INTER-STATE DISPARITY IN HEALTH CARE FACILITIES IN THE NORTH EAST INDIA

Dissertation Submitted to Sikkim University in Partial Fulfilment of the Requirements for the Award of the Degree of

MASTER OF PHILOSOPHY

Submitted by

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Date: 27.02.2015

DECLARATION

I, Farhat Hossain, hereby declare that the issues raised and matter discussed in this thesis entitled **"Inter-State Disparity in Health Care Facilities in the North East India"** are the outcome of my own effort, that the contents of this thesis has not appeared anywhere for the award of any previous degree to me as well as to anybody else to my best knowledge, and no part of this thesis has been submitted by me for any degree in any other educational institution.

This is being submitted in partial fulfillment of the requirements of the degree of Master of Philosophy in the Department of Economics, School of Social Sciences, Sikkim University.

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CERTIFICATE

This is certified that the dissertation entitled **"Inter-State Disparity in Health Care Facilities in the North East India"** submitted to Sikkim University in partial fulfilment of the requirements for the degree of **Master of Philosophy in Economics** is the result of research work that is carried out by Ms. Farhat Hossain under my direct supervision. No part of the thesis has been submitted for any other degree.

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This dissertation titled "Inter-State disparity in Health care facility in the North-East India" provides a systematic treatment in Health economics and divided into five parts which gives us some valuable information with reference to health care facility in the North-East India.

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Sikkim University, Gangtok **Farhat Hossain**

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Abbreviations

ANM	:	Auxiliary nurse midwife
ASHA	:	Accredited Social Health Activist
AYUSH	:	Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathy
APSGH	:	Average population Served per Government Hospital
APSGHB	:	Average population Served per Government Hospital Bed
APSGAD	:	Average population Served per Government Allopathic Doctors
CBR	:	Crude Birth Rate
CDR	:	Crude Death Rate
CHC	:	Community Health Centre
DEA	:	Data envelopment Analysis
FRUs	:	First Referral Units
GSDP	:	Gross State Domestic Product
HFWTC	:	Health and Family Welfare Training Centre
IMR	:	Infant Mortality Rate
LHV	:	Lady Health Visitors
LEB	:	Life Expectancy at Birth
MMR	:	Maternal Mortality Rate
MMUs	:	Mobile Medical Units
MPW	:	Multi-Purpose Worker

NHA	:	National Health Accounts
NHP	:	National Health Programes
NRHM	:	The National Rural Health Mission
NUHM	:	National Urban Health Mission
OECD	:	Organization for Economic Co-operation and Development
OPE	:	Out of Pocket Expenditure
PHC	:	Primary Health Centre
PDGR	:	Population Decadal Growth Rate
PCFI	:	Percentage of Children Fully Immunized
PCPBE	:	Per Capita Public Expenditure
PCPvtE	:	Per Capita Private Expenditure
PCHE	:	Per Capita Health Expenditure
SC	:	Sub Centre
TFR	:	Total Fertility Rate

Chapter 1

Introduction

1.1. Introduction

Good health confers on a person or group's freedom from illness and the ability to be realized one's potential. Health is, therefore, best understood as the indispensible basis for defining a person's sense of wellbeing. Good health contributes to the production of consumable services because the better the state of health, the more time available for income-generating or productive activities. So, health care of every individual is very important for the overall economic development of a country. Health and health care need to be distinguished from each other and the former is seen as a direct function of latter (Srinivisan, 2010). According to Amartya Sen (2014), health care is not something that is supported by economic growth but it is something that supports economic growth. Health care covers not merely medical care but also all aspect of pro preventive care too. In India out of pocket expenditure is very low as compared to developed countries and it dominates the cost of financing in health care. Health care can be improved by a good political economy, progress made in poverty mitigation i.e. health care to the poor, reduction in inequality, generation of gainful and quality employment (to facilitate capacity to pay and accept individual responsibility for one's health), public information and development communication and through personal life style changes.

Health is indeed closely related to the accretion and persistence of poverty. Those who fall into poverty and those who remain poor, despite their best efforts, are most often beset by illness and unbearably high medical expenses. Social wellbeing is threatened by the non-provision of adequate health care facilities as poverty is

deepened and widened because of illness is left uncured. The poor bear a disproportionately higher burden of illness, injury and disease than the rich. They suffer ill health due to variety of causes e.g. poor nutrition for instance, reduces ability of work and weaken their resistance to disease. With their body often being their main income earning asset, sickness and disability have significant adverse implications in terms of loss of work and income, compounded by their inability to obtain adequate health care. Frequently, treatment expenditure and loss of earnings force poor families to exhaust their savings and assets, and take recourse to borrowings, leading to vicious circle of poverty, higher insecurity from illness and poor health status. Poor health condition can be a major source of capability deprivation and hence a cause for unemployment and poverty. More recent evidences from Organization for Economic Co-operation and Development (OECD) countries suggest that changes in lifestyle and non-medical advances have had a bigger impact than medical advances and health care on longevity and wellbeing.

1.2. Health Care and Health Care Facilities

The economics of health and health care of a country is a product of several outcome indicators like, life expectancy, morbidity, mortality, nutrition, access to safe drinking water and sanitation etc. Health infrastructure, an output indicator, often plays a paramount role of delivering these outcomes. India's improvements in terms of these outcome indicators of health have been possible due to the health infrastructure (Bhadra, 2012).

Access to health services is very important for the socio-economic development of the country. Access to health services divided into three parts. Firstly, the state of physical access to health services which includes indicators like

proportion of children who received first dose of oral polio vaccine, proportion of children fully immunized, providing expecting mother for ante-natal check up. Second part constitutes the state of social access to health services basically the social discrimination by education, caste, sex, religion and its relation with fertility level, family planning acceptance rates, child and infant mortality, maternal mortality. Lastly, the third part is the state of economic access of health services includes lack of access of adequate money for treatment expenditure or the out of pocket expenditure on health, public funded health and insurance schemes for poor people.

Every country needs basic health care facility to maintain comfortable life and relieve pain and suffering. The societal values and political philosophy influences how a country approaches the trade-off between equity and efficiency in health care system. The allocation of resources in public and private finance on health care has three common objectives; improving population's health, protecting people from financial catastrophe, and meeting the public's expectations regarding the availability of health care services. But the distribution of health expenditure in rich and poor countries is highly skewed which create a biggest barrier to achieving the national goal and objectives. Approximately 20-25 percent of a country's total expenditure in any year is spent on one percent of the population, and approximately 50 percent of expenditure is spent on 5 percent of the population and for rest 20-25 percent of the population, there is no spending for health care in a given year (Hsiao and Heller; IMF, 2007).

The World Health Organization (WHO) has recommended five key components, such as financing, service delivery, workforce, governance and information for monitoring several key indicators (WHO, 2008b) for making health

system efficient. Monitoring health system allows the effectiveness, efficiency, and equity of different health system models. It also helps to identify weaknesses and strengths of areas that needs further investments e.g. additional health facilities, better health information system, or better trained health personnel.

1.3. Global Perspective in Health and Health Care

Health expenditure as a percentage of GDP is significantly higher i.e. more than doubled in developed countries as compared to India (4.1 percent). Public Health Expenditure as a proportion of total health expenditure is very high in developed countries and it is low in developing countries. In general, low- income countries have a higher share of private health expenditure than do middle and high income countries. High out of pocket expenditure may discourage people from accessing preventive or curative care and can impoverish households that cannot afford proper health care.

The table 1.1 presents the information on different indicators of health systems of some selected developed and developing countries. It indicates that developing countries like India, China, Pakistan, Bangladesh, Nepal and Sri Lanka have a higher share of private health expenditure than the developed countries like Norway, UK and Japan. But the USA is an exception where it is below 50 percent. In India, private health expenditure is approximately 75 percent and it is also found that public expenditure is one of the lowest among the developing countries. Health expenditure as a percentage of GDP is significantly higher in developed countries and it is almost double as compared to the developing countries. USA has highest percent of health expenditure as a percentage of GDP i.e. 15.7 percent among the developed countries and Pakistan has lowest share of health expenditure as a percentage of GDP

i.e. 2.7 percent. In India, health expenditure is only 4.1 percent as a percentage of GDP which is near to the China (4.3 percent). Out of Pocket expenditure of private expenditure on health is lowest in USA and it is only 22.6 percent followed by 32.2 percent in Saudi Arabia and 62.7 percent in UK and rest of the countries have more than 80 percent out of pocket expenses. Per Capita health expenditure is very high in developed countries and it is not comparable with the developing countries. Norway has highest per capita expenditure which is $7354 followed $7285 in the USA. Bangladesh has lowest per capita expenditure and it is $15 followed $20 in Nepal), $23 in Pakistan and $40 in India. Low Per capita health expenditure does not mean that the developing countries are enjoying better health condition than the developed countries. But it signifies that the developing countries are unable to spend and meet the expected health expenses.

The WHO (2010) estimates that at least 2.5 physicians, nurses, and midwifes per 1000 people are needed to provide adequate coverage with primary health care intervention associated with achieving the Millennium Development Goals. All the developing countries are having less than 2.5 physicians, nurse and midwifes per 1000 people and developed countries are mostly fulfilling the requirement. In India, only 0.6 physicians are available to 1000 people and 1.3 nurses and midwifes available to 1000 people. Norway has highest percentage both in terms of physicians (3.9) and nurses and midwifes (16.3). The lowest availability of Physician and Nurse and Midwifes per 1000 people is 0.2 in Nepal and 0.3 in Bangladesh.

Availability of Hospital beds per 1000 people is higher in developed countries. Among the developing countries Sri Lanka has 3.1 hospital beds per 1000 people. Hospital beds per 1000 people are highest in Norway with 3.9 and minimum in

Bangladesh with 0.4. India has only 0.9 hospital beds per 1000 people due to its poor health care facilities.

In terms of health profile the developed countries perform better than the developing countries. Sri Lanka has good health profile among the developing countries and the Life Expectancy at Birth (LEB), Infant Mortality Rate (IMR), and Total Fertility Rate (TFR) and Maternal Mortality Ratio (MMR) are near to the developed countries. Life expectancy at birth in all the developed countries is more than 80 years except USA i.e.78 years whereas the developing countries it is less than 70 years. Infant Mortality Rate for developed countries is within single digit number whereas for the developing countries it is two digit numbers per 1000 live births. The Muslim dominating countries like Pakistan (4) and Saudi Arabia (3.1) have highest TFR than the other countries may be because of religious customs and beliefs and educational backwardness. The TFR for India is 2.7 children per woman and IMR is 52 per 1000 live births. Maternal Mortality ratio is significantly higher in developing countries and it is at three digit number in most of the developing countries whereas it is very less in developed countries and remains within single digit. In India 301 women die per 100000 live births due to pregnancy related issues.

Table 1.1 shows that Coefficient of Variation (CV) is more than sixty percent for most of the health indicators. The CV for health expenditure is highest for per capita health expenditure and more than hundred percent variations are realized for 11 selected countries which show worsening of disparities among them. About 61.79 variations are observed for total health expenditure as a percentage of GDP. In terms of health workers the coefficient of variation is too high for the selected countries as mentioned in table 1.1. 131 percent variation is realized for the availability of nurses

and midwifes per 1000 people in selected countries and about 77.86 percent variation is for physician per 1000 people. The variation of facilities for hospital beds per 1000 people is about 105.2 percent between. The CV is largest for health indicator such as Infant Mortality Rate with 93.4 percent variation and Maternal Mortality Rate with 81.11 percent variation. The lowest coefficient of variation is for life expectancy at birth i.e. only 9.5 percent and 30.8 percent variation is for total fertility rate. The larger the coefficient of variation shows larger amount of disparities among the countries. It is also evident that in terms of health expenditure, workforce, health infrastructures and other indicators there is a huge disparity among the countries which ultimately effects in health care facilities and population health in different countries.

Table1.1: Health Expenditure, Workforce, Infrastructures and Health Indicators in 11 Selected Countries

	Health expenditure				**Health workers**		**Hospital Beds**	**Health Indicators**			
Countries	Total Exp. % of GDP	Public Exp. % of total	Out of pocket Exp. % of private exp	Per Capita health Exp. (in $)	Physicians per 1000 people	Nurse and Midwifes per 1000 people	Hospital beds per 1000 people	LEB (in years)	IMR (per 1000 live births)	TFR (no of children)	MMR (per 1000 live births)
Norway	8.9	84.1	95.1	7354	3.9	16.3	3.9	81	3	2	7
US	15.7	45.5	22.6	7285	2.7	9.8	3.1	78	7	2.1	11(ME)
Japan	8.0	81.3	80.8	2751	2.1	9.5	14	83	3	1.3	6(ME)
UK	8.4	81.7	62.7	3867	2.2	0.6	3.9	80	5	1.9	8(ME)
China	4.3	44.7	92.0	108	1.5	1.0	2.2	73	18	1.8	37
India	4.1	26.2	89.9	40	0.6	1.3	0.9	64	52	2.7	301
Saudi Arabia	3.4	79.5	32.2	531	1.6	3.6	2.2	73	18	3.1	10
Pakistan	2.7	30.0	82.1	23	0.8	0.4	0.6	67	72	4	276
Bangladesh	3.4	33.6	97.4	15	0.3	0.3	0.4	66	43	2.3	351
Nepal	5.1	39.7	90.8	20	0.2	0.5	5	67	41	2.9	281
Srilanka	4.2	47.5	86.7	68	0.6	1.7	3.1	74	13	2.3	44
Mean	6.2	53.9	75.6	2006	1.5	4.2	3.6	73.3	25	2.4	185.7
S.D	3.8	22.8	25.7	2928	1.2	5.4	3.7	6.6	23.3	0.7	150.6
C.V (%)	61.7	42.4	33.9	146	76.8	131	105.2	9.1	93.4	30.8	81.1
Min Value	2.7	26.2	22.6	15	0.2	0.3	0.4	64	3	1.3	351
Max Value	15.7	84.1	97.4	7354	3.9	16.3	3.9	83	72	4	6

Note: ME stands for Model estimates for data in case of MMR based on National Estimates, Exp. stands for expenditure

Source: World Development Indicators, 2010, World Bank

There are certain challenges for low income countries and high income countries. High income countries or advance economies face several issues related to aging population, declining fertility rates, changed diet and lifestyles (Hsiao and Heller, 2007). Aging population has two other challenges; one is the pressure for a change in the health care delivery system and the second is the likelihood of a more rapid rise in health care cost. The fertility rates are declining because in advanced economies women are more concentrated on their carrier and child bearing at their workplace seems to be difficult. The people living developed countries have changed their diet and lifestyles. As a result, obesity has emerged as a serious health problem leading to widespread and long term chronic medical problems, such as diabetes, high blood pressure, and cardiovascular illness (Olshansky et.al; Goldman et.al 2005 cf. Hsiao and Heller; IMF, 2007). Now people in the developing countries like India have also changed their diet and lifestyles experiencing similar kind of problems. The low income countries are not progressing well in terms of their health indicators and health outcomes. The health indicators such as Maternal Mortality Ratio (MMR), Infant Mortality Rate (IMR) are falls below in comparison to the required rate to achieve the Millennium Development Goals. Because of low per capita incomes, low income country governments lack the financial resources to provide minimal support of health care services.

1.4. Inter-State Health Care Disparity in India

After sixty seven years of independence India remains one of the unhealthiest countries in the world. The inter-state disparity in health care is widening because of the inappropriate utilization of potentialities irrespective of its capacity. India with 16 percent of world population, accounts for about 30 percent of the infant and child

mortality in the world. The maternal mortality of the country is significantly higher than its population share justifies. Life expectancy at birth of the average Indian is only about 64 years which is about 15 years lower than which has been already achieved by developed countries. More than fifty percent of Indian women suffer from anemia and calcium deficiency which results in high rate of morbidity. Almost half of the Indian children under three years suffer from various levels of malnutrition (Kurian, 2010). This shows gloomy health profiles in India. The total health expenditure as a percentage of GDP is only approximately four percent and private health expenditure as a percentage of total health expenditure is about 75 percent which can be considered as a biggest catastrophe to the Indian economy and a huge burden to the poor people in the country.

There is a persistence of inter-state inequality and disparity in India in terms of access to health care, distribution of public health expenditure as well as health outcomes. The variation of health expenditure as a percentage of total expenditure across the 14 major states is very less but the public expenditure as percentage of total expenditure varies significantly. Public spending on health in India is amongst the lowest in the world, whereas its proportion of private spending on health is one of the highest. It is verify from Social Development Report (2010) that Rajasthan and Karnataka have highest share of public expenditure as a percentage of total expenditure and it is 30.4 and 28.9 percent respectively. The highest share of private expenditure as a percentage of total expenditure is in Uttar Pradesh (92.5%) followed by Haryana (89.6%) and Bihar (88.2). The share of total health expenditure in richer states like Haryana and Punjab is lower than the poorer states like Bihar and Odisha. Kerala and West Bengal have largest share of health expenditure as a percentage of total expenditure 4.71 percent and 4.93 percent respectively. The share of private

expenditure as percentage of total health expenditure is more and the states are withdrawing from this vital sector of human welfare. The expanding private sector involvement creating a profit oriented activities in health sector and it is crucial condition for human welfare (Kurian, 2011). Bhadra and Bhadra (2012) analyzed the issues relating to the low public expenditure on medical and public health because it often plays a imminent role to have improved health related outcomes. Sen (2004) also mentioned that stagnating public health expenditure leads to high drug prices and health services, flagrant gender inequalities as well as privatization of health care sector.

The Table 1.2 indicates that the percentage of public expenditure as share of GSDP is highest for North-East India (2.29 percent) and lowest for Haryana (0.49 percent) whereas the mean is 0.88 percent. The percentage share of public expenditure out of state expenditure is highest for Kerala with 4.65 percent to lowest in Maharashtra with 2.88 percent and the mean is 3.67 percent. The state of Kerala is performing better among the all states in India in terms of health expenditure, infrastructure and profile. Kerala have highest Per-Capita health expenditure i.e. ₹507 and it is lowest in Bihar only ₹166.

The numbers of government allopathic doctors have highest in the states like Maharashtra (14509), Tamil Nadu (13538) and Uttar Pradesh (10164). It may be because of higher number of medical institutes located in these states. Bihar and Gujarat have lowest number of government doctors and the figure is only 1206 and 2764 respectively. Although the numbers of doctors are inadequate in the states of Bihar, Haryana, West Bengal, Odisha, Punjab and Gujarat but the number of nurse and midwifes are adequate in all the 14 major states except Bihar. Tamil Nadu

(202949) and Karnataka (187053) have highest number of registered nurses and midwifes whereas it is lowest in Bihar (8947) and Haryana (22248). Average population served per hospital beds is highest in the states like Bihar (7846) followed by Uttar Pradesh (3499) and Haryana (3122) and lowest in Kerala(910).

The health indicators such as LEB, IMR, TFR and MMR are varies significantly for most of the states. Life Expectancy at Birth (LEB) varies from 73.8 years in Kerala to 57.1 years in Madhya Pradesh and 58.7 years in Odisha. Infant Mortality Rates (IMR) varies from 12 in Kerala to 59 in Madhya Pradesh. The corresponding minimum and maximum figure for Maternal Mortality Ratio (MMR) are 81 for Kerala and 359 and 318 for Uttar Pradesh and Rajasthan respectively. The Total Fertility Rate (TFR) is highest in the Uttar Pradesh and Bihar with 4.4 and 4.3 children per woman respectively. Kerala and Tamil Nadu have lowest TFR with1.7 and 1.8 only.

From table 1.2 it is observed that overall performance in health is good in the states like Kerala, Tamil Nadu and worst performing states are Bihar and Uttar Pradesh. Kerala and Karnataka are performing well due to better human development and awareness among the people, female literacy, more consciousness about their health and lastly because of good governance. Kerala is successful in promoting basic human capabilities through its health expenditure.

The health care facilities for North-East India are still different from the rest of the country. The North-East India is known for the richness of natural resources and has high potentiality for development but it is not growing as much as expected. There exists economic backwardness within the states due to the difficult terrain and geographic conditions. Although the North-East India is considered under the special

focus states with 10 percent outlay for health and family welfare but the health outcomes are not satisfactory. In North-East India the average availability of health worker such as total number of government allopathic doctors and total number of registered nurses and midwifes are minimum with respect to the other Indian states. Average population served per hospital bed for North-East India is 1061 persons which is satisfactory due its low population size. The health indicator like LEB, IMR, MMR and TFR in North-East India are better than the national average but it is below in comparison to other better performing states in India such as Kerala and Punjab. The per capita health expenditure is also very high in North-East India with ₹1093.

The mean value for percentage of public expenditure as share of GSDP is only 0.88 percent whereas it is high for as share of state expenditure i.e.3.67 percent. The mean figure for per capita health expenditure is ₹391 and for government allopathic doctors it is 6322.3 and 88583.6 is registered nurses and midwifes which is lower than the North-East India except the figure for nurses and midwifes. The mean value of average population served per hospital bed is 2376 persons and in North-East India it is only 1061 persons. The Coefficient of Variation (CV) for percentage share of public expenditure as GSDP is high with 48.34 percent but less variation is realized for percentage share of public expenditure as state expenditure with 15.50 percent. More than 70 percent variation is in health workers and average population served per government hospital bed reflecting the inter-state disparities in health infrastructure. The coefficient of variation for per capita health expenditure is 54.4 percent which reflects the inequitable distribution of income among different states in India. In terms of health indicators the coefficient variation is low except for the maternal mortality rate. About 86.6 percent variation is observed for maternal mortality rate reflecting

the disparities of woman status in different states with respect to their educational level, working condition, and health awareness.

Table1.2: Health Expenditure, Workforce, Infrastructures and Health Profiles in 14 Major States in India

States	Health Expenditure			Health Workers		Hospital Beds	Health Indicators			
	% of Public Exp. as Share of GSDP	% of Public Exp. as Share of State Exp	Per Capita Health Exp. (in ₹)	No of govt allopathic doctors	Total no of regd. nurses and midwifes	Avg. popn. served per govt hospital bed	LEB (in years)	IMR (1000 live births)	MMR (100000 live births)	TFR (no of children)
Andhra Pradesh	0.72	3.22	402	7799	168947	2230	63.7	43	134	2.1
Bihar	1.12	4.12	166	1206	8947	7846	61	44	261	4.3
Gujarat	0.57	3.06	320	3586	91018	1746	63.5	41	148	2.8
Haryana	0.49	3.19	364	2764	22248	3122	65.4	44	153	3
Karnataka	0.87	3.77	405	4648	187053	1119	64.6	35	178	2.3
Kerala	0.88	4.65	507	3878	136341	910	73.8	12	81	1.7
Madhya Pradesh	0.87	3.19	214	4929	100361	2492	57.1	59	269	3.7
Maharashtra	0.55	2.88	351	14509	97974	2477	66.4	25	104	2.2
Odisha	0.98	4.41	303	3435	72461	2514	58.7	57	258	2.7
Punjab	0.65	3.01	348	3545	56485	2426	68.6	30	172	2.2
Rajasthan	0.98	3.90	405	9551	101738	1777	61.3	52	318	3.7
Tamil Nadu	0.71	3.43	421	13538	202949	1203	65.4	22	97	1.8
Uttar Pradesh	0.92	3.86	269	10164	25748	3499	59.3	57	359	4.4
West Bengal	0.69	4.32	292	3325	51491	1213	65	32	145	2.2
North-East India	2.29	4.01	1093	7957	4992.8	1061	67.4	36.9	NA	2.2
India	NA	NA	391	115483	1406006	1947	62.7	44	212	2.9
Mean	0.88	3.67	391	6322.3	88583.6	2376	64.1	39.3	191	2.75
S.D	0.43	0.57	212	4063.8	63394.9	1706	4.26	13.8	86.6	0.88
C.V (%)	48.34	15.50	54.4	64.27	71.5651	71.81	6.64	35	45.3	32
Min value	0.49	2.88	166	1206	4992.8	910	57.1	12	81	1.7
Max value	2.29	4.65	1093	14509	202949	7846	73.8	59	359	4.4

Source: Computed from 12th Five Year Plan, Social Development Report, 2010. National health profile, 2012

1.5. Statements of the Problem

1.5.1. Financial Problem in Health

Health sector in India is neglected since independence and only 1% of GDP is invested in health sector. In 11th five year plan (2007-2012) only 61% i.e. ₹75, 533 crores out of the total budgeted expenditure of ₹ 1, 23,9001crore has been spent on health sector. This shows underutilization of the funds. It is the failure of the Government policy that they can't utilize the funds in efficient manner for the proper inter-regional inclusive development in health sector. A massive health sector reform is needed, including integration of primary health care with specialized services. Amartya Sen (2014) stated in an interview that India has over reliance on private sector where basic public health services were not available. Recent evidence suggests that ineffective incentives and lack of accountability undermine the public provision of health services, leading to underperformance and substandard care (Lewis 2006). This may help explain why public spending shows minimal effects on health status. Jack and Lewis (2004) attribute the shortcomings to government failure, and lack of sound institution undermines health investment. But recently within this limited period NRHM has succeeded in putting back the issue of public health at the top of Government agenda. This has put pressure on the state government to divert resources to health sector and strengthing the public health system. Due to low price spending there will be an impact on equity. There is an urgent need to restructure the budgeting system to make it more functional, amenable to review of resources use to take corrective measure in time and to make it flexible enough to have the capacity to respond to an emergency and local needs. This showing that financial problem also leads to managerial problem. The financing of health will influence key

macroeconomic variables such as the fiscal balance, tax rates, wage rates and competitiveness, prices, and possibly even interest rates and the current account. The pressure on health financing may give rise to a need to raise tax or insurance rates or product prices. Governments may seek to address the fiscal imbalances associated with a higher health spending by raising tax rates. The burden of higher taxes on people can also influence the potential for health medical cost which may lead to lower household saving.

1.5.2. Socio-Economic Problem of Health

Ensuring equitable access of all Indian citizens residents in any part of the country, regardless the income level, social status, gender, caste or religion to affordable accountable and appropriate assured quality health services (promote, preventive, curative and rehabilitative) as well as public health service addressing wider determinants of health delivered to individuals and populations with the Government being the guarantor and enabler although not necessarily the only provider of health and related services. In India health care access and availability has a peculiar public private mix that generates a political economy which makes the health sector purchasing power dependent. This is a contradiction given the fact that the majority do not have the purchasing power even to sustain adequate nutritional requirement. In a country like India where nearly half of the population struggles under severe poverty condition and another one half of the remaining manages at a subsistence level, it is tragic that social needs like health and education have to be more often than not bought in the market place. In India under nutrition level are extremely high. According to NFHS-2 conducted in 1998-99 (National Family Health Survey) 47% of all Indian children below age 3 are underweight, 52% of all adult

women are anaemic. In India 36% have a body mass index below the cut-off of 18.5 commonly associated with chronic energy deficiency (International Institute for Population Science 2000). This humanitarian catastrophe is not just a loss for the persons concerned but also a tragedy for the nation as a whole. A decent society cannot be built on the ruins of hunger, malnutrition and ill health. Poor health affects both the ability to save and the impetus to save. Sickness can impose large out of pocket expenses that reduce current and accumulated household savings. In many developing countries the weakness of public and private insurance systems means that out–of-pocket spending by households is the main source of financing for the health system. For example, in India 83 percent of health spending comes from the private sector and 94 percent of private sector spending consists of out-of-pocket expenses (WHO 2007). Health shocks may throw families into poverty if they lack insurance and are forced to sell productive assets, such as land or animals to pay for medical expenses (Xu and others 2003). Health development can be lead by two factors. One is the state responsibility for healthcare and other is the free medical care for all. Health is the foundation of better quality of life. The two key elements of human capital are the extent to which the labour is educated and level of its health. Recent empirical work has sought to assess the association between human capital and aggregate economic performance and found that given labour and capital, improvement in health status and education of the population lead to a higher output (Barro and Sala-i-Martin, 2004). Health is very important factor to raise the human capabilities and capabilities induces knowledge & efficiency in work which is needed to the country's overall development and growth. The improvements in health result in improvements in national income, poverty could decline on account of both the standard trickle down effects and an increased financial capacity of nation to set up

safety nets. In rural areas health is neglected for many years and their capabilities are not sufficient for their working capacity. Therefore it is very important to improve the rural health infrastructure, ensuring adequate presence of healthcare manpower and addressing local needs and concerns.

1.6. Research Questions

The present study attempts to answer the following research questions:

1. What is the nature of public health care facilities available in the North-East India?

2. What is the relationship between health expenditure and facilities in North-East India?

3. Whether health care facility has any impact on health profile in the North-East India?

1.7. Objectives of the Study

1. To describe the health profile of the people in the North-East India.
2. To analyze the inter-state disparities in health care facilities in the North-East India.
3. To measure the relationship between health expenditure and health care facilities in the North-East India.

1.8. Hypothesis of the Study

1. (H_0): Variations in the health indicators do not have any significant relationship with the health status of the states.

(H_1): Health indicators have significant relationship with the health status of the states.

2. (H_0): Variations in the health care services and facilities do not have any significant relationship with the access to health care for all.

(H_1): Health care services and facilities have significant relationship with the access to health care for all.

3. (H_0): Variations in the health expenditure and investment do not have any significant relationship with health outcomes.

(H_1): Health expenditure and investment do have significant relationship with health outcomes.

1.9. Methodology

The present study considers all the eight States in North-East India i.e. Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. The data have been analyzed based on secondary sources. The States are taken as unit of analysis and interpretation. All the statistical techniques and tools are applied at State-level only which may be limitations and scope of the study.

1.9.1. Nature of Data: The data related to health profile of North-East India considers indicators such as IMR, MMR, TFR, CBR, CDR, sex ratio, population decadal growth rate, percentage of children fully immunized, neonatal mortality rate

etc. The information regarding the health facilities such as number of SCs, PHCs and CHCs, sub-divisional hospital, district hospital of different states are taken from the district level data of National Rural Health Mission (NRHM). The budget estimates of revenue expenditure are used for the analysis of health expenditure in North-East India and also using per capita health expenditure.

***1.9.2. Type of Data*:** The present study for the analysis of health profile, health infrastructure and health expenditure were worked out through cross section data. Further study can be done with the help of time series data.

1.9.3. Sources of Data: In order to estimate the model we used secondary data. Health profiles of the states are collected from Ministry of Statistics and Programme Implementation (MOSPI) and Registrar General of India. The sources like National Rural Health Mission (NRHM) and National Family Health Survey (NFHS) were helpful for analyzing health facilities. Some information are also collected from the source like State Finance, Reserve Bank of India, Economic Survey (GOI), Human Development Report of North-Eastern Staes for e.g. Sikkim Human Development Report, for the study of intra regional differences in health care system. The health expenditure of India was listed with the help of National Health Accounts. The data from Central Statistical Organization (CSO) are helpful for analyzing the health care expenditure and a comparative framework of the states in North-East India.

***1.9.4. Method of Analysis**:* To study the objectives, the effect of health care expenditure on health status of people in the North-East India is analyzed through the correlation analysis and a comparison is worked out across the states. Gini-coefficient of inequality is used for the study of health inequality in the North-East India by using

the health expenditure such as Per Capita Health expenditure, Per capita public and private health expenditure and population. Ranking method is used for constructing indices of eight states for the study of health status in North-East India. Data Envelopment Analysis (DEA) is used for studying the efficiency of the states by using indicators such as lMR, Average population per government hospital, Per Capita Public Expenditure and Average population served per allopathic doctors.

Chapter 2

Literature Review:

Dimension of Health and Health Care Facilities

2.1. Health and Health Care

Health involves many aspects and cannot be defined in exact measurable terms because its presence is largely a matter of subjective judgement. As precisely health is a relative affair that represents the degree to which an individual can operate with effectiveness within the particular circumstances of his heredity, and his physical and cultural environment (Mansourian, 2010). Last (2001) defines the notion of sustainable health as a sustainable state of equilibrium among human and other living things with which we share the earth. In this perspective, equilibrium or harmony, is considered to be the critical concept; while cultural elements and belief system are also essential features of this description of health. Health and health care have been defined in various ways by many organizations. According to World Health Organization (WHO, 1946) health is defined as the state of complete physical, mental and social well-being and not merely the absence of disease and infirmity. The preamble of WHO further states that the enjoyment of highest attainable standard of health is one of the fundamental rights of every human being. As Amartya Sen (Nobel laureate) observes health from the perspective of human development and capability approach. He also mention that health is among the most important condition of human life and a critically significant constituent of human capabilities which we have reason to value (2002, p.660). This is essential because health is a basic component of happiness and well-being and also serves as a means to empowering

people with capabilities and freedom. As capabilities provide freedom from hunger and poverty, ensuring access to basic preventive and curative healthcare is an essential component of anti-poverty intervention and thereby leading to development and improvement in the health status of the population (Rao et .al. 2008).

2.1.1 Health: A Cause or Effect of Economic Growth

In addition to its intrinsic value, health plays an instrumental role for economic growth, educational achievements and cognitive development, employment opportunities, income earning potential, as well as the more amorphous aspect of dignity, safety, security and empowerment. The report of the WHO's Commission on Macroeconomics and Health (2001: i), states that extending the coverage of crucial health services to the world's poor could save millions of lives each year, reduce poverty, spur economic development and promote global security. According to this view, better health care may be able to accomplish what development practitioners, non-governmental organisations (NGO) and economists have been suggesting that foreign aid and diplomacy has failed to achieve it among the countries. This report also mentions that with the increased spending on health as a way to promote economic growth, leads to increase in both health status and household earnings. Researchers also have revealed a significant link between health and growth and hence argued for large increase in government spending on health (Bloom and Canning 2003a, 2003b).

The reverse has also been argued, where wealth is seen to be necessary input for the achievement of health which is specially known by infant mortality outcomes. Indeed, Pritchett and Summers (1996) found that wealthier nation are healthier nation as demonstrated by the strong association between per capita income and child

mortality. They suggest that the effect on income on health is causal and that, for every unit change in per capita income, there is a 0.2 to 0.4 percent drop in child mortality rates.

Economic growth assumes a central role in development objectives and many have contested the centrality of economic growth to health. Anand and Ravallion (1993) find the relationship between GNP per capita and health to operate mainly through the impact of GNP on private incomes, particularly of the poor and public expenditure on health care. When both the factors are included in their statistical analysis, GNP alone explains very little about the relationship. While it is true that increased economic growth provides the resource base to develop and strengthen health system, increase in GNP are not always translated into health improvements. Health improvements have more to do with public, as well as individual, resource allocation and priority setting. In other words it is not only the absolute availability of resources, but rather how these resources are distributed and used.

Sen (1999, p-620) describes GNP induced health improvement as growth mediated health development. This takes place, when fast economic growth is broad and highly employment-oriented. It is also argued that economic growth results in the expansion of social services, including health care, education and social security. This argument has been empirically verified by Ranis et.al (2000).

Modern growth theory distinguishes two channels through which human capital accumulation affects the growth rate. According to the tradition of Lucas, the first approach argues that the differences in growth rate of per capita incomes are driven by differences in rates of human capital accumulation. It is straightforward to

show how improvements in health increase the return to human capital accumulation, and thus have a direct affect on the growth rate.

Schumpeter defined the second approach as the differences in the level or stock of human capital affect the capacity of the economy to innovate and catch up with more advanced countries. Since the stock of human capital is correlated with the level of health achievement, it is again straightforward to explain the growth impact of health performance (Aghion and Howitt, 1998 *cf.* Akhtar 2010).

Some cross country studies shows a significant link between health, income inequality and economic development. Income has a larger effect on health and longevity among the poor than among the rich. The income redistribution from rich to poor, within countries, or between countries, will improve population health (Preston, 1975). Pritchettn and Summers (1996) use the relationship between income level and health to argue for an emphasis on economic growth in poorer countries as a method of improving population health. However, the findings of Easterly (1999) weaken this argument. Easterly finds that, although income levels and population health are closely related, the effect of changes in income on population health over reasonable time spans appears to be quite weak. By contrast, relatively inexpensive public health interventions and policies can have remarkable impacts on population health, even in poor countries. In practice, the major forces behind health improvements have been improvements in health technologies and public health measures that prevent the spread of infectious disease, not higher income (Cutler, Deaton, and Lleras-Muney 2006). A number of studies have highlighted the impact of better population health on inflows of foreign capital which is opposed to increase in domestic saving. This effect is usually thought to operate in situations in which foreign direct investment and

expatriates (either in the role of staff or consumers) are highly complementary (Alsan, et.al, 2006 & Sachs et.al, 2002).

A recent version of Preston (1975) curve established the international relationship between life expectancy and national income in current purchasing power parity. The evidence from poorest countries shown that increase in average income strongly associated with increase in life expectancy but as income per head rises, the relationship flattens out, and is weaker or even absent among the richest countries. As Preston originally noted the relationship between mortality and income within countries, and also characterize that there would be a negative relationship across countries between income inequality and life expectancy.

The Commission on Macroeconomics and Health (2001) reports finds that a 10 percent improvement in life expectancy at birth (LEB) is associated with a rise in economic growth of at least 0.3-0.4 percentage points per year, controlling for other growth factors (Bloom et al 2004, p24).The difference in annual growth between a high income county having an life expectancy at birth of 77 years and a low income country with life expectancy at birth of 49 years is about 1.6 percentage points per year. The cumulative effect over a period of time becomes quite substantial (Gallup and Sachs, 2001).

2.2. Health and Regional Development

Baily (2010 *cf.* Akhtar, 2010) observes that various set of activities established a significant link between health care services and regional development. Health care services have a great potential for stimulating the economic development not only in metropolitan areas but also in peripheral regions. Some health services face the basic constraint of physical proximity to their market. These health care services can

constitute an important element of the economic base of a region. Often, it is not only the most rapidly growing sector of the economy, but also it can be an export-oriented activity as it serves local population and outside patients. A significant proportion of health services like hospital services to pharmaceutical activities must be regarded as basic as they are not only exportable but also highly responsive to external demands. Regional development through the health services is responsible for creating jobs and increasing the quality of life and bringing financial injections in the local economy.

This inequitable pattern of regional development in the state is associated with the urban population getting larger chunks of available resources. The improvement of districts health system through better management is another plank of NRHM strategy which include fully functional facilities from sub-centre to district hospital, increasing and improving human resources in rural areas, accountable health delivery, effective decentralization, reduced MMR, IMR and TFR, action for preventive and promotive health, disease surveillance, hamlet to hospital referral linkage, health information systems, planning and monitoring with community ownership, equity issues like women's empowerment and securing entitlements for scheduled castes/tribes and minorities (Purohit, 2008).

According to Ahmad (2011), health disparity should be viewed as a chain of events signified by a difference in: environment; access to, utilization of, quality of health care; health status; or a particular health outcome that deserves scrutiny. Such a difference should be evaluated in terms of both inequality and inequity, since what is unequal is not necessarily inequitable. The specific determinants of health disparity as per WHO (PAHOWHO, October 1999) criteria include natural, biological variations; health- damaging behaviour that is freely chosen, such as participation in certain

sports and pastimes; the transient health advantage of one group over another when one group is first to adopt a health promoting behaviour; health- damaging behaviour in which the degree of choice of lifestyles is severely restricted; exposure to unhealthy, stressful living and working conditions; inadequate access to essential health services and other basic services; and health-related social mobility, involving the tendency for sick people to move down the social scale.

The problem of rural-urban disparities in health care services is further aggravated by the disparities in regional distribution. In rural areas more than 70 percent of populations live only with 30 percent of doctors, and 17 percent of beds are located; As a result there is one doctor per 1100 in urban areas while in rural areas a single doctor has to serve about 9,140 people. In case of bed population ratio the corresponding population figures are 389 in urban areas and 6,264 in rural areas (Khethinani, 1991).

A better understanding of the economics of health services must be integrated in regional policies so that if the government wants to use all possible means for peripheral development then the peripheral region must be benefited greatly from health service activities (Bailly, 2010).

The problem of regional disparities is a multi dimensional concept. It not only embodies the differences on economic basis, but also considers variation in cultural and social arrangement. The per capita net domestic product of a region is often used to highlight the inter-state differences on regional basis .The other important indicators of regional disparity can be crude birth rate, crude death rate, life expectancy, and infant mortality rate (Alam, 2011). Regional differences may be inter-state and intra-state in character and again it may be sectoral or total. Disparities

between states in development outcomes can largely be attributed to governance and delivery services. In spite of improvement in quality of health care, wide inter-state and rural-urban disparities in outcomes and impacts continue to persist in health sector.

The problem of regional disparities has further accentuated after reforms. The New Economic Policy of the Government of India with its emphasis on greater role of the private sector and market forces has major implications for regional disparities (Singh, 1999 *cf.* Kapil, 2010). Regional medicometry is defined by the supply of, and demand for, medical services in a regional context. It employs the combined viewpoints and the methods of geography, epidemiology, economics, sociology and regional science to develop a comprehensive analysis of the multifaceted aspects of modern health care system. Medicometric research is able to contribute to the orientation of the medical and health care policies of our society which is based upon a multidimensional approach. The application of mathematical and statistical methods to the testing of regional medicometry can be analyzed by medical regularities in space and it incorporate with the viewpoints of all the actors in the health system with an overall concern for issues of efficiency and equity. In this study mediometric studies includes the analysis of regional impacts of hospitals in peripheral region. There is a direct impact through the supply of health care which attracts patients residing within and outside the region. Further, the hospital limits the tendency of local patients to seek treatment in other regions. Direct impacts are also produced through the supply of jobs which discourage emigration of qualified local workers. The multiplier concept has been widely used in studies on regional hospitals located in peripheral regions. The high level of health care and accessibility to health infrastructure are creating a good quality of life. The cultural life of the region

supported by the relatively affluent and well educated workers associated with health care provision and which indirectly increase the regional prestige (Bailly, 2010).

Regional medicometry is based upon four perspectives that are global in nature and that recognize the important role played by space and by society. The first perspective is the explicit recognition of the system's environment which is due to the insertion of the health care system within the broader context of economic social systems. Economic, geographical, social and ethical criteria are operative at this level and it is necessary to conceptualize it in terms of alternative allocation of scarce resources.

The second perspective is a broad interpretation of efficiency which requires examining questions dealing with medical investments and expenditure from the perspective of social responsibilities and economic efficiency. This notion also require us to analyze demand for health services in the framework of flexibility of choice and to regard the supply of health services as a function of both the present and future states of the system of health care.

The third perspective of regional medicometry is the geographical scale of intervention. In this all health related policies must form a coherent system in which objective and efficiency criteria must be defined in a global manner, taking into consideration the various spatial scales at which intervention can occur. Under the two approaches the geographical scale of intervention can occur. Firstly, top-down approaches that give priority to broad national objectives and constraints and lastly, a bottom-up approach that give priority to local objective and constraints.

The fourth perspective is the temporal scale of intervention which taking the criteria of objective and efficiency of health-related policies and explained by two

approaches. Firstly, short term approach that emphasizes the resolution of immediate problems and lastly, long-term approach that gives priority to the development and continuing support of infrastructure and comprehensive programmes and to addressing major structural problems (Bailly, 2010).

2.3. Health and Productivity

Some evidences from the cross country studies show that health has a positive and statistically significant effect on the rate of growth of GDP per capita. Higher income potentially permits individual and societies to afford better nutrition, access to better healthcare and presumably achieve better health (Bloom et.al, 2004). The development of the historical retrospective approach to Robert W. Fogel (1986 cf. Spence and Lewis, 2009), several of whose works have shown how much of a country's or region's economic growth would depend on the extent to which there was proper nutrition and improved health. Lebibenstein (1957 cf. Spence and Lewis, 2009) hypothesized that relative to poorly nourished worker those who consume more calories are more productive and that at very low level of intake, better nutrition is associated with increasingly higher productivity. Workers who are trapped by their low nutrition and inability to work would devote all their energies to finding food, and would have no energy for consuming anything other than food, for saving or even for procreation (Gersovitz, 1983). The story of nutrition and wages has directly incorporated the two way causality between health and earnings and provides a general equilibrium explanation of unemployment and poor health that has obvious relevance to poor countries now as well as to the historical record in now rich countries. The nutritional wage model provides an account how inequality affects

both health and earnings while explicitly recognizing that health and earnings are simultaneously determined (Deaton, 2003).

Another study finds that food intake or nutritional level, average daily calories intake per person, level of education or literacy rate are some components worth mentioning. They affect the mortality, life expectancy and child health of an economy. Maternal malnutrition leads to premature birth, under weight babies. Maternal health condition directly influences the child health and childcare. Health condition and health status of a mother are two dominant factors, which reflect the social concern for women (Malakar and Bose, 2011).

The unfair distribution of health capabilities may therefore affect social justice in several ways (Sen, 2002). Based on evidence from South Asia, Osmani and Sen (2003) conclude that gender bias results in high maternal under-nutrition, which leads to intra-uterine growth retardation of the foetus. This leads to a very high prevalence of low birth weights, which in turn contributes to a high prevalence of both child under-nutrition and adult ailments. Thus, women's deprivation in terms of nutrition and health attainment has serious repercussions for society as a whole.

In another study, Glewwe et al. (2001) found that well nourished children perform better in school than under-nourished ones, mainly because their learning productivity per year was higher. Malnutrition not only lowers the learning productivity of school children but it also reduces their intellectual capacities. Iodine deficiency, for example, lowers IQ scores by as much as 10-15 percentage points (UNICEF 2005). The health and nutritional status of children can potentially determine their achievements in the social, psychological and economic spheres of their lives (Ariana and Naveed, 2009).

2.4. Heath Infrastructure

Adequate health infrastructure is necessary to ensure in access to basic healthcare facilities. Access to health care reflects either a consumer's ability to pay (a market approach, where private financing offers people the opportunity to purchase more or better services), or is regarded as a citizen's right irrespective of income and wealth (representing universal or near- universal access to health care for all citizens). The mix and proportion of various sources of financing for health care systems have a great impact on equity and accessibility in health care (Mansourian, 2010). The World Health Organization has had the greatest influence on the development of modern national health policies and health care systems. These systems should provide health care to protect and improve the health of a population by means of health promotion, disease prevention, and diagnostic and therapeutic services.

Health care policy and planning is divided into two parts: first is the characteristics of health delivery system (personnel and facilities) which includes number, volume, size, distribution, location, organization, preferences, prejudices, price, quality; and second is the characteristics of potential users (individual and communities) and it includes number, distribution, location, need for service, ability to avail service, effective demand, preferences, prejudices, attitudes, values. Health delivery system generates availability of potential access (spatial or aspatial) and potential users generate utilization of realized access (spatial or aspatial) and both the characteristics relate to spatial or aspatial facilitators or barriers. Aspatial access is expressed most commonly in terms of differential pattern of availability and utilization of health care resources among various subgroups in a population due to economic, social, cultural, political and psychological barriers. Spatial access is the

geographical expression of relative availability and utilization of health care services. Availability of potential access and utilization of realized access have the present access of spatial pattern, aspatial pattern, degree or level which generate inadequate or unsatisfactory future access of health and adequate or satisfactory future access of health (Khan, 1985).

The factors that can contribute to health achievements and failure go well beyond health care, and include many influences of very different kinds, varying from genetic propensities, individual incomes, food habits and lifestyles, on the one hand, to the epidemiological environment and work condition, on the other hand we have to go well beyond the delivery and distribution of health care to get an adequate understanding of health achievement and capability (Sen, 2002, p.660).

A number of studies have highlighted the issue of the efficiency in resource utilization in the health care sector and focused on overall health system performance and its impact on health outcomes (WHO 2000; Murray and Frenk 1999; Worthington 2004; Hollingsworth & Wildman 2002; Jamison et al. 2001; Salomon et al. 2001; Evans et al.2001; Wang et al. 1999; Sankar and Kathuria 2004). Such attempts have developed an idealized yardstick that is used to evaluate economic performance of health system by deploying frontier efficiency measurement techniques.

Further studies suggests that the overall efficiency of the public health delivery system remains low due to considerable disparities across districts which includes the differentials in availability and utilization of inputs such as per capita availability of hospitals, beds, and manpower, and adversely affects life expectancy. There exists considerable disparity between rural and urban areas in healthcare infrastructure like concentration of hospitals, beds, and dispensaries in urban areas

which resulting in higher per capita availability in urban areas relative to rural counterpart. Rural infrastructure such as PHCs and SCs are not adequately supported by necessary inputs (Purohit, 2008).

It reveals that rural public health facilities can be strengthened by overcoming deficiencies in physical infrastructure and shortage of equipments and machines. Deficiencies of physical infrastructure include the functional disorder and lack of facilities at the SCs, PHCs and CHCs units where healthcare is actually delivered. The availability of functional labour room is very low and PHCs did not have 4-6 beds, or care corner for newborn babies in the majority of the states which was revealed by evaluation survey (Husain, 2011).

Gill's (2009) study also highlights that the lack of regular electricity supply to Sub-Centres (SCs) in some states like Uttar Pradesh (UP). The infrastructural facilities in CHCs is reported to be satisfactory but the non-availability of facilities like mobile medical units, blood storage, emergency care facilities for children and surgery needs to be addressed by concerned states. Gill (2009) found that an absence of general cleanliness like toilet facilities and medical waste disposal system in many SCs, PHCs and CHCs, despite the presence of a sufficient number of cleaning staff. The shortage of medical equipment like electrocardiogram (ECG) machines, cardiac monitor for OTs, baby cradles, infant warmers, oxygen cylinder, laryngoscope or wheelchair, thermometers, fetoscopes and lack of blood pressure apparatus at various SCs, PHCs and CHCs. Now by concluding that these achievements have fallen short of what was originally conceptualized, the investment has had a positive impact on several health indicators like immunization, institutional deliveries and ante-natal care (Duggal, 2009). There are some limiting successes of NRHM but the NRHM did not

adequately take the complexities of Indian rural societies characterized by gender disparities, and divided on the lines of caste, micro-politics and economic class. In its focus on architectural modification of health system and introducing modern managerial concepts, the NRHM did not pay attention to the socio-cultural context in which health system is situated and which ultimately determines the success of policies and measures including decentralization of services.

In another study Khan (1985) examines the expansion of health infrastructure and manpower has minimum effect on health care that reach to the vast majority of people, particularly in rural areas of Bangladesh. In 1980, after 7 years of conscious effort to bridge the rural urban gap, less than 10 percent of the doctors and about 24.5 percent of the hospital beds were in the rural areas where 90 percent of the people live; the quality of rural health care facilities also remained relatively inferior (Khan, 1985, *cf.* Planning commission, 1980). The relatively developed and more urbanized areas of the country have greater concentration of health care facilities and manpower. The immense qualitative gap between urban and rural facilities and at least in the Third World Countries like Bangladesh finds expression in vastly different rates of inpatient service utilization and also some extent outpatient service utilization at different level of a hierarchy of facilities. The straightforward application of such indicators as hospital per bed utilization ratio and facility per population ratio without using appropriate weighting factor is improper.

Das Gupta (2008) suggested that the improved health care facilities leads to better health status of its population, reduce its overall mortality rate, and arrest the spread of communicable diseases like tuberculosis, malaria, HIV-AIDS and others. It can also contribute to the quality of education by improving attendance of students

and lead to improvements in the productivity and income-earning capacity of future generation which can also curb poverty of a region. Das Gupta (2008) further mentioned that the North-Eastern states have a poorly developed health care delivery system both in terms of health care personnel and health care institutions and infrastructures especially in rural and tribal areas. The improvement in the health care delivery system in the north-eastern region can be possible through market –oriented reforms. The pro-reform lobby advocates two kinds of market-oriented reforms in the health care delivery system in the North-East to overcome the problems facing it. Under the first kind of reform that is commercialization, a health care service provider is supposed to cover most or all of its costs directly from the individual or household service user. Reduction of subsidies for the provision of health care services by the public provider is most common form of commercialization. Basically commercialization of the health care delivery system offers an economic solution to the problem of scarce resources plaguing the government sector and it also reduce the fiscal deficit of states by reducing subsidies. The second kind of market-oriented reform that is suggested for the North- East is privatization of health care delivery system with private companies taking over some or all operations and responsibilities of providing health care services to the people and being compensated either through user fees or a fee-for-service by the government. The imposition of user fees also curtails the unnecessary use of scarce and expensive health care and diagnostic facilities. According to the pro-reform lobby the government's role in the health care system is to be restricted to ensuring robustness of competition and effective regulation public service provider.

Health care facilities can be improved with a focus on four key components. Firstly strengthening rural health facilities, secondly deficiencies in manpower which

related to provisioning of health care at the household level through the Accredited Social Health Activist (ASHA), thirdly decentralizing the health sector by enhancing the capacity of panchayats to control and manage the provisioning of health services and lastly positioning of a health management information system (Husain, 2011).

2.5. Health Expenditure

More recent studies on inequalities in health status suggest on the access to preventive and protective health care, access and service utilization, public sector subsidy utilization and reduction of out of pocket expenditure by free drug availability at public sector health institution (Rao et.al., 2008 and Prinja et.al.,2008s). Inequities in health arise because of the circumstances in which people grow, live, work and age, and the systems put in place to deal with illness. The conditions in which people live and die are, in turn, shaped by political, social, and economic forces (Commission on Social Determinants of Health, 2008). As Prinja et.al. (2008) mentioned that health inequities have two dimensions. Firstly, the horizontal equity which emphasizes treating equals equally and focuses on equal access for those in equal need. It ensures that the provision of health services should be based on the principle of need and not on the ability to pay. Health status and access and utilization of health services are treating under the dimension of horizontal equity. Secondly, the vertical equity which highlights the need to treat unequals differently, i.e. richer people should pay a higher proportion of their income for accessing health care services compared to poor people. Out of Pocket expenditure is treating under the dimension of vertical equity. Another dimension of redistribution is added to this two-fold typology, which ascertains who gets the benefit of public subsidy and what extent. This study was to ascertain inequities in self reported health status, service utilization, and out of pocket

health care expenditure in two states of Haryana and Punjab and union territory of Chandigarh in north India. The differences in health status based on income, gender, educational status, geographic region and occupation have been documented in India which shows association of poor health with poverty, female gender, poor educational status and rural residence. Basically the socio-economic inequalities in health status have been defined as the differences in the prevalence or incidence of health problems between individual people of higher or lower socioeconomic status. Inequalities which are socially unjust are considered to be inequitable. International Society for Equity Health defines equity as the absence of systematic and potentially remediable differences in one or more aspect of health across populations of population subgroups defined socially, economically, demographically or geographically (Prinja et.al, 2012).

The poor state of public health infrastructure has forced the less privileged to seek unregulated private healthcare with significant adverse impact. Low level of public spending has particularly resulted in poor infrastructure for preventive health care. At the same time, access to preventive and protective health care enhances the entitlement of the poor by enabling steady employment, improving productivity and facilitating demographic transition (Rao et.al., 2008). Further analysis shows that inter-state disparities in health spending and appropriate equalization system, ensures a fair distribution of resources between different states. The model of equalization adopted should not involve a trade off in terms of efficiency and accountability. Generally, the states with low per capita incomes and with high concentration of poverty, per capita public expenditure on health and family welfare is very low. It is evident that low per capita expenditure in states with larger concentration of poverty results in high out of pocket expenditure. The out of pocket expenditure being highly

regressive in nature leads to low access to health care services to the poor. When the low income states allocate higher proportion of their GSDP for health expenditure, their per capita expenditure is much lower.

Prinja et.al (2012) again suggests that for an improvement in free drug availability at public sector institutions to reduce out of pocket expenditure which increase utilization especially for poor people and thus reduce inequalities. The effort to improve quality and responsiveness in public sector can be carried by regulating drug prices for essential drugs and its availability especially for the poorest. The categorization of essential drugs still needs to be undertaken by the Government of India. This study presents a progressive out of pocket financing pattern in health care in three states in north India. Rich people spend more as a proportion of their consumption expenditure on health care where as poor people spend more on basic subsistence such as food leaving little for meeting other needs. The high out of pocket expenditure poses financial barriers for the poor people to access health services especially high cost hospitalization and it was reflected in a high unmet need which had a pro-poor distribution. The evidence of pro-poor distribution of public sector subsidy utilization, initiatives to improve utilization of public sector services are likely to reduce inequities in health service utilization and financing. User charges are regressive and require careful implementation to protecting the interests of poor against catastrophic illness expenditure.

2.6. Survey of Method of Analysis

There is a perception that the health of an individual is influenced by factor of a social, economic and environmental nature. Correspondingly, measurements intended to illuminate health issues need to take account of these wider factors like potent non-health sector variables must enter consideration. There is little argument that income, education, economic pressures, unemployment, poor housing, and poverty itself all have significant consequences for health, although interaction between health and non-health sector variables may occur in an unpredictable way. In the context of monitoring health, since it is necessary to monitor all factors that affect health, it follows that changes and variables outside the health sector are a proper concern (Mansourian, 2010).

2.6.1. Methods on Health and Economic Growth

Smith (1963-67) has revealed that the ratio of health care expenditure to GDP increased as countries were developed economically and industrially. GDP is a major determinant of health expenditure after adjusting for inflation, exchange rates and population. The analysis provided by Newhouse (1977) suggests that per capita GDP of the country is the single most important factor affecting health expenditure. The study found a positive linear relationship between fractions of health care expenditure to GDP. This result also verify by Gerdtham et.al (1992) by using cross section observation of 19 OECD countries in 1987 and found that per capita GNP is the most significant factor in explaining per capita health expenditure. In another study by Hitris and Posnett (1992) used 560 pooled time series and cross section observation from 20 OECD countries over the period 1960-1987 and found a strong and positive correlation between per capita health spending and GDP. Engel curve is used for the

analysis of marginal utility of health care expenditure. The test for stationarity and co-integration and elasticity approach are used for the study of health care expenditure and GDP. Initial studies used cross sectional and time series data for the analysis but in more recent studies (Gerdtham et.al; Hitris and Posnett; 1992) have used panel data.

2.6.2. Methods of Health and Productivity

The health workforce productivity has been measured by variety of ways such as macroeconomic accounting model by combining microeconomic estimates of the impact of health on productivity, regression analysis for the effect of health on economic performance by using variables like wages, health indicators. The other method of health workforce productivity is involve by aggregating the total health care services provided to the population into a Composite Service Index (CSI) and aggregating the relevant labour inputs into some a composite human resources for health measure (CHRH) i.e. productivity=CSI/CHRH (Vujicic et.al.,2009)

Another group of studies attempts to overcome the shortcomings of the macroeconomic evidence by adding microeconomic elements. Their use of more refined techniques and reliance on measures that better capture the economic effects of health and nutrition investments arguably provide a firmer foundation than macro studies for drawing conclusion about the link between health and growth. Shastry and Weil (2003) and Weil (2005) use a different methodology to estimate the share of cross-country variation in income that can be associated with differences in health status. Combining microeconomic estimates of the impact of health on productivity with a macroeconomic accounting model, they decompose aggregate country output into a (residual) productivity terms plus the return to certain factors, including

physical capital, educational human capital, and health human capital. Measures of output, physical capital, and educational capital (proxied by year of schooling) are readily available for some countries, although admittedly a subset, particularly for education; the challenge is to construct a measure of health that is relevant to productivity.

Weil's (2005 cf. Spence and Lewis, 2009) approach to accounting for the effect of health on economic performance is to estimate the returns (in terms of higher wages) to a number of health indicators, including adult height, adult survival rate, and age of menarche, using instruments for differences in health inputs, birth weight differences and data on caloric intake. He finds that a 10 percent increase in the adult survival rate would lead to an increase in labour input per worker of 6.7 percent and in GDP per worker of about 4.4 percent. Weil calculates that about 9.9 percent of the variance of log GDP per worker is attributable to health and nutrition gaps between countries by using cross-country regression with lagged variables as instruments at 95 percent confidence interval.

2.6.3. Methods of Health and Regional Development

Health care delivery system with respect to regional development analysis through Composite Index (CI) by using variables such as outpatient service utilization and inpatient service utilization, Pearson's Correlation analysis and coefficient of variation for the study the relationship between access and disparity related variables.

Khan (1985) adopted a methodology with application in Bangladesh by devising three indices which may be used separately as an indicator of specific aspects of regional health care delivery system and they can be combined to derive a composite index of relative access of health care. First is the Index of outpatient and

ambulatory service utilization, secondly Index of inpatient service and hospital bed utilization and thirdly Index of quality service available lastly by combining three index composite index of relative access to health care. The relationship of the access and disparity related variables with density of population, degree of urbanization and sub divisional area size were analyzed through Pearson's correlation analysis. In order to identify the important determinants of urban, rural and combined access, and of urban and rural disparity a series of stepwise multiple regression analyzed were performed. The application of composite index in analyzing the Bangladesh data demonstrated the usefulness of aggregate measures.

A study on regional disparities in India by S.R. Hashim (Planning Commission Report 1995) shows that co-efficient of variation in the per capita net domestic product between states, a commonly used measure of disparity was 31.49 percent in 1970-71, rose to 37.15 percent in 1980-81 and further to 39.17 percent in 1990-91

Some studies on Health Inequity and Disparity analysis were often to use Concentration Index (CI), Composite Index of health infrastructure (CII) and coefficient of correlation for studying relationship between health status and health infrastructure. and lastly the multiple regression, correlation and descriptive statistics by using key health indicator, infrastructure and expenditure related variables such as IMR, Life Expectancy at Birth , Hospitals, Dispensaries with their Bed Capacity, Income, Per Capita SDP etc.

Prinja et al. (2012) analyzed the data from the 60^{th} round of National Sample Survey Organization (NSSO) on Morbidity and Health Care was used for the analysis by mean consumption expenditure quintiles. Indicators were devised to document

inequities in the three dimensions. Concentration index (CI), and equity ratio in conjunction with concentration curve were computed to measure equity.

Measuring health inequality can be approached in two ways. On one hand, the population of any country can be grouped according to determinants such as income, education level, and ethnicity. Key health indicators, such as infant mortality, life expectancy, and prevalence of important conditions, can then be calculated for each group and compared. On the other hand, variation can be examined directly by considering a continuous scale for a health indicator. For example, child mortality may range 40 fold from 200 per 1,000 for persons of lowest socio-economic status to 5 per 1,000 for those of highest socio-economic status. Both approaches are rooted in the notion that health differences are interesting only when correlated with some other component of well-being, such as income, education, or social class (Mansourian, 2010).

Dadibhavi and Bagalkoti (1994, *cf.* Kapil, 2010) tried to measure the inequalities in health services in India for 17 major states and data were taken at two points of time, i.e.1976-78 and 1990-92. IMR and Life Expectancy at Birth (LEB) were used to measure health status. Perusal of data showed that IMR had improved and LEB was also satisfactorily high. Health infrastructure was measured in terms of hospitals, dispensaries, bed capacity and PHCs, It was observed that there was expansion in all the states but some states developed more than the others. After constructing Composite Index of Infrastructure (CII) and studying Coefficient of Correlation between health status and health infrastructure variables, it was concluded that generally advanced states had better infrastructural facilities. The Coefficient of Variation increased, indicating worsening of disparities.

WHO believes that differences in health are intrinsically important, and not just if they correlate with other socio-economic factors, simply because health is an intrinsic component of well-being. WHO has also developed methods to measure inequality in child mortality risk; it has identified some population with low levels of child mortality but substantial inequality, and others with high levels of child mortality and intermediate to high levels of inequality. Both of these analytical approaches highlight the importance of considering not only the health of populations but also the distribution of health within populations.

Khare (2011) measures the level of health status of major 45 districts of Madhya Pradesh and to identify the determinants of health disparities and correlates of inter district variation therein. The study is based on secondary data collected from various published sources on thirteen basic indicators of health standards, health infrastructure as well as other related indicators of education, employment and gender. Statistical packages such as Factor analysis, Multiple Regression, Correlation and simple descriptive statistics have been used to aid this study.

IMR is often considered as the most appropriate indicator of health system, although it reflects the combined impact of factors like access to health care facilities, educational level and economic wellbeing of the people in a region. The study of inter-state inequality by Kundu et al. (2013) used IMR as a negative proxy indicator for health for men and women and for rural and urban areas. In the context of inter - state inequality, one notices a high coefficient of variation for men and women and for rural and urban areas. The values of these coefficients have, however have gone down marginally over the years. Kundu et al find in his study that the correlation of per capita SDP with infant mortality rate (IMR) are, however, strongly negative since

the states with high per capita income like Maharashtra, Delhi, Karnataka, Punjab, Gujarat and West Bengal report low mortality rate while the less developed states like Odisha, Chhattisgarh, Rajasthan, Uttar Pradesh and Madhya Pradesh record high IMR.

2.6.4. Methods of Health Infrastructure

Stochastic frontier estimation model is used for the efficiency in health infrastructure across the districts of West Bengal. The dependent variables is health output i.e. life expectancy at birth or infant mortality rate and the independent variables represented by per capita health facilities such as hospital beds, number of PHCs and SCs, doctors, paramedical staff and error term.

The health system efficiency was measured through the stochastic frontier estimation model. This model include health output (life expectancy or IMR) produced by health system of factor inputs and it represented by per capita heath facilities including per capita availability of hospital beds, per capita number of PHCs or SCs, doctors per capita, paramedical staff per capita, and skilled attention for birth per capita and lastly stochastic error term. The dispersion in technical efficiency can be explained by a set of variables that includes per capita income, male and female literacy separately, total enrolment, teacher-pupil ratios in primary, middle and secondary educational institutions separately, population growth, population density, urban population, percentage of male and female labour force, rural habitat fully cover by water supply, and the percentage of coverage through safe drinking water and sanitation facilities. The observation on health system efficiency from the frontier estimation model is that all the independent variables to explain life expectancy have emerged with appropriate signs and are statistically significant. The variables

representing hospital per ten thousand population and full immunization have emerged with positive signs and it indicates the positive impact of governmental intervention in expansion of hospital facilities and the desirable impact of full immunization coverage in enhancing life expectancy. The percent of PHCs with adequate infrastructure and adequate supply have emerged with negative signs which indicate the inadequacy of the various inputs provided through PHCs (Purohit, 2008).

2.6.5. Methods of Health Expenditure

Health expenditure is measured by Data Envelopment Analysis (DEA) through Cobb-Douglas production function for the study of state level efficiencies and estimating cost function with an econometric model through cost-benefit analysis and cost-utility analysis**.**

Rao et.al (2008) used two different approaches for measuring health expenditure. The first approach, it estimates the expenditure requirement according to the physical norms prescribed by the ministry in its various policy statements. Thus the requirements of health centre and sub-centre, hospital beds, on the capital expenditure side, and the requirement of doctors, paramedical personnel and drug, on the recurring expenditure side, may be estimated for the given population and its demographic composition. In fact such a study was done by the National Institute of Public Finance and Policy (NIPFP) and National Commission on Macroeconomics of Health. In the second approach the cost of providing the normative standard of health service is estimated. The equalization is worked out in relation to this based normative expenditure based on the estimated cost functions. This study attempts to estimate expenditure needs of healthcare using alternative approach firstly, it estimates the expenditure requirement for ensuring both physical and human infrastructure involved

in the healthcare and secondly the study estimates the cost functions in an econometric model and based on this estimate the cost of providing the prescribed standard of services which is on expenditure need.

Kaur et al.(2011) analyzed the impact of public health expenditure on health status of India (how it influences IMR in India) and have explained inter-state differences on this basis and worked out state level efficiency scores using Data Envelopment Analysis (DEA) model. DEA is a performance assessment tool for an alternative as well as compliment to traditional production function approach. DEA is useful for calculating patterns of dynamic efficiencies. Methods like Cobb Douglas production function approach are used to study the technical and allocative efficiencies. In the study, DEA procedures have been used to generate efficiency scores for the 12 states of India for the time period 1993 to 2003.Thus the results that are arrived at in the present study evaluate which state is most efficiently utilizing its public health expenditure to decrease IMR, an important indicator of health.

To summarize the above-mentioned literature the following research gap could be identified:

1. The various researchers revealed a significant link between health, economic growth and income inequality through analyzing the association between per capita income and infant mortality or GNP with life expectancy at birth whereas my study include the effect of health care expenditure on all the health indicators such as CBR, CDR, IMR, TFR, Population decadal growth rate and Percentage of children fully immunized.

2. Baily, Purohit, Kethinani and others found that the inequitable pattern of regional development in the state and in rural-urban areas due to the disparities

in health care services such as inequitable distribution of health manpower, infrastructure, health indicators and governance and delivery service. These studies mainly analyze of health indicator, Infrastructure, Expenditure Independently or taking of two variables whereas my study analyzing the disparities in North-East India by including health profile, health infrastructure like number of SCs, PHCs and CHCs and facilities and availability of health manpower in SCs, PHCs and CHCs and all aspects of health expenditure.

3. The various studies on health and productivity approach by Bloom, Fogel, Lebibenstein, Deaton, Ariana, Bose, Sen includes components such as nutrition level, calorie intake in producing better health of person with intellectual capacities, increased learning productivity and wages and lastly economic growth but my study considering the effect of calorie intake and government expenditure on nutrition on health outcomes.

4. The various studies on health infrastructure by Gill, Duggal Khan, Purohit and other put emphasis on the infrastructure such as facilities at SCs, PHCs and CHCs and hospital per bed utilization ratio, facility per population ratio, per capita availability of beds, distribution of health manpower . The entire above factor are including in this study with analyzing the percentage approach and deriving a positive correlation between health profile and health infrastructure facility.

5. Prinja et.al, Rao et.al analyzing disparities in health spending, free drug availability at public sector institution and Das Gupta (2008) study only based on market oriented reforms in health care delivery system in North-East India whereas I study all the aspects of healthcare delivery system and proportion

public and private sector expenditure. In North-East India the research in health care is very less and no such studies have done on this topic. The present study would focus on the spatial disparities in health care facilities occurring in North-East India and its access by the people in the region**.**

Due to the inadequacy of public investment and healthcare expenditure some major Indian states remains at a lower level. A comparative analysis across states may not bring out individual state specific factors that lead to different health outcomes and in turn it may depend upon how the state is focusing on its different region or districts (Purohit, 2008). Now by concluding even if the level of service does not improve drastically due to financial constraint we may at least hope for more equitable system of health care delivery (Khan, 1985). Thus the reform in health sector will have to address the issue of increasing the allocation to health care, focusing on preventive care, ensuring greater access to health care by the poor and significantly improving the productivity of public spending (India MoHFW, 2005a, 2005b, 2005c).

Health care facilities have three different aspects. First one is the public health care facility which is delivered through a three-tier structure of health services comprising the primary, secondary and tertiary health care facilities with the objective of bringing the healthcare services within the reach of people. The primary tier would have three types of health care institutions, namely, SCs, PHCs, and CHCs. The district hospitals are to function as the secondary tier and tertiary health care is to be provided by health care institutions which are well equipped with sophisticated diagnostic and investigative facilities. The second aspect of health care facility is the private health care facility which is delivered through the private hospitals, private

health care institution or nursing homes and private clinics, and diagnostic centres. The third aspect is the indigenous institutions or NGO based health care institution.

Several studies measure the disparities in health care facilities on the basis of different aspects of health care. The health system efficiency was measured through stochastic frontier estimation model. The estimate of cost function in an econometric model is used for measuring different approaches of health expenditure. Data Envelopment Analysis (DEA) model is used for state level efficiency scores. The effect of health on economic performance is to be estimated the returns with the help of number of indicators. Based on the literature reviewed above, it has been made clear that three or four prominent method could be used to measure the disparities such as Stochastic Frontier Estimation model (Purohit, 2008), Composite Index model (Khan, 1985), Data Envelopment Analysis model and Pearson Correlation analysis (Kaur et.al.,2011), Factor analysis, multiple regression, correlation and simple descriptive statistics (Khare,2011) etc.

It is found from the above study that health care infrastructure gap remain substantial and are exacerbated by underutilization of existing resources. The health care spending is not growing at the same pace as GDP and out-of- Pocket spending continues to be high. Therefore health care delivery system can be strengthened with more effective and efficient use of public resources. It's very important to provide mechanisms to promote quality improvement and innovation through competition between healthcare providers within a publicly funded health system and the drawing of insights from diverse private sector providers. The promotion of greater transparency and availability of information to enable patients to make better choices about their own healthcare seems a worthy intension (Tritter.et.al, 2010).

The study is based on secondary data collected from various published sources on health standards, health indicators, health infrastructure and expenditure. The published sources are such as 60th round of National Sample Survey Organization (NSSO), National Institute of Public Finance and Policy (NIPFP), National Commission on Macroeconomics of Health, WHO, Ministry of Health and Family Welfare (GOI), National Family Health Survey, National Rural Health Mission, State Finances, Planning Commission, Rural Health Statistics etc.

In a nutshell, it is understood that the disparities in health care services are found to be two types. The first may be described as spatial nature which can be elaborated in the form of health infrastructure, health profiles and health expenditures etc. over a geographic region. The second aspect may be interpreted as social disparities which may be interpreted as the access to health services by different groups or people within a region or sub-region at the state level. The present study would focus on the spatial disparities in health care facilities occurring in North-Eastern states and its access by the people in the region. Rank Correlation, Pearson's Correlation analysis, Coefficient of Variation, Gini-coefficient and Data Envelopment Analysis (DEA) model is used as a methodology to study the regional disparities in health care facility in the North-East India.

Chapter 3

Health Profile, Infrastructure and Expenditure in the North-East India

3.1. Introduction

The critical review of literature in the previous chapter already explained various aspects of health care and it is found from the literature that the health care services can be interpreted and analyzed under the three dimensions. The three dimensions such as health profile, health infrastructure and health expenditure also called the basic instrument of the health care system. Various types of health indicators like CBR, CDR, IMR, MMR, Life Expectancy at Birth (LEB), Percentage of Children Fully Immunized (PCFI) etc. basically reflect the health profile of the states through which one can understand about the health status of the people in the North-East India. In order to improve access and quality of health services, it is very important to provide adequate and available health infrastructure services to all. Health infrastructure includes the services and facilities of all the health care institution like SCs, PHCs, CHCs, Sub-divisional Hospitals, District Hospitals and Mobile Medical Units (MMUs). The medical institutes and training centres are also under the health infrastructure which fulfilling the manpower requirement and skill development and research in health care services. The third dimension i.e. health expenditure includes private expenditure and public expenditure. Health expenditure has direct implications for health outcomes and it is considered as the priority areas in the planning process of the country for keeping good health and improving physical capacity of the people. The present study tries to explore the various dimension of health care with the help of different tables, charts and diagrams and analyze to

understand the health conditions and health care facilities and its spending pattern in North-East India.

India is known for her unity in diversity but, possibly it is not very widely known that there is a region called North-East India in the country where diversity is much more vivid and varied within a small spatial sphere. The socio-cultural and economic environment of the states in the North-East India is in wide divergence with the rest of the country. The North-East India shares about 17 percent of country's total forests and it has 12.5 million hectares of forests. The percentage of forest area to total area is 49 percent (Ashokvardhan, 2004).

North-East India consists of eight states such as Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. These states are linked with the rest of the country through a narrow corridor in the northern region of West Bengal while Assam provides the corridor for the other six states of the north eastern region except Sikkim. The North-East India has distinct regional personality. The general economic profile of this region is one of extreme backwardness reflecting by and large a low level of living standards. The infrastructure remains underdeveloped and intra-regional links are weak. The North-East India has immense resource potential but the technical knowhow is still deficient. The North-Eastern Council is established in 1973 with an objective of addressing its special needs and requirements including those related to security.

3.2. Health Profile

As mentioned earlier that a country's improvement in health status can be seen by its health profile in different states. Basically health profiles are consisting by different health indicators like CBR, CDR, IMR, MMR, TFR and Life Expectancy at Birth etc. These indicators are summary statistics of complex, multidimensional assessment of human activity and well being.

The IMR has in the past regarded as a highly sensitive or proxy measure of population health. This reflects the apparent association between the cause of infant mortality and other factors that are likely to influence the health status of whole population such as their economic development, social well being, rate of illness, general living condition and the quality of the environment. Fuchs (1974), in his study of infant mortality reductions in New York City between 1900 and 1930, attributes to rising standards of living, level of education, and lower fertility, rather than to medical advances. Because of the medical advances and improved literacy rate, there is a decline in CDR and CBR. TFR is also changing significantly and reduced over the years because of increased female literacy and mean age of women at marriage and working female in economic activity. MMR is also reduced with the improving quality of health facilities where institutional deliveries are being facilitated.

Table 3.1-Health Profile of North-East India

States/ Indicators	Sex Ratio	CBR	CDR	IMR	MMR	TFR	LEB	PDGR	PCFI
Arunachal Pradesh	920	21.1	6.1	32	NA	2.7	68.54	25.90	20.50
Assam	954	23.6	8.4	61	390	2.6	59.00	16.90	17.00
Manipur	987	14.4	4.1	16	NA	1.5	68.54	18.65	42.30
Meghalaya	986	24.4	8.1	59	NA	3.2	68.54	27.80	42.30
Mizoram	975	17.6	4.5	36	NA	1.9	68.54	22.80	59.60
Nagaland	931	17.2	3.6	26	NA	2.1	68.54	-0.50	14.10
Sikkim	889	18.1	5.7	31	NA	2	68.54	12.40	47.40
Tripura	961	14.8	5.1	34	NA	1.7	68.54	14.80	40.60
NE India	950.37	18.9	5.7	36.87	NA	2.2	67.35	17.34	35.47
India	940	21.8	7.1	44	212	2.4	68.90	17.64	42.00

Source: National Rural Health Mission, Ministry of Health and Family Welfare, Government of India (2014), SRS bulletin, January 2011, *cf.* Human development report NER (2011)

3.2.1. North-East in Indian Scenario

The comparative statistics of different health indicators such as IMR, MMR, TFR, Life Expectancy at Birth etc. points out that the states in North-East India like Arunachal Pradesh, Mizoram, Nagaland, Sikkim and Tripura placed in almost similar situation and performed much better than all India level. IMR for male and female is low i.e. only 34.3 and 35.7 deaths of children before the age of one year per 1000 live births in the North -East India where as the all India IMR for male and female are 63 and 62 deaths of children per 1000 live births which is very high as compare to the North-East India (HDR Sikkim, 2009). Chandrasekhar (2011) in his study on IMR revealed that IMR depends to a large extent on the environmental condition for their survival. The North-East India has better environmental condition than the all India level. In India the death of infant is due to the poor and insanitary environment. The other reason of infant mortality is low female literacy and inadequate nutrition of the mother. In both the cases North-East India performs better than the national average.

All the states in North-East India have good sex ratio than the national average i.e. 940 except 889 in Sikkim and 920 in Arunachal Pradesh. Sex ratio is highest in Manipur i.e. 987. The North-East India have good sex ratio because of women are working and contributing to productive activities in the economy whereas in other states in India (mainly rural India) they are confined in household works and are treated as burden.

3.2.2. Crude Birth Rate and Crude Death Rate

The CBR is defined as the number of live births in a year per 1000 of the mid-year population. The crude birth rate is called crude because it does not take into account age or sex differences among the population (Kumar, 2011). According to the Population Census of India, 2011 all India average CBR is 21.8 live births per 1000 mid-year population. The Table 3.1 shows that the highest number CBR in Meghalaya (24.4) followed by Assam (23.6) and Arunachal Pradesh (21.1) which was near to national average. The remaining states in North-East India have much lower number of births per 1000 mid-year population than the national average. The inter-state variations in CBR are also noticeable and the lowest CBR is represented by (14.4).

The CDR is defined as the number of deaths in a year per 1000 of the mid-year population. According to the Population Census of India, 2011 all India average CDR is 7.1 deaths per 1000 mid-year population. The higher number of deaths per 1000 population is found in Assam (8.4) and in Meghalaya (8.1) exceeding the national average. The remaining states in North-East India have lower number of deaths per 1000 mid-year population than the national average of CDR. CDR was lowest in Nagaland (3.6) with an ascending order of state of Manipur (4.1), Mizoram (4.5), Tripura (5.1), Sikkim (5.7) and Arunachal Pradesh (6.1).

3.2.3. Population Growth/Total Fertility Rate

TFR measures the number of children born to a woman during her entire reproductive period. According to 2011 census, in India, the decadal growth of population is 17.64 percent and TFR is 2.4 children per woman. The highest Population Decadal Growth Rate (PDGR) is found in Arunachal Pradesh with 25.90 percent and it is more than the national average. The lowest PDGR is found in Nagaland with negative growth -0.5 percent. All the states in North-East India have low PDGR than national average except Manipur. Meghalaya has highest TFR with 3.2 children per woman among all the states in North-East India and lowest in Manipur with 1.5. The lowest PDGR is due to the difficult geographical conditions of North-East India. This physical condition may lead to low availability of medical and health services and educational backwardness resulting deprivation in socio-economic status of North-East India in comparison to all India level.

3.2.4. Infant Mortality Rate

IMR is the death of children before the age of one year per 1000 live births and it is a sensitive indicator of the health and nutritional status of population. IMR reveals the state of health status of an economy and also reflects the outcome of health measures and focus on the socio-economic development level of a country or region. India is the second largest populated country in the world and suffers from high rate of infant mortality. The monitorable target for eleventh five year plan is reducing infant mortality rate to 28 per 1000 live births. As stated in Table 3.1, the present status of IMR for India is 44 per 1000 live births. Among the North-East India, Assam and Meghalaya have high IMR i.e. 61 and 59 per thousand live births than all India level and remaining states have low IMR. The lowest IMR of 26 per 1000 is found in

Nagaland. Overall, there is a trend of declining of IMR but it is yet to achieve the monitorable target.

The figure 3.1 shows that IMR is too high in all the states in North- East India as compare to the CBR and CDR. It is evident from the figure 3.1 that Assam and Meghalaya have high IMR as compare to the national average. The remaining states of North-East India have low IMR than the national average. CBR is high in Meghalaya and it is more than the national average. CDR is significantly declining in North-East India and found lower in three states i.e. Manipur, Mizoram and Nagaland.

Figure 3.1.Crude Birth Rate, Crude Death Rate and Infant Mortality Rate

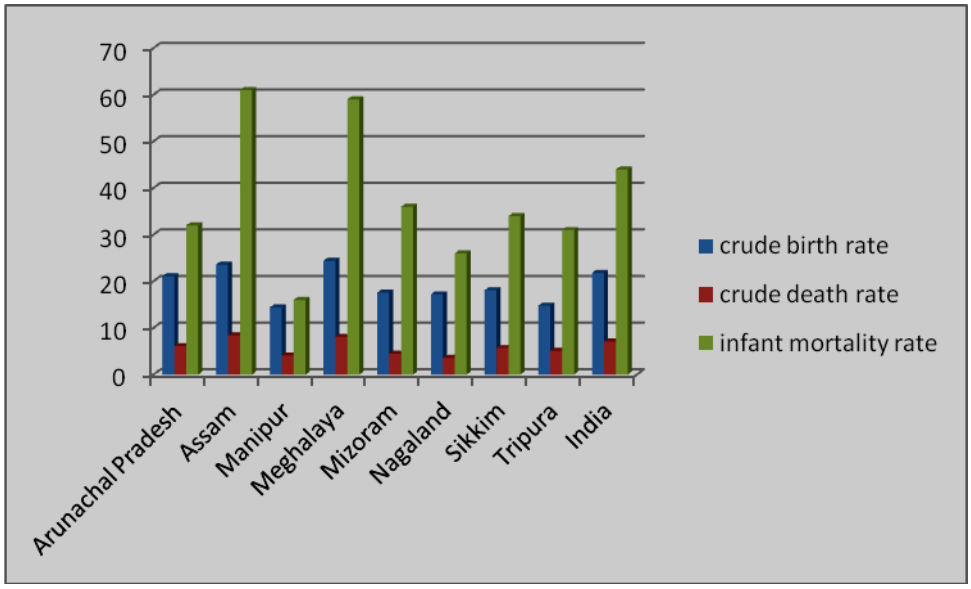


Table 3.2 shows the reduction of IMR in North-East India and there is a fluctuation in reduction of IMR within the states in North-East India showing the regional imbalances. In Meghalaya, IMR is reduced by -49.89 percent. The lowest reduction in IMR is found in Arunachal Pradesh and it is only -3.8 percent. Arunachal Pradesh is relatively free from the ban of discrimination against the girl child. Caring for the children is mother's responsibility but in Arunachal Pradesh both parents share

this responsibility which reflects good health of the mother (HDR Arunachal Pradesh, 2005). This is partly responsible for relatively lower reduction of IMR in Arunachal Pradesh. Sikkim and Manipur have -23.23 and -19.73 percent reduction of IMR where as the remaining states in North-East India have less than ten percent reduction of IMR.

Table 3.2-Reduction of IMR in North-East India

States	**Reduction (%)**
Arunachal Pradesh	-3.80
Assam	-4.89
Manipur	-19.73
Meghalaya	-49.89
Mizoram	-7.84
Nagaland	-9.03
Sikkim	-23.23
Tripura	NA

Source: Malakar and Bose (2011).

3.2.5. Maternal Mortality Ratio

MMR measures number of women of reproductive age (15-49 years) is dying due to maternal causes per 100000, live births and is a sensitive indicator of the quality of the health care system. In eleventh five year plan the monitorable target for MMR was to reduce MMR to 100 per 100000 live births. The recent status of maternal mortality ratio is 212 per 100000 live births for India whereas for Assam maternal mortality ratio is too high i.e. 390 per 100000 live births .The data for other states of North-East India is not available.

3.2.6. Life Expectancy at Birth

Life Expectancy at Birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. Life expectancy in India has increase more than double in the last sixty years. At the time of independence life expectancy at birth was 30 years only and according to the Population Census of 2011 it increased by 68.9 years. This has revealed the decrease in death rate and indicates the quantity and quality health care services in India. All the state in North-East India has the same level of LEB except Assam i.e. 59 years which is below the national average.

3.2.7. Percentage of Children fully Immunized

The coverage of immunization has increased marginally from 42 in 1998-99 to 44 percent in 2005-06. Nagaland has lowest Percentage of Children Fully Immunized (PCFI) of 14.1percent than followed by17 percent Assam and 20.5 percent in Arunachal Pradesh which is much lower than the national average of 42 percent. Mizoram placed the top position in terms of children fully immunized i.e. 59.6 percent and Sikkim secured second place with 47percent. Both the states are placed higher than the national average. The remaining states in North-East India like Manipur (42.3 percent), Meghalaya (42.3 percent) and Tripura (40.6 percent) are close to the national average.

3.2.8. Calories intake and Infant Mortality

Calorie intake is very much positively related to Life Expectancy and it is negative to Infant Mortality Rate. A well nourished person is expected to have better intellectual capacities and more productive than the malnourished person. Lack of health due to inadequacy in calorie intake may also contribute to lower LEB and increased IMR. From the above statement it convinces to understand that deprivation in one dimension often induces and reinforces deprivation in other aspects of life.

Table 3.3- Inter-State Difference in Calories Intake in North-East India

States	Rural	Urban	IMR
Arunachal Pradesh	2130	2511	32
Assam	1983	2108	61
Manipur	2157	2073	16
Meghalaya	1977	2066	59
Mizoram	2110	2200	36
Nagaland	2216	2169	26
Sikkim	1892	2108	31
Tripura	1924	2039	34
All India	2153	2071	44

Source: NSSO 50th Round, July 93-June 94, Report-405

The information depicted in Table 3.3 suggests that the average daily calories intake by an Indian is below the prescribed the minimum per capita requirement of 2250 calories. Situation in urban area is marginally better than rural areas. All the states in North-East India seem to be worst in terms of nutritional requirement. Calorie deficiency in rural areas is most prevailing in the states like Sikkim, Tripura, Meghalaya and Assam. Only Nagaland and Manipur have more calorie intake than the national average in case of rural areas. Calorie deficiency in urban areas is observed in states like Tripura and Meghalaya.

3.2.9 Temporal analysis of Basic Health Parameters

In 1971, India was in early stage of development and both the CBR and CDR were too high during the period. There is a decline of CDR currently and it is accompanied by decline in CBR. As stated in Table 3.4, the CBR for North-East India was 35.86 live births per 1000 mid-year population in 1971, and it 18.21 in 2011. In 1971 CBR for North-East India was near to the national average but in 2011, it has declined more rapidly for North-East India. During the period from 1971-2011, Manipur and Tripura have shown rapid decline in CBR. The CBR in Manipur and Tripura was 33.3 and 35.8 live births per 1000 mid-year population respectively in 1971 but in 2011, it is only 14.4 and 14.3. There is an increase of CBR in Nagaland and Mizoram from 15.8 and 15.7 in 1991 and to 16.1 and 16.6 in 2001. During 1971-2004, Assam has highest CBR except 1981. Among the states in North-East India, Meghalaya has the highest CBR continuously after 2004. Assam and Meghalaya have highest CBR because of the accessibility of health care services and availability of skill manpower in health due to the number of medical college and training institute is more than the other states in North-East India. After 1971 the coefficient of variation is increased from7.25 percent to 24.11 percent in 2004 then declining up to 2010 by 19.47 percent and now it slightly increase by 20.74 percent. Although the disparities in CBR is increasing in North-East India but there is chances of reduction in CBR due to the fluctuation in the period 1971-2012. The Crude Birth Rate is reduced over the period of 40 years in North-East India because of increase female literacy and more participation to productive activities as compare to other states in the country.

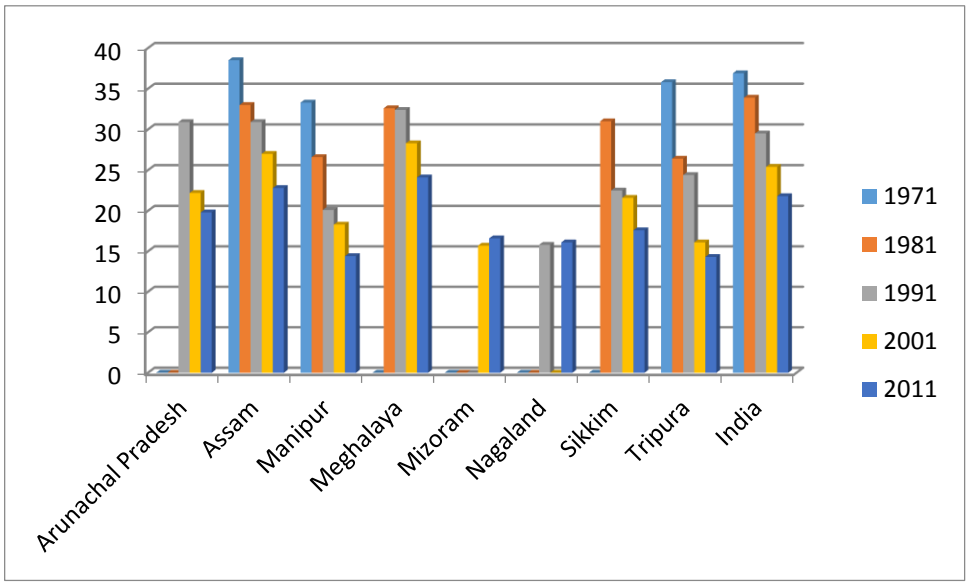
Table 3.4: Temporal Analysis of Crude Birth Rate in the North-East India

States/Indicators	Crude Birth Rate (No of live births in a year per 1000 of the mid-year population)														
	1971	1981	1991	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Arunachal Pradesh	NA	NA	30.9	22.2	20.2	18.9	21.2	23.3	22.5	22.2	21.8	21.1	20.5	19.8	19.4
Assam	38.5	33	30.9	27	26.6	26.3	25.1	25	24.6	24.3	23.9	23.6	23.2	22.8	22.5
Manipur	33.3	26.6	20.1	18.3	16.8	15.5	13.9	14.7	13.4	14.6	15.8	15.4	14.9	14.4	14.6
Meghalaya	NA	32.6	32.4	28.3	25.8	24.7	25.2	25.1	24.7	24.4	25.2	24.4	24.5	24.1	24.1
Mizoram	NA	NA	NA	15.7	16.9	16	19.1	18.8	17.8	18.2	17.8	17.6	17.1	16.6	16.3
Nagaland	NA	NA	15.8	NA	NA	NA	13.9	16.4	17.3	17.4	17.5	17.2	16.8	16.1	15.6
Sikkim	NA	31	22.5	21.6	21.9	21.9	19.5	19.9	19.2	18.1	18.4	18.1	17.8	17.6	17.2
Tripura	35.8	26.4	24.4	16.1	14.9	14.5	15	16	16.6	17.1	15.4	14.8	14.9	14.3	13.9
India	36.9	33.9	29.5	25.4	25	24.8	24.1	23.8	23.5	23.1	22.8	22.5	22.1	21.8	21.6
NE India	35.86	29.92	25.81	21.31	20.44	19.68	19.11	19.90	19.51	19.53	19.47	19.02	18.71	18.21	17.95
S.D	2.60	3.21	6.31	4.99	4.57	4.69	4.60	4.14	4.06	3.62	3.69	3.61	3.64	3.69	3.72
C.V	7.25	10.73	24.45	23.44	22.35	23.86	24.11	20.83	20.81	18.57	18.98	18.98	19.47	20.28	20.74
min	33.3	26.4	15.8	15.7	14.9	14.5	13.9	14.7	13.4	14.6	15.4	14.8	14.9	14.3	13.9
max	38.5	33	32.4	28.3	26.6	26.3	25.2	25.1	24.7	24.4	25.2	24.4	24.5	24.1	24.1

Source: Data book for Planning Commission, August 2014

The trend of CBR is analyzed only for the census years to understand how it is changing in different states of North-East India The figure 3.2 indicates that CBR was high with 38.5 live births per 1000 mid-year population in Assam in 1971 and in 2011, it is high with 24.1 live births per 1000 mid-year population in Meghalaya. In 1971 CDR was low in Manipur (33.3) and in 2011 it is low for Tripura (14.3). The coefficient of variation is increased from 7.25 percent in 1971 to 25.45 percent in 1991 which has slightly decreased by 20.28 percent in 2011.

Fig 3.2: Trends of Crude Birth Rate in North-East India (1971 to 2011)



The table 3.5 provides CDR during the period from 1981-2012. In 1971, Assam had very high CDR (17.8) as compare to India (14.9). The data for other states of North-East India is only from 1981 onwards. Interestingly, Assam has highest number of death in per 1000 mid-year population during the period from 1981 to 2012 with an exception in 1991. The reason for highest CDR in the state is due to frequent occurrence of flood and spread of water born disease such as skin infection, malaria and jaundice etc. On the other hand, Mizoram and Nagaland did not experience any change in CDR from 1991 to 2012. Nagaland has lowest CDR in North-East India with 3.2 deaths per 1000 mid-year population in 2012. It is low because of rich tradition of indigenous medicinal practices in hill states of Nagaland, Mizoram and Arunachal Pradesh. This traditional medicine practices has been helpful for reducing mortality level. It is also reflected in CDR from 1991 to 2011 in Arunachal Pradesh from 13.5 to 5.8 deaths per 1000 mid-year population. Overall the CDR is improving over the period of 40 years due to better medical facilities, increased literacy rates and improved road connectivity and accessibility in the region.

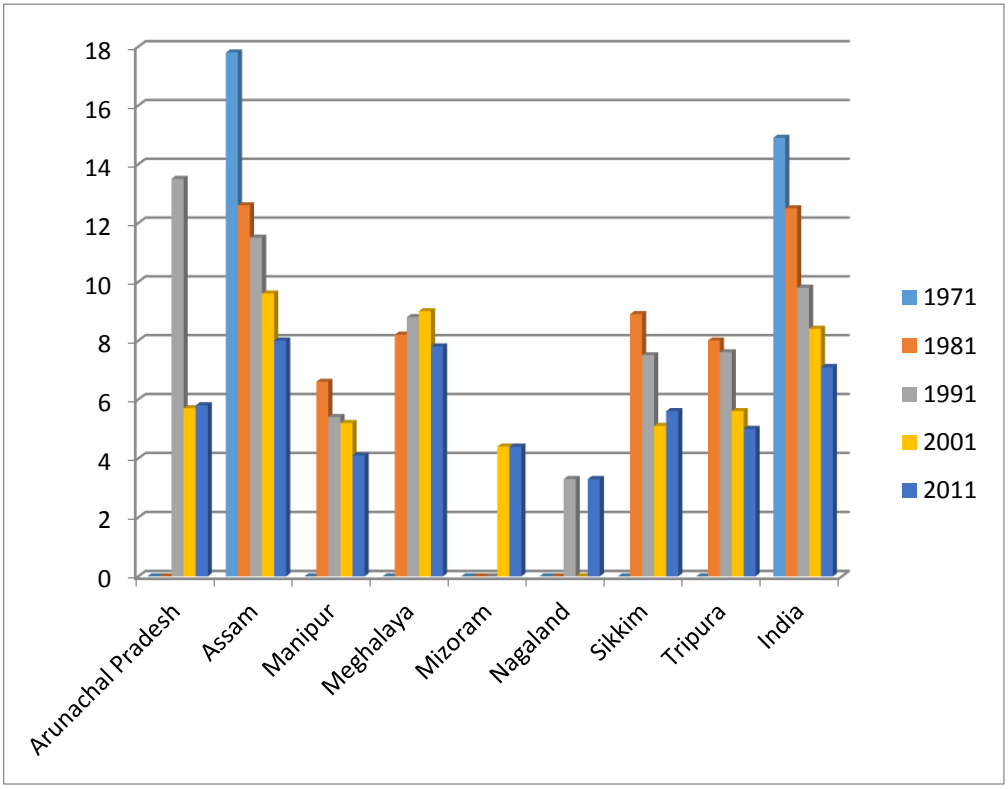
Table 3.5: Temporal Analysis of Crude Death Rate in the North-East India

States/Indicators	Crude death rate (No of deaths in a year per 1000 mid-year population)													
	1981	1991	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Arunachal Pradesh	NA	13.5	5.7	4.8	4.7	4.7	5	5	5.1	5.2	6.1	5.9	5.8	5.8
Assam	12.6	11.5	9.6	9.2	9.1	8.8	8.7	8.7	8.6	8.6	8.4	8.2	8	7.9
Manipur	6.6	5.4	5.2	4.6	4.8	4.3	4.1	4.5	4.4	5	4.7	4.2	4.1	4
Meghalaya	8.2	8.8	9	7.7	7.4	7.3	7.5	8	7.5	7.9	8.1	7.9	7.8	7.6
Mizoram	NA	NA	4.4	4.8	5.1	5.2	5.1	5.5	5.2	5.1	4.5	4.5	4.4	4.4
Nagaland	NA	3.3	NA	NA	NA	3.7	3.8	4.8	5	4.6	3.6	3.6	3.3	3.2
Sikkim	8.9	7.5	5.1	4.9	5	4.9	5.1	5.6	5.3	5.2	5.7	5.6	5.6	5.4
Tripura	8	7.6	5.6	5.7	5.5	5.5	5.7	6.3	6.5	5.9	5.1	5	5	4.8
India	12.5	9.8	8.4	8.1	8	7.5	7.6	7.5	7.4	7.4	7.3	7.2	7.1	7
NE India	8.86	8.2286	6.3714	5.9571	5.9429	5.55	5.625	6.05	5.95	5.938	5.775	5.6125	5.5	5.3875
S.D	2.2512	3.4649	2.0516	1.7915	1.6702	1.6852	1.6723	1.5334	1.4511	1.483	1.7061	1.6763	1.6861	1.6651
C.V	25.409	42.108	32.2	30.073	28.104	30.365	29.729	25.346	24.388	24.98	29.543	29.866	30.656	30.907
Min	6.6	3.3	4.4	4.6	4.7	3.7	3.8	4.5	4.4	4.6	3.6	3.6	3.3	3.2
Max	12.6	13.5	9.6	9.2	9.1	8.8	8.7	8.7	8.6	8.6	8.4	8.2	8	7.9

Source: Data book for Planning Commission, August 2014

The figure 3.3 shows trend of the states in North-East India. The coefficient of variation is increased from 25.40 percent in 1981 to 42.10 percent in 1991. It is reduced to 30.65 percent in 2011 and slightly increases in 2012 i.e. 30.95. The variation is increase by 30.95 in 2012. The coefficient of variation is much more for CDR than the CBR in North-East India which reflects the disparities in health profile in the region.

Fig 3.3: Trends of Crude Death Rate in North-East India (1971 to 2011)



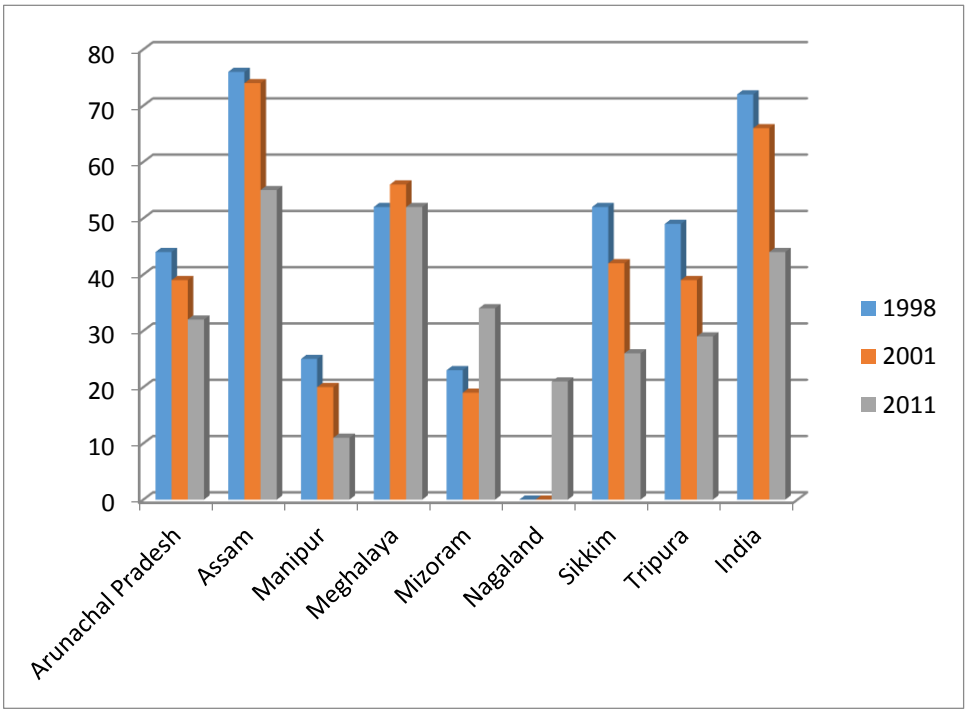
In Table 3.6 the period considered from 1998-2012 as per the availability of IMR data. IMR is improving over the years in the North-East India and as well as India. Over the periods 1998-2012 the reduction of IMR is faster for India (72 to 42) in comparison to North-East India (45 to 31). In 1998, IMR was low in Mizoram i.e. 23 deaths of children per 1000 live births and it declined to 14 in 2002 but in 2012, IMR is suddenly increased to 35. The figure for Mizoram is quite surprising because it has lowest IMR from 1998 to 2003 in North-East India but after 2004 it started increasing. Manipur has lowest IMR since 2002 and in 2012, it declined to 10 which is lowest in the North-East India and India as well. On the other hand, Assam has highest IMR in North-East India since 1998 till 2012 and declining from 76 to 55 deaths of children per 1000 live births. The reason for high IMR in Assam is due to the low health status of the mother, unavailability of ante-natal and post-natal care, underdeveloped infrastructure and inadequacy of good all weather transportation network and communication system, and frequent occurrence of natural calamities such as floods are the major constraints in providing and accessing of health care services. The health care services and skill health personnel are far better in Manipur than any other states in North-East India. Manipuri girls are actively involved in nursing profession which may be one of the reasons for low IMR in the state. There was a fluctuation in coefficient of variation of IMR during 1998 to 2002, it increased 39 to 56 percent and declined thereafter.

Table 3.6: Temporal Analysis of Infant Mortality Rate in the North-East India

States/Indicators	Infant mortality rate(Death of children before the age of one year per 1000 live births)												
	1998	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Arunachal Pradesh	44	39	37	34	38	37	40	37	32	32	31	32	33
Assam	76	74	70	67	66	68	67	66	64	61	58	55	55
Manipur	25	20	14	16	14	13	11	12	14	16	14	11	10
Meghalaya	52	56	61	57	54	49	53	56	58	59	55	52	49
Mizoram	23	19	14	16	19	20	25	23	37	36	37	34	35
Nagaland	NA	NA	NA	NA	17	18	20	21	26	26	23	21	18
Sikkim	52	42	34	33	32	30	33	34	33	34	30	26	24
Tripura	49	39	34	32	32	31	36	39	34	31	27	29	28
India	72	66	63	60	58	58	57	55	53	50	47	44	42
NE India	45.857	41.286	37.714	36.429	34	33.25	35.625	36	37.25	36.875	34.375	32.5	31.5
S.D	18.05	19.354	21.36	19.277	18.369	18.14	18.031	18.063	16.342	15.551	15.212	14.823	15.052
C.V	39.362	46.878	56.636	52.918	54.027	54.557	50.614	50.176	43.872	42.173	44.254	45.608	47.785
Min	23	19	14	16	14	13	11	12	14	16	14	11	10
Max	76	74	70	67	66	68	67	66	64	61	58	55	55

Source: Data Book for Planning Commission, August 2014

Fig 3.4: Trends of Infant Mortality Rate in North-East India (1998 to 2011)



The figure 3.6 indicates that Assam have maximum number of Infant Mortality Rate (IMR) i.e. 76 death of children per 1000 live births in 1998 and 55 death of children in per 1000 live birth in 2011 in North-East India and it is higher than the national average for both the years. The coefficient of variation over the period is increased from 39.36 percent in 1998 to 45.60 percent in 2011 and 47.78 in 2012 reflecting widening disparities in North-East India.

3.3. Health Infrastructure

Health Infrastructure is an important indicator to understand the health care delivery provision and mechanisms in a country. Health Infrastructure indicators are subdivided into two categories viz health educational infrastructure and service infrastructure. Educational infrastructure provides details of medical colleges, student's intake capacity to M.B.B.S course, post graduate degree/diploma in medical

and dental colleges, admission to BDS and MDS courses, Ayush[1] institutes, nursing courses and paramedical courses. Service infrastructure in health includes details of allopathic hospitals, hospital beds, Indian System of Medicine and Homeopathy hospitals, SCs[2], PHCs[3], CHCs[4], blood banks, eye banks, mental hospitals and cancer hospitals.

Health care facility and services play a very important role enhancing better health for all in a state and also a provider of quality employment, education, hygiene, income and environmental safety. Health care facility and services are two types: one is the institutional services and facilities and other is the non-institutional service and facilities. Health care delivery system is analyzed both in terms of health care

[1] AYUSH i.e Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathy initiated in November, 2003 with a view to providing focused attention to development of education & research in Ayurveda, Yoga & Naturopathy ,Unani, Siddha and Homeopathy systems. AYUSH continued to lay emphasis on up gradation of AYUSH educational standards, quality control & Standardization of drugs, improving the availability of medicinal plant material, research and development and awareness generation about the efficacy of the systems domestically and internationally.

[2] A health Sub-centre covers a population of 5000 in plain areas and 3000 in hilly and difficult terrains. All primary health care services are being provided at the door steps of the community.

[3] Primary health centre (PHC) is the cornerstone of rural healthcare. Primary health centre and their sub-centre are supposed to meet the health care needs of rural population. Each primary health centre covers a population of 1, 00,000 and is spread over about 100 villages .A medical officer, block extension educator, one female health assistant, a compounder, a driver and laboratory technician look after the PHC. It is equipped with a jeep and necessary facilities to carry out small surgeries. The PHC are established and maintained by the State Governments under the Minimum Needs Programme (MNP) and Basic Minimum Services Programme (BMS).A PHC acts as a referral unit for 6 sub-centres. It has 4-6 beds for patients. The activity of primary health centres involves curative, preventive, primitive and Family Welfare Services.

[4] The Community health centre (CHC) is the third tire of the network of rural health care institution, was required to act primarily as a referral centre for every four PHCs & for the patient requiring specialized health care services.

personnel and health care institution and infrastructure. Health care personnel include health assistants, health worker, nurses, and doctors. Health care institution and infrastructure includes medical colleges and training centers for improving skilled health care personnel, SCS, PHCs, CHCs, Sub-divisional hospitals and District hospitals.

3.3.1. Status of Sub-Centres (SCs), Primary Health Centres (PHCs) and Community Health Centres (CHCs)

According to the Indian Public Health Standards (IPHS, 2010), a Health Sub-Centre is the most peripheral and first contact between the primary health care system and the community. A Sub-centre provides interface with the community at grass root level, providing all the primary health care services. The purpose of the Health Sub-centre is largely preventive and promotive, but it also provides a basic level of curative care. As per population norms, there shall be one Sub-centre established for every 5000 population in plain areas and for every 3000 population in hilly/tribal/desert areas. There are 148366 SCs functioning in the country as per the National Rural Health Mission (NRHM)[5] data in March, 2011 and in North-East India only 1547 SCs are functioning. The manpower strength for each Sub-centre is

[5] The National Rural Health Mission (NRHM) was launched by the Hon'ble Prime Minister on 12th April 2005, to provide accessible, affordable and quality health care to the rural population, especially the vulnerable groups. Under the NRHM North-Eastern States have been given Special focus. The thrust of the mission is on establishing a fully functional, community owned, decentralized health delivery system with inter-sectoral convergence at all levels, to ensure simultaneous action on a wide range of determinants of health such as water, sanitation, education, nutrition, social and gender equality.

desirable for two Auxiliary Nurse and Mid-Wife (ANM)[6] and one health worker as per population norm. These are the following essential services which are provided in a Sub-centre.

- Maternal Health: Antenatal Care, Intra-Natal Care, Post Natal Care.
- Child Health: Newborn Care Corner, Immunization Services, Nutritional guidelines for prevention and control of childhood diseases like malnutrition, infections, diarrhea, fever, anemia etc.
- Family Planning and Contraception.
- Safe Abortion Services(MTP)
- Curative Services: Provide treatment for minor ailments including fever, diarrhea. ARI, worm infestation and first aid.
- Control of local endemic diseases.

The Bhore Committee (1946) gave the concept of a PHC as a basic health unit to provide as close to the people as possible, an integrated curative and preventive health care to the rural population with emphasis on preventive and promotive aspects of health care. A typical primary health centre (PHC) covers a population of 20,000 in hilly, tribal or difficult areas and 30,000 populations in plain areas with six

[6] Auxiliary nurse midwife have some training in secondary school. A period of on the job training may be included, and sometimes formalised in apprenticeships. An auxiliary nurse midwife has basic nursing skills and no training in nursing decision making. Auxiliary nurse midwives assist in the provision of maternal and newborn health care, particularly during childbirth but also in the prenatal and postpartum periods. They posses some of the competencies in midwifery but are not fully qualified as midwives (UNFPA 2011, WHO: 2010).

indoor/observation beds. It acts as a referral unit for six SCs and refers out cases to CHC (30 bedded hospitals) and higher order public hospitals located at sub-district and district level. In terms of service delivery angle, PHCs may be of two types, depending upon the delivery case load: Type A and Type B. Type A PHC categorized with delivery load of less than 20 deliveries in a month and Type B PHC with delivery load of 20 or more deliveries in a month. The manpower capacity for PHCs should be one MBBS Medical Officer (desirable), one Staff nurse and one sanitary worker-cum-watchman provided to take care of additional delivery case load. There are 24,049 PHCs functioning in the country as on March, 2012 as per bulletin on Rural Health Statistics 2012 and in North-East India has 1547 PHCs. Assam has largest number of PHCs i.e. 975 PHCs in the North-East India followed by Nagaland (126) and Meghalaya (107). The lowest number of PHCs is 24 in Sikkim and 57 in Mizoram. All The PHCs should have assured services that covers all the essential elements of preventive, promotive, curative and rehabilitative primary health care. This implies a wide range of services that includes following:

- Medical care: OPD services, 24 hours emergency services, Referral services, In-patient services.

- Maternal and Child Health Care including family planning: Antenatal care, Intra-natal care, Post-natal care, New Born care, Care of the child, Family planning.

- Medical Termination of Pregnancies using Manual Vacuum Aspiration technique.

- Management of Reproductive Tract Infections / Sexually Transmitted Infections.

- Nutrition Services in coordination with ICDS.
- Disease Surveillance and Control of Epidemics.
- Basic Laboratory Services.

The CHCs were designed to provide referral as well as specialist health care to the rural population. These centres are however fulfilling the tasks entrusted to them only to a limited extent. In order to provide quality care in these CHCs Indian Public Health Standards (IPHS) are being prescribed to provide optimal expert care to the community and achieve and maintain an acceptable standard of quality of care. These standards would help to monitor and improve the functioning of the CHCs. Health care delivery in India has been envisaged at three levels namely primary, secondary and tertiary. The Secondary level of health care essentially includes CHCs, constituting the First Referral Units (FRUs) and the district hospitals. Four PHCs are included under each CHC thus catering to approximately 80,000 populations in tribal/hilly areas and 1, 20,000 populations in plain areas. CHC is a 30 bedded hospital providing specialist care in Medicine, Obstetrics and Gynaecology, Surgery and Paediatrics (IPHS, 2010). There are 4,833 CHCs established in the country and in North- East India has 246 CHCs. These are the following services which can be known as the Assured Services in CHCs:

- Care of routine and emergency cases in surgery.
- Care of routine and emergency cases in medicine.
- 24-hour delivery including normal and assisted deliveries.
- Essential and Emergency Obstetric Care including surgical intervention like Caesarean Sections and other medical interventions.

- Full range of family planning services including Laparoscopic Services.
- Safe Abortion Services.
- New-born care.
- Routine and emergency care of sick Children.
- All the National Health Programmes (NHP) should be delivered through the CHCs.
- Other facilities: Blood Storage Facility, Essential Laboratory Services, Referral Transport Services.

Table 3.7-Status of Health Infrastructure in North-East India

(As on March 2012*)*

States	No of Sub-Centres	No of PHCs	No of CHCs	Total Population
Arunachal Pradesh	286 (460)	97 (69.13)	48 (17.28	1382611
Assam	4604 (6233.85)	975 (1038.97)	109 (259.74)	31169272
Manipur	420 (907)	80 (136.08)	16 (34.02)	2721756
Meghalaya	397 (988)	109 (148.20)	29 (37.05)	2964007
Mizoram	370 (363.67)	57 (54.55)	9 (13.63)	1091014
Nagaland	396 (660.20	126 (99.03)	21 (24.75)	1980602
Sikkim	147 (202.56)	24 (30.38)	2 (7.59)	607688
Tripura	719 (734.20)	79 (122.36)	12 (30.59)	3671032
North-East	7339	1547	246	45587982
India	148366	24049	4833	1210193422

Note: Figures in bracket shows the required number of SCs, PHCs and CHCs as per IPHS population norms.

Source: Bulletin on Rural Health Statistics in 31st March, 2012.

3.3.2. Facilities at Sub-Centre, Primary Health Centre and Community Health Centre

The physical facilities at sub centre level are generally divided in four categories, namely Sub-Centre with ANM Quarters, availability of water supply, supply of electricity and approachable road connectivity.

The Table 3.8 states that in Indian scenario SCs with ANM quarters having an average percentage of 55. Meghalaya stands as a highest position in terms of SCs with ANM quarters i.e. 99.01 percent in North-East India followed by Sikkim (95.20percent) and Mizoram (94.59 percent) which is more than the national average of 55 percent. In Manipur no SC have the facility of ANM quarter. Tripura has a very lower percentage of SCs with ANM quarter i.e.7.75 percent. The SCs with ANM quarters is 17.17 percent in Nagaland and 39.86 percent in Arunachal Pradesh as compare to the national average. The SCs with ANM quarters in Assam is near to the national average.

Arunachal Pradesh and Mizoram are the states where hundred percent ANM living in SCs quarters followed by Nagaland (97.05 percent) and it is more than the all India average of 60.75 percent. Manipur is the only state in North-East India where no ANM living in SCs quarters. The remaining states in North-East India like Meghalaya (42.64 percent), Tripura (32.65 percent), Sikkim (20.86 percent) and Assam (19.94 percent) fall below the national average.

Regular water and electric supply is the basic infrastructure for ensuring good health services in a country. Manipur is the state where 88.33 percent of the SCs working without regular water supply followed by Mizoram (80.0 percent), and Meghalaya (72.59 percent) which is much more than the national average (24.75

percent). In Arunachal Pradesh, only 4.19 percent has working without regular water supply facilities similarly 6.16 percent in Sikkim and 9.53 percent in Assam which is lower than the national average (24.75percent). In North East India 57.99 percent of the SCs having no electricity facilities and in India, it is 24.47 percent. Assam, Meghalaya and Manipur more than 60 percent of the SCs have been working without electricity supply and it is more than the national average.

The approachable road connectivity is poor in North-East India and it is a great difficulty for providing accessible health care for the people living in the region. The percentage share of without all weather motorable approach road to SCs in India is only 6.89 percent but in case of North- East India it is better (19.23 percent). Nagaland has highest numbers of SCs running without all weather motorable approachable roads (33.33 percent) followed by Arunachal Pradesh (33.21 percent), Tripura (31.32 percent) and Manipur (27.38 percent) which are above the average of North-East India and far better than the national average. Assam has lowest numbers of SCs running without all weather motorable approach road (14.96 percent) followed by Sikkim (17.12 percent), Meghalaya (18.02 percent) and Mizoram (18.64 percent) and less than the average of North-East India.

Table 3.8-Health Care Facilities at Sub-Centre

States	Sub-Centre (1)	With ANM quarter (2)	With ANM living in SCs quarter (3)	without regular water supply (4)	Without electric supply (5)	without all weather motorable approach road (6)
Arunachal Pradesh	286 (100.0)	114 (39.86)	114 (100)	12 (4.19)	63 (22.02)	95 (33.21)
Assam	4604 100.0)	2542 (55.21)	507 (19.94)	439 (9.53)	3111 (67.57)	689 (14.96)
Manipur	420 (100.0)	0 (0.0)	0 (0.0)	371 (88.33)	268 (63.80	115 (27.38)
Meghalaya	405 (100.0)	401 (99.01)	171 (42.64)	294 (72.59)	265 (65.43)	73 (18.02)
Mizoram	370 (100.0)	350 (94.59)	350 (100.0)	296 (80.0)	0 (0.0)	69 (18.64)
Nagaland	396 (100.0)	68 (17.17)	66 (97.05)	210 (53.03)	195 (49.24)	132 (33.33)
Sikkim	146 (100.0)	139 (95.20)	29 (20.86)	9 (6.16)	4 (2.73)	25 (17.12)
Tripura	632 (100.0)	49 (7.75)	16 (32.65)	334 (52.84)	304 (48.10)	198 (31.32)
NE India	7259 (100.0)	3663 (50.46)	1253 (34.20)	1965 (27.06)	4210 (57.99)	1359 (19.23)
India	148124 (100.0)	81422 (54.96)	49470 (60.75)	36663 (24.75)	36250 (24.47)	10217 (6.89)

Note: In bracket showing the percentage of various facilities.

Source: Computed from NRHM State Data Fact Sheet for March, 2011

The Indian Public Health Standards (IPHS, 2006) for Primary Health Survey has been prepared keeping in view the resources available with respect to functional requirements for PHCs with minimum standards such as building manpower, instruments, and equipments, drugs and other facilities etc. There are wide ranges of PHCs facilities which include PHCs with Labour room, Operation Theatre, telephone and computer facilities and PHCs with at least four beds. The other PHCs facilities include the availability of electric supply, regular water supply and approachable road connectivity for referral transport. In terms of patient accountability services, every

PHC should have a Rogi Kalyan Samiti/ Primary Health Centre's Management Committee to monitor the functioning of the PHCs.

The Table 3.9 depicts that Mizoram is the only state which performs better in terms of all the health care facilities at PHCs in North-East India. Meghalaya, Mizoram and Sikkim have hundred percent labour room facilities in all the PHCs and it is above the national average of 65.7 percent. Manipur is the only state where 47.5 percent of the PHCs having labour room facilities and fall below the national average. The remaining states of Tripura (75.9 percent), Assam (73.1 percent), Nagaland (69.8 percent) and Arunachal Pradesh (69.1 percent) have better position in terms of labour room facilities in PHCs.

In Table 3.9 shows that the PHCs having the facilities of operation theatre in North-East India lags far behind the all India level. In North-East India only 10.99 percent of PHCs have the facilities of operation theatre whereas the national average is 38.39 percent. Manipur and Meghalaya are the worst performing states and not even one of PHC have the facility of operation theatre. In Mizoram every PHCs has operation theatre facility followed by Sikkim (91.7 percent). Assam has only 3.51 percent of PHCs functioning with operation theatre and Tripura with only 5.06 percent.

The North-East India is in a good position in terms of facilities of PHCs with at least four beds. The percentage for PHCs with at least four beds in North-East India (62.78 percent) is almost similar to the all India level (62.4 percent). Meghalaya, Mizoram and Sikkim are performing better in North-East India with hundred percent PHCs have with at least four beds followed by Nagaland with 97.6 percent. Manipur,

Assam, Tripura and Arunachal Pradesh are in worst situation with 23.5 percent, 54.5 percent, 58.2 percent and 60.8 percent respectively.

The electricity supply in every PHC in North-East India is little less than the all India level. In Arunachal Pradesh 32 percent of PHCs do not have electricity supply and in India it is 8.1 percent. All the PHCs in Mizoram and Sikkim have electric supply.

Table 3.9 also shows that the problem in the availability of water supply in the North-East India. About 38.27 percent of PHCs in North-East India functioning without regular water supply as compared to the national average of 12.50 percent. Although Mizoram is better in terms all the facilities but there is a scarcity of regular water supply in the state. All the PHCs in Mizoram are functioning without regular water supply and all weather motorable approachable road although it has hundred percent facilities of referral transport. Sikkim is the only state where more than fifty percent of PHCs functioning as per the IPHS norms.

Table 3.9-Health Care Facilities at PHCs

States	PHCs (1)	with labour room (2)	with operation theatre (3)	with at least 4 beds (4)	w/o electric supply (5)	w/o regular water supply (6)	w/o all weather motorable approach road (7)	with telephone (8)	with Computer (9)	Referral Transport (10)	Registered RKS (11)	No of PHCs Funtioning as Per IPSC norms (12)
Arunachal Pradesh	97 (100.0)	67 (69.1)	11 (11.3)	59 (60.8)	31 (32.0)	29 (29.9)	11 (11.3)	13 (13.4)	0 (0.0)	45 (46.4)	85 (87.6)	0 (0.0)
Assam	938 (100.0)	686 (73.1)	33 (3.5)	511 (54.5)	83 (8.8)	392 (41.8)	29 (3.1)	447 (47.7)	562 (59.9)	502 (53.5)	938 (100.0)	NA
Manipur	80 (100.0)	38 (47.5)	0 (0.0)	19 (23.8)	15 (18.8)	55 (68.8)	12 (15.0)	6 (7.5)	73 (91.3)	0 (0.0)	73 (91.2)	0 (0.0)
Meghalaya	109 (100.0)	109 (100.0)	0 (0.0)	109 (100.0)	4 (3.7)	13 (11.9)	59 (54.1)	18 (16.5)	85 (78.0)	55 (50.4)	109 (100.0)	3 (2.7)
Mizoram	57 (100.0)	57 (100.0)	57 (100.0)	57 (100.0)	0 (0.0)	57 (100.0)	57 (100.0)	57 (100.0)	45 (78.9)	57 (100.0)	55 (96.5)	0 (0.0)
Nagaland	126 (100.0)	88 (68.8)	39 (30.9)	123 (97.6)	25 (19.8)	20 (15.9)	16 (12.7)	118 (93.7)	24 (19.0)	33 (26.2)	126 (100.0)	21 (16.6)
Sikkim	24 (100.0)	24 (100.0)	22 (91.6)	24 (100.0)	0 (0.0)	0 (0.0)	1 (4.2)	23 (95.8)	22 (91.7)	24 (100.0)	22 (91.7)	14 (58.3)
Tripura	79 (100.0)	60 (75.9)	4 (5.1)	46 (58.2)	5 (6.3)	12 (15.2)	50 (63.3)	29 (36.7)	57 (72.2)	73 (92.4)	79 (100.0)	22 (27.8)
NE India	1510 (100.0)	1129 (74.7)	166 (10.0)	948 (62.7)	163 (10.8)	578 (38.3)	235 (15.5)	711 (47.1)	868 (57.5)	789 (52.2)	1487 (98.5)	60 (3.9)
India	23780 (100.0)	15629 (65.7)	9131 (38.4)	14830 (62.4)	1920 (8.1)	2969 (12.5)	1572 (6.6)	12402 (52.2)	11034 (46.4)	9657 (40.6)	18702 (78.6)	3594 (15.1)

Note: RKS: Rogi Kalyan Samiti N/ Primary Health Centre's Management Committee for improvement of the management and service provision of the PHC (as per the Guidelines of Government of India).

Source: Computed from NRHM State Data Fact Sheet, March 2011

According to the Indian Public Health Standards (IPHS, 2010) every CHC should be provided specialist care in Medicine, Obstetrics and Gynaecology, Surgery and Paediatrics. The CHCs should have the facilities of 30 indoor beds with one operation theatre, labour room, X-ray facility, computer/statistical assistant for MIS accountant and laboratory facility. The other physical infrastructures in CHCs include the facility of new-born care corner, functioning stabilization units for new born, quarter facilities for specialist doctors and availability of AYUSH and allopathic drugs for common ailments. The availability of referral transport is also very necessary for providing emergency services for health care system. The registration of Rogi Kalyan Samiti can be a support services for quality control and internal monitoring of the CHCs.

Although every CHCs should have four specialists according to the IPHS but North-East India performing very poor in terms of four specialists at CHCs. The CHCs are functioning without four specialists in all the seven states in North-East India as mentioned in the table 3.10. Assam is the only state where 25.92 percent of CHCs have the facilities of four specialists.

Assam, Meghalaya, Mizoram, Sikkim and Tripura have hundred percentage facilities in CHCs with functional laboratory. Manipur and Arunachal Pradesh have 87.50 per cent and 79.16 percent respectively in terms of CHCs with functional laboratory. The North-East India (95.08 percent) is very close to the national average (94.51 percent) in this regard. Arunachal Pradesh is the only state where CHCs are working without computer/statistical assistant for MIS/Accountant. Assam, Manipur, Meghalaya, Mizoram, Sikkim and Tripura have hundred percent facilities of CHCs

with computer/statistical assistant for MIS/accountant except Nagaland (47.61 percent).

About 76.23 percent of CHCs in North-East India performs with functional operation theatre (O.T.) which is slightly lower than the national average of 87.12 percent. There are hundred percent facilities in functional O.T in every CHC in Mizoram, Nagaland and Sikkim followed by Assam (93.51 percent). Meghalaya, Tripura and Manipur have are 20.68 percent, 27.27 percent, and 43.75 percent respectively in CHCs with functional operation theatres.

Meghalaya, Mizoram, Nagaland, and Tripura have hundred percent facility of CHCs with at least 30 beds whereas in Arunachal Pradesh and Sikkim do not qualify for 30 beds facility. All the CHCs in North-East India are functioning with hundred percent availability of functional labour room except Arunachal Pradesh i.e. 95.83 percent.

Table 3.10- Health Care Facilities at CHCs

States	CHCs	with all 4 specialist	with computer/statistical assit. for MIS/accountant	with functional lab	with functional O.T	with at least 30 beds	with functional labour room	with functioning stabilization units for new born	with new born care corner
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Arunachal Pradesh	48 (100.00)	0 (0.00)	0 (0.00)	38 (79.16)	37 (77.08)	0 (0.00)	46 (95.83)	0 (0.00)	8 (16.66)
Assam	108 (100.00)	28 (25.92)	108 (100.00)	108 (100.00)	101 (93.51)	101 (93.51)	108 (100.00)	84 (77.77)	108 (100.00)
Manipur	16 (100.00)	0 (0.00)	16 (100.00)	14 (87.50)	7 (43.75)	7 (43.75)	16 (100.00)	NA	12 (75.00)
Meghalaya	29 (100.00)	0 (0.00)	29 (100.00)	29 (100.00)	6 (20.68)	29 (100.00)	29 (100.00)	3 (10.34)	12 (41.37)
Mizoram	9 (100.00)	0 (0.00)	9 (100.00)	9 (100.00)	9 (100.00)	9 (100.00)	9 (100.00)	2 (22.22)	9 (100.00)
Nagaland	21 (100.00)	0 (0.00)	10 (47.61)	21 (100.00)	21 (100.00)	21 (100.00)	21 (100.000	0 (0.00)	21 (100.00)
Sikkim	2 (100.00)	0 (0.00)	2 (100.00)	2 (100.00)	2 (100.00)	0 (0.00)	2 (100.00)	0 (0.000	2 (100.00)
Tripura	11 (100.00)	0 (0.00)	11 (100.00)	11 (100.00)	3 (27.27)	11 (100.00)	11 (100.00)	0 (0.00)	5 (45.45)
NE India	244 (100.00)	28 (11.47)	185 (75.81)	232 (95.08)	186 (76.23)	178 (72.95)	242 (99.18)	89 (36.47)	177 (72.54)
India	4809 (100.0)	641 (13.33)	4158 (86.46)	4545 (94.51)	4190 (87.12)	3354 (69.74)	4557 (94.75)	938 (19.50)	2884 (59.97)

Source: Computed from NRHM State Data Fact Sheet, March 2011

Table 3.11- Health Care Facilities at CHCs (continued)

States	CHCs	with functional X -ray machine (10)	with quarter for specialist doctor (11)	with specialist doctors living in quarter (12)	with referral transport available (13)	with registered RKS (14)	Functioning as per IPHS norms (15)	allopathic drugs for common ailments (16)	AYUSH drugs for common ailments (17)
Arunachal Pradesh	48 (100.00)	13 (27.08)	3 (6.25)	3 (100.00)	40 (83.33)	31 (64.58)	0 (0.00)	48 (100.00)	NA
Assam	108 (100.00)	60 (55.55)	NA	NA	108 (100.00)	108 (100.00)	NA	108 (100.00)	108 (100.00)
Manipur	16 (100.00)	12 (75.00)	16 (100.00)	0 (0.00)	16 (100.00)	16 (100.00)	0 (0.00)	16 (100.00)	16 (100.00)
Meghalaya	29 (100.00)	18 (62.06)	4 (13.79)	4 (100.00)	29 (100.00)	29 (100.00)	1 (3.44)	29 (100.00)	19 (65.51)
Mizoram	9 (100.00)	9 (100.00)	1 (11.11)	1 (100.00)	9 (100.00)	9 (100.00)	0 (0.00)	9 (100.00)	2 (22.22)
Nagaland	21 (100.00)	3 (14.28)	19 (90.47)	19 (100.00)	21 (100.00)	21 (100.0)	0 (0.00)	21 (100.00)	21 (100.00)
Sikkim	2 (100.00)	2 (100.00)	0 (0.00)	0 (0.00)	2 (100.00)	2 (100.00)	0 (0.00)	2 (100.00)	0 (0.00)
Tripura	11 (100.00)	8 (72.72)	3 (27.27)	0 (0.00)	11 (100.00)	11 (100.00)	1 (9.09)	11 (100.00)	11 (100.00)
NE India	244 (100.00)	125 (51.22)	46 (18.85)	27 (58.69)	236 (96.72)	227 (93.03)	2 (0.81)	244 (100.00)	177 (72.54)
India	4809 (100.00)	2811 (58.45)	2707 (56.29)	2008 (41.75)	4270 (88.79)	4752 (98.81)	884 (18.38)	4728 (98.31)	2692 (55.97)

Source: Computed from NRHM State Data Fact Sheet, March, 2011

3.3.3. Manpower Resource Status in Sub-Centres, PHCs and CHCs

According to the Indian Public Health Standard (IPHS) guidelines the minimum requirement for manpower facilities for SC should be two ANM (one essential and one desirable) and one Health Worker Male (essential) for Type A SCs. For Type B SCs, it is recommended to provide two ANMs (essential), one Health Worker Male (essential) and one Staff Nurse or ANM (Desirable). PHCs are expected to provide 24 hour service with basic Obstetric and nursing facilities. Under NRHM, Type A PHCs are being operationalized for providing 24 X 7 services in various phases by placing at least 3 Staff Nurses and one Medical Officer (MBBS), one health assistant male, one health assistant female or lady health visitor, one laboratory technician, two multi-skilled Group D worker and one sanitary worker cum watchman in terms health facilities. For Type B PHCs, additional staff in the form of one MBBS Medical Officer (desirable, if the case load of delivery cases is more than 30 per month) and one staff nurse and one sanitary worker-cum-watchman are to be provided to take care of additional delivery case load. The manpower requirement scheme provide for four posts of medical specialists, one each in Surgery, Medicine, Paediatrics and Gynaecology. As regards to manpower, three specialists namely, Anaesthetist, Eye surgeon and Public Health Programme Manager will be provided on contractual basis in addition to the available four specialists. The CHCs should be equipped with the required number of para-medical staff, such as seven Nurse Mid Wives (NMWs), one Compounder, one Laboratory Technician and one Radiographer. The provision of supporting staff at each CHCs such as, two posts of Ward Boys, one Dhobi, three Sweepers and one Aya. The following requirements are being projected based on average bed occupancy of 60 percent. It would be a dynamic process in the sense that if the utilization goes up, the standards would be further upgraded.

3.3.3. a. Sub-Centre without Manpower Availability

In the Table 3.12, it is seen that the manpower availability of health worker (male) is too low in the North-East India and India as compare to the availability of health worker (female) or ANM. Nagaland is the only state with full manpower availability of health worker (male) and female/ (ANM). Although the actual figure for SCs without ANM is high in Tripura but in percentage term it is highest in Arunachal Pradesh with 19.58 percent followed by Tripura (18.51 percent) and Mizoram (7.29 percent) but higher than the national average of 3.23 percent. Assam, Manipur, Nagaland and Sikkim are the four states where all the SCs has 100 percent manpower requirement of health worker female or ANMs. In Meghalaya 3.45 percent SCs functions without ANM and it is near to the national average. All the states in North-East India have better manpower in terms of health worker (male) than the national scenario. In Assam 48.17 percent of SCs works without health worker (male) and it is near to the national average (49.06 percent).

Table 3.12-Numbers of SCs without the Manpower availability or Without ANM/Health Worker (Female) and Health Worker (Male)

States	Sub-Centre	Without HW(F)/ANM	Without HW(M)
Arunachal Pradesh	286 (100.00)	56 (19.58)	138 (44.75)
Assam	4604 (100.00)	0 (0.0)	2218 (48.17)
Manipur	420 (100.00)	0 (0.0)	89 (21.19)
Meghalaya	405 (100.00)	14 (3.45)	123 (30.37)
Mizoram	370 (100.00)	27 (7.29)	73 (19.72)
Nagaland	396 (100.00)	0 (0.0)	0 (0.0)
Sikkim	146 (100.00)	0 (0.0)	9 (6.16)
Tripura	632 (100.00)	117 (18.51)	227 (35.91)
NE India	7259 (100.00	214 2.94	2877 (39.63)
India	148124 (100.00)	4791 (3.23)	72677 (49.06)

Note: Data for 2010 repeated for Health Worker Male (In bracket percentage figure is given)

Source: NRHM State Data Fact Sheet for March, 2011

3.3.3. b. Primary Health Centres (PHCs) with and without Manpower Availability

According to the IPHS norm at least one Medical Officer is necessary for the functioning of the PHCs. The requirement of Medical Officer further increased if the utilization of PHCs goes up. Manpower availability is too low in PHCs in North-East India as reflected in the Table 3.13. The requirement of the doctors is much higher than the doctors in position. In North-East India some of the PHCs in the states like Arunachal Pradesh, Mizoram and Nagaland having no doctors at all. Very few PHCs have more than four doctors. The PHCs in Mizoram, Nagaland and Sikkim have been working without four plus doctors and three plus doctors. In North-East India only 9.33 percent of PHCs functioning with the availability of four plus doctors and it is

3.13 percent at all India level. Manipur is the only state where 47.50 percent of PHCs functioning with four plus doctors and 45 percent with three plus doctors followed by Tripura (16.45 percent and 13.92 percent respectively) which exceeds the situation prevailing in India. Assam is very close to the North-East India figure i.e. 9.17 percent in terms of PHCs with four plus doctors and 12.57 percent with three doctors. Arunachal Pradesh is the least performing in terms of four plus and three plus doctors availability in PHCs. About 58.33 percent of PHCs in Sikkim functioning with the availability of two doctors only followed by Assam (46.16 percent) and Tripura (39.24 percent) which is more than the average of North-East India (36.82 percent) and above all India level (25.89 percent). In North-East India about 34.83 percent of PHCs having the facility of lady doctor where in India, it is much lower at 20.86 percent. Sikkim and Manipur have good percentage share of lady doctors in PHCs. In Sikkim only 25 percent of PHCs do not have lady doctors and in Manipur it is 40 percent. The lower percentages of PHCs with lady doctor are found in the state of Nagaland (12.69 percent) and Arunachal Pradesh (20.61 percent).

Table 3.13- Numbers of PHCs With Doctors and Without Doctors /Lab Technicians/Pharmacists

States	PHCs	With four+ Doctor	With three Doctor	With two Doctor	With one Doctor	Without Doctor	Without lab tech	Without Pharm.	With Lady Doctor
Arunachal Pradesh	97 (100.00)	2 (2.06)	4 (4.12)	33 (34.02)	48 (49.48)	10 (10.30)	55 (56.70)	64 (65.97)	20 (20.61)
Assam	938 (100.00)	86 (9.17)	118 (12.57)	433 (46.16)	301 (32.08)	0 (0.00)	NA	NA	347 (36.99)
Manipur	80 (100.00)	38 (47.50)	36 (45.00)	6 (7.50)	0 (0.00)	0 (0.00)	8 (10.00)	12 (15.00)	48 (60.00)
Meghalaya	109 (100.00)	2 (1.83)	0 (0.00)	15 (13.76)	92 (84.40)	0 (0.00)	8 (7.33)	2 (1.83)	32 (29.35)
Mizoram	57 (100.00)	0 (0.00)	0 (0.00)	3 (5.26)	44 (77.19)	10 (17.54)	6 (10.52)	13 (22.80)	16 (28.07)
Nagaland	126 (100.00)	0 (0.00)	0 (0.00)	21 (16.66)	87 (69.04)	18 (14.28)	69 (54.76)	32 (25.39)	16 (12.69)
Sikkim	24 (100.00)	0 (0.00)	0 (0.00)	14 (58.33)	10 (41.66)	0 (0.00)	0 (0.00)	17 (70.83)	18 (75.00)
Tripura	79 (100.00)	13 (16.45)	11 (13.92)	31 (39.24)	24 (30.37)	0 (0.00)	12 (15.18)	3 (3.79)	29 (36.70)
NE India	1510 (100.00)	141 (9.33)	169 (11.19)	556 (36.82)	606 (40.13)	38 (2.51)	158 (10.46)	143 (9.47)	526 (34.83)
India	23887 (100.00)	747 (3.13)	897 (3.75)	6185 (25.89)	14852 (62.17)	1099 (4.60)	7778 (32.56)	5640 (23.61)	4983 (20.86)

Source: Computed from NRHM State Data Fact Sheet, March 2011

There is also deficiency of Para-medical staff in the PHCs in North-East India but it is relatively better than all India average.Only10.46 percent of PHCs functioning without laboratory technician as compared to the national figure of 32.56 percent. Arunachal Pradesh and Nagaland are the states where 56.70 percent and 54.76 percent PHCs performing without the availability of laboratory technician than followed by Tripura (15.18 percent). The non-availability of laboratory technician and pharmacist can be a major cause for inaccessible health care services in the states. Manipur (10.00 percent) and Mizoram (10.52 percent) are close to the average percent of North-East India in terms of PHCs without laboratory technician and in Meghalaya only 7.33 percent of PHCs do not laboratory technician. In India 23.61 percent of PHCs do not have pharmacist where the picture for North-East India is far better and

it is just 9.47 percent. Sikkim and Arunachal Pradesh are the state with a deficiency of pharmacist. About 70.83 percent of PHCs in Sikkim and 65.87 percent of PHCs in Arunachal Pradesh are functioning without pharmacists. But in Meghalaya and Tripura only 1.83 percent and 3.79 percent of PHC do not have pharmacist.

3.3.3. c. Shortfall of Health Workforce in North- East India

Availability of adequate human resources is an essential component of health infrastructure. The Table 3.14 and 3.15 show that there is a huge shortfall of specialized doctors such as Surgeons, Obstetrician / Gynaecologist, Paediatrics, Total Specialist and Radiographer at CHCs. The pictures look gloomy which presents the actual availability of medical specialists against the requirement and the gap between requirement and in position is very prominent. The large number of shortfall in CHCs is obviously the greatest handicap in delivering specialized health care services to the rural people, for which these institutions are created. The existence of Shortfall could be due to the non-availability of specialists, resource constraints of the state government and less number of medical and training institutes in North-East India. In case of Para-medical staff such as Health Worker (female) at SCs, Health Assistant (female) at PHCs, Pharmacist at PHCs and CHCs, Laboratory Technician at PHCs and CHCs and Nurse staff in PHCs and CHCs the picture is slightly acceptable. The Para-medical staffs in position are excess of their requirement. This is likely to affect adversely the utilization of health care services in CHCs.

Table 3.15 shows that there is a shortage of health worker male and surplus of health worker female or ANM at SCs in North-East India. This also happens in case of health assistant (male) and health assistant (female) at PHCs in North-East India. It is due to females are more prone to nursing activities than the male and male workers

are unwilling to work at a lower wage. The largest health worker male shortage is shown in Meghalaya with 66.49 percent shortfall. Most of the states in North-East India have shortfall of health worker male except Sikkim, Manipur, and Mizoram. Sikkim have experienced huge surplus of health worker male and it is more than ten times of the requirement. About 95 percent surplus of health worker female or ANM and more than hundred percent surpluses of nursing staff at PHCs and CHCs in Manipur clearly indicate that girls are actively involved in health sector than man. In case of nursing staff in PHCs and CHCs in North-East India, there is about 75.37 percent of surplus. Tripura have highest percentage of surplus in nursing staff in PHCs and CHCs. Only Arunachal Pradesh and Sikkim have shortfall of 32.33 percent and 36.84 percent respectively for nurses in PHCs and CHCs. Arunachal Pradesh is the only state in North-East India which is deprived by health workforce.

Only in case of MBBS doctors there is a surplus but for specialist doctors there is huge deficiency in every CHCs in North-East India. More than 80 percent deficiency experienced in surgeons, paediatricians and total specialists in CHCs and about 69.10 percent deficiency of Obstetrics and gynaecology in CHCs in North-East India. Although the average picture for North-East India for the availability of doctors is showing good but when we go for individual states the situation looks gloomy. Out of the eight states in the region four states of Arunachal Pradesh, Meghalaya Mizoram and Nagaland have deficiency of doctors. Nagaland stands first in terms for deficiency in doctor and it is about 21.42 percent. More than hundred percent surplus of doctors are found in Manipur and more than fifty percent surplus of doctors are found in Assam and Tripura. The other Para-medical staffs like Radiographer has 50 percent deficiency than the requirement and in case of pharmacist and laboratory technician there is surplus of 2.39 percent and 1.95 percent respectively. Table 3.15

clearly indicates the inequitable distribution of health workforce exists in the North-East India.

Table 3.14-Numbers of Health Personal/ Worker in SCs, PHCs and CHCs

Categories of Health Workforce	**Arunachal Pradesh**		**Assam**		**Manipur**		**Meghalaya**		**Mizoram**		**Nagaland**		**Sikkim**		**Tripura**		**North-East**	
Health Workforce /States	***P***	***R***	***P***	***R***	***P***	***R***	***P***	***R***	***P***	***R***	***P***	***R***	***P***	***R***	***P***	***R***	***P***	***R***
Health worker (M) at SCs	148	286 (138)	2386	4604 (2218)	469	420	133	397 (264)	394	370	234	396 (162)	1592	147	543	719 (176)	5899	7339 (1440)
Health Worker (F) at SCs	395	383	8723	5579	975	500	787	506	650	427	867	522	291	171	1169	798	13867	8886
Health Assist (M) at PHCs	78	97 (19)	0	975 (975)	65	80 (15)	69	109 (40)	22	57 (35)	0	126 (126)	12	24 (12)	140	79	386	1547 (1161)
Health Assist(F) at PHCs	NA	97	452	975 (523)	64	80 (16)	79	109 (30)	19	57 (38)	37	126 (89)	20	24 (4)	155	79	826	1547 (721)
Doctor at PHCs	92	97 (5)	1478	975	170	80	104	109 (5)	49	57 (8)	99	126 (27)	32	24	119	79	2143	1547
Surgeon at CHCs	0	48 (48)	42	108 (66)	0	16 (16)	1	29 (28)	1	9 (8)	12	21 (9)	0	2 (2)	0	11 (11)	56	244 (199)
Obster& Gynac atCHCs	0	48 (48)	69	109 (40)	0	16 (16)	5	29 (24)	0	9 (9)	2	21 (19)	0	2 (2)	0	12 (12)	76	246 (170)
Paedia at CHCs	1	48 (47)	20	109 (89)	1	16 (15)	1	29 (28)	0	9 (9)	4	21 (17)	0	2 (2)	0	12 (12)	27	246 (219)
Total Specialist at CHCs	1	191 (190)	122	436 (314)	1	64 (63)	9	116 (107)	0	36 (36)	9	84 (75)	0	8 (8)	0	48 (48)	142	983 (841)
Radiographer at CHCs	9	48 (39)	65	109 (44)	12	16 (4)	22	29 (7)	5	9 (4)	0	21 (21)	2	2	7	12 (5)	122	246 (124)
Pharmacist at PHCs &CHCs	56	145 (89)	1303	1084	127	96	142	138	46	66 (20)	60	147 (87)	10	26 (16)	92	91	1836	1793
Lab tech at PHCs &CHCs	88	145 (57)	1243	1084	132	96	134	138 (4)	61	66 (5)	70	147 (77)	28	26	72	91 (19)	1828	1793
Nurse staff at PHCs&CHCs	293	433 (140)	2795	1738	574	192	414	312	153	120	382	273	24	38 (14)	1098	163	5733	3269

Note: P stands for man in position; R stands for manpower required; M stands for Male; F stands for Female; NA stands for Not Available. In bracket shortfall of Health Workforce is shown in absolute figures.

Source: Computed from RHS bulletin, March 2012, Ministry of Health and Family Welfare, Government of India.

Table 3.15: Shortfall/ Surplus of Health Workforce in SCs, PHCs and CHCs

	STATUS OF SHORTFALL / SURPLUS OF HEALTH WORKFORCE																	
Categories of Health Workforce	**Arunachal Pradesh**		**Assam**		**Manipur**		**Meghalaya**		**Mizoram**		**Nagaland**		**Sikkim**		**Tripura**		**North-East**	
Health Assist (M) at PHCs	19	-48.25	2218	-48.17	49	+11.66	264	-66.49	24	+6.48	162	-40.90	1445	+982.99	176	-24.47	1440	-19.62
Health Worker (F) at SCs	12	+3.13	3144	+56.35	475	+95.00	281	+55.53	223	+52.22	345	+66.09	120	+70.17	371	+46.49	4981	+56.05
		-19.58	975	-100.00	15	-18.75	40	-36.69	35	-61.40	126	-100.00	12	-50.00	61	+77.21	1161	-75.04
Health Assist(F) at PHCs	NA	NA	523	-53.64	16	-20.00	30	-27.52	38	-66.66	89	-70.63	4	-16.66	76	+96.20	721	-46.60
Doctor at PHCs	5	-5.15	503	+51.58	90	+112.5	5	-4.58	8	-14.03	27	-21.42	8	+33.33	40	+50.63	596	+38.52
Surgeon at CHCs	48	-100.00	66	-61.11	16	-100.00	28	-96.55	8	-88.88	9	-42.85	2	-100.00	11	-100.00	199	-81.55
Obster& Gynac atCHCs	48	-100.00	40	-36.69	16	-100.00	24	-82.75	9	-100.00	19	-90.47	2	-100.00	12	-100.00	170	-69.10
Paedia at CHCs	47	-97.91	89	-81.65	15	-93.75	28	-96.55	9	-100.00	17	-80.95	2	-100.00	12	-100.00	219	-89.02
Total Specialist at CHCs	190	-99.47	314	-72.01	63	-98.43	107	-92.24	36	-100.00	75	-89.28	8	-100.00	48	-100.00	841	-85.55
Radiographer at CHCs	39	-81.25	44	-40.36	4	-25.00	7	--24.13	4	-44.44	21	-100.00	0	0.00	5	-41.66	124	-50.40
Pharmacist at PHCs &CHCs	89	-61.37	219	+20.20	31	+32.29	4	+2.89	20	-30.30	87	-59.18	16	-61.53	1	+1.09	43	+2.39
Lab tech at PHCs &CHCs	57	-39.31	159	+14.66	36	+37.50	4	-2.89	5	-7.57	77	-52.38	2	+7.69	19	-20.87	35	+1.95
Nurse staff at PHCs&CHCs	140	-32.33	1057	+60.81	382	+198.95	102	+32.69	33	+27.50	109	+39.92	14	-36.84	935	+573.61	2464	+75.37

The following Table 3.16 shows that Assam has highest number of Sub-divisional hospitals, District hospitals and Mobile Medical Units followed by Tripura and it is lowest in Sikkim. It may be because of geographical extent of Assam (largest) and Sikkim (smallest). Mobile Medical Units are inadequate for Tripura, Meghalaya, Sikkim and Mizoram.

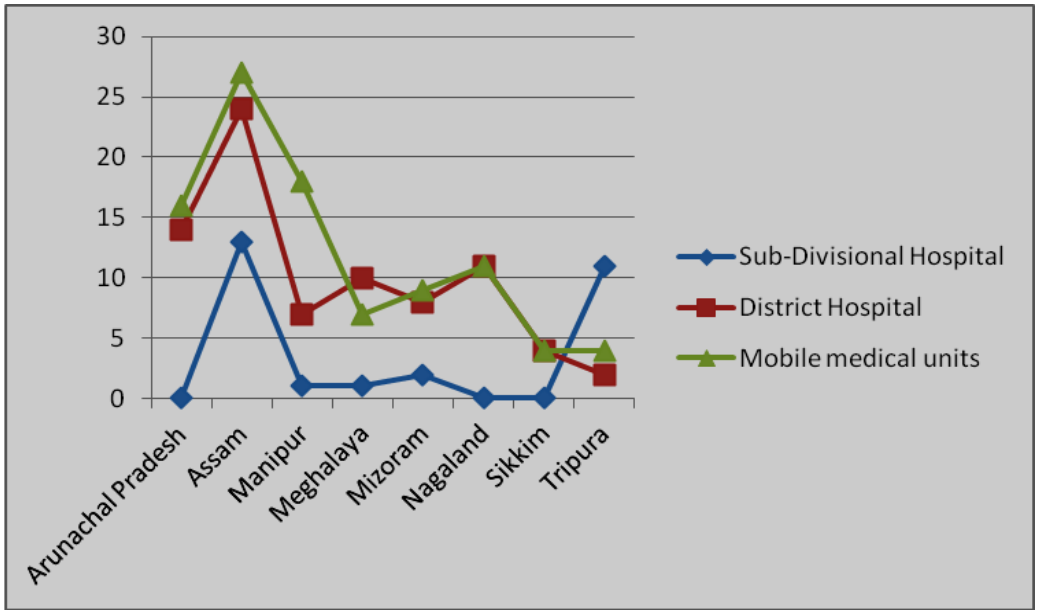
Table 3.16-Numbers of Sub Divisional Hospitals, District Hospitals and Mobile Medical Units functioning in North East India

States	Sub-Divisional Hospital (SDH)	District Hospital(DH)	Mobile Medical Units(MMU)
Arunachal Pradesh	0	14	16
Assam	13	24	27
Manipur	1	7	18
Meghalaya	1	10	7
Mizoram	2	8	9
Nagaland	0	11	11
Sikkim	0	4	4
Tripura	11	2	4
North-East India	28	80	96
India	985	613	1825

Source: National Rural Health Mission State Data Fact Sheet, March 2011.

Figure 3.5 clearly shows that Assam has highest number of sub-divisional hospitals, district hospitals and mobile medical units in North-East India. The remaining states in North-East India do not have adequate numbers of sub-divisional hospitals, district hospitals and Mobile Medical units.

Figure 3.5- Sub-Divisional Hospital, District Hospital and Mobile Medical Units



As per the Table 3.17, there are 23,916 hospitals having 622,628 beds in the country. The North East India has 1816 hospital and represents only 7.5 percent of total number of hospitals in India. The total number of beds in the hospitals is 28067 i.e. 4.5 percent in comparison to Indian scenario. Assam has highest number of hospitals and bed capacity and Mizoram has lowest in the both. Tripura stands first where each government hospital has maximum pressure of population in respect to their bed capacity. The population pressure per Government hospital and per Government hospital bed is lowest in Arunachal Pradesh followed by Manipur. Average population per Government hospitals and per government hospital bed mainly depends on the density of population in

the states and availability of health infrastructure. It is low for Arunachal Pradesh because of low density of population.

Table 3.17- Numbers of Government Hospitals and Beds (Including CHCs) and Population served per Hospital and Bed in North-East India

States	Total Number of Hospitals	Total Number of Beds	Projected Population (000)	Average population served per Govt. Hospitals	Average population served per Govt. Hospital bed	Reference period
Arunachal Pradesh	384	5010	1184	3083	236	01.01.2013
Assam	1020	10179	31167	30556	3062	01.01.2013
Manipur	225	1385	1187	5276	857	01.01.2012
Meghalaya	40	2957	2591	64775	876	01.01.2013
Mizoram	22	1064	1204	54727	1132	01.01.2013
Nagaland	53	2427	2197	41453	905	01.01.2013
Sikkim	33	1560	608	18424	390	01.01.2012
Tripura	39	3485	3574	91641	1026	01.01.2013
NE India	1816	28067	43712	24070	1557	
All india	23916	622628	1212270	50689	1947	

Source: Directorate of Health Services of States, Government of India, National Health Profile 2012

The medical educational infrastructure in the country has shown rapid growth during last 20 years but in case of North-East India the extension was very low during the last two decades. This shows the negligence of central government towards North-East India and role of the state government in expanding medical educational infrastructure. As shown in Table 3.18, the country has 356 medical colleges with total admission capacity of 39474 students. In North-East India, there are only 11 medical collages with admission capacity 1176 students which is very low as a proportion to all India level. The total number medical colleges and admission capacity is highest in Assam. According to National health profile, 2012 there are five medical colleges in Assam and no medical colleges exist in Mizoram, on the other hand, there are nine medical collages and health

institution in Assam and one medical college in Mizoram as per the information displayed by Ministry of Development of North-Eastern Region in their website. .

Table.3.18-Numbers of Medical Colleges and Health Institutes in North-East India

(As on March 2010)

States	No of Govt/Private Medical Collages	Intake
Arunachal Pradesh	0	0
Assam	5	626
Manipur	2	200
Meghalaya	1	50
Mizoram	0	0
Nagaland	0	0
Sikkim	1	100
Tripura	2	200
NE India	11	1176
India	356	39474

Source: National Health Profile 2012

3.3.3. d. Medical institute and Training centre in North- east India

As mentioned earlier that there are very less number of medical colleges and institutes in North-east India. Arunachal Pradesh and Nagaland do not have any medical colleges and institutes which is responsible for manpower deficiency in health sector resulting in worst situation in terms of health outcomes. Assam and Meghalaya has only one each HFWTC and no MPW Training School whereas Mizoram and Tripura have only one each MPW Training School and no HFWTC**.** Human resource for health care through the expansion of professional and technical education is very important for the increase and availability of skilled professional. The North-East India is ignored by

training centres which is very essential for providing health care facility. Only Manipur has both the training centre i.e. HFWTC and MPW Training school.

North-East India has 30 schools for ANM or Health Worker (Female) and only four promotional training schools for LHV[7] or health assistant (Female) funded by Government of India whereas at all India level there are 319 and 34 school respectively. Assam has highest number of both the schools i.e. 18 schools for ANM and only one schools for LHV. Assam, Manipur, Sikkim and Tripura have only one each school for LHV out of the four schools exist in North-East India where as the remaining states in North-East India do not have any school for LHV/HA (F). There are three schools for ANM/HW (F) in Manipur whereas for Meghalaya, Nagaland and Tripura have only two each ANM schools and Arunachal Pradesh and Sikkim both have only one each ANM schools.

Nevertheless the various pieces of existing evidence indicate that India faces a policy challenge in the health sector due to the dual burden of communicable as well as non-communicable diseases. Mizoram and Nagaland report fairly high prevalence among ante-natal clinic (ANC) attendees.

India still has a long way to go. The less developed states, rural areas, the poor, marginalized groups and women continue to have poor health outcomes which are made worse by their poor access to healthcare. Equity and welfare of a society mainly depend on proper health care system. With the establishment of NRHM in 2005, the focus shifted

[7] Lady Health visitors are nationally registered nurses and midwives who have undertaken further training to as part of a primary health care team. As their name suggests, their role is to promote mental, physical, and social well-being in the community by giving advice and support to families in all age groups. Limited resources and staff within the NHS have traditionally meant that their work has been focused on childhood development, but the scope to expand their roles is slowly improving.

to the demand side, and although supply side attempts to improve infrastructure, build the capacity of the health personnel, create a cadre of ASHA and improve health management information system.

3.4. Health Expenditure

The quality of public health care services depends on the effectiveness of health care spending. Definition of health expenditure depends on whether one included only health expenditure on medical and public health or with the combined expenditure on family welfare, water supply, sanitation and nutrition. The expenditure on medical and public health has direct impact on the health condition of the people but expenditure on water supply, sanitation and nutrition have a huge indirect positive impact on the health condition of the poor people. Clean water supply and sanitation increases hygiene in a society which reduces infectious diseases in a country. Nutritional security plays a very important role in achieving inclusive growth in an economy and significant impact on socio-economic inequalities as nutrition increases human quality of life expected through the improved health. The expenditure on public health including family welfare, water supply, sanitation, and nutrition in 2010-11 was about 1.7 percent of GDP which was very low. The NRHM also aims to change the Centre-State sharing in health care spending from 20:80 to 40:60 in the long run.

The Total Health Expenditure can be divided into two parts: Public Expenditure and Private Expenditure. The Public Expenditure on health is financing through the Central government and State Government. Central Government includes Ministry of Health and Family Welfare and other Central Ministries and State Government includes the State Departments of Health and Family Welfare and other Departments. Health

expenditure as a share of GDP varies across the countries and region, reflecting the relative priority to health as well as the diverse financing and organizational structure of health system in each country (OECD, 2013). Total health expenditure measures the final consumption of health goods and services plus capital investment in health care infrastructure and includes spending by both public and private sources.

3.4.1. Public Expenditure on Health

According to World Bank (2014) public health expenditure consists of recurrent and capital spending from government (central and local) budgets, external borrowings and grants (including donation from international agencies and nongovernmental organizations) and social (compulsory) health insurance funds. Public Expenditure on Health is incurred by three tiers of the government; the central government, state government and local bodies. It is often argued that the public health expenditure is one of the important components for the provisioning of health facilities which further results in better outcomes. India's performance in improving the health outcomes however remained far from satisfactory may be because of low public expenditure on health (Hooda, 2013).

3.4.2. Private Expenditure on Health

According to World Bank (2014) private health expenditure includes direct household spending or out of pocket expenditure, private insurance, charitable donations and direct service payments by private corporations. Private health expenditure can be channelled through private facilities. The role of public expenditure in health care provision varies with reference to the efficiency, responsiveness, and quality and

consumer choice. The table 3.22 explains the public and private expenditure on health for India and North-East India.

It is clear from table 3.19 that the revenue expenditure on medical and public health cover a very small proportion out of social services both in North-east India and India. Social service expenditure includes expenditure in medical and public health; education, art and culture; water supply and sanitation; family welfare; housing; urban and rural development; nutrition and social security and welfare. Medical and public health expenditure in India is only 10.93 percent of social service expenditure and in case of North-East India is slightly better with 15.52 percent. Arunachal Pradesh has highest revenue expenditure on medical and public health; and water supply and sanitation i.e. 20.63 percent and 20.81 respectively. It is lowest for both the cases in Tripura with 12.18 percent and 1.82 percent. About 1.82 percent spends on family welfare in North-East India and it is near to the national average. The revenue expenditure for family welfare varies from a low of 0.59 percent in Arunachal Pradesh to a high of 2.29 percent in Nagaland. The revenue expenditure on nutrition plays a very important role in enhancing human capabilities but in India it is neglected. The country's expenditure is about 4.44 percent on nutrition and it is 7.73 percent for North-East India. Although the average picture for North-East India is better than India but for individual states like Assam (10.82 percent), Nagaland (8.43 percent) and Meghalaya (8.12 percent) have good revenue expenditure on nutrition. There should be more revenue expenditure on health in North-East India as it financial status under the high focus states where more funds are allocated on this group of states.

Table.3.19-Public Finances on Health in the North-East India

States	Revenue Expenditure (₹ lakh) and Budget Estimate (2009-10)				
	Medical & Public health	**Family Welfare**	**Water Supply& Sanitation**	**Nutrition**	**Social Services**
Arunachal Pradesh	18217 (20.63)	529 (0.59)	18380 (20.81)	796 (0.90)	88301 (100.00)
Assam	141028 (14.81)	20612 (2.16)	22357 (2.34)	103045 (10.82)	952241 (100.00)
Manipur	12139 (13.14)	1330 (1.44)	3598 (3.89)	1661 (1.79)	92320 (100.00)
Meghalaya	17644 (14.05)	1769 (1.40)	10479 (8.34)	10192 (8.12)	125501 (100.00)
Mizoram	25613 (23.31)	1675 (1.52)	7748 (7.05)	2027 (1.84)	109874 (100.00)
Nagaland	12152 (15.64)	1779 (2.29)	2777 (3.57)	6553 (8.43)	77661 (100.00)
Sikkim	9007 (14.54)	933 (1.50)	2073 (3.34)	1551 (2.50)	61923 (100.00)
Tripura	18383 (12.18)	1665 (1.10)	2754 (1.82)	2389 (1.58)	150828 (100.00)
NE India	254183 (15.52)	30292 (1.82)	70166 (4.23)	128214 (7.73)	1658649 (100.00)
India	3388767 (10.93)	571408 (1.84)	1056543 (3.40)	1378381 (4.44)	30992052 (100.00)

Source: State Finances, A Study of Budgets of 2009-10, Reserve Bank of India

3.4.3. Per Capita Health Expenditure and NSDP

As revealed in Table 3.20, Sikkim has the highest per capita NSDP (National State Domestic Product) i.e. ₹30652/- and lowest in Tripura i.e. ₹12481/- where as the per capita health expenditure was highest in Sikkim i.e. ₹1507/- and lowest in Manipur i.e. ₹ 673/-. Assam, Manipur, Meghalaya, Mizoram and Nagaland have lowest per capita health expenditure than the national average. On the other hand, Tripura is only state whose per capita NSDP is lowest in North-East India but it spends a larger proportion on health.

Table 3.20-Per Capita Finance on Health in the North-East India

States	Per Capita NSDP 2008-09 (in ₹)	Per Capita Health Expenditure(NHA-04-05)(in ₹)
Arunachal Pradesh	22475	1454
Assam	16272	774
Manipur	16508	673
Meghalaya	23069	894
Mizoram	20483	1133
Nagaland	17129	819
Sikkim	30652	1507
Tripura	12481	1486
NE India	19883.62	1092.50
India	25494	1201

Source: -National Health Accounts 2004-05 and CSO 2008-09, cf.Annual Report on Health,

Table.3.21- Per Capita Public Expenditure on Health in the North- East India, 2006-07 to 2009-10 at current prices (in ₹)

States	2006-07	2007-08	2008-09	2009-10
Arunachal Pradesh	1453	1405	1824	2046
Assam	320	465	514	715
Manipur	482	881	838	987
Meghalaya	601	738	765	1119
Mizoram	1279	1646	2137	2756
Nagaland	1073	1161	1100	1256
Sikkim	1143	1476	2247	2498
Tripura	600	670	762	955

Note: Total Expenditure is the sum of expenditure by the Central and the State Government at the State-level. Central Government expenditure at the State-level, include expenditure both through the treasury and off-budget route. State-level expenditure indicates budgetary expenditure of States, net of grants received from the Central Government.

Source: Choudhury and Amar Nath, 2012

It is clear from the trend line in figure 3.6 that over the years per capita public expenditure on health in the North –East India increasing.

Figure 3.6 Trends and Pattern of Per Capita Public Expenditure on Health in North- East India

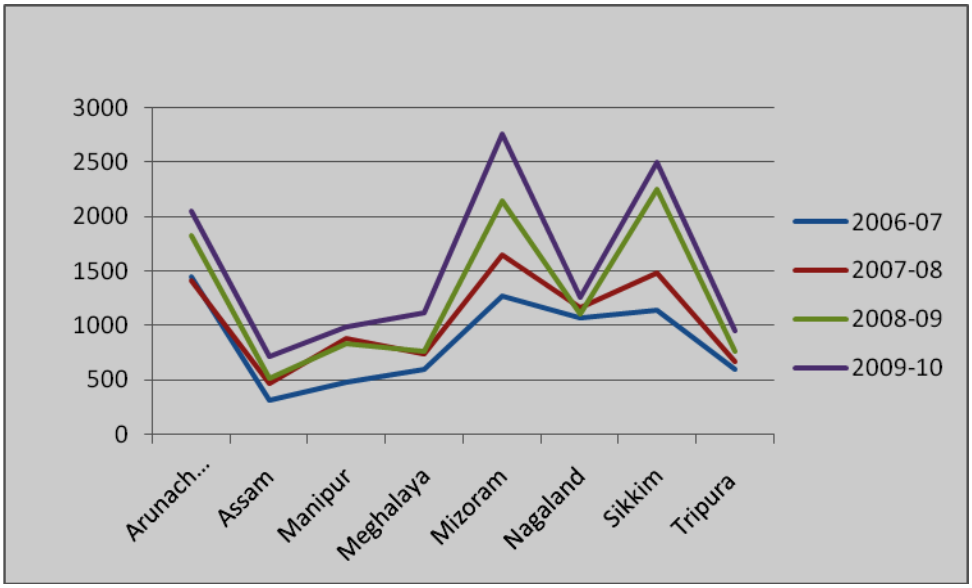


Table.3.22 clearly indicates that in India health expenditure mostly dominated by private sector but situation is different North-East India. In the wake of economic reforms in 1991, the role of public sector is minimized over the years and it maximized for private sector. About 80 percent of total health expenditure in India is private and only 20 percent carried out by the public sector which is very low in comparison to world data. The North-East India has relatively better situation in terms of public expenditure as compared to private expenditure. The share of public expenditure is 31 percent out of total health expenditure and remaining 69 percent for private expenditure. Mizoram and

Nagaland places a situation like developed countries where more than 75 percent is public health expenditure and less than 25 percent is private health expenditure. Assam is the only state where 79 percent of total expenditure is private and only 21 percent is public expenditure.

Table 3.22- Public and Private Expenditure on Health in the North East India

States		Expenditure(in Rs.000)		Expenditure(in Rs.000)		Percentage Share	
	Public expenditure	Private expenditure	Total Expenditure	Per Capita Public Expenditure	Per Capita Private Expenditure	Public Exp. As share of GSDP	Public Exp. As share of State Expenditure
Arunachal Pradesh	965753 (57.82)	704270 (42.17)	1670023 (100.00)	841	613	3.46	4.63
Assam	4546276 (20.88)	17217701 (79.11)	21764067 (100.00)	162	612	0.86	3.08
Manipur	667254 (43.71)	859204 (56.28)	1526458 (100.00)	294	379	1.32	2.57
Meghalaya	1043636 (48.12)	1125015 (51.87)	2168651 (100.00)	430	464	1.75	5.04
Mizoram	805874 (76.52)	247185 (23.47)	1053059 (100.00)	867	266	3.28	4.43
Nagaland	1330660 (78.00)	375247 (22.00)	1705907 (100.00)	639	180	2.49	5.85
Sikkim	612475 (71.78)	240773 (28.21)	853248 (100.00)	1082	425	3.82	2.83
Tripura	1097598 (22.06)	3877742 (77.93)	4975340 (100.00)	328	1158	1.32	3.68
NE India	11069526 (31.00)	24647137 (69.00)	35716663 (100.00)				
All india	263132133 (20.13)	1044135932 (79.87)	1307268065 (100.00)	242	959	NA	NA

Source: Table No, 1.3 of National Health Accounts Report 2004-05 of Ministry of Health and Family Welfare (MOHFW), Government of India (With Provisional Estimates from 2005-06 to 2008-09), National Health Profile 2012

The table 3.23 shows expenditure per hospitalisation in Government Hospital, Private Hospital and all hospitals with respect to the rural areas and urban areas and it reflects the rural-urban disparity in North-East India. This table clearly indicates that expenditure per hospitalisation in case for private hospital is much more than the other hospital in the all states in North-East India. The average total medical expenditure in

North-East India for Government Hospital is ₹2561.25 in rural areas and ₹ 3205.25 for urban areas. The table shows a contrasting picture for Private hospitals. The average medical expenditure for Private Hospital in North-East India is ₹8585.28 in rural areas and ₹ 35416.3 in urban areas which shows over reliance on private hospitals in North-East India than the government hospitals.

Table 3.23: Rural-Urban Disparity in Average total medical expenditure for treatment per hospitalization case (inpatient) for last 365 days in Govt/Private Hospital

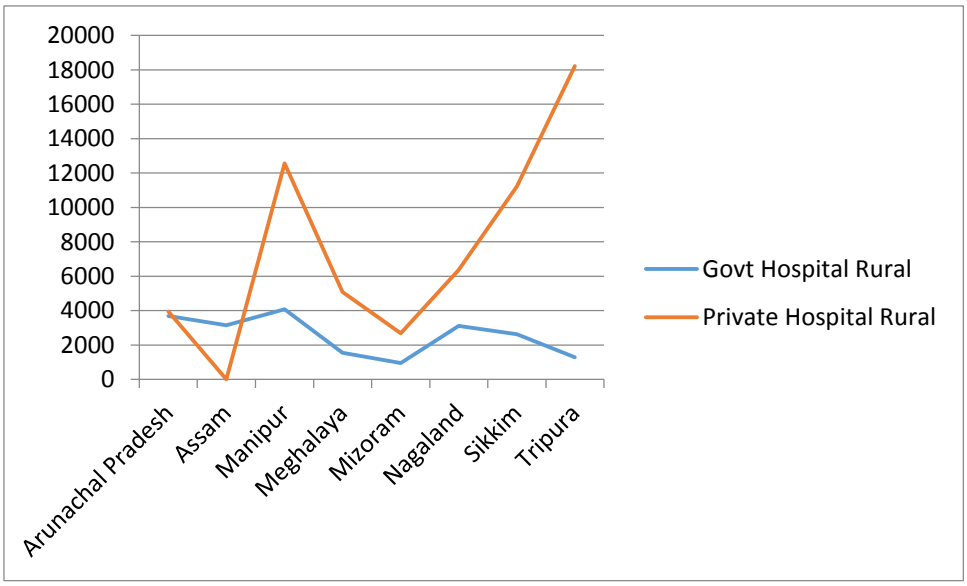
	Expenditure per Hospitalisation (in ₹)					
	Govt Hospital		Private Hospital		All Hospital	
States	Rural	Urban	Rural	Urban	Rural	Urban
Arunachal Pradesh	3686	3868	3951	6836	3716	4237
Assam	3157	2696	NA	NA	8179	20048
Manipur	4090	4932	12568	11593	5550	5786
Meghalaya	1545	2867	5080	9123	2493	6824
Mizoram	954	2500	2687	15673	1073	5201
Nagaland	3124	3692	6375	8349	4232	5890
Sikkim	2634	2619	11217	16738	3273	6470
Tripura	1300	2468	18219	179602	1925	20929
NE India	2561.2500	3205.25	8585.286	35416.3	3805.13	9423.125
S.D	1164.0941	879.625	5613.008	58963.1	2247.85	6878.366
C.V	45.4502	27.44326	65.3794	166.486	59.0742	72.99453
Min	954	2468	2687	6836	1073	4237
Max	4090	4932	18219	179602	8179	20929

Note: for larger state like Assam data available for Govt and other hospital and for smaller state data available for Govt and private hospitals.

Source: The Report of 60th round of NSSO, 2004

In rural areas generally government hospital plays a predominant role in health care but the figure 3.7 reflecting a different picture. In North-East India, the average total medical expenditure for treatment per hospitalization case (inpatient) is more for private hospitals not only in urban areas but also in rural areas. The role of private hospitals in facilitating treatment per hospitalization (inpatient) is very much prominent in rural areas of North-East India except Arunachal Pradesh and Assam. It may be due to higher per capita expenditure prevailing in North-East India than other parts of the country.

Fig 3.7: The Rural Disparity in Average total medical expenditure for treatment per hospitalization case (inpatient) for last 365 days in Govt/Private Hospital



Finally, this Chapter is broadly classified into three sections such as health profile, health infrastructure and health expenditure with reference to North-East India. This chapter makes an interesting analysis in regional disparities in health care sector with the help of various tables and figures. In the first section i.e. Health profile explaining the condition of different health indicators like CBR and CDR, PDGR/ TFR, IMR, MMR and

life expectancy at birth. The inter-state variations in health indicators are noticeable. CBR is highest in Meghalaya (24.4) and lowest in Manipur (14.4) but CDR is highest in Assam (8.4) and lowest in Nagaland (3.6). Meghalaya has highest TFR with 3.2 children per woman and lowest in Manipur with 1.5.

The second sections deals with health infrastructure with reference to the status of SCs, PHCs and CHCs with their various facilities and manpower resource. This section reveals that the health centres in North-East India are not fulfilling some of the objectives and norms of IPHS. The geographic condition of North-East India is the constraints and barrier in providing potential health infrastructure in this region. Due to this physical condition of the geographical area, there are some linkages problems between the health centres. Duggal (1989) already revealed that the health infrastructure such as the number of hospitals, dispensaries, health centres, hospital beds are far from adequate. The health centres are facing huge gap between the requirement and persons in position in manpower availability. The availability of proper manpower are creating biggest barrier in providing health care access to all in North-East India. Mejia and Fulop (WHO, 1978) found that the lack of manpower and of other resources is the most obvious constraint to the development of the health sector. There should be coordination between the two major components of health system: health care delivery and health manpower development. Unfortunately, such coordination is lacking in most of the cases in North-East India. Lack of coordination exists not only between the two major components of the health system but also among the sub-system within each component. In relation to health manpower, the lack is visible in the gap existing between manpower planning and manpower production, administration and management.

Finally, third section analyses different aspects of health expenditure such public expenditure on health, private expenditure on health, per capita health expenditure which includes public and private both and the trends and pattern of per capita public health expenditure in North-East India with the help of tables and figures. Duggal (1989), point out that the large volume of private health expenditure in India is probably one of the largest in the world when viewed as a proportion to the total health expenditure. This is a threatening situation because most of the people spending on health care not out of choice but forced by circumstances, especially the non-availability and inadequacy of public health care services in North-East India as well as in India.

Chapter 4

Analysis of the Results

The previous chapter explains the various dimensions of health care facilities such as health profile, health infrastructure and expenditure. In the present chapter, the focus is to use different methodology such as composite index, independent t-test, and level of variation in the health profile, infrastructure and expenditure. Gini-coefficient is used to measure the health inequality; Data Envelopment Analysis (DEA) for deriving the state level efficiency in health care; and Pearson's correlation coefficient. Chapter 3 analyses the actual values of various components of health profile, health infrastructure and health expenditure with respect to eight states of the North-East India. The health profile is composed of Sex ratio, CBR, CDR, IMR, TFR, Population Decadal Growth Rate and Percentage of Children Fully Immunized. The health infrastructure constitutes of the number and facilities associated with SCs, PHCs and CHCs. The facilities taken into consideration are the availability of water and electricity supply, all weather approachable road connectivity, with labour room, operation theatre, four beds , functional lab facility etc and average population served per government hospital beds, per allopathic doctors . The health expenditure is composed primarily of Per Capita NSDP, Per Capita Health Expenditure, Per Capita Public and Private Expenditure, Proportion of Public and Private Expenditure out of the total expenditure, Public expenditure as share of GSDP and state expenditure, Revenue Expenditure on Medical & Public Health, Family Welfare, Water Supply & Sanitation, Nutrition and Social Services.

The above mentioned individual indicators of health profile, infrastructure and expenditure makes us difficult to understand the performance of eight states in the North-East India in terms of health facilities and outcomes. Therefore, individual ranks for each indicator as well as average ranks of all indicators for each state are computed to facilitate the ranking of the health profile, health infrastructure and expenditure of the North- East India. Purohit (2008) uses ranking of districts of West Bengal for knowing the efficiency in health care system whereas Booske et. al (2010) has assigned weights for health outcomes and health factor for country health ranking. Both the studies are helpful for this research to know state-level performances in terms of health facilities and health outcomes in the North-East India.

The ranking criteria for health profile, health infrastructure and expenditure is done with respect to the performance of the eight states in the North-East India are given below: 1 is assigned for Best Performance and 8 is assigned for Worst performance. According to the performances the ranks are hereby assigned as follows:

Rank Index	**1**	**8**
Sex Ratio	Higher Value	Lowest Value
CBR	Lowest Value	Highest Value
CDR	Lowest Value	Highest Value
IMR	Lowest Value	Highest Value
TFR	Lowest Value	Highest Value
Population Decadal Growth Rate	Lowest Value	Highest Value
%age of Children fully immunised	Highest Value	Lowest Value

Table 4.1: Ranks of Health Profile

States/ Indicators	Sex Ratio	Crude birth rate	Crude death rate	Infant mortality rate	Total fertility rate	population decadal growth rate	Percentage of Children fully immunized	Avg rank of health profile
Arunachal Pradesh	7	6	6	4	7	7	5	6.00
Assam	5	7	8	8	6	4	6	6.29
Manipur	1	1	2	1	1	5	3	2.00
Meghalaya	2	8	7	7	8	8	3	6.14
Mizoram	3	4	3	6	3	6	1	3.71
Nagaland	6	3	1	2	5	1	7	3.57
Sikkim	8	5	5	3	4	2	2	4.14
Tripura	4	2	4	5	2	3	4	3.43

Note: (All the figures are in Ranks)

The reason for including lower crude birth rate and lower total fertility rate as rank 1 is based on some recent studies which have proven that lower CBR and TFR reflect political freedom and increase in per capita income. A nation can improve her economic performance by politically influencing her population size. The estimates show that if the birth rate declines, then political freedom as well as political stability increases. Feng (2003) found that 10 percent increase in political freedom reduces fertility by 2.2 percent and birth rate by 1.6 percent. The Table 4.1 shows that Manipur stand rank 1 in Sex Ratio, CBR, IMR and TFR and the overall ranking or average ranking is second in terms of health indicator.

Assam ranks as number 1 for number of SCs, PHCs and CHCs both in terms of population criteria as well as total numbers in position. The average ranking is 2.66 for Meghalaya. The average ranking is low for Mizoram (7) and Sikkim (8). The number of SCs, PHCs and CHCs are greater in Assam as it is the largest state in terms of its population size and area in comparison to Sikkim and Mizoram.

Table.4.2: Rank of Numbers of SCs, PHCs and CHCs

States	Sub-Centre		PHCs		CHCs		Average Rank
	Total number	Pop. basis	Total number	Pop. basis	Total number	Pop. basis	
Arunachal Pradesh	7	6	4	6	2	6	5.16
Assam	1	1	1	1	1	1	1
Manipur	3	3	5	3	5	3	3.66
Meghalaya	4	2	3	2	3	2	2.66
Mizoram	6	7	7	7	7	7	6.83
Nagaland	5	5	2	5	4	5	4.33
Sikkim	8	8	8	8	8	8	8
Tripura	2	4	6	4	6	4	4.33

Note: (All the figures are in Ranks)

In the Table 4.3, the average ranking is best for Sikkim (3.50) in North-east India although the number of Sub-Centre is less but it ranks second in most of the facilities available in SCs. The numbers of SCs in Sikkim are adequate in terms of population size and area. The average ranking is lowest for Manipur (6.17) and it ranks more than five in case of facilities at SCs.

Table 4.3: Rank of Health Care Facilities at SCs

States	Sub-Centre	With ANM quarter	With ANM living in SCs quarter	without regular water supply	Without electric supply	without all weather motorable approach road	Average Rank
Arunachal Pradesh	6	5	1	1	3	7	3.83
Assam	1	4	6	3	8	1	3.83
Manipur	3	8	7	8	6	5	6.17
Meghalaya	2	1	3	6	7	3	3.67
Mizoram	7	3	1	7	1	4	3.83
Nagaland	5	6	2	5	5	8	5.17
Sikkim	8	2	5	2	2	2	3.50
Tripura	4	7	4	4	4	6	4.83

Note: (All the figures are in Ranks)

Sikkim stands at lowest rank i.e. 8 in terms of number of PHCs but with reference to the facilities at PHCs its average ranks 2.09 which is the best among the North-East India. Mizoram and Nagaland has been placed similar average rank i.e approximately rank 3 and Tripura and Assam have ranked 4th in case facilities at PHCs although the rank of total number of PHCs is different for each state. The facilities at PHCs in Manipur and Arunachal Pradesh have lowest average rank i.e 5.45 and 5.27 respectively.

Table 4.4: Rank of Health Care Facilities at PHCs

States	PHCs	WLR	WOT	WaL4B	WOES	WORWS	WOAWMAR	WT	WC	RT	RRKS	Average Rank
Arunachal Pradesh	6	5	4	3	7	5	3	7	8	5	5	5.27
Assam	1	3	6	5	4	6	1	4	6	3	1	3.64
Manipur	3	6	7	6	5	7	5	8	2	7	4	5.45
Meghalaya	2	1	7	1	2	2	6	6	4	4	1	3.27
Mizoram	7	1	1	1	1	8	8	1	3	1	2	3.09
Nagaland	5	4	3	2	6	4	4	3	7	6	1	4.09
Sikkim	8	1	2	1	1	1	2	2	1	1	3	2.09
Tripura	4	2	5	4	3	3	7	5	5	2	1	3.73

Note: With Labour Room=WLR, With Operation Theatre=WOT, With at Least 4 Beds=WaL4B, Without Electric Supply=WOES, Without Regular Water Supply=WORWS, Without All Weather Motorable Approach Road=WOAWMAR, With Telephone=WT, With Computer=WC, Referral Transport=RT, Registered Rogi Kalyan Samiti= RRKS. (All the figures are in Ranks)

Table 4.5 clearly indicates that the average rank for facilities at CHCs is better for all the states in the North-East India. The average rank is high at 1.67 and 1.78 in Assam and Mizoram to a low rank 3.67 for Arunachal Pradesh. The remaining states in the North-East India have similar average rank i.e. approximately 2 in case of facilities at CHCs. Assam and Mizoram have good health infrastructure in comparison to other states but the ranks of health profile is low in these states.

Table 4.5: Rank of Health Care Facilities at CHCs

States	CHCs	with all four specialist	with functional lab	with functional O.T	with at least 30 beds	with functional labour room	with new born care corner	with functional X -ray machine	with referral transport available	Average Rank
Arunachal Pradesh	6	2	3	3	4	2	5	6	2	3.67
Assam	1	1	1	2	2	1	1	5	1	1.67
Manipur	3	2	2	4	3	1	2	2	1	2.22
Meghalaya	2	2	1	6	1	1	4	4	1	2.44
Mizoram	7	2	1	1	1	1	1	1	1	1.78
Nagaland	5	2	1	1	1	1	1	7	1	2.22
Sikkim	8	2	1	1	4	1	1	1	1	2.22
Tripura	4	2	1	5	1	1	3	3	1	2.33

Note: (All the figures are in Ranks)

In the Table 4.6, the average rank for average population served per government hospital, hospital bed and allopathic doctors facility for Arunachal Pradesh is better (rank: 2.50) because of low decadal growth rate of population and the pressure of population for each facilities is less. The Rank is lowest at 6.67 in Mizoram in absence of these facilities. Mizoram has lowest rank in average population served per government hospitals, per government hospital beds and per government allopathic doctors due to some political disturbances that are prevailing in this state for a long time.

Table 4.6: Rank of Numbers of Government Hospitals and Beds (Including CHCs) and Population served per Hospital and Beds in North-East India

States	Total Hospitals		Projected Population('000)	APSGH	APSGHB	APSGAD	Average Rank
	No	Beds					
Arunachal Pradesh	2	2	7	1	1	2	2.50
Assam	1	1	1	4	8	7	3.67
Manipur	3	7	6	2	3	3	4.00
Meghalaya	5	4	3	7	4	5	4.67
Mizoram	8	8	5	6	7	6	6.67
Nagaland	4	5	4	5	5	8	5.17
Sikkim	7	6	8	3	2	1	4.50
Tripura	6	3	2	8	6	4	4.83

Note: (All the figures are in Ranks)

In the Table 4.7, the average rank for per capita health expenditure which includes per capita NSDP in Sikkim have 1st rank and Manipur and Assam stands 7th rank than followed by Nagaland. The per capita income in Sikkim is high due to the increased participation rate of women in economic activities. Assam and Mizoram have 3rd rank in revenue expenditure on medical and public health which is better than the other states in the North-East India. Tripura is lowest performer with an average rank of 6.4 in terms of revenue expenditure on medical and public health and Sikkim and Manipur placed similar rank in this.

Table 4.7: Rank of Per Capita NSDP and Health Expenditure

States	Per Capita NSDP 2008-09(in ₹)	Per Capita Health Expenditure(NHA-04-05)(in ₹)	Average Rank
Arunachal Pradesh	3	3	3
Assam	7	7	7
Manipur	6	8	7
Meghalaya	2	5	3.5
Mizoram	4	4	4
Nagaland	5	6	5.5
Sikkim	1	1	1
Tripura	8	2	5

Note: (All the figures are in Ranks)

Table 4.8: Rank of Revenue Expenditure on Medical and Public Health

States	Revenue Expenditure(in ₹ lakh)					
	Budget estimates(2009-10)					
	Medical & Public health	Family Welfare	Water Supply& Sanitation	Nutrition	Social Services	Average Rank
Arunachal Pradesh	2	8	1	8	6	5
Assam	4	2	7	1	1	3
Manipur	7	5	4	6	5	5.4
Meghalaya	6	6	2	3	3	4
Mizoram	1	3	3	5	4	3.2
Nagaland	3	1	5	2	7	3.6
Sikkim	5	4	6	4	8	5.4
Tripura	8	7	8	7	2	6.4

Note: (All the figures are in Ranks)

In the Table 4.9, the Average Rank on health expenditure includes public, private and total health expenditure, per capita public & private health expenditure, and Public expenditure as a share of GSDP & state expenditure. The average rank is better for Nagaland (Rank: 2.29) than followed by Mizoram i.e. rank 3.14 and worst for Assam and Manipur with average rank 6.29 and 6.00 respectively.

Table 4.9: Rank of Health Expenditure

States	Public Exp.	Private Exp.	Total Exp.	Per Capita Public Exp.	Per Capita Private Exp.	Public Exp. as share of GSDP	Public Exp. As share of State Exp.	Average Rank
Arunachal Pradesh	4	4	5	3	7	2	3	4.00
Assam	8	8	1	8	6	7	6	6.29
Manipur	6	6	6	7	3	6	8	6.00
Meghalaya	5	5	3	5	5	5	2	4.29
Mizoram	2	2	7	2	2	3	4	3.14
Nagaland	1	1	4	4	1	4	1	2.29
Sikkim	3	3	8	1	4	1	7	3.86
Tripura	7	7	2	6	8	6	5	5.86

Note: (All the figures are in Ranks) Exp. Stands for expenditure

There is a positive moderate rank correlation between Infant Mortality and Calorie intake. If the calorie intake is increase mainly for women i.e. women has no nutritional deficiency than it leads to decrease in maternal mortality and infant mortality rate. Infant mortality i.e. death of children before the age of one year per 1000 live birth is occurring because of nutritional deficiency of mother, immature childbirth and malnutrition of the baby. Calorie deficiency has direct effect on infant mortality because of the aforesaid reason. In the Table 4.10, the average rank for calorie intake is rank 2 in Arunachal Pradesh and Nagaland and rank 7 is for Tripura respectively. Arunachal Pradesh, Mizoram and Nagaland known for its tribal traditional societies and the food consumed by them have medicinal properties. The people in these states consume number of herbs and leaves enrich with carbohydrates and dietary fibre which them from illness.

Table.4.10: Rank of Calorie Intake in North-East India

States	Rural	Urban	Average Rank	IMR
Arunachal Pradesh	3	1	2	4
Assam	5	4	4.5	8
Manipur	2	5	3.5	1
Meghalaya	6	6	6	7
Mizoram	4	2	3	6
Nagaland	1	3	2	2
Sikkim	8	4	6	3
Tripura	7	7	7	5

Note: (All the figures are in Ranks)

The Composite index shows the average rank of health profile, infrastructure and expenditure in North-East India. States like Nagaland, Sikkim, Tripura have performed better on this front. The average rank in health profile in Manipur reflects good health status but the same in terms of facilities at SCs and health expenditure is not good enough.

Table 4.11: Composite Index of Health Profile, Infrastructure and Expenditure in the North-East India

States	Avg. Rank of Health Profile	Avg. Rank of number of SCs,PHCs,CHCs	Avg. Rank of Facilities at SCs	Avg. Rank of Facilities at PHCs	Avg. Rank of Facilities at CHCs	Avg. Rank of Hospital Bed Facilities	Avg. Rank on Per Capita Finance on Health	Avg. Rank on Health Expenditure
Arunachal Pradesh	6.00	5.16	3.83	5.27	3.67	2.50	3	4.00
Assam	6.29	1	3.83	3.64	1.67	3.67	7	6.29
Manipur	2.00	3.66	6.17	5.45	2.22	4.00	7	6.00
Meghalaya	6.14	2.66	3.67	3.27	2.44	4.67	3.5	4.29
Mizoram	3.71	6.83	3.83	3.09	1.78	6.67	4	3.14
Nagaland	3.57	4.33	5.17	4.09	2.22	5.17	5.5	2.29
Sikkim	4.14	8	3.50	2.09	2.22	4.50	1	3.86
Tripura	3.43	4.33	4.83	3.73	2.33	4.83	5	5.86

Note: (All the figures are in Ranks)

Table 4.12 presents the Spearsman's Rank Correlation of health indicators like health infrastructure facility and health expenditure. Booske et.al. (2010) in his study used country health ranking by weighting distribution of health outcomes and health factors. The rank correlation between crude birth rate and total fertility rate is 0.9048 reflecting high positive correlation. The rank correlations between health profile with health facilities and expenditure have a positive correlation but they all are insignificant except the rank correlation between health profile and facilities at CHCs which is significant at 5% level. It has been found that the health profile of North East India is far better than the national average. The reason for this is the widespread use traditional practices which use a variety of plants and herbs as medicine to cure common ailments. In addition to plants, a number of insects are also used in traditional medicines which are major source of protein and fat. This practice of traditional medicine could be the reason for low rank correlation between health profile with infrastructural facility and health expenditure. The Human Development Reports of every state in North–East India testifies the positive effects of traditional medicines on the health profile of the states. The average rank of health profile and number of SCs, PHCs and CHCs are positively correlated with only 0.173 percent. The above rank correlation results clearly suggests that the health profile will improved with the expansion of facilities at SCs, PHCs and CHCs but their numbers have little effect on health outcomes.

Table 4.12: Rank Correlation between Health Profile with Infrastructure Facility and Health Expenditure (North-East India)

Variable 1	Variable 2	Rank
IMR	Calorie Intake	0.458
CBR	TFR	0.905
Health Profile	Number of SCs, PHCs and CHCs	0.173
Health Profile	Facilities at SCs	0.534
Health Profile	Facilities at PHCs	0.611
Health Profile	Facilities at CHCs	0.393
Health Profile	Average Population served per hospital, hospital beds and allopathic doctors facility	0.540
Health Profile	Per Capita Finance on Health	0.314
Health Profile	Government revenue expenditure on Health	0.540
Health Profile	Public and Private expenditure on Health	0.626

It is found in Table 4.13 that the rank correlation is very high (0.861) for health facilities at SCs and Government revenue expenditure on health. The rank correlation between health facilities at SCs and public and private health expenditure is also very high (0.805) when compared to the correlation between health facilities at CHC with public and private expenditure (0.333). The rank correlation between health facilities at CHCs with per capita finance on health, Government revenue expenditure on health and public and private expenditure on health is significant at 1% level although the rank correlation value is less. The above results showing that government health expenditure is very much important for providing health facilities at SCs, PHCs and CHCs. The similar studies by Rao and Choudhury (2008) and Bhat and Jain (2004) also found the effects of government health care expenditure in providing health care services to all.

Table 4.13: Rank Correlation between Health Infrastructure Facilities with Health Expenditure (North-East India)

Variable 1	Variable 2	Rank
Health Facilities at SCs	Per Capita Finance on Health	0.784
Health Facilities at SCs	Government revenue expenditure on Health	0.861
Health Facilities at SCs	Public and Private expenditure on Health	0.805
Health Facilities at PHCs	Per Capita Finance on Health	0.708
Health Facilities at PHCs	Government revenue expenditure on Health	0.770
Health Facilities at PHCs	Public and Private expenditure on Health	0.751
Health Facilities at CHCs	Per Capita Finance on Health	0.082
Health Facilities at CHCs	Government revenue expenditure on Health	0.445
Health Facilities at CHCs	Public and Private expenditure on Health	0.333
Average Population served per hospital, hospital beds and allopathic doctors facility	Per Capita Finance on Health	0.509
Average Population served per hospital, hospital beds and allopathic doctors facility	Government revenue expenditure on Health	0.681
Average Population served per hospital, hospital beds and allopathic doctors facility	Public and Private expenditure on Health	0.579

In the Table 4.14, simple correlation analysis is done with the proposed health indicators and per capita health expenditure. It is found that most of the relationship between health outcomes and health expenditure are negatively correlated. The correlation has a lower value close to –0.3321 representing the negative correlation between IMR and Per Capita Public Expenditure (PCPBE) which means that with the increase in PCPBE, the IMR would reduce and vice versa. The highest value obtained in this analysis of 0.2709, representing the positive correlation between the CDR and Per Capita Private Expenditure (PCPvtE). If the PCPvtE increases then it is also leads to increase in CDR. This will happen as the out of pocket expenditure is increases due to higher medical cost and expenses i.e. per capita private expenditure on health as a result unable to spending on health by poor people and they will die. A study by Davis et.al (2012) using correlation analysis to measure the treatment effects in advanced or metastatic Cancer at an individual level.

Table 4.14: Correlation between Health Outcomes and Per Capita Health Expenditure

Variable 1	Variable 2	Correlation
IMR	Per Capita Public Expenditure	-0.332
IMR	Per Capita Private Expenditure	0.186
IMR	Per Capita Health Expenditure	-0.150
TFR	Per Capita Public Expenditure	-0.040
TFR	Per Capita Private Expenditure	-0.052
TFR	Per Capita Health Expenditure	-0.083
CBR	Per Capita Public Expenditure	-0.089
CBR	Per Capita Private Expenditure	-0.084
CBR	Per Capita Health Expenditure	-0.156
CBR	Per Capita Public Expenditure	-0.307
CDR	Per Capita Private Expenditure	0.271
CDR	Per Capita Health Expenditure	-0.053

Statistical Analysis of the Health Variables

To analyse the performance of individual health variables, we use independent t-test and F-test method. The eight states of North-East India are divided equally into two groups on the basis of IMR as well as geographical conditions. The first group consists of the four states such as Assam, Meghalaya, Mizoram and Tripura which are mainly located in plain areas and the second group consists of Arunachal Pradesh, Manipur, Sikkim and Nagaland, which are mainly covered by hill/tribal areas. The health variables

taken into consideration are IMR, TFR, CBR, CDR, PCFI, APSGH, APSGHB, APSGAD, PCPBE, and PCHE.

The mean (μ) and standard deviation (σ) of the health variable is computed for both group one and two. Here X is assigned for group one and Y for group two. The number of population parameters is n=8; the number of independent variables is k=2, as there are two groups; and consequently, the number of degrees of freedom being f= n-2 is calculated as f=6.

In Table 4.15, the Levene's Test of equal variance is computed between the two groups is accepted at 5% level of significance (α).

The null hypothesis for the analysis is as follows,

H_0 : There is no significant difference between the mean of level of health variables in X and Y

i.e.

$H_0 : \mu_x = \mu_y$ (at $\alpha = 5\%$)

The alternative hypothesis for the analysis is hereby given as,

$H_1 : \mu_x \neq \mu_y$ (at $\alpha = 5\%$)

The Independent t-test of Health Variables is hereby computed using Levern's technique (See Appendix III) and tabulated in Table 4.15.

Table 4.15 Independent t-test of Health Variables

Health Variables	μ (σ)		t-test value	F test value	α	n (f)	H_0
	X	Y					
IMR	47.5 (14.47987)	26.25 (7.32006)	2.619	11.573	0.014	8 (6)	R
TFR	2.35 (0.68557)	2.075 (0.49244)	0.652	1.203	0.315	8 (6)	A
CBR	20.1 (4.65761)	17.7 (2.76043)	0.887	3.791	0.099	8 (6)	A
CDR	6.525 (2.01060)	4.875 (1.21209)	1.406	13.674	0.01	8 (6)	R
PCFI	39.875 (17.49998)	31.075 (16.25308)	0.737	0.153	0.709	8 (6)	A
APSGH	6.04E+04 (25284.9462)	1.71E+04 (17617.208)	2.814	0.313	0.596	8 (6)	A
APSGHB	1.52E+03 (1030.698)	5.97E+02 (334.4816)	1.711	3.382	0.116	8 (6)	A
APSGAD	5.49E+03 (868.0034)	4.14E+03 (1917.9784)	1.284	1.355	0.289	8 (6)	A
PCPBE	4.47E+02 (301.1504)	7.14E+02 (333.4556)	-1.19	0.091	0.773	8 (6)	A
PCHE	1.07E+03 (313.9027)	1.11E+03 (428.7784)	-0.156	2.467	0.167	8 (6)	A

R stands for Rejected; A stands for Accepted.

As per the result t -value is 2.619 is for IMR and it is significant at 5% level. It is found that the mean of IMR for X is 47.5 and it is lower for Y i.e. 26.25. The standard deviation for X (14.48) is double than Y (7.32). Since there is no difference of means of IMR between the two groups, H_0 is rejected. While doing this test we have assumed equal variances and it is confirmed by the Leven's test. So the t- value under equal variances is rejected for IMR and CBR and rest of the health variable are accepted under the null hypothesis that there is no difference of mean of Health variable between the two groups.

The mean of TFR for the first group is little higher than the second group and in case of standard deviation it is same. The mean and standard deviation for first group is

2.35 and 0.68557 and for second group it is 2.07 and 0.4924 respectively. The Levene's Test of equal variance between the two groups is rejected at 5% level of significance. As per the result t -value is 0.652 and it is insignificant at 5% level. It means the null hypothesis that there is no difference of mean of TFR between the two groups is accepted.

The mean of CBR is higher for the first group i.e. 20.10 and for second group it is 17.70. The standard deviation is for first group (4.65) and second group (2.76). The Levene's Test of equal variance between the two groups is rejected at 5% level of significance. Hence the t-test of the mean differences of the two groups under equal variance assumption has been taken into consideration. As per the result t -value is 0.887 and it is insignificant at 5% level. It means the null hypothesis that there is no difference of mean of CBR between the two groups is accepted.

The mean of CDR for the first group is 6.52 which are much higher than the second group (4.87). The standard deviation of CDR is 2.01 for first group whereas it is little less for second group i.e. 1.21. The Levene's Test of equal variance between the two groups is accepted at 5% level of significance. Hence the t-test of the mean differences of the two groups under equal variance assumption has been taken into consideration. As per the result t -value is 1.406 and it is significant at 5% level. It means the null hypothesis that there is no difference of mean of CDR between the two groups is rejected.

The mean of PCFI for the first group is 39.87 which are much higher than the second group (31.07). The standard deviation of PCFI is 17.49 for first group which is near for second group i.e. 16.25. The Levene's Test of equal variance between the two

groups is rejected at 5% level of significance. Hence the t-test of the mean differences of the two groups under equal variance assumption has been taken into consideration. As per the result t -value is 0.737 and it is insignificant at 5% level. It means the null hypothesis that there is no difference of mean of CDR between the two groups is accepted.

The mean of APSGH for the first group is 6.0425E4 whereas it is for second group 1.7059E4. The standard deviation varies from high range 25284.94625 for first group to 17617.20869 for second group. The Levene's Test of equal variance between the two groups is rejected at 5% level of significance. Hence the t-test of the mean differences of the two groups under equal variance assumption has been taken into consideration. As per the result t -value is 2.814 and it is insignificant at 5% level. It means the null hypothesis that there is no difference of mean of APSGH between the two groups is accepted.

The mean of APSGHB for the first group is 1.5240E3 whereas it is higher for second group i.e. 5.9700E2. The standard deviation varies from high range 1030.6915 for first group to 334.48169 for second group. The Levene's Test of equal variance between the two groups is rejected at 5% level of significance. Hence the t-test of the mean differences of the two groups under equal variance assumption has been taken into consideration. As per the result t -value is 1.711 and it is insignificant at 5% level. It means the null hypothesis that there is no difference of mean of APSGHB between the two groups is accepted.

The mean of APSGAD for the first group is 5.4930E3 which is little higher than the second group i.e. 4.1410E3. The standard deviation of APSGAD is 868.00346 for first group and for second group is 1917.97845. The Levene's Test of equal variance between the two groups is rejected at 5% level of significance. Hence the t-test of the mean differences of the two groups under equal variance assumption has been taken into consideration. As per the result t -value is 1.284 and it is insignificant at 5% level. It means the null hypothesis that there is no difference of mean of APSGAD between the two groups is accepted.

The mean of PCPBE for the first group is 4.4675E2 whereas it is for second group 7.1400E2. The standard deviation varies from 301.15043 for first group to 333.45564 for second group. The Levene's Test of equal variance between the two groups is rejected at 5% level of significance. Hence the t-test of the mean differences of the two groups under equal variance assumption has been taken into consideration. As per the result t -value is -1.190 and it is insignificant at 5% level. It means the null hypothesis that there is no difference of mean of PCPBE between the two groups is accepted.

The mean of PCHE for the first group just nearer to the second group and in case of standard deviation it is higher for second group.. The mean and standard deviation for first group is 1.0718E3 and 313.90272 and for second group it is 1.1132E3 and 428.77840 respectively. The Levene's Test of equal variance between the two groups is rejected at 5% level of significance. Hence the t-test of the mean differences of the two groups under equal variance assumption has been taken into consideration. As per the result t -value is -.156 and it is insignificant at 5% level. It means the null hypothesis that

there is no difference of mean of Per Capita Health Expenditure (PCHE) between the two groups is accepted.

The above mentioned results found that there is a difference between the mean of IMR and CDR in group one and group two and rest of the health variable the mean is same for both the groups. As mentioned earlier that the states in group one mostly located in plain areas and group two is in hill/tribal areas. The health indicators like IMR and CBR is low in hill areas as compare to plain areas because of good environmental condition, indigenous medicine practices and better health status of women .

To understand the wide range of variation in the growth of the health indicators, The Coefficient of variation (CV) is composed for all the states in the North-East India in Table 4.16. The CV has been used extensively for calculating the economic and health inequality (Aitkinson A 1970, Cowell FA, Mehta F, 1882, Chakravarty S.R. 2001). It is a normalized measure of dispersion and it is defined as the square root of variance (standard deviation) to the average value of the distribution. The coefficient of variation is highest for the APSGHB and it is 81.6 percent. About 79.32 percent and 68 percent coefficient of variation is observed in case of APSGH and PCHE which is the main reason of worsening of disparities in North-East India. The variation is much more in case for APSGH and APSGHB because of the unique regional characteristics of North-East India. In plain areas like, Assam, Tripura the APSGH and APSGHB is much more than the hill areas such as Arunachal Pradesh, Sikkim and it is clearly reflects the existence of high coefficient of variation for both the indicators. More than fifty percent coefficient of variation has occurred in PDGR, Per PCPBE and PCPvtE. The variation in health indicator is minimum and less than 10 percent except for IMR and PCFI. The

coefficient of variation for IMR and PCFI is 42.2 percent and 46.03 percent respectively. There is no such variation observed in case of life expectancy at birth for the North-East India except Assam. In Assam, the life expectancy is just 59 years which is below the national average and IMR is too high i.e 61 death of children before the age of one year per 1000 live births may be because of percentage of children fully immunized is only 17 percent and lowest among the other states belonging to the North-East India.

Table-4.16: Levels of Variations in Health Indicators, Infrastructures and Expenditure in North-East India

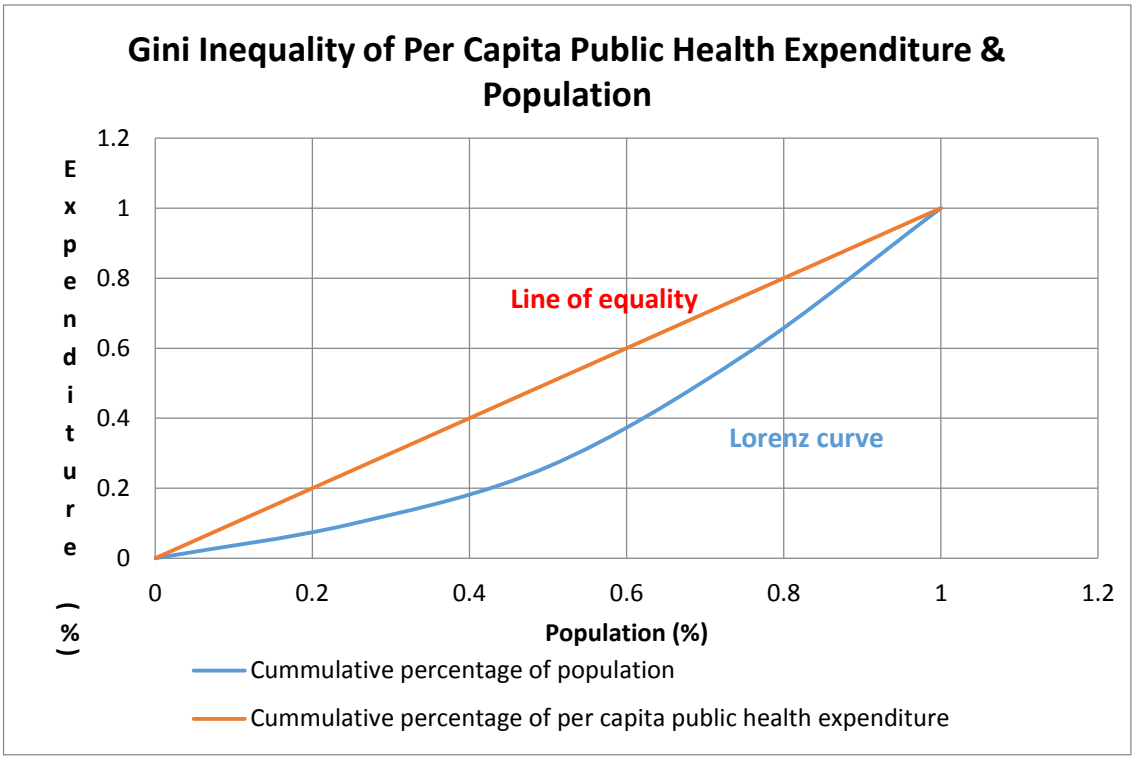
States/ Indicators	Health indicators							Health infrastructure			Health expenditure		
	CBR	CDR	IMR	TFR	LEB	PDGR	PCFI	APSGH	APSGHB	APSGAD	PCPBE	PCPvtE	PCHE (in Rs)
Arunachal Pradesh	21.1	6.1	32	2.7	68.54	25.9	20.5	3083	236	3738	841	613	1454
Assam	23.6	8.4	61	2.6	59	16.9	17	30556	3062	6457	162	612	774
Manipur	14.4	4.1	16	1.5	68.54	18.7	42.3	5276	857	3812	294	379	673
Meghalaya	24.4	8.1	59	3.2	68.54	27.8	42.3	64775	876	5449	430	464	894
Mizoram	17.6	4.5	36	1.9	68.54	22.8	59.6	54727	1132	5706	867	266	1133
Nagaland	17.2	3.6	26	2.1	68.54	-0.5	14.1	41453	905	6798	639	180	819
Sikkim	18.1	5.7	31	2	68.54	12.4	47.4	18424	390	2216	1082	425	1507
Tripura	14.8	5.1	34	1.7	68.54	14.8	40.6	91641	1026	4360	328	1158	1486
India	21.8	7.1	44	2.4	68.9	17.6	42	50689	1947	10404	242	959	1201
Results for above eight States in North-East India													
Mean	18.9	5.7	36.9	2.21	67.35	17.3	35.48	38742	1061	4817	580	512	1093
S.D	3.77	1.77	15.6	0.57	3.37	8.97	16.33	30730	865	1556.2	327	301	349
C.V	19.94	31.09	42.2	25.8	5.01	51.7	46.03	79.32	81.6	32.31	56.3	58.8	68.1

The performance of health workforce at various centres in the North-East India is also very important in determining the proper availability and accessibility of health care facilities. The descriptive statistics like mean, standard deviation, coefficient of variation and minimum and maximum values of the health workforce in North-East India is tabulated in Table 4.17. The positive values representing the surplus of health workforce in percentage and negative is for shortfall of health workforce in percentage. Most of the mean value is negative. The mean value is positive i.e. surplus for health worker at SCs (male and female both), doctor at PHCs and nursing staff at PHCs and CHCs. The Coefficient of variation in health workforce basically explains the extent of variation in its use in the health inequality measurement (Spinakis et.al, 2011). The mean value is lowest at-93.93 i.e. the average percentage shortfall is highest for total specialist at CHCs. The mean value for nursing staff at PHCs is highest at 108.04 percent showing more than hundred percentage of the surplus in it. The coefficient of variation is more than hundred percentages for health worker (M) at SCs, health assistant (M) at PHCs, health assistant (F) at PHCs, Doctor at PHCs, Pharmacist, laboratory technician and nursing staff at PHCs and CHCs. The variation showing the regional disparities is widening and worsening for health workforce in North-East India.

Table 4.17: Health Workforce in North-East India

Health Workforce/States	Mean	S.D	C.V	Min	Max
Health worker (M) at SC	96.61	359.19	371.81	-66.49	982.99
Health Worker (F) at SC	55.62	25.97	46.70	3.13	95.00
Health Assist (M) at PHCs	-38.65	56.52	-146.23	-100.00	77.21
Health Assist(F) at PHCs	-22.70	56.85	-250.42	-70.63	96.20
Doctor at PHCs	25.36	45.59	179.80	-21.42	112.50
Surgeon at CHCs	-86.17	21.99	-25.52	-100.00	-42.85
Obster & gynac at CHCs	-88.74	21.98	-24.77	-100.00	-36.69
Paedia at CHCs	-93.85	8.04	-8.57	-100.00	-80.95
Total Specia at CHCs	-93.93	9.76	-10.39	-100.00	-72.01
Radiographer at CHCs	-44.61	32.14	-72.06	-100.00	0.00
Pharmacist at PHCs &CHCs	-19.49	38.53	-197.73	-61.53	32.29
Lab tech at PHCs &CHCs	-7.90	29.21	-369.89	-52.38	37.50
Nurs staff at PHCs&CHCs	108.04	201.69	186.68	-36.84	573.61

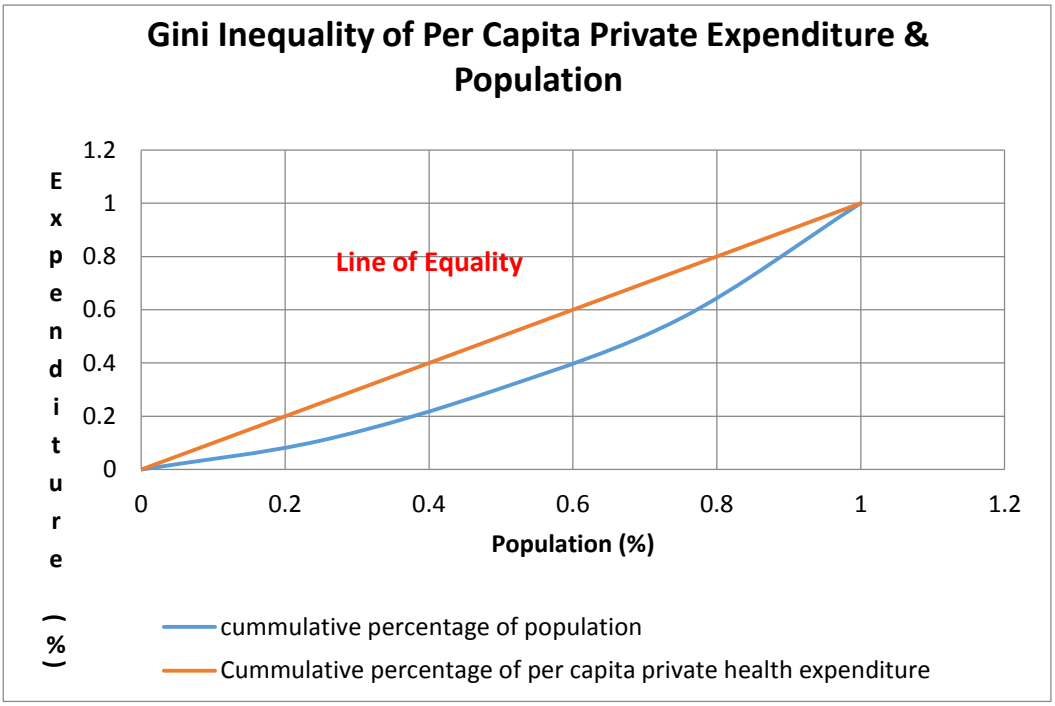
Fig4.1: Gini Inequality between Per Capita Public Health Expenditure and Population of North East India



Gini coefficient between per capita public health expenditure and population given by 0.5-0.36/0.5=0.28

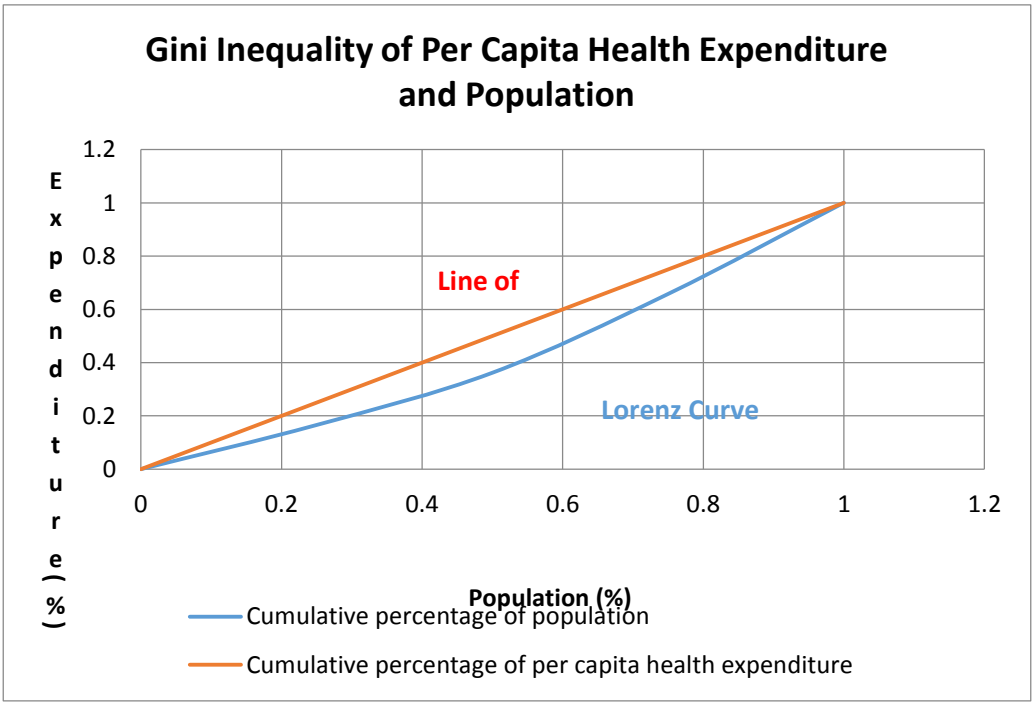
Lorenz curve along with Gini-coefficient has been widely used as an important tool to characterize the variation in health (Le Grand, 1987). The inequality in health can also be measured with respect to some socio-economic variables such as income (Hausman, 2007). Here, Gini Inequality is used to depict whether health inequality exists in the North-East India or not. The results show that health inequality is not so much prominent on our states which are on focus. The reason for low health inequality is due to traditional medicine practices as well as higher per capita income as compare to the the national average.

Fig4. 2: Gini Inequality between Per Capita Private Health Expenditure and Population of North East India



Gini coefficient is given by 0.5-0.37/0.5=0.26

Fig4. 3: Gini Inequality between Per Capita Health Expenditure and Population of North East India



Gini Coefficient is given by (0.5-0.4215)/0.5=0.157

Gini-coefficient is very less for the all the three relationship between health expenditure and population. Gini-coefficient is 0.28 for Per Capita Public Expenditure and Population and it is 0.26 for Per Capita Private Expenditure and Population. The Inequality between per capita health expenditure and population the Gini-coefficient is only 0.15 representing no inequality among the expenditure and population. As we know that the value of Gini inequality varies from 0 to 1 and inequality would be more when Gini-coefficient is closer to 1.

Efficiency Ranking through Data Envelopment Analysis (DEA)

Data Envelopment Analysis (DEA) is originally introduced by Charnes, Cooper and Rhodes (1978), latter referred to as CCR defines as the production frontier estimation method that solves a serious of transposed fractional programs to determine the relative efficiency of multiple systems (here states). The essential characteristics of DEA model is the reduction of multi-output, multi-input situation for each DMU to that of a single (weighted combination) 'virtual' output and a single 'virtual' input. DEA is a linear programming method which enables the measurement of efficiency consistent with the theoretically based concept of production efficiency. Data Envelopment Analysis (DEA) developed originally as a set of techniques for measuring the relative efficiency of a set of Decision Making Units (DMUs), when the price data for inputs are either unavailable or unknown. For a particular DMU this ratio provides a measure of efficiency, which can be compared with other DMU in the system. This comparison usually performed by a sequence of linear programming formulation yields a ranking of the different DMU in the system in a scale of relative efficiency from a lowest to a highest where the later is 100 per cent efficient. CCR model (1978) proposed a model of

input orientation with constant return to scale. The model with variable return to scale also has been proposed by Banker, Charnes and Cooper (1984) which is known as BCC model. These techniques are nonparametric in the sense that they are entirely based on the observed input output data.

Data Envelopment Analysis (DEA) is used to measure the efficiency of the states in North-East India and examines the relationship between the inputs in a production process (average population served per government hospital, per capita public expenditure and average population served per government allopathic doctors) and output of that production process (IMR). The technical efficiencies are measured through the constant return to scale and variable return to scale. The scale of efficiency for Manipur, Nagaland, Sikkim and Tripura is represented by 1. The other four states such as Arunachal Pradesh, Assam, Meghalaya and Mizoram have increasing return to scale means they have the potential to increase their health infrastructure to achieve efficiency. Manipur, Nagaland, Sikkim, and Tripura considered as the most efficient states due to the better health outcomes and health care facilities in comparison to the other parts of North-East India which is revealed by composite ranking indices in the previous analysis. The temporal analysis of basic health parameter such as CBR, CDR and IMR is far better in Manipur and Tripura than the remaining states of North-East India.

The usual way to introduce DEA is via the ratio form. For each DMU, we would like to obtain a measure of ratio of all output over all inputs, such as u'yi/v'xj where u is a M x 1 vector of output weight and v is a K x 1 vector input weight. To select the optimal weight the mathematical program is

$\text{Max}_{u,\,v}\ (u'y_i/v'x_i)$

s.t

$u'y_i/v'x_j \leq 1 \quad j = 1, 2, 3\ldots\ldots\ldots\ldots, N$

$u, v \geq 0$ ……

(1)

To avoid infinite number of solutions the additional constraint to be imposed to the above system of equations is $v'x_i = 1$, which provides

$\text{Max}_{\mu,\,v}\ (\mu' y_i)$

s.t $v' x_i = 1$

$\mu' y_j - v' x_j \leq 0,\ j = 1, 2, 3$ ……, N

$\mu, v \geq 0$

(2)

The duality version of equation (2) can be specified as

$\text{Min}_{\theta,\lambda}\ \theta$

s.t $- y_i + Y\lambda \geq 0$

$\theta X_i - X\lambda \geq 0$

$\lambda \geq 0$

(3)

Where, θ is a scalar and λ is an N x 1 vector of constant. The value θ will be the efficiency score of the i^{th} DMU. The DMU having $\theta = 1$ is technically efficient (Farrell, 1957). However, the possibility of parallel shape of the frontier in both sides of the axes can be better explained with the use of input and output slack and radical movement. The multistage DEA is used to identify the efficient projected points which have input and

output mixes which are as similar as to those inefficient points and that it is also invariant to unit measurement (Coeli, 1997).

The Constant Return to Scale (CRS) is only applicable and appropriate when all the DMUs are operating at optimum scale. However, the imperfection in knowledge and dynamic changes may be the major factor for DMUs not operating at optimal scale. Banker, Charnes and Cooper (1984) have suggested an extension to the Variable Return to Scale (VRS). The use of VRS specification will permit the calculation of technical efficiency devoid of these scale efficiency. The made to the CRS model is by adding the convexity constraint: $NI'\lambda=1$. The equation (3) can be modified as

$$\text{Min}_{\theta,\lambda}\ \theta$$

$$s,t\ -y_i + Y\lambda \geq 0$$

$$\theta X_i - X\lambda \geq 0$$

$$N1-\lambda = 1$$

$$\lambda \geq 0$$

This approach forms a convex hull of intersecting planes, which develop the data points more tightly than the CRS conical hull, and provides technical efficiency scores, which are greater than, or equal to those obtained using CRS model. Technical efficiency is calculated by running CRS and VRS separately. The scale efficiency is obtained by dividing the CRS technical efficiency by the VRS technical efficiency.

Table 4.18: The Technical Efficiency of the States with respect to constant return to scale and variable return to scale

	states/indicators	CRSTe	VRSTe	Scale	
1	Arunachal Pradesh	0.570	1.000	0.537	Irs
2	Assam	0.160	0.435	0.368	Irs
3	Manipur	1.000	1.000	1.000	_
4	Meghalaya	0.297	0.470	0.632	Irs
5	Mizoram	0.603	0.647	0.932	Irs
6	Nagaland	1.000	1.000	1.000	_
7	Sikkim	1.000	1.000	1.000	_
8	Tripura	1.000	1.000	1.000	_
	Mean	0.704	0.819	0.809	

Table 4.19: Peer Counts

States	Peers			No of Counts
1	1			1
2	3	7	1	0
3	3			3
4	7	3		0
5	3	7	6	0
6	6			1
7	7			3
8	8			0

Table 4.20: Peer Weightage

States		Weight	
1	0.301	0.623	0.076
2	1		
3	1		
4	0.783	0.217	
5	0.459	0.378	0.162
6	1		
7	1		
8	1		

Table 21: Input/Output Target

States	OutPut	Input 1	Input 2	Input 3
1	1.00	32	3083	3738
2	5.342	26.561	13305.126	2811.598
3	3.00	16.00	5276	3812
4	6.132	27.745	15570.52	2562.377
5	5.00	23.297	16119.245	3692.608
6	6.00	26	41453	6798
7	7.00	31	18224	2216.00
8	8.00	34	91641	4360

The efficiency scores of BCC model has been presented in Table 4.18. States like Manipur, Nagaland, Sikkim and Tripura have achieved most optimum scale size. The Mean technical efficiency is 0.704 and 0.819 for pure technical efficiency and the mean of scale efficiency is 0.809. Arunachal Pradesh is working under pure technical efficiency. It uses all its resources to its minimum but due to certain disadvantages, it fails to achieve full scale efficiency. It means it has the capacity to expand its output. It can become efficient by using 32 units of 1st input, 3083 and 3738 units of 2nd and 3rd input respectively. Secondly, Assam has neither full pure technical efficiency nor full mix efficiency. Hence, the technical efficiency is very low i.e. lowest among all the states. It can make efficient by taking a convex combination of inputs of Manipur, Sikkim and Arunachal Pradesh as the weightage of 0.301, 0.623 and 0.076 respectively. As far as the technical efficiency rank is concerned, Assam is most inefficient followed by Meghalaya, Arunachal Pradesh and Mizoram and rest of the other states have achieve 100 percent technical efficiency.

Meghalaya can make Sikkim, Manipur as the peers and by using 78.3 percent of the inputs used by Manipur and 21.7 percent of the inputs of Sikkim, it can achieve fully

technically efficient. Among all the states Manipur and Sikkim has been chosen as the most number of time peers by other states in achieving the full efficiency. Table 4.19 shows the number of time the states act as the peer for other and Table 4.20 shows the weightage of the peers to become fully technically efficient. The last table shows the input targets for each state if they want to become efficient.

Chapter-5

Summary of the Findings and Suggestions

The present study deals with the study of inter-state disparity in health care facilities in the North-East India with reference to health indicators, infrastructure and expenditure in the North-East India. The objectives of the study are: to describe the health profile of the people in North-East India; analyze the inter-state disparities in health care facilities in the North-East India; and measure the relationship between health expenditure and health care facilities in North-East India.

In order to fulfil the objectives, descriptive measures has been used to describe the health profile of the people and disparities in the North-East India. Ranking method is used for constructing indices of eight states for the study of health status in North-East India. The effect of health care expenditure on health status of people in the North-East India is analyzed through the rank correlation analysis, simple correlation coefficient and a comparison is worked out across the states. Gini-coefficient of inequality is used for the study of health inequality in the North -East India by using the health expenditure such as PCHE, Per capita public and private health expenditure with Population and Data Envelopment Analysis (DEA) is for the rank efficiency of the states by using indicators such as lMR, APSGH, PCPBE and APSGAD.

Disparities in health are due to the variation in health status, differences in environment, access, utilization and quality of health care and other criteria include natural and biological variation, health damaging behaviour. The measurement of

disparity in health care is depends upon the health status, health expenditure and financing, health care utilization and quality and health care resources.

The global disparity in health care facilities between eleven selected countries includes developed and developing countries are found the variation in health indicators, health expenditure, health facilities and workforce. In terms of health profile the developed countries perform better than the developing countries. Life expectancy at birth in most of the developed countries is more than 80 years except USA i.e. 78 years whereas the developing countries it is less than 70 years. IMR for developed countries is within single digit number whereas for the developing countries it is two digit numbers per 1000 live births. The Muslim dominating countries like Pakistan (4) and Saudi Arabia (3.1) have highest TFR than the other countries may be because of religious customs and beliefs and educational backwardness. The TFR for India is 2.7 children per woman and IMR is 52 per 1000 live births. MMR is significantly higher in developing countries and it is at three digit number in most of the developing countries whereas it is very less in developed countries and remains within single digit. In India 301 women die per 100000 live births due to pregnancy related issues. Sri Lanka has good health profile among the developing countries and the health indicator such as LEB, IMR, TFR and MMR are near to the developed countries.

Health expenditure as a percentage of GDP is significantly higher i.e. more than double in selected developed countries as compared to India (4.1percent). USA has highest percent of health expenditure as a percentage of GDP i.e. 15.7 percent among the developed countries and Pakistan has lowest share of health expenditure as a percentage of GDP i.e. 2.7 percent. In India, health expenditure is only 4.1 percent as a percentage of

GDP. Out of Pocket expenditure of private health expenditure is lowest in USA and it is only 22.6 percent followed by 32.2 percent in Saudi Arabia and 62.7 percent in UK and rest of the countries have more than 80 percent out of pocket expenses. PCHE is very high in developed countries and it is not comparable with the developing countries. Norway has highest per capita expenditure which is $7354 followed $7285 in the USA. Bangladesh has lowest per capita expenditure and it is $15 followed $20 in Nepal), $23 in Pakistan and $40 in India. Low PCHE does not mean that the developing countries are enjoying better health condition than the developed countries. But it signifies that the developing countries are unable to spend and meet the expected health expenses.

Hospital bed per 1000 people is highest for Norway with 3.9 hospitals beds per 1000 people and minimum for Bangladesh with 0.4 hospital beds per 1000 people. India has only 0.9 hospital beds per 1000 people. Norway has highest percentage both in terms of physicians (3.9) and nurses and midwifes (16.3). The lowest availability of Physician and Nurse and Midwifes per 1000 people is in Nepal (0.2 and 0.5) and Bangladesh (0.3).

The larger the Coefficient of Variation (CV) shows larger amount of disparities among the countries. The CV is more than sixty percent for most of the health indicators. The CV for health expenditure is highest for PCHE and more than hundred percent variations are realized for 11 selected countries which show worsening of disparities among them. About 61.79 variations are observed for total health expenditure as a percentage of GDP. In terms of health workers the coefficient of variation is too high for the selected countries as mentioned in table 1.1. About 131 percent variation is realized for the availability of nurses and midwifes per 1000 people in selected countries and about 77.86 percent variation is for physician per 1000 people. The variation of facilities

for hospital beds per 1000 people is about 105.2 percent between. The CV is largest for health indicator like IMR with 93.4 percent variation and lowest for life expectancy at birth i.e. only 9.5 percent.

The inter-state disparity in health care facilities in India is widening because of the inappropriate utilization of potentialities irrespective of its capacity. India, with 16 percent of world population, accounts for about 30 percent of the infant and child mortality in the world. The percentage of public expenditure as share of GSDP is highest for North-East India with 2.29 percent and lowest for Haryana with 0.49 percent whereas the mean is 0.88 percent. The percentage share of public expenditure out of state expenditure is highest for Kerala with 4.65 percent to lowest in Maharashtra with 2.88 percent and the mean is 3.67 percent. The state of Kerala is performing better among the all states in India in terms of health expenditure, infrastructure and profile. Kerala have highest Per-Capita health expenditure i.e. ₹507 and it is lowest in Bihar only ₹166. Life Expectancy at Birth (LEB) varies from 73.8 years in Kerala to 57.1 years in Madhya Pradesh. IMR varies from 12 in Kerala to 59 in Madhya Pradesh. The corresponding minimum and maximum figure for Maternal Mortality Ratio (MMR) are 81 for Kerala and 359 and 318 for Uttar Pradesh and Rajasthan respectively. The Total Fertility Rate (TFR) is highest in the Uttar Pradesh (4.4) and Kerala have lowest TFR (1.7).

The numbers of government allopathic doctors have highest in Maharashtra (14509) may be because of higher number of medical institutes located in the state and Bihar has lowest number of government doctors (1206). Although the numbers of doctors are inadequate in the states of Bihar, Haryana, West Bengal, Odisha, Punjab and Gujarat but the number of nurse and midwifes are adequate in all the 14 major states except

Bihar. Tamil Nadu (202949) has highest number of registered nurses and midwifes whereas it is lowest in Bihar (8947). Average population served per hospital beds is highest in the states like Bihar (7846) and lowest in Kerala (910).

The Coefficient of Variation (CV) for percentage share of public expenditure as GSDP is high with 48.34 percent but less variation is realized for percentage share of public expenditure as state expenditure with 15.50 percent. More than 70 percent variation is in health workers and average population served per government hospital bed reflecting the inter-state disparities in health infrastructure. The CV for PCHE is 54.4 percent which reflects the inequitable distribution of income among different states in India. In terms of health indicators the coefficient variation is low except for the MMR i.e. 86.6.

The health care facilities for North-East India are still different from the rest of the country. In the North-East India the availability of health worker such as total number of government allopathic doctors and total number of registered nurses and midwifes are minimum with respect to the other Indian states. Average population served per hospital bed for the North-East India (₹ 1061) is satisfactory due to low population growth in this region. The health indicator like LEB, IMR, MMR and TFR in North-East India are better than as Kerala and Punjab. The PCHE is also very high in North-East India (₹ 1093).

North-East India has distinct regional personality. The general economic profile of this region is one of extreme backwardness reflecting by and large a low level of living standards. The infrastructure remains underdeveloped and intra-regional links are weak.

The North-East India has immense resource potential but the technical knowhow is still deficient. The comparative statistics of different health indicators such as IMR, CBR, CDR MMR, TFR, LEB and others point out that the states like Arunachal Pradesh, Mizoram, Nagaland, Sikkim and Tripura placed in almost similar situation and performed much better than India. Due to the difficult physical terrain, the availability of medical and health services are not adequate and resulting deprivation in socio- economic status in comparison to India. It is found that CBR is 21.8 live births per 1000 mid-year population at national level. Meghalaya has 24.4 live births per 1000 of the mid-year population and Manipur has the lowest CBR i.e. 14.4. The inter-state variations in CBR and CDR are also noticeable. Assam has highest CDR with 8.4 deaths per 1000 mid-year population whereas CDR is lowest in Nagaland with 3.6 against the national average is 7.1. Similar results are found in IMR. It is high in Assam and low in Nagaland i.e. 61 and 26 deaths of children before the age of one year per 1000 live births respectively. The IMR in Nagaland (26) performs better as compare to the national average (44). In terms of population decadal growth rate, Arunachal Pradesh has the highest i.e. 25.9 percent and lowest is in Nagaland with negative growth i.e. -0.5 percent. Meghalaya has highest TFR with 3.2 children per woman during her entire reproductive period among the all states in North-East India and lowest in Manipur by 1.5. All the state in North-East India has the same level of life expectancy rate (68.54 yrs) except Assam (59 yrs). Nagaland has lowest percentage of children fully immunized i.e. 14.1 percent and Mizoram placed the top position in terms of children fully immunized i.e. 59.6 percent.

The physical facilities at SCs levels are generally divided into four categories, namely SCs with ANM Quarters, availability of water supply and electricity supply and

approachable road connectivity. Meghalaya performs the best in terms of SCs with ANM quarter i.e. 99.01 percent but Manipur has no sub-centre with ANM quarter. Arunachal Pradesh and Mizoram have hundred percentages ANM living in SC quarter, followed by Nagaland (97.05 percent) and it is more than the all India's average i.e. 60.75 percent.

Regular water and electric supply is the basic Infrastructure for ensuring good health services in any country. The states in North-East India are lagging behind in this matter in comparison to the national figures. In Manipur 88.33 percent of the SCs is working without regular water supply as compared to the national average (24.75 percent). Arunachal Pradesh has regular water supply facilities in all the SCs with only 4.19 percent of the SCs has been working without water supply facilities. In North East India, 57.99 percent of the SCs having no electricity facilities as compare to India i.e. 24.47 percent. In Assam 67.57 percent of the SCs are without electricity supply and it is more than the national average (24.47percent).

The PHCs having the facilities of operation theatre in the North-East India lags far behind the all India level. Only 10.99 percent of PHCs has the facilities of operation theatre whereas the national average is 38.39 percent. Mizoram is the only state which performs better in terms of all the facilities in SCs, PHCs and CHC. Meghalaya, Mizoram and Sikkim have hundred percent labour room facilities in all the PHCs and it is more than the national average i.e. 65.7 percent. The approachable road connectivity is very poor, thus acts as the biggest barrier for providing accessible health care for the people living in North-East India. The states are in a good position in terms of facilities of PHCs with at least four beds. The percentage for PHCs with at least four beds in North-East India (62.78 percent) is same as to the all India level (62.4 percent). Meghalaya, Mizoram

and Sikkim have hundred percent facilities in every PHCs having with at least four beds as well as electricity supply, except in Meghalaya. In Arunachal Pradesh 32 percent of PHCs do not have electricity supply as compare to the national average of 8.1 percent. About 38.27 percent of PHCs in North-East India has been functioning without regular water supply as compared to the national average of 12.50 percent. Although Mizoram is better in terms all the facilities but there is a scarcity of regular water supply in this state. Hundred percent of PHCs in Mizoram have been working without regular water supply.

Although every CHC should have four specialist according to the IPHS but the North-East India is performs very poor in terms of four specialist care in the CHCs. The CHCs are functioning without four specialists in all the seven states in north-east India. Assam is the only state where 25.92 percent of CHCs having the facilities of four specialists. Meghalaya, Mizoram, Nagaland, and Tripura have hundred percent facility of CHCs with at least 30 beds whereas in Arunachal Pradesh and Sikkim do not have at least 30 beds facility.

All the CHCs in North-East India have been functioning with hundred percent availability of functional labour room except 95.83 percent in Arunachal Pradesh. North East India have 1816 hospitals which is only 7.5 percent of total hospitals in India and number of beds in the hospital is 28067 i.e. 4.5 percent in comparison to India. Assam has highest number of hospital with largest bed capacity and Mizoram has lowest number of hospitals as well as bed capacity. The population pressure per Government hospital and per Government hospital bed is lowest in Arunachal Pradesh than followed by Manipur. Tripura has the biggest pressure of population in respect to their capacity in each government hospital.

Human resource for Health through the expansion of professional and technical education is very important for increasing the availability of skilled professionals. The country has 356 medical colleges with total intake of 39474 students. North-East India has only 11 medical collages with intake of 1176 student's which is very low as a proportion to all India level. The total number medical colleges and admission capacity is highest in Assam. Arunachal Pradesh and Nagaland do not have any medical colleges and institutes which is responsible for manpower deficiency in health sector and resulting in worst situation in terms of health outcomes. Assam and Meghalaya has only one HFWTC and no MPW Training School whereas Mizoram and Tripura have only one MPW Training School and no HFWTC**.** North-East India has 30 schools for ANM/Health Worker (Female) and only 4 promotional training schools for LHV/Health Assistant (Female) funded by Government of India whereas at all India level it is 319 and 34 school respectively. Assam has highest number of both the schools i.e. 18 schools for ANM and only one schools for LHV respectively. Assam, Manipur, Sikkim and Tripura have only one school for LHV out of the four schools in North-East India where as the remaining states in North-East India do not have any school for LHV/HA (F). Nagaland and Tripura each have only two ANM schools and Arunachal Pradesh and Sikkim have only one ANM schools respectively

The huge shortfall of specialized doctors such as Surgeons, Obstetrician/Gynaecologist, Paediatrics, Total Specialist and Radiographer at CHCs looks gloomy which presents the actual availability of medical specialists against the requirement and the gap between requirement and in position is very much prominent. The large number of shortfall in CHCs is obviously the greatest handicap in delivering

specialized health care service to the rural people, for which these institutions were created. The existence of shortfall could be due to the non-availability of specialists, resource constraints of the state government and less number of medical and training institutes in North-East India. In case of Para-medical staff such as health worker (female) at SCs, health assistant (female) at PHCs, Pharmacist at PHCs and CHCs, Laboratory Technician at PHCs and CHCs and Nurse staff in PHCs and CHCs are excess of their requirement. This is likely to affect adversely the utilization of health care services in CHCs.

The largest health worker (male) shortage is shown by Meghalaya with 66.49 percent shortfall. Most of the states in North-East India have shortfall of health worker (male) except Sikkim, Manipur, and Mizoram. Sikkim have experienced huge surplus of health worker male and it is more than ten times of the requirement situation. About 95 percent surplus of health worker (female) or ANM and more than hundred percent surpluses of nursing staff at PHCs and CHCs in Manipur clearly indicate that girls are actively involved in health sector than man. In case of nursing staff in PHCs and CHCs in North-East India, there is about 75.37 percent of surplus. Tripura has highest percentage of surplus in nursing staff in PHCs and CHCs. Arunachal Pradesh is the only state in North-East India which is deprived of health workforce. More than 80 percent deficiency is experienced in surgeons, paediatricians and total specialists in CHCs and about 69.10 percent deficiency in the Obstetrics and gynaecology department of CHCs clearly indicating the inequitable distribution of health workforce in North-East India.

The quality of public health care services depends on the effectiveness of health care spending. The revenue expenditure on medical and public health cover a very small

proportion of social services all over including North-east India. Medical and public health expenditure in India is only 10.93 percent of social service expenditure and in case of North-East India is slightly better i.e.15.52 percent. Arunachal Pradesh has highest revenue expenditure on medical and public health and water supply and sanitation i.e. 20.63 percent and 20.81percent respectively. It is lowest for both in Tripura with 12.18 percent and 1.82 percent respectively. About 1.82 percent is spent on family welfare in North-East India which is close to the national average. The country's expenditure is about 4.44 percent on nutrition whereas 7.73 percent for North-East India. The PCHE was highest in Sikkim i.e. ₹1507/- and lowest in Manipur i.e. ₹673/-. Assam, Manipur, Meghalaya, Mizoram and Nagaland have lowest PCHE than the national average. In North-East India the share of public expenditure includes 31 percent out of total health expenditure and remaining 69 percent for private expenditure. Mizoram and Nagaland are the only states where more than 75 percent is public health expenditure and rest is for private health expenditure. Assam is the worst performing state where 79 percent of total expenditure is private and only 21 percent is public expenditure.

The rank correlation is as high as 0.9048 between CBR and TFR thereby reflecting high positive correlation. The rank correlations between health profile with health facilities and expenditure have a positive correlation. The rank health profile and number of SCs, PHCs and CHCs are positively correlated with only 0.173 percent. The rank correlation has a higher value of 0.861 for health facilities at SCs and Government revenue expenditure on health. About 0.805 is the rank correlation between health facilities at SCs and public and private expenditure on health. The rank correlation between health facilities at CHCs and public and private expenditure on health has

minimum value with 0.333. The rank correlation between health facilities at CHCs with per capita finance on health is very low i.e. only 0.08 and with Government revenue expenditure on health and public and private health expenditure is low i.e. 0.33 and 0.44 respectively.

It is found that most of the relationship between health outcomes and health expenditure are negatively correlated. The correlation has a lower value close to -0.3321 representing the negative correlation between IMR and PCPBE which means with the increase in PCPBE, IMR would be reduced and vice versa . The higher value of correlation is 0.2709 representing the positive correlation between the CDR and P CPvtE. If the PCPvtE increase than it is also leads to increase in CDR. This is increase due to higher medical cost and expenses i.e. PCpvtE on health, high out of pocket expenditure of poor people.

Independent t-test is applied for significance of health variable between two groups. The first group consists of four states such as Assam, Meghalaya, Mizoram and Tripura on the basis of higher rate of IMR for the first group as compare to the second group. The other reason for dividing the states within two groups is due to the geographical and physical condition. The first group is basically the plain areas and the second group consists by hilly/ tribal states. While doing this test we have assumed equal variances and it is confirmed by the Leven's test. So the t- value is under equal variances are rejected for IMR and CBR and rest of the health variable are accepted under the null hypothesis that there is no difference of mean of Health variable between the two groups.

Gini coefficient is 0.28 for Per Capita Public Expenditure and Population and it is 0.26 for Per Capita Private Expenditure and Population. The Inequality between PCHE and population the Gini-coefficient is only 0.15 representing no inequality among the expenditure and population. As we know that the value of Gini inequality varies from 0 to 1 and inequality would be more when Gini-coefficient is closer to 1. Gini-coefficient is very less for the all the three relationships between health expenditure and population and it signifies that equality exists between the variables.

Data Envelopment Analysis (DEA) is used to measure the efficiency of the states in North-East India and examines the relationship between the inputs in a production process (average population served per government hospital, per capita public expenditure and average population served per government allopathic doctors) and output of that production process (IMR).

The technical efficiencies are measured through the constant return to scale and variable return to scale. The scale of efficiency for Manipur, Nagaland, Sikkim and Tripura is represented by 1. The other four states such as Arunachal Pradesh, Assam, Meghalaya and Mizoram have increasing return to scale implying that they have the potential to increase their health infrastructure to achieve efficiency.

The above mentioned summary of the findings is indicating the following suggestions.

1. ` Although healthcare sector is one of the largest service sector but it faces substantial challenges in providing accessible health services for all. The government needs to adopt a broader healthcare approach while at the same time

taking measures to achieve additional progress on IMR, MMR, TFR, under nutrition among children, anaemia among women and girls, provision of clean drinking water for all.

2. There should be management and institutional reforms in order to strengthen the public sector and allow it to function as a promoter, provider, contractor, and regulator and facilitate quality assessment and quality assurance. There is a need to establish a Public Health Service Cadre at Centre and State levels that would comprise public health professionals with multidisciplinary education.

3. The NRHM should increase public spending on health, reduce regional imbalances in health infrastructure, pool resources, integrate various organizational structures and vertical national programmes and turn CHCs into functional hospital meeting certain standards.

4. Government should be more focus about the problem of non-availability and uneven distribution of skill health care provider which is clearly revealed in my study also.

The conclusion is derived from this research are as follows:

- The achievement for most of the health indicators in North-East India achieve favourably with the national average. However, there is a need to address for improving quality in health care and easier access of health care facilities.

- Although Government introduce inclusive development for minimising the regional disparities but there still exists the skewed rural/urban availability of

public health service, inequitable distribution of health personnel among the health centres and hospitals.

- As mentioned earlier that in North–East India most of the hill/tribal states are practicing traditional medicine to cure common ailments but there is absence of the integration between indigenous medical practitioners with modern medical practitioners.

- It is also observed that in Tripura, Nagaland and Sikkim, the incidence of jaundice, malaria and tuberculosis is much higher than the national average. There is more need to establish medical colleges and training institutes for doctors, nurses and mid-wives to bridge the gap in health facilities.

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Appendices

Appendix I

The Map for North-East India

Appendix II

The calculation procedure for Gini-Coefficient

Table 1: Per Capita Public Health Expenditure and Population of North East India

states/indicators	Population	Per Capita Public Expenditure	
Arunachal Pradesh	1382611	841	162
Assam	31169272	162	294
Manipur	2721756	294	328
Meghalaya	2964007	430	430
Mizoram	1091014	867	639
Nagaland	1980602	639	841
Sikkim	607688	1082	867
Tripura	3671032	328	1082
Total exp			4643

Table 2: Calculation of Gini Inequality between Per Capita Public Health Expenditure and Population of North East India

%	popu	Pcpe	pro of total income	%	cummulative	pop %	cummu pche	Popu
0.25	25	456	0.098	9.82	0.00	0	0	0
0.50	50	758	0.163	16.33	0.098	0.25	0.098	0.25
0.75	75	1480	0.319	31.88	0.261	0.50	0.261	0.50
1.00	100	1949	0.420	41.98	0.580	0.75	0.580	0.75
			1	100	1.000	1.00	1.000	1.00

Fig1: Gini Inequality between Per Capita Public Health Expenditure and Population of North East India

Area under lorenz curve
=0.5*(0+0.098)*0.25+0.5*(0.098+0.261)*0.25+0.5*(0.261+0.58)*0.25+0.5*(0.58+1)*0.25=0.36

Gini coefficient is given by 0.5-0.36/0.5=0.28

Table 3: Per Capita Private Health Expenditure and Population of North East India

states/indicators	population	Per Capita Private Expenditure	
Arunachal Pradesh	1382611	613	180
Assam	31169272	612	266
Manipur	2721756	379	379
Meghalaya	2964007	464	425
Mizoram	1091014	266	464
Nagaland	1980602	180	612
Sikkim	607688	425	613
Tripura	3671032	1158	1158
		Total exp	4097

Table 4: Calculation of Gini Inequality between Per Capita Private Health Expenditure and Population of North East India

%	Pcpre	pro of total income	cumm	0	0	0
0.25	446	0.109	0.109	0.25	0.109	0.25
0.50	804	0.196	0.305	0.50	0.305	0.50
0.75	1076	0.263	0.568	0.75	0.568	0.75
1.00	1771	0.432	1.000	1.00	1.000	1.00

Fig 2: Gini Inequality between Per Capita Private Health Expenditure and Population of North East India

Area under lorenz curve
=0.5*(0+0.109)*0.25+0.5*(0.109+0.305)*0.25+0.5*(0.305+0.568)*0.25+0.5*(0.568+1)*0.25=0.3705

Gini coefficient is given by 0.5-0.37/0.5=0.26

Table 5: Per Capita Health Expenditure and Population of North East India

Population	Per Capita Health Expenditure(NHA-04-05)(in Rs)	
1382611	1454	673
31169272	774	774
2721756	673	819
2964007	894	894
1091014	1133	1133
1980602	819	1454
607688	1507	1486
3671032	1486	1507
	Total exp	8740

Table 6: Calculation of Gini Inequality between Per Capita Health Expenditure and Population of North East India

PCHE	pro of total exp(Cummu)		0	0	0
1447	0.166	0.166	0.25	0.166	0.25
1713	0.196	0.362	0.50	0.362	0.50
2587	0.296	0.658	0.75	0.658	0.75
2993	0.342	1.000	1.00	1.000	1.00

Fig 3: Gini Inequality between Per Capita Public Health Expenditure and Population of North East India

Area under lorenz curve

=0.5*(0+0.166)*0.25+0.5*(0.166+0.362)*0.25+0.5*(0.362+0.658)*0.25+0.5*(0.658+1)*0.25=0.4215

Gini Coefficient is given by (0.5-0.4215)/0.5=0.157

Gini coefficient is very less for the all the three relationship between health expenditure and population. Gini coefficient is given by 0.5-0.36/0.5=0.28

Appendix III

The Result of Independent t-test

Group Statistics

	Categ	N	Mean	Std. Deviation	Std. Error Mean
IMR	1	4	47.5000	14.47987	7.23994
	2	4	26.2500	7.32006	3.66003

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
IMR	Equal variances assumed	11.573	.014	2.619	6	.040	21.25000	8.11249	1.39945	41.10055
	Equal variances not assumed			2.619	4.439	.053	21.25000	8.11249	-.42138	42.92138

Group Statistics

	Categ	N	Mean	Std. Deviation	Std. Error Mean
TFR	1	4	2.3500	.68557	.34278
	2	4	2.0750	.49244	.24622

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
TFR	Equal variances assumed	1.203	.315	.652	6	.539	.27500	.42205	-.75772	1.30772
	Equal variances not assumed			.652	5.445	.541	.27500	.42205	-.78378	1.33378

Group Statistics

	Categ	N	Mean	Std. Deviation	Std. Error Mean
CBR	1	4	20.1000	4.65761	2.32881
	2	4	17.7000	2.76043	1.38022

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
CBR	Equal variances assumed	3.791	.099	.887	6	.409	2.40000	2.70709	-4.22401	9.02401
	Equal variances not assumed			.887	4.876	.417	2.40000	2.70709	-4.61232	9.41232

Group Statistics

	Categ	N	Mean	Std. Deviation	Std. Error Mean
CDR	1	4	6.5250	2.01060	1.00530
	2	4	4.8750	1.21209	.60605

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
CDR	Equal variances assumed	13.674	.010	1.406	6	.209	1.65000	1.17385	-1.22230	4.52230
	Equal variances not assumed			1.406	4.926	.220	1.65000	1.17385	-1.38112	4.68112

Group Statistics

	Categ	N	Mean	Std. Deviation	Std. Error Mean
PCFI	1	4	39.8750	17.49998	8.74999
	2	4	31.0750	16.25308	8.12654

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PCFI	Equal variances assumed	.153	.709	.737	6	.489	8.80000	11.94165	-20.42016	38.02016
	Equal variances not assumed			.737	5.968	.489	8.80000	11.94165	-20.45876	38.05876

Group Statistics

	Categ	N	Mean	Std. Deviation	Std. Error Mean
APSGH	1	4	6.0425E4	25284.94625	12642.47313
	2	4	1.7059E4	17617.20869	8808.60434

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
APSGH	Equal variances assumed	.313	.596	2.814	6	.031	43365.75000	15408.55727	5662.36860	81069.13140
	Equal variances not assumed			2.814	5.357	.035	43365.75000	15408.55727	4538.14922	82193.35078

Group Statistics

	Categ	N	Mean	Std. Deviation	Std. Error Mean
APSGHB	1	4	1.5240E3	1030.69815	515.34907
	2	4	5.9700E2	334.48169	167.24084

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
APSGHB	Equal variances assumed	3.382	.116	1.711	6	.138	927.00000	541.80639	-398.75248	2252.75248
	Equal variances not assumed			1.711	3.625	.170	927.00000	541.80639	-640.71130	2494.71130

Group Statistics

	Categ	N	Mean	Std. Deviation	Std. Error Mean
APSGAD	1	4	5.4930E3	868.00346	434.00173
	2	4	4.1410E3	1917.97845	958.98922

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
APS GAD	Equal variances assumed	1.355	.289	1.284	6	.246	1352.00000	1052.62426	-1223.67878	3927.67878
	Equal variances not assumed			1.284	4.179	.266	1352.00000	1052.62426	-1521.73741	4225.73741

Group Statistics

	Categ	N	Mean	Std. Deviation	Std. Error Mean
PCPBE	1	4	4.4675E2	301.15043	150.57522
	2	4	7.1400E2	333.45564	166.72782

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PCGPE	Equal variances assumed	.091	.773	-1.190	6	.279	-267.25000	224.65766	-816.96748	282.46748
	Equal variances not assumed			-1.190	5.939	.280	-267.25000	224.65766	-818.34453	283.84453

Group Statistics

	Categ	N	Mean	Std. Deviation	Std. Error Mean
PCHE	1	4	1.0718E3	313.90272	156.95136
	2	4	1.1132E3	428.77840	214.38920

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PCHE	Equal variances assumed	2.467	.167	-.156	6	.881	-41.50000	265.69994	-691.64433	608.64433
	Equal variances not assumed			-.156	5.498	.881	-41.50000	265.69994	-706.30437	623.30437