Assessment of demand is an important component of manpower planning process. A wide variety of factors influence demand in a complex manner. Due to complexity of the interaction of these factors, the task of projecting manpower demand becomes difficult but still it is an essential one. This chapter is devoted to a brief discussion on the various conceptual and methodological issues involved in projecting manpower demand. It begins with a discussion on the nature and objective of manpower demand projections. The concept of demand is subject to different interpretations. An attempt is made to define the various terms making distinction between demand, need, requirements and effective demand.

There are various methods and techniques of projecting manpower demand. A brief review of these methods has been made. We, then, proceed to discuss the choice of technique for estimating the demand for health and medical manpower after examining the relative merits/demerits of various techniques and their suitability and applicability in the particular context.

In the light of the data availability and other considerations, appropriate techniques have been developed for working out the requirements of nursing personnel up to 2001. The estimates thus worked out are presented in Chapter X with methodological details and assumptions made. An at-
tempt is also made to work out the estimates for different states separately.

I. NATURE AND OBJECTIVES OF MANPOWER PROJECTIONS

Manpower projections cannot be regarded as 'forecasts' or 'predictions' of what might happen in the future but only indicate what needs to be done in the manpower field if certain objectives are to be achieved.

The overall purpose of manpower projections and planning is often described as the promotion of balance between future demand and supply of manpower totally as well as within specific categories. Manpower projections are the guidelines for taking manpower policy decisions expressed in terms of manpower targets indicating the direction for action. A series of projections on different assumptions indicating the long range implications of different proposed courses of action need to be made for facilitating the task of manpower planner in exercising judgement for taking policy decisions.

Manpower projections are essentially 'teleological' in

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Statement about the future can be of several kinds:

Exceptional pre-statement attempts to predict a future course of events as it will most probably take place; they may represent anything between a sheer guess and a highly refined judgement based on a solid ground of

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nature and are conditional upon projection or plan of development. A rational manpower policy is conceived within the framework of an internally consistent development plan. In the absence of an 'official' plan or programmes of development, the manpower planner may need to build up hypothesis for the future pattern of development and base the demand projections on them. A number of value judgement are involved in the exercise.

Manpower projections cannot be very precise. They simply indicate the broad order of magnitude and dimension of the various manpower problems. However, there are a number of purely "physical limitations", in the process of preparing future projections, particularly the scarcity of statistical reliable and consistent data. This renders difficult the task of developing any ratio or norms which are needed to facilitate the process of projecting future pattern.

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data and worked out in a series of complex calculations.

Conditional pre-statements confine themselves to statements of the 'if so' type: if A occurs, B will occur. The probability of A occurring is not dealt within a conditional pre-statement as such.

Teleological pre-statements too concern themselves with the casual relations between future events, but they reverse the perspective of the conditional pre-statement; they say something of the following kind: 'in order to make B occur, A has to be done', thus look upon A as a means rather than a cause. They do not, in themselves express any opinion about the desirability of B (the thing to be achieved through A).
It is, however, difficult to avoid imbalances between demand and supply. The best that can be assured is that advance action can be taken for maximum utilization of scarce resources on the basis of projections. The resources are too limited and there are various competing demands for investment. The manpower projections may serve the purpose of "feasibility check" for unattainable but desirable objectives and highlight the need of fixing priorities.

Due to the dynamic nature of the whole process, manpower projections can not be regarded as finite. They should be revised periodically in the light of new developments that may occur or new data that may become available. The ideal technique would be one of "rolling forecast", projections should be continuously revised.

Manpower projections may be short term, medium term or long term, ranging from one to three years, five years or fifteen to twenty years. While short term exercise will have to be more detailed, they cannot be expected to influence educational or economic planning in any real sense but can only be in the nature of programatic or situational assessments. Medium term projections though somewhat less detailed, are more useful for programming educational needs especially if they form the components of long term perspective. A desirable arrangement appears to be to indicate target for development over a period of 15 - 20 years, compose medium projections for educational and employment needs and build in a process of continual annual and bienni-
reviews for taking note of changing conditions and evolving the validity of assumptions.2

II. DISTINCTION BETWEEN 'NEED AND 'DEMAND'

In health, education and social service sectors, projections of manpower requirements are often based on the concept of need and speak in terms of consumer demand in a situation in which supply responds not to a market but to a political decision and the judgement of the government. For example, it might be felt that the availability of qualified doctors in every village is a desirable 'need' but the question arises, whether we have or do not have the capacity to pay for their services. It is thus necessary to make a distinction between the 'need' that is the level of desirable social requirement of manpower and the 'demand' which is based on economic considerations. For the latter, the assessment of requirements should take into account not only the services which the society needs but also its capacity to pay for the services required.3

'Demand' thus refers to the total amount of various types of health services that a given population seek and

2. Srivastava, R.K., Projecting Manpower Demand Ministry of Home Affairs (Directorate of Manpower), New Delhi, 1964.

has the means to purchase at the price that prevail at a given time. Whereas the 'need' represents an estimation based on professional judgement and current medical technology of the number of workers or amount of services necessary to attain and maintain a particular level of health care. 'Need' exceeds demand when there are insufficient resources to produce or purchase services in accordance with the professionally determined needs'.

III. REVIEW OF METHODS & TECHNIQUES FOR PROJECTING MANPOWER DEMAND

There is no universally accepted method of assessing the future requirement of manpower. Broadly, the various approaches could be classified as follows:

1. Direct Enquiry Method
2. Normative approach
3. Trend based projections
4. ILOR-Trend Method (Incremental Labour Output Ratio)
5. Component/Segmental approach
6. International Comparison Method
7. Occupation/Industry Matrix approach
8. Econometric Model.


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The salient features of the techniques mentioned above are briefly indicated below:

**Direct Enquiry Method.**

This method involves requesting employers to furnish their future requirements for manpower. Questions are asked seeking information from employers regarding present employment in their establishments, their additional demand, their estimates of expected replacement needs and turnover—etc. Though this method suffers from some limitations mainly arising from the lack of a long-term perspective on the part of the employers to which future manpower needs could be related, yet it may be desirable to work out some estimates of additional requirements on the basis of this approach after giving due allowances for the shortcomings.

The main advantage of this method is that it utilises the extensive experience of each employer who possesses intimate knowledge of the current personnel requirement, technological changes and other related factors operating at the micro-unit levels. Moreover, demand estimates based on the information obtained from the employers will be useful principally when utilised in conjunction with and as a supplement to other analytical approaches.

Further, the information collected from different establishments will also help in developing norms linking manpower with production, investment and total employment.
for the different sectors of the economy on the one hand and in determining the immediate training needs on the other. In any case some type of establishment surveys are necessary to assess the current manpower situation.

**Normative Approach**

This is the approach most commonly used in India. Under this method, certain ratio or norm, between the demand for manpower category in question and a variable, is established and this ratio is applied for estimating future manpower requirements, with or without any change. The other variable could be 'population', 'national income', 'other related manpower category', 'total consumer expenditure, and investment' etc. Following types of ratios could be used in estimating the demand for manpower of various categories:

(a) Doctor-Population ratio;
(b) Doctor-Nurse ratio;
(c) Nurse-Bed Ratio
(d) Teacher-Pupil ratio
(e) Engineer-technician ratio
(f) Supervisor-worker ratio or Engineer-Worker Ratio;
(g) Engineer-investment ratio or Engineer-Expenditure Ratio; and
(h) Engineer-Output ratio.
Trend-Based Projections:

This method involves projecting manpower requirements by extrapolation of quantitative trend data into the future. The main value of this approach is its simplicity. Implicit in the projection of a past trend into the future is the assumption of continued operation of the same complex set of causative factors that has governed the relationship in the past. A variety of factors influence the future pattern and adjustments need to be made in projections by making suitable allowances for them. However, when projections have to be made for a short and medium periods, this is probably the only practical and feasible approach.

ILOR-Trend Method:

This is a somewhat more promising method of extrapolating trends in ILOR, the incremental labour-output ratio, where 'labour', refers to a particular type of manpower category and 'output' to industrial output or National Income. In this approach, the manpower requirements are projected by extrapolating a linear regression of the manpower in question on national income, using past data. It is an improvement over the 'trend based projection method', and that of the 'normative method' as in this method, a relationship between the manpower and a related variable is established and future requirement are derived from the relationship and not as a simple ratio of the past.
Component/Segmental Approach

This method involves analysis of factors affecting demand for manpower in specific occupations in different segments, the assessment of how these factors may operate in the future and the development of projections based on their combined effect on future requirements. The growth of each manpower category is affected by its own complex of factors. As such the methodology and steps involved for projecting demand will not be the same for all the categories. For each category, appropriate steps and approach identifying factors and components affecting growth of occupation have to be developed. The approach involves developing manpower employment norms in relation to some parameter in the several segments systematised according to various characteristics.

If the programme of development is known for the different components/or segments, programmatic approach could be used as a basis for estimating manpower demand. For a given plan or programme of development, the manpower requirements are estimated for each scheme or project separately from occupational or staffing patterns which are either known or can be derived from past and current data and aggregated for occupational categories. Programmatic approach can be effective only when manpower planners work in close collaboration with the agencies concerned with or responsible for implementation. This is in fact the most
appropriate method for working out requirements for health and education sectors.

**International Comparison Method:**

Preparations of projections in some cases, be facilitated by drawing upon the experience of more advanced countries which have passed through comparable situations. Such comparisons are indicative of the principal directions of change and cannot be used for detailed planning for obvious reasons. At any given time the manpower situation is a result of the interaction of many factors some of which may not be apparent. Hence, quantitative data from other countries can't be applied without careful interpretation and judgement.

**Occupational Industry Matrix Approach:**

This is the most general technique of all, the Parnes method used in OECD's Mediterranean Regional Project (MRP), to produce educational plans for Portugal, Spain, Italy, Greece, Yugoslavia and Turkey within a common conceptual framework. The approach is to proceed in stages from an initial projection of a target GNP in some future years exogenously determined by an economic plan, to a supply of educated manpower required to achieve the target.

The approach is very cumbersome. It requires an analysis of the outlook of production and employment in each of the industries and the study of the trends in the use of
different occupations in the different industries. Occupations are quite large in number and their composition pattern differs from industry to industry and that too varies from unit to unit according to technological advancement. The analysis will in fact involve developing occupation-industry matrix and thereafter keeping them up to date with the changing effect of technological progress. Further, there is also a problem of developing occupation-industry matrix.

Econometric Models:

Efforts have been made in recent years to estimate demand for manpower by using techniques based on Econometric Models. These models allow for a simultaneous impact of several variables. The method of regression can, in principle, consider two or more factors simultaneously, but in practice only single factor equation have generally been used. One distinct feature of econometric technique is that they make relatively greater use of sophisticated mathematics. A variety of statistical data is required to prepare a meaningful Econometric model. Generally such sophisticated manpower data in finer details are not available. Moreover, applied research workers are attracted more by simplicity of practical procedure.
IV. **CHOICE OF TECHNIQUE FOR WORKING OUT THE REQUIREMENT FOR HEALTH MANPOWER**

In the foregoing paragraphs, various techniques for projecting manpower demand have been discussed. Each technique has got its own utility and limitations. It may not be desirable, however, to prepare estimates for future requirements by adopting only one or the other method. Much will depend upon the type and adequacy of the data available, but in practice, it may be useful to try a combination of techniques after examining the suitability and applicability of each under a given set of conditions governing the requirements.

Some of the techniques which may suitably be applied for estimating the demand for health manpower are discussed in the following paragraphs.

Projection of demand for health manpower could be attempted by adopting the following methods:

I. Global or normative approach i.e. linking requirements for health manpower with some parameter (e.g. Health Personnel : Population ratio method;

II. Income/expenditure approach; and

III. Component or programmatic approach i.e. by looking into the declared programme for the development of medical and health services over a period of 15 - 20 years and deriving requirements for health manpower using appropriate norms for staffing pattern.
METHOD I: Health Manpower: Population Ratio

This is the most common method used for projecting the requirements primarily because of its simplicity and least data requirements. It is, in fact, a broad indicator of the extent of medical and public health facilities desired than the precise requirements.

This approach has obvious drawbacks. A ratio does not indicate the type of health services rendered or needed because it neither takes into consideration the nature, scope and quality of services nor the economic, social and physical characteristics of the people being served. It is, in fact, a resultant effect of the operation of an integrated whole of a complex set of causative factors which cover every aspect viz., the technology, the organisation, the productivity levels etc. and other socio-economic factors. If the ratio for the target year is projected by extrapolation of past trends, it implies an assumption of continued operation of the same complex set of causative factor in the future.

Despite the limitation inherent in this method, it is widely used because of the difficulties involved in the task of analysing the various factors influencing demand and lack of requisite data base for the purpose. Everyone concerned with the subject has pointed out its limitations but ultimately resorted their recommendations on the same.
The requirements based on this method provide useful guidelines for obtaining a broad order of magnitude of the expansion of education and training facilities. Nevertheless, it cannot be taken as a substitute for more detailed calculations which are necessary for manpower analysis and determining demand for various health programmes.

International comparison of nurse-population ratios, prevalent in advanced countries, are often made to derive a desirable ratio. This usually shows a picture of shortages until the standard of most advanced countries is reached. The method may be questioned on the ground that there is no good reason to assume that the countries have just the right ratio. Moreover, the procedure ignores the differences in social and economic conditions and in the structure and organisation of health services. However, if the countries selected are taken on the basis of a comparable stage of economic development, the ratio may be somewhat reasonable in the 'demand' sense.

**METHOD II: Income/Expenditure Approach**

Provision of adequate health care services depends upon the availability of funds for different health programmes. Unless the demand is backed by means to fulfil them, it is not possible to implement the various programmes effectively. This raises the question of allocation of adequate funds to health care services.
In a Govt. financed health care system, there is absence of 'price variable' or 'market' in determination of health services. The decisions about the expenditure on health care services are frequently taken on political ground, which may or may not take economic considerations into account. Although the resources allocated by Govt. are based on political judgement yet it could not be determined independent of the country's level of economic development and its needs for other types of goods and services. It, therefore, becomes necessary to consider the conflicting claims of various diverse objects of expenditure like housing, nutrition, education as well health. In view of this, it is to be first decided what resources can be allocated for health and medical care? What percentage of the budgetted public expenditure can be (should be) spent on medical care and health and what should be its relative share in the total national income? In a privatised system, however, the capacity of the individuals to pay for the medical & health services is an important factor in determining the magnitude and nature of demand for services. The demand and supply in such a sytem is subject to 'price mechanism'.

Recent studies in different countries have indicated that there is a relationship between economic development and the pattern of demand for health care services. Higher levels of income are accompanied by corresponding higher expenditure on health and medical services. A strong posi-
tive correlation exists between income and demand for health care services.

The demand for health manpower, therefore, in Govt. administered system can be worked out by linking the growth of the stock of health manpower with the increase in Govt.'s revenue expenditure on health and medical services, which can be fixed by examining its share in the total national income (GDP). For fixing the target at a future date, the issues would be to determine the level of GDP (National Income) and percentage of GDP which should be allocated as revenue expenditure on health and medical care.

But for 'private sector' oriented system, two different methods can be used e.g. (i) Medical Services - User Approach and (ii) Linking demand in private sector with increase in per capita national income.

Medical services user approach takes into account the capacity and willingness of the people to pay for medical services. The demand in economic terms is related to price and would be generally limited by the financial resources of the family. Determining the amount to be incurred for medical service, then becomes a matter of allocating limited family income in alternative uses. There is a relationship between family income and expenditure on health services.

Demand for health manpower (viz., doctors, dentists etc.,) can therefore, be worked out on the basis of income elasticity of household expenditure on health services. On the basis of the household data on income of household and expenditure as available from National Sample Surveys rounds, the PPD (Perspective Planning Division in Planning Commission) worked out the income elasticity of household expenditure on medical services to be 1.3. This means that if per capita income goes up by 1 per cent, households are inclined to increase their expenditure on medical and health services by 1.3%. Nevertheless, it needs to be borne in mind that though a very apt technique for estimating the requirements of personnel in private sector; yet not equally applicable to all categories of the health and medical manpower. It is an appropriate technique only for estimating the requirements of self employed personnel.

The demand for private medical practitioners can also be estimated by shorter method i.e. by relating it directly to the national income. It can be worked out by assuming that the demand in private sector would increase in proportion to the increase in per capita income.

METHOD III - Component/Programmatic Approach

This is the most scientific approach for working out the requirements of health manpower as it tends to analyze

7. Ibid - at Sr.No (6).
the target/achievement of each of the health programmes and seeks to set service target for each one of them at a future data based on past performance. This will, in fact, require a clear outline of the envisaged development programme with respect to the medical and health services over stipulated period.

The most important pre-requisite for effectively projecting health manpower requirements by component method are two-fold:

(i) statistical basis for the explanation and measurement of factors affecting demand, and
(ii) intimate knowledge regarding the functioning of various components of health care service system.

Future manpower demand is affected by numerous factors, some of which are easily identifiable while others may not be quite apparent. The size, distribution, density, socio-economic characteristics and health status of population are among the most important. Availability and accessibility of health resources and the efficiency with which they are utilized are significant determinants of demand for health services. Technological advances, quality of health care, preventive as opposed to curative services, method of remuneration are some of the variables which could have a major impact on manpower requirements and costs. There is interrelationship between different factors. A careful analysis of these numerous factors or determinants of manpower demand, the assessment of how they will operate in future and
the development of projection by estimating their combined effect over future period is a far more difficult exercise. How to quantify and measure the effect of the inter-action of these various factors for working out the estimates of demand is one of the major problems.

The real problem is availability of adequate and reliable data. Under such conditions, there is a need for developing a simple appropriate technique for projecting manpower demand. It may be useful to build up a series of 'indicators' expressed in terms of 'Ratios' 'norms', 'relationship of demand variable with some parameters etc. on the basis of past trends. A multiple correlation analysis of these various indicators will facilitate in determining the likely future trend of demand for each component.

The importance of past trends in the projections exercise cannot be over-emphasized. A review of what was actually accomplished during the past; and what main departure from the past trends are called for with what implications for policy and cost need to be determined. It may be mentioned that a lot of changes may be desirable but these may not be feasible. Only gradual change is possible and that too with great efforts. Extrapolation of past trends with due allowance will enable to formulate judgmental assumptions which can be applied to the available data for projecting future trends. This is perhaps the most appropriate technique which is simple and practicable.
The 'indicators' may be worked out for each component of the health service system separately. This would require details about the operation of various health activities falling under each of the components of health care service system. For determining the requirements of health services, an assessment of health situation: analysing health problems, policies, plans, programmes, allocation of resources etc., is essential. A consideration of various activities of each component separately can greatly help to understand the dynamics of demand as well as facilitate planned development. This will provide the basis for choosing an appropriate method matching for each component part of health service system.

An important consideration which should be kept in mind while adopting the component approach is that there should be a proper balance between accuracy of data and the level of details.

A systematic collection and analysis of requisite statistical data whatever available from various sources is the starting point. An establishment survey(Direct enquiry method) of current practices of employers' preferences may be useful for establishing norms. However, all desirable data may not be available and as such a number of alternatives assumptions have to be made for determining the future demand.
In this context, it may be mentioned that Prof. Hall in the Publication: 'Health Manpower Planning' (WHO 1978) has described four methods for estimating demand for health services and manpower viz., (1) Manpower/Population ratio method; (2) Health demand (economic) method; (3) Service target method and (4) health needs. Of these four methods, the first three more or less correspond to health manpower: population ratio method; income/expenditure approach and the component/programmatic approach described earlier as techniques which can be suitably applied for estimating the demand for health manpower. The fourth and the last method i.e. based on health needs is more in-depth and present the demand in the 'need' sense while the other three refer to 'effective demand'. The description of 'health needs' method as made in the above mentioned document is reproduced below for reference.

The document about the method states that 'Health needs' method seeks to determine what health services people actually require to keep them healthy. The determinations are made by health professionals, with or without the involvement of the consuming public, and are based primarily on medical and technological considerations. Other issues such as cost, the capacity to deliver the services needed, and the degree to which people are apt to seek the services, may be important but are of secondary concern.

8. Ibid at Sr.No.4 (pp.63-64).
To use the health need approach one will need:

- to determine the disease-specific mortality and morbidity rates;
- to prepare norm-governing the number, kind, frequency and quality of service to be provided to persons suffering from each disease category;
- to prepare staffing norms so as to convert the various services into the amount of time required of the doctor, nurse, technician, auxiliary etc., to perform the services;
- to calculate the total personnel hours needed in the target year for the projected population based on the disease-specified morbidity rates, the service required per sick person and the amount of personnel time required to perform each service;
- to divide the total personnel hours needed by the average number of hours worked annually per person to determine the total supply of health manpower required.

This method is considerably very useful for determining the health services epidemiologically and to determine the realistic staffing pattern norms based upon in-depth micro studies. But it is not suitable for working out the overall manpower requirements for the health service system as a whole because it needs lot of data on disease specific mortality and morbidity rates, generation of which itself
require various area specific micro-studies or establishment of a perfect information system on the subject.

The requirements of general nurses in the following section have been worked out by using the alternative method of nurse : population ratio; nurse : doctor ratio; nurse : expenditure relationship and the component/programmatic approach; while for ANMs/LHVs, the requirements are worked out through programmatic approach but by combining it with population ratio and the staffing pattern norm. The nurse : population ratio has been used because of the simplicity of the technique and to check the consistency of the estimated requirements with other sets of requirements. The nurse : doctor ratio provides the requirement with a professional consideration regarding the role of nurses in a hospital setting vis-a-vis other category; who have to work together for the same cause. The requirements based on nurse : expenditure relationship signify the limit under financial constraints and thus presents the requirements in terms of economic/demand while the requirements based on component approach, in limited sense, signify the needs of the health service system for nursing personnel. These four sets of estimates of requirements thus present the estimates on a continuum representing different conditions for demand.