performed by the government which are aimed directly at maintaining and improving health and include, in addition to the traditional activities, those which are classified as environmental sanitation, nutrition, research, and personnel training. All these activities will be included in the program, whether or not they are the executive responsibility of the ministry in charge of public health.

It is not essential to plan all the aspects that are included in the field being planned. In economics, for example, it would be possible to draw up a subprogram to develop manufactures or exports or tobacco. In health, the eradication of malaria or the construction of hospitals can be planned separately.

Nevertheless, planning must extend to all components of an activity, in the first place, for the obvious reason that resources in short supply are used in all of them; and in the second place, because each activity has an internal structure which, although flexible, should be maintained. For example, it is highly probable that where there is a hospital in a locality, the hospital's area of influence will end up being served much better and at a lower cost if the medical care services in the area are coordinated with a large central hospital.

In fact, planning should ideally cover every field of collective action, not only for the reasons already mentioned, but also because they are all interrelated. It is a well-known fact that a worker's state of health influences his productivity, and that productivity in turn affects the capacity for economic development, the source from which the resources for providing health services are drawn.

The present impossibility of reducing the objectives of various activities to a common denominator, or of establishing comparative values for education, health, employment, etc., is not sufficient reason for not applying planning to the greatest possible number of activities, since the very fact that the resources in each area will be utilized with maximum efficiency will make for less dramatic errors in arbitrarily allocating the available resources among the various heterogeneous activities.

However, one exception must be made. Planning is in itself an activity that requires resources too, especially highly specialized personnel. It will obviously not be worth while to plan subactivities or activities of only secondary importance, because whatever may be saved by planning them will not cover the cost of planning them. In each case it will be up to the planner to decide which actions deserve to be included for the time being in the study, and which actions may be postponed.

Mention must also be made of the spatial problem. Any activity may be defined in terms of its components, as was already explained above, and also in terms of the area in which it will be carried out. Economic planning may refer to an entire country, to an area of the country, or to a locality. The spatial dimension may also be defined by the subject of the plan itself. Such is the case of milk production or malaria eradication.

Consideration of the spatial context gives rise to yet another problem, that of deciding which alternative to choose, because if there are several areas in which resources need to be used in order to improve health, it is logical to ask in which area it would be advisable to spend more.

In economics, one way of solving this problem is to decide to attain the maximum national product regardless of the consequences this attainment will have in terms of economic stagnation or the deterioration of one or more regions. In fact, that is what would happen in most cases if only one criterion for attaining the maximum were applied, since every country has regions with greater natural or cultural as-

sets than those of other areas. The use of the resources in such areas therefore results in greater production than would be obtained from using them in other areas. This explains why, in all countries, economically advanced and economically retarded areas coexist.

The same holds true of health activities. There may be areas in which every 100 monetary units used to decrease mortality will make it possible to prevent a certain number of deaths, and that number will be higher there than if those units had been applied in another region. From the national viewpoint it would be more advantageous to use the resources in the first region, to the detriment of the second, but that would leave the population of the second region unprotected.

There is no planning solution for this difficulty, because an ethical judgment is involved in making the decision, namely, the equitable distribution of the benefits of progress, which was mentioned above. It is possible, however, to determine what it will cost a nation to provide this equitable distribution. To do this, it is first necessary to estimate the number of deaths that would be prevented if the available resources were used without taking distribution, as such, into account; secondly, arbitrary criteria must be used to allocate the resources among regions. If resources were distributed in this way, the reduction in mortality would be less than if resources had been distributed solely on the basis of efficiency. The difference, therefore, will be the cost of equitable distribution. A knowledge of this cost may be of great help in making decisions about allocating the resources among regions.

Spatial considerations also give rise to a problem of defining the limits of a region, a matter that will be dealt with in detail when the problems of diagnosis are discussed.

C. THE PLANNING PROCESS

We must now examine, in conceptual terms, how a plan is prepared in the course of time. Methodological aspects will be dealt with in

other chapters in this document. The statement is based on the supposition that the activity in question is being planned for the first time and that the subject, field, and time period have already been decided.

The process comprises the following stages: (1) diagnosis; (2) planning as such; (3) discussion and decision; (4) execution; and (5) evaluation and revision.

For each of these stages there are well-defined time limits, and in each of them tasks that can be accurately defined must be accomplished.

1. Diagnosis

One of the basic principles of planning is that the aims of a program must meet the following three basic conditions: feasibility, internal compatibility, and efficiency.

The feasibility of an objective largely depends on the point of departure. If the infant mortality rate in a given place is 140 per 1,000 live births, there will be little possibility of cutting that rate by half within five years, regardless of the amount of resources available to reduce it. The possibility of drawing up feasible recommendations will, therefore, largely depend on a knowledge of the present situation of the subject being planned, which calls for the following:

- (a) a description, preferably quantitative, of the status of the subject in relation to the field being planned;
- (b) a knowledge of those factors which determine it;
- (c) an analysis of their perspective; and
- (d) an evaluation, i.e., whether or not it is satisfactory.

If it is a matter of economic development the description will involve the expression in quantitative terms of the pattern or patterns for measuring the situation. In practice, the national per-capita income or the national product is used and must be measured. As already stated, in the case of health, these patterns are

mortality and morbidity, for lack of other positive indicators. A statistical investigation will therefore be guided by the patterns that measure the objectives of the activity.

The most complicated part of the diagnosis is the ascertainment of the factors that produce the situation, and at the same time it is the part that produces the most useful guides for planning. The reason it is complicated is that the per-capita income of a country is conditioned by many factors that are interrelated in a particular and definable manner, and possess their own dynamics. A low per-capita income level may possibly be related to a low per-capita productivity per person engaged in agriculture and to a high proportion of the population engaged in that activity. The *increase* in per-capita income, on the other hand, is related to savings capacity, education, and innovation. In making an economic development diagnosis of a given situation, it is not enough to verify whether those conditions exist or not. It will be necessary to go beyond that and ascertain the reasons for low agricultural productivity and savings. Generally speaking, the relationships between these factors are not linear but circular, because the level of income affects the capacity for saving and for education, and these in turn affect productivity. In economics, a quantitative determination of the system of relationships is possible by preparing what is called a *model*. The model expresses quantitatively what would happen to the aggregate of variables if action were taken on one or more of them, and this greatly facilitates making decisions.

In health programming it is also necessary to identify the factors that determine the health level, as expressed by mortality and morbidity, and the interrelationships of these factors. It is a known fact that the level of economic development, age structure, level of education, nutrition, distribution of income, urban and rural composition of the population, availability of resources, municipal organization, and various other factors have a bearing on mortality and morbidity. What is not well known is the

extent of the influence of each of the factors and their interrelationship. That is why for the moment it is not possible in the health field to prepare models that make it possible to verify the dynamics of a situation in given circumstances and facilitate decision-making. However, it does seem possible to make important progress in this field, especially as regards the influence of actions performed to modify the situation. If they are aimed at reducing mortality and morbidity, the totality of these actions is called a health policy. In practice, one of the most important tasks of diagnosis is to determine the influence which that health policy exerts.

Health action or policy, like economic action, is performed within certain constraints, the importance of which depends on the time period being considered. At a given moment such constraints are represented chiefly by the physical environment, the quantity and quality of the existing resources, the technical knowledge available, and the social, economic, political, and cultural context within which the operations take place. In the long run, resources, knowledge, social context, and even physical environment may be modified. In any event, in order to diagnose a given period in the past, all of these elements of information must be gathered and analyzed.

The second task of diagnosis, therefore, is to make an inventory of such aspects of each of these factors as are considered most relevant to the activity in question. If manufacture is to be planned, the amount of available urban land is of interest rather than agricultural land; average humidity rather than average rainfall; and what types of industries already exist, their productivity and the extent to which installed capacity is utilized, the raw materials and natural resources, the availability of skilled labor, market conditions, financial institutions, and the industrial economic policy. If health is to be planned, it will be necessary to ascertain how much of the population is served by water supply, how many hospitals there are and their capacity, the degree to which the hospitals use their resources, what personnel

they have available, which are the most frequent diseases, what is the population and what is its age structure, etc.

Some of these factors will have changed with the passing of time, and to what extent and in what direction must be known. For example, last year's per-capita income level or mortality and morbidity rates will not suffice. It will also be necessary to know their magnitude during some of the preceding years, for a situation in which an activity is stagnant is quite different from a situation in which there have been changes. The period which a diagnosis should cover will vary according to the activity being planned. In economics, it should not be less than 10 years. In health, perhaps five years will suffice, because mortality and morbidity are phenomena that fluctuate but little from year to year. An analysis of the behavior of such factors over time will help in understanding the phenomena that become the targets of the action. If, for example, a change in tariff policy occurred during the period under study, it will be possible to evaluate to what degree that change influenced industrial growth. The same holds true of health, if during the period in question vaccination programs, or latrine construction programs, etc., were carried out.

The third task of diagnosis is to estimate to what degree the situation will tend to continue in the foreseeable future as it has in the past, *assuming that the present policy is not changed*. It is a matter of ascertaining, for example, if the annual increase of per-capita income of say 3 per cent, recorded for the past 10 years, is likely to continue for the next five or 10 years. In the past this growth could have been due to a high demand for the country's export products on the world market, as a result of war. If there is little probability that such a war will occur again, the demand will decrease and will affect the rate of income growth. It will be essential to establish this because if exogenous factors made a 3 per cent annual growth possible, a target of 5 per cent may be perfectly feasible; whereas if such factors had occasioned a growth of only

1 per cent, then a target of 5 per cent would perhaps be unattainable. In the case of health, the mortality rate may be rapidly decreasing as the result of new water supply and sewerage systems, but such an effect eventually tapers off, and when it does, any future decline in mortality will occur at a slower rate than in the past, assuming that the health policy has not been changed.

Attempts at making a prognosis always meet with skepticism. This stems from a lack of understanding of the basic fact that any decision about actions with long-term effects involves a prognosis implicitly or explicitly. The countries that built tuberculosis hospitals implicitly recognized that the incidence of the disease would continue to be the same as in the past, even though they did not write it into any document. That being the case, it is evident that a prognosis should be made explicit, as in that way it has the advantage of showing the assumptions on which it was based. Furthermore, no forecast will ever state that such and such a thing will occur, but rather that if A occurs there are good grounds for supposing that B will follow.

The fourth task of diagnosis is to evaluate the situation, to determine whether it is satisfactory or not. This involves the establishment of a suitable standard of comparison. If the infant mortality rate in a country is 150 per 1,000 live births, how can we judge whether it is high or low? Some will say it is too high, because to them it will seem a shame that so many children should die. Others will say that the rate is only 25 per 1,000 in the United States of America. Neither of these standards is suitable, because the rating of a situation as satisfactory will depend on what may be attainable in the circumstances. Some might say that, as far as they are concerned, not a single child should die, hence any situation not meeting this desideratum would be considered unsatisfactory. Although such a standard is evidently not attainable and therefore useless, a comparison between countries is not, no matter how different they may be and regardless of the fact that a poor country with a young popu-

lation cannot aspire to have the same health level as a high-income country with an adult population, until such time as it changes the conditions indicated, among others.

How then can a suitable standard be designed? There are such standards in economics. We have already spoken of the one used to judge a situation at any time, namely, that an economic situation is unsatisfactory if a higher production rate can be achieved by the transfer of a resource from one use to another. The standards are therefore determined by the maximum production value obtainable with given resources. There is also a criterion for judging the situation with respect to change, i.e., that the rate of increase in production is low if the entire voluntary savings potential is not being used to increase productive capacity.

The first criterion may readily be applied to health without change. It will be necessary to investigate how the resources are distributed among the various subactivities that make up health, what techniques are applied in each case, and to what extent each instrument available is being used to best advantage. Then a comparison will have to be made between the result that would be obtained, in terms of mortality and morbidity, if the resources were allocated in a different manner, if they were employed at full capacity, and if inefficient techniques were replaced. In fact, the comparison could only be made after the plan had been executed, but in the diagnostic stage a planner can gain an approximate idea of the order of magnitude of these differences.

The second criterion, the one applicable to the rate of improvement of an economic situation, is not at present adaptable to the field of health. No attempt will be made to solve the problem, in this document, especially since it does not have as much importance in health as it does in economics.

2. Planning as such

As already mentioned the purpose of a diagnosis is to ascertain the current status of the

activity being planned, to determine which factors condition it, and to evaluate the situation. It is the function of planning as such to prepare the action plans that must be submitted to the political authorities for decision. Generally, several alternative plans must be presented because each of them has political implications regarding which the planner cannot make decisions.

The preparation of a plan as such involves the following three basic tasks: (a) estimation of the physical and money resources that will be available from year to year for the entire duration of the plan; (b) establishment of the targets for the attainment of which these resources will be used; and (c) selection of the instruments that will be employed.

At the time the plan is initiated, there will already be available a certain amount of physical resources such as hospitals, care centers, drugs, equipment, etc., the details of which are known thanks to the diagnosis. In addition, the plan will receive a certain amount of funds each year under the national budget and other sources, and these will be used partly for general operating expenses, such as salaries and wages, purchase of food and drugs, payment of services, etc., and partly for investments, i.e., the construction of buildings, sewerage systems, etc., and the purchase of equipment. All of these expenses, both operating and investment, will be covered by those annual contributions. Throughout the duration of the plan, the activity will have at its disposal all of the durable resources represented by the inventories that were available at the beginning, plus whatever is added to them through investment, less what becomes destroyed by use. In addition, the plan will have such resources as may be acquired with the funds obtained for operating expenses. What is required is an estimate of such annual contributions throughout the duration of the plan, even though the planner must work with all the resources at his disposal. The method to be used for making such an estimate will be discussed further on in this document.

The second task is to decide to what use the resources available will be put. It will be re-

called that the general rule for allocating resources is that they should be allocated in such a way as to obtain a maximum product per resource unit used, and the proof that this standard is being attained is in the impossibility of further increasing production by transferring a resource from one use to another.

The application of this same standard to health will require a definition of the possible uses to which the resources can be put. We propose in this document to identify the use with the disease, or more generally speaking, with a given hazard to health. The problem then consists in how to allocate the resources available from year to year to control the various diseases.

If the reduction of mortality is considered to be the only purpose of health activities, then the problem of allocations could easily be solved, since the diagnosis makes it possible to ascertain the cost of each death prevented, disease by disease. Supposing there are only three diseases—A, B, and C—in a given case, and that the cost of each death prevented is 10, 20, and 40 monetary units, respectively, and that 1,200 such units per year are available to prevent them. If the sum is divided equally among the three uses, the number of deaths prevented will be 70. If, however, the entire amount is allocated to disease A, in accordance with the economic standard previously described, the number of deaths prevented will be 120.

This example shows how one should proceed under the supposed conditions. In principle, all diseases are arranged according to the cost of preventing a death, and the resources available are allocated to combat the disease that appears in first position until it is reduced to a level that the most efficient technique permits. Any resources left over are then allocated to the disease in second place, and so on down the line.

Among the supposed conditions, one which is implicit is that the cost of preventing one death is the same regardless of the frequency of the disease or of the intensity with which it is attacked. In fact as the prevalence of a disease diminishes, it becomes more expensive to con-

trol it, so that the order of diseases on the priority scale may change in the course of time. This matter can be solved by obtaining the appropriate information.

Another implicit assumption is that it is possible to reduce any disease, which is not true. In order to avoid the problem here, it is proposed to group all diseases into two groups, i.e., those which can be reduced and those which cannot be reduced, based on the criterion of vulnerability, which will be explained in detail in the chapter on diagnosis.

The health authorities will increasingly have to care for cases of nonreducible diseases, such as most of the cardiovascular afflictions, which will occur in greater numbers as the population, its level of education, and the degree to which it is urban, increases. There is therefore no possibility that in the course of time resources may be taken away from the care of these diseases, in spite of the fact that total morbidity and mortality could be reduced to a greater degree if such resources were devoted to the care of other diseases.

The solution we propose to the problem of how to distribute the resources among the diseases that can and cannot be reduced consists in considering them as subjects that cannot be reduced to a common denominator,⁶ which means allocating the resources to them according to arbitrary criteria.

In the planning practice, the procedure would be as follows: the care of diseases that cannot be reduced will be regarded as a community demand that must be met; the planner should therefore estimate the number of cases that will require such care and provide the necessary resources for it. He will make his calculations by replacing the inefficient techniques being used and standardizing the instruments according to procedures that will be described further on. An estimate of the number of cases and cost per case will make it possible to calculate the expenditures that will be incurred for each disease, and for all of the diseases that cannot be

⁶ Reduction of mortality in the case of diseases that can be reduced, and satisfying the demand for services in the case of diseases that cannot be reduced.

reduced as a whole. The remaining resources will be allocated to the diseases that can be reduced, in accordance with the previously indicated criterion, i.e., cost per death prevented.

The number of cases of diseases that cannot be reduced will be estimated on the basis of those which, it is expected, will need the same care as in the past, since the demand for service may increase if special promotional campaigns are developed.

It may be seen from these statements that it is essential to estimate the cost of each death prevented in the case of reducible diseases and of each case treated in the case of diseases that cannot be reduced. This information must be collected at the time the diagnosis is made. The unit costs will vary during the time the plan is in effect because improved efficiency in the use of the resources will be possible. To achieve that, is one of the principal tasks of planning.

The reduction in unit costs for the attack on each disease may have various origins. To examine them with greater clarity it will be necessary to point out the links between the real physical resources used for each disease and the effect they produce on it. As indicated, in order to use the resources they must, in the first place, be grouped into instruments, such as the vaccination instrument, for instance. Each instrument can perform one or more tasks (vaccination of a given number of persons per year) and a combination of tasks, in certain proportions, may be used for the control of a disease. In this document such a combination is called a technique.

When the diagnosis is being made, care will be taken to verify whether or not the resources are well instrumentalized. For example, whether there are vaccinators who lack means of transportation; whether each instrument produces normal output, i.e., whether it is fulfilling a suitable number of tasks; whether or not the tasks are being performed with a satisfactory degree of concentration and coverage (consultations by pregnant women and number of these cared for); whether or not the techniques consist of a normal proportion of tasks, so that the efficiency or relationship between the effect

on the disease and the technique used is the highest possible.

In most cases it will be possible to introduce improvements at each of these levels, although it will not be possible to attain normal standards from one year to the next. Consequently, a planner will have to establish targets of performance and efficiency for the use of resources in each disease. Once these goals are established, he will be able to calculate the costs, using the price of each resource for the year. Such prices may vary in time but it will not be worth while to attempt to calculate this variation, except in countries in which inflation is chronic.

Technological changes such as the discovery of a new vaccine, for instance, may affect the cost of attack on the disease during the time the plan is in effect, and this is a factor that will have to be taken into account whenever a new technique is put into general use. It is not recommended that medical discoveries be taken into account, however, because their effect is unforeseeable.

The proposition that costs may be reduced in the course of time, as the result of efforts to rationalize the instrumental use of the resources, in no way contradicts the previously made proposition that the costs of a given disease may increase as its importance decreases. Clearly the two forces will be operating in opposite directions. The net result will depend on the initial situation regarding the degree of rationalization in the use of the resources and in the particular characteristics of each disease.

For each disease two types of costs must be recognized: the current or operating costs, which include the payment of salaries and wages, acquisition of services, food and drugs; and the investment costs, which include building costs, equipment, machinery, and in general all the goods that last more than one year. Naturally, one cannot charge the cost of investment in an instrument to one year, but only that portion of its total lifespan which corresponds to the year. For example, for equipment one could take a fifteenth part of the total cost, and for buildings a fiftieth part.

As a result of these operations, the planner

will have the following information available for each year that the plan will be in effect: (a) the total amount of financial resources expected to be received from the budget and other sources; (b) the way in which these funds and those that were already available to the activity will be distributed between the diseases that can and those that cannot be reduced, as well as their distribution among all diseases or by subgroups in each category; (c) how the financial resources will be divided between operating and investment expenses, and among the first, how much will go to salaries and wages, the purchase of food and drugs, etc.; and among the second, the type of investment that will be made, such as water systems or transport, laboratory equipment, etc.; (d) the standardization goals to be attained year by year, and the unit cost for each case treated and each death prevented; and (e) the anticipated reduction in mortality, and the cost of each case treated of the diseases that cannot be reduced.

Item (a) merits three comments. First, the information on the expenditures made for investments should be accompanied by additional information on engineering projects pertaining to the work to be carried out in the first and second years of the plan, and accompanied also by draft projects of works that will be begun in succeeding years. Such information should show that the most economical solution and techniques were selected, that both the construction and installation needs were taken into account, and should further be accompanied by a time-table for the building, installation, and start of operation of these works.

Second, there is no doubt that various government agencies will be involved in the responsibility for executing the plan. It will therefore be necessary to establish clearly what each agency must do, what amount of the financial resources it will manage, and how the administrative coordination of the activities of all agencies involved will be accomplished.

Thirdly, it should be noted that the amount of resources devoted to meeting the demand for services by the population affected by diseases that cannot be reduced, will also have an effect

on the reduction in mortality, which must be calculated and added to the results obtained from the attack on diseases that can be reduced.

To meet the objectives of the plan it will be necessary in most cases to adopt legal and regulatory measures regarding the use and administration of the resources, administrative hierarchy, accounting systems, and so forth, and such measures should be clearly specified so that they may readily be transformed into draft laws and regulations.

We shall conclude this section with a brief comment on the matter of funds that may be devoted to health improvement. According to the method set forth in this document, this amount is established in an arbitrary manner by decisions taken at the highest political levels. The method does not offer any procedure that will justify allocating a larger portion of the nation's financial resources to the health sector, which is a matter of constant concern to the authorities. The reason for this is that for the moment health cannot be put on the same basis as economic production or education, or any other activity that competes for a nation's resources. Notwithstanding, the planning method helps reduce the degree of arbitrariness of these decisions, since it makes a comparison between them possible. For example, if a ministry proposes to build a monument at a cost of 1,000 monetary units, and the health plan shows that the prevention of one death costs 10 units, it becomes obvious that the cost of the monument is the 100 deaths that could be prevented if the resources were assigned to health instead of to the monument. It is probable that this kind of comparison will contribute toward curbing the extravagances incurred both inside and outside the field of health.

3. Discussion and Decision

In countries that have a central planning unit, a health plan will first be discussed with the planning authority that has the responsibility for coordinating the plans of the various activities and of verifying whether or not the total result

is feasible, internally consistent, and efficient. In many cases, coordination at this level will result in a revision of the plan. To reduce such revision to the minimum, the planners of each sector should present proposals to the central authority regarding what can be reduced, should the estimates of financial resources for any reason have been excessive, and what should be expanded in the event that larger sums than anticipated are available.

The proposal that is submitted to the central planning unit should of course have the approval of the highest political authorities of the health sector. A discussion of the plan at this level will not be able to cover every detail. The planner should therefore prepare a summary report indicating the main objectives, the amount of resources expected to be used, proposed legal and regulatory changes and, in sum, highlighting those aspects of the plan's implementation that might involve political problems.

Once the plan has been incorporated and coordinated with the plans of the other sectors, all of them should be discussed at the level of the President and the Council of Ministers. The information problems that this involves are the concern of the central unit and need not be discussed here, except for one aspect.

The medium-term plan is the basis on which the annual budget proposal is constructed. The Budget Office of the Treasury usually indicates at the proper time, in agreement with the central planning unit, the amount of financial resources that will probably be available for each department. That information and the objectives of the plan will make it possible to draw up a budget proposal. This requires that the objectives of the program be expressed according to the classifications used in the budget system, a task that is usually cumbersome and inefficient. It is therefore recommended that the so-called program budget system be adopted.

The President and his Council of Ministers must discuss and reach a final decision on the program and the budget at the same time, to avoid discrepancies between what can occur when examining immediate and longer-term problems separately.

The last stage of this procedure of discussion and decision rests with the Congress. And here is where the greatest risks are run, because its members place an exaggerated importance on the regional distribution of public expenditure. There are two ways to reduce these risks. The first and most important is to introduce the program budget technique, which forces the acceptance or rejection of a complete project. And the second is to obtain a greater participation in plan preparation by members of the congressional committees.

4. Execution, Supervision, and Revision

The truth of the matter is that it is possible to know whether a plan is good only after it has been executed, which means that execution is as important as preparation.

Proper execution of a plan will essentially depend on good administration. It is somewhat useless to employ refined techniques for making the best possible decisions if these are not going to be executed or not going to be well executed. Planning can therefore also be applied to execution, but that subject will not be discussed in this document. Suffice it to say that what we propose here may lead, first, to a notable improvement in administrative activity, in the same way as the manner in which a firm handles its accounting will affect the activity of its executives; and in the second place, that *the degree of execution of the plan is closely linked with the degree of direct participation in the plan's preparation by its executors. This is of such importance that it may be placed on the level of a planning principle.*

The planner should have a vital interest in supervising the execution of the plan because he will have to revise the plan periodically and will need the information to be gained from such supervision for that task.

This supervision should indicate to what degree the objectives of the plan are being met, and if this is not the case, it should indicate the reasons. It is a matter of information and analysis. There are good reasons both for and

against the proposition that the planners themselves should be in charge of the supervision.

On the other hand, a planner has to use the information on the fulfillment of objectives because he will have to base the preparation of new programs partly on that information. Ideally, where a five-year plan exists, a new

one should be drawn up each year, taking away the first year and adding another at the end.

That would permit adapting the plan to any changes in unforeseeable factors which may occur. Planning, therefore, does not consist in drawing up a document, but is rather a continuous process.

CHAPTER 2

DIAGNOSIS

A. INTRODUCTION

In the previous chapter it was stated that diagnosis represented a fundamental stage in the planning process and one that exercised a decisive influence on its quality.

Accuracy in diagnosis is as essential to the treatment of health in a community as it is to the treatment of the health of the individual. It is clear that the health problems of a community are closely bound up with environmental conditions and with the extent of its economic, social, and cultural development, factors that also affect the health of the individual, although not to the same degree. A high-density population group that has adequate water supplies and a system for the disposal of excreta and has achieved high income and educational levels is confronted with health problems of a very different nature from those of a group that is still at the bottom of the scale of social and economic development. Two such communities differ not only in the nature of the problems affecting them, but also in the quantity and quality of the resources they have available to meet and resolve those problems.

If the diagnostic process is to make a useful contribution to planning, it must be based on objective criteria and be complete.

Because of the tendency of the specialist to be

partial to his own special field, there is a danger that he will attach greater weight to this field than it actually deserves in the community being studied. It is therefore necessary to adopt criteria that will permit the relative importance of each health problem and its conditioning factors to be weighed objectively.

The diagnosis must cover the entire population and not merely a part of it and must avoid any breakdown into different social groups such as, for instance, eligible and ineligible persons under the various social security systems or the various socioeconomic groupings that constitute the community. It should also take account of all relevant factors affecting the situation.

On the other hand, the objective of completeness in diagnosis should not be too rigorously interpreted. In practice the analysis of any real situation, while answering some questions, raises others in an unending series that could carry the inquirer into every field of human knowledge. But plan diagnosis is not an academic exercise and should be undertaken within a limited sphere of reference. It is therefore essential to fix its functions very precisely. These are: (a) defining the subject to be diagnosed; (b) collecting the data required to provide a description of the prevailing situation; (c) supplying an explanatory commentary; (d) prognosis; and (e) evaluation.

B. DEFINING THE SUBJECT

When we talk of a national plan, whether it relates to the health sector or to any other, we usually assume that the unit to which it relates is the country and that the corresponding diagnosis would logically apply to that unit. This should not, however, be taken as indicating that every *national* plan should be based on the *average* characteristics of a country. The use of these as a basis may lead to serious errors, when conditions in different parts of the territory are widely divergent as, in fact, happens in the case of health.

In the first place, it must be remembered that in Latin America, and probably in any of the regions of the world that can be defined as underdeveloped, as well as, although to a lesser extent, in the more advanced countries, each nation is a mosaic of communities at different levels of development. If we consider any Latin American country, it is evident that between the capital or major cities and the regions remote from these, there is not only geographic distance but also a wide "historical" gulf characterized by economic, social, and cultural differences. In various areas the influence of these factors makes for a situation in which the problems and the possible approaches to their solution are of a widely divergent character.

If we also consider that the level of health in a community is the product of the reciprocal influence of environmental, demographic, social, and cultural factors, it will be apparent that health conditions and the realistic objectives that can be pursued for their improvement will vary widely from one region to another. If there is a causal connection between the form of treatment that is advisable in a given situation and the situation itself, and if the latter is largely the outcome of the degree of socioeconomic development, then it is essential for national health plans to be based on the smallest geographic units that will clearly indicate rather than conceal the fundamental differences between them.

Moreover, in practice the realization of many of the measures recommended in a health plan

depends primarily on the resources existing in a community at a given time. It must not be forgotten that areas can also be classified according to the resources they have available. In turn, the extent to which rational use is made of these resources will depend very largely on the nature of local problems.

Finally, there is a factor of a psychological and administrative character that lends support to the argument that the *local area* should form the basic planning unit. This is because the local health authorities should participate actively in the planning functions so that they develop the interest and understanding necessary to ensure that it is brought to fruition. Excessive centralization and the divorce of the planning and executive functions usually create an atmosphere of indifference and even hostility on the part of the local authorities.

All these factors—the different levels of development of the communities that form a country and the differences in the resources each has available, the idea that health is the product of factors associated with development and the need for active participation on the part of local authorities—point to the conclusion that the most suitable units for programming health plans should be relatively small areas that can be grouped into larger programming regions. The combined local plans would provide the basis for regional plans and these, in turn, would constitute part of the national plan.

We can now proceed to establish some criteria for delimiting local programming areas.

Let us assume that a local programming area, as a center for community services, should contain *permanent* resources that will enable it to promote and protect the health of the physically fit and secure the recovery and rehabilitation of the sick. To restore health it must, at least, be provided with medical, surgical, obstetric, and pediatric resources.

A second factor is that such an area must possess, within the limits of its local area, complete political and administrative services. This is essential both at the stage of diagnosis and for the subsequent evaluation of plans, since the statistical data produced by such political

and administrative services are quite indispensable. Therefore, the programming area cannot be smaller than the geographic unit for the registration of births and deaths.

On the basis of the foregoing criteria the next practical step will be to compile a list of all birth and death registration areas in the country and to determine what permanent resources they have to provide health services. Adjoining areas with incomplete permanent resources will be grouped to form local program areas that will have the necessary resources for health promotion and protection and can provide the four basic services for the restoration of health.

The preventive aspects of permanent health care are closely bound up with the ability of members of a community to attend regularly at treatment centers and to be visited on frequent occasions at their homes. The range of effectiveness of such centers is limited to the population group residing within an area that is, broadly speaking, not more than two hours away from the nearest center by the usual means of transport of the community.

The distance given is based on empirical considerations and is therefore no more than an illustration of the general principle that the limits of a local unit should so far as possible be determined in the light of whatever area can be effectively covered by the health services at a reasonable cost.

In some instances consideration will have to be given to the total population that will be included within the local program area. On the basis of experience it is estimated that it should not exceed 100,000 to 150,000 inhabitants, as difficulties in identifying the major problems and their complexity increase markedly above these limits. It is essential to define them, for administrative efficiency is reduced whenever the unit exceeds a certain size. This factor and the criterion of the sphere of effectiveness of the centers are mentioned here primarily as guiding principles to be borne in mind when health units are being reorganized, as indeed they must be at some future stage. At present there is no alternative but to determine areas on the basis of the availability of resources and

the existence of registration of births and deaths.

Regional organization, based on the foregoing principles, leaves two problems unresolved: the situation of big cities with, for instance, populations of 150,000 and over and those areas of the country that cannot be incorporated into local units of the kind proposed in this study.

It is recommended that the first of these problems should be solved by regarding cities with a population of 150,000 or more as local planning areas acting as centers of regions, and providing these with more specialized health services.

After a country has been divided into local program areas in accordance with the principles that have been laid down, it is likely that there will be some places that cannot be incorporated into any of the programming areas, as they are too remote from the nearest treatment center. If some of these are not very large they can be incorporated into the adjoining local program area with the greatest resources. If they should overlap more than one political and administrative area, each of the latter could be taken over by the nearest local program area. In the case of vast sparsely populated regions whose inhabitants live at a considerable distance from the treatment centers, there is no choice but to limit health activities to periodic campaign-visits until such time as these regions can be converted into new program areas.

The distinction that is made between these two kinds of areas corresponds to the kinds of medical activity that can be undertaken in each. In the one case it is possible to introduce permanent health care facilities and in the other, in the absence of resources, all that can be done is to mount intensive campaigns, either periodic or transitory, against various major diseases such as smallpox, yaws, etc.

A grouping of two or more local programming areas constitutes a program region. Regional organization, as well as serving as an operational base, provides access to the more specialized resources of a country's major cities. In this study the term "planning region" is used

to mean groups of local planning areas that are linked to a region by economic, cultural, or political ties or by communications, so that it acts both as a focal point and as a center of influence. Such a focal center usually contains the principal offices of the main units of health administration and is the seat of political and administrative authorities of a level higher than that of the local area.

The locality where the regional office is located will employ its resources not only to meet the health needs of its own local programming area, but also to assist the other local planning areas of the region wherever their resources prove to be inadequate. Generally speaking, this is likely to happen in connection with these kinds of treatment of a specialized nature which, owing to their high cost, it is neither possible nor desirable to provide in each local program area.

A planning region should have a population of not more than 600,000 and not less than 250,000, i.e., it should include between two and six local planning areas.

It is clear that local planning areas and regions, as defined, will not necessarily coincide with existing political and economic divisions and that this will give rise to administrative and budgetary problems that will need to be solved progressively, for it must be recognized that the adoption of planning will always call for administrative change.

Finally, it must be borne in mind that certain facilities such as universities, neurosurgical centers, research institutes, and other similar agencies are designed for the country as a whole and not solely for regional use, even though they may be situated within a local planning area and form a part of a planning region.

C. THE INFORMATION REQUIRED FOR DIAGNOSIS

The description of the health situation in a local planning area, which from here on will be regarded as the local unit of programming, should be presented systematically within the following general framework: (1) diseases;

(2) an inventory of the resources available and of the activities carried out; (3) the allocation of resources to various uses; (4) the unit cost of different activities undertaken; (5) population; and (6) environment.

1. Diseases ¹

The most important principle governing the study of diseases arises from the fact that it is essential to establish the total cost of combating each disease and the cost of each death prevented in the category of reducible diseases, as well as the cost of each case treated. As research work of this kind can make heavy demands on time and energy, it is best to limit detailed study to the economics of the major diseases. As a guide in making the choice here, it is recommended that the criteria of the incidence, importance, and vulnerability of diseases should be applied to death rates.

The traditional means of measuring the incidence of a disease is to assess its contribution to total deaths from all causes. If there are 500 deaths and 75 of these are attributable to disease A, the incidence of the latter is said to be 15 per cent, or 0.15. This procedure suffers from the disadvantage that it makes no allowance for the existence of certain diseases typical of particular age groups (such as, for instance, the diseases of early childhood) which are important causes of death within these groups but which may not make a very significant contribution to the general death rate because the number of individuals affected is small in relation to the total population. To remove this difficulty the incidence of each disease could be measured and the relative influence it exerts on the total number of deaths weighted in terms of the number of deaths from all causes within the same groups ² (if these groups varied in

¹ It should be pointed out that, in the general discussion of this subject, it was indicated that the death rate would be used for purposes of illustration.

² By way of illustration, if "a" represents the deaths in age group 1 and "b" those in age group 2 attributable to disease A; "c" deaths from all causes in group 1 and "d" the same factor in group 2; "e" total

size, they would first have to be standardized).

The importance of a disease is the effect produced on the community by deaths attributable to it. This importance can be expressed in terms of the relative significance attached to deaths at different ages.

A measure of the importance can be obtained by making use of any of the following criteria, which represent different methods of evaluating deaths in terms of age groups.

(a) If adult lives are regarded as more important than those of children and still more so than those of old people, a weight of 1 can be assigned to deaths in the adult group, less than 1 to children's deaths, and a still lower weight to deaths among old people. The deaths are multiplied by the corresponding weights and the sum of the weighted values represents the importance of the disease. It should be expressed as an average by dividing the sum of the weighted values by the total number of deaths attributable to the same disease.

(b) If the value of a life is regarded as being in inverse ratio to the age of the individual, the weight for deaths in each age group should be reduced as the age at death rises. This criterion would be similar to the years of potential productive capacity (YPC) which, as previously explained, cannot at present be used because of incomplete statistics. Nevertheless, as what is really required is a comparative scale rather than a series of absolute values, the available life tables, even those from an advanced country, could in fact be employed to give an approximation, using as a basis for weighting the life expectancy at the mid-point of each age group (duly standardized to allow for any differences in the size of the groups). Another way of constructing an index illustrating the factor of importance, based on the same principle, would be to assign a weight of 1 to children less than one year old and reduce this

deaths among the entire population; and M the weighted incidence of disease A, then:

$$M = \frac{\left(\frac{a}{e}\right)\left(\frac{a}{c}\right)}{\left(\frac{b}{e}\right)\left(\frac{b}{d}\right)}$$

by one-hundredth for each subsequent year of age.

(c) The third criterion of selection is the construction of an index of the vulnerability of each disease. By this is meant the prospect of preventing it in terms of present methods and knowledge. It is possible to envisage vulnerability in terms of both mortality and morbidity rates. The idea of a vulnerable mortality rate will not be used in this study and is only mentioned here with a view to clearly defining the concepts we are using. The differences between these two concepts is best illustrated in the case of rabies, where the morbidity rate is of maximum vulnerability (this is why rabies is classified as an eradicable disease) but where, on the other hand, the mortality rate possesses minimum vulnerability. In the future, whenever we refer to vulnerability, we shall mean the vulnerability of the morbidity rate. This criterion is used to classify the diseases in two categories—reducible and nonreducible—as was indicated in the preceding chapter.

The concept of vulnerability is of great importance in programming, as the objective of planning is to employ resources where they can be of the most use. There are still insufficient data available for any kind of precise expression of this concept in quantitative terms and it remains a field with ample scope for future research. Nevertheless, it is possible to draw up an approximate scale of vulnerability, commencing with values close to zero for those diseases that, in the present state of knowledge, it is not possible to prevent effectively (such as cancer and some of the cardiovascular diseases), and rising to 1.0 in the case of eradicable diseases such as smallpox. A vulnerability coefficient of $\frac{2}{3}$ could be assigned to reducible diseases, such as the majority of the communicable diseases, and one of $\frac{1}{3}$ to other conditions, such as accidents, which are less vulnerable than infectious diseases but more so than the cardiovascular diseases. It is essential to recognize that such a scale is unsatisfactory quantitatively and that it is entirely arbitrary. In fact, not only is there no basis for establishing that the

vulnerability of communicable diseases is exactly $\frac{2}{3}$ of the vulnerability of eradicable diseases, but it will readily be recognized that this factor varies, at times quite considerably, between the various communicable diseases. Thus, for example, the vulnerability of diphtheria to medical action is undoubtedly greater than that of whooping cough.³ In any event we know that the vulnerability of noneradicable infectious diseases is less than that of eradicable infectious diseases and the problem is to determine—even if only in approximate terms—how much less. We consider, however, that even with its shortcomings, the criterion of vulnerability should form part of any analysis of the death rate undertaken in connection with planning, making use, until such time as the techniques we have suggested have been perfected, of the coefficients indicated above, which will permit the principal causes of death to be weighted in terms of the likelihood of reducing them to a greater or lesser degree. Finally, it should be pointed out that the vulnerability of any disease varies with the time factor.⁴ This means that, in defining the incidence to which a disease can be reduced, the period of time in which such a reduction can be achieved should be shown for each disease and this period will be different in each case. It also means that the vulnerability factor will vary according to the incidence of the disease, although this variation may not be significant in practical terms. In the long term, the vulnerability of reducible diseases must tend asymptotically to approach zero.

The ranking of diseases to select them for

³One way of determining somewhat more closely the relative vulnerability of the more important communicable diseases may be the observation of the trends in these diseases in advanced countries over a period covering the last 20 years. This argument is based on the fact that such countries (especially the United States of America) have achieved maximum control of communicable diseases and therefore differences observed in trends to some extent reflect different degrees of vulnerability. The writers have not overlooked the cultural changes that have taken place over the last 20 years in the United States and in other advanced countries and the influence of these on the data. Nevertheless, this method can serve as a guide.

⁴With the possible exception of eradicable diseases.

study can best be effected by combining the indices of incidence, importance, and vulnerability. The procedure is quite a simple one, involving the multiplication of the index of importance for each disease, in each age group, by the incidence factor (simple or weighted) and the addition of the results. This total is multiplied by the index of vulnerability for the disease in question. Lastly, the diseases are arranged in decreasing order of magnitude according to their final coefficient. In terms of its incidence, a disease may appear near the top of the list but, because it principally affects persons of a very advanced age, it may have a low importance factor, which will reduce its position on the priority scale. On the other hand, it would again tend to ascend on the scale if its coefficient of vulnerability were high.

Tables 1 to 3 illustrate the preparation of such a scale of study priorities for diseases based on data obtained in 1960 in two districts of the State of Aragua in Venezuela.

2. Inventory of Resources Available and Activities Carried Out

It has already been stated that the capital resources of the health sector consist of all the durable assets in existence, including such physical assets as buildings, water supply systems, laboratory and transportation equipment, and supplies of medicines and other materials.⁵ Each of these durable goods possesses a value that becomes less each succeeding year in accordance with a rate of depreciation, so that if the appropriate information is at hand, a list can be drawn up showing the total annual value of the resources available in this category. If details of the value of the inventory at the end of each year are also available, the manner in which the capital resources available to the sector have been modified in the period under consideration will also be known. The changes made from year to year are the result of new construction and the acquisition of equipment, plus

⁵In the case of water supply systems only part of their value belongs to the health sector.

TABLE 1. *Causes of death by age groups, by order of incidence. State of Aragua, Venezuela, 1960.*

Causes of death (*)	Total		Age groups					
	No.	%	Less than 1 year old	1-4 years	5-14 years	15-49 years	50-69 years	70 years and over
All causes	434	100.0	136	28	12	76	101	81
Cardiovascular diseases (B22-25-26-27-28-29)	88	20.3	—	—	1	13	41	33
Dysentery, gastritis, duodenitis, etc. (B6, B36)	42	9.7	33	7	—	—	1	1
Premature births	37	8.5	37	—	—	—	—	—
Tumors (B18, B19)	29	6.7	—	1	1	4	13	10
Accidents (excluding transportation).	24	5.5	2	2	1	13	1	5
Influenza, the pneumonias, and bronchitis (B30, B31, B32)	19	4.4	15	2	1	—	—	1
Transportation accidents (E802-E861)	17	3.9	—	—	6	11	—	—
Pulmonary tuberculosis (B1)	12	2.8	—	—	—	4	5	3
Other diseases of early childhood (B44)	11	2.5	11	—	—	—	—	—
Other causes	155	35.7	38	16	2	31	40	28

(*) Categories according to the *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, 1955 Revision*. World Health Organization, Geneva, Switzerland, 1957.

TABLE 2. *Causes of death by age groups, by order of index of importance. State of Aragua, Venezuela, 1960. (*)*

Causes of death	Total deaths	Total importance	Average importance	Age groups					
				Less than 1 year	1-4 years	5-14 years	15-49 years	50-69 years	70 years and over
Premature births	37	37.0	1.00	37.00	—	—	—	—	—
Other diseases of early childhood (B44)	11	11.0	1.00	11.00	—	—	—	—	—
Dysentery, gastritis, duodenitis, etc. (B6, B36)	42	41.2	0.98	33.00	7.00	—	—	0.75	0.50
Influenza, the pneumonias, and bronchitis (B30, B31, B32)	19	18.5	0.97	15.00	2.00	1.00	—	—	0.50
Transportation accidents (E802-E861)	17	14.2	0.83	—	—	6.00	8.25	—	—
Accidents (excluding transportation).	24	18.0	0.75	2.00	2.00	1.00	9.75	0.75	2.50
Tumors (B18, B19)	29	19.7	0.68	—	1.00	1.00	3.00	9.75	5.00
Pulmonary tuberculosis (B1)	12	8.2	0.68	—	—	—	3.00	3.75	1.50
Cardiovascular diseases (B22-25-26-27-28-29)	88	58.0	0.65	—	—	1.00	9.75	30.75	16.50

(*) Deaths according to Table 1. Coefficient of importance of one death below 15 years of age: 1; between 15 and 69 years: 0.75; other ages: 0.50. Results standardized by age.

TABLE 3. *Order of the priorities for the study of causes of death according to the indices of incidence, importance, and vulnerability. State of Aragua, Venezuela, 1960.*

Causes of death	Coefficient of incidence (*)	Coefficient of importance (†)	Coefficient of vulnerability	Product (2×3×4)	Order of priority
(1)	(2)	(3)	(4)	(5)	(6)
Dysentery, gastritis, duodenitis, etc. (B6, B36)	9.7	0.98	0.66	6.27	1
Premature births	8.5	1.00	0.33	2.80	2
Influenza, the pneumonias, and bronchitis (B30, B31, B32)	4.4	0.97	0.33	1.40	3
Cardiovascular diseases (B22-25-26-27-28) ..	20.3	0.65	0.10	1.32	4
Pulmonary tuberculosis (B1)	2.8	0.68	0.66	1.25	5
Transportation accidents (E802-E861) ...	3.9	0.83	0.33	1.07	6
Other diseases of early childhood (B44) ...	2.5	1.00	0.33	0.82	7
Tumors (B18, B19)	6.7	0.68	0.10	0.45	8
Accidents (excluding transportation)	5.5	0.75	0.10	0.41	9

(*) From Table 1.

(†) From Table 2.

Note: Arranged in accordance with the weighted coefficient of incidence on pp. 24-25, the causes of death would appear in the following order: dysentery; premature births; other diseases of early childhood; cardiovascular diseases; transportation accidents; accidents (excluding transportation); influenza, etc.; tumors; and pulmonary tuberculosis.

changes in inventory, less annual depreciation charges.

In addition, details of the working or operating funds employed each year must be available. These include the salaries and wages paid, excluding those payable for the construction of durable goods; the materials used in the course of a year; travel expenses; and in general, all expenditure reflected in the annual budget that is not intended for investment purposes. The total annual operating costs, plus depreciation charges on durable goods and inventory changes, together constitute the total funds expended in one year by the health sector.

To prepare a diagnosis, it would also be necessary to have available detailed information relating to the total value of the capital and operating resources that were at the disposal of the health sector in each year of the period that is to be examined. It is, however, very unlikely that these figures could be produced for each year, more especially since records of capital resources are not maintained and the value of current expenditure is not fully recorded and is, in any case, shown in terms of prices that fluctu-

ate from year to year. Acceptable figures might well be obtained as a result of fairly intensive research but it is doubtful whether such an effort would be justified. On the other hand, it is essential to have this information for the final year of the period.

The information must be obtained in both real and money terms, i.e., the physical amounts of the resources must be known, as, for example, the square feet of hospital construction; the physician-hours contracted for; the number of hospital beds available; the vehicles owned, etc., together with the corresponding figures of costs. A list of the principal data to be obtained is provided in the Annex to this chapter (see page 50).

The inventory of action taken by the health sector should be prepared in a form suitable for subsequent analysis along the lines already discussed above.

For practical reasons, the inventory should be drawn up in terms of executive units such as hospitals, outpatient services, sanitary units, health centers, rural medical posts, health posts, or health and other units responsible to municipi-

palities, state governments, the central government, autonomous services, etc.

3. Allocation of Resources to Various Uses

The collection of information on the amounts of resources utilized is the first stage in reaching a decision on the sum to be allocated to the attack on each disease during the year under review. By means of this it will be possible to determine afterwards how much it costs to prevent death from a specific cause and how much it costs to restore to health a person suffering from the effects of a particular disease.

For the purpose of planning it is not, however, enough to provide a simple list of the resources used to attack the disease. The basic data must be so organized that it will be possible to obtain some idea, for instance, as to the efficiency with which the resources have been used and the reasons why, in some cases, they have not been employed more effectively. With these aims in mind, it is suggested that the resources should be broken down into three categories: instruments, tasks, and techniques.

a. Instruments, Tasks, and Techniques

By instruments we understand the entire range of diverse resources which, in order to carry out a particular health function, must be combined in proportions that will vary within limits determined by technical and economic factors. These limits are relatively narrow. For instance, only rarely can a doctor restore a patient to health without recourse to supplementary resources. In a hospital the process of curing a patient involves the use of buildings, beds, laboratories, physicians, etc., although it does not require a permanent physician for each case and it is likewise unthinkable that one physician should attempt to treat hundreds of patients at the same time. It follows that the function of restoration to health of a patient in a hospital presupposes a complete series of resources combined in proportions that can be defined. Vaccination, health examinations, consultation, and

home visits are other examples of health functions.

On the other hand, by tasks or activities we mean all those actions or series of actions that are performed in a time sequence in order to achieve a specific and measurable health objective. For instance, hospitalization is a task the purpose of which is to restore the health of a patient, and the results of which can be expressed in terms of the number of discharges from the hospital. Each task is carried out by a specific instrument. In the case in point, it is the hospital bed. As values can be assigned to both instruments and tasks, it is possible to establish the number of tasks or steps, i.e., discharges, that have been performed by a particular instrument (the hospital bed) within a specified time, and consequently calculate the unit cost of each.

In treating a disease, it generally happens that more than one step is needed, especially when groups of persons rather than isolated individuals are involved. For instance, in the case of diphtheria the tasks required include vaccination, hospitalization, consultation, and epidemiological investigation. The combination of tasks that have to be performed to combat a disease will be called the technique (or procedure). The cost of any given technique can be determined, since it is possible to calculate the cost of the instruments employed to carry out the various tasks that constitute the technique.

On the foregoing basis we can establish a causal relationship between, on the one hand, the resources and, on the other, a particular disease. Table 4 summarizes the definition of the various concepts discussed above and contains a specific illustration based on diphtheria.

The identification and evaluation of the tasks or actions undertaken and of the instruments employed permits the calculation of, what we shall call here, the efficiency or product of instruments, i.e., the number of tasks accomplished in a given period, normally one year. If, for instance, we know the number of patients discharged from a hospital and the number of hospital beds, the product or output per hospital bed, as an indication of the efficiency of this

TABLE 4. *The relationship between resources and disease.*

Disease	Method	Tasks	Instruments	Resources
Expressed in terms of the mortality and morbidity rates of the community	Series of tasks employed to combat a disease	Action designed to remove or modify the factors that give rise to the disease	All the resources required to take the necessary measures combined according to their respective functions	Capital and labor allocated to health
Diphtheria	Prevention	Vaccination (dose)	Vaccinator-hour	Vaccinator, equipment, materials, etc.
		Epidemiological survey (surveys undertaken)	Epidemiologist-hour	Epidemiologist, assistants, laboratory, buildings, equipment, etc.
	Cure	Hospitalization (patients discharged and recovered)	Active hospital bed	Doctors, nurses, laboratories, buildings, beds, etc.
		Consultation (patients recovered)	Consultant doctor-hour	Similar to those specified for hospitalization (except for beds)

particular instrument of treatment, can readily be calculated. The same concept can be applied in the case of the number of consultations for each hour of a physician's time, the number of house visits for each hour of the time of a visiting nurse, and so on in the case of any of the instruments employed.

b. Problems of Instrumentation

For the purpose of identifying the instrument and facilitating its evaluation, it is suggested that it should be given the name of the least divisible of the various resources of which it is composed. Alternatively, it can be named after any other component that would identify it more effectively. For instance, the act of hospitalization imposes a demand on a whole series of different resources: the hospital buildings themselves, beds, physicians, nurses, general technical services, administrative services, etc. In this case the least divisible of these is the bed as all the other factors are only partially involved in the course of the hospitalization of a patient. The bed represents a factor that is itself wholly involved in the process of hospitalization, whereas the other factors (physician, nurse, lab-

oratory, food, etc.) may be shared by a number of patients who are hospitalized during the same period. In this case we can therefore describe the instrument as the hospital bed.

In this sense, not every bed in a hospital can be regarded as a hospital bed, but only those beds that contribute to the realization of tasks designed to terminate in the discharge of a patient.

After defining the names of the various instruments, the next stage is to proceed to count these. It is quite easy, for instance, to determine the number of hospital beds in any hospital (daily census), the number of vaccinations in a health unit, or the number of hours of medical consultation provided by an outpatient service.

The third stage is to determine the composition of each instrument, as observed. To do so it will be sufficient to divide the quantity of each component factor or resource by the instruments expressed in units. By way of illustration, let us suppose that the general medical section of a hospital has 120 beds with a staff of 10 physicians working a total of 12,000 hours a year, and a central laboratory preparing for it some 73,000 tests a year. Expressed in terms of days,

the hospital bed, envisaged as the instrument, would represent one bed, 0.32 hours of medical attention, and 2 laboratory tests. It would also represent other factors that have not been indicated here in order to simplify the illustration. Table 5 is an example based on data obtained in San Antonio, Chile, of how the composition of three instruments of treatment, i.e., hospitalization, outpatient consultation, and home visits, can be expressed.

It is also necessary to ascertain for each year the extent to which each instrument is being utilized. Thus, for instance, if a hospital possesses 100 beds, it has available 36,500 bed-days. If only 18,250 bed-days are taken up, the degree of utilization of the capacity of this instrument is only 50 per cent.

c. Problems Related to the Tasks

Besides defining the various tasks along the lines suggested in the foregoing paragraphs and attaching a name to them—e.g., hospitalization, vaccination—it is necessary to decide on a unit of measurement for them as well as on their composition, concentration, and the degree of coverage achieved within the community.

The choice of a unit of measurement presents no problems, as in each case we are dealing with a *measure that is complete in itself*, such as *one visit by a nurse, one hospital discharge, one vaccination, etc.* The composition of each task, as, for example, the sequence of activities followed in a pregnancy consultation, cannot be determined at this stage since complete statistics of such activities are not usually maintained. It would, however, be useful for the planner to have such information available, as there will be instances in which a modification would permit savings in the more expensive resources committed to such activities.

By concentration we mean the number of times a particular task is fulfilled in the case of a particular patient. By way of illustration, the concentration in the case of a pregnancy consultation is 3, if each pregnant woman is examined three times in the period. It will be clear that such information can only be provided if a reg-

ister of first treatments is maintained. A knowledge of the concentration is important to the planner, for if it is very small or excessively large in relation to efficiency standards, the effect on health may be nil or bought at a very high price.

The coverage is the relationship between the number of subjects treated and the total number of such subjects in the community, and is dependent on the nature of the disease it is sought to control. In this instance, as in the previous one, the information is of interest to the planner as, in the case of some diseases, it is futile to take measures unless a certain minimum coverage can be achieved.

d. Calculation of Costs of Combating Individual Diseases

If we proceed along the lines suggested it will be possible to estimate the cost during the year under review of combating each individual disease. In the case of the example given in Table 4, if we can ascertain the number of vaccinations given, i.e., the number of tasks, the number of instruments employed in fulfilling these tasks, the composition of the instruments in terms of resources, and the price paid per unit of each of the various classes of resources, it will be possible to determine the full cost of vaccination against diphtheria. Moreover, if we can calculate the total number of diphtheria patients discharged from the hospital each year, the number of bed-days devoted to the treatment of these cases, the composition or breakdown of the hospital bed as the means of cure, and the unit price of the corresponding component resources, we shall be able to determine the annual cost of cures of this disease by this means attributable to hospitalization. If we work out the cost of an epidemiological survey and of consultations with physicians, by a similar procedure, we shall be able to demonstrate the total cost of combating the disease in a given year, i.e., the total value of the resources assigned to its prevention and cure.

Similar calculations can be made for each disease, using the criteria of incidence, importance,

TABLE 5. Resources available, by type of activity or task. San Antonio Program Area, Chile, 1961.

List of resources available (1)	All tasks			Task: Hospitalization			
	Annual amount		Cost per real unit (escudos/hours) (4)	Annual amount		Unit: 1 bed-year	
	In real units (hours) (2)	In monetary units (escudos) (3)		In real units (hours) (5)	In monetary units (escudos) (6)	In real units (hours) (7)	In monetary units (escudos) (8)
Medical director	1,500	7,023	4.68	960	4,493	7	31
Doctors	33,250	72,298	2.17	22,111	47,981	154	333
Dentists	4,750	30,269	6.37	—	—	—	—
Nurses	7,000	10,485	1.49	29	4,380	0.2	30
Midwives	8,500	10,705	1.26	5,100	6,426	35	45
Pharmacy	3,000	6,258	2.09	1,500	3,129	10	22
Welfare workers	3,500	4,941	1.41	1,050	1,480	7	10
Sanitary inspector	5,250	3,427	0.65	—	—	—	—
Statistical personnel	10,500	5,711	0.54	2,205	1,191	15	8
Administrative personnel	13,000	17,013	0.94	10,080	9,475	70	66
Chauffeurs	8,000	6,248	0.78	2,560	1,997	18	14
Personal services (cleaners)	40,000	21,670	0.54	1,600	8,640	11	60
Cooking staff	16,000	7,857	0.49	14,720	7,213	102	50
Laundry staff	4,000	1,512	0.38	3,040	1,155	21	8
Other personnel	54,000	8,603	0.16	21,600	3,456	150	24
Nursing auxiliaries	92,750	50,232	0.54	33,390	18,031	232	125
Food	—	22,533	—	—	22,534	—	156
Laundry	—	903	—	—	795	—	6
Transportation	—	11,076	—	—	4,431	—	31
Drugs	—	32,673	—	—	16,664	—	116
Purchase of linen	—	3,455	—	—	2,799	—	19
Purchases, maintenance, construction	—	55,988	—	—	30,774	—	214
Subsidies	—	68,676	—	—	—	—	—
Breast feeding, children's diet	—	43,682	—	—	—	—	—
Other expenses	—	20,755	—	—	9,963	—	69
Number of instruments	—	—	—	144 beds	—	—	—
Total cost of specific tasks	—	—	—	Escudos 207,007	—	—	—
Number of tasks	—	—	—	6,685 discharged patients	—	—	—
Unit cost of instrument	—	—	—	Escudos 1,437	—	—	—
Degree of utilization of instrument	—	—	—	72.57%	—	—	—
Output of the instrument unit	—	—	—	46.4 discharged patients per bed-year	—	—	—
Average unit cost per task	—	—	—	Escudos 31.00 per discharged patient	—	—	—

TABLE 5. Resources available, by type of activity or task. San Antonio Program Area, Chile, 1961 (continuation).

List of resources available	Task: medical consultation								Task: house visit by nurse				
	Unit: 1 physician-hour				Unit: 1 visiting nurse-hour				Annual amount		Unit composition		
	Annual amount		Unit composition		Annual amount		Unit composition		In real units (hours)	In monetary units (escudos)	In real units (hours)	In monetary units (escudos)	
	(5)	(6)	(7)	(8)	(5)	(6)	(7)	(8)					
(1)													
Medical director	240	1,123	0.03	0.12	45	211	0.03	0.14					
Doctors	9,476	20,363	1	2.17	—	—	—	—					
Dentists	4,750	30,270	0.50	3.19	—	—	—	—					
Nurses	1,960	2,920	0.21	0.31	1,470	2,190	1	1.49					
Midwives	3,400	4,284	0.36	0.45	—	—	—	—					
Pharmacy	1,500	3,129	0.16	0.33	—	—	—	—					
Welfare workers	2,100	2,961	0.22	0.31	—	—	—	—					
Sanitary inspector	—	—	—	—	—	—	—	—					
Statistical personnel	5,145	2,778	0.54	0.29	787	425	0.54	0.29					
Administrative personnel	2,520	2,369	0.26	0.25	540	508	0.37	0.35					
Chauffeurs	640	499	0.07	0.05	1,200	936	0.82	0.64					
Personal services (cleaners)	16,000	8,640	1.69	0.91	1,600	864	1.09	0.58					
Cooking staff	1,280	627	0.13	0.07	—	—	—	—					
Laundry staff	760	289	0.08	0.03	100	38	0.07	0.03					
Other personnel	21,600	3,456	2.28	0.36	2,160	346	1.47	0.24					
Nursing auxiliaries	22,260	12,020	2.35	1.27	—	—	—	—					
Food	—	—	—	—	—	—	—	—					
Laundry	—	72	—	0.0	—	18	—	0.01					
Transportation	—	2,658	—	0.28	—	1,551	—	1.05					
Drugs	—	14,703	—	1.55	—	—	—	—					
Purchase of linen	—	346	—	0.04	—	138	—	0.09					
Purchases, maintenance, construction	—	15,387	—	1.62	—	2,849	—	1.94					
Subsidies	—	—	—	—	—	—	—	—					
Breast feeding, children's diet	—	43,683	—	4.61	—	—	—	—					
Other expenses	—	4,981	—	0.53	—	1,660	—	1.13					
Number of instruments	9,476	hours of medical consultation			1,470	visiting nurse-hours							
Total cost of specific tasks	Escudos 177,758				Escudos 11,734								
Number of tasks	35,063 consultations				580 visits								
Unit cost of instrument	Escudos 18.74				Escudos 7.98								
Degree of utilization of instrument	(*)				(*)								
Output of the instrument unit	3.7 consultations per physician-hour				0.4 visits per visiting nurse-hour								
Average unit cost per task	Escudos 5.07 per consultation				Escudos 20.23 per visit								

(*) Not recorded.

and vulnerability, until all the diseases covered by the study have been included.

The costing of individual diseases often presents serious difficulty. One of the major problems is how to prorate the cost of a resource or means of action among various diseases when it is used at the same time in combating more than one of these. Another problem arises in connection with employment of a single resource in various sectors.⁶ Yet another difficulty arises in connection with the method of prorating annually the cost of a resource with a life of more than one year. The various solutions proposed to these problems, which arise so frequently in economics, are for the most part applicable to the health sector and it is therefore unnecessary to discuss them at length.⁷

Anyone with firsthand knowledge of the kind of data that are normally available will realize how difficult it is to determine costs.

Until recording procedures have been improved, it will continue to be necessary to have recourse to expedients that provide approximate answers, such as surveys of consultations based on a sample of clinical records or prorating nursing visits or health inspections on the basis of the relative frequency of the diseases that such measures are designed to control. In any case, a qualitative analysis of the component parts of such measures and an estimate of the time devoted to each stage can be a useful guide in this difficult task.

If these difficulties can be overcome and the unit costs of resources and instruments analyzed, information will be available not only on the total outlay each year on each disease, but also on the distribution of costs among such items as hospitalization, vaccination, consultations, etc., and among primary resources such as physicians' salaries and those of nurses and other auxiliary

personnel, expenditure on medicines and other primary materials, and the depreciation of equipment and buildings.⁸

The total of the annual *costs* incurred with respect to each of the diseases under review is not the same as the total of the annual *expenditures* on health of all the administrative units responsible for these activities in the local programming area. The difference is due to the fact that the latter sum, which has to be determined by the planner, includes both current expenditure and investments for the year. The latter should not be charged in full to the cost for the year in which they were made, but only to an extent proportionate to the total number of years that the assets represented by the investment will last. Therefore, in order to determine the cost, the part of the investment chargeable to future years should be subtracted from the annual *expenditure*. On the other hand, the calculation of the *cost* per disease should include current expenditures as well as the depreciation of equipment and buildings. The latter is not computed in the public accounting procedures of the Latin American countries so that, in order to compare costs with the figure for total *expenditure*, we have to subtract depreciation charges from the former. A comparison between the totals for both figures for all diseases will show a difference equal to the depreciation value of the resources employed in the year in question to combat all the diseases not considered separately. To obtain the total *cost* of combating these diseases we have to add to that difference the element of the depreciation assigned to diseases not considered separately.

4. Unit Costs of the Different Activities Undertaken

It is generally realized that the treatment of many forms of disease involves the combination, in differing proportions, of curative and preventive techniques. Only in the case of nonreduci-

⁶ The supply of drinking water is a typical illustration of an activity that has repercussions on health and on other aspects of life. The entire cost of a water supply system should not therefore be attributed to the health sector.

⁷ Later in the text some attention is given to the problem of bringing costs up to date, an important factor when a choice has to be made between a number of alternative plans for the employment of new resources.

⁸ An illustration of this concept will be found in Table 6, based on the First Ten-Year Health Plan (1964-1973) of El Salvador.

ble diseases are curative techniques exclusively employed.

a. Curative Techniques

The object of curative techniques is clearly to cure or restore the health of the individuals affected and who seek the relative services. The planner should, therefore, ascertain what the present cost per cure is and endeavor to reduce it to a minimum.

As has already been pointed out, the restoration of health is effected principally through hospitalization and outpatient consultation. The previous section explained how total hospitalization costs for each disease are calculated. To obtain the unit cost it is only necessary to divide the total cost by the number of patients discharged cured.

In the case of consultations, records of cured patients are not usually maintained, although it would not be difficult to arrange for this to be done in the future. For practical purposes until the necessary research has been undertaken, it is proposed to regard all cases treated as cures, an expedient that will entail an underestimate of the unit cost.

If the curative technique in the case of a particular disease involves both hospitalization and outpatient treatment, it will, of course, be necessary to calculate the cost per cure arising from a combination of both these tasks. The procedure employed is simple: the total hospitalization and outpatient consultation costs are added together and the result divided by the sum of the number of patients discharged cured and the number of outpatient cases treated.⁹

The application of curative procedures to non-reducible diseases leads to the recovery and discharge of patients and reduces the number of deaths. It is, however, very difficult to estimate, with the data at present available, the actual number of deaths prevented. For this reason the economic analysis of nonreducible diseases should be confined to the calculation of the cost

⁹ This poses the question of what is the "most suitable" combination of tasks, which will be discussed later.

per cure. This cost should invariably be kept at a minimum so as to secure the recovery of the largest number of patients with a given volume of resources.¹⁰

b. Preventive Measures

In the case of reducible diseases it is possible to calculate the unit cost per person protected, the cost of preventing each potential case of the disease, and the cost per death prevented as a result of the measures of prevention taken.

The cost per person protected is obtained by dividing the total cost of the preventive measures taken against a particular disease by the number of persons protected, due allowance being made for the duration of the protection provided. The cost of preventing each potential case of a disease is the total cost of the preventive measures taken divided by the number of cases prevented, obtained by multiplying the number of persons protected by the difference between the probability of contracting the disease with protection and without it. If the protected population is 1,000 and the probability of contracting the disease without protection is 0.10 and with protection 0.01 the number of potential cases prevented is $0.09 \times 1,000$.

The number of deaths prevented by the measures of protection taken is obtained by subtracting the number of deaths that would occur with protection from the number that occur without it. The former figure depends on the number of those who become ill, despite the preventive measures taken, and on the number of fatal cases occurring among them, and the latter on the number of cases of the illness and on the untreated fatality rate among these. The cost per

¹⁰ The fact that it is not possible to calculate the number of deaths prevented, as a result of the cure of patients suffering from nonreducible diseases, is one of the principal reasons why the prevention of reducible diseases and the cure of nonreducible diseases should be regarded as distinct functions and why it is necessary to allocate resources between them in accordance with arbitrary criteria. It therefore follows that it is most important to initiate a research project with a view to establishing a basis for the calculation of the number of deaths prevented as a result of recoveries from the nonreducible diseases.

TABLE 6. *Cost of health policy by disease and by activity. Western Region, El Salvador, 1962. (*)*
(monetary unit: colones)

Name of disease	No. of func- tions	Total cost (†)	Hospitalization		Consultation	
			No.	Unit cost	No.	Unit cost
Totals	7,507	3,622,042.92	41,665	2,676,668.82	210,505	805,296.40
1. Senility, ill-defined and unknown causes	2,298	236,878.38	3,970	51.96	7,979	3.83
2. Tuberculosis	98	163,738.00	1,408	80.08	10,197	3.83
3. Syphilis	41	20,283.44	14	57.96	4,985	3.83
4. Typhoid and paratyphoid fevers	12	47,033.58	558	73.52	710	3.83
5. Tetanus	86	3,716.21	44	21.09	18	3.83
6. Dysenteries and gastroenteritis	421	189,857.96	1,978	57.16	18,293	3.83
7. Diphtheria	7	14,005.26	176	57.51	630	3.83
8. Whooping cough	100	12,757.68	—	—	2,390	3.83
9. Meningitis	9	29,118.00	102	285.47	—	—
10. Measles	161	95,688.58	462	156.53	4,616	3.83
11. Poliomyelitis	3	953.04	4	119.51	—	—
12. Malaria	82	23,664.70	330	57.29	1,241	3.83
13. Other infectious and parasitic diseases	120	405,141.00	4,338	56.41	31,110	3.83
14. Tumors	121	126,439.00	1,256	96.61	1,326	3.83
15. Cardiovascular diseases	131	102,211.00	1,098	90.70	711	3.83
16. Acute respiratory conditions	425	378,245.54	2,362	67.70	55,088	3.83
17. Pregnancy, childbirth, and postnatal	41	223,367.52	5,602	22.79	21,122	3.83
18. Congenital malformations	23	22,397.00	266	84.23	—	—
19. Injuries in childbirth	338	4,330.48	88	49.21	—	—
20. Other diseases of early childhood	1,087	28,928.04	220	19.68	28	3.83
21. Accidents and violence	402	388,057.64	7,574	98.39	11,343	3.83
22. All other causes	1,501	1,030,044.58	9,815	95.75	23,550	3.83
23. Rabies	—	1,032.98	—	—	—	—
24. Smallpox	—	16,019.31	—	—	—	—
25. Healthy persons	—	58,114.00	—	—	15,168	3.83

(*) First Ten-Year Health Plan (1964-1973), El Salvador.
(†) Includes some minor activities not shown here.

TABLE 6. Cost of health policy by disease and by activity. Western Region, El Salvador, 1962 (*) (continuation).
(monetary unit: colones)

Name of disease	Visit			Vaccination			Examination		
	No.	Unit cost	Total cost	No.	Unit cost	Total cost	No.	Unit cost	Total cost
Totals	30,461	—	71,206.89	172,270	—	41,451.29	47,193	—	23,913.76
1. Senility, ill-defined and unknown causes ..	—	—	—	—	—	—	—	—	—
2. Tuberculosis	3,934	2.34	9,196.00	6,024	0.29	1,758.00	—	—	—
3. Syphilis	161	2.34	376.36	—	—	—	—	—	—
4. Typhoid and paratyphoid fevers	—	—	—	4,422	0.29	1,289.00	923	1.97	1,820.00
5. Tetanus	561	2.34	1,311.25	14,569	0.10	1,408.00	—	—	—
6. Dysenteries and gastroenteritis	2,843	2.34	6,644.50	—	—	—	35,090	1.97	69.16
7. Diphtheria	20	2.34	47.48	14,569	0.10	1,408.00	—	—	—
8. Whooping cough	881	2.34	2,058.34	14,569	0.10	1,408.00	—	—	—
9. Meningitis	—	—	—	—	—	—	—	—	—
10. Measles	1,282	2.34	3,007.00	—	—	—	—	—	—
11. Poliomyelitis	—	—	—	—	—	—	—	—	—
12. Malaria	—	—	—	—	—	—	—	—	—
13. Other infectious and parasitic diseases	881	2.34	2,058.34	58,801	0.29	17,128.00	11,180	1.97	22,024.60
14. Tumors	—	—	—	—	—	—	—	—	—
15. Cardiovascular diseases	—	—	—	—	—	—	—	—	—
16. Acute respiratory conditions	3,105	2.34	7,257.54	—	—	—	—	—	—
17. Pregnancy, childbirth, and postnatal	6,315	2.34	14,759.52	—	—	—	—	—	—
18. Congenital malformations	—	—	—	—	—	—	—	—	—
19. Injuries in childbirth	—	—	—	—	—	—	—	—	—
20. Other diseases of early childhood	10,478	2.34	24,490.56	—	—	—	—	—	—
21. Accidents and violence	—	—	—	—	—	—	—	—	—
22. All other causes	—	—	—	—	—	—	—	—	—
23. Rabies	—	—	—	3,562	0.29	1,032.98	—	—	—
24. Smallpox	—	—	—	55,239	0.29	16,019.31	—	—	—
25. Healthy persons	—	—	—	—	—	—	—	—	—

(*) First Ten-Year Health Plan (1964-1973), El Salvador.

death prevented will be the total cost of prevention divided by the number of deaths prevented. Very little information is available on the untreated fatality rate, although a better understanding of this could be obtained by further research. Meanwhile, it is possible to make use of estimated values of the kind used in the examples (see Table 7).

It is possible to determine the number of potential cases of a disease that have been *prevented* only if we know the probability of contracting that disease both with and without the appropriate preventive measures. The rates of incidence of a disease (duly broken down), taken in conjunction with a knowledge of its vulnerability, give some indication of the probability in both cases. On the other hand, it frequently happens that preventive measures to protect the health of an individual are incomplete, e.g., only one immunization is given when three are required. In each instance we have assumed that an individual who does not receive the protection provided by the complete cycle of treatment, as recommended by medical knowledge, will not be protected against the disease. From the practical standpoint this means that it is necessary to establish the number of persons who have received the full treatment in accordance with epidemiological requirements, and to exclude those who have obtained only a part of the treatment. Generally speaking, records are available showing the number of times the same individual has been treated, although in a number of cases, where routine records have not been kept, it will be necessary to consult original reports.

In calculating the results achieved, the time factor must be taken into account. If a vaccination is given in one year, its protective effects may last for one or several years according to the disease. If they last for more than one year, the total cost incurred in a given year must be divided by the number of years its protective effects last in order to obtain the unit cost. For instance, if to prevent the occurrence of a disease among 100 persons for one year, it is necessary to vaccinate them each year, the total cost

is divided by the number of cases prevented during the year of vaccination, but if they have to be vaccinated every three years the cost is divided by three times the number of cases prevented annually.

Protective measures can be taken with varying degrees of intensity. For example, if a particular disease is eradicable, the campaign may either be continued to the point of eliminating the disease or it may be somewhat less intensive. In the latter case both curative and preventive techniques will have to be used to combat the disease. In the case of reducible but noneradicable diseases it is always necessary to combine both techniques, even if preventive measures are being undertaken to the maximum extent possible. In both instances, however, it is possible to choose between various combinations of curative and preventive measures. To facilitate this choice, it is most important to know how much it costs to prevent a death by curative action in the case of a reducible disease. With this in mind, it is proposed that the number of fatal cases prevented through the cure of reducible diseases should be calculated on the basis of the difference between the number of fatal cases arising in the case of persons who have been treated and the number arising in the case of those who have not been treated. Although, as we have already indicated, the information at present available on the number of fatal cases occurring among persons who have not been treated is scanty, it would be possible to obtain usable estimates by research methods.

Such a procedure will necessarily inflate the cost per death prevented as, in point of fact, it is only the most serious cases that are treated in the hospital. Moreover, the cost per death prevented by the techniques of prevention will also be inflated, as no allowance is made for the benefit conferred on society and on the individuals concerned by the fact that, as a result of these techniques, individuals have not become ill. These overestimates, the relative extent of which it is impossible to determine, are only significant when there is very little variation be-

TABLE 7. Unit cost of the actual health policy.

Disease: Whooping cough

Area: Northern Santiago, Chile

Year: 1963

A: Curative Techniques

Tasks or actions	Per recovery					Per death prevented				
	Specific annual cost per disease (escudos)	Cases treated (*)	Patients recovered			Cost per patient recovered T ₂ /7 (escudos)	Deaths prevented			Cost per death prevented T ₂ /12 (escudos)
			Coefficient of probable recovery				Coefficient of probable fatality			
(1)	(2)	(3)	Without treatment (†)	With treatment (†)	Difference 5-4	Number T ₃ × 6	Without treatment (†)	With treatment (†)	Difference 9-10	Number T ₃ × 11
Hospitalization	15,801	48	(4)	(5)	(6)	(7)	(9)	(10)	(11)	(12)
Consultation	8,358	789	0.97	0.99	0.02	17	0.03	0.01	0.02	17
Totals (T)	24,159	837								

B: Preventive Techniques

Tasks or actions	Estimate of persons protected					Deaths prevented				
	Specific annual cost per disease (escudos)	Concentration of tasks			Persons protected	Coefficient of probable infection			Cost per death prevented T ₂ /12 (escudos)	
		Actual	According to norm	Degree norm was attained 3/4		Without protection (†)	With protection (†)	Difference 8-9		Coefficient of probable natural fatality (†)
(1)	(2)	(3)	(4)	(5)	Cases treated (*)	Number 5 × 6	Without protection (†)	With protection (†)	Difference 8-9	Number T ₇ × 10 × 11
Immunization	5,755	2	2	1	(6)	(7)	(8)	(9)	(10)	(12)
Visits	1,403	1	1	1	23,672	23,672	0.60	0.45	0.15	107
Total (T)	7,158				Total number of persons protected (†) (T)	23,672				67

(*) First treatment.
(†) Norm.

tween the cost per death prevented in terms of preventive and curative techniques.¹¹

Table 7 indicates the form in which the data relating to the calculation of the unit costs of combating a particular disease can be set out. There follow some observations on the population and environmental factors solely with a view to ensuring that they are borne in mind in the preparation of the diagnosis. As these are fields with which the health specialist is normally familiar, it has been considered unnecessary to discuss them at length.

5. Population

Information on population is quite essential to health planning, as the number of inhabitants and their age-distribution in part determine the extent and nature of the medical attention with which a community must be provided. The pathology of a young population will be different from that of a community in which the average age of the inhabitants is higher and which will therefore require medical attention of a different kind. In the latter instance, a significant part of the resources will have to be devoted to the degenerative diseases, whereas in the former these will have to be used principally for the treatment of the diseases prevalent in younger age groups. Moreover, a knowledge of the composition of the population by age group is essential for the calculation of specific morbidity and mortality rates.

It will therefore be necessary to determine the total number of inhabitants and their age-distribution on the basis of the population estimates made for post-census years. No reliable figures are available for some of the Latin American countries, either because no census has been made or because the last one was made a long time ago.¹² Furthermore, some of the cen-

¹¹ The method of calculation based on the number of deaths prevented and suggested in the case of diseases of this kind cannot be applied to nonreducible diseases in the absence of any information as to the probability of sickness or death in the case of persons who have not been given treatment.

¹² This situation is being rapidly corrected.

suses made in Latin America suffer, in varying degrees, from two fundamental defects: omissions in counting, sometimes, of substantial numbers, and an incorrect distribution by age, due to the fact that in some countries many members of the population are unaware of their age. For these reasons and owing to the immense importance of a knowledge of the population structure, it will be necessary to make a critical analysis of existing data, supplementing them with local surveys.

Another important characteristic of the population of a local programming area is its geographic distribution within the area, including the number and size of the population centers. The provision of services in predominantly rural areas calls for a different approach than that required in areas that are principally urban in character.

It will also be necessary to obtain estimates of the probable rate of increase (or decrease) of the population over a period of 10 years. The need for such population projections arises from the fact that, as will be seen later, health planning will itself cover an extensive period. Such projections are usually prepared regularly by the central government in accordance with various methods that it is unnecessary to discuss here.

Finally, information will be required on the rate of livebirths among residents of the area and on the recording of livebirths and stillbirths in the area. The former will permit an estimate to be made of certain population groups for which provision has to be made (pregnant women and others) while the latter information will help in the assessment of the specific demand for particular kinds of medical attention (such as childbirth, etc.).

6. Environment

When the population characteristics of the local programming area are known, the environment in which this population lives should be analyzed in terms of its influence on the health of the community. Such an analysis should include at least the following aspects: housing,

water supply, disposal of excreta, food, refuse, vectors, industries, and schools.

a. Housing Conditions

It will be necessary to have information on the number of dwellings in the area, based, of course, on a generally accepted definition of a dwelling. Dwellings will be classified according to their condition, on the basis of such established criteria as healthfulness, crowding, etc.

b. Water Supply

The enteric diseases continue to be very widespread in Latin America and still constitute the primary cause of child mortality in a very large number of countries. For this reason the improvement of the quality of the drinking water available to the population will undoubtedly be assigned an important place in planning.

The fact that is most necessary to establish is how many of the members of the population are consuming water of good quality, for example, water piped into their dwellings from a potable water supply system or from properly protected wells. If this information is not already available, it will have to be obtained by means of a survey.

It will also be necessary to know the geographic area covered by the water supply system, its maximum capacity for expansion, and the existence of any projects to establish new sources of supply within the period to which the health plan relates. This information can be obtained from the agencies responsible for the various services.

c. Disposal of Excreta

The information that will be required is the number of dwellings (with the number of persons living in each) possessing a satisfactory system for the disposal of excreta, either by connection to a sewer system or in the form of a septic tank or sanitary latrine. A survey will also have to be made in each locality of the extent of the sewerage system, of its capacity for expansion, and of any projects to construct new

systems during the period to be covered by the health plan. This information can be obtained from the responsible administrative authorities. Data relating to the facilities available for the disposal of excreta normally can be obtained from census sources, but if no census has been made or if the information is not recent, a special survey will be necessary.

d. Food

Another very important aspect of a study of the environment is an assessment of sanitary conditions in establishments in which food is produced, stored, and sold, such as abattoirs, dairies, meat markets, restaurants, etc. During the preliminary planning stage a census should be made of such establishments in order to determine whether the conditions under which they operate are satisfactory. From the programming standpoint it is important to know how many and what types of establishments are operating below the standards regarded as acceptable, since it will give an indication, *inter alia*, of the number of personnel that will be required to inspect and control the activities of such establishments.

e. Refuse

The effective collection and removal of refuse is an important factor in the control of flies and other vectors. It is therefore essential to know the number of dwellings and members of the population receiving a domestic refuse collection service, the frequency with which this service is provided, and the method of disposal of the refuse collected (dumps, fills, incineration, etc.). The former data can readily be obtained from the municipal authorities concerned, and the latter through the survey being made to ascertain the arrangements for water supply and disposal of excreta in dwellings.

f. Vectors

According to the conditions that prevail in each local programming area, surveys should be undertaken to establish the existence of potential vectors of such diseases as malaria, encephala-

litis, onchocerciasis, shistosomiasis, Chagas' disease, etc. Such surveys should be conducted on standard lines for determining existing vector types and their relative indices of density.

g. Industries

The working conditions of the population may constitute a threat to health. It is therefore necessary to ascertain the nature of the various kinds of industries established in the area, the potential risk of occupational diseases and accidents, and the number of workers employed in each. It is also necessary to be aware of projects for the establishment of new industries.

b. Schools

Information should also be obtained on the number of schools in the area, their distribution, the school population they serve, and any projects for the expansion of educational facilities.

D. EXPLANATION OF HEALTH CONDITIONS

The diagnosis should not confine itself to a description of health conditions in the community but should seek to explain these in the light of the influence on them of the various factors involved.

Epidemiology shows that health conditions are affected by four principal factors: (a) the characteristics of the population; (b) the agents that cause disease; (c) the physical environment; and (d) the sociocultural and economic milieu. Health planning adds a fifth factor, health policies, and concentrates a large part of its attention on these.

Epidemiology has not attempted to assess the relative importance of each of these conditioning factors nor the relative influence each exerts on health conditions, although such information would prove of great value in formulating more effective health policies. For instance, if a particular programming area has a high infant mortality rate due to gastroenteritis attributable to the fact that a large proportion of the population has no potable water, it has to be decided

whether the absence of potable water is the result of a very low income level that makes it difficult to provide more funds for the building of the works needed, or whether it is the outcome of an inadequate public investment policy, a consequence of defects in the structure of local government, or finally, if it is due to the lack of sufficient interest on the part of the community itself in the execution by its own efforts of works of common concern. If the explanation should lie in the last of these factors, then it may well be the case that the use of the available resources to arouse the community's interest would have a greater impact on the health situation than, say, the building of a hospital.

The main driving force in the reciprocal relationship of factors affecting health is very likely to be found in the transformation of the socio-cultural and economic milieu, i.e., in the phenomena of social change such as higher income levels, more educational opportunity, a better understanding of the pathogenic agents, increased urbanization, etc. If this is the case and if it is a fact that health policies contribute to social change, it is also pertinent to consider to what extent health conditions influence the capacity for work, the ability to innovate, and the many other factors that play a decisive part in the process of social change. If in fact they do, it would amount to saying that health is a cumulative phenomenon, tending to promote positive social changes that themselves give rise to better health. The answers to such questions as that may well lead to a modification of the principles governing the allocation of resources within the health sector and between it and other sectors.

Enough has been said to illustrate the need for a better understanding of the dynamics of health conditions. Meanwhile the planner must confine himself to what is already known and build on the basis that he can exercise most influence through a health policy of the kind we have been considering. This is not to say that he should overlook the other factors, for they provide the framework within which he must act. They must therefore be examined and considered as a whole in analyzing the situation

in his programming area. A table similar to Table 8, relating to a specific disease, will be a valuable aid in doing so.

E. PROGNOSIS OF THE HEALTH SITUATION

The health situation in a community does not remain static. It is continually subject to modification by changes in the total population, in its distribution between urban and rural areas and by age, as well as other factors. A picture of the situation at a given moment is not therefore what is needed. We need only consider as an example how much value such a description would have in a few years time in the case of an area that is inadequately provided with water supply and sewage facilities but in which services of this kind are in the course of construction. Again it sometimes happens that the effect of the introduction of specific health measures is realized slowly and the full impact is not felt for some time. A description of existing health conditions in an area in which these services have only recently been established will very soon cease to be of any value for programming purposes. Finally, it should be pointed out that the extent to which a target is realistic largely depends on the likely repercussions on a particular program of factors outside the program sector itself, such as, for instance, the prospects of economic growth.

Prognosis has a very clearly defined function to perform in health planning; it must answer the question: *What is the likely pattern of health conditions in a community for, say, the next 10 years, if there is no change in health policies?*

By *no change in health policies* we mean the maintaining throughout the period of projection of: (a) the level of expenditure *per inhabitant* in the program area; (b) the distribution of expenditure among diseases; (c) the methods used to combat each disease; and (d) the measures and instruments, including their efficiency, cost, concentration, and coverage.

The prognosis serves a dual purpose. In the first place, it permits an evaluation of current

policies, by providing for a comparison between the projected trends that would result from the maintenance of these policies and the trends that would emerge if they were modified in accordance with the criteria of efficiency. In the second place, it acts as a point of departure in setting targets for each of the various forms of action proposed in the plan.

The primary function of the prognosis is to project the total population, its age-structure, and its urban and rural composition. Its secondary function is to project the death rate of each of the major diseases in terms of an extrapolation under given assumptions of the trends indicated by the corresponding rates for the preceding five or 10 years.

The assumptions used to project trends in death rates will involve an examination of the relative influence that may be brought to bear on them in the future by the following factors: population changes; projects to introduce such services as hospitals, water supply, and other systems that were in the course of construction during the stage of diagnosis or that were decided on but not proceeded with; and finally, any increase in the level of earnings per inhabitant, any extension of the school-leaving age, any improvement in nutritional standards, etc. Even if the influence of the last of these factors on health cannot at present be measured, a knowledge of them will nonetheless assist the planner in forming a judgment as to their significance.

As this projection will be made on the assumption that neither the level of resources per inhabitant nor the allocation of these resources among the various diseases will be changed, an estimate of the total resources that will be available and of the sum that will be allocated to combat each disease can be made on the basis of a projection of the population. Moreover, as it is assumed that techniques and instruments will be constant, it will be possible to forecast the probable number of deaths that will be recorded each year for the entire period of the projection.

As is evident from Table 9, which provides an example of a projected disease, the principal

TABLE 8. Health levels—The conditioning factors

Year: 1962

Hospital region: Cauquenes, Chile

Name of disease: Dysentery and gastroenteritis

I Incidence and structure of disease				II Susceptibility			III Milieu								
Categories	No.	Rate per 1,000 inhab.	Age groups affected	%	Population	No.	%	Housing	No.	Rate per 1,000 inhab.	Level of education	No.	Rate per 1,000 inhab.	Others	%
(a) Deaths	21	0.4	-5	15	(a) Total	50,220	100	Total	9,694	193	(a) Schools	45	1	(a) Auxiliary	—
(b) Discharged patients	184	4	—	—	(b) Susceptible	23,847	47.5	Without water	5,960	119	(b) Registered	6,400	130	(b) Rural	56
(c) Consultations	1,812	36	—	—	(c) Exposed	7,395	14.7	Without system for disposal of excreta	6,269	125	(c) Illiterates	17,200	344.	(c) Unemployed	—

IV. Health policy

A: Tasks

Type	Number			Coverage			Specific annual cost per disease (escudos)					
	Total	First visits	Concentration observed	Persons protected		%	Annual expenditure		Annual appropriation for each disease		Unit cost	Total cost
				No.	(5)		(6)	For health	For the particular condition	For health		
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1)												
Hospitalization	184	184	2/3	184	—	40	7,360	1	1	1	40	7,360
Consultations	1,812	1,296	1.40	926	—	6	10,872	1	1	1	6	10,872
Inspection of housing	642	642	1	3,403	—	3	1,928	1	1	1	3	1,928
Inspection of various establishments	1,475	472	3.12	17,075	—	3	4,425	1	1	1	3	4,425
Building (latrines)	98	98	1	519	—	238	23,324	0.8	1	6.5	30	2,940
						Total	47,909		Total		Total	27,525

B: Instruments

Category	Number available	Degree of use as a %	Efficiency	Specific annual cost per disease (escudos)								
				Annual appropriations for each disease		For health	For the particular condition	Period in years	Unit cost	Total cost		
				Total expenditure	Unit expenditure						(6)	(7)
				(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)												
Bed-day	1,691	0.81	52.56	4.4	7,360	1	1	1	4.4	7,360		
Physician-hour	318	1	5.7	34.2	10,872	1	1	1	34.2	10,872		
Inspector-hour	2,982	1	0.71	2.1	6,353	1	1	1	2.1	6,353		
Worker-day	1,750	1	0.056	13.3	23,324	0.8	1	6.5	1.6	2,940		
				Total	47,909		Total		Total	27,525		

(*) Based on norm.
 Note: A(13) and B(11) are not necessarily equal, as the values for A(11) and B(9) may differ.

TABLE 9. *Prognosis by disease.*

Disease: Dysentery and gastroenteritis

Hospital region: Cauquenes, Chile

	Year of diagnosis 1962		Estimate corrected according to corrected 1973 rate										Corrected rate	First estimate Rate
	No.	Rate	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973		
			1	2	3	4	5	6	7	8	9			
1. Mortality rate	21	0.42% _c	20.7	20.4	20.2	19.9	19.6	19.4	19.1	18.8	18.6	18	0.38% _c	0.42% _c
2. (a) Discharges	184	3.66% _c	181	179	176	172	172	169	167	165	163	160	3.3% _c	3.66% _c
(b) Consultations	1,812	36.08% _c	1,788	1,764	1,741	1,717	1,694	1,671	1,647	1,624	1,600	1,577	34.5% _c	36.08% _c
3. Susceptible persons exposed	7,395	14.7%	7,114(*)	6,974	6,857	6,739	6,620	6,506	6,390	6,304	6,217	6,132	12.6%	M
4. Milieu														
With system for the disposal of excreta	3,425d	68% _c	3,425	3,865	3,865	3,865	6,425(*)	6,425	6,425	6,425	6,425	6,425	133% _c	M
With water	19,420p	387% _c	19,420	25,495(*)	25,495	25,495	25,495	25,495	25,495	25,495	25,495	25,495	525% _c	M
Total dwellings	9,694d	5.2p/d	9,694	9,694	9,694	9,694	9,694	9,694	9,694	9,694	9,694	9,694	5p/d	M
5. Instruments available (at constant rate)														

M=majority.

c=constant.

d=dwellings.

p=persons.

p/d=persons per dwelling.

(*) Beginning of change in conditioning factors (in absolute terms). The relative changes are shown in year 1.

data required will be obtained from the diagnosis. For instance, such a projection will have to cover the total number of dwellings and the proportion of these that have no water and lack adequate facilities for the disposal of excreta and the collection of refuse. The total number of dwellings can be projected on the basis of past experience of the ratio of the number of houses built to the increase in family units. In order to assess the future situation of these dwellings with respect to the problem of water supply, it will be necessary to consider their distribution between urban and rural areas and the capacity of the water mains in the urban areas. It will also be necessary to know the number of houses already under construction or to be built that are to be supplied from these mains, and the maximum resources that will be available for the construction of new mains.

On the basis of such calculations it will be possible to determine whether there is a tendency for health conditions to improve, remain static, or deteriorate—in terms of a reduction, levelling-off or increase in the death rate for reducible diseases and in terms of similar trends in the demand for curative measures against these diseases (hospitalization and consultation facilities).

If we knew the value of the ratio of each of the indicators of health to the whole series of its conditioning factors, we could estimate trends in the death rates of reducible diseases with a satisfactory degree of approximation. As these values are at present unknown, in practice we could proceed along the lines that have been attempted in some cases:

- (1) Calculate in the case of each reducible major disease the specific death rates for the previous 10 years.

- (2) Calculate the trend indicated by the rates by means of a suitable mathematical method.

- (3) Extrapolate this trend for each year of the period covered by the plan (10 years).

- (4) Estimate the expected number of deaths for each major disease and for each year of the

period, applying the rates obtained in point 3 to the corresponding estimates of population.

- (5) Correct the expected number of deaths in accordance with the reduction or increase that is expected to result from the services that are already in the course of installation or the installation of which has already been approved or, as the case may be, from the failure to install such services.

- (6) Add to the number of deaths obtained in point 5 those forecast (by extrapolation) as being likely to result from all reducible causes not accounted for in point 1.

- (7) Calculate the forecast death rate for each year of the period covered by the plan, dividing the number of deaths obtained in point 6 by the corresponding population.

- (8) Recalculate the trend for the period.

The projected demand for curative services is based on the extrapolation of the trend in demand recorded in a preceding period, which may be five or 10 years. The data used for this purpose are the number of patients treated (first visits) by the medical care services of the area both in inpatient and outpatient facilities. The number of cases treated may, of course, have been less than the number of persons seeking treatment. If this information has been recorded it should be taken into account and the extrapolation corrected accordingly. If the use made of some resources is excessive, this should also be taken into account as it indicates that the services provided are insufficient to meet the need. The population of the area may also be tending to increase. In this event, the increasing trend should be allowed for in the projection of the number of cases to be treated. To the extent that there is expected to be an intensification of urban development and an increase in the income per inhabitant and in educational facilities, the rate of demand for curative services will also tend to rise. A comparison of such rates in regions at different economic levels with different ratios of urban to rural development will provide a basis on which the observed rates of the area in the past can be projected.

As has already been indicated, it is essential to project the demand for curative services for each reducible disease.

The projected demand in the case of non-reducible diseases is obtained by subtracting the demand for curative services for reducible diseases from the total demand for such services.

It would be useful to the planner to have available a demand projection for curative services for each of the nonreducible diseases, or at least for the more important of these, since total future costs are likely to be affected by changes in the composition of the services demanded. If this should prove impossible, it will at least be necessary to have a projection indicating the demand in terms of pediatric, obstetric, medical, and surgical services.

F. EVALUATION OF THE HEALTH SITUATION

All the preparations described in the preceding pages are designed to ensure that the planner is fully aware of existing health conditions in the local programming area as well as of possible future trends in the health situation. He will also be required to make an objective judgment as to whether that situation is satisfactory or not. Any judgment of this nature must inevitably involve a comparison between conditions as they are and some alternative that is regarded as acceptable. To say that a person has fever implies a comparison with some other temperature that is normal. Strictly speaking, to evaluate the existing situation it would be necessary to define the normal state of health of a community, but as this is not at present practical we have here adopted the criterion that the situation is not normal if, *with the resources available per inhabitant, it would have been possible to have achieved a higher level of health in the past or will be possible, during the period of prognosis, to reach a more satisfactory level than that indicated in the projection of the trend.*

In more concrete terms, the evaluation should answer the following questions:

(1) Are the resources fairly distributed among the various reducible diseases?

(2) Are the most effective methods being employed in combating each disease?

(3) Is the general standard of the instruments in use adequate with respect to (a) their composition; (b) their effectiveness; and (c) their concentration and coverage?

(4) How and when can shortcomings indicated under the previous three points be corrected?

The results obtained from this analysis will principally depend on the criteria used to evaluate instruments and techniques. As has repeatedly been explained, the allocation of resources between reducible diseases is based on the principle of the lowest cost per death prevented.¹³ It should therefore be sufficient to analyze the proportional distribution of total costs among diseases and the cost per death prevented in each case in order to obtain an indication of whether the resources devoted to each disease have been well or poorly allocated. If the results of such an analysis reveal a situation such as the one indicated in Table 10, there will be a strong presumption that the distribution of resources is unsatisfactory, since about a third of these are being used to combat disease C, where the cost per death prevented is very high, whereas a very small proportion is being allotted to diseases A and B. Nevertheless, this in-

¹³ It should be recalled that the principle that the prevention of any one death is as significant as the prevention of any other has been accepted. The calculation of cost also involves the concept of vulnerability.

TABLE 10. *Distribution of resources among causes of death and cost per death prevented.*

Cause of death	Percentage	Cost per death prevented
A	2%	26
B	8%	28
C	35%	150
D	35%	31

formation cannot be conclusive for three main reasons.

In the first place, it can happen that it is not possible, for reasons of a technical nature, to reduce the measures being taken against disease C below the point indicated. Part of the reserves devoted to C cannot be transferred to the other categories and the only alternatives may be either to continue expenditure on C at the same level or not to spend anything on C. If this is the case, it will be evident from the diagnosis.

Secondly, and much more important, it should be remembered that the costs per death prevented are based on the actual situation; their level may reflect a poor selection of techniques or an inefficient use of the instruments available, so that a comparison of these costs calls for further examination. Let us assume, for instance, that the adoption of improved techniques and the standardization of the instruments employed would make it possible to reduce the cost per death prevented in category D to 21 and in category A to 25. In that case the allocation of more resources to D than to A would be justified.

In the third place, it may be the case that the low incidence of A does not justify the allocation of more resources to combat it.

Consequently, the first essential step is to evaluate the instruments, tasks, results, and techniques and the effectiveness with which these have been combined in combating each disease, for which purpose it will be again necessary to compare the observed facts with an acceptable standard.

It will be recalled that, in the case of instruments attention should be concentrated on the following factors: their composition in terms of resources, their degree of utilization, and the results achieved. It may be found that the composition of a particular instrument, such as the hospital bed, is such that the depreciation on the structure and equipment represents 50 per cent of the total cost of the item itself. This would be tantamount to saying that the structure and equipment were being inadequately utilized or that an excessively luxurious structure had

been built, if it is borne in mind that the depreciation costs on fixed assets should not exceed, say, 20 per cent of the unit cost of the instrument. If medical consultation, another instrument in the sense defined, is capable of treating 100 patients a day but is only treating them at the rate of 50 a day, it will be clear that the full treatment capacity of this instrument is not being utilized.

In analyzing the various functions performed by a given instrument, the important factors are the components of each task, the degree of concentration per patient, and the coverage and proportion of persons protected. In the case of each of these three factors the observed value may not coincide with what is regarded as the norm. The establishment of norms for components (composition) and concentration is relatively easy. Certain difficulties arise, however, in the case of coverage. For instance, if it is decided to vaccinate 20 per cent of the population against smallpox in a year, this target can be achieved fairly readily if adequate instruments are available. On the other hand, to meet a target of, say, 20 per cent of the pregnant mothers depends not only on the existence of the instruments to this end but also on the demand for treatment of this nature. This is a factor that has to be taken into account in evaluating coverage. Shortcomings in the instruments available and in the action taken with them will certainly be reflected in results and efficiency, so that one indirect way of appraising instruments and tasks in their various aspects is an evaluation of results, even if this sidesteps the substance of the problem, i.e., an explanation of the reasons why the level of efficiency is low.

Operational standards or norms with which planners in local programming areas can work should be determined in association with the local planners themselves, since one of the means used in establishing such norms is based on the highest levels of efficiency observed in the various regions of the country. For instance, the operational norm for a bed in the obstetrics wing of a hospital would be 150 discharges per hospital bed per year if this were the highest

figure in the country. Naturally, in a particular area it might be quite impossible to reach the highest figures in the country and, in this case, a suitable *ad hoc* adjustment would have to be made.

Another aspect of this problem that must be evaluated is whether or not the most suitable techniques are being used.

The question of the suitability of the techniques employed has two aspects. One relates to the technique in the most widely accepted sense of the word and is especially important in Latin America, where there is a tendency to adopt enthusiastically methods that have been developed in other regions of the world. As a case in point, let us consider one instrument—vaccination, with special reference to two diseases, poliomyelitis and diphtheria. If we analyze the vaccination procedure employed against the first of these diseases in various Latin American countries, it will be evident that, whereas some of these advocate the original Salk procedure of three doses or the use of vaccines with an attenuated virus, others are introducing vaccination procedures with five inoculations. Both procedures ignore the fundamental fact that the natural immunity to poliomyelitis of children in underdeveloped countries differs considerably from that of children from countries with good environmental sanitation, and that even three doses may be excessive in our context. It therefore appears essential to undertake epidemiological studies to ascertain suitable immunization procedures with respect to both the level of dosage and the ages at which it should be administered. The importance of this is considerable since, if it can be shown, for instance, that three doses at specific ages would be sufficient, the cost of vaccination against poliomyelitis would be reduced by 40 per cent in the case of those countries that recommended five doses, without any significant variation in the incidence of the disease. The same considerations apply in the case of diphtheria. Studies in this field indicate that, even at the age of three years, the natural immunity of children drawn from the lower social and

economic levels amounts to 45 per cent and that by the age of five it is of the order of 55 per cent. It will readily be understood that this fact alone should substantially modify the vaccination procedures to be used in the case of population groups of this nature.

The term technique is here used in its widest sense, i.e., in the sense in which it has been used in this study and which is illustrated in Table 8 with respect to gastroenteritis. It was stated in that connection that a technique consists of a number of component factors such as water supply, hospitalization, etc. In many instances an increase in the ratio of one of the component factors to the others can raise efficiency and reduce costs.

With regard to the procedure for evaluating activities undertaken in connection with curative measures against nonreducible diseases, there is little to add here except that, as will be recalled, such evaluation should not in this instance include an analysis of the allocation of resources by individual diseases, since it is assumed from the start that the entire demand must be met. The evaluation procedure is therefore limited to making a comparison between the actual cost per cure and the standard cost or norm. To make such a comparison it will be necessary to make an analysis of instruments, tasks, and techniques on the same lines as those referred to in the preceding paragraphs.

At this stage in the evaluation of health activities it is unnecessary to prepare a detailed breakdown of the reduction in costs that could be achieved by a standardization of instruments, tasks, and techniques. On the other hand it is necessary to be sure that the differences observed between the unit costs of combating the various diseases reflect either a low coefficient of vulnerability on the part of a particular disease or the inaccessibility of the population, rather than shortcomings in the use of instruments and techniques. Once this has been clearly established, it is possible to make rough corrections in the costs to remove the grosser inaccuracies and provide a basis for deciding to what extent

the existing situation is unsatisfactory. Similarly, the evaluation can be extended to include the period of the prognosis, since the situation during that period will be much better than is

indicated by the original prognosis, if a re-allocation of resources by disease has been undertaken and techniques and instruments have been brought up to standard.

Annex

BASIC DATA REQUIRED FOR THE DIAGNOSIS ¹⁴

A. Population

Present population of the total area, by age groups.

Population distribution in the geographic area: number of localities and their populations; urban and rural populations.

Maps of the area; location of health centers; access roads.

Population at two previous censuses.

Projection of population for the next 10 years.

Birth rate: livebirths to residents, and livebirths and stillbirths in the area by politico-administrative division and place of treatment during confinement.

B. Environment

General facts: general information relating to the geography of the area, its hydrography, highways, politico-administrative divisions.

Housing: number of dwellings, classification, indices of crowding, projects for the building of new houses.

Water supply: types according to locality; extent of systems; house connections; proportion of population served by each type of supply; nature of treatment; expansion projects and introduction of new services.

Disposal of excreta: elimination systems by locality; extent of sewerage system; population served; number of house connections to sewer mains; final treatment; construction projects.

Food control: census of production and dispensing establishments; production volume; personnel employed; hygienic conditions; construction projects.

Refuse: systems of collection; number of dwellings and population served; frequency of service; procedures for final disposal.

Vectors: existence of principal types of vectors in the area and their epidemiological significance; indices of density.

Industries: number and location by type; number of workers in each; hygienic conditions of work; industrial risks; expansion projects and establishment of new industries.

Schools: number of classrooms by type of instruction; distribution in the area;

¹⁴ This list of data indicates the nature of the information required for the method of diagnosis proposed. The planner can extend or reduce the list in accordance with the scope or limitations of his study.

location maps; hygienic conditions, with specific reference to water supply and facilities for the disposal of excreta; school population; absenteeism; projects for the establishment of new schools, by type.

C. Diseases

Death rate: number of deaths among residents of the area in the last five or 10 years, by cause ¹⁵ and by population age groups.

Morbidity rate: (a) number of persons seeking medical advice at each establishment in the five or 10 years preceding the study, with indication of the diagnosis made, the age of the patient, and whether one or more visits were made; (b) number of patients discharged from each establishment in the five or 10 years preceding the study, with indication of the diagnosis made on discharge, the age of the discharged patient, the number of days spent in the hospital, and the condition of the discharged patient.

D. Inventory of Available Resources and Statement of Preventive and Curative Services Rendered

Complete list of all personnel in the area, by establishment, with indication of official hours of work, their remuneration and employment or profession, and the distribution of their hours of work among hospital inpatients, outpatients, and preventive services by type.

Number of hospital beds available, expressed as an average on the basis of the daily census of hospital beds by specialty.

Buildings: number of buildings in which the health work of the area is carried out; size, type, and functions; whether owned or rented; date of construction and original price.

Special equipment by specialty, such as operating tables, X-ray machines, cribs, electrocardiographs, basal metabolism rate equipment, equipment for hospital outpatients and for preventive services. Purchase date and price.

Services provided: the number of units supplied by each service, expressed in annual totals, such as:

Number of laboratory tests; type and specialty served.

Number of prescriptions for antibiotics, analgesics, sera, and others.

Number of radiological examinations, by type (fluoroscope, X-rays, etc.).

Number of radiation treatments.

Number of surgical operations, by specialty and by origin of patient (inpatient, outpatient, etc.).

Number of pints of blood, plasma, and other transfusions made by the blood bank, by specialty.

Number of consultations with hospital inpatients, outpatients, or patients from other services undertaken by the personnel of each special field.

Number of food portions distributed to inpatients, outpatients, and personnel, with indication of sources of supply.

Number of pounds of clothes laundered, with indication of originating service.

Number of autopsies and biopsies, with indication of originating service.

Number of epidemiological surveys initiated for the principal communicable diseases that have been present in the area.

Number of first, second, third, or more doses of vaccine, by types and by age group.

¹⁵ In accordance with the recommendations of the World Health Organization.

Number of first consultations and total number of consultations for pregnancy, childbirth, and for children under five years.

Number of first home visits and total number of home visits for pregnancy, childbirth, and children under five years and for diagnosis.

Number of schoolchildren examined, by institution, proportion of defects encountered, and proportion of defects corrected.

Number of premises inspected and total number of visits of inspection, by types of institution and by function, e.g., sanitation, hygienic, industrial, etc.

Number of first consultations and total number of consultations for dental health, by age groups.

Budget statement: details for the years under review, including salaries and wages, miscellaneous personnel costs, purchases, expenditure on maintenance and repair, subsidies paid, rent, investments, etc.

CHAPTER 3

DETERMINATION OF FEASIBLE ALTERNATIVES IN THE LOCAL PROGRAMMING AREA

A. GENERAL PROBLEMS OF PREPARING THE PLAN AS SUCH, AND ALLOCATION OF RESOURCES BY AREA

1. Introduction

Within the general planning process, the phase of the actual preparation of the plan is designed to answer two main questions:

- (a) What volume of resources should be allocated to the activity, in this case health, in each of the years covered by the plan?
- (b) To what diseases should available resources be assigned preferentially, and what techniques are *best suited* to the purpose?

This approach suggests that the sequence of work would consist in determining first the resources available and then, by derivation, the targets that can actually be attained. However, the inverse sequence is equally valid, first stating the desired targets and then estimating the resources required to attain them. For example, reasonable targets might be set for annual reduction in mortality and morbidity rates, from which the necessary resources could be derived, or the volume of resources available estimated

and the maximum reduction in mortality and morbidity possible calculated on that basis.¹

The procedure calling for initial target identification might meet with objections on the grounds that feasibility is one of the basic criteria in establishing targets, while availability of resources is one of the principal factors in determining feasibility.

In practice, owing to the complex relations existing among the elements involved, successive approximations are almost inevitable, regardless of whether the determination of resources or of targets is taken as the point of departure. Whichever sequence is adopted, the results should be the same. However, in some cases, one method may entail more extensive revision than the other; experience alone will serve to indicate which is preferable from this standpoint.

A combined working procedure is generally adopted. It is proposed that the central health planning authority take responsibility for determining the volume of resources that will be

¹ It should be remembered that a target is a quantified objective for which a date has been scheduled. The specific difference in the case of mortality is as follows: *objective* = reduction of mortality; *target* = reduction of the rate by 10 per cent over the next three years.

available to finance health activities throughout the country during the period of the plan. At the same time, the local programming authority would be responsible for defining the minimum and maximum limits of the field within which feasible targets can be chosen for the local area without considering the exact amount of resources on hand for each particular zone. The combination of all these data makes it possible to prepare definitive plans for the communities, the regions, and the country, as will be seen elsewhere.

This procedure has been selected for three main reasons. First, current information gaps make it very difficult to prepare a plan for a local program area on the basis of resources that will be available in the future. Second, it is obvious that the resources that *should* be allocated to any particular local area must be defined in the context of the national situation. Third, the national planner is able to submit alternative plans to the highest political authority for a final decision. The differences between these alternatives are expressed in terms of the volume of resources required by each, the proposed allocation of resources among diseases and the apportionment of resources among various program areas. Consequently, if the national planner has several alternatives available for each of the local areas, it will be possible to elaborate a great many of these for the nation as a whole, combining them in different forms.

Once the general procedure to be followed has been decided upon, the other specific problems entailed in plan preparation are directly related to the contents of the plan. These contents should include the total amount of resources to be employed year by year throughout the nation and in each region and area; the proposed targets for each division of activity and each disease; the targets designed to standardize instruments and techniques to be used in each case; required annual expenditures for both current operations and investment; personnel needs and expected difficulties in procurement; investment projects to be initiated; and the legal, regulatory, and administrative provisions

essential for the execution, control, revision, and evaluation of the plan.

This chapter will discuss certain of these problems in relation to the local program area, in reference to minimum and maximum alternatives only. Others will be dealt with in Chapter 4.

2. The Need for Establishing Alternative Maximum and Minimum Plans for Each Local Area

Although the reasons for recommending the procedure based on simultaneous consideration at the central and local levels have already been outlined, certain additional comments must be included on the advisability of establishing for each local area the lowest and highest limits of the field within which feasible alternatives for health activities can be found.

The need for determining a minimum limit is motivated by consideration of the fair distribution of health benefits referred to in Chapter 1. Actually, a national policy based exclusively on efficiency criteria, such as maximum mortality reduction with available resources, can, as noted, lead to complete neglect of the health of individuals affected by diseases that can only be combated at very high cost. To avoid such an imbalance, it is here proposed that the full demand for curative services be met without broadening such demands further.

However, this approach does not solve the other serious problem of equitable distribution arising from the application of an efficiency criterion, which aims at avoiding the omission of certain localities.

The way in which exclusive application of efficiency criteria can lead to the neglect of certain areas can be easily and usefully demonstrated. If a country is heterogeneous, there is most probably a cost differential in different areas for the prevention of death from a single cause. This makes it necessary to compute, for example, not only the average national cost per life saved by measures designed to combat gastroenteritis, but also the corresponding costs

in the various parts of the country. Table 11 outlines the alternatives available to the national planner for distribution of its resources based on a country with three areas and on regional cost differentials for the control of each disease.

As the table indicates, there are nine objectives to choose from; however, the shortage of resources makes it impossible to attain them all. If the criterion used for selection is maximum reduction of mortality with the resources available for combating reducible diseases, disease B in region II will be chosen first, followed by B in region I, A in I, C in I, and so on successively until the resources have been exhausted.

It will be observed that unit costs for all diseases are higher in region III than in the other areas and it is possible that, if resources are not sufficient to combat all diseases throughout the country, region III may be left without any health service at all. This example doubtlessly exaggerates the problems of this type that may arise in practice, for if services are installed in all the regions it may be inadvisable, even from a strictly economic standpoint, to abandon present installations, despite the fact that unit costs for region III are higher. This is one of the many limitations encountered by the planner in reassigning resources. In any case, the example serves to illustrate the fact that strict

application of an assignment criterion based on efficiency can lead to situations that appear to be unacceptable, such as depriving a region of health services because of high local cost.

The dilemma posed by equitable distribution on the regional level is as follows: either the resources are distributed among the regions in order to achieve maximum reduction in the death rate, even though some regions may not be included, or else health services are provided to all the regions, even though this does not lead to maximum reduction in the *national* rate of mortality.

To resolve this geographic aspect of the problem of equitable distribution, it is recommended that available national resources be assigned to the local program areas in such a way as to ensure that current health levels will be maintained unimpaired in all areas during the plan period.

This approach establishes the minimum alternative for each local program area. In accepting it, the nation would agree to allocate to each local area all the resources required to ensure that the current health level would not be lowered. *Mutatis mutandi* is a valid principle for every country.

On the other hand, it is recommended that a maximum alternative be prepared that would establish the highest possible rate of increase in the health level of a community during the plan period, assuming unlimited physical and money resources. Actually, the rate at which community health can be improved depends not only on the resources available but also on other factors limiting an area's capacity for effectively utilizing a greater volume of resources. These factors include the length of the period of latency and development of the instruments, and other administrative and socioeconomic considerations.

Preparation of a maximum alternative for the country as a whole is of academic interest only, since it is highly improbable that sufficient financing would be available for its implementation. However, it can be feasible for one or for a limited number of local areas. In fact, it may be that the nation has a volume of resources

TABLE 11. *Unit cost per life saved by disease and region.*

(monetary units)

Disease and region	Unit cost
Disease "A"	
Region I	125
" II	160
" III	230
Disease "B"	
Region I	118
" II	105
" III	285
Disease "C"	
Region I	145
" II	190
" III	310

available for health activities during the plan period that exceeds the level of financing required to implement the minimum alternative in all areas. The contents of the preceding pages suggest the advisability of distributing the balance on a regional basis so that these additional resources can procure a maximum reduction in the number of deaths for the nation as a *whole*. This optimum might perhaps be attained by assigning to some regions the resources necessary for carrying out the minimum alternative; to others, those required to implement the maximum, that is, to launch a "big push" in the field of health; and to still others, sufficient funds to finance an intermediate plan.

B. PREPARATION OF THE MINIMUM ALTERNATIVE

1. The Role of the Predicted Trend

Maintenance of the health level recorded at the time of diagnosis is understood to mean, specifically, maintenance of the mortality rate resulting from reducible diseases and satisfaction of the demand for curative services *per inhabitant* at the same levels registered for the base period or those indicated by predicted trends. It should be pointed out that a forecast of the health situation in a program area is based on the assumption that the volume of health resources *per inhabitant* available to the area at the time of diagnosis will be sustained. The situation forecast may be better, worse, or unchanged in relation to the initial period. If it is the same or better, this means that application of the minimum alternative will make it possible to maintain the predicted health level with a smaller volume of resources per inhabitant than that employed in the initial period, as the result of better allocation of resources among diseases and standardization of instruments, tasks, and techniques. If the predicted trend is unfavorable, the minimum alternative will indicate whether reassignment and standardization will suffice to head off such deterioration or whether the amount of resources per capita will have to be increased.

The proper functions of planning can be inferred from the foregoing. First, it must standardize instruments and tasks; it must select the most efficient techniques and establish goals of standardization, to be expressed in results, that will serve as a basis for estimating the unit cost of each instrument.² Second, it must quantify its objectives in relation to both reducible and nonreducible diseases. Finally, it must estimate the total expenditure required to achieve these objectives. The following examination shows what each of these questions entails.

2. Standardization of Instruments and Standardization Targets

As stated in the chapter on diagnosis, the study of instruments will show that in many cases resources are poorly utilized, are not used to full capacity, and are unsatisfactory as to results, characteristics which are evaluated by comparison of their composition, degree of utilization, and results with a set standard. There are two questions involved here: how to establish the standards and how to determine the time required for their fulfillment, that is to say, how to establish the targets for standardization of instruments.

A standard can usually be established either by research or by estimation. In many cases, experimental research will make it possible to define the standard representing maximum efficiency. In others, where research is not feasible, estimates must be made.

Estimation of a standard can be based either on a consensus of authorities, defining in general a minimum standard, or on an analysis of observed values in the country or in other countries where similar conditions exist, which results in the selection of one of these as a guide.

Certain precautions must be taken in establishing standards for instruments and tasks. In the first place, it must be borne in mind that

² This is the standardized cost; the result of the diagnosis is the observed cost.

they are designed to reduce the costs of combating diseases but that, in fact, there is no reduction in cost if the effect of health services on the disease is decreased at the same time, even though fewer monetary units are expended. Consequently, the cost reduction is subject to considerations of technical efficiency. On the other hand, standards cannot be determined by technical considerations alone. For example, obstetricians may consider five examinations of each expectant mother during the gestation period as ideal from the medical standpoint, but if three examinations achieve the main objectives of consultation, a greater number of expectant mothers can be attended by eliminating two consultations per patient.

In the second place, the standards must be realistic. The fact that in highly developed countries outpatient care includes all types of examinations cannot be considered as a standard in defining the instrument of outpatient care in an underdeveloped country; the fact that in some countries each hospital bed represents 500 square feet of construction is also irrelevant to the case in point.

Finally, it must be remembered that standards are not inflexible. Technological innovations, changing personnel attitudes, and many other factors make it necessary to modify them from time to time.

Once the standards have been established, the problem of yearly standardization of targets must be solved. In the case of some instruments, a standard can be achieved in a matter of months, but in others, the personnel must be fully re-educated to accept the standardization or change in other conditions, such as certain administrative provisions; this is difficult to achieve within a brief period. It is impossible to generalize in this matter, since much will depend on the conditions of each local program area, including the caliber of the personnel. Perhaps the most realistic procedure for establishing these targets is to hold discussions with those responsible for utilizing each instrument in order to reach an agreement on the expected rate of improvement in the respective

results. Emulation plays an extremely important role in this process.

Once standardization targets have been set for each instrument, which are expressed in the proposed annual output, it is possible to determine the cost of each instrument unit, since each output target entails a specific composition of the instrument in terms of primary resources.

3. Quantification of Targets, Instruments, and Resources for Nonreducible Diseases

It will be recalled that, with reference to the demand for services, the minimum alternative entails the maintenance of curative services already available per inhabitant. It will also be recalled that curative services are provided for both reducible and nonreducible diseases. The foregoing proposal is valid for both aspects, but for reasons that will be clarified elsewhere, it is advisable to establish separate targets for each group.

The diagnosis makes it possible to determine the volume of services provided for treatment of nonreducible diseases, expressed in terms of hospital discharges per thousand inhabitants, outpatient consultations per thousand inhabitants, etc. Since a population projection for the local program area is available, it is a simple matter to estimate the total services that must be provided in order to maintain the hospitalization and consultation rates recorded for the period of diagnosis. In making such an estimate, it must be considered that hospitalization and consultation rates are different for urban and for rural zones, so that if the population projection indicates that a significant rural-urban movement can be expected, mean hospitalization rates for the area will have to be revised.

A knowledge of the number of individuals to be treated makes it possible to determine the volume of instruments required to provide this treatment. It will be recalled that the first step taken by the planner is to standardize instruments and tasks and to establish targets for

output. On the basis of this information, only a simple division is necessary, as for example, discharge targets by proposed output of the hospital-bed instrument, in order to ascertain how many beds will be required during the period.

In estimating the instruments needed to satisfy increased demand, it should be considered that some of these may have surplus installed capacity. For example, a large hospital may be utilizing 65 per cent of its installed capacity rather than the normal 85 per cent. If this is the case, complete new instruments will not be required until existing ones are operating at full capacity, although heavier expenditures will be incurred for food, pharmacy, and other items, which can easily be estimated.

Insofar as available information permits, the planner should ensure that specific rates of cure do not deteriorate during the plan period. In some instances, the use of better curative techniques may help improve rates without increasing costs.

Finally, information on the volume of instruments and their composition in terms of resources makes it possible to estimate the amount of resources that will be required annually. Since the unit price of such resources is known, both the cost and the total expenditure necessary are apparent.

It is advisable to clarify the difference between the two concepts of annual cost and annual expenditure. Let us assume that the cost of a hospital bed-day is six monetary units, of which five are current and one represents depreciation of the building and equipment.

Total annual cost per bed will be 2,190 monetary units, but only 1,825 will be expended in money, since 365 represent depreciation. On the other hand, for years in which new hospital beds are installed, the column of expenditures will include the 1,825 monetary units of current costs plus the investment required for bed installation. If this cost is 5,000 monetary units per bed, the total expenditure for that year will be equal to the operating costs for the number of beds involved plus the cost of investment per bed for the number of beds installed.

Tables 12 and 13, referring to the hospital instrument, have been prepared to illustrate these operations.

The figures appearing in column (a) of Table 12 result from the projection of demand, and those contained in (b) are established by the planner on the basis of observed figures and standardization targets. Column (c) is the product of the two foregoing items. Column (d) represents annual days of occupancy for the beds proposed by the planner. Column (e) results from the division of column (c) by (d). Column (f) shows total beds at the time of inventory plus those to be added during the period by construction under way at the time of plan preparation and projects already approved at that date. Column (g) represents the difference between (e) and (f).

Table 13 refers to total annual costs and expenditures. The figures appearing in columns (a), (b), and (c) are computed by taking into account the composition of the instruments in terms of resources and unit price of each resource. Columns (d), (e), (f), (g), and (h) need no explanation. Column (i) indicates annual expenditures required to *establish* new instruments; it differs from (f) in that the latter contains only annual depreciation charges.

4. Determination of Targets and Calculation of Instruments for Prevention and Treatment of Reducible Diseases

This aspect is concerned with maintaining the mortality rate for reducible diseases observed during the base period, which may be the last year of diagnosis. However, it is not the observed rate of specific mortality per disease, but the over-all average with which it deals. Certain specific rates may increase, provided the average is retained. Nevertheless, targets must be determined disease by disease, since it is almost certain that all of them must be combated to some extent.

It will be recalled that mortality reduction through preventive measures aimed at a disease is calculated by multiplying the number of in-

TABLE 12. Computation of the number of hospital-bed instruments required during the plan period.

Year	Number of discharges (a)	Mean hospital occupancy targets (b)	Number of bed-days required (c)	Degree of utilization targets (d)	Number of hospital beds required (e)	Number of hospital beds available (f)	Additional beds required (g)
0							
1							
2							
3							
4							
5							
—							
—							

Note: The year 0 represents the present observed situation.

TABLE 13. Calculation of total, current, and investment expenditures required to provide hospitalization services. (monetary units)

Year	Instrument unit cost (per bed-day) Monetary units		Total cost (unit cost per number of bed-days)		Total cost	
	Total (a)	Current (b)	Total (d)	Current (e)	Total (g)	Current (same as current costs) (h)
1						
2						
3						
4						
5						
—						
—						

dividuals in whom illness has been prevented by the untreated natural fatality coefficient, and that the number of individuals in whom illness has been prevented is estimated by multiplying the number of individuals protected by the difference between probabilities of acquiring the disease with or without prevention.⁸ Therefore, if the mortality and probabilities of acquiring a disease are constant throughout the plan period, the number of lives to be saved through measures applied to a reducible disease is directly proportional to the number of individuals protected against this disease.

Consequently, computation of the additional number of lives that must be saved is reduced to a determination of the additional number of individuals who must be protected.

The computation can begin with the diseases for which costs per life saved is lowest, utilizing fully standardized instruments. Let us assume that disease C shows the lowest cost. Supposing further that to maintain a mortality rate for reducible diseases equal to that of the base year it is necessary to decrease predicted deaths by 100 a year; the next step will be to increase the number of individuals protected against disease C to a point where 100 deaths have been prevented.

It may, however, be impossible to prevent the additional number of deaths by operating solely through the prevention of C, either because an effort of this scope exceeds the coefficient of vulnerability assigned to that disease, above which unit costs rise sharply, or because it exceeds the point of eradication. In this case, of course, consideration is given to the disease appearing in second place on the list of costs per life saved, and so successively with the others until the stated target has been attained.

Once the target of mortality reduction has been achieved, the diseases whose cost per life saved is highest are studied to determine the feasibility of decreasing some of the resources assigned thereto in the past and trans-

ferring them to other, lower-cost diseases. If feasible, the first operation will lead to an increase in deaths and the second to a reduction that outweighs that increase. Since the target is to maintain the mortality rate, the attack on the disease chosen will be extended only insofar as the reduction of mortality is equal to the increase. This process will be continued until it is no longer possible to transfer additional resources from the high-cost diseases to the low-cost ones.

Once the foregoing operations have been carried out, a determination will be made of the number of individuals to be protected against each disease and, consequently, the number of instruments that must be brought into play. The rest of the operations required to compute total cost and total expenditure are identical to those discussed in the preceding section.

The established order of priority, based on cost per life saved, can entail a very different assignment of resources per disease from that of the base period; for this reason, its full implementation can be difficult. In general, there are many areas of resistance to change in the allocation of resources, derived from the technical specialization of certain instruments or from factors affecting the staff itself. The planner will have to take such resistance into account and, on this basis, modify the optimum scale of priority. Computations for both total annual costs and total annual expenditures will be affected by such modification.

The operations outlined in Sections 3 and 4 give an estimate of the annual costs and expenditures required to meet the demand for treatment of individuals affected by nonreducible diseases and to protect the population against the risks of incurring reducible diseases.

The costs and expenditures entailed in satisfying the demand for treatment relating to reducible diseases remain to be determined.

It will be recalled that this demand is projected on the basis of an analysis of the mortality rate caused by reducible diseases, on the one hand, and the rate of hospitalization and

⁸ As noted in Chapter 2, this information is known, approximately, only in the case of certain communicable diseases; the present study stresses the need for investigating the importance of this aspect.

consultation relating to the same diseases, on the other. Consequently, it might be considered that if these rates remain constant, treatment demand will increase only as a result of increase in population. However, as noted, maintenance of the average mortality rate is not the same as maintenance of the mortality level for each disease. Furthermore, since the assignment of resources among diseases is revised and the various diseases differ in their rates of hospitalization and consultation, the treatment demand can increase at a higher or lower rate than population expansion. The ratio of increase can easily be established by applying the trend to each disease rather than to the over-all picture.

5. Computation of Total Annual Costs and Expenditures

Once the modification in demand for treatment of reducible diseases has been quantified, the next step is to calculate the necessary instruments and total costs and expenditures by using the same procedure outlined in Section 3. The sum of these costs and expenditures, together with those resulting from the prevention of reducible diseases and treatment for nonreducible diseases, gives the total value of resources that must be utilized to implement the minimum alternative.

The resources required by the minimum alternative plan can be greater or less, in per-capita terms, than those for the initial period, depending on the effectiveness with which the resources were employed and the extent to which this effectiveness can be improved. If the resources required are less than in the initial period, this means that the program area can carry out the same health activities as before the plan with fewer resources and at lower cost. In this way, it will be helping to save more lives and to treat more cases in other parts of the country or in that same area, if the surpluses are made available.

6. Targets and Requirements of the Minimum Plan When the Trend Indicates Maintenance or Improvement

Up to this point, we have analyzed the case in which the predicted trend indicates a deterioration in the health level. If, on the other hand, this trend should point to maintenance or increase in that level, the task of the planner with reference to preparation of the minimum plan would be confined to reducing the cost of combating each disease, standardizing instruments, and improving techniques. The process is almost identical to the preceding case. The number of instruments available throughout the plan period is known, since the forecast has made it possible to project this aspect; it is also known that the tasks they are accomplishing point the health level trend toward maintenance or improvement. Furthermore, it is known to what degree results can be improved thanks to the attainment of standardization targets, and how much greater efficiency can be achieved, thanks to the use of better techniques. By achieving such improved results and efficiency, it will be possible to implement the trend to either maintenance or improvement through a smaller volume of instruments than those indicated in the forecast. Since the unit cost of the standardized instruments is known, the total cost can be calculated by simple multiplication.

On the other hand, the trend in the mortality rate for reducible diseases may be downward while that of medical care services may be upward, as the result, for example, of exaggerated enthusiasm in hospital construction. The reverse may also be true. Neither of these alternatives creates problems that cannot be solved by the procedures already outlined.

C. PREPARATION OF THE MAXIMUM ALTERNATIVE

1. The Concept

As already noted, the maximum alternative represents the body of activities required to

increase protection against risks associated with reducible diseases and to expand treatment services for all types of diseases with the maximum speed technically, administratively, and socially feasible.

If the maximum alternative is implemented in a local program area, it will be possible to achieve the lowest feasible mortality rate in connection with reducible diseases, given the medical skills and socio-demographic characteristics of the community, the instrumental latency and development periods and the executive ability of the administrative agencies, although every alternative should include reasonable possibilities of improving the administrative mechanism.

Adoption of the maximum alternative signifies that at the end of a prudent period, which may be longer or shorter than the term of the plan, the chief preventive activity will be oriented toward maintaining reducible diseases at their lowest limit, which will lead to a sharp curtailment of expenditures. At the same time, expenditures relating to treatment services of nonreducible diseases will increase, owing to population aging, and the need for cutting costs per case treated will become much more urgent.

The point at which treatment expenditures are reduced may become apparent after the first plan, since it may be impossible to eradicate the disease or to reduce it to the extent its vulnerability permits within the 10 years of the original plan. However, the plan will be drawn up with a view to achieving this level whenever it becomes feasible, even though this point may not be reached within the 10 years, and will include all activities necessary to achieve that objective. Whatever aim cannot be attained will, naturally, be included in the plan for the following period.

2. Determination of Targets, Instruments, and Resources for the Prevention and Treatment of Reducible Diseases

The goals for the maximum alternative plan relating to reducible diseases should be estimated individually for each disease.

Let us take, for example, gastroenteritis. The risk of being stricken by this ailment depends largely on whether or not drinking water and suitable sewage disposal systems are available. The diagnosis will indicate what percentage of the population in the program area lacks these services, whether because mains have not been installed or because house connections have not been made. The prognosis will show the expansion of this sector in both rural and urban environments.

The planner should indicate the percentage of the population to be protected in order to reduce the disease to the maximum extent possible in accordance with its estimated vulnerability. Most probably, it will not be necessary to protect 100 per cent. In most cases it will not be feasible to protect the marginal cases, since this would entail a very high cost.

The administrative agencies in charge of constructing water supply and sewerage systems will be responsible for scheduling provision of these services within the shortest possible period to the entire population specified by the health planner.

These agencies will also be responsible for defining the total cost and expenditure required for supply of their services and the sequence in which the installations will be scheduled. Therefore, the responsible agencies will prepare a maximum plan for providing water supply and sewage disposal systems, although this plan need not be detailed. For the purposes envisaged here, a preproject is sufficient.

The health planner will examine ways and means of improving, as rapidly as possible, sanitary conditions of manufacture and consumption of foodstuffs and of collection and disposal of refuse. This will require, in many cases, more frequent inspections, acquisition of additional equipment, modification of municipal regulations, and several other measures, some of which will entail a heavier expenditure, which will not be difficult to estimate.

In the case of other reducible diseases, the procedure is very similar to that described. First of all, a determination should be made of the present unprotected population; the

percentage that must be protected to reduce the disease to its lowest level according to its estimated vulnerability; the population increment that will require protection during the plan period; the instruments to be employed to protect those individuals, calculated with the aid of standardization targets; the volume of primary resources to be utilized, and finally, the value of these resources, which can be obtained by multiplying the volumes by observed prices during the base period.

3. Quantification of Treatment Service Targets

It will be recalled that, under the minimum alternative, the targets for treatment services of nonreducible diseases are estimated by assuming the rates of hospitalization and consultation per 1,000 inhabitants to be constant, so that the demand for services expands parallel to population growth, taking into account the modifications resulting from changes in urban-rural composition. Under the maximum alternative, the hospitalization and consultation rates are revised to conform to the level recommended by medical technique, simultaneously with an attempt to increase rates of cure.

Actually, very little is known at present concerning suitable hospitalization and consultation rates, except in cases such as pregnancies. This in part reflects the lack of information on the present epidemiology of nonreducible diseases, a matter that requires a great deal of research. Consequently, in determining realistic targets for increased rates of hospitalization and consultation, there is no other course but to fall back upon interregional or interarea comparisons. The diagnosis of the different areas in the country can furnish very valuable information on this point, and international comparisons will also be most useful. The experience of the social security system can also prove helpful.

In computing treatment needs for cases relating to reducible diseases, the procedure is the same as for the minimum alternative, that

is to say, it is based on a correlation between the mortality rate for each reducible disease and the hospitalization and consultation rates for the same disease. Consequently, the first step will be to compute the effect on the mortality rate for each disease of the activities required to decrease it to its lowest level, as indicated by its estimated vulnerability.

The major impact on a disease, according to its estimated vulnerability, is achieved when 100 per cent of the population exposed to the risk of incurring the disease in question have been protected.⁴ However, in certain cases the effect on mortality is not apparent at the time protection is furnished to the individual. For example, if water and sewage disposal systems are made available to a group of 1,000 individuals at a given date, the mortality rate caused by gastroenteritis will not reach its lowest level until some time after that date. This represents what this text terms the development period of the instruments. If we assume that the development period for the two instruments mentioned above is one year, and accept the vulnerability of gastroenteritis as approximately 0.75, the mortality rate for the entire population protected in that year will be reduced at the end of 12 months to approximately 25 per cent of its original level.

On the other hand, the latency period for these instruments, that is, the time required to adapt them to normal conditions, may be two years, so that if construction activities are initiated on a given date, the mortality rate from the disease in the population to be protected will be reduced to a minimum, as determined by its vulnerability, within a period of three years. Therefore, if the population protected at the start of the plan, the additional segment to be protected annually, and the period of development are known, it will be possible to determine the annual reduction in the mortality rate for the disease and the number of cases that will require treatment services, at the same rates of hospitalization and consul-

⁴In many cases, it is not necessary to protect 100 per cent of the population exposed to the risk in order to attain the effective vulnerability.

tation as for the initial period. These rates can be revised subsequently as in the case of nonreducible diseases.

The calculation of instruments required for treatment is identical to that outlined for the minimum alternative. When the number of cases to be treated and the standardized output of instruments are known, a simple division will indicate the annual number of instruments necessary.

4. Total Expenditures for Maximum and Minimum Alternatives

Generally speaking, the total annual expenditures required for the maximum alternative are computed in the same way as those for the minimum alternative, so that no further explanation is necessary. However, there is one problem of some interest for both the maximum and the minimum alternatives that calls for additional comment. This is the determination of the optimum opportunity for construction of facilities requiring heavy capital outlays, such as hospitals, water systems, etc. Take, for example, the case of a hospital.

According to the technique of hospital administration, there is an optimum size for hospitals; below this optimum, unit operating costs spiral, making it inadvisable to construct, for example, a 20-bed hospital.

By way of illustration, let us suppose that the minimum is 80 beds and that the average annual increment in demand is 20 beds. If the new hospital is opened in January of the year 1, it will operate at 25 per cent of capacity during that year, at 50 per cent during the year 2, and at 75 per cent during the year 3 (Graph 1).

Underutilization entails an additional cost that must be held to a minimum. One way of ensuring this in the case illustrated would be to build in the fourth year, but this would mean that several cases would be unattended unless existing hospital facilities can overextend their capacity for those years. Failure to treat a number of cases represents a loss to

the community. If this loss could be compared to the loss represented by underutilization, it would be possible to specify with some degree of precision the optimum date of construction. Such a comparison is not possible at present and the only feasible course is to seek construction techniques that will ensure "expandable" installations, that is, units that can be added to at reasonable cost as the demand for services increases.

In the case of water and sewerage systems, underutilization is largely the result of delays in completing house connections. In preparing these projects, it might be preferable to sacrifice some degree of speed in the construction of basic installations in order to step up individual connections.

Owing to the indivisibility of investments, the series of annual expenditures will exhibit many irregularities. They will be heavy during the construction years and approximate the operating-cost level in the other years.

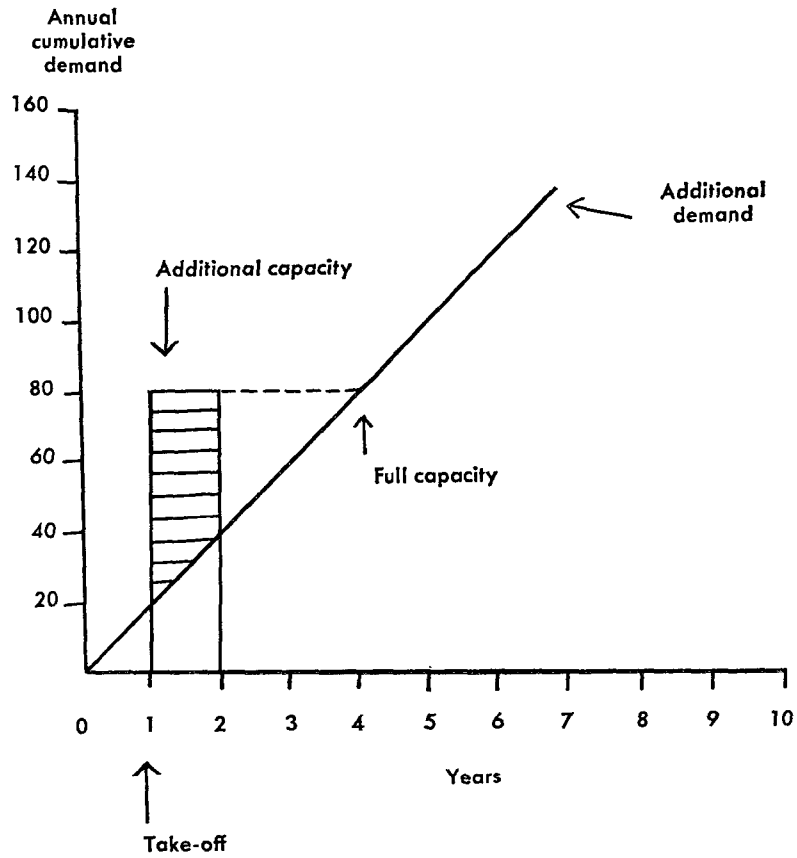
A graphic representation of expenditures under the minimum alternative would be similar to line B of Graph 2, indicating a continuous upward trend but showing surpluses above the normal level for some years. These would be the years of concentrated investment.

Expenditures under the maximum alternative will follow line A, with a heavy concentration in the first two years, a drop below line B once the maximum vulnerability points have been achieved and a tendency to outstrip the minimum alternative thereafter, reflecting the increasing importance acquired by treatment.

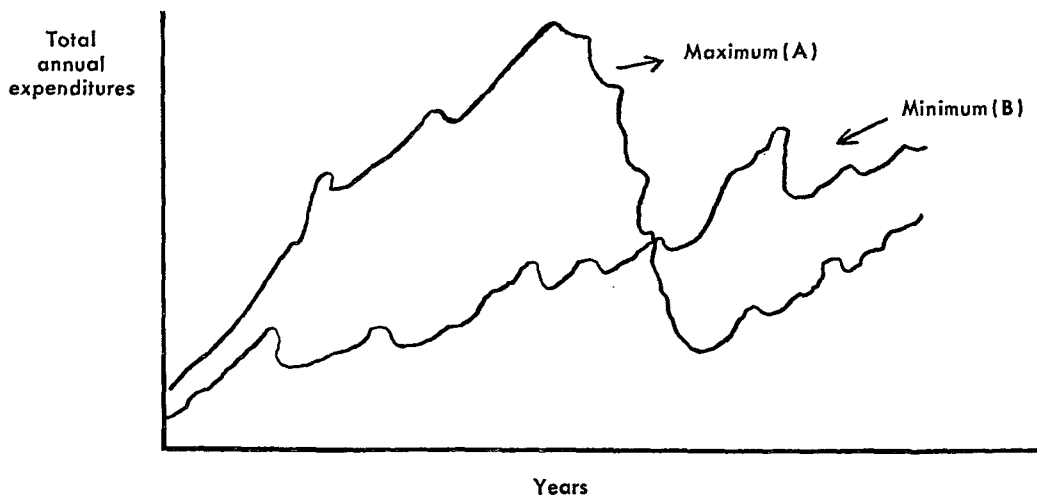
5. Unit Costs

Since the maximum alternative is based on the assumption of unrestricted resources, it might be considered unnecessary to compute unit costs per life saved in connection with reducible diseases and per case treated in connection with nonreducible diseases. It will be recalled that these costs are used under the minimum alternative as a guideline for assigning resources among reducible diseases within the

GRAPH 1. Relationship between Demand and Installed Hospital Capacity.



GRAPH 2. Expenditure Curves for Maximum and Minimum Alternatives.



program area. However, the preparation of alternatives other than the minimum in each program area serves the purpose of facilitating the central health planners' task of assigning among regions and diseases the surplus resources over and above those required to finance the minimum alternative throughout the country. If, for example, it is impossible to reduce gastroenteritis to its minimum level throughout the country within a period of 10 years, according to estimated vulnerability, it may be advisable to pursue this objective in certain areas. The areas selected should, of course, be those offering a lower cost per life saved.

In examining the method of estimating costs per life saved in the diagnosis, it was stated that total current and capital costs incurred in combating a disease should be divided by the number of lives saved, and that the same method should be used to estimate costs per case treated.

This procedure is not correct for the calculation of unit costs for deaths *to be prevented* or cases *to be treated* in the future with instruments whose construction is still undecided.

It must be stressed that the role of unit costs is to facilitate the selection of an alternative. In planning the construction of new instruments, there are many to choose from and the alternatives must be placed on a comparable footing if no such basis is available. For example, let us assume that one instrument or technique of sanitation activity requires the expenditure of 100 monetary units a year for 10 years and that another calls for the expenditure of 500 in the first year and 55.6 for each of the following 9 years, with a cumulative expenditure of 1,000 in both cases. If both alternatives save the same number of lives during the period, the unit cost will be different, since the expenditure of 100 this year is not equivalent to the expenditure of 100 within 2, 3, or 10 years. If the interest rate is 8 per cent, 100 monetary units scheduled for expenditure in the year 10 are equivalent to 47 units scheduled for expenditure this year, while the 100 to be disbursed in the

year 20 are equivalent to 20.5 today. Applying this criterion to the example cited above, the total cumulative cost discounted to date for the first technique will be 706 units and for the second, 850, not 1,000 in both cases. Only if the second alternative makes it possible to avoid 20 per cent more deaths than the first will the two be equally attractive, since the cost per life saved would then be identical.

The method of estimating these discounted costs is identical to that used to evaluate investment projects in the economic field. For example, in constructing a hospital, an annual schedule of operating and investment outlays will be prepared for each year of estimated useful life of the project, and in discounting these annual expenditures to date, they will be added together and divided by the sum of cases expected to be treated during the entire useful life of the hospital.⁶

From the example stated above, it can be inferred that, given a rate of interest and the period of useful life of the project, the cost per life saved or per case treated will increase proportionately to the increase in the ratio of total expenditures incurred at present, that is, the increase in the ratio of initial fixed investment to total expenditures. In general, treatment techniques require a heavy fixed investment. The cost of installing a hospital bed, for example, is usually more than 5,000 dollars and may, in most cases, be greater than the per-capita cost of installing a water supply system, insofar as the health aspect is concerned. Furthermore, in many cases disease prevention does not require fixed investments; in contrast, treatment of the same disease does require them to some extent. A typical example is malaria.

In accordance with the preceding paragraph, in preparing the maximum alternative and, strictly speaking, in all cases, as for example in combating gastroenteritis, the annual schedule of expenditures required for construction and operation of the water system or systems during their entire useful life will be drawn up and

⁶ This assumes that a case treated this year is equivalent to a case treated in any future year.

the annual discounted data totaled. A decision will then be made regarding the portion of this sum that cannot be assigned to health and the portion that can be assigned to gastroenteritis.

The value obtained from these computations is greater than what should be assigned to the attack on gastroenteritis, since its prevention entails savings on treatment services. Treatment savings can be computed, since it is possible to estimate the reduction in number of patients through prevention. On the basis of hospitalization and consultation rates, the reduction in the number of treatments can be estimated. Since the cost of treatment is known, this determines the total savings in treatment services. This figure is subtracted from the direct expenditure required for prevention and the difference divided by the number of lives saved during the entire useful life of the project.

Strictly speaking, this procedure should be applied in the same way as the computation of cost per life saved for each reducible disease under the minimum alternative. Actually, the only difference between the two extreme alternatives is the extent to which prevention and treatment are utilized in each case. For the minimum, greater emphasis is placed on treatment than on prevention. Viewed from another angle, a much longer time is required to protect 100 per cent of the population exposed

to the risks of reducible diseases. For this reason, it is quite probable that the unit cost for the minimum alternative will be higher than that of the maximum in every case in which there is a high initial investment per case treated.

Following this procedure, it would be feasible to estimate the cost per life saved for various alternatives ranging from the maximum to the minimum. If the minimum has the highest cost, it may be that the unit costs are reduced proportionally to the increase in prevention, in which case it will be very simple to estimate the intermediate cost of any alternative. But it may be that the reduction in unit costs is greater or less than the increase in prevention.⁶

Owing to the lack of experience in computing unit costs for various combinations, it is recommended that each local program area calculate only the maximum and the minimum alternatives for each reducible disease and for the treatment demand. The national planning agency will, at any rate, have many possible combinations available, since it may recommend for a given area implementation of either the minimum or the maximum alternative or of an intermediate formula that would apply minimum alternatives to certain diseases and maximum alternatives to others.

⁶ If, for example, economies or diseconomies of scale should exist in either treatment or prevention.

CHAPTER 4

PREPARATION OF REGIONAL PLANS AND THE NATIONAL PLAN

A. INTRODUCTION

The preparation of extreme alternatives for each local program area marks the close of the first stage in the process of planning. The second stage, which will be examined in this chapter, is concerned with preparing alternative plans on all levels: national, regional, and local. These plans will invariably include one that represents the sum of minimum alternatives for the local areas, since these are the basis of fair distribution, but will not include the sum of local maximum alternatives, since it is highly unlikely that sufficient financial resources would be available to implement such a plan throughout the country. The maximum plans are used mainly as the instrument of analysis by the planner to facilitate assignment of resources, by area, for surpluses above the level required to finance local minimum alternatives. Therefore, one of the main tasks in this second stage is the preparation of other feasible intermediate alternatives, which are more ambitious than the minimum, but usually less so than the maximum.

Feasible alternatives beyond the minimum level applicable to the local area are the responsibility of the regional rather than the local planner. In like manner, it is the national planning agency that should decide upon

the best regional alternatives, although its regional counterpart should suggest those it considers preferable. There are two main reasons for this chain of decision. In the first place, the best *national* health strategy may not be the sum of the best regional strategies, nor the best regional plan the sum of its local parts. In the second place, some essential health activities cannot be regionally or locally centered.

B. THE TASKS OF THE REGIONAL PLANNERS

1. Functions of the Regional Authority

Mention was made in Chapter 2 of the characteristics that define a planning region. It was described as constituting a center that provides specialized services for health treatment, such as cardiology, neurology, and others proper to a regional hospital. The center is also the seat of political authority and of cultural activities of broader significance than those of the local areas. All of these functions are exercised not only to the benefit of the central core population but also in the interests of the local areas within its sphere of influence, which, together with the core, form the planning region.

Each planning region should have a health authority. The primary functions of this au-

thority are to see that the specialized health services mentioned previously are provided efficiently, together with various others that can be implemented more effectively at the regional than at the local planning level.

Among these functions, mention should be made of emergency campaigns aimed at communicable diseases, certain applied research projects, in-service personnel training, staff recruitment, acquisition of materials, works contracts and others.

Each of these activities should be expressed in the form of special regional programs, that is to say, the corresponding targets, necessary instruments, and schedule of expenditures will be established for each. In addition, the regional planner should prepare, on the basis of proposals advanced by the local areas and of special regional plans, the alternatives to be transmitted to the national authority.

2. Special Regional Plans

The problems arising in connection with the preparation of plans to provide specialized treatment services, which, owing to the cost factor, cannot be set up in all the local areas, are similar to those already discussed in the preceding sections dealing with treatment. It will be necessary to compile an inventory of available instruments, analyze the output and composition of instruments, establish standards and standardization targets, project demand, and calculate the instruments required to meet it, including costs per case treated.

Emergency campaigns, however, do not lend themselves to planned action as defined here, owing to their unpredictability. Consequently, the regional authority will have to confine itself to providing for services with which to meet emergencies whenever they arise.

Furthermore, the regional authority will have to prepare penetration plans designed to provide health care for those residing in isolated areas who lack permanent health facilities. To satisfy its most urgent needs, this sector re-

quires both transitory and periodically repeated programs.

The diseases that should be combated in these zones cannot be selected by the same method employed for more accessible areas, because of the lack of statistics and the difficulty of applying health instruments that have been designed to deal with the problems of urban aggregates rather than scattered families. Therefore, it is preferable to choose a limited number of diseases characterized by a simple chain of epidemiology and by high vulnerability that affect a large number of individuals and can be combated by the use of very simple instruments.

It is equally impossible to stipulate strict criteria for specifying the optimum total volume of resources to be used for penetration plans, although it can be suggested that the sum resulting from multiplying the average of per-capita resources available for preventive action in the region by its population be taken as a maximum limit.

A great many of the other services to be provided by the regional area can be quantified on the basis of information contained in the plans of local areas comprising the region. For example, these plans will furnish information on personnel needs, in-service training, acquisition of materials, and applied research.

3. Preparation of Alternatives for the Region

The office of regional health planning will draw up the regional alternatives on the basis of various combinations of local plans plus special regional plans. These regional alternatives are the raw material with which the national office of health planning works.

In addition to those already mentioned, there are two primary reasons for preparing regional alternatives. The first is derived from the fact that the zones of demographic concentration in the local planning areas are usually distributed excentrically, close to the politico-administrative boundaries, which indicates the advisabil-

ity of expanding the installations of an urban community located in area A to serve the rural population of a location in area B as well, rather than establishing new installations in B. The regional authority would avoid any squandering of resources for this purpose, since the planner for area B will be inclined to recommend that such installations be set up in that area.

The second reason is based on the need for simplifying the task of the national planner as concerns the handling of information. If the local areas forwarded all their information intact, the national agency would find it difficult to handle it effectively. The regional planner synthesizes the information and forwards only the data referring to minimum plans and those with high priority.

The regional planner will have no difficulty in preparing a minimum alternative for the region, since this will be the expression of the sum of minimum plans for the local planning areas and special regional programs. This task will be confined to coordinating these levels, particularly in connection with the installation of specialized or unspecialized services covering more than one area.

The preparation of more ambitious alternatives will require an estimate of resources available to the region in each year of the plan. It is the task of the national planner to undertake this responsibility along the lines indicated elsewhere. The following assumes, consequently, that such information is available.

Once the resources available to the region are known, the main task is to determine how to use surpluses above the level necessary to implement minimum plans in each local area and those relating to special regional programs. All the necessary information is available for this purpose. Actually, each local planning area will submit its minimum plan, proposals for control of each reducible disease at the level of its estimated vulnerability, and a proposal for maximum acceleration of treatment services. Each of these proposals will be accompanied by an estimate of total and

unit costs and by an outline of the annual expenditures required throughout the plan period.

The procedure to be followed by the regional planning agency in assigning surplus resources is identical to that employed by the local planner. From the total projected resources, it will subtract those needed to satisfy the minimum plans and the special regional programs. It will then assign the balance to stepping up the attack on reducible diseases in accordance with the cost per life saved.

To this end, the regional office will organize available information in a table similar to Table 14, which contains hypothetical figures by way of illustration. Given the costs indicated therein, the planning office will proceed to allocate the surplus resources to combat disease A in area I, since it shows the lowest cost per life saved. In other words, it will propose that A in area I be combated at the level of its estimated vulnerability or to the extent that surplus resources permit. If there is still a balance outstanding, it will recommend that these resources be used to combat disease A in area II, and so successively until all the resources have been exhausted. In the event that all reducible diseases can be covered at the minimum level in terms of vulnerability

TABLE 14. *Unit costs per life saved for the various causes of death and local areas under maximum and minimum alternatives.*

(monetary units per life saved)

Causes of death	Area I		Area II		Area III	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
A	15	10	26	14	56	25
B	20	15	47	35	25	18
C	—	—	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—
N	340	105	510	150	130	52

without exhausting the funds available, these will then be used to expand treatment services, beginning with those local areas with the lowest cost per case treated where it is possible to promote increase in the demand.

The preceding estimates make it possible to prepare the second regional alternative. From the program standpoint, it is advisable to draft two additional alternatives. One is based on the assumption that a greater volume of resources will be available than that specified by the national planner; this increment can be set arbitrarily at an additional 20 per cent. The purpose of this alternative is to be prepared in the event that national projections should eventually prove to have erred on the side of underestimation. The other alternative can be based on the receipt of only 80 per cent of project resources in the event that predicted resources should have been overestimated. The drafting of these two alternatives presents few problems, since it is a question of increasing or decreasing the list of diseases that can be combated on the minimum level indicated by their vulnerability.

Finally, reference must be made to one complication that might arise. This is the possibility that, for example, disease A in area I cannot be eradicated unless it is eradicated in the other areas at the same time. In this case, the cost per life saved in relation to disease A may exceed that of disease B (see Table 14). Therefore, it cannot be approached on the basis of three alternatives but must be limited to a single plan and should be assigned a new priority rating. Naturally, the resulting cost may not be the same as the calculated average of 10, 14 and 25, and should then be recalculated.

C. THE RESPONSIBILITY OF THE NATIONAL PLANNER

1. Introduction

The chief responsibility of the national health planner is the same, on the national level, as that of the regional planner. He should en-

deavor to distribute the resources available for the health sector, in excess of the minimums required for implementing the minimum alternative throughout the country, among the regions in such a way that efforts designed to combat reducible diseases ensure maximum reduction in the number of deaths together with minimum costs per case treated.

This task is accomplished in various ways. First, by reviewing regional proposals and transferring resources from high-cost to low-cost regions within the limits set by the minimum alternative. Second, by preparing national plans and ensuring their coordination with regional and local plans. Finally, by developing planning methods to be followed in the local and regional areas, including the preparation of standards of instrumentalization and results. In addition, it is the responsibility of the national planner to instruct his regional counterparts with regard to the resources that will be available for each region during the plan period and, in some cases, to project total health resources for the entire country.

2. Projection of Available Health Resources

If a national planning mechanism exists, it is the duty of the general planning agency, which is concerned with establishing the general economic framework of reference within which all State activities will be carried out, to prepare a projection of the resources available to the government during the plan period and a basis for distribution of these resources among such sectors as the armed forces, industrial promotion, agriculture, and all others within its purview.

There is no need to discuss in a work of this type the detailed techniques to be followed in projecting the revenue of the public sector. Suffice it to note, to illustrate its complexity, that this aspect entails the projection of total production of goods and services, distribution of income and volume of certain transactions, such as real estate sales. It also

involves a decision on tax rates, tax administration, and the public debt.

On the basis of projected receipts, the general planner proposes to the political authority a scheme for allocation of percentages among the various State activities. The criteria used to prepare this proposal are arbitrary ones, owing, among other causes, to the absence of a technique for establishing equivalency between one activity and another. However, through planning, this arbitrariness will be reduced to some extent, as the social cost of each decision becomes apparent.

The distribution proposed by the general planner is not definitive. Once approved or modified by the political authority, it serves as a guide for each government sector in the preparation of its program proposals. When these are available, the assigned percentages are reviewed, since a comparative study may indicate the advisability of reducing some quotas and increasing others. This demonstrates the importance of preparing alternative plans for each activity.

If no general planning mechanism exists and it is decided to program the health sector anyway, the national health planner will have to prepare a projection of public receipts and offer alternative proposals regarding the percentage that should be assigned to the health sector. For this purpose, the ratio of the base period may be assumed to be constant or other rates may be chosen on the basis of international comparison. Urban population expansion and other criteria indicating the need for increased sanitation services may also be taken into consideration.

3. Assignment of Resources among the Various Regions

At a given date, the national planner will have all the regional proposals and their corresponding alternatives on hand. On the basis of the minimum alternatives and the annual expenditures required for execution of the national plans, the central agency may estimate the

balance of resources that can freely be reassigned among the various regions. The information may be organized into a table similar to that shown as Table 15. Furthermore it will have a list of the diseases that each region considers to hold highest priority once the minimum alternative has been satisfied, the respective costs per life saved, and the expenditures required for the proposed activities. These data may be arranged in a table similar to Table 16.

On the basis of this information, the national planning agency proceeds along the same lines as the regional planner with respect to local areas, and as the local planner with respect to the various reducible diseases. It selects the disease whose cost per life saved is lowest and calculates the framework of annual expenditures corresponding to this disease, as shown in Table 16, from the resources available for reassignment, as shown in the last line in Table 15. If there is no deficit, the outline of expenditures for the selected disease is added to the corresponding region. If funds are still available, the planner chooses the disease appearing in second order of importance, based on cost per life saved, and repeats this operation until all resources available for reallocation have been exhausted, in such a way as to include all diseases that the regional authorities consider to hold top priority in stepping up their attacks. Any remaining resources will be assigned to the expansion of treatment services, selecting first those regions where cost per case treated is lowest.

In some cases, resources available for assignment might represent a relatively low value in certain years, owing to the concentration of investments demanded by the minimum alternative, insufficient to finance in that year all the additional programs that can be financed in other years. This will oblige the national planner to revise the investment schedule for the minimum alternative or to change the dates for initiation of the additional programs, up to a point where annual expenditures and resources coincide exactly.

It is quite obvious that if the sum of ex-

penditures for the additional programs does not exceed the amount available for reassignment, the national planner will have no choice possible. In this case, priorities are in practice, established by the programs already prepared and, naturally, by the decision of their plan-

ners. This is a frequent occurrence in the field of public works, where it is customary to prepare a number of projects whose aggregate costs are lower than or equal to available surpluses; this method offers no assurance that the most urgent projects will be carried out first.

TABLE 15. *Resources projected and available for national reassignment.*
(in thousands of monetary units)

Resources and expenditures	Years									
	1	2	3	4	5	6	7	8	9	10
a. Projected resources										
b. Expenditures under minimum alternative										
Region I										
" II										
"										
"										
"										
Region N										
c. Expenditures under national programs										
d. Total fixed commitments (b + c)										
e. Available for reassignment (a - d)										

TABLE 16. *Programs in addition to the minimum alternative.*

Program	Cost per life saved	Annual expenditure									
		Years									
		1	2	3	4	5	6	7	8	9	10
Region I											
i. Disease											
ii. Disease											
"											
"											
"											
"											
n. Disease											
Region II											
i. Disease											
ii. Disease											
"											
"											
"											
n. Disease											

The first alternative at the national level is the minimum one. The operations outlined in the preceding paragraph lead to the second alternative at the national level. However, it may be essential to submit certain others to the political authority, based on the same availability of resources as for the second mentioned. For example, in some regions there may be a clamor for hospital construction that has not been included in the minimum alternative. The planning office can introduce such demands into the program, subtracting the operating and investment costs of their installation from the volume of resources available for reassignment. In carrying out this operation, it will have to eliminate certain low-priority diseases included under the second alternative; as a consequence, there will be a smaller reduction in the mortality rate throughout the plan period. In other words, there will be more deaths with the additional hospitals than without them, and the planner will have a very powerful argument for defending the other alternative.

4. Other Responsibilities of the National Planner

The national planning agency is also responsible for preparing the national programs, such as central command, training, research, and investment. Generally speaking, it will also be that agency's duty to participate in the preparation of investment projects and of bills and by-laws facilitating execution of the tasks proposed under the plan.

a. Central Command Plans

These are aimed at combating diseases that, for epidemiological reasons, can be attacked effectively only if they cover an extensive area of the country, because of the very high cost of a locally or regionally organized approach. Typical examples are malaria and smallpox. In general, this type of national activity is justified only in certain stages of the epidemiological process; therefore, it should be undertaken for only a limited period. Once the

measures designed to control the disease have become routine, the necessary instruments should be assigned to the local planning areas for supervision and periodic control of the conditioning factors of the disease.

The method of determining the resources required for attack on these diseases is identical to that described in relation to reducible diseases, and their priority ratings are also based on cost per life saved. Consequently, it will suffice to include them in Table 16, on equal footing with any other additional regional program. They will be implemented only if assignable resources permit, unless their cost per life saved is so low that they deserve to be included in the minimum alternative. In this case, the local planners should be informed so that they may include them under that alternative, even though the local authorities will not be the ones responsible for their execution.

b. Trained Personnel Requirements

The preparation of the health plan includes projection of the need for trained personnel entailed in future plan execution. All local plans should specifically present their personnel requirements, classified by type: physicians, nurses, vaccinators, etc., together with the number of each and their tentative date of employment.

These data are obtained from an analysis of composition of the instruments required to execute the health activities provided for in the plans, as well as the corresponding chronological program for gradual and progressive standardization of the same instrument. A review of the observed composition of the instruments will indicate immediate needs, while the annual program will indicate the number and type of individuals to be incorporated progressively.

The regional authorities should consolidate and coordinate local personnel needs as indicated by the respective plans, adding the personnel required for execution of activities on the regional scale.

Personnel requests contained in the regional plan receive, in turn, the same treatment at the central level, which makes it possible to prepare a personnel budget detailed by region and by type of need, both immediate and future.

Once personnel needs have been projected, the central office should compare them with probable availabilities. To this end, it will analyze the teaching capacity of national educational institutes, keeping in mind the demands of other personnel sectors for the specialties analyzed. For example, consideration will be given to the total demand for physicians and not only for physician-administrators.

The confrontation of projections of capacity and need will guide the educational sectors in channeling their efforts and will make it possible for health authorities to expand properly those projections for which they are responsible.

The fact that the national health planner is responsible for preparing the budget of skilled personnel in no way implies that execution of the training plan should be centralized. On the contrary, all local training possibilities should be utilized.

c. Investment Plans

The investment plan represents the aggregate of investment projects; such a project is understood to mean the over-all background that makes it possible to predict each stage in the establishment of new installations, from construction to take-off.

Both the local and the regional planners indicate the year in which it is necessary to place a unit such as a hospital, for example, in operation, specifying its proper capacity, size by number of hospital beds, services required, and location. However, they cannot, generally speaking, prepare the project for the hospital or for any other new installation. This task corresponds to the central health authority and, in most cases, to the authorities responsible for public works. In this case, the health authority should determine the technical specifications for construction and the standards governing content of the project.

In essence, each project should contain the engineering project, based on technical specifications dictated by the health authority; the schedule of works; the materials and personnel required to assure administration and results; fixed investment in operating expenditures; and economic evaluation of the project.

Part of this information is of interest only to the health planner. Another part is of interest to other sectors; for example, the schedule of works concerns not only the health planner, as an indication of the approximate date on which new personnel must be contracted, but also the economic planner, in examining the impact of the public works program on public finances and on employment.

Economic evaluation of the project, in the case of a hospital, makes it possible to determine the cost per case treated in that hospital. An estimate of that cost is the means by which the health planner persuades those responsible for engineering designs to propose the most economical solution possible. In this task, the health planner will have a very direct responsibility, since the engineers need his cooperation to prepare the evaluation.

It will be recalled that the local planners must include in the plans they prepare figures on investment expenditures in health centers, hospitals, water supply systems, and other similar installations proposed during the plan period. These figures cannot be ascertained with any degree of precision until the definitive projects are ready. Consequently, once a decision has been reached on the installations to be constructed, estimates of annual expenditures for the communities, regions, and country must be revised, which does not create any serious problems. Furthermore, as additional experience is acquired and constructions are standardized, the national planner will be able to prepare alternative figures on unit costs in various regions of the country, which would be made available to the local planner.

d. The National Plan and the Budget

As shown, the national plan contains, among other items, a proposal with reference to es-

sential expenditures year by year for health activities. Some of these activities are the direct responsibility of the health authorities, but others correspond to other state or municipal agencies, as for example, the supply and management of water and sewerage services and refuse disposal. The plan should specify with absolute clarity the responsibilities of the different agencies, the expenditures entailed, and the receipts available to each.

The health budget, that is, the proposed expenditure for the following year, is based on the proposals of the plan for the first year. This requires preparation of a consolidated budget including all areas normally corresponding to the ministry of health and to the autonomous health services, in addition to the health activities carried out by other agencies. The consolidated budget actually represents the plan for the first year. Furthermore, budgets for each of the participating agencies must be prepared as well.

Budget preparation on the basis of the plan inevitably presents problems in relation to classification of expenditures and receipts, since it is customary to prepare budgets by classifying expenditures into wages and salaries, acquisi-

tion of materials, and a series of other items, arranging them by executive units, such as divisions or departments. Unfortunately, functional classifications specifying proposed expenditures in combating the various diseases or expenditures for prevention and treatment are not made. This classification is indispensable, since it is the one used in the plan. Budgets that present expenditures classified in the manner suggested here are called program budgets, or functional budgets. These terms are derived from the fact that all expenditures corresponding to a program should be presented under this program and every program is related to an objective or a target.

Therefore, adoption of a planning system in the field of health implies a need for transforming the budget system, not only in its formal aspect, but also in relation to congressional discussion and approval. However, the program system can be adapted most favorably to the health sector, even without amending the budget mechanism, since it would lead to significant savings and the design of a much more efficient policy than would be possible under any other method.

