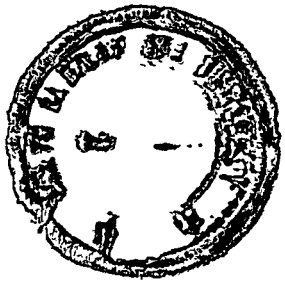
EVALUATION OF PUBLIC EXPENDITURE

ON

HEALTH FACILITIES IN ASSAM

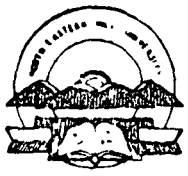
SUPERVISED BY
Dr. S. K. Mishra
Reader
Department of Economics
School of Social Sciences

BY
Diganta Kumar Majumdar
Department of Economics
School of Social Sciences



DISSERTATION

Submitted In Partial Fulfilment of The Requirement of The Degree of Master of Philosophy



The North-Eastern Hill University

Shillong

April, 1987

Phone :
Grams : NEHU

North-Eastern Hill University

Lower Lachumiere, Shillong-793001 (Meghalaya)

Dr. S. K. Mishra
Reader
Department of Economics

22nd APRIL 1987

CERTIFICATE

This is to certify that Mr. Diganta Kumar Majumdar has worked under my supervision for his M. Phil Dissertation entitled "EVALUATION OF PUBLIC EXPENDITURE ON HEALTH FACILITIES IN ASSAM", and no part of this dissertation has been submitted elsewhere for the award of any degree. The dissertation, in my opinion, is worthy of the award of the M. Phil Degree.

(S. K. Mishra)
Reader
Department of Economics
North Eastern Hill University
Shillong.

CONTENTS

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SHILLONG (DIGANTA KUMAR MAJUMDAR)
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CHAPTER - I

INTRODUCTION

1. Health: An Individual and Social Need

In the broad spectrum of human needs, sound health is perhaps the most illuminating one. Good health condition is regarded as a very important index of social development attained by a people. On the contrary, ill health kills all the positive elements of human life. An unhealthy person can seldom emancipate himself from the grip of pessimism and therefore, scarcely have a positive attitude towards life. It is held by a number of great minds that the philosophy of Nietzsche was largely a product of his strong vivacity and invalidness[1] – his disabled vivacity led him to discover "will to power" which gave a philosophical and ideological support to Nazism and the resultant cruelties and World War II.

Psychologists are of the opinion that good health conduces the man to take positive attitude towards life, ensures cooperation and enhances the sense of benevolence. K. J. Arrow[2] in his "The Limits of Organisation" goes a long way to argue how a positive attitude towards life, cooperation and the sense of benevolence work as an economic resource. One would agree, therefore, that good health condition of the people is conducive to obtain the vintage of happiness

and thereupon, the economic development of a country. Further, good health conditions are conducive to greater productivity of the working force. It is no wonder, therefore, if the modern art of public or state management attaches a great importance to develop health facilities in the country.

But the phenomenon of the interest taken by social scientists and public policy makers in the issues of public health and medical care are recent in origin.[3] Earlier it was left to the medical professionals who, in fact, took advantages of the situation and did not think wide in the national interest.[4] Therefore, the social planners now believe that the government has the responsibility to foster health of the citizen — in fact, the public health has become a public good. Enough evidence has been found to prove that ill health is economically wasteful[5] and the State must take it up in a very sincere sphere of public policy. The World Health Organisation (WHO) has very categorically pointed out that ill health invariably makes people hopeless, dejected, lethargic and disrespectful to law and moral codes of conduct. It is imperative for the State, therefore, to strive for the better public health.

2. Definition of Health

More popularly, health is defined in negative terms: the absence of physical and mental disorder and diseases. WHO has given a positive definition, "It is a state of complete physical, mental and social well-being and not merely absence of diseases."[6] In one of the leading works on medical science in the ancient India a healthy person is defined (of course in the standard medical terminology of ancient India) thus: A 'Swastha' (healthY) person is in the state of 'malakriya' and a balance among three Doshas, three Agnis and Seven Dhatus, and his Mana, Indriyas and Atma are calm or Prasanna.[7] We note that this definition is indeed a positive definition.

The Dag Hammerskjoeld Seminar held in Uppsala in 1977 on "Another Development in Health" made a significant contribution to the definition of health from a different perspective. It feels that there is a need for redefinition of the health concept, taking into account the social, economic and cultural determinants of health status of a population. Health is a human condition that cannot be achieved through development of medical services alone. Health is the responsibility of the individual, the community and the government as a whole. It is, therefore, ultimately a political question. In certain countries significant changes in health

conditions will be possible only through fundamental social and economic changes.[8] Hence, health does not mean merely absence of diseases but a complete adjustment of the individual to external environments — physical and social. It is a positive state of well-being of an individual having harmonious development of physical and mental capacities.

The above definitions of health are indeed very good and ideal, but they are teleological in nature. When we are to use them operationally the difficulties are enormous. Hence, the challenge lies not in arriving at an appropriate definition but perhaps in the measurement of the levels of health in the context of a particular definition and in the critical analysis of an understanding of the implications in terms of planning, implementation of health programmes[9] and their evaluation. Whenever we try to be operational, we have to fall back on the negative and physical definition of health; number of people suffering from diseases, number of people suffering from disorder, number of people dying from diseases etc. become the important measures of health condition. That is why the negative definition of health still remains popular among planners and executives.

3. Economic Arguments in Support of Public Health Programmes

Health is now considered as an item of investment. This is one of the ramification of disillusionment from the

old paradigm of economic growth in which health was viewed as an item of consumption.[10] Currently, a growing realisation is being manifested that there exists a cause and effect relationship between health and development. Better health is conducive to increase the number of potential hours of work and production. Factors like mortality, morbidity and disability are liable for reducing the potentiality of working force. Sickness not only brings about sufferings but also an economic loss. The sick man cannot work and therefore, loses his wages. Illness frequently disables a man permanently or for a long time. He becomes unemployable, and the result may be that a whole family drops down on the social scale. Sickness deprives the society of the productive labour power. In every country thousands of people die of diseases that could have been cured or prevented. Every such case is a capital loss for the nation.[11] Evidences from empirical studies make the point clear that ill-health reduces the potentiality of workers. The United States National Health Survey (1965) revealed that approximately 5.5% working days were lost in 1964 for health reasons in the U.S.A. The Bhore Committee (1946) estimated the annual loss to India between Rs. 147 crores and 187 crores due to malaria in the pre-independence period.[12] An attempt to work out the loss of productivity due to general morbidity without

considering the nature of the disease was made by P.R. Panchamukhi. He used the NSS data for estimating the incidence of mortality, its prevalence and duration.[13] The estimated numbers of days of incapacity due to morbidity in 1957-58 were of the order of 160.3 lakhs (urban) and 823.5 lakhs (rural). The loss of output, on the basis of these estimates, was Rs. 1225.3 lakhs and for the year 1958-59 this increased to Rs. 1576.1 lakhs. Such facts stirred up great involvement of Indian planners to expand health services. The objectives of expanding health services were mainly to enhance efficiency and productivity.

Apart from the efficiency and productivity considerations, health has its relations with economic development as well. Denison[14] and Schultz[15] considered education as an important factor of development while Muskin,[16] and Fuchs[17] have highlighted the need of good health conditions for economic development. Empirical researches conducted by some eminent economists like Denison, Kendrick, and Abramovitz have proved the fact that growth of labour and capital alone cannot explain overall economic growth.

Health development as such is being looked upon as an effective strategy for development planning. It works as a part of the efforts to improve the quality of life of all

people. In this context WHO has expressed its view in its paper entitled "Health and New International Economic Order" that indicators of good health are also indicators of development — a healthy development. The UNICEF and ILO have also reinforced the concept of health as a prominent factor for all development activities to be planned and organised by the community. It may be relevant to maintain the UNICEF programme known as WHENEERS formed by "Water for drinking and household use; Health care, preventive, promotive as well as curative; Education; Nutrition, Economic activities for Women; Environmental sanitation; Recreation facilities and Shelter for healthy living."

4. An Outline of the Present Study

Recognising the role of public health in strengthening the human capital, enhancing the efficiency of the productive system, fostering economic development and promoting the well-being of the people, the government of Assam took initiatives to develop medical infrastructure in the State since the very beginning of the planning era in India. Beginning with the First Five Year Plan gradually and successively a number of hospitals and dispensaries were set up and medical personnel were recruited to strengthen the medical infrastructure. Paramedical facilities were developed and steps were taken to eradicate epidemics. On these programmes a vast amount of physical and financial resources were spent.

Now, after three decades of conscious public efforts in promoting the health conditions in Assam, a natural query that might be made is: have the public efforts been successful in meeting the objectives they started with? Or have we been frittering away the scarce resources for no good of the people? Thus, we want to evaluate the public programmes for health in the State of Assam.

In the succeeding Chapter - II, we provide the geographical, social and economic frame in which health problems in Assam emerge and the public programmes for promoting the health conditions have been taken up. We hold that this frame is a necessity for understanding the relevance of the steps taken by the government and limitations faced by them.

In Chapter III, we have described how, since the launching of the First Five Year Plan, the Government of Assam has been allocating resources to develop the health facilities in the State and what have been the recorded impacts of the same. Our approach to description has been keenly concerned with the objective of evaluation of the achievements in the plan periods.

In Chapter IV, our main concern has been to discuss the theoretical foundations on which the choice of the criteria for evaluation of public programmes on health may

be made. We have elaborately discussed why and how we have selected the criteria for evaluation.

In Chapter V, we have analysed the trends in development of different components of the medical infrastructure like hospitals, dispensaries, various health personnel and the area and the population served by them. This exercise provides us with a synoptic view of the pressure on the medical infrastructure.

We have made an attempt to evaluate the public health programmes in Chapter VI. First, we have constructed a composite general index of the level of development of health facilities in Assam. We have evaluated the equity aspect of spatial distribution of health facilities. We have anlysed the trends in the indoor and outdoor patients served by the medical system and evaluated the efficiency of the system in catering to the needs of the patients. We have also assessed the effectiveness of health facilities in lowering down birth rates, death rates, and infant mortality rates in the State.

Finally we have summarised the findings of the exercise on evaluation and suggested some policy guidelines for the future in Chapter VII. We envisage that health programmes ushered on the lines of these suggestions will be conducive to attaining the ambitious objectives of the health policies and planning.

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(7) Charak Samhita. It defines a healthy person:

"Samadōshah Samāgnischa
Samadhātu malakriyah
Prasannātmendriya manah
Swastha ityabhidheeyatē."

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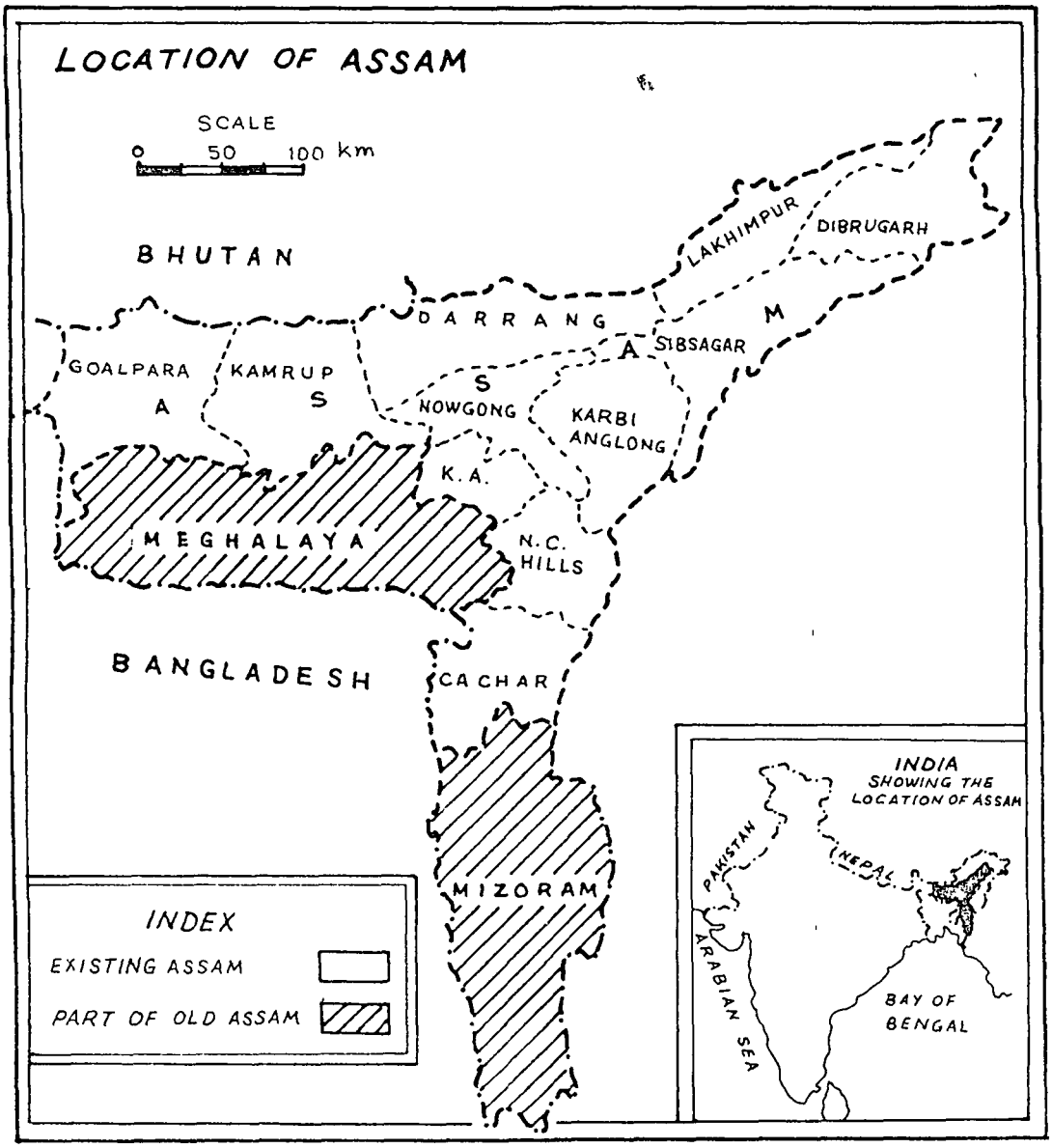
CHAPTER - II

AN INTRODUCTION TO THE GEOGRAPHICAL AND SOCIO-ECONOMIC SET-UP OF ASSAM WITH SPECIAL REFERENCE TO HEALTH CONDITIONS

1. In this chapter an attempt has been made to study the health condition of the people in the geographical and socio-economic set up of the state of Assam.

It is a recognised fact that health condition of the people depends on the general geographical condition in which they live and the students of medical geography have found that certain specific geographical and climatic conditions are associated with a predominance of certain specific diseases and health disorders. Nevertheless, the level of socio-economic development also contributes significantly in determining the health conditions. The entire environment in which people live is partly shaped by the natural forces and partly by the man-made factors, and with economic development many of the geographical factors affecting the health of the people are controlled and regulated. Thus one of the considerations in evaluating the human efforts in improving the health conditions of the people would be as to what extent the association of geographical-cum-climatic factors with the occurrence of health disorders could be weakened.


LOCATION OF ASSAM
SCALE
0 50 100 km
BHUTAN
LAKHIMPUR
DIBRUGARH
DARRANG
SIBSAGAR
GOALPARA
KAMRUP
NOWGONG
KARBI ANGLONG
K.A.
MEGHALAYA
N.C. HILLS
BANGLADESH
CACHAR
MIZORAM
INDEX
EXISTING ASSAM
PART OF OLD ASSAM
INDIA
SHOWING THE LOCATION OF ASSAM
PAKISTAN
NEPAL
ARABIAN SEA
BAY OF BENGAL

2. The Geographical Location of Assam

The area of this study covers the State of Assam which is situated in the north-eastern region of India, extending from 24°8'N to 27°56'N latitude and 89°42'E to 96°E longitude. This State has covered 78,523 Sq. Km i.e. 35% area of of the North-Eastern Region.[1] It is bounded by Bhutan and Union Territory of Arunachal Pradesh on the North, Arunachal Pradesh, Nagaland and Manipur on the East; Mizoram, Tripura, Bangladesh and Meghalaya on the South, and Bangladesh and West Bengal on the West. The State of Assam, for which this study is taken up, comprises ten administrative districts;[2] eight in the plains and two in the hills. Table 2.1 shows the districts of Assam and their geographical areas.

Table 2.1: Area of Assam and its Districts

State/District	Area (in Sq.Km)
Assam (excluding Mizoram)	78,523.00
Goalpara	10,359.00
Kamrup	9,863.00
Darrang	8,775.00
Nowgong	5,561.00
Sibsagar	8,989.00
Lakhimpur	5,646.40
Karbi Anglong	10,332.00
N.C. Hills	4,890.00
Cachar	6,962.00
Dibrugarh	7,023.90

3. Health and the Climatic Conditions

Almost all diseases affecting mankind are found in all parts of the world but their nature of affecting depends on natural factors like climate, weather, humidity, etc. biological factors like resistance power of human body etc. and dietary factors. But some diseases are purely climate oriented. Diseases like malaria, small pox, various types of fever, jaundice, filaria, cholera, dysentry etc. are mainly climate oriented. They together, all grouped as tropical diseases, occur most frequently in hot and moist climate. The people of Assam largely suffer from tropical diseases like malaria, dysentry, diarrhoea, chicken pox, small pox, measles, respiratory diseases etc. Children are also affected by tropical diseases that take many lives. Those diseases take endemic form during the period of April and September every year. High temperature, maximum heat and heavy rainfall are mostly liable for occurrence of tropical diseases in the State. Therefore, nature is considerably responsible for diseases.

The climate of Assam is regulated by a number of factors such as its geographical location, pressure cells of North Western India and the Bay of Bengal, predominance of tropical airmass, local mountain and hilly winds. Therefore, its temperature and humidity vary. This variation makes alternate warm and cold which affect human body very adversely.

In general, the climate of Assam is characterised by the relative coolness, extreme humidity, heavy summer rainfall and relative winter drought. The average annual temperature in the State is 23.56°C and the average relative humidity is 8.25%. Every year Assam is hit by heat wave during the period of May and September. Temperature remains unexpectedly high at the time of heat wave and people prefer excessive cool foods and drinks in order to get relief of hot. This situation leads the people to the trap of tropical diseases. Although rainfall is copious being 2,000 mm annually on an average, yet warm remains long. During this period, the general climatic condition for health and energy remains poor in the State.

Rainfall is almost uniform throughout the year in all the plains districts of Assam except the areas adjoining the Meghalaya plateau especially in the Southern part of the Nowgong district which falls in a rainshadow belt. The districts of Sibsagar, Lakhimpur and Dibrugarh, and the upper part of the Brahmaputra valley, Goalpara in the lower part, Cachar in the Barak valley get very high rainfall. About 70% of the total annual rainfall is confined to the months June to August and almost rainless period starts from December and remains upto February. Assam happens to be the State of India where flood is common and appears almost every year.

Heavy rainfall spate rivers, swamps. drains and it causes flood. Recurrence of flood due to heavy rainfall, water logging, improper and insufficient drainage facilities not only impoverish the State economy in many ways but also take away many human lives. Dysentry, diarrhoea, malaria, cholera etc. are the diseases that appear this time. They create havoc in some parts of the State and take human lives relentlessly. In 1960, 3238 persons died of dysentry and diarrhoea against 3150 in 1953. Cholera took 117 human lives in Assam in the said year and small pox took 253 lives.

The severity of diseases depends on season. With the change of season, the severity of diseases changes. However, appearance and disappearance of diseases are based on the change of season. Malaria, dysentry, cholera and other epidemics appear with arrival of summer season. In Assam, summer starts in April followed by rainy season with the advent of monsoon in the last week of May and early part of June. According to seasonal characteristics, the year of Assam may be divided into four seasons:

i) Pre-monsoon,
ii) monsoon,
iii) retreating monsoon, and
iv) winter.

This climatic seasonal cycle has a great bearing on the health condition of the people of the State.

The pre-monsoon season starts in Assam by early part of March every year. During this season temperature rises gradually along with occasional thunder showers. The early part of this season to mid April is affected by very strong wind causing excessive transpiration and evaporation and dust storm. Small pox, cholera, malaria, respiratory diseases are the result of the pre-monsoon season.

The South-West monsoon hits Assam by the middle of June and remains upto September. This season is characterised by cloudy weather, high percentage of humidity, heavy rainfall, higher temperature and wind. Rainfall is very frequent and about 18 to 20 days in a month are normally recorded to be rainy. Heavy down-pour brings about flood almost every year, damages considerable amount of food crops, animals and human lives. After receding flood water, epidemics normally appear in a devastating way. Much flood water remains in drains, swamps etc. where mosquitoes take shelter. Most of the drains in the State are kutcha and therefore, the possibility of water logging is maximum. Irregular clearance and frequent blockade of drains due to heavy erosion, deposition of debris etc. increase water logging. As a result, drains become the den of mosquitoes. They spread malaria germ

through biting. Assam is not free from malaria. In 1968, 993,996 cases were recorded while 9,105,769 cases in 1969 and 17,250 cases in 1970 were recorded.

By the middle of September, South-West monsoon starts to retreat and the intensity of rainfall starts to decrease. Weather mostly remains fair but foggy in the morning. The winter season begins at the end of November and continues upto February. Rainfall during this season is very less; weather remains cool with low temperature around 10° to $12^{\circ}C$ and heavy morning fogs. The State also encounters the cold wave during December and January every year. During this time, many people of the State suffer from respiratory diseases like cold, cough, bronchitis, asthma etc. and chronic respiratory diseases such as common lunge diseases etc. This is highly prevalent pulmonary health problem hitting 10 to 20% of adult population. Bronchial asthma affects 3% of the population with intermittent wheezing and shortness of breath. Cool weather and high humidity are highly responsible for its occurrence. Asthmatics are affected by weather along with other environmental stresses such as cold air, respiratory infections, psychological factors and pollens. People not only suffer from such diseases but also lose lives.

4. Health and the Demographic Structure

Within the premises of socio-economic study, population study has its own importance. It gains more importance when health condition of a particular state is analysed. Population study involves the study of the trend of population growth, density of population, percentage of urban and rural population, birth and death rates, child mortality rates etc. It is quite natural that in a highly population growing state, medical facilities should be increased and their distribution should be based on the extent of population growth. Medical facilities are also to be given with an objective to keep the people free from diseases and maintain the manpower free from health hazards. Government responsibility not only comes to check death rate but also comes to check population growth rate. Proper care is also needed to reduce child and infant mortality and morbidity rates.

The total population of Assam stands at 146.25 lakh as per 1971 Census,[3] accounting for 2.67% of the total population of the country within 2.39% of the total area of the country. The State has been persistently experiencing high rate of population growth during the past 70 years (1901-71). Table 2.2 reveals the trend of population in Assam since 1901.

Table 2.2: Trend of Population Growth in Assam, 1901-71.

Year	Population (in '000)	Population as per % to total of India	% decade variation	
			Assam	India
1901	32,90	1.38	-	-
1911	38,49	1.52	16.99	5.75
1921	46,37	1.85	20.47	0.30
1931	55,61	1.99	19.92	11.00
1941	68,47	2.10	20.37	14.23
1951	82,25	2.22	19.94	13.31
1961	111,03	2.47	34.97	21.64
1971	146,95	2.67	34.95	24.80

Source: Census of India, 1971.

The table 2.2 clearly shows that the State has recorded a phenomenal growth rate of population at 34.97% during 1951-61 and 34.95% during 1961-71 against 21.64% and 24.80% respectively in the case of India as a whole. The annual growth rate in the State stands at 3.5% against 2.5% in India. Such an abnormally high growth rate is caused not alone by biological factor but also by large scale immigration Influx emigrants from various parts of the country are causing to increase population growth rapidly in Assam. It is estimated that the population of Assam would not have exceeded more than 80 lakh in 1971 had there been no immigration and emigration into the State. This has also been estimated that the

remaining 66 lakhs are immigrants and emigrant and their offsprings.[4] On an average, each district of Assam has 14.62 lakh population according to 1971 Census Report but districts like Lakhimpur, Dibrugarh and the hill districts of Karbi Anglong and N.C. Hills have population below the average. Kamrup district happens to be the most populous district of Assam having more than double the average size of population. On the contrary, hill districts are very sparsely populated. Table 2.3 shows the size of population and corresponding government health facilities in Assam.

Table 2.3: Districtwise Breakup of Population on Health Facilities in Assam.

State/ District	Population in 1971	No. of hospital in 1976-77	Population per hospital	No.of dispensary in 1976-77	Population per dispensary
Assam	14,957,542	55	271,955	416	35,956
Goalpara	2,225,103	11	202,282	70	31,787
Kamrup	2,854,183	9	317,131	93	30,690
Darrang	1,736,188	6	289,365	52	33,388
Nowgong	1,680,895	5	336,179	58	28,981
Sibsagar	1,837,389	7	262,484	47	39,093
Dibrugarh	1,411,119	7	201,588	21	67,196
Lakhimpur	711,600	1	711,600	18	39,533
Cachar	1,713,318	6	285,553	32	53,541
Karbi Anglong	379,310	1	379,310	17	22,312
N.C. Hills	76,047	2	38,024	8	9,506

Table 2.3 shows the distribution of government health facilities in the State. There were 55 government hospitals in Assam in 1976-77 and one hospital had to cover 2.71 lakh population while a government dispensary had to cover 3.5 thousand people. Districtwise the distribution of health facilities from the government sources is perceptible from this table. Goalpara district is most favourably endowed with government hospital. Although this district is holding second position from the point of view of population yet the number of government hospitals is more (11) in this district while Kamrup district, the populous district of Assam, is having less number of government hospitals (9). Hill districts are relatively having less government hospitals. For instance, Karbi Anglong had only 1 government hospital among 3.7 lakh population and that hospital had to serve the entire population of the said district, while with comparatively less population, N.C. Hills district has 2 government hospitals. In Lakhimpur district, there was only one government hospital in 1976-77 which had to serve the whole district. Hence, health facilities from the government sources have not been equally distributed in Assam. It seems that population factor either was ignored or did not get much weightage at the time of establishment of government hospital. This type of disparity is also marked in the case of distribution of government dispensaries in Assam.

Population growth rate is not homogeneous in Assam, rather it varies very widely. The growth rate is found to be higher in hill districts than the districts of plains. Karbi Anglong has registered the highest increase of population (68.28%) among the districts of Assam during 1961-71. But this growth rate is only attributable to biological factor because immigrants cannot settle easily due to stringent administration. In plains, high rate of population growth is attributable to two factors - natural or biological and immigration.[5] Nevertheless, plain districts may be grouped into following categories on the basis of population growth rate:

i) higher percentage variation,

ii) lower percentage variation, and

iii) State average growth.

Table 2.4 represents the distribution of districts by growth rate range wise.

Table 2.4: Distribution of Districts by Growth Rate, 1961-71
State Average Growth Rate - 34.95%

Higher Growth Rate		Average Growth Rate	Lower Growth Rate	
Above 50% Range I	10 - 50% Range II	Range III	10 - 50% Range IV	Below 50% Range V
1. Karbi Anglong (68.28)	1. Goalpara (44.12)	1. Kamrup (38.38)	1. Dibrugarh (26.55)	-
2. Lakhimpur (58.56)	2. N.C.Hills (40)	2. Darrang (34.62)	2. Cachar (24.29)	-
	3. Nowgong (38.83)		3. Sibsagar (21.81)	

Source: Census of India, 1971.

If population growth in the State is studied at a micro level, it is found that 37 police stations have growth rates higher than the State average, 51 police stations below the average and 14 in the average range. Sadiya polic station has highest growth rate (182.71%) recorded in 1971 Census followed by Dhemaji (108.08%) and Dhakuakhana (70.97%) police stations.

Seeing the sharp population growth rate it may be expressed that health facilities should be increased considerably in the State. But are they increasing commensurate with the growth of population? Answer to this question is a big No. The rate of growth of health facilities from the government level are exceedingly inadequate. The percentage rate of population growth in Assam during the decade 1950-51 to 1960-61 was 34.99% and annual growth rate was 3.5% while the percentage growth rate of hospitals during 1950-51 to 1960-61 was 27.5% and annual growth rate was only 2.75%. Of course, the percentage growth of dispensary during 1950-51 to 1960-61 was highly satisfactory being 294.55% and annual growth rate was 29.45%. The deficiency of hospital growth rate was compensated by the growth of dispensaries and eased the situation considerably. But the growth rate of dispensaries declined abruptly to the negative level during 1960-61 to 1976-77. During these 16 years, the growth rate of dispen-

saries was 36.10% while population growth rate during this period was 34.71% and annual growth rate was 3.5%. Thought might come that this big gap was replenished by the growth of hospitals during this period. But the thought is not correct. The percentage increase of hospitals during 1961-76 was only 7.84% and annual growth rate was 0.49%. Hence, a big gap remains between population growth and the growth of medical facilities from the government sources.

High rate of population growth is good from one respect, that is, it -

i) provides manpower both skilled and unskilled,

ii) manpower improves the economic condition of the people as well as the economy of the State.

iii) harness the developmental resources properly,

iv) builds infrastructure for all round economic development.

Therefore, a State gets its potential manpower from its population which is believed to be the most effective to bring about economic development. In order to sustain smooth economic development manpower should be kept free from health problems. Medical facilities get importance in this context. People of a welfare state demand health facilities from the government and government's liability, in this case, is to provide adequate health facilities in order to foster its

manpower. But high population growth rate has certain adverse effects. It creates over congestion, increases the growth of slums, imabalances distribution and generates a lot of socio-economic evils. It also increases density of population which ultimately demands more health facilities.

High density of population affects human health in various ways. Densely populated areas are prone to communicable diseases like tuberculosis, leprosy, filaria, goitre, venereal diseases, cancer etc. Since sanitary condition in densely populated areas is mostly bad, people of such areas are likely to be caught by epidemics. Therefore, health facilities should be sufficient in those areas where density of population is high.

The Census Report of 1971 reveals the density of population of Assam as 186 persons per Sq. Km. This rate is higher than the All-India rate (177 per Sq. Km). Table 2.5 shows the districtwise breakup of density of population along with percentage rate of rural and urban population, sex-ratio and literacy percentage.

Table 2.5: Districtwise Breakup of Density of Population, Rural-urban Composition and Literacy percentage in Assam.

District/ State	Density per Km^2	Rural (% to total)	Urban (% to total)	Sex ratio (Female per '000 males)	Literacy percentage
Goalpara	215	92.26	7.74	927	21.98
Kamrup	289	88.26	11.74	890	28.77
Darrang	198	94.02	5.98	888	22.76
Nowgong	302	92.90	7.10	899	28.92
Lakhimpur	123	96.44	3.56	888	16.56
Dibrugarh	201	83.88	16.12	859	30.46
Sibsagar	204	91.58	8.42	886	36.62
Cachar	246	92.08	7.92	923	30.57
Karbi Anglong	37	97.31	2.69	875	19.17
N.C. Hills	16	93.17	6.83	841	27.25
Assam	186	91.19	8.9	896	28.14
India	177	80.10	19.9	930	29.46

Source: Census of India, 1971.

The table 2.5 shows that plains districts are very highly populated than the hill districts are. The density of population in plains districts varies from 302 in Nowgong district to 123 in Lakhimpur district while Karbi Anglong and North Cachar Hill districts have low densities with 27 and 16 per Sq. Km respectively. Other districts have higher densities of population than the State average, for instance, 289 in Kamrup, 246 in Cachar, 215 in Goalpara per Sq. Km respectively. Rangewise, Nowgong district has occupied the first

rank (302) followed by Kamrup (289), Cachar (246) and Goalpara (215) as second, third and fourth respectively.

Thickly populated areas should have adequate health facilities from government sources. But are government health facilities adequate in these densely populated districts of Assam? Let us analyse the situation briefly. Kamrup has been shown as a thickly populated district but there are only 9 government hospitals i.e. one government hospital among 3.17 lakh population. Goalpara which is second on density of population, is having 11 government hospitals i.e. one government hospital among 2.02 lakh population (Table 2.3). Although the number of govemment dispensaries is high in Kamrup district but health facilities are still inadequate. Government dispensaries cannot provide anticipated health services in Assam; either they are not run by experienced health personnel or they are ill-equipped for rendering treatment. Hence, health facilities catered through government dispensaries are insufficient and unsatisfactory.

Modern medical facilities are urban oriented; usually the attendance rate of urban dwellers is more than the rural dwellers. As urban centres provide multifarious facilities, attraction towards urban centres is very high. Therefore, medical facilities, both government and non-government, are in

abundance in urban areas and they are well-equipped with most modern medical instruments. But the situation in Assam is quite different. Assam's population is predominantly rural dweller. The percentage of urban population in the State was only 8.9% in 1971 while it was 7.4% in 1961. Hence, a slight development of urban area is noticed. There are only four towns where population falls within the range of 50,000 to one lakh. Guwahati is the only Class I town in Assam where population is above one lakh. Among districts, Dibrugarh is the most urbanised district with the urban dwellers of 16.12% followed by Kamrup with 11.74% while Karbi Anglong with 2.69% is the least urbanised district. Hence, the percentage rate of rural population in Assam is high (91.19%) than the All-India rate (80.10%). In this context it may be mentioned that there are 21,995 inhabited villages as per 1971 Census accounting for 4% of the total number of villages in the country. The population sizes of the villages are varied from less than 200 persons to more than 10,000 per village and the average size is 606 persons. Since there is inadequate health facilities in rural areas, villagers are bound to come to urban areas for medical treatment. Coming to urban areas for treatment purposes requires a good means of transport communication but most of the rural areas do not have such facility. In many cases, diseased people succumb death without proper

medical treatment in rural areas due to absence of transport/ communication. A large proportion of villages has no motorable roads. Therefore, ambulance or any other cars cannot enter either to provide necessary medical aid or to shift patient to nearest government hospital or dispensary. Out of 21,995 villages, 4,833 villages (22%) have no transport facility of any kind. Only 5,366 villages (24%) at present have all-weather motorable roads connected with urban centres.

Sex ratio has indirect influence on the health facilities in Assam. Higher percentage of female lead to increase the growth of population and thereby the demand for medical facilities increases. In a warm State like Assam, puberty starts at very early age. Early marriage coupled with longer period of reproductivity are the causes attributable to high rate of population growth. The sex ratio in Assam was 896 per thousand male in 1971 against 869 in 1961. The N.C. Hills district has recorded the lowest sex ratio of 841. All the plain districts along with Karbi Anglong hill district have recorded high increase in the sex ratio (Table 2.5). There is marked difference between the rural and urban sex ratios in Assam being 913 and 749 respectively in 1971. Sex ratios in Goalpara, Kamrup and Cachar are more than the State's average

5. Health and the General Economic Factors

Health condition of the people depends on the economic condition also. Economic conditions decide the general living condition: consumption of necessary goods, housing, etc. Health condition depends on nutritional intake of food which in turn depends on the expenditure on food articles. People living on starch alone suffer from several deficiencies and are prone to several diseases. People living in congested areas, in small dark and damp houses are prone to several diseases. But that the people live on starch and cannot afford to consume proteinous diet and sufficient green vegetables, and that the people live in slums is not because they love to do so - it is because their economic condition does not allow them to live better. And this compulsion is largely due to the lower level of socio-economic development.

To go into the further details, it is known that an ordinary human diet must contain six main components, of which three are the most essential viz. carbohydrates, fats and proteins.[6] They are the sources of energy for human being. Calories intake for maintaining good health varies from person to person. An estimate reveals that a lumberjack needs, on an average, 3,700 calories in a day while a household worker needs 2,100 calories.[7] The dietary habit of the Assamese people does not comply with what scientists would regard

as adequate for being free from deficiency diseases. Rural masses in Assam fall an easy prey to several diseases due to malnutrition. Many of them do not get required quantity of food. Therefore, their diet usually consists of inferior cereals or rice and some pulses. Such diet cannot contribute to retain the resistance power of human body; rather it makes it prone to be attacked by the various diseases like tuberculosis, leprosy, loss of weight in adults, mental retardation etc. In 1981-82, 498 persons died of T.B. against 308 in 1968, 305 in 1969 and 280 in 1970 in Assam. In 1970, about 123 persons died of leprosy against 113 in 1963 and 88 in 1953. These soaring up rates of death indicate the deficiency of food value in taken by the people in Assam.

Food energy is also needed in every action of human being. During certain phases of life, sufficient calories are needed for the growth of human body. Infant and children need relatively high amount of calories per kilogram of body weight to grow and develop. Pregnancy and lactation require extra energy for the growth of the fetus and of the mother's reproductive tissues. However, nutrition is the single most important factor in the physical, behavioural and intellectual development of a child. Lack of proper nutrition affects infants very adversely and it becomes a cause of death. In Assam, malnutrition is one of the major factors responsible.

for high mortality and morbidity in the State. Bad sanitation, unhygienic atmosphere, lack of personal hygiene, lack of pre-natal and post-natal medical care etc. are also responsible for high infant mortality rate in Assam. In 1977, the infant mortality rate was 115 per 1000 live birth while it was 136 in 1974. The infant mortality rate in rural areas is much higher than the urban. Table 2.6 shows the situation. The

Table 2.6: Infant Mortality Rate in Assam

(Per '000 live birth)

Year	Rural	Urban	Combined
1974	138	113	136
1975	147	94	144
1976	126	100	124
1977	116	95	115

Source: Statistical Handbook of Assam, 1982.

Situation of infant mortality was very grave in 1975. There were 147 infants out of 1000 live births died in rural areas. The infant mortality rate in Assam is far more higher than some other foreign countries, for instance, in Sweden (9), U.S.A. (16), U.K. (17), Thailand (27) and Sri Lanka (45).[8] The infant mortality rate in Assam was higher than the All-India rate (120 per thousand live birth) upto 1976.

High infant mortality rate in Assam is also due to low literacy percentage. Proper child care, maintenance of hygiene both personal and environmental need proper knowledge and knowledge develops through education. People may avoid the possibility of diseases if adequate knowledge is had. The level of literacy and education raise the [illegible] of life and bring about happiness. It is highly essential among women folk mainly among rural women. The percentage of literates in Assam was 28.1% in 1971 against 27.83% in 1961. There is a spatial variation of literacy in the State. Sibsagar district recorded the highest percentage of literates (36.6%) and Karbi Anglong the lowest (19.17%). The female literacy (18.6% in 1971) was much lower in rural areas than in towns. In 1971, the literacy rate in rural areas was 25.2% while in urban areas it was as high as 58.6%. The female literacy in rural areas was still lower being only 16.4% against 50.7% in urban areas.

Economic structure of a State is moulded by the economic condition of its people. Any economy is supposed to be rich when the economic condition of its inhabitants is sound. Soundness of an economy is measured commonly by per capita income. High per capita income is said to manifest economic soundness and it spells prosperity in the economy and vice versa. There is a good relationship between human health and

per capita income. A moderately high per capita income is conducive to good health. Under such condition people can take necessary calory content food in order to maintain good health. But high per capita income is sometimes not conducive to maintain good health. People having higher per capita income usually incline towards the consumption of more fat content food which is harmful for health. People of western countries usually consume a diet with higher percentage of fat. Consequently, such people are prone to coronary heart disease and to cancer of colon, breast, prostate, ovary, uterus and pancreas.[9] It also estimated that the Japanese, until recently, consumed food that contained much less fat than the Americans did (about 10-20% of the calories) and result is that they are less prone to these diseases. But people of less developed countries mainly suffer from malnutrition. It is said that malnutrition is one of the major factors responsible for high mortality and morbidity in Assam.

Economically, Assam is the most backward State in India.[10] It has paradoxically remained economically backward in spite of possessing rich natural resources. This point may be cleared from the fact that in 1982-83 Assam's per capita income at current prices was Rs. 1,501 as against All India average of Rs. 1,891 and the highest per capita income of Punjab of Rs. 3,484. The trend of growth rate of per capita

income in Assam compared to the All India average is very distressing. While the All India average per capita income has increased at the annual rate of 1.1% during the period from 1960-61 to 1982-83, Assam's per capita income increased only at the annual rate of 0.2% during the same period. Consequently, the gap between the All India verage per capita income and the per capita income of Assam has widened over the years.

Comparing the average per capita income between 1973-74 and 1975-76 with A, B and C groups of States, the average per capita income of Assam during the said period was too low. Assam's position is lowest even among the D Group of States. Table 2.7 discerns the average per capita income of Group A, B, C and D States in the country.

Table - 2.7: Average Per capita Income

Group	State	Average per capita income (in Rs.) 1973-74 to 1975-76
A	1. Punjab	1,586
	2. Haryana	1,399
	3. Maharastra	1,349
B	4. Gujrat	1,349
	5. Karnataka	1,054
	6. West Bengal	1,033
C	7. Kerala	948
	8. Tamil Nadu	942
	9. Andhra Pradesh	928
D	10. Rajasthan	853
	11. Orissa	793
	12. Assam	791

Source: Report of the Seventh Finance Commission 1978.

The per capita income of Assam in 1950-51, recalculated at constant 1970-71 prices, was higher by Rs. 50.4 compared to the All-India position. It is more so in the case of per capita health expenditure in Assam. The details of per capita plan expenditure and per capita health expenditure have been shown in Table 2.9.

Table 2.8: Per capita plan expenditure (actual) in Assam, All India and per capita plan expenditure on health in Assam during plan period.

(in Rs.)

Plan period	Assam	All India	Expenditure on health in Assam
First Plan (1951-56)	29	38	2.35
Second Plan (1956-61)	57	51	4.27
Third Plan (1961-66)	103	94	7.79
Three Annual Plans (1966-69)	61	68	-
Fourth Plan (1969-74)	136	145	6.72
Fifth Plan (1974-79)	324	345	7.85

Table 2.9 manifests that the per capita plan expenditure during the First Five Year plan period in Assam was Rs. 29 while All India per capita plan expenditure was Rs.38. The position did not change as India progressed from plan to plan. The per capita plan expenditure on health during First Five Year plan period in Assam was too low being Rs. 2.35

PER-CAPITA PLAN EXPENDITURE (ACTUAL) IN ASSAM AND INDIA
AND
PER-CAPITA PLAN EXPENDITURE ON HEALTH IN ASSAM DURING FIVE YEAR PLAN

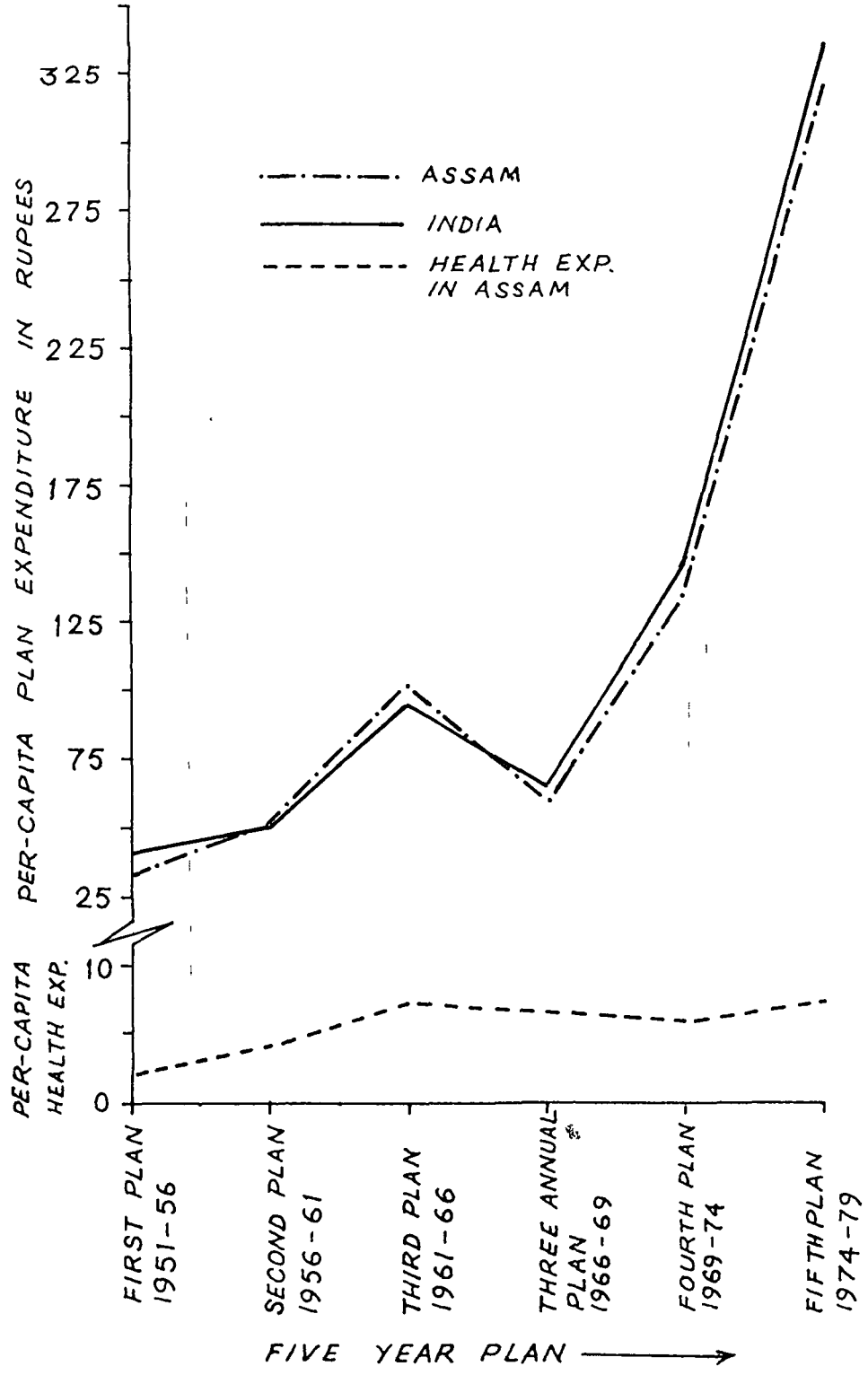


FIG. 1.

which increased upto Rs. 7.79 during the third plan period but it registered decline to Rs. 6.72 during fourth plan period. An improvement was marked in this regard during the fifth plan when the per capita plan expenditure on health was increased to Rs. 7.85 (Fig. I). This situation indicates the utter inadequacy of State expenditure on health.

In Assam, health facilities from the State Government sources are not only insufficient but also unsatisfactory. Seeing the unequal location of government hospitals, a question arises whether there is a clear and well thought guiding principle for establishing government hospitals, dispensaries etc. Due to insufficient medical facilities from the government in rural areas, diseased people of these areas are compelled to go either for local medicines or to some quack. The consequence is not so happy in this regard. Mortality rate increases under such circumstances. This is a very serious problem in rural areas of Assam. As a result the mortality rate in the rural areas is more than that in the urban areas. Table 2.9 reveals the mortality rate of Assam in 1972.

Table - 2.9: Mortality Rate in Assam 1972

ASSAM		INDIA	
Rural	Urban	Rural	Urban
227.5	163.9	190.8	172.9

Table 2.10 truly indicates that government health facilities are utterly inadequate and it draws a proper attention of the government to review its health policy. Understanding its importance, the Government of Assam has been giving due priority on the development of health facilities during the Five Year plans under formulation at present.

Notes and References

1. The area of Assam has been changed a number of times. Before partition, Sylhet and North East Frontier Agency (now Arunachal Pradesh) were the parts of Assam. After partition, Sylhet and a part of Karimganj were separated from Assam. After partition, Sylhet and a part of Karimganj were separated from Assam and linked with East Pakistan (now Bangladesh) but three police stations viz. Badarpur, Ratabari and Patharkandi remained in India and with them Karimganj Sub-division was formed. From 1901-41, the Census area of Assam comprised Sylhet, the Naga administrated area, Sadiya frontier tract and the Balipara frontier tract of the NEFA. In 1951, the area of Assam, as shown by the Surveyor General of India, was 85,012 Sq. miles including entire NEFA, the old Naga Hills district and Naga tribal area excluding the portion of Sylhet which was parted to then East Pakistan. In 1951, 32.8 Sq miles hilly strip lying to the South of Bhutan of Kamrup district was parted to Bhutan. In 1960, the Naga Hills district and the former Tuensang division of NEFA were separated and formed a new State called Nagaland. By transforming the whole of the North Cachar Hills subdivision, a new district called United Mikir and North Cachar Hills district was formed between 1951 and 1961.

NEFA was separated from Assam in 1961 and therefore, the Census area of Assam for 1961 confined within 47,091 miles. In 1971, United Khasi and Jaintia Hills and Garo Hills districts were separated from Assam in order to form Meghalaya and Mizo district separated for forming Mizoram. Internal administrative set up was also changed several times. In 1971, the old Mikir and North Cachar Hills district were divided into Mikir Hills and North Cachar Hills. The old Lakhimpur was also divided into North Lakhimpur and Dibrugarh in the said year.

2. Now Assam has 16 administrative districts after being created 6 more districts viz. Dhubri, Kokrajhar, Barpeta, Darrang, Jorhat and Karimganj on 30th June 1983.
3. Census could not be carried out in Assam in 1981 due to agitation on foreign national issue which started in 1979 and continued to 1985. However, the Census of India projected the total population of the State as 199 lakhs in 1981.

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CHAPTER - III

A DESCRIPTION AND EVALUATION OF HEALTH FACILITIES CREATED IN ASSAM DURING THE PLAN PERIOD

1. In this chapter an attempt has been made to describe and evaluate the health facilities created in Assam during the plan period - that is, since 1950. To begin with, the role of the government regarding improvements in health facilities has been highlighted in the national perspective. Following it, the efforts of the Assam Government in creating the facilities of health in the State have been described. The achievements in this regard during the 1st, 2nd, 3rd, and 4th plans are detailed out and evaluated.

In 1972 Assam was divided. A substantial portion of the territory of the pre-1972 Assam formed two new states of Meghalaya and Mizoram. Shillong, the capital of pre-1972 Assam was given to Meghalaya. As a consequence of this division, the overall structure of the health facilities in Assam experienced a substantial alteration. In this new perspective the efforts of the Government of Assam in creating health facilities after 1972 have been recorded and evaluated.

After the mid 70's the political environment of Assam began growing unstable and it remained so till the mid 80's. During this period of political instability, the development

of health facilities in Assam — along with the general development — suffered a great set-back. It also affected proper documentation. Hence, the inventory of information for this period is rather scanty. However, with the limitations posed on the availability of information, an attempt has been made to keep the description and evaluation up-to-date, as much as possible.

2. Health Facilities in the National Perspective

Public health that comprises of preventive measures and control of communicable diseases is primarily the responsibility of the State Government. Since the political setup of India is quasi-federal, the Central Government plays a substantial role in various health programmes along with State Governments. It prepares and fosters some important health programmes such as family welfare programme, sponsors and supports major health programmes of national significance such as control of tuberculosis, leprosy, malaria etc. State governments are often summoned to work hand in hand with the central government in order to execute health programmes and attempt to control various diseases. Specifying the role of the State on health matters, the Constitution of India says, "the State shall regard the raising of the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties."[1]

Health programmes have been getting much importance during the plan period in our country. A nation's prosperity largely depends on the healthy living of its inhabitants. Proper health programmes should not only be prepared but also be executed timely. Every Five Year plan, therefore, has been paying much attention to it.

Long time back, the Health Survey and Development Committee (1946) was appointed to survey the health condition of the people of India. After thorough study, the Committee remarked that health of the inhabitants of India was not satisfactory. The Committee had pointed out the following reasons of ill-health of the people of the country.

1. Lack of proper medical care both curative and preventive.
2. Lack of hygienic environment suitable to healthy living i.e. lack of safe water supply and sanitation and absence of proper removal of human waste.
3. Low resistance due to lack of adequate diet and proper nutrition.
4. Lack of general and health education.
5. Lack of proper housing.

There was, therefore, an immediate need to remove all deficiencies in order to keep the country's people free from health hazards.

Any health strategy for the State should include the following programmes.

(i) Health education.

(ii) Water supply and sanitation.

(iii) Eradication of communicable diseases like malaria, small pox, leprosy, tuberculosis, cholera etc.

(iv) Maternal and child care.

(v) Effective check on the manufacture and distribution of food and drugs to prevent adulteration.

(vi) Family planning.

(vii) Removal of disparities between urban and rural areas in the provision of medical care and health services.

(viii) Extension of hospital facilities.

(ix) Expansion of training facilities for para medical personnel.

(x) The streamlining of supplies and services so that the quality of health services is improved.

The Draft of the First Five Year Plan clearly mentioned that health is fundamental to progress of a nation at any phase.

> "In terms of resources for economic development, nothing can be considered of higher importance than the health of people which is a measure of their energy and capacity as

> well as of the potential of manpower for productive work in relation to the total number of persons maintained by the nation. For the efficiency of industry and agriculture, the health of the workers is an essential consideration."2

Realising the importance of health, the Draft of First Five Year Plan clearly showed the causes of low health in the country. It was found that the causes of low state of health in the country were the lack of hygienic environment conducive to healthful living, low resistance due primarily to poor diet and lack of nutrition, lack of proper housing, good drinking water, lack of proper removal of human wastes, and lack of medical care both curative and preventive. Lack of proper education and poor economic status were also more liable for poor health. Accordingly, priorities should be accorded to remove all the deficiencies. Therefore, the Draft of First Five Year plan laid much importance on health and contained the following priorities.[3]

(a) Provision of water supply.

(b) Control of malaria.

(c) Preventive health care of the rural population through health units and mobile health units.

(d) Health services for mothers and children.

(e) Education and training and health education.

(f) Self sufficiency in drugs and equipments.

(g) Family planning and population control.

3. Health Facilities: Efforts of the Government of Assam

Following the recommendations of the Health Survey and Development Committee (1946), a pattern for primary health centres was worked out early in the plan period. These health services were expected to serve as a focal point for the development of both curative and preventive health services in rural areas. A comprehensive health programme should cover -

(i) Urban health programmes, and

(ii) Rural health programmes.

Since a higher percentage of inhabitants of Assam (91.19%) lives in rural areas special health care facilities were required for the rural masses mainly in rural areas. Accordingly, provision was kept in the First plan draft of Assam to cater health care facilities through community development blocks. It was also planned to finance under the community development programme. Special programmes for controlling communicable diseases like T.B., malaria, leprosy etc. got due importance during the said plan period.

The Government of Assam established its first medical college at Dibrugarh in 1947 and that institution started producing medical personnel since 1952. The remarkable achievement during the First Five Year plan in Assam was to get first batch of graduate doctors from her own medical college in 1952.

3.1. Efforts in the 1st Five Year Plan

Health facilities at the State Government level expanded gradually during the first plan period. The number of government hospitals increased to 43 and state dispensaries to 284 from 40 and 165 respectively by the end of the First Plan. Hospital beds also increased remarkably from 2361 in 1950-51 to 2667 by the end of the plan. During this period, the number of doctors registered for medical practice increased from 96 in 1950-51 to 126 in 1955-56 and thereby the total number of registered medical practitioners increased in the State from 2423 in 1951 to 2998 in 1956. The percentage increase of doctors was 24% during this plan period. The area served by hospitals and dispensaries were reduced sufficiently with the increase of their numbers. There was only one government hospital in Assam within 2263.86 Km^2 at the beginning of the First Five Year Plan and it was reduced to 2119.36 Km^2 at the end of the plan. The area covered by a state dispensary had tremendously fallen from 565.96(Sq. Km)in 1950-51 to 318.24 in 1955-56 due to increase of dispensaries. The area served by a doctor was also reduced from 41.11 Sq. Km in 1950-51 to 33.23 Sq. Km in 1955-56 and doctor population ratio stood at 1:2741 in 1955-56 from 1:3395 in 1950-51 due to increase in the number of doctors.

Looking to the outdoor and indoor medical treatment facilities, it was found that about 11 lakh i.e. 13.37% people got medical treatment at outdoor at various government hospitals in 1956 against 12 lakh i.e. 14.59% in 1955. Nearly 19.38 lakh i.e. 23.56% people were treated at government hospitals and dispensaries in Assam in 1956 against 18.76 lakh i.e. 22.80% in 1951. The population bed ratio was also declined from 3483.71:1 in 1950-51 to 3084:1 in 1955-56. In 1956, about 32 thousand (0.39%) people got operation facilities as against 34 thousand (0.41%) in 1951. Thus, a significant change was recorded with regard to health facilities during the first five year plan.

A total expenditure of Rs. 193.41 lakh was incurred during the first five year plan in order to promote health facilities in Assam. Table 3.1 shows the allocation of outlay and expenditure during the said plan period.

Table 3.1: Outlay and Expenditure during the First Five Year Plan

(Rs. in Lakh)

Heads of development	Total first plan allotment	Expenditure during the first five year plan					
		1951-52	1952-53	1953-54	1954-55	1955-56	Total Expenditure
Medical	227.0	29.62	38.98	30.15	25.68	67.93	184.36
Public Health	-	0.71	0.74	1.00	2.76	3.84	9.05

Source: Statistical Abstract, Assam 1960-61.

In spite of much development, the First Five Year plan left some disparity with regard to the location of hospitals, dispensaries and other health facilities in the State. Most of the health programmes were carried out during this plan period only in the form of expansion and continuation of the schemes initiated in the post war period. Therefore, a gap did exist between rural and urban health facilities at the end of the First plan. Although the area covered by a government hospital and state dispensary was reduced in Assam as a whole yet district wise disparity remained. During this period 3 hospitals were set up in Assam, of which 2 were established in Goalpara and 1 was in Darrang District. The percentage increase of hospital was very low being 1.5% while population growth rate during this period was a little more than 2%. A district wise difference is perceptible with regard to population per government hospital during this period. By the end of the first plan, situation stood as one government hospital among 4.43 lakh population in Nowgong district while there was one government hospital among 1.73 lakh in Sibsagar district and 1.32 lakh in Darrang district. This manifests that health facilities increased in the State during the first plan period without following population hospital criterion.

3.2. Efforts in the 2nd Five Year Plan

Under such circumstances, the Second Five Year Plan was launched with a view to remove all constraints that come in the progress of health activities in the previous plan. In the language of the Second Five Year Plan "the fundamental aim is to expand existing health services to bring them increasingly within the reach of all people and to promote a progressive improvement in the level of national health."[4] Accordingly, the main objective was kept in the Draft of the Second Five Year Plan to decentralise health facilities and divert them mainly to rural areas. It was also mentioned that attention would be paid to increase the number of trained technical personnel especially medical graduates, nurses, auxiliary nurses, midwives, pharmacists, and other para medical personnel.

The plan was also aimed at to control communicable diseases such as malaria, leprosy, filaria, goitre and tuberculosis. Malaria was identified as one of the most dangerous public health enemies in Assam which took many human lives during Second Plan period. Table 3.2 shows the severity of malaria from 1953 to 1960.

Table 3.2: Malaria Mortality and Morbidity in Assam from 1953 to 1960.

Year	Malaria morbidity	Malaria mortality	Malaria mortality rate per 1,000 population
1953	162,861	14,781	1.61
1954	242,005	11,155	1.20
1955	140,775	8,260	0.88
1956	96,240	5,955	0.63
1957	74,613	5,797	0.61
1958	98,148	4,131	0.42
1959	110,290	3,937	0.39
1960	120,893	3,095	0.38

Source: Annual Report of Directorate of Health Services, Assam, 1960.

Seeing the severity of malaria, the Government of Assam followed the foot steps of the Malaria Control Programme of the Government of India. In this connection, a drastic change was made by the State government by transforming malaria control programme to malaria eradication programme in 1958 which aimed at to eradicate this disease completely by 1964. The Malaria Institute of Shillong was developed by providing research facilities on malariology and parasitology in order to achieve the target. This institution was also assigned the duty to impart training to

malaria inspectors and other personnel connected with this programme. At the end of the Second Five Year Plan, 14 malaria eradication units engaged to eradicate malaria from the State.

Since communicable diseases are of serious nature, they need early prevention and control. Under the programmes of controlling communicable diseases, the Government of Assam accorded great importance on malaria, filaria, leprosy and tuberculosis control programmes. In view of filaria control, one survey cum control unit was established in Jorhat in 1959. Similarly, a leprosy pilot project was started at Dotoma in Goalpara district along with the accommodation to 30 indoor patients including clinical facilities. With 16 leprosy colonies and 180 leprosy treatment centres and sub-centres, the Assam Government targeted to control leprosy to the maximum possible extent. Apart from leprosy, 2 goitre control units were serving during the Second Five Year plan period in the State in order to provide treatment facilities to goitre attacked people.

During the second plan period, tuberculosis was detected as the most virulent disease and understood its lethality. About 90 thousand people were suffering from this disease during the said plan period. This situation drew the attention of the Government of Assam and necessary actions

were taken to control it. Accordingly, mass B.C.G. vaccination campaign was carried out mainly among the susceptible groups of the people. Table 3.3 shows the medical facilities catered by the State government to patients suffering from communicable diseases during the second plan period.

Table 3.3: Treatment facilities for communicable diseases during the Second Five Year Plan

Disease	No. of centres for treatment	Name of the places located the treatment facilities
Malaria	14	-
Filaria	1	Jorhat
Leprosy	1	Dotoma
Tuberculosis	5	Goalpara, Dhubri, Barpeta, Tezpur and Nowgong

The medical college hospitals have important role to play for ensuring medical treatment facilities and immunising people from diseases. This type of institution possesses modern medical facilities with modern instruments either for treatment or for operation, expert health personnel and other sophisticated medical equipments. Understanding it, the Government of Assam gave much importance on the development of medical facilities in the Dibrugarh Medical College Hospital and plan was prepared to establish two more medical college hospitals in Assam, one each in Gauhati and Silchar. The Gauhati Medical College Hospital was established in October 1960 and started functioning as a second medical college hospital in Assam.

Table 3.4: Outlay and Expenditure under the Second Five Year Plan, Assam.

(Rs. in lakh)

Head	1956-57			1957-58		1958-59		1959-60		1960-61		Total expenditure for the Second Plan
	Second plan provision 1956-61	Allotment as per Planning Commission	Expenditure	Allotment as per Planning Commission	Expenditure	Allotment as per Planning Commission	Expenditure	Allotment as per Planning Commission	Expenditure	Allotment as per Planning Commission	Expenditure	
Health	495.86	106.80	28.06	120.00	61.23	92.23	77.04	96.00	92.68	110.00	91.87	350.88

Source: Statistical Abstract of Assam, 1960-61.

The anticipated expenditure on health in Assam during the second plan period was Rs. 495.86 lakh, but Rs. 350.88 lakh, was actually spent during this plan period. Table 3.4 reveals the total outlay and expenditure on health in the State during the second plan period.

Health facilities from the government sources increased substantially during the second plan period. 8 sub-divisional headquarters hospitals were improved; 60 family planning clinics were established both in rural and urban areas in order to stop infant mortality and maternal mortality. Table 3.5 shows the physical achievements of health facilities during the second plan period.

Table 3.5: Health facilities at the end of second five year plan.

Item	Position in 1955-56	Target under second plan	Achievement at the end of 1956-61
Hospital	43	-	51
Dispensary	284	-	651
Hospital bed	2,667	3,800	3,348
Medical college	1	2	2
Intake capacity in medical colleges	65	200	200

In Assam, most of the diseases are transmitted through water. Pollutants enter water from two main sources viz. point sources and non-point sources. Point sources include waste damped into water by pipes, sewers and other conduits from factories, sewage treatment plants and waste and drainage dispersal systems. They may be controlled. But it is harder to pin-point the non-point sources of water pollutants. They mainly happen due to sewage, fecal matters, pesticides, fertilizers and top soil carried into streams, ponds, tanks etc. by rainwater. Water borne micro-organisms are responsible for causing harm in human body in the form of diseases like cholera, typhoid, amoebic, shigella dysentry, schistormiasis, giardiasis, hookwarm and salmonellosis. They are far more intense in rural Assam due to poor sanitation like open sewers, lack of running water, inadequate toilets and lack of treatment facilities and personal hygiene. Village people of Assam are often attacked by amoebic dysentry in the form of diarrhoea, constipation, cramps and soreness around liver. To stop diseases transmitted through water, the Public Health Engineering organisation was established in the State in 1956 by the Government of Assam. This department was mainly concerned with water supply schemes under the National Water Supply and Sanitation Scheme (Rural and Urban) sponsored by the Government of India. Under this scheme, Rs. 93.73 lakh.

and Rs. 45 lakhs were proposed to be spent for rural and urban water supply and sanitation scheme respectively during the second five year plan. For the rural schemes, the Govern ment of India agreed to give a grant to the extent of 50% and the balance 50% to be borne by the State government. For urban schemes, the entire amount was allotted by the Government of India as loan to State Government. Among urban schemes, Gauhati water supply and Shillong water supply schemes[5] were worth to name. Under rural schemes, this department took 14 major and 6 minor rural water supply schemes during the second plan period. In 1957, the Public Health Engineering Department was separated from the Directorate of Health Services in order to render better services.

While assessment of the progress of health programmes during the second plan period is made, it is found that the number of government hospitals increased from 43 in 1955-56 to 51 in 1960-61 i.e. the percentage increase was 18.6%. The rate of growth of government dispensaries was spectacular being 117.7% in the State during this plan period. The area served by a doctor was reduced from 33.23 Sq. Km to 27.61 Sq. Km and population doctor ratio finally stood at 2,337:1 against 2,744:1 in 1955-56. The percentage rate of doctors was increasing at the rate of 4.1% during the period of the second five year plan. The area per hospital and dispensary was reduced

to a great extent. In 1955-56, there was only one government hospital within 2,119.36 Sq. Km and a state dispensary within 333.14 Sq. Km in 1955-56. But by the end of the second five year plan the situation become one government hospital within 1,953.13 Sq.Km and a dispensary within 153.01 Sq. Km. Population per nurse was fallen from 18,693:1 in 1955-56 to 12,337:1 in 1960-61 and nurse per bed finally dropped from 1:7 in 1955-56 to 1:6 in 1960-61. Table 3.6 indicates some important physical achievements during the second plan period in Assam.

Table 3.6: Physical achievement under the Second Five Year Plan.

Item of development	Unit	Second plan target 1956-61	1956-57	1957-58	1958-59	1959-60	1960-61	Total 1956-61
Health								
Hospital beds (Additional)	No.	470	50	50	118	73	60	351
Estt. of Primary Health Centres/ Units	No.	70	30	13	1	10	11	65
Family Planning Centres (both urban & rural)	No.	80	-	43	10	4	3	60

Source: Statistical Abstract of Assam, 1960-61.

In all, the progress of health facilities in Assam during the second plan period was good but district wise disparity with regard to government hospital, dispensary, population per doctor, bed etc. still remained. The area hospital ratio in all the districts remained almost same during this period, only change happened to dispensary with regard to area. Population per hospital bed increased in almost all districts during this period. In 1960-61, population per government hospital was increased in Nowgong district (6 lakh) followed by Kamrup (4 lakh) and Cachar (3 lakh). Although the situation was eased considerably with the increase in hospital beds in the State but districtwise population per bed still remained unequal. In Nowgong district, the hospital bed per population was 1:15.9 thousand in 1960-61 while 1:7.5 thousand in Cachar and 1:7.3 thousand in Sibsagar.

3.3. Efforts in the Third Five Year Plan

Health programme also got prime importance during the Third Five Year plan period from the state government. The demand for medical facilities had been increasing with the increase in population in the state and the development of medical science and treatment. The State was required to cope herself with change. In towns modern medical facilities were given through hospitals while primary medical treatment facilities were made available through dispensaries in rural areas.

Health programme in the third plan incorporated the following heads:

1. Improvement of environmental hygiene both rural and urban areas.
2. Control of communicable diseases.
3. Provision of adequate institutional facilities to serve as a base for organising health services.
4. Provision for training of medical and public health personnel.
5. Family planning.
6. Public health services.

The government also determined to increase the provision of maternity and child welfare, health education and nutrition during this plan period. In the context of health programmes, the draft of the third five year plan contained a bold objective and expressed it as:

> "the broad objective of the health and family planning programmes in the third plan is to expand health services, to bring about progressive improvement in health of the people by ensuring a certain minimum of physical well being and create conditions favourable to greater efficiency and productivity."6

In order to carry out health programmes, the third plan allocated Rs. 865 lakhs against Rs. 350.88 lakh in the

second plan. Table 3.7 shows the outlay incurred during the third plan against the second plan.

Table 3.7: Third Five Year Plan, Resource Allocation

(Rs. in lakh)

Programme	Second plan anticipated outlay	Third plan allocation
Water supply and sanitation (rural and urban)	93.73	144.00
Primary health units, hospitals and dispensaries	114.56	140.00
Control of communicable diseases	80.37	353.00
Education and Training	47.79	174.35
Indigenous system of medicine	0.58	3.75
Family Planning	1.12	35.00
Other schemes	13.20	14.90
Total	351.35	865.00

Source: Third Five Year Plan, Assam Vol. I (1961-66).

Assam could not be set free from communicable diseases during the second plan period despite much efforts. Therefore, a massive strive was felt necessary to put rein on their endimicity. Realising the urgency, the third plan accorded priority on the control of communicable diseases like malaria, leprosy, tuberculosis, small pox, venereal diseases, goitre etc.

T.B. control programme received importance in Assam during the third five year plan. The state government had included the following schemes in the said plan in order of priority:

(i) Extensive use of B.C.G. vaccination.

(ii) Establishment of T.B. clinics.

(iii) Extension of hospital beds.

(iv) Establishment of one T.B. training and demonstration centre.

Mass B.C.G. vaccination programme started since 1949 had reduced the susceptibility of T.B. From the said year to the end of 1964, about 84 lakh had been tuberculin tested and 30 lakh vaccinated out of a population of about 11.8 millon. In 1964 alone 6.4 lakh people were tuberculin tested and 2.3 lakh vaccinated. During this period, a series of programmes like door to door B.C.G. vaccination programme, mass registration of tested persons etc started in order to control severity of this disease. Direct vaccination without pre-vaccination tuberculin tests of the younger age group 0 to 6 was also introduced by the end of 1964. To control T.B. more effectively, B.C.G. vaccination programme was integrated with the District Tuberculosis Centre. With the advent of modern anti T.B. drugs and quick detection of infectious cases, the state government therefore, gave impetus on the tuberculosis

clinics during the third plan period. The aim of the government was not to leave any district without any T.B. clinic service by the end of the third five year plan period as a part of the National Tuberculosis Programme.

The number of T.B. clinics increased from 7 to 19 and T.B. beds to 940 among the estimated 1.3 lakh T.B. patients in Assam during the third plan period. The deficiencies found in the development of anti-tuberculosis programme in the State were due mainly to the non-availability of qualified trained personnel to impart specialized training in tuberculosis to all categories of medical and ancilliary personnel including medical students. Proposal to set up a tuberculosis centre and a demonstration centre at Gauhati was taken this plan period. Table 3.8 reveals the district wise breakup of the total number of T.B. cases treated in T.B. clinic and T.B. Hospitals.

Table -3.8: Districtwise breakup of T.B. patients treated in 1964.

District	Cases treated
Goalpara	1,649
Kamrup	1,730
Darrang	571
Nowgong	573
Sibsagar	1,611
Lakhimpur	573
Cachar	1,299
Garo Hills	287
Mizo Hills	254
United N.C. & Mikir Hills	120
K & J Hills	879
Total	9,546

Source: Annual Report, Directorate of Health Services, Assam 1964.

Financial stringency during this period posed a strong constraints to increase the number of beds in different clinics and hospitals for T.B. treatment. Expressing the inability, the Directorate of Health Services said, "we are finding it difficult to cope with our limited budget, hence the establishment for further beds has been given a low priority and only 61 beds could be established in different institutions in the year."[7]

At the beginning of the third five year plan, it was estimated that over 2 lakhs people were suffering from leprosy. Assam was, therefore, earmarked as one of the States in India where incidence of the said disease was high, varying between 20 to 40 thousand people. In order to control the menace of leprosy, 6 additional (subsidiary) centres were established in places where incidence of the said disease was marked e.g. Boko and Masalpur in Kamrup district, Dimakuchi in Darrang district, Pahumara in Sibsagar district, Umden in United Khasi and Jaintia Hills district and Daldali in United Mikir and North Cachar Hills district. The state government approved the scheme to setup 4 leprosy colonies under the centrally sponsored scheme at Harisinga, Narayanpur, Sonapur and Malasipathar. In 1964, 1649 leprosy cases were detected and 13,917 cases were brought under treatment at 231 clinics and 16 institutions against 10,699 in 1960. Table 3.9 shows the number of cases treated in 1964 in Assam at various leprosy centres.

Table 3.9: Leprosy cases treated in 1964 in Assam.

District/ Leprosy Centre	No. of Centre/ Institutions	Remaining from last year	New cases detected	Total No. of cases treated during the year	Death	Cured	Relieved
Darrang	17	491	97	588	3	2	39
Cachar	6	577	109	686	5	4	1
U.M. & N.C. Hills	107	6,273	185	6,458	38	3	5
Nowgong	7	709	79	770	8	-	15
Garo Hills	23	354	87	441	4	10	28
Kamrup	26	574	64	637	12	1	40
Lakhimpur	15	143	14	157	1	4	64
Mizo Hills	-	-	16	16	3	-	7
K & J Hills	10	89	16	56	6	1	4
Sreemanta Sankar Mission	7	596	132	728	18	33	-
Barbheta Leprosy Colony	1	364	294	674	5	46	45
Santipara Leprosy Colony	7	841	309	1,150	2	-	10
Makunda Leprosy Colony	1	767	215	982	6	51	-
Sarihaijan K. Nivas	4	542	32	574	9	-	-
Total	231	12,320	12,319	13,917	120	155	258

Source: Annual Report, Directorate of Health Services, Assam 1964.

The state government had increased the number of health personnel to provide more treatment facilities to leprosy

Table ..7: Leprosy cases treated in 1994 in Assam

Disabl. of Leprosy Cases	No. of Cases Treated in the Year	Multibacillary Cases	Paucibacillary Cases

attacked people. One more medical officer was given in the charge of dispensaries and he was assisted by 42 leprosy injectors, 20 leprosy social workers in anti-leprosy scheme 25 leprosy injectors and 5 non-medical assistants in centrally sponsored scheme, 58 leprosy injectors in survey scheme, 69 leprosy injectors in eradication scheme and 5 ayurvedic physicians.

Like leprosy, malaria and small pox caused major harm in the State. The Government of Assam took a pilot scheme in 1960-61 with an aim to eradicate these diseases by 1964. The activities in the State with regard to malaria eradication plans were prepared, organised and administered by a Malaria Institute of Assam. In order to control filaria and goitre, adequate attention was paid during the third plan period. 2 goitre centres, 1 each at Diphu and Gauripur were opened in order to control it. Filaria unit of Jorhat also actively worked to offer medical facilities to filaria affected people

In addition to mentioned diseases, many people suffered from cholera, plague, kala-azar, dysentry and diarrhoea, respiratory diseases, enteric fevers, beri-beri and diptheria during this period. Table 3.10 shows the number of deaths from various diseases during 1962-64.

Table 3.10: Number of deaths from major tropical diseases in Assam.

Disease	1962	1963	1964
	Death	Death	Death
Cholera	9	13	312
Plague	Free from this disease	Free from this disease	Free from this disease
Kala-Azar	-	78	60
Dysentry & Diarrhoea	2,586	2,368	3,017
Respiratory diseases	2,967	2,427	2,278
Enteric Fevers	288	146	84
Beri-beri	12	20	46
Diptheria	71	38	30

Source: Annual Report, Directorate of Health Services, Assam 1964.

To control these diseases and to check the mortality rate, the State required much medical facilities. While assessing the progress of health facilities during the third plan period in Assam, a significant change comes to limelight The number of government hospitals were increased to 73 by the end of the third plan while there were only 51 hospitals in 1960-61. The percentage increase of government hospitals during this period was remarkably high being 43.1%. The number of dispensaries also registered increase from 651 in 1960-61 to 701 in 1965-66 i.e. the percentage increase was

7.68%. Hence, the area coverage of a government hospital declined from 1953.13 Sq. Km in 1960-61 to 1556.40 Sq.Km in 1965-66 while the area coverage of a state dispensary stood at 142.09 Sq. Km in 1965-66 from 153.01 Sq.Km in 1960-61. With the increment of the number of doctors, the area to be served by a doctor had fallen from 28.30 Sq Km to 23.47 Sq. Km and population doctor ratio stood at 2737:1 in 1965-66 from 1077:1 in 1960-61. A spectacular achievement was made to population bed ratio during this plan period. At the beginning of the third plan, the population per bed was 3176 which reduced to 1973 by the end of the plan.

Maternity, child welfare and family planning programmes are also the constituents of health. While studying health facilities in the State, their importance was evoked. Maternity and child welfare involve in the development or maternity health care, check maternity mortality and morbidity, restoration of physical fitness during the time of pregnancy while child welfare is associated with the reduction of infant and child mortality and morbidity, vaccination to children to save them from polio, diptheria and other diseases. Family planning has its own importance. Rapidly increasing population in the state is not a good sign because it begets a number of economical, social and political problems. Hence, the population growth should be checked through family planning.

The programme of Maternity and Child Welfare was initiated by the Government in 1948. The number of centres had increased from 4 in 1948 to 114 in 1964 and facilities were extended to 116 State dispensaries and local board dispensaries. Since maternity and child welfare services formed an integral part of health programme in the Primary Health Centres, many maternity and child welfare services were integrated with family planning programme during the third plan period.

The family planning programme, started in 1957-58, was implemented and functioned through the State Health Directorate. The family planning units were splitted into rural and urban family planning. Both urban and rural family planning centres came up at a large scale to popularise family planning methods among people in order to reduce the birth rate. Table 3.11 shows the position of family planning centres at the end of the third plan in Assam.

Table 3.11: Number of family planning centres at the end of third five year plan.

Centres	Urban	Rural	Total
Government Family Planning Centres	24	156	180
Local Bodies (Assam Mahila Samity, Gauhati)	1	-	1
Voluntary Organisation (Red Cross Society, India)	4	3	7

Source: Annual Report, Directorate of Health Services, Assam 1964.

In spite of much progress during the third five year plan period in the field of health facilities from the State government level in Assam, deficiencies still remained. In many fields, shortages were so acute that the state government had to review its health programmes and tried to remove deficiencies during the Fourth Five Year Plan.

3.4. Efforts in the Fourth Five Year Plan

The Fourth Five Year Plan was formulated primarily to remove deficiencies in basic infrastructure, shortage of medical and para medical personnel, lack of training facilities, inadequacy of organisational setup and non-availability of building and staff. Therefore, the fourth plan programmes were chalked out with a view to provide minimum standard of medical care and public health services by the end of the Fifth Five year plan. The Draft of the Fourth Five Year Plan gave importance on rural health. It was decided to expand more health care facilities in the rural areas. In the beginning of the fourth plan, it was found that 55 blocks out of 130 had no primary health centres; consequently rural people did not get anticipated medical facilities at the block level. Accordingly, the plan aimed at to put more rural areas under primary health centres and dispensaries. The target was, therefore, fixed to establish one primary health centre in each block.

Population growth in Assam during the decade 1961-71 was the highest in the country being 34.37% compared to All India rate being 24.57%. Therefore, the State Government paid special attention to the family planning programme. The plan aimed at to bring down the birth rate from 40 per thousand to 25 per thousand. Many institutional base consisting of 67 Rural Family Planning Programme units, 10 urban family planning units, 24 state sterilisation units and 32 mobile family planning units were working together to achieve the target. Keeping connection with family planning programme, the maternity and child welfare programme also received importance during this period. Initially, this programme was fostered by Indian Red Cross Society and other voluntary organisations. The state government took over the activities since 1948 with only 4 such centres. Subsequently, both the services continued at a wider scale through its 113 centres. During the fourth plan period, the maternity and child welfare services were given through 165 dispensaries and 77 public health centres with its sub-centres. International organisation like UNICEF also provided aid to this programme in the form of kinds.

In view of special health programme, the Fourth Five Year Plan gave much importance on T.B., leprosy, malaria, small pox, cholera programmes. With the advent of modern anti T.B. drugs and increased diagnostic and treatment, the intensity

of T.B. had fallen to a remarkable extent during the fourth plan period. In 1970, out of 9073 patients treated 280 patients died while in 1968 out of 19,729 patients treated 303 patients died. During this period, there were 11 district T.B. clinics and 7 sub-divisional clinics in the State. In addition, there were 5 T.B. hospitals (1 government and 4 private), 27 T.B. wards (16 government and 11 private) and 15 government and 1 private clinic with 688 beds (government 293 and private 395). During this plan period, 16 lakh persons were vaccinated and over 9 thousand T.B. patients were given treatment.

Anti-leprosy programme was also continued during the fourth plan with a view to check its endemicity. This programme was carried out through 2 hospitals, 8 colonies, 131 government treatment centres, 58 private treatment centres with a total of 749 beds. Table 3.12 shows the leprosy cases treated in different institutions of the State.

Table 3.12: Leprosy cases treated in Assam 1968 to 1970.

Year	No. of cases treated	No. of cases cured	No. of cases relieved	No. of cases discharged otherwise	No. of deaths
1968	1,717	174	332	844	88
1969	8,214	96	186	341	113
1970	9,788	139	168	513	123

Source: Annual Report, Directorate of Health Services, Assam 1970.

Like anti-leprosy programme, the National Malaria Eradication Programme was continued during this plan period. The State Government endeavoured through 13 units and 45 sub-centres located in different parts of the state in order to check malaria incidence. D.D.T. spray operation was carried out throughout the State to check this disease.

In spite of much efforts, Assam could not be set free from the epidemics and cholera. In 1970, cholera and small pox broke out in epidemic forms in the districts of Kamrup, Goalpara, Darrang, Nowgong, and Sibsagar while small pox occurred in the districts of Goalpara, Nowgong, Sibsagar and Lakhimpur which took 67 and 31 lives respectively.

The notable aspect of health facilities in Assam during the fourth plan period was the introduction of Contributory Health Services Scheme for the government employees residing at Shillong on an experimental basis in February 1971. Later it was expanded to Dhubri, Gauhati, Silchar and Tezpur. Employees State Insurance Scheme was expanded to Dhubri, Gauhati, Dibrugarh, Makum and Tinsukia during this plan period

In the field of treatment, about 1.69 lakh patients were treated indoor and about 60 lakh outdoor at various government hospitals, dispensaries and primary health centres. In addition, 551 indoor and 9,528 outdoor patients were treated

in Ayurvedic College, 981 T.B. cases were treated in T. B. hospitals and clinics and 1,224 cases were treated in the Mental Hospital, Tezpur.

3.5. Efforts after the Reorganisation of Political Boundaries of Assam.

The total number of government hospitals stood in the State by the end of the fourth plan at 54 and dispensaries 416 and hospital beds at 5,642 against 73 hospitals and 627 dispensaries by the end of the third plan. This difference occurred due to change in the political boundary of Assam made in 1972. Garo Hills district, United Khasi and Jaintia Hills district and Mizo district were separated from the State of Assam in the said year in order to form separate political units viz. Meghalaya and Mizoram. During the fourth plan period, Assam got one more medical college hospital at Silchar which came up in 1968 and as a result the total number of medical college hospitals in the state stood at three. They were equipped with modern treatment facilities and experts in many disciplines. Dibrugarh Medical College hospital and Gauhati Medical College hospital had special treatment facilities for the most dreadful disease, cancer. There was no new mental hospital set up during the fourth plan period, only the Mental Hospital, Tezpur was rendering facilities for the treatment of mad and non-criminal lunatics in Assam. During

this plan period, 4 new primary health centres were established at Kakapathar in Dibrugarh district, Bihdia in Kamrup, Samaguri in Nowgong and Sapekhati in Sibsagar district. Altogether there were 146 primary health centres during this plan period extending medical facilities to the people residing in the rural and urban areas in the State.

Despite delimitation of political boundary of Assam in 1972, the percentage rate of increasing doctors was significant being 5.47%. The area to be served by a doctor stood at 12.67 Sq. Km by the end of the plan against 20.46 Sq. Km at the beginning of the fourth plan. The situation of population hospital and population dispensary were improved. For instance, there was one hospital within 2,032.85 Sq. Km and a dispensary within 252.81 Sq. Km in 1969-70 which was reduced to 1,454.12 Sq. Km and 198.79 Sq. Km respectively.

After much development, deficiency still remained in rural areas with regard to dispensaries, bed in rural dispensaries and primary health centres. Out of 5,000 hospital beds available in the public sector health centres in Assam during the said plan period only 500 beds were available in rural areas and the rest were available in urban areas. In addition, 78 primary health centres out of 143 had neither office nor residential accommodation for doctors and other health personnel.

Depending on this condition, the Fifth Five Year Plan kept an objective to make up the backlog in such a way so as to reach the All India standards within 15 years. The plan also aimed at to narrow down the gap between rural and urban health facilities in a planned way.

Urban and rural health problems are not alike. People of urban areas are more prone to communicable diseases while people of rural areas are likely to suffer from malnutrition. Hence, policies relating to health should be different. Since health facilities were inadequate in relation to demand in rural areas, the fifth five year plan gave much emphasis on rural health covering preventive health care, nutrition programme and family planning programme. Medical facilities were extended to rural areas through primary health centres. The government of Assam, therefore, decided to establish 53 primary health centres at the block level in rural areas of which 30 centres would be located at most populous blocks and rest 23 in tribal and backward areas. 30 primary health centres were selected to upgrade as 30 bedded hospital and 600 new sub-centres would be established on the basis of one sub-centre for 10,000 people.

Although the State Government targeted to eradicate malaria and small pox from the State by 1964, but malaria was still recurring in the State. Therefore, the government decided to pursue vigorously to eradicate it during the fifth plan period. The government also gave much importance to the

Table 3.13: Fifth Five Year Plan Outlays & Expenditures on Health in Assam.

(Rs. in lakh)

Head of Development		5th Five Year Plan outlay	1974-78 Actuals	1978-79 Agreed outlay		Proposed outlay 1978-79	
				Total	Of which M.N.P.	Total	Of which M.N.P.
Medical, Public Health & Sanitation							
(a) Medical (Excluding E.S.I.)	G	500.50	823.22	330.00	179.00	3,116.00	1,431.00
	H	46.00	97.85	48.50	21.00	364.00	200.00
	T	-	-	-	-	-	-
(b) Public Health & Sanitation	G	673.50	Included in (a)	Included in (a)	Included in (a)	Included in (a)	Included in (a)
	H	-	-	-	-	-	-
	T	-	-	-	-	-	-
(c) Employees State Insurance Scheme (E.S.I.)	G	-	-	1.50	-	20.00	-
	H	-	-	-	-	-	-
	T	-	-	-	-	-	-
Total Medical, Public Health & Sanitation	G	1,174.00	823.22	331.50	179.00	3,136.00	1,431.00
	H	46.00	97.85	48.50	21.00	364.00	200.00
	T	1,220.00	921.07	380.00	200.00	3,500.00	1,631.00

G = General, H = Hills, T = Total.

Source: Draft Fifth Five Year Plan Outline. Planning and Development Department, Assam, p.66.

programmes to combat other communicable diseases such as cholera control programme, T.B. vaccination programme, leprosy control programme etc. The total plan allocation for the Fifth plan was 1,220 lakh. against 746.61 lakhs in the fourth plan (Table 3.13).

Although health programmes got considerable attention during the fifth plan but achievements were not spectacular. Health facilities from government sources did not increase adequately. However, the number of government hospitals increased from 54 in 1974 to 55 in 1979 and government dispensaries increased from 401 in 1974 to 425 in 1979 i.e. the percentage increase was 11.03%. The total medical personnel increased to 6,884 in 1976 against 6,200 in 1974 i.e. the percentage increase was 5.52% and auxiliary health personnel increased from 11,364 in 1974 to 12,050 in 1976 (i.e. 16.04%). There were only three medical college hospitals with 2,277 beds, 17 sub-divisional hospitals, 2 T.B. hospitals and 1 mental hospital at the end of the Fifth Five Year Plan.

4. An Evaluation of the Achievements: An Overall Account

Progress in the field of health care can be evaluated through life expectancy at birth, fall in death rate, control of communicable diseases etc. Achievements by were not insignificant during the planning period in Assam. Persisting

government efforts made it possible to check the severity of some diseases like cholera, small pox, tuberculosis, malaria etc. Owing to the expansion of health facilities, Assam has been reported to be free from plague. Tuberculosis has now been made a curable disease and the death toll has been reduced remarkably. Malaria cannot create havoc in the State as it did in the past. Life expectancy also has increased significantly from 32 years in 1941-51 to 53 years in 1976-80 and death rate has fallen from 27 per thousand population to 14 per thousand population. Health facilities have been decentralised so that rural masses can enjoy medical facilities from the government sources.

In spite of much government efforts during the plan periods, health facilities are not adequate in the State of Assam. The standard of health services continues to be lower than other States of India. A wide disparity is still present between urban and rural health facilities. The primary health centres and dispensaries have to cover a large area and population and therefore, they cannot serve the entire population. Due to lack of adequate finance, standard of health services has been sub-standard. Even though malaria, small pox, cholera and similar diseases have greatly been controlled, still they often appear to take human lives. The target to eradicate malaria and small pox by 1964 — remains in the policy.

Although the incidence of malaria has been checked to a great extent, but it recurs in the State now and then. Cholera still occurs in an endemic form in Kamrup district. The present government hospital facilities in the State are utterly inadequate to meet the growing demand for hospital services. It has been roughly estimated that for 2,000 persons one hospital bed is available in the State whereas the national objective is to have at least one bed among 1,000 people. Even on its account, as it will be shown in the following chapters, the indicators of the general level of development of health facilities provide us with picture of high pressure of population on health facilities. Of course, this is so partly due to the rapid increase in population in the State on account of natural growth and immigration. Nevertheless it also shows that development of health facilities have not attracted the attention and efforts of the government commensurate with their worth and suggest that an increasing intensity of concern is warranted.

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6. Draft Outline. Third Five Year Plan (1960-61- 1965-66).
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CHAPTER - IV

FORMULATION OF EVALUATION CRITERIA

The objectives of the ongoing chapter are twofold: (1) to discuss theoretically the foundations on which the criteria of evaluation of the public efforts to develop the health facilities may be decided, and (2) to choose certain criteria on which the public efforts to develop the health facilities carried out by the government of Assam since the beginning of the plan period can be evaluated.

1. Theoretical foundations of the criteria of evaluation of public efforts to develop health facilities:

1.1 The Objective of Evaluation

To discuss on the theoretical foundations of the criteria of evaluation of public efforts to develop health facilities it is required that the "objectives of evaluation" must be clearly stated. One of the possible objectives of evaluation is to make an appraisal or to analyse whether the public efforts could meet their "stated objectives" or not.[1] However, more often than not, the "stated objectives" are qualitative in nature and targets in quantified terms are not stated. In such a case it would be impossible to decide whether the stated objectives are met or not unless we concede to measure the success of the public efforts in degrees on certain scale.

In case the stated objective is only one, it is easier to devise a scale on which the degree of success can be measured. However, usually, this is not the case. The objectives of a public policy or efforts are many and these objectives are often in conflict with one another. In such a case the task is to carry out a multi-criteria evaluation. If each of the objectives in this type of problem is such that it admits of measurement of the degree of success in attaining it, the multi-criteria evaluation is amenable to be dealt with as a vector maximum problem. Once this is possible, we require weights to be assigned to each objective and using these weights, the degrees of success in meeting different objectives are subjected to a weighted aggregation yielding the degree of overall success in meeting the objectives. However, the problem of choosing suitable weights has always been tricky and as yet no objective method to decide weights is known.

Ragner Frisch[2] suggests a method that may sometimes be useful to get a rough estimate of the weights. He considers that these weights are nothing but the coefficients of a social preference function (operational social preference function) associated with the objectives of the public policy whose success can be measured in degrees. In applying his method he suggests the analyst to approach the represen-

tative of the society with a menu of alternatives recording different degrees of attainment of different objectives and to seek his preferences. By varying the degrees of attainment of different objectives in the menu, the analyst can ascertain those particular combinations of the degrees of attainment of different objectives about which the representative of the society reveals his indifference. Through these combinations it is possible to work out the relative weights to be assigned to different objectives of the public policy.

But difficulties in applying the method suggested by Frisch are immense. First, the question is, who is the representative of the society.[3] It is rather impossible to find one. The society is comprised of different classes whose interests often conflict with one another, and each class has a set of arguments that can justify its interests. The ideologies for justifying interests of different classes are different and often incompatible with one another. Further, suppose we are ready to approach the representatives of different classes and determine the weights of class-preference functions, the question is how to combine a number of class preference functions to make a single social preference function. Once again we have to decide weights to be assigned to different class preference functions such that

they can be aggregated. It is not difficult to see that the procedure is leading to an infinite regress.

The consequences of the indeterminacy noted above are that while for one the attainments of the public efforts may be highly satisfactory, for some other, these attainments may be unimportant and illusive. Thus one may applaud the grand success of the public efforts while the other may dismiss it as an utter failure.

The next problem associated with the exercise of appraisal is the legitimacy of the practice of entertaining only the "stated objectives" for appraisal. A public program that has been implemented may have many side-effects which did not make an appearance in the "stated objectives". It is possible that those who formulated the program could see these side-effects before hand but they did not take note of them explicitly and such an action may sometimes be purposefully directed. On other occasions, the side effects might not have been foreseeable. In any case, one may argue that appraisal should be made on the overall effects of the efforts and in accounting for the overall effects all the effects - intended and unintended, stated and not stated, foreseen and unforeseen, should be included in the exercise of appraisal.

Another possible "objective of evaluation" of a public policy/programme is to "learn from the experience" in order to perform better in the future. If this be the objective of evaluation, it is suggestive and corrective. A receptive body of public authorities and policy-makers then admits of the shortcomings that it had had in formulating or/and implementing the programme. This objective of evaluation copes up easily with the proposals of including the extraneous criteria, the unstated objectives and unforeseen side effects in the appraisal of the public policy/programme.

1.2 Economic evaluation versus social evaluation

The choice of criteria of evaluation of public policies/programmes depends to a great extent whether the basis of evaluation is economic or social. Economic evaluation has a different frame of reference than the social evaluation has and in accordance with the frame of reference the justification of the criteria is put forth.

Economic evaluation is based on the idea that at a given point of time a society has limited resources at its disposal and they may be allocated to different programmes that may have different objectives to meet. These programmes and their objectives may be competing among themselves to

claim for the limited resources. All these programmes and objectives differ in their importance and the urgency of their fulfilment. A prudent decision to allocate the limited resources would be to optimise the resource use such that the net benefit from the programmes is maximised.

To illustrate, let us take up the problem of evaluating the public programmes on the development of health facilities. The public exchequer has a limited amount of resources and the budget is rather fixed. The physical assets and raw materials too are limited. The ultimate objective of the public programmes is to help the people live better. This objective may be met by so many possible alternative programmes e.g. financing industries to produce necessary and comfort goods, improvement of the communication and transportation network, improvement of the law and order situation improvement of educational infrastructure and so on. Then we must allocate the limited physical and financial resources on different programmes such that the living condition of the people in general is improved to the greatest possible extent.

But the questions raised by the above approach are many in number. First, what do we mean by the living condition of the people in general? What are the indicators that

measure different aspects of the living condition of the people? How to make a comprehensive and single measure or index that may be used to measure the overall living condition of the people? Should we proceed on the principle "the greatest good of the greatest number" or "to each according to his need?"[4] And that is not all. How to measure the benefits from the improved educational infrastructure or improved transportation network, increased employment, production of necessaries and comforts, capital goods and consumption goods and so on?

The conclusion following from a perusal of these questions is that to evaluate the programme on improving the medical infrastructure necessitates the evaluation of all the public programmes together. But this is not a viable proposition. Even if it were viable, the problem of measurability of benefits is practically unsolvable. From the operational point of view, therefore, evaluation must be carried out on ad-hoc basis and this is what is really done in practice.

The ad-hocism in the practice of evaluation goes with an ad-hocism in the choice of the criteria of evaluation. These criteria are always subject to falliability in more or less degree, but there is no escape from ad-hocism.

The social basis of evaluation has a different frame of reference. The utilitarian element that is dominant in the economic evaluation is disregarded here. Social justice in the democratic framework and human rights are invoked to justify the social evaluation.[5] But this approach too is not free from the problems. The objectives of the society and the place of an individual in the society, the conflict between the social choice and individual values and such questions are no easy matter to decide. On these issues there are different viewpoints, and each viewpoint has a support of an elaborate system of philosophy. These philosophies are often conflicting among themselves. Social evaluation based on the philosophy of Nietzsche will applaud what the social evaluation based on the philosophy of Bentham or that of Rousseau will condemn.[6] The result is that one cannot help but take sides and face criticism. The choice of criteria for social evaluation will depend on the ideology defining the relations of an individual with the society and the state, the objectives of the social organisation and polity and the related issues. That is to say that the choice of criteria of evaluation is not ideology-neutral.

Attempts have been made to put the economic and social bases of evaluation of public policies/programmes together in a broader framework. Social justice may be defined on

utilitarian grounds. Earlier works on the choice of criteria of evaluation sought their justification on the economic grounds where economics was concerned with the market-mechanism or the institution of exchange. Recently, however, economics has broadened itself not to be limited to the market mechanism, but to include what has been named as the grants Economics.[7] K. Boulding, the leader proponent of grant economics maintains that the "exchange system" is only one of the three major modes of organising social life. The other two are the "threat system" and the "integrative system", the last one giving rise to the Grants economics. In the broad framework, then, social basis of evaluation is not beyond economics. Of course, here economics means a generalised economics that includes "Exchange economics" and "Grants economics".

Sometimes regarding evaluation of public policies/programmes the question has been raised whether the programmes produce capital goods or consumption goods. That is to say that, for example, expenditure on health should be considered an investment in human resources or public consumption.[8] Unfortunately, when we are empirically dealing with the issue, there is a great deal of indeterminancy in classifying the goods and services into these two categories. Myrdal argues that in underdeveloped economics where people live on a very

low level of consumption, an increase in consumption expenditure may be regarded as investment. After all, consumption of necessaries leads to enhancement of productive capabilities and efficiency. Viewed as such, consumption expenditure is investment in effect as it leads to an increase in production. However, at a higher level of consumption expenditure, the marginal productivity due to consumption declines to zero or becomes insignificant[1]. Now, when we take up the issue of public expenditure on health programmes, one may argue that in underdeveloped economies where people have scarcely enough resources to spend on medical care, every rupee spent on health programme is an investment. But one must note that it may be misleading if held indiscriminately. In underdeveloped economies the rate of unemployment also is very high and this is particularly true of the Indian economy. Since the human resources, whatever their quality might be, are not utilised properly due to the problem of unemployment, an investment on human resources would not bear any production Hence, in such a situation every rupee spent on improving the health condition may not be considered as investment.

Once again we invoke the issue of human rights. To be unemployed is not by volition. It is because the society is not in a position to generate enough employment opportunities. The security of the unemployed is the duty of the society and

the State. Hence, if expenditure on health facilities does not increase production, the State should not attempt to curtail this expenditure; rather it should try to generate more employment such that the unemployed manpower can be productively employed. Once we stretch this issue further, the task of evaluation of public expenditure on health programmes becomes very much involved.

The discussion on the theoretical foundations of the choice of criteria of evaluation of public expenditure/policy/programmes on health immediately suggests us that it is very difficult, if not impossible to choose the criteria of evaluation without arousing ideological controversies and even more, to justify a set of criteria will diverge much in practice than what the theoretical considerations would prescribe. The limitations posed before a practising evaluator are, therefore, obvious. Keeping this in view it has been decided that in the present exercise we will adopt the social evaluation method in the broad economic framework. Since it is not practicable to evaluate the real benefits of the health programmes, nor the opportunity cost thereof, we will proceed with some operation criteria.

2. Operational Criteria for Evaluation of Public Expenditure/ Programmes on Health Facilities in Assam

2.1 Operational Considerations

Rather axiomatically, we assert that the objective of the public expenditure on health and programmes to develop health facilities in the State of Assam has been to improve the health condition of the people in general. In fact, this objective has been declared to be the "maintained" purpose of the public efforts in this direction. The Constitution of India accords that "the state shall regard the raising of the level of nutrition and the standard of living of its people and the improvement of the public health as among its primary duties."[9] Maintenance of public health has explicitly been given an economic justification as the draft of the first five year plan clearly mentioned that:

> "in terms of resources for economic development, nothing can be considered of higher importance than the health of people which is a measure of their energy and capacity as well as of the potential of manpower for productive work in relation to the total number of workers maintained by the nation. For the efficiency of industry and agriculture, the health of the workers is an essential consideration."[10]

Further, this maintained objective and justification for the same is reflected by the Draft third five year plan which states:

> "the broad objective of the health and family planning programmes... is to expand health services, to bring about progressive improvement in health of the people by ensuring a certain minimum of physical well-being and create conditions favourable to greater efficiency and productivity."11

An explicit recognition of the physical well-being at certain minimum level is a characteristically significant point for consideration. Further, in the fourth five year plan distributional justice was highlighted. The public efforts were strongly criticised to favour urban areas and as a response to the same, the fourth plan made a note to improve health facilities in rural areas.

We note therefore that the objective of the maintenance and improvement of health conditions are based on three arguments: (a) the productivity argument, (b) well-being argument, and (c) equity and distributional justice argument.

In any case, to estimate as to what extent the public efforts to maintain and improve health condition of the people led to a rise in productivity is a difficult, if not an impossible task. The net domestic product of the State of Assam has significantly increased during the period of our study. In 1961, the NDP of Assam was around Rs. 300 crores

(at 1948-49 prices) which increased to Rs. 514 crores (at 1948-49 prices) in 1976-77. But this increase may be accounted for several aspects of development like technological, structural and infrastructural aspects. To what extent did these factors raise the productivity of the workers and what net rise is attributable to the improved health conditions is a difficult and tedious task to resolve, which at any rate, requires an elaborate and independent study solely directed to accomplish with.

Similarly, the physical well-being of the people on account of improvements in health facilities is no easy matter to yield to measurement. However, this problem is not as difficult as the measurement of improvements in productivity due to improvements in health condition. Per capita income of Assam was Rs. 253.3 (at 1948-49 prices) in 1960-61. It increased to Rs. 300 in 1976-77 (at 1948-49 prices). Health facilities were significantly improved during this period as we have noted in the preceding chapter. Death rate in rural and urban areas declined significantly. Birth rates also decreased considerably. Life expectancy at birth also recorded a significant improvement. On these indicators we have enough data that may be analysed to appreciate the achievements of development in health facilities.

So far the objective of equity and distributional justice is considered we may study the district wise distribution of health facilities and it may be helpful in evaluating the public efforts in meeting this objective. Similarly, the issue of equity of distribution of health facilities in rural and urban areas may be studied.

2.2. Criteria for Evaluation

Since we admit of our inability to measure the contribution of improved health facilities to the improved efficiency and productivity, we propose that the improved health facilities by themselves are the measure of the degree of success of the public efforts. We assume that improved health facilities have led to an improvement in efficiency and productivity.

The physical well-being of the people may be measured by the birth rate, death rate and life expectancy at birth. It may be measured by the structure of occurrence of death due to different reasons — diseases, casualities and the remainder. We envisage that the physical well-being increases with decrease in birth and death rates and increase with life expectancy at birth. Further, if the proportion of deaths due to diseases and casualities decrease, we envisage that the well-being of the people in general is increased.

With the above consideration we propose the following criteria for evaluation of public efforts on improving the health facilities in Assam.

(1) Criteria of Improvement in Public Health Facilities (Institution and personnel)

(a) Area served by a Government hospital.

(b) Area served by a government dispensary.

(c) Area served by a Doctor.

(d) Population served by a Doctor.

(e) Population served by a Nurse.

(f) Beds attended by a nurse.

(g) Beds attended by a midwife.

(h) Population served by an auxiliary nurse-cum-midwife.

(i) Beds attended by an auxiliary nurse-cum-midwife.

(j) Population served by a Dhai.

(k) Population served by a Health Visitor (health visitors are exclusively meant for rural population).

(l) Indoor and outdoor patients treated.

(2) Criteria of Improvement in Physical well-being

(a) Birth rate.

(b) Death rate.

(c) Life expectancy at birth.

(d) Proportion of total deaths due to diseases and casualities.

(e) Occurrence of contagious and epidemic diseases.

(3) Criteria of Improvement in distribution of health facilities

(a) District wise distribution of health facilities measured per area and per population.

(b) Distribution of health facilities in rural and urban areas per population.

The degree of success of public efforts in improving the health condition of the people is inversely related with the measures of area, population and beds served by a unit of medical institution and medical personnel. That is to say, a decline in area, population and beds served will indicate a greater degree of success. Similarly, decline in birth rate, death rate, proportion of deaths due to diseases and casualities, and occurrence of contagious and epidemic diseases will indicate a greater degree of success. However, increase in life expectancy at birth and number of patients treated will indicate a greater degree of success. Further, a movement of distributional share of districts and rural/urban people towards equality will measure a greater degree of success in attaining the distributional justice.

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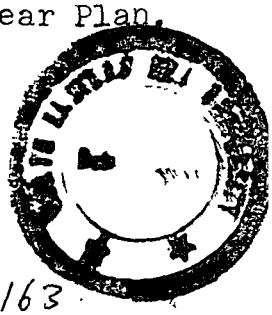

CHAPTER - V

DEVELOPMENT OF MEDICAL INFRASTRUCTURE IN ASSAM IN THE POST-INDEPENDENCE PERIOD: AN ANALYSIS OF GROWTH TRENDS

In Chapter III, we have analysed the growth of public expenditure on health programmes and development of medical infrastructure in the State of Assam. In this chapter our main objective is to analyse how, on account of the governmental efforts, medical infrastructure developed in the post-independence period. The medical infrastructure comprises of the medical institutions like hospitals, dispensaries, beds etc. and medical personnel, like doctors, nurses, midwives, auxiliary nurse-midwives, health visitors, dhais etc. The efficiency of the medical infrastructure is judged on the basis of the number of population served by them together with the area they cover. It is obvious that in cases when the number of population served by them is too large or/and the area covered by them is too large, their efficiency declines. In a populous State like Assam a sizeable load of population on the medical infrastructure is expected, but if this load declines through time, it may be concluded that their efficiency increases.

1. Government Hospitals

In 1950-51 there were 40 hospitals (government) in Assam. To this, three hospitals were added during the 1st

plan period. By 1960-61,51 hospitals were there in the State. During the third 5 year plan this number increased to 64 and by 1967-68 this number increased to 73. With the separation of Meghalaya and Mizoram from Assam, the present state of Assam was left with only 54 hospitals in 1972 and till 1978-79 not even one hospital could be added to this figure. However, during 1979-81 one hospital was set up to make the total number of hospitals in the State at 55.

In 1950-51, the area served by a government hospital was 2,490 Sq. kilometers. By the end of the 1st 5 year plan, this figure declined to 2,317 Km^2. By the end of the 2nd 5-year plan it further decreased to 1953 Km^2. In 1966, this figure was at 1556 Km^2. The area served by a hospital in the State further dropped down to 1454 Km^2 in 1972. After 1972, till 1979, the area remained more or less constant. However, it dropped down to 1267 Km^2 in 1981.

To analyse the trend in the decline of area served by a hospital in the State we have fitted three curves. They are:

$$\hat{AH} = 2472.407 - 39.835\ t;\ R^2 = 0.793,\ n = 31.$$
$$(37.19)\quad (10.99)$$

$$\hat{AH} = 2609.002 - 64.685\ t + 0.777\ t^2;\ R^2 = 0.807, n = 31.$$
$$(26.01)\quad (4.48)\quad (1.77)$$

$$\hat{AH} = 2674.09 - 87.288\ t + 2.515\ t^2 - 0.036\ t^3$$
$$(18.63)\quad (2.28)\quad (0.91)\quad (0.64)$$

$$R^2 = 0.803,\ n = 31.$$

(Figures in brackets are Student's t values. This convention will be maintained hereafter).
Where AH is the Area (in Km^2) served by a government hospital, t is time (1 for 1951 .... 31 for 1981).

It is indicated by the value of R^2 and student's t values associated with the coefficients that the linear curve is quite well fitted, suggesting that the area served by a hospital decreased steadily at the rate of 39.84 Km^2 per year.

In 1950-51, population served by a hospital was 205.6 thousand which, however increased to 271.9 thousand in 1976 and 282.0 thousand in 1981, and thus every year about a load of 2.5 thousand people per hospital increased. These figures show that during 1951-81 growth of population was more rapid than the growth of the hospitals in the State leading to an increased load of population on the medical infrastructure, or alternatively, enough number of hospitals were not set up to keep up the pace with the growth of population in the State.

2. Government Dispensaries

In 1950, the number of government dispensaries in Assam was 176. In the terminal year of our analysis (1981) the number increased to 435. The table given below gives us

the number of dispensaries, area served per dispensary and population served per dispensary in the 1st Five Year Plan onwards.

Table 5.1: Number of government dispensaries, area and population served by a dispensary in Assam.

Year	1950	1955	1960	1965	1972	1975	1981
No. of dispensaries	176	299	651	701	392	411	435
Area served by a dispensary in Sq. Km.	566	333	153	142	200	191	181
Population served by a dispendsary (in 1000)	46.74	27.51	17.05	15.84	38.16	36.38	35.00

A perusal of the table 5.1 reveals that during the period 1950-71 number of dispensaries increased rapidly and the load of population and area to be served by a dispensary declined with a great speed. However, after the division of Assam, a good number of dispensaries, much more than commensurate with the population and area, went in Mizoram and Meghalaya. As a result, we see that in 1972 the area served by a dispensary and population served by a dispensary increased substantially. Since 1972 the pressure of population and area to be served by a dispensary could not be lessened to any significant extent.

To analyse the trend in the decline of area served by a dispensary in the State during 1950-81 period we have fitted three curves as follows.

$$\hat{AD} = 377.392 - 8.328\ t \quad ; \quad R^2 = 0.38,\ n = 31.$$
$$\qquad\quad (11.32) \quad (4.58)$$

$$\hat{AD} = 541.640 - 38.192\ t + 0.933\ t^2 \quad ; \quad R^2 = 0.73,\ n = 31.$$
$$\qquad\quad (15.74) \quad (7.71) \quad (6.21)$$

$$\hat{AD} = 696.052 - 91.881\ t + 5.062\ t^2 - 0.086\ t^3$$
$$\qquad\quad (26.34) \quad (13.05) \quad (9.99) \quad (8.25)$$
$$R^2 = 0.92,\ n = 31.$$

Where AD is Area (Km^2) served by a dispensary. Among these trends the last one (Cubic curve) fits best to the data as judged on account of the value of R^2 and the t values associated with the coefficients.

3. Doctors

Doctors deserve the most important position among the health personnel. In Assam, the number of doctors with the beginning of the plan period (1950-51) was 2423 which increased to 8000 in 1981. The following table provides us with the figures how doctors, area served by a doctor, and population served by a doctor have undergone changes in the period 1950-1981.

Table 5.2: Number of Doctors, area and population served per doctor in Assam

Year	1950	1955	1960	1965	1972	1975	1981
No. of doctors	2423	2998	3608	4245	5676	6884	8000
Area served per doctor (Km^2)	41.11	33.23	27.61	23.47	13.83	11.41	9.81
Population per doctor (1000)	3.40	2.74	3.08	2.62	2.64	2.17	2.20

We have fitted three curves to analyse the growth of doctors in the State of Assam during 1950-81 period. These curves are given below.

$$\hat{DR} = 1948.120 + 166.384\ t;\ R^2 = 0.956,\ n = 31.$$
$$(18.04)\quad (23.79)$$

$$\hat{DR} = 2552.086 + 36.963t + 4.793t^2;\ R^2 = 0.994, n = 31.$$
$$(41.84)\quad (3.55)\quad (12.81)$$

$$\hat{DR} = 2283.943 + 145.985t - 5.113t^2 + 0.245t^3;\ R^2 = .998$$
$$(56.591)\quad (11.49)\quad (4.72)\quad (9.27)\quad n = 31$$

where DR is the number of doctors in Assam.

Similarly, we have fitted three curves to analyse how area served per doctor has declined over time in Assam. The curves are given below.

$$\hat{ADR} = 40.549 - 1.127t; \quad R^2 = 0.986, \ n = 31.$$
$$(99.11) \quad (42.54)$$

$$\hat{ADR} = 40.523 - 1.121t - 0.0002t^2; \ R^2 = 0.985, \ n = 31$$
$$(61.50) \quad (9.97) \quad (0.05)$$

$$\hat{ADR} = 42.58 - 1.958t + 0.076t^2 - 0.002t^3;$$
$$(56.99) \quad (8.33) \quad (3.78) \quad (3.84)$$
$$R^2 = 0.991, \ n = 31.$$

where ADR is Area (Km^2) served per doctor.

The trend curves fitted to analyse the rate of decline in population served by a doctor are given below:

$$\hat{PDR} = 3068.87 - 30.161t \ ; \ R^2 = 0.446, \ n = 31.$$
$$(31.53) \quad (4.79)$$

$$\hat{PDR} = 3180.644 - 54.113t - 0.887t^2; \ R^2 = 0.443, \ n=31.$$
$$(20.68) \quad (2.06) \quad (0.94)$$

$$\hat{PDR} = 3479.515 - 175.630t + 11.929t^2 - 0.273t^3; R^2 = .508$$
$$(16.79) \quad (2.69) \quad (2.15) \quad (2.01) \quad n = 31$$

where PDR is population served per doctor.

If we compare the curves of ADR and PDR we find that in both cases the cubic equation is a better fit. However, in case of ADR, the explanatory power of the cubic curve is very high ($R^2 = 0.991$) while in case of PDR the explanatory power of the curve is rather low ($R^2 = 0.508$).

4. Nurses

Of all the auxiliary medical personnel, nurses occupy the top position. Their contribution to general health is magnificent. Life of a sick person/patient in the hospital largely depends on the efficiency of nurses. They may take a responsible role in preventing diseases. The activities of a nurse are not confined within a hospital or a dispensary, but also have a broad field outside these medical institutions, and thus their contribution to keep up the health of the people in general is great.

The total number of nurses in Assam during 1950-51 was 263. In 1955-56 it increased to 428 and by 1960-61 it recorded at 900. The growth rate kept pace with the growing population in the State and in 1965-66 the number of nurses increased to 1464. The division of Assam did not affect the growth in the number of nurses. In 1972-73 it became 1888 and by 1981 the number well over 2.6 thousand. The area and population served per nurse declined over time.

The following table presents how the number of nurses increased with time and the hospital beds and the population served by them reduced in 1950-81 period.

Table 5.3: Number of nurses, hospital beds and population served by a nurse in Assam

Year	1950-51	1955-56	1960-61	1964-65	1971-72	1975-76	1980-81
No. of nurses	263	428	900	1464	1835	2044	2650
Population served by a nurse (1000)	31.27	19.22	12.34	7.58	8.15	7.32	5.80
Beds attended by a nurse	9.45	6.54	3.88	3.84	2.92	3.10	2.60
No. of beds (1000)	2.49	2.80	3.50	5.63	5.37	6.35	6.87

It is noted that since 1971-72 the number of beds increase appreciably, but the number of nurses did not increased so rapidly, which led to increase in the beds attended by a nurse. However, in 1977-81 period the position improved considerably.

To analyse the growth trends in the number of nurses in Assam we have fitted three curves. They are:

$$\hat{N} = \underset{(0.36)}{-14.505} + \underset{(36.91)}{85.512t} \; ; \; R^2 = .979, \; n = 31.$$

$$\hat{N} = \underset{(1.60)}{92.185} + \underset{(7.34)}{64.862t} + \underset{(2.41)}{0.688t^2}; \; R^2 = 0.982, \; n = 31.$$

$$\hat{N} = \underset{(1.63)}{134.163} + \underset{(2.11)}{49.369t} + \underset{(1.09}{1.958t^2} - \underset{(0.72)}{0.028t^3};$$

$$R^2 = 0.982, \; n = 31.$$

where N = number of nurses.

A specification analysis of the curves fitted above would suggest that the cubic curve is not a correct specification of the growth trend in the number of nurses in the State. The quadratic curve is better specified one among the three curves fitted.

Similarly, we have fitted three curves to analyse how the load of population per nurse has declined over time. These curves are:

$$\hat{PN} = \underset{(16.53)}{23719.625} - \underset{(9.04)}{755.564t}; \quad R^2 = 0.733, \; n = 31$$

$$\hat{PN} = \underset{(33.70)}{31925.772} - \underset{(16.10)}{2343.850t} + \underset{(11.24)}{529.429t^2}; \; R^2 = 0.953, \; n = 31.$$

$$\hat{PN} = \underset{(23.70)}{35853.681} - \underset{(6.74)}{3793.586t} + \underset{(3.73)}{171.730t^2} - \underset{(2.67)}{2.640t^3}$$

$$R^2 = 0.983, \; n = 31.$$

where PN is the population served by a nurse.

The beds attended by a nurse has shown that they follow a quadratic trend or a cubic trend. This is shown by the curves fitted in the data on beds attended per nurse.

$$\hat{BN} = \underset{(23.64)}{7.872} - \underset{(11.17)}{0.217t}; \; R^2 = 0.809, \; n = 31.$$

$$\hat{BN} = \underset{(27.90)}{9.480} - \underset{(10.11)}{0.528t} + \underset{(6.14)}{0.010t^2}; \; R^2 = 0.919, \; n = 31$$

$$\hat{BN} = 10.306 - 0.832t + 0.035t^2 - 0.006t^3$$
$$(23.70) \quad (6.74) \quad (3.73) \quad (2.67)$$
$$R^2 = 0.934, \; n = 31.$$

where BN is the number of beds attended by a nurse.

5. Midwives

Among the auxiliary medical personnel, the position of midwives is next to nurses. While nurses are a general purpose personnel, midwives have a more specialised role in taking care of the mothers and infants. Efficient midwives may greatly reduce the number of still births and infant mortality and also the loss of life of the mother.

The total number of midwives in 1950-51 was 335 which increased to 509 in 1955-56. In 1960-61, the number grew to 848. In 1965-66, the number of midwives increased to 1196. Division of Assam did not affect the number of midwives substantially and it recorded at 1378 in 1971-72. In 1975-76 the number increased to 1527, followed by 1700 in 1980-81. Number of beds attended by a midwife declined over time during the first two five year plans. However, during 1961-66 it showed a stagnation. After ward, once again a declining trend was observed but it could not continue longer. On the whole, it may be noted that the number of beds attended by a midwife remained constant at 4 after the end of the 2nd Five Year Plan, though temporal fluctuations have occurred here and there.

In the following table 5.4 the number of midwives and beds attended by them have been shown.

Table 5.4: Number of midwives and beds attended per midwife in Assam

Year	1950-51	1955-56	1960-61	1965-66	1971-72	1975-76	1980-81
No. of Midwives	335	509	848	1196	1378	1527	1700
Beds attended per mid-wife	7.41	5.50	4.12	4.70	3.90	4.15	4.00

We have fitted three curves to anayse how the number of midwives and the number of beds attended by a midwife have changed over time.

$$\hat{MW} = 268.892 + 49.888t; \quad R^2 = 0.983, \; n = 31.$$
$$(12.96) \quad (41.29)$$

$$\hat{MW} = 197.876 + 63.633t - 0.458t^2; \quad R^2 = 0.988, \; n = 31.$$
$$(7.11) \quad (14.89) \quad (3.32)$$

$$\hat{MW} = 269.360 + 37.249t + 1.704t^2 - 0.048t^3$$
$$(7.71) \quad (3.75) \quad (2.24) \quad (2.88)$$

$$R^2 = 0.990, \; n = 31.$$

Where MW is the number of midwives. The trend curves for the beds attended by a midwife are:

$$\hat{BMW} = 6.133 - 0.091t \; ; \; R^2 = 0.641, \; n = 31.$$
$$(28.85) \quad (7.33)$$

$$\hat{BMW} = 6.922 - 0.244t + 0.005t^2; \; R^2 = 0.758, \; n = 31.$$
$$(25.28) \quad (5.79) \quad (3.74)$$

$$\hat{BMW} = 7.580 - 0.486 + 0.025t^2 - 0.0004t^3;$$
$$(21.56) \quad (4.87) \quad (3.26) \quad (2.63)$$
$$R^2 = 0.803, \; n = 31.$$

Where BMW is the number of bed attended by a midwife.

If we compare the pattern of growth in beds attended by a nurse with the beds attended by a midwife, we find that though initially the number of beds attended by a nurse was greater than those attended by a midwife, through time this position was reversed. This has been due to a great deal of increase in the number of auxiliary nurse midwives who are close substitutes of midwives in taking care of the mothers and infants.

6. Auxiliary Nurse-midwives

Auxiliary Nurse-midwives function somewhere between the nurses, the general purpose medical personnel, and midwives, the special purpose medical personnel taking care of the gynaecological cases. Thus they are the close substitutes of nurses and midwives. The number of auxiliary nurse-midwives (ANM) has shown a rapid increase in the period under study. In 1950-51, their number was only 32. During the

first five year plan the increase in their number is not very great as they were only 51 in 1955-56. However, in the second five year plan their number increased rapidly to record at 408. Their number was doubled by 1965-66, and further it increased to 1345 in 1971-72. Since then their number is slowly increasing and it recorded over 1750 in 1980-81.

In general the growth rate of the number of ANM has superceded those of nurses and midwives. The following table gives a comprehensive idea of the increase in their number and decline in the number of beds and population served by them.

Table 5.5: Number of ANM, beds attended by ANM and population served by ANM in Assam.

Year	1950 -51	1955 -56	1960 -61	1965 -66	1971 -72	1975 -76	1980 -81
Number of ANM	32	51	408	783	1345	1542	1750
Beds attended per ANM	78	55	9	7	4	4	4
Population served by one ANM (in 1000)	257	161	27	14	11	9.7	8.8

The trend analysis of the number of ANM is presented by the following curves:

$$\hat{ANM} = -284.993 + 69.531t; \quad R^2 = 0.974, \; n = 3\cdot$$
$$\qquad\qquad (7.81) \quad (32.73)$$

$$\hat{ANM} = -149.718 + 43.348t + 0.873t^2; \; R^2 = 0.982,$$
$$\qquad\qquad (3.18) \quad (5.99) \quad (3.73) \quad n = 31.$$

$$\hat{ANM} = 76.763 - 40.242t + 7.722t^2 - 0.152t^3;$$
$$\qquad\qquad (3.14) \quad (5.79) \quad (14.48) \quad (13.01)$$
$$R^2 = 0.998, \; n = 31.$$

As we see, the cubic curve is the best fit in explaining the growth of ANM in the study period.

Beds attended per ANM has shown rapid decrease over time and the trend may be described by the following curves:

$$\hat{BANM} = 54.682 - 2.317t; \quad R^2 = 0.64, \; n = 31$$
$$\qquad\qquad (10.06) \quad (7.32)$$
$$\hat{BANM} = 83.805 - 7.953t + 0.188t^2; \; R^2 = 0.899, \; n = 31.$$
$$\qquad\qquad (18.52) \quad (11.44) \quad (8.36)$$
$$\hat{BANM} = 93.844 - 11.659t + 0.491t^2 - 0.007t^3;$$
$$\qquad\qquad (15.84) \quad (6.94) \quad (3.81) \quad (2.38)$$
$$R^2 = 0.914, \; n = 31.$$

where BANM is bed attended per ANM.

Population served by an ANM is described to be declining by the following trend curves.

$$\hat{PANM} = 176.299 - 7.460t;\ R^2 = 0.587,\ n = 31.$$
$$(9.04)\quad (6.57)$$

$$\hat{PANM} = 259.584 - 23.580t + 0.537t^2;\ R^2 = 0.770,$$
$$(11.37)\quad (6.72)\quad (4.73)\quad n = 31.$$

$$\hat{PANM} = 294.314 - 36.399t + 1.588t^2 - 0.023t^3;$$
$$(9.30)\quad (4.05)\quad (2.30)\quad (1.54)$$
$$R^2 = 0.781,\ n = 31.$$

Where PANM is population (1000) served per ANM in the State.

7. Dhais

Dhais are very important medical personnel who complement nurses and midwives. The number of Dhais was 501 in 1950-51 and it tripled during the 30 years since then. The following table may help us to see how their number, beds attended by them and population served by them changed over time.

Table 5.6: Number of Dhais and beds and population served by a Dhai in Assam.

Year	1950 -51	1955 -56	1960 -61	1965 -66	1971 -72	1975 -76	1980 -81
Number of Dhais	501	713	1162	1300	1411	1483	1490
Beds attended per Dhai	5	4	3	4	4	4	4
Population served per Dhai (1000)	16.4	11.5	9.6	8.5	10.6	10.1	10.0

The number of Dhais increased rather slowly. The trend curves fitted to their number are:

$$\hat{DH} = 588.687 + 37.182t; \quad R^2 = 0.887, \ n = 31$$
$$\qquad (13.95) \quad (15.14)$$

$$\hat{DH} = 349.450 + 83.486t - 1.543t^2; \quad R^2 = 0.978, \ n = 3$$
$$\qquad (12.08) \quad (18.79) \quad (10.74)$$

$$\hat{DH} = 331.292 + 90.188t - 2.093t^2 + 0.012t^3$$
$$\qquad (7.96) \quad (7.68) \quad (2.31) \quad (0.61)$$
$$R^2 = 0.978, \ n = 31.$$

Where DH is the number of Dhais. It is obvious that the cubic curve is mis-specified and the quadratic curve is the best fit to describe how the number of Dhais has grown over time.

The trend curves of beds attended per Dhai are given below:

$$\hat{BDH} = 4.047 - 0.005t; \quad R^2 = 0.06, \ n = 31$$
$$\qquad (18.48) \quad (0.43)$$

$$\hat{BDH} = 4.667 - 0.125t + 0.004t^2; \quad R^2 = 0.117, \ n = 31.$$
$$\qquad (14.94) \quad (2.61) \quad (2.58)$$

$$\hat{BDH} = 5.768 - 0.532t + 0.037t^2 - 0.0007t^3$$
$$\qquad (17.45) \quad (5.67) \quad (5.18) \quad (4.69)$$
$$R^2 = 0.511, \ n = 31.$$

Where BDH is beds attended by a Dhai.

It is obvious that the cubic curve fits the data well while the linear trend and quadratic trend are not fitting the data.

Population served per Dhai may be described to grow by the following trend curves:

$$\hat{PDH} = \underset{(3.12)}{32.651} - \underset{(1.89)}{1.150t}; \quad R^2 = 0.05, \; n = 31$$

$$\hat{PDH} = \underset{(4.15)}{62.053} - \underset{(2.98)}{6.840t} - \underset{(2.55)}{0.190t^2}; \quad R^2 = 0.21, \; n = 31.$$

$$\hat{PDH} = \underset{(5.33)}{100.273} - \underset{(3.92)}{20.947t} + \underset{(3.28)}{1.346t^2} - \underset{(2.86)}{0.026t^3}$$

$$R^2 = 0.38, \; n = 31$$

Where PDH is the population (in 1000) served by a Dhai.

It may be noted that the growth in the number of Dhais, beds attended by them, and population served by them cannot be explained very well by trend analysis as the curves fitted have rather poor explanatory power.

8. Health Visitors

Health visitors have a commendable hold to restore and keep up the general health in the State. They are treated as essential health personnel mostly in the less developed, remote rural areas where health institutions like hospitals are not within an easy reach. The system of health visitors

was primarily started to visit door-to-door in order to know the condition of physical health of the people and provide treatment on ailment as first aid. In addition, they also teach the rural masses about personal hygiene and sanitation and the necessary steps to be taken at the time of epidemic and contagious diseases. Hence, an increase in the number of health visitors is likely to control diseases, especially in rural areas.

But unfortunately much could not be done to increase the number of health visitors in the State. One would wonder to see that their number is only 50 in 1980-81 while it was 11 in the year 1950-51. The State of Assam is dominated by rural people and they exceed a crore in number. For such a large population, the number of health visitors should have been in thousands, but it is discouraging to see that population served by a health visitor exceeds 3 lakh, which is impossible for any one to take care of.

We note therefore, that the efforts of the government in improving the health facilities have mainly gone on to benefit the urban people while rural people have been rather forgotten. It is undesirable and shows that the public expenditure on health facilities have been directed to create imbalance between rural and urban areas. We will

return to this aspect later on when we will evaluate the health programme and public expenditure on them.

The trend of increase in the number of Health visitor and the population served by them may be described by the following curves.

$$\hat{HV} = \underset{(5.49)}{7.342} + \underset{(16.86)}{1.313t}; \quad R^2 = 0.907, \; n = 31$$

$$\hat{HV} = \underset{(6.60)}{11.873} + \underset{(1.58)}{0.436t} + \underset{(3.27)}{0.029t^2}; \quad R^2 = 0.931, \; n = 31$$

$$\hat{HV} = \underset{(3.18)}{7.121} + \underset{(3.44)}{2.190t} - \underset{(2.34)}{0.114t^2} + \underset{(2.98)}{0.003t^3}$$

$$R^2 = 0.947, \; n = 31$$

Where HV is the number of health visitors.

In case of population served by a health visitor, the trend curves are:

$$\hat{PHV} = \underset{(24.29)}{626.028} - \underset{(7.43)}{11.147t}; \quad R^2 = 0.647, \; n = 31.$$

$$\hat{PHV} = \underset{(19.09)}{699.835} - \underset{(4.51)}{25.432t} + \underset{(2.61)}{0.476t^2}; \quad R^2 = 0.710, \; n = 31$$

$$\hat{PHV} = \underset{(22.22)}{833.753} - \underset{(7.03)}{74.859t} + \underset{(5.53)}{4.526t^2} - \underset{(5.02)}{0.090t^3}; \quad R^2 = .85 \quad n = 31$$

Where PHV is the population (in 1000) served by a health visitor.

Concluding Remarks

As we have seen in the preceding sections, on account of the public efforts there has been a great improvement in the medical infrastructure. Nevertheless we note that the area served by the medical institutions and medical personnel is quite large and one cannot hope that for such a large area the medical institutions and personnel are enough to cater to the need of the people. One cannot expect a hospital to cater to the needs of 2.82 lakh people and similarly, one cannot expect a government dispensary to be adequate for servicing the health needs of 35 thousand people. Even if we assume that only 1% of people are ailing (which is by any standard too small a figure in the existing conditions of Assam) the load on the medical infrastructure becomes tremendously high that must reflect on the efficiency of the medical institutions and personnel and many people must not be in a position to be taken care of. It shows that in spite of the efforts of the government in expanding the medical infrastructure, people are not in a position to receive adequate medical care from the existing infrastructure.

Further we note that the development of medical infrastructure has been biased in favour of the urban areas. Rural areas have largely been ignored. For serving the rural areas properly and judiciously it was needed that adequate number of

health visitors and primary health centres should have been provided. We have noted that the number of health visitors is very small from the very beginning and they remained in a small number till 1981. Similarly, primary health centres which are primarily located in rural areas have not been set up in adequate number and they can at best be considered to be a drop in the desert of the rural needs for health facilities.

In 1968-69, there were only 90 primary health centres and area served by a primary health centre was 1107 Sq. Km. The number slowly increased to 146 in 1976-77 and area served by a unit of primary health centre declined to 538 Sq. Kms. The growth in the number stopped at 146 and till 1981 no new primary health centre had been established and thus the area served by a unit of primary health centre stagnated at 538 Sq. Kms. Now, one primary health centre catering to the needs of people living in a vast area of 538 Sq. Km. is utterly inadequate as the load of population on one primary health centre is over 138 thousand. We conclude therefore that the public efforts have been unjust to cater the needs of the rural people in the State of Assam.

CHAPTER - VI

DEVELOPMENT OF HEALTH FACILITIES IN ASSAM: AN EVALUATION

In this chapter an attempt has been made to evaluate the health facilities in Assam created by the public expenditure on improving the medical infrastructure since the beginning of the planning era. First, we construct an overall index of the level of development of health facilities in the State and later we use it as an explanatory variable for analysing the fall in death rate, birth rate, infant mortality rate and increasing the number of patients served. We have also evaluated the equity aspects of distribution of health facilities in the study period. Based on our findings we propose guidelines for health programmes that may be taken up for planning in future.

The Overall Development of Health Facilities in Assam: Constructing a General Index

In the preceding chapter we have seen that during the plan period (since 1951) different indicators of health facilities in Assam have grown at different rates and from this we may conclude that during the said period health facilities in the State have improved considerably. However, we lack in a comprehensive measure of the overall health facilities.

In this section an attempt has been made to construct a comprehensive measure of the health facilities in the State that we may refer to as a measure or an index of the development of health facilities in the State.

For constructing such an index we have selected the following twelve indicators of health facilities:

(1) Area (in Km^2) served by a government hospital = X_1
(2) Area (in Km^2) served by a government dispensary = X_2
(3) Area (in Km^2) served by a doctor = X_3
(4) Population served by a doctor = X_4
(5) Population served by a nurse = X_5
(6) Beds attended by a nurse = X_6
(7) Beds attended by a midwife = X_7
(8) Population served by a health visitor = X_8
(9) Beds attended by an auxiliary Nurse-midwife = X_9
(10) Population served by an auxiliary Nurse-midwife = X_{10}
(11) Beds attended by a Dhai = X_{11}
(12) Population served by a Dhai = X_{12}

Using the above enumerated twelve indicators, an attempt has been made to construct the said composite index of the level of development of health facilities. Now, this composite index must be such that it represents the said

twelve indicators in the best possible manner. For this we have carried out the principal component analysis.

The principal component analysis is a statistical method which constructs a composite index Z by linear aggregation of the original indicators X_1, X_2, ... X_m, such that

$$Z_i = W_1X_{i1} + W_2X_{i2} + ... + W_mX_{im}; \; i = 1, 2,....,n.$$

The composite index Z is an ideal representative of X as the sum of the squared correlation coefficients of Z with individual X's is maximum, that is

$\sum_{j=1}^{m} r^2_{zx_j}$ is maximised. Moreover, the weights assigned to different indicators in the construction of Z are the coefficients of correlation of Z with X. That is

$$r_{zx_j} = W_j.$$

Thus, the principal component Z is constructed such that $\sum W_j^2$ is maximised.

For constructing an index that we are interested in, one may derive the first principal component. But sometimes, it happens so that the representative power of the first principal component is very poor. It is poor in the sense that it explains less that 50% of the total variation in the

COMPOSITE INDEX OF DEVELOPMENT OF HEALTH FACILITIES IN ASSAM

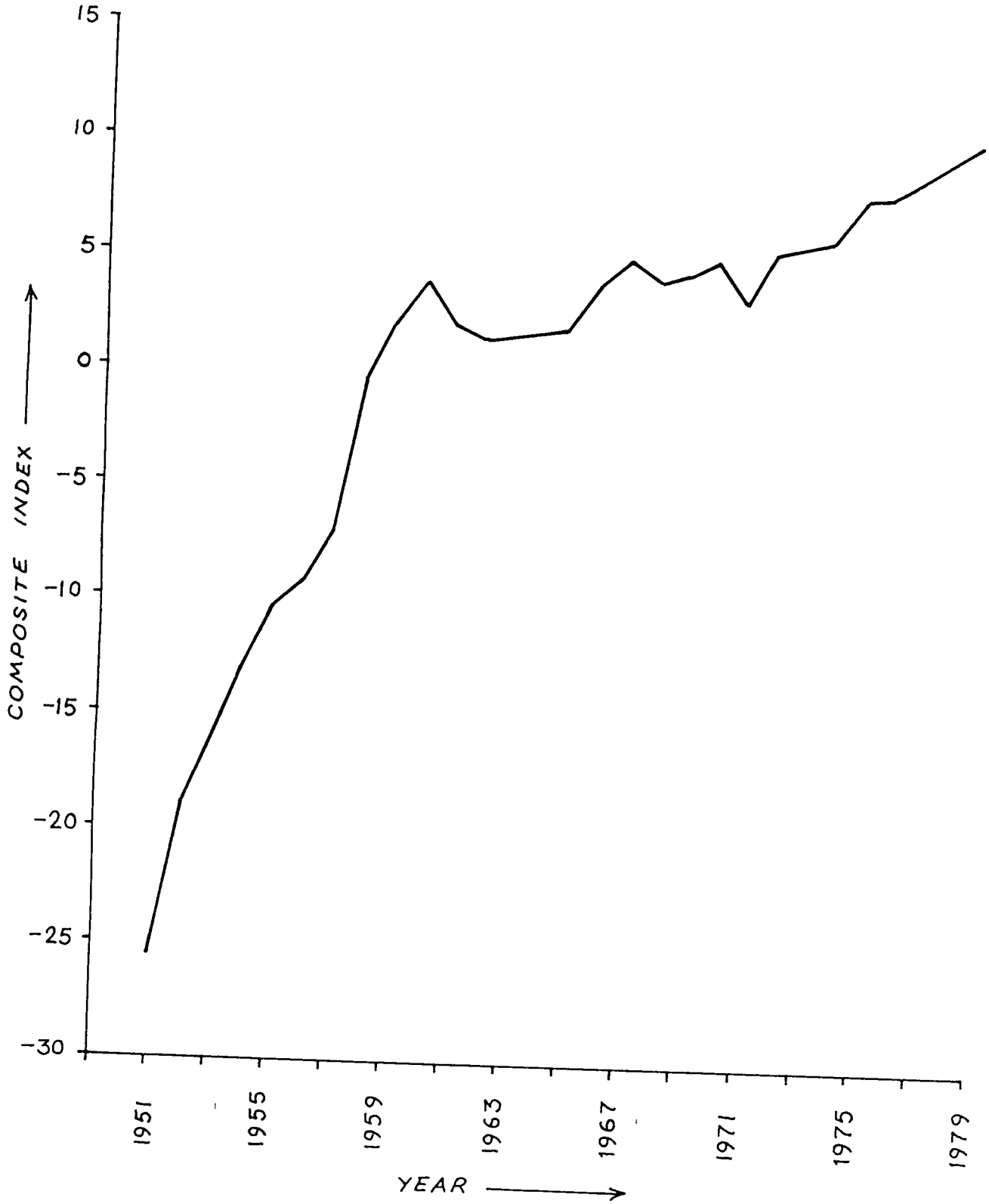

FIG. 2.

indicators. In such a situation it is not appropriate to use the first principal component as a lone representative index. Through suitable techniques, several principal components may be used to make the representative power of the index higher and dependable. However, if the representative value of the first principal components exceeds 60%, it can be used satisfactorily.

In the exercise at hand we have extracted first three principal components. But since the first principal component has a very high power of representation (74.5%) we have not needed the subsequent principal components for our purpose. The correlation matrix of the original indicators (X) is given in table 6.1. The matrix of weights and eigen values are presented in table 6.2. The three principal components are presented in table 6.3.

We have also presented the development of overall health facilities in Assam (measured by the index) graphically for a comprehensive use. (Fig. 2).

Table 6.1: Correlation Matrix of Indicators of Health Facilities

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}
X_1	1.000	.777	.878	.642	.842	.883	.691	.764	.809	.761	.073	.334
X_2		1.000	.653	.556	.902	.826	.792	.828	.897	.827	.558	.557
X_3			1.000	.813	.849	.897	.820	.822	.796	.772	.123	.359
X_4				1.000	.753	.782	.701	.864	.647	.674	.217	.431
X_5					1.000	.967	.898	.915	.966	.911	.388	.535
X_6						1.000	.933	.893	.939	.904	.365	.497
X_7							1.000	.844	.905	.907	.556	.571
X_8								1.000	.882	.846	.420	.523
X_9									1.000	.927	.454	.508
X_{10}										1.000	.451	.500
X_{11}											1.000	.385
X_{12}												1.000
Mean in 1000	1.872	.249	.023	2.585	12.39	.005	.005	459	.019	64.4	.004	15.40
S.D.	.383	.117	.010	.382	7.291	.002	.0001	114	.022	79.6	.0001	28.2

Table 6.2: Weights (Loadings) of Indicators

	$W\text{-}PC_1$	$W\text{-}PC_2$	$W\text{-}PC_3$
X_1	.8431	- .3822	-.1038
X_2	.8944	.2077	-.1478
X_3	.8792	- .3878	.0284
X_4	.7974	- .2378	.2793
X_5	.9803	- .0414	-.0462
X_6	.9722	- .0935	-.0371
X_7	.9395	.1427	-.0300
X_8	.9537	- .0305	.0598
X_9	.9594	.0446	-.1503
X_{10}	.9335	.0519	-.1155
X_{11}	.4509	.8097	-.2290
X_{12}	.5807	- .4080	.6550
Eigen value	8.9314	1.2547	0.6367
Power of representation	74.4%	10.46%	5.3%

Table 6.3: First Three (largest) Principal Components or Indices of Health Facilities

Year	Numerical value of Indices		
	PC_1	PC_2	PC_3
1950-51	-25.48	-2.64	-2.32
52	-18.89	-0.59	1.12
53	-15.83	-0.54	1.02
54	-12.90	0.78	0.62
55	-10.27	0.75	0.56
56	- 8.97	0.70	0.58
57	- 7.21	0.64	0.66
58	- 0.53	2.13	-0.11
59	2.15	1.96	-0.18
60	3.73	1.92	-0.19
61	1.92	2.32	-0.89
62	1.58	2.23	-0.81
63	1.52	0.50	-0.36
64	1.65	0.17	-0.04
65	1.91	0.13	-0.24
66	3.87	-0.05	-0.26
67	4.96	-0.35	-0.11
68	4.11	-2.05	0.34
69	4.50	-0.06	0.29
70	5.21	-0.18	0.36
71	2.93	0.20	-0.23
72	5.56	-0.55	-0.33
73	5.79	-0.67	-0.23
74	6.16	-0.73	-0.15
75	7.94	-0.86	0.01
76	7.90	-1.01	0.09
77	9.02	-1.23	0.16
78	9.69	-1.37	0.26
79	10.25	-1.56	0.39

A perusal of the index (PC_1) of health facilities in the table 6.3 and graph reveals that while in the year 1950-51 it reads -25.48, it increased gradually to 10.25 in the terminal year 1978-79. The rate of growth during the initial years was faster and by the end of the 2nd Five Year Plan it achieved the average level (in this index average is measured at zero). During the 3rd Five Year Plan, development is nominal, but since then, the growth rate is appreciably high once again.

We conclude from this analysis that the efforts of the government in improving the health facilities in the State and public expenditure on health have been considerably successful. But it must be noted that this success in itself has no much importance. The success in creating health facilities must be accompanied by the success in a number of other concerning matters, like:

(a) Whether the facilities created are judicially distributed over different districts and accessible to the people of all localities.

(b) Whether the facilities have been able to meet their end purpose, that is, they have been able to cater to the needs of the ailing people and keep the overall population free from the occurrence of diseases.

Spatial Balance in Availability of Health Facilities: An Evaluation

In this section we propose to analyse and evaluate whether public expenditure on health facilities have been judicious and desirable when evaluated on the criteria of balance in areas and population distribution. In this analysis we assume four propositions to be imperative in nature.

(1) A person cannot be discriminated with another person in the matter of the provision of the opportunity of an access to health services.
(2) Farther the distance of the available health facilities from the person, greater are the chances of his sufferings to increase.
(3) Given the limits of health facilities, a larger number of people sharing them implies lesser availability of these facilities to a person selected at random to be a sufferer of a disease.
(4) Desirability of public expenditure in expanding and extending health facilities increases if these facilities are developed such that a person selected randomly may have an access to health services in least time and without any discrimination.

Granted that the above propositions are imperative in nature public expenditure on health facilities can be

judicious only if it leads to spatial balance in distribution of health facilities and also it leads to a balance in distribution in terms of population pressure on health facilities. We note here that this criterion of evaluation of public expenditure is not a criterion of cost-benefit. Explicitly it is a criterion based on the principles of democratic social justice, since the problem of the maintenance of health of the people is not only an economic problem, but rather more importantly it is a social, public and ethical problem related with the overall human rights.

For analysing the structural changes in the spatial distribution (district wise) of sufficiency of health facilities in Assam we have constructed five indicators. They are -

(1) Population per government hospital (X_1)

(2) Population per government dispensary (X_2)

(3) Population per bed (X_3)

(4) Area (in Km^2) served by a government hospital (X_4)

(5) Area (in Km^2) served by a government dispensary (X_5).

As it is obvious, if population or area served by one unit of health facility is large, load on the facilities is more and in a populous state which is also deficient in health facilities, this load may be adversely affecting the efficiency of the system.

With the five indicators mentioned above we have tried to answer the following questions.

(1) Is the relative structure of spatial distribution changing over time and if yes, whether it is toward the desirable direction?

(2) If structural changes are taking place what are the component of these changes?

We have computed the above indicators for the years 1976-77 and 1981-82 taking districts as a unit of observation. Our analysis would have been much more fruitful if we could employ the data for years prior to 1976-77 but due to inavailability of data it could not be possible.

We have pooled the district-wise data for the two years mentioned above and carried out the principal component analysis. The correlation matrix for the pooled data is given below in table No. 6.4.

Table 6.4: Correlation Matrix

	X_1	X_2	X_3	X_4	X_5
X_1	1.000				
X_2	.282	1.000			
X_3	.338	.049	1.000		
X_4	.141	-.415	-.288	1.000	
X_5	-.303	-.669	-.387	.656	1.000
Average in Lakh	2.537	.349	.027	.022	.0027
S.D. in Lakh	1.437	.152	.0146	.0229	.0017

From the above correlation matrix we have extracted Eigen values and Eigen vectors given in the table below. Figures in brackets are loading of the components.

Table 6.5: Eigen vectors and Loadings

	PC_1	PC_2	PC_3	PC_4	PC_5
X_1	.436 (.406)	1.000 (.829)	.399 (.272)	-.821 (-.252)	.299 (.102)
X_2	.813 (.756)	-.160 (-.132)	.801 (.546)	1.000 (.307)	.393 (.136)
X_3	.568 (.528)	.533 (.442)	-1.000 (- .681)	.798 (.245)	.108 (.037)
X_4	-.779 (-.725	.644 (.534)	.419 (.286)	.817 (.251)	-.621 (-.213)
X_5	-1.000 (- .930)	.108 (.089)	-.069 (-.047)	.271 (.083)	1.000 (.342)
λ	2.406	1.193	.920	.287	.193

The table given below gives the values of principal components, districtwise.

Table 6.6: Principal Components (Districtwise breakup)

District	1976 - 77				
	PC_1	PC_2	PC_3	PC_4	PC_5
Goalpara	1.066	-.722	-1.289	.280	-0.220
Kamrup	.989	-.128	.156	-.500	- .229
Darrang	2.011	.993	-1.599	.330	- .037

Table 6.6 (Contd.)

District	1976-77				
	PC_1	PC_2	PC_3	PC_4	PC_5
Nowgong	-1.903	.908	1.042	-.114	-.269
Sibsagar	.229	-.442	-.192	.085	.252
Lakhimpur	3.196	3.135	-.283	-.412	.363
Cachar	2.480	-.871	1.787	.157	.034
Dibrugarh	1.598	-.613	.278	.414	.139
K. Anglong	-4.828	2.745	.950	.487	-.133
N.C. Hills	-4.267	-1.217	-.733	-.183	.228

District	1981-82				
	PC_1	PC_2	PC_3	PC_4	PC_5
Goalpara	.629	-1.081	-.996	.022	-.310
Kamrup	.968	- .133	.157	-.512	-.235
Darrang	1.500	.381	-1.263	.137	-.120
Nowgong	-1.088	-.091	.600	-.370	-.079
Sibsagar	.304	-.516	-.146	.043	.231
Lakhimpur	1.518	-.625	-.298	-.093	.051
Cachar	2.373	-.899	1.672	.069	.023
Dibrugarh	1.109	-1.107	.769	.263	.092
K. Anglong	-3.469	.375	-.070	.114	-.000
N.C. Hills	-4.414	-1.341	-.544	-.251	218

Next we have plotted the values of the components graphically; on X axis, the districtwise figures for the year 1976-77 and on the Y axis the districtwise figures for 1981-82 have been plotted. An unchanged structure will observe

STRUCTURAL CHANGES IN SPATIAL DISTRIBUTION OF GOVT. DISPENSARIES, ASSAM
1976 - 82

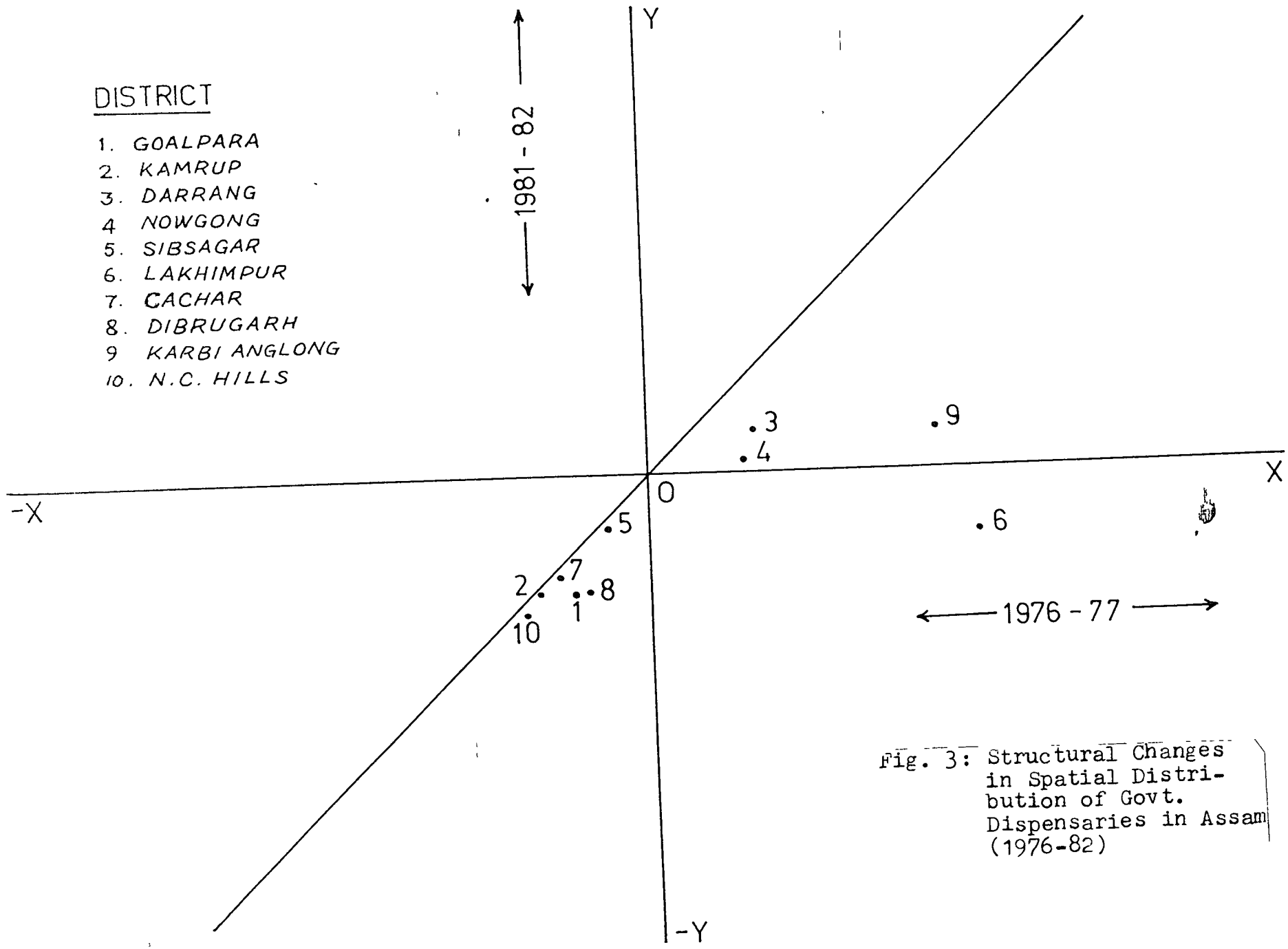

Fig. 3: Structural Changes in Spatial Distribution of Govt. Dispensaries in Assam (1976-82)

STRUCTURAL CHANGES IN SPATIAL DISTRIBUTION OF GOVT. HOSPITALS IN ASSAM
1976 - 82

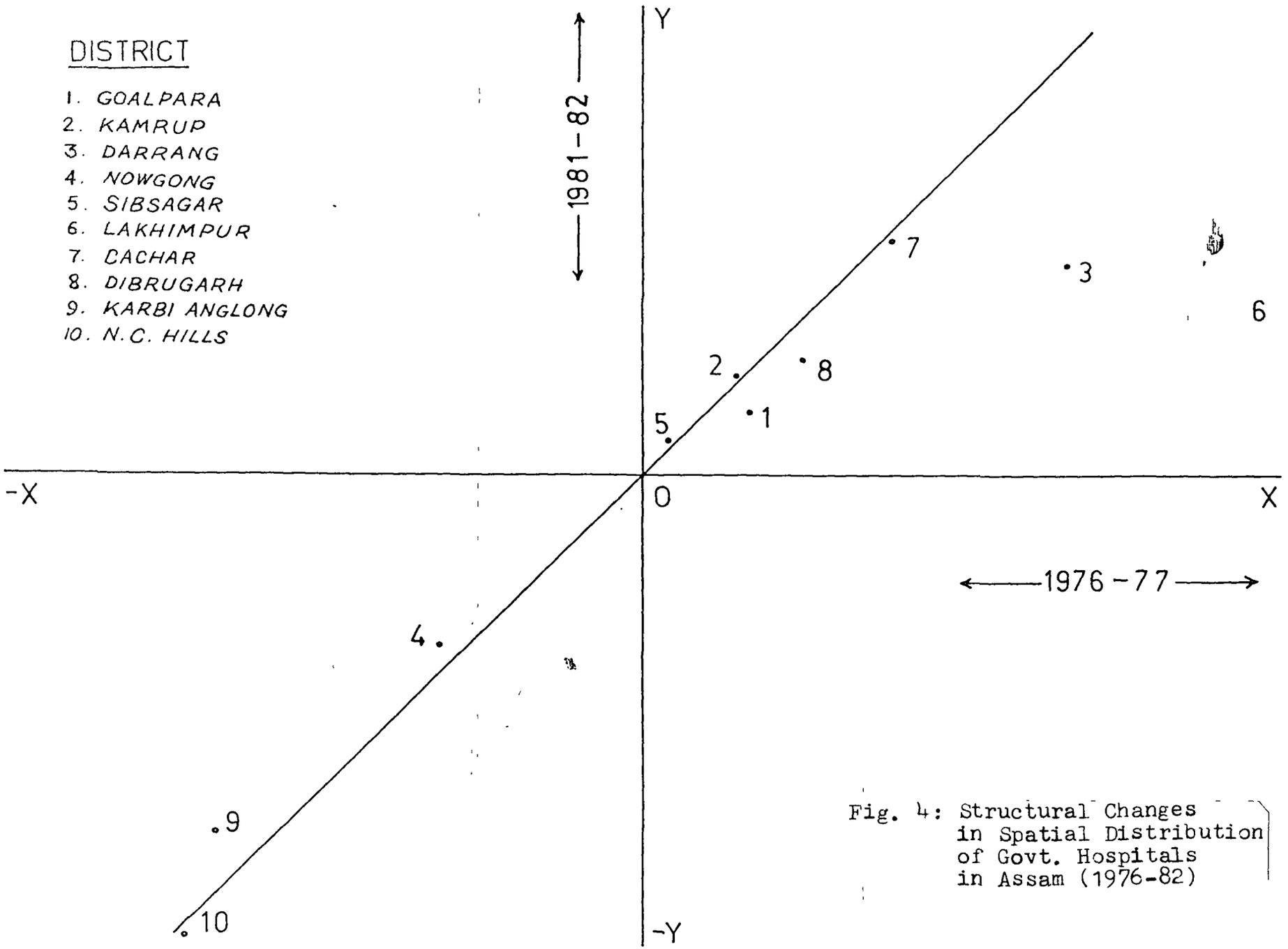

Fig. 4: Structural Changes in Spatial Distribution of Govt. Hospitals in Assam (1976-82)

the points on a line of 45^{o} angle but a change in structure will observe a deviation from this line. This exercise we have done for only first two principal components which together explains over 70% variation in the five indicators taken up for our analysis.

From the graph (Fig. 3) it is observed that four districts viz. Kamrup, Sibsagar, Cachar and Dibrugarh have neither deteriorated nor improved significantly so far the load on the health facilities is concerned but three districts viz. Nowgong, Karbi Anglong and N. C. Hills have developed more load on the health facilities. On the contrary, Lakhimpur district has improved greatly in per capita and per area availability of health facilities. Goalpara and Darrang districts also have recorded betterment in health facilities. The first principal component is identified with area served (Km^2) by a government dispensary (X_5).

When we take into consideration the second principal component which is identified with the population served by a government hospital (X_1), we find that the districts Darrang, Nowgong, Karbi Anglong and Lakhimpur have improved and their loads have gone down significantly. Out of them Lakhimpur and K. Anglong have succeeded in acquiring and extending the facilities of hospital disproportionately very high in comparison with other districts, (Fig. 4).

On the whole, Darrang and Lakhimpur districts have succeeded in extending health facilities both in terms of dropping down the population and area they served per unit of facility i.e. to say that the density of these facilities in Darrang and Lakhimpur districts has tremendously increased. In contrast to this, N.C. Hills district has developed greater load to cater to health needs of the people.

We conclude from this exercise that during the period under consideration structural changes have notably taken place and some districts have enriched their health facilities on the cost of some other districts and in the distribution of health facilities the degree of imbalance has increased.

For a balance in development it was desirable that underdeveloped districts like N.C. Hills should have attracted more attention from the government but unfortunately it could not happen so and thus the public expenditure on extension and expansion of health facilities in different districts have been far from judicious and desirable.

Output of the Health Facilities: Service to Indoor and Outdoor Patients

In the two preceding sections we have noted that though the public expenditure programms on health facilities taken

up by the government in the plan periods have been able to create a developed infrastructure for keeping up the health of the people, the spatial distribution of these facilities has been far from desirability and some areas have developed a greater pressure on health facilities. Now we proceed to analyse the output the facilities created by the government. We consider the number of indoor and outdoor patients served by these facilities as the output of the system. In true sense, the outputs of the health facility system are:

(a) No. of people saved from death that might have occurred in absence of the medical/health facilities made available to them.
(b) No. of people saved from being disabled due to diseases.
(c) No. of people saved from being affected by diseases, especially contagious diseases.
(d) An economic benefit that accrued from saving people from death and disease.

But in face of the problem of availability of information and problems in estimation of the benefits from the treatment and prevention of diseases and death, it is not possible to evaluate the health system on these criteria of true output. Hence, we have relied on the number of indoor and outdoor patients served by the health facility system as the criteria for evaluating the system.

Growth of Indoor Patients Served by the System

We have fitted a quadratic equation to analyse the growth of indoor patients served by the system.

$$\hat{Y}_1 = \underset{(1.91)}{25.7155} - \underset{(0.31)}{0.6072t} + \underset{(4.65)}{0.2737t^2}; \; R^2 = 0.91; \; n = 31$$

As indicated by the value of R^2 the fit is reliable as it explains 91% of the variation in the time series data on the number of indoor patients served by the system. The coefficient associated with t^2 is significant at 1% level, and it indicates an accelerated growth of the number of indoor patients served over time.

Growth of Outdoor Patients served by the System

The cubic curve fitted to analyse the growth of outdoor patients served by the system is given by:

$$\hat{Y}_2 = \underset{(2.85)}{2195.5083} + \underset{(1.62)}{331.4719t} - \underset{(1.68)}{24.8183t^2} + \underset{(3.22)}{0.97883t^3};$$

$$R^2 = 0.95, \; n = 31.$$

The cubic curve fitted above has a great explanatory power as indicated by the value of R^2. However, the coefficient associated with t^3 alone is significant at 1% level of significance.

Growth of Indoor and Outdoor Patients (total)

The cubic curve fitted in the data of total indoor and outdoor patients served by the system is given by:

$$\hat{Y} = \underset{(2.93)}{2208.9956} + \underset{(1.67)}{335.1165t} - \underset{(1.72)}{24.8716t^2} + \underset{(3.32)}{0.98564t^3}$$

$$R^2 = 0.95, \quad n = 31.$$

Since in the total patients served, a great majority (over 98%) are outdoor patients, the cubic curve fitted for the total is very close to that for the outdoor patients served by the system. Over time, however, the proportion of indoor patients in the total has increased substantially indicating improvements in the hospitals in providing indoor facilities to the patients.

Number of Patients Served: Efficiency of the Health Personel in the system

Next we have made an attempt to find out a structural relation in the number of patients served and the health personnel in the system. The health personnel in the system are:

No. of doctors (X_1); No. of nurses (X_2), No. of midwives (X_3); No. of health visitors (X_4); No. of Auxiliary nurse-midwives (X_5) and No. of Dhais (X_6).

We have run a regression analysis of Y_1 (no. of indoor patients served in 1000), Y_2 (no. of outdoor patients served in 1000) and Y (No. of total indoor and outdoor patients served in 1000) on the health personnel. Our structural equations found out after specification analysis are:

$$\hat{Y}_1 = \underset{}{31.3903} + \underset{(0.65)}{0.00936X_1} - \underset{(0.43)}{2.50855X_4} + \underset{(1.80)}{0.11082X_5}; \quad \underset{(2.64)}{}$$

$$R^2 = 0.864, \; n = 26.$$

$$\hat{Y}_2 = \underset{}{-5296.0117} + \underset{(5.88)}{2.7872X_1} - \underset{(5.16)}{4.34304X_2} + \underset{(4.86)}{156.90733X_4}; \quad \underset{(3.00)}{}$$

$$R^2 = 0.920, \; n = 26.$$

$$\hat{Y} = \underset{}{-5341.0259} + \underset{(6.07)}{2.8225X_1} - \underset{(5.34)}{4.2854X_2} + \underset{(4.90)}{153.40425X_4}; \quad \underset{(3.00)}{}$$

$$R^2 = 0.926, \; n = 26.$$

It may be noted that while in explaining Y_1, health personnel X_1, X_4 and X_5 are relevant; for explaining Y_2, the health personnel X_1, X_2 and X_4 are relevant. That is to say, for explaining the growth in indoor patients role of auxiliary nurse-midwives is very important, but in case of outdoor patients the role of auxiliary midwives is not there. Instead, for explaining the growth of outdoor patients X_2 (number of nurses) has a significant role.

Further, the role of doctors in treating indoor and outdoor both types of patient is positively signed. But the health visitors lead to decrease in the number of indoor patients and increase in the number of health visitors lead to an increase in the number of outdoor patients. The explanation of this finding is obvious as the health visitors serve the patient outdoor and thus reduce the load or demand for indoor treatment. These findings have very clear policy implications for health planning. By increasing the number of health visitors, the load on the indoor facilities for treatment can be sizeably reduced.

The Efficiency of the Overall System of Health Facilities in treating the patients

In the preceding section we have constructed a composite index or measure of the level of the overall development of health facilities in the State for the years 1950-51 through 1978-79. Now, we propose to regress the number of patients served on the index of the overall level of develop ment of health facilities. In proposing so we envisage that the efficiency of the health system may be measured by the parameters of the model.

$$Y_1 = a_1 Z^{b_1}; \text{ and } \quad Y_2 = a_2 Z^{b_2}$$

where Y_1 and Y_2 are the number of indoor patients served and the number of outdoor patients served respectively. Z is the PC_1 composite index of the measure of

overall health facilities in the State. The numerical value of the parameter $\hat{b}_1$ ($\hat{b}_2$) would measure the elasticity of the indoor patients served (outdoor patients served) in response to the betterment in the health facilities.

The estimated equation in the above scheme relating to outdoor patients (Y_2) is:

$$\hat{Y}_2 = 5784.0872Z^{0.0489}; \; R^2 = 0.669$$

the elasticity $\hat{b}_2$ is significant at 10% level as the standard error of estimate is quite high (0.03439) rendering the computed t statistic to be as low as 1.42.

The estimated equation for indoor patients (Y_1) is given as follows:

$$\hat{Y}_1 = 80.3263 \; Z^{0.0724}; \; R^2 = 0.765$$

The elasticity $\hat{b}_1$ is significant at 5% level as the standard error is small (0.040) rendering t statistic to be 1.805.

It may be noted that in case of the outdoor patients served the elasticity is lower as well as the estimated figure has a more dispersed distribution. In case of indoor patients served, the elasticity is higher and also its reliability is more. However, in any case, the numerical value of elasticity is very low which indicates that the

number of patients served (outdoor and indoor both) is not much responsive to the development of health facilities in the State. If our conclusion is taken to evaluate the health facilities in the State, it would suggest that though in terms of the number of hospitals, dispensaries, doctors and nurses together with other personnel the State has observed a considerable development in the plan period, the efficiency of these facilities and personnel in serving the patients have not development in the same proportion. We conclude therefore, that the efficiency of the overall system in catering to the need of the health facilities in the State has remained poor.

The following table 6.7 presents the percentage increase of health personnel in the State during 1951-79 period vis-a-vis the parcentage increase of the patients served by them.

Table 6.7: Percentage increase in number of Health personnel and Patients treated

Health personnel Patients served	No. in 1950-51	No. in 1978-79	% increase in 78-79 over 50-51
Doctors	2,423	7,000	188.89
Nurses	263	2,600	888.59
Midwives	335	1,675	400.00
Health visitors	11	50	354.55
Auxiliary Nurse Midwives	32	1,708	5,237.50
Dhais	501	1,490	197.41
Indoor Patients	24,000	273,000	1,037.50
Outdoor Patients	2,745,000	15,595,000	468.12
Total Patients	2,769,000	15,868,000	473.06

As we see in the table 6.7, the number of indoor patients served by the system increased (during 1951-79) over 10 times, while the number of outdoor patients served by the system increased over 4.6 times. The number of doctors increased about 2 times (1.85 times exactly). The number of midwives, health visitors and Dhais increased 4 times, 3.54 times and 1.97 times respectively. Thus, doctors, midwives, health visitors and Dhais increased less in proportion than the patients served by the system. However, a spectacular increase in the number of nurses (8.99 times) and Auxiliary nurse-midwives (52.38 times) have far exceeded the growth rate of the patients served. Now, since the composite index of health facilities is heavily loading the components of nurses and auxiliary nurse-midwives, the number of patients treated in response to the composite index became quite low as observed in the anlysis above.

The table 6.8 below presents the load of patients served per personnel in the system.

Table 6.8: Patients served per medical personnel 1951-79

Per medical personnel	Indoor patients 1951	Indoor Patients 1979	Outdoor patients 1951	Outdoor patients 1979
Doctor	9.90	39.00	1,132.89	2,227.86
Nurse	91.25	105.00	10,437.26	5,998.08
Midwife	71.64	162.99	8,194.03	9,310.45
Health visitor	2,181.82	5,460.00	249,545.45	3119,000.00
Aux. Nurse midwife	750.00	159.84	85,781.25	9,130.56
Dhai	47.90	183.22	5,479.04	10,466.44

A perusal of the table above reveals that the number of patients attended by almost all personnel are quite high. If it is so, it may be estimated that the number of patients attended by a doctor in one day is around 7, while the number of patients attended by a nurse in one day is about 19. For midwives, this number is 29. So for the auxiliary nurse-midwives. However, for a health visitor this number is 9,746, indicating why health visitors can be considered to be heavily loaded if they are to be considered so in any sense of the term.

We conclude, therefore, that except in case of doctors, other health personnel are quite heavily loaded, and hence, we cannot expect efficiency to increase in the system as they are inadequate at present and need expansion.

Effectiveness of Health Facilities: Trends in Birth and Death rates in Assam

One of the criteria for evaluating the effectiveness of health programmes is whether birth and death rates declined significantly over time or not and if so, whether trends in development of health facilities explain the trends in these rates or not. In this section we propose to investigate the same.

The linear trend line of birth rate (rural) is given by

$$\hat{BRR} = \underset{(135.53)}{54.5675} - \underset{(35.09)}{0.82366t}; \quad R^2 = 0.977, \; n = 29$$

The trend line of birth rate (urban) is given by

$$\hat{BRU} = \underset{(76.83)}{53.8104} - \underset{(26.96)}{1.0992t}; \quad R^2 = 0.962, \; n = 29$$

The trend line of Death rate (rural) is given by

$$\hat{DRR} = \underset{(39.54)}{35.8563} - \underset{(16.26)}{0.8583t}; \quad R^2 = 0.901, \; n = 29$$

The trend line of Death rate (urban) is given by

$$\hat{DRU} = \underset{(4.76)}{31.7462} - \underset{(2.32)}{0.8988t}; \quad R^2 = 0.156, \; n = 29$$

It may be noted that the rate of decline in the urban birth rate is faster than that in the rural birth rate. Further the rate of decline in rural death rate is faster than the rate of decline in the rural birth rate, though the difference is not very remarkable. Statistically, the rate of decline in urban death rate is more dispersed as the standard error of estimate is quite large (0.3874) while the standard errors of estimate of the rates of decline in DRR, BRU and BRR are considerably small (0.0528, 0.0408, and 0.0234 respectively), and thus, much more reliable.

Determinants of Birth and Death Rates: Health Facilities and PCY

As we have noted above, birth rates and death rates in rural and urban areas have declined significantly over time, but we must correlate them with the development index of health facilities in the State so that we may be able to evaluate the effectiveness of the public programmes on health.

One may argue at this stage that decline in birth rate and death rate in urban and rural areas may be attributable to the overall level of economic development that has occurred during the study period in Assam. Hence, birth rates and death rates should be considered as functions of the level of economic development together with the development of health facilities in the State. In principle we agree with the argument. However, we face two problems. The first is concerned with the measure of the general level of economic development. The second is concerned with the interrelationship of the general level of economic development with the level of development of health facilities, as one may argue that health facilities are dependent on general economic development.

Conventionally, the general level of economic development is measured by the per capita income of the people.

However, it is contended that, especially in case of underdeveloped economies, per capita income may be an inefficient and sometimes a misleading, measure of development.[1] Alternative measures of economic development have been proposed.[2] But due to several problems associated with these measures one may be skeptical about their reliability and representative power.[3] We have decided, therefore, to use the traditional measure (per capita income) of overall economic development, though we concede that our analysis may not be free from inadequacies and limitations.

We have run regression analysis for establishing the relationships of birth and death rates with per capita income and the index of health facilities (Z). In case of death rates we find that

$$\hat{DRR} = \underset{}{24.2401} - \underset{(0.095)}{0.1080Z} - \underset{(0.1939)}{0.00394\ PCYC} - \underset{(0.595)}{0.32384t};$$

$$R^2 = 0.927,\ n = 19$$

$$\hat{DRU} = \underset{}{12.71484} + \underset{(0.082)}{0.0862Z} - \underset{(0.074)}{0.001374\ PCYC} - \underset{(0.705)}{0.24363t};$$

$$R^2 = 0.783,\ n = 19$$

The above equations have been obtained from the data for 19 years (1961 to 1979; observations at annual level). Z is the index of overall health facilities and PCYC is the per capita income measured in Rupees, at current prices. t stands for time ; t = 1 for 1961 ..... t=19 for 1979.

It may be noted that in case of both the equations above, the values of R^2 are quite large. However, the Student's t values associated with the regression coefficients in the above equations are very small. Such a finding indicates that the estimator has suffered the problem of multicollinearity. It is quite expected as our variables are time series with strong linear trends.

Since the estimates of parameters (coefficients) of the above equations are not reliable, we must reject them. However, we have tried to solve the problem of multicollinearity with Ridge regression method suggested by Hoerl and Kennard.[4] We have failed to obtain any reliable estimates by this method also. We have observed that the coefficients associated with the independent variables have a strong tendency to equalise, but their standard errors of estimate do not decrease considerably to make the estimates of coefficients reliable.

Next, we have attempted to solve the problem of multicollinearity by dropping the time variable (t) from the specification. But then also, we have failed to solve the problem of multicollinearity.

We have learnt from the exercises mentioned above that we should not regress death rates on Z and PCYC. We have resorted to use per capita income at constant prices as an explanatory variable for analysing death rates. In our opinion this resort is justifiable as the real economic development is measured more reliably by per capita income at constant prices. Per capita income at current prices may be a misleading indicator as it is very much affected by inflationary forces. The well-being of the people depends on the real purchasing power and not the nominal income or money income. Per capita income at current prices may increase significantly overtime without any enhancement of the well being of the recipients of income in the economy.

Using per capita income at constant prices (base 1948-49) and Z as explanatory variables we have estimated regression equations. They are:

$$\hat{DRR} = 40.4900 - \underset{(0.854)}{0.6114552} - \underset{(0.565)}{0.06891}\ PCYK$$

$$R^2 = 0.906;\ n = 19.$$

$$\hat{DRU} = 24.3001 - \underset{(0.343)}{0.210067Z} - \underset{(0.459)}{0.04784}\ PCYK$$

$$R^2 = 0.605;\ n = 19$$

Where Z is the index of health facilities and PCYK is the per capita income at constant prices (base 1948-49).

We observe that though the values of R^2 in both the equations are quite high, but the t values associated with the coefficients are miserably low. Now, such a problem may arise either due to misspecification of the model on account of inclusion of an irrelevant variable, or due to strong degree of multi-collinearity or due to autoregressive disturbances.

First we take up the problem of the possibility of misspecification of the model.[5] Economic arguments suggest us that for a decrease in death rates, Z and PCYK both are relevant variables because development of health facilities are as responsible for promoting health conditions of the people as the increase in per capita income is. Moreover, in the present analysis our task is to evaluate the efficacy and efficieny of health facilities in lowering the death rates in Assam. The competing hypothesis is that increase in per capita income also may be equally responsible for the same. We cannot, therefore eliminate per capita income from the model. Further, the coefficient of correlation between PCYK and DRR is - 0.91 and that between PCYK and DRU is -0.844. We cannot therefore brush PCYK aside as an

irrelevant variable in the models explaining DRR and DRU. Nor we can disregard Z as an explanatory variable in the models as the coefficients of correlation between DRR and Z is -0.93 and that between DRU and Z is -0.83. The coefficient of correlation between Z and PCYK is 0.889. It suggests the possibility of strong multicollinearity problem and not the specification problem.

However, before we attribute the problems in estimation to multicollinearity, we test for autocorrelation in the residual vectors of the estimated equations. We use Durbin Watson test[6] for this purpose. The Durbin Watson Statistic $\hat{DW}$ is defined as:

$$\hat{DW} = \left(\sum_{i=1}^{n-1} (\hat{e}_{i+1} - \hat{e}_i)^2\right) / \sum_{i=1}^{n} \hat{e}_i^2$$

where $\hat{e}$ stands for the residual vector in the model that has been estimated. The table of Durbin Watson Statistic provides us with two values of the statistic, DL and DU for a given level of significance (1%, 5% etc), the number of observations and the number of explanatory variables (including constant term). If the value of $\hat{DW}$ is smaller than DL we ascertain positive autocorrelation and if $\hat{DW}$ is greater than DU we ascertain an absence of positive autocorrelation. We remain indecisive in the case when $\hat{DW}$ lies between DL and DU.

We find that the numerical value of $\hat{DW}$ for DRR regression equation is 1.3378 and that for DRU regression equation is 1.1529. For 19 observations and three variables ($n = 19$; $K = 3$) the values of DL and DU at 1% level of significance are 0.83 and 1.26 respectively. We conclude, therefore, that in the case of DRR regression equation the residual vector is not autocorrelated but we are indecisive in case of the regression equation for DRU. In any case, however, presence of autocorrelation in the residual vectors is not ascertained.

Thus, we conclude that the problems in estimation are mainly due to the strong degree of multicollinearity present among the explanatory variables Z and PCYK. A rough estimate of the strength of multicollinearity among the explanatory variables may be made by the statistic.[7]

$$M = 1/\lambda_n$$

Where λ_n is the smallest eigen value of the intercorrelation matrix (R) of independent (explanatory) variables. By solving the characteristic equation.

$$\lambda^2 - 2\lambda + (1 - r^2) = 0 = \lambda^2 - 2\lambda + 0.209679$$

where r is the coefficient of correlation between Z and PCYK, we get two values of λ (1.889 and 0.111). Thus

the numerical value of the smallest eigen value is 0.111 and hence the value of M is 9.009, which is considerably large. We ascertain, therefore, a strong degree of multi-collinearity to be present.

To resolve the problem of multicollinearity several methods have been suggested in the econometric literature. However, on account of our limitation we are not able to collect more data or the time series for a longer period. We hesitate to apply Ridge-regression method as it yields biased estimates and we have observed that in our problem the bias is likely to be large and damaging. While our purpose is to disentangle and assess the contributions of PCYK and Z, we cannot proceed for evaluation if our parameters are estimated with large biases.

As the last resort we propose that since the time series (Death rates, Z and PCYK) show a strong linear trend and multi-collinearity may be there on account of the commonness of the linearity in trends among these variables, the trend components from all the three time series may be eliminated and regression be run with the residuals. That is, we specify the models as:

$$DRR^* = a_o + a_1 Z^* + a_2 \, PCYK^*$$

$$DRU^* = b_o + b_1 Z^* + b_2 \, PCYK^*$$

Where DRR* etc. are defined as

$$DRR^* = DRR - K_{10} - K_{11}t$$

$$DRU^* = DRU - K_{20} - K_{21}t$$

$$PCYK^* = PCYK - K_{30} - K_{31}t$$

$$Z^* = Z - K_{40} - K_{41}t$$

We have estimated K_{ij} by ordinary least squares and presented them in table 6.9.

Table 6.9: The Coefficients of trend line (n=19) of Death rates and their explanatory variables

Variable	DRR	DRU	PCYK	Z
$\hat{K}_{i0}$	23.2912	12.4211	252.0193	0.3005
$\hat{K}_{i1}$	-0.5044	-0.2474	2.5665	0.4782

The estimated residuals of Death rates, Z and PCYK are presented in Table 6.10. Note that some of the residuals show oscilatory tendencies.

The estimated regression equations using the residuals are:

$$\hat{DRR}^* = \underset{(0.034)}{-0.028298Z^*} - \underset{(0.605)}{0.0557146\ PCYK^*}\ ;\ R^2 = 0.321.$$

$$\hat{DRU}^* = \underset{(0.233)}{0.190434Z^*} - \underset{(0.434)}{0.0387838\ PCYK^*};\ R^2 = 0.161$$

Table - 6 10: Estimated Residuals of Death rates, Z and PCYK Net of Time Trend

Year	t	DRR*	DRU*	Z*	PCYK*
1961	1	0.3132	2.3262	1.1413	-1.2858
1962	2	0.4175	-0.6263	0.3231	-0.4523
1963	3	-0.5781	-0.5789	-0.2152	-6.3188
1964	4	-1.1737	-0.9316	-0.5634	4.9147
1965	5	-0.7693	-0.4842	-0.7816	14.8482
1966	6	-0.4649	-0.3369	0.8002	8.3818
1967	7	-0.2605	-0.3895	1.3120	1.4153
1968	8	0.0439	-0.3421	-0.0162	6.8488
1969	9	0.3482	-0.1947	-0.1044	-4.2177
1970	10	0.7526	0.0526	0.1274	-7.8842
1971	11	0.2570	0.2000	-2.6308	-13.1507
1972	12	0.8614	0.2474	-0.4791	-13.7172
1973	13	0.9658	0.5947	-0.7273	-7.3837
1974	14	1.1702	0.6421	-0.8355	-7.8502
1975	15	1.1746	0.6895	0.4663	0.8833
1976	16	0.3789	0.1368	-0.0519	7.3168
1977	17	-0.5167	0.1842	0.5899	3.0504
1978	18	-1.2123	-0.5684	0.7817	15.3839
1979	19	-1.7079	-0.6211	0.8635	-0.7826

It is obvious that none of the coefficients are significantly different from Zero (Note that these equations do not have a constant term as averages of the residuals are all zero). Thus, we fail to estimate any meaningful and significant coefficients measuring the contribution of Z and PCYK to the determination of urban and rural death rates in the study period under consideration. We are left with no option except that we conclude that both the variables Z and PCYK contribute to the observed decline in death rates though we cannot estimate their individual contributions in isolation. We are not in a position to assign any relative importance to either variable.

We have carried out similar analysis for explaining the declining birth rates also. Our findings are not different from the ones described above. Here also we failed to disentangle the individual contribution of Z and PCYK in determining the birth rates in rural and urban areas. However, we report the regression equations of birth rates as follows:

$$\hat{BRR} = 64.85957 - \underset{(0.817)}{1.195629Z} - \underset{(0.300)}{0.074558PCYK}$$

$$R^2 = 0.850;\ n = 19$$

$$\hat{BRU} = 38.45391 - \underset{(1.088)}{2.586794Z} + \underset{(0.0612)}{.024769\ PCYK}$$

$$R^2 = 0.836\ ;\ n = 19$$

In retrospect we note that our attempts to explain the declining trends in death and birth rates by the index of health facilities Z, and per capita income (in constant prices) have been rewarding in the sense that we have established that health facilities are an important factor, though its individual effectiveness, net of the effectiveness of rise in PCYK, cannot be ascertained.

Structural Changes in Deaths due to Various Causes

One of the important measures of the effectiveness of health programmes is the changes in the structure of deaths due to various causes. Improvements in health conditions lead to decline of the proportion of death tolls due to epidemics and contagious diseases.

We lack in data for analysing the structural changes in deaths due to different causes. Hence, we have to rely on the data for 10 yers, from 1953 through 1959 and from 1962 through 1964. The table 6.11 presents the structure of death tolls due to various causes.

Table - 6.11: Percentage of Deaths due to Various Causes

Year/ Cause	Cholera, Smallpox & plague	Fevers	Dysentry & Diarrhoea	Respira-tory diseases	All other causes
1953	0.70	59.63	6.21	6.63	26.82
1954	0.11	61.41	9.24	6.56	22.67
1955	0.89	57.53	10.03	7.19	24.36
1956	0.54	47.17	8.37	8.64	35.28
1957	0.26	57.61	7.85	8.45	24.34
1958	0.30	51.71	9.01	8.52	30.51
1959	0.24	53.96	8.94	7.34	29.51
1962	0.15	50.20	10.01	11.47	28.17
1963	0.18	49.17	7.22	12.23	31.02
1964	0.19	51.20	12.39	12.16	24.06

The table (6.11) suggests that the proportions of deaths due to respiratory diseases, dysentry and diarrhoea show an increasing trend while the proportion of deaths due to cholera and small pox shows a decreasing trend. Respiratory diseases are often caused either by air pollution or due to unhygienic living in damp places or deficiency in food. However, diarrhoea and dysentry are often caused due to poor facilities of drinking water and sanitation. The public efforts have mainly been concentrated on irradicating epidemics like cholera and small pox and malaria and it seems

that these efforts have been considerably effective. Providing enough supply of treated drinking water of checking further deterioration of air quality, etc., are very broad and demanding exercises. The government has not been able to do much in this regard and it may be so due to resource constraints. However, our data base does not allow us to assert anything beyond 1953-64 period. Some information that one may get from the statistics scattered here and there is that deaths due to malaria, kala azar, cholera, and small pox have shown a further decline. If it were so, it strengthens our findings that medical facilities created by the government have been effective in meeting the purposes of public expenditure on health.

Trends in Infant Mortality

Infant mortality is one of the very important indicators of the effectiveness of the health programmes run by a government. This indicator may be used for evaluating the effectiveness of health programmes in our study. The following table gives us a picture of the trend in infant mortality in Assam for a few years.

Table - 6.12: Infant Mortality Rate in Assam

Year	1960	1974	1975	1976	1977	1978	1979	1980
Total infant mortality rate	184	136	144	124	115	118	104	103
Urban infant mortality rate	153	113	96	100	95	86	60	64
Rural infant mortality rate	187	138	147	126	116	120	106	105

A perusal of the table (6.12) above reveals that infant mortality rates are declining over time. The rate of decline in the infant mortality rate in urban areas is appreciably faster than that in rural areas. The time trends of infant mortality rates are given by the following trend lines:

$$\hat{IMT} = 192.283 - \underset{(2.78)}{4.0178t} \quad ; R^2 = 0.918, \; n = 8.$$

$$\hat{IMU} = 163.931 - \underset{(2.52)}{4.287t} \quad ; R^2 = 0.864, \; n = 8.$$

$$\hat{IMR} = 195.361 - \underset{(3.26)}{4.079t} \quad ; R^2 = 0.914, \; n = 8$$

Where IMT, IMR and IMU stand for total infant mortality rate, rural infant mortality rate and urban infant mortality rate respectively.

The relationships of infant mortality rates with Z and PCYK are given below:

$$\hat{IMT} = 288.1317 - \underset{(0.68)}{7.854Z} - \underset{(0.25)}{0.324PCYK};\ R^2 = 0.889,\ n = 8$$

$$\hat{IMR} = 294.5824 - \underset{(0.66)}{7.878Z} - \underset{(0.25)}{0.338\ PCYK};\ R^2 = 0.887,\ n = 8$$

$$\hat{IMU} = 109.541 - \underset{(1.747)}{15.119Z} + \underset{(0.384)}{0.376\ PCYK};\ R^2 = 0.949,\ n = 8$$

Note that the equation of IMU is misspecified[8] on account of inclusion of irrelevant variable PCYK. The better specified equation is:

$$\hat{IMU} = 194.194 - \underset{(4.008)}{11.974Z};\ R^2 = 0.941$$

We may conclude that health facilities, together with general economic development of the State, have been effective in lowering the infant mortality rates and thus, the public efforts for improvement of health conditions in Assam have attained an appreciable degree of success. Especially in case of the urban areas, health programmes have been very effective.

The Summary of Evaluation Exercise

Now we put our findings on the evaluation exercises together in order to develop an overall picture.

(1) Area served by medical institutions and medical personnel is declining over time and the rates of decline are appreciable, though the medical infrastructure has remained overloaded as the area served by them is quite large.

(2) Population served by medical institutions and medical personnel is declining over time and the rates of decline are appreciable. However, population load on the medical infrastructure remains to be considerably great.

(3) Rural areas have not attracted enough efforts of the government.

(4) The efficiency of the medical infrastructure in treating the patients has been rather low and it may be so due to a large load of population and patients on the infrastructure.

(5) Birth rates, death rates and infant mortality rates have declined considerably over time and development of health facilities has contributed to this decline.

The decline is also attributable to the general economic development.

(6) Deaths due to epidemic diseases have decreased more in proportion than the deaths due to certain diseases which are caused by poor drinking water supply, sanitation and poor living condition.

(7) Distribution of health facilities among different districts and between rural and urban areas has not been judicious and equitable.

(8) Medical institutions have been poorly equipped and due to this their efficiency has been low.

These findings suggest us that in future the public efforts should be guided by the following considerations:

(1) Further extension and expansion of medical infrastructure.

(2) Provision of enough medicines, apparatus, and equipments in the hospitals and dispensaries.

(3) Expansion and extension of primary health centres in rural areas and increase in the number of health visitors.

(4) Restoration of balance in distribution of health infrastructure among different districts of the State.

(5) Extension of the water supply and sanitation facilities, especially in rural areas.

(6) Checks on air and water pollution.

(7) Educating the people to make them aware of the possible causes of diseases, their epidemic spreading and measures to check them. A number of modern methods using mass media like television may be used for educating the people, especially in rural areas. Public provision of televisions in the villages may be suggested to help increase the mass education on health awareness.

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(8) It may be noted that the coefficient of correlation between IMU and PCYK is -0.891 and accordingly, the coefficient of regression should be negatively signed. But we see that the coefficient of regression is 0.376,

and moreover its t value is very poor. This suggests that in explaining IMU with Z and PCYK, the inclusion of PCYK is irrelevant. Further, the constant of regression equation turns out to be 109.541 – lower than the value of the first observation on IMU (153 in the year 1960). With decreasing trend it should have been larger than 153. The coefficient associated with Z becomes inefficient due to such a misspecification, though it remains significant. In testing the regression coefficient of PCYK our null hypothesis is that it should be less than zero and we use one tailed test. On the basis of this test also, the coefficient is not significant. This hypothesis of misspecification is corroborated when we estimate regression coefficient of Z after deletion of PCYK. The constant turns out to be larger than 153, the R^2 value is insignificantly reduced, and the t value of the coefficient of Z increases very much.

CHAPTER - VII

CONCLUDING REMARKS AND GUIDELINES FOR HEALTH POLICY IN FUTURE

1. A Summary of the Study

Now, before we close our longwinded endeavour, it would be worthwhile to review the preceding chapters and to form a comprehensive idea on the subject matter taken up for our study. The objectives of our endeavour, as proclaimed in the beginning of the study, have been to overhaul the trends of the public expenditure on creation and expansion of health facilities in Assam since the dawn of the planning era and thereupon to frame certain policy guidelines for health planning in the future. We reiterate that sound health has been the greatest aspiration of a person as well as of a nation. Good health stimulates human ingenuity, gives him incentives to take part in the developmental activities and makes the social climate congenial to improve the economic status of the State.

But unfortunately, Nature has no special regard for the human aspirations. The laws of her providence are unknown. Injury, ailment, disease and death have been the greatest dread and they all spring up from the lap of Nature. The physical environment often determines the lot of the people living in, and we find the health condition of the

people greatly dependent on the climatic factors of the environment. Nevertheless, man has been very keen to free himself from the bounds that Nature puts on him and he has made suitable changes in his surroundings that befits him. The man-made environment, the social and economic surroundings, has now become a major determinant of his lot. To appreciate these aspects we have ventured in Chapter II to study the location of Assam, its natural, social and economic environments and their relation with the occurrence, frequency, typology and consequences of various kinds of diseases. In underdeveloped economies like ours, we have no enough resources to numb the temper of Nature and hence we find that the people of Assam suffer greatly from the tropical diseases. The densely populated districts of Assam are further hit by communicable diseases and epidemics. The frequency, intensity and coverage of these diseases specify the scope and limitations of public health programmes. Hence, we hold that evaluation of public health programmes cannot be dissociated from the environmental considerations that are determined by the physical and socio-economic set up in which the people live, ail and strive for better health.

Recognising the role of public health in strengthening the human capital, enhancing the efficiency of the productive system, fostering economic development, and promoting

the well-being of the people, the Government of Assam took initiatives to develop medical infrastructure in the State. Since the First Five Year Plan the Government of Assam has been trying to control the occurrence of tropical and communicable diseases and improve the health condition of the people. A great deal of physical and financial resources have continually been spent on health programmes. We have documented and analysed these public efforts on health programmes in Chapter III. In the table 7.1 below we summarise the public expenditure on health programmes in the Five Year Plans.

Table - 7.1: Health Expenditure in Five Year Plans

Sl. No.	Measure	Five Year Plans				
		I	II	III	IV	V
1.	Total Expenditure on Health (Rs. lakh)	193.41	350.88	865.00	746.61	1220.00
2.	Per capita Health Expenditure (Rs.)	2.35	4.27	7.79	6.72	7.85
3.	Per capita income (Rs) Current prices Average for mid year	280.00	315.00	330.00	491.00	816.00
4.	Ratio of P.C. Health Expenditure to P.C. Income x 100	0.84	1.36	2.36	1.37	0.96

From the table 7.1 the inadequacies of public expenditure on health is evident. Further, we note that from the First to the Third Five Year Plan, the ratio of per capita health expenditure to per capita income showed a gradual rise. But afterwards, a declining trend starts. This declining trend in the said ratio indicates the shifting of priorities of the Government after the Third Five Year Plan and indeed it affected the growth rate of public health facilities in the State (A close examination of the composite index of the level of development of health facilities in Assam testify the turning of the trend). Irrespective of the shifting of the priorities (which we do not approve of), however, the health facilities continued expanding and their services to the people were largely reflected in the declining death rate, birth rate and infant mortality rate. The frequency, intensity and coverage of epidemics showed a great deal of decline; malaria, kala azar and plague have largely been eradicated.

The achievements of the public programmes on health have certainly been appreciable, but the exercise of evaluation must be more analytical in which role of subjective and teleological assessment should be kept to a minimum. Hence, we proceeded to choose certain objective criteria on which to base our exercise of evaluation. In doing so we did a

comprehensive discussion on the theoretical foundations of the criteria of evaluation of public programmes. Thus, we devoted Chapter IV on the theoretical discussion and thereafter on the selection of criteria for evaluation of public efforts on improving health condition of the people. In view of our limitations we could not go ahead to assess the impacts of the improved health condition of the people on the efficiency, productivity and growth of the economy. We assumed therefore that the index of development of health facilities and reduction of pressure on them identify with the increase in the economic well-being and reflect an enhancement in the efficiency and productivity of the economy. We concede that our supposition is falliable but in view of the constraints imposed on us we could hardly perform better.

In Chapter V, therefore, we proceeded to analyse the trends in the development of some selected measures or indicators of health facilities — medical institutions, medical personnel and pressure on them. So far these trends could reveal we found that they have been appreciable and speak of the success of the public efforts in improving opportunities for better health condition of the people in the State of Assam. Nevertheless, it has also been revealed that health facilities in Assam remain inadequate and overloaded.

In Chapter VI, our main concern was to evaluate the public programmes on the criteria of decline in birth, death and infant mortality rates, attainment of balance in spatial distribution of health facilities, efficiency of the health system in catering to the patients and the like. We also analysed the structural changes in the proportion of deaths due to various causes.

The analysis made in Chapter VI reveals the gradual improvement in the efficiency of the existing health system. However, we have observed that spatial balance in development of health facilities has been a far cry. Rural areas suffered the deal of discrimination and neglect.

We appreciate the role of public efforts in lowering birth rates, death rates and infant mortality rates that were observed in our study period, though we faced unsurmountable difficulties in disentangling the individual impact of public efforts from that of rise in per capita income. Indeed, general economic development has a great impact on improving the health condition of the people; nevertheless, the role of improved health facilities has been remarkable.

To sum up, on an overall consideration, the government efforts to improve health facilities in Assam deserve an applause. But a full complacence will come if the Assam

Government takes some more bold steps to ameliorate the present health condition through certain modifications in its present health policies.

2. Some Guidelines for Health Planning in the Future

We suggest that the health planning of the Government of Assam should incorporate the following suggestions.

(1) The Government should follow a definite criterion for the establishment of medical institutions in the State. It seems to be most effective if the government accepts population as a potent criterion for establishing the medical institutions like hospitals and dispensaries in different districts of the State.

(2) Since the location of a government health institution is very important, the site selection should be done very carefully. Access, time and distance of travel may be analysed for the selection of proper site for the establishing a health institutions like hospitals and dispensaries in different districts.

(3) The provision of proper and adequate transport facilities should be made so that modern health facilities can reach every nook and cranny of the State.

(4) The provision of indoor health facilities (at present available only in the government hospitals) should be made in the government dispensaries and the primary health centres. The quality of the services of primary health sub-centres should be improved so that they can independently cater to health needs of the people.

(5) The population pressure on the government hospitals for outdoor health facilities may be reduced by improving the quality of treatment given by the government dispensaries and primary health centres.

(6) Every government health institution, especially where provision of indoor medical treatment is available, should possess requisite amount of essential equipment and necessary medicines for treatment.

(7) To do away with the shortage of health personnel, the enrolment of the medical student should be increased in the medical colleges. For this purpose, the capacity of the medical colleges should be increased. If shortage of space is the main hindrance for increasing the capacity, some suitable private complex may be hired temporarily.

(8) The government should take the initiative to create jobs for the medical graduates. This may be done by establishing new medial institutions or by expanding the existing

health institutions. The tendency of private practice may be checked through campus recruitment system.

(9) The tendency of private practice of the government health personnel, especially doctors, should be checked by improving their pay scale. A good amount of non-practice allowance may be given to the government doctors in order to check the tendency of private practice. If this can be done, the quality of health services in the government medical institutions will be improved.

(10) Good laboratory provision should be made in every government health institution and every laboratory should be put under at least one competent technical person. Care should be taken that the health reports given by the government laboratory are correct and dependable.

(11) Since the ambulance facility is an essential desideratum for a health institution, necessary steps should be taken by the government so that every government health institution gets at least one ambulance. This will contribute to improve the efficiency of the health institution.

(12) Intermittent studies should be made to evaluate the progress of health activities in the State. Such evaluation should be carried out through expert committees. The future

health plans should be prepared on the basis of reports of the expert committees.

(13) Publication of health journals, health articles, health reports etc. will prove helpful for improving health condition of the people. The audio-visual system, documentary films on health, hygiene and sanitation and other cultural activities based on health will also prove helpful to make the people, especially rural people, conscious about their health.

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