EFFECT OF PUBLIC HEALTH EXPENDITURE ON INFANT MORTALITY RATE: AN ECONOMETRIC INVESTIGATION

Dissertation submitted to the Jawaharlal Nehru University in partial fulfillment of the requirements for the award of the Degree of MASTER OF PHILOSOPHY

By
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Certified that the dissertation entitled **EFFECT OF PUBLIC HEALTH EXPENDITURE ON THE INFANT MORTALITY RATE: AN ECONOMETRIC INVESTIGATION,** submitted by **DEBARPITA ROY** in partial fulfillment for the award of the degree of Master of Philosophy (M.Phil) of this University, is her original work and may be placed before the examiners for evaluation. This dissertation has not been submitted for the award of any others degree of this University or of any other University.

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(Debarpita Roy)

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1. Introduction

"The death of a child is a tragic loss. Yet every year, almost 11 million children die- that is, 30,000 children before their fifth birthday. Most of these children live in developing countries and die from a disease or a combination of diseases that can be prevented or treated by existing inexpensive means. Sometimes, the lack is as simple as a lack of antibiotics for treating pneumonia or of oral rehydration salts for diarrhoea. Malnutrition contributes to over half of these deaths." [1]

The above is cited from the Millennium Development Goals (MDGs) Report, 2005. In September 2000, the largest-ever gathering of Heads of State ushered in the new millennium by adopting the UN Millennium Declaration. The Declaration, endorsed by 189 countries, was then translated into a roadmap setting out goals to be reached by 2015. The eight MDGs build on agreements made at United Nations conferences in the 1990s and represent commitments to reduce poverty and hunger, and to tackle ill-health, gender inequality, lack of education, lack of access to clean water and environmental degradation.

Three out of eight goals, eight of the 16 targets and 18 of the 48 indicators relate directly to health. Health is also an important contributor to several other goals. The significance of the MDGs lies in the linkages between them: they are a mutually reinforcing framework to improve overall human development. The MDGs provide a vision of development in which health and education are squarely at the centre. Thus it is gross underestimation to say development is just about economic growth. Health forms a crucial component of the process as it is the necessary condition for human capital to prevail.

The primary health care objectives, which also form the crux of development today are:

- Fewer women dying in childbirth;
- More children surviving the early years of life;

[1] The Millennium Development Goals Report 2005, United Nations

- Dealing with the catastrophe of HIV/AIDS;
- Making sure people have access to life-saving drugs;
- Better health - in all its forms - making a major contribution to the reduction of poverty.

In the above scenario, where the focus of a nation's government has to be multi pronged in relation to health care, the role of the government in budgeting, planning and execution is of immense importance. The World Development Report , 1993 provided three justifications for government intervention in health:

- The poor cannot always afford healthcare that would improve their productivity and well being. Publicly financed health care services would help the poor to reduce poverty or alleviate its consequences.
- Some actions that promote health care are pure public goods or create large positive externalities. Private markets would not produce them at all or would produce little.
- Market failures in health care mean that government intervention can raise welfare by improving how the markets function

The fact that Indian government is one of the lowest spenders on health care (in the bottom five spenders as a percentage of GDP), and infant mortality rate (IMR) has dropped from 146 deaths per 1,000 births in the 1950s to 70 in 1999, stroked my curiosity to explore the effects of government health care on IMR. For the same I looked at the IMR and per capita government health care expenditures for the period of 1990-2003, for 16 major states of India.

Below is a table comparing the public health care expenditure across various countries of the world, developing, developed and African countries.

Table of comparison between different Countries

Country	Total health care expenditure as % of GDP (2002)	Public health care expenditure as % of GDP (2002)	Public health care expenditure as % of total health care expenditure (2002)	IMR (1990)	IMR (2003)
Bangladesh	3.1	0.8	22.1	96	46
Brazil	7.9	3.6	45.9	50	33
Canada	9.6	6.7	69.9	7	5
Germany	10.9	8.6	78.5	7	4
Ghana	5.6	2.3	41	78	59
China	5.8	2	33.7	38	30
India	**6.1**	**1.3**	**21.3**	**84**	**63**
Israel	9.1	6	65.7	8	4
Mexico	6.1	2.7	44.9	37	23
Philippines	2.9	1.1	39	45	27
United Kingdom	7.7	6.4	83.4	8	5
United States of America	14.6	6.6	44.9	9	7
Sri Lanka	3.7	1.8	48.7	26	13
Pakistan	3.2	1.1	34.9	96	74
Vietnam	5.2	1.5	29.2	38	19
Switzerland	11.2	6.5	57.9	7	4
Zambia	5.8	3.1	52.9	101	102

Source: World Development Indicators 2005, World Bank

From the above table of comparison it is evident that for developed countries like Germany, UK, USA and Switzerland health care expenditure is a higher percentage of GDP in comparison to developing countries. Similarly the government component in the entire health care expenditure is higher for these countries in comparison to the other countries. While the IMR for India was 63 in 2003, it was 7 for USA and while the public health care expenditure constituted 6.6% of GDP in USA in 2002, in India it was only 1.3%.

Thus the effect of government or public health care expenditure on IMR in the case of India aroused my interest and I endeavour to explore the same in my study.

2. Government health care expenditure in India

As of 2005, India is among the lowest five countries of the world in terms of government expenditure on health as a percentage of the GDP (0.9%), only Cambodia, Congo, Georgia and Sierra Leone rank below India[2]. Per capita government spending too falls below the minimum financial requirement (30-40 US Dollars per year) to cover essential health care needs of an individual in a developing country (WHO 2001). The low level of public spending is compounded by (a) a highly inefficient use of available resources, and (b) sharp inequalities in access to healthcare based on region, class, caste and gender. Public sector health expenditure accounts for 70-90% of the total health care expenditure in rich European countries. In India it hovers around 20%. In the union budget for 2006-07 many of the United Progressive Alliance (UPA) flagship schemes like Bharat Nirman for the augmentation of rural infrastructure, the rural employment guarantee, the Sarva Shiksha Abhiyan, the National Health Mission (NRHM), the midday meal programme, the urban renewal mission etc have partly got the booster dose that was expected. For various many social sectors like health, education, women and child development the budget estimates for 2006-07 was much higher than the 2004-05 actuals. Though one sees large increases for the social sectors, this is not enough to ensure a radical transformation of these sectors. The National Health Policy 2002 fixed 2 per cent of GDP as the optimum government health spending. The National Common Minimum Programme (NCMP) recognized this and has committed to allocating 3 per cent of GDP as public expenditure on health, a target to be reached before the UPA government's term ends. Thus by 2008-09, assuming the current growth rate, GDP at current prices is likely to be Rs.52,000 billion and 3 per cent of this would be Rs.1,50,000 crore. The latter is nearly five times of what the state and central governments currently spend on health, and hence a very daunting target to achieve.

Health in the constitution on India, like most social sectors, is a central and state subject and the contribution of the state governments to health spending is between 80 and 85 per cent of the total public expenditure on health. While in recent years the union governmen

[2] World Development Report, 2005

has substantially hiked its contribution to the health budget, increasing at 30 per cent per annum, in itself it makes a very small impact on the overall health budget. Presently the health budget of state and central combined is less than 1 per cent of GDP. To reach 3 percent of GDP both the central and state governments have to more than triple their budgets. As things stand today, the central government has shown its capacity is limited to increasing its contribution by about one-third each year, which is only 11 per cent of the targeted increase. The state governments capacity seems to be restricted to an annual increase of about one-sixth, which is a mere 5 per cent of the target expected. The central governments own expenditure is increasing rapidly, whereas its grants to the state have shrunk; the state governments' health spending is stagnating and, as a consequence, the overall public health expenditure remains below 1 per cent of GDP. Among the key programmatic allocations in the union health budget, Here we see that traditional sectors like hospitals and medical education and family planning services are now receiving a smaller chunk of the health budget in comparison to the "new" like reproductive and child bearing health (RCH), HIV/AIDS, immunization (especially pulse polio). This has resulted in better performance than before in the areas like immunization, antenatal care, institutional deliveries and hospitalization, although still about 10 per cent of those below poverty liner seek immunization from the private sector. Private sector accounts for 25 per cent of antenatal care, 30 per cent of institutional deliveries and 40 per cent of hospitalizations among the people living below the poverty line.

From union budget 2005-06 there has been a boost to rural health allocations. State budgets are the more critical component in public health financing as they account for about four fifths of the total public health budget.

During the last decade, there has been a slowing down of investment in public health in most states and this is reflected in the declining proportion of resources that are being allocated to health in the states budgets. State governments' health resources came down from about 1 per cent of GDP in 1990s to 0.6 per cent of GDP in 2002. Government per capita spending on health varies between about Rs50 in Bihar and Rs140 in Kerala and where government spending is high health indicators are high too.

With some renewed interest in health and National Rural Health Mission (NRHM) initiative, there appears to be an upward trajectory in state budgets too. However, this

observation is based on the budget estimates and often this may be significantly different from expenditures. In recent years two things have happened in many states. First, most states have faced a severe fiscal crisis that has put pressure on their social sector budgets, which have seen a downward trajectory. Second, in many states, the public health system has been subject to (what is loosely referred to as) health sector reforms. International funding agencies like the World Bank, the European Commission, and bilateral funding institutions like USAID and DIFID have invariably directed these reforms. These "reform" projects have only focused on a small part of the public health system and often advocated strategies that favor commercialization of health care, like the adoption of user fees in public hospitals, privatization or outsourcing of a arrange of services within the health sector, promotion of public-private partnerships via franchising, social marketing, contracting out services, etc.

The government sector is able to meet only 18 per cent of outpatient and 40 per cent of the inpatient care in the country. The synergistic impact of the fiscal crises and health sector reforms has adversely affected public health systems in most states. The reduction in own resources and injection of external funds have created a scenario wherein the state governments are losing control over their public health systems. This is not healthy for the vast majority of populations who are poor or live at subsistence level, as they are dependent on public health system, especially for hospital care. A case in point is the impact of user fees in Maharashtra. In an ongoing review of user fees in public hospitals it is revealed that on an average each district hospital in Maharashtra has accumulated over Rs.60 lakh as user fees and rural hospitals over Rs.15 lakh each, because they are both unable to use these funds, both due to administrative constraints as well as the fear (expressed by the chief medical officers and medical superintendents) of being accused of misappropriation. Thus the collection of user fees has not contributed to the claimed efficiency of such a strategy. On the contrary, it has caused impoverishment of those who have accessed and paid for services at public hospitals. The latter still suffer from inadequate resources and allocation inefficiencies leading to an increasing number of poor patients turning away from the public health system. A vast majority of rural government healthcare institutions lack essential facilities [Government of India 2002a]. Over 5 per cent of them do not have doctors, 32 per cent don't have laboratory

technicians and 5.4 per cent are without pharmacists. Many of then are without essential drugs. As a result, over 60 per cent of the private out-of-pocket health expenditure is spent on medicine and consultancy fee. Research highlights paradoxical situation. The utilization of government health care facilities is low where they are efficient whereas they function inefficiently where there is high demand for them. About 50 per cent of government resources are spent on cost-ineffective tertiary care while only about 10-15 per cent is spent on primary care. National Health Policy 2002 wanted the ratio to be reverted. The rural-urban divide in healthcare infrastructure (both private and public) is accentuated by the fact that more than 94 per cent of the doctors and 68.5 per cent of hospitals are located in urban areas where only 27.8 per cent people live; an urban doctor serves 2,000 people while his rural counterpart has to serve 20,000. Similarly, an urban bed serves 455 people while rural bed serves 10,000 people. There is a stark difference on the extent of rural-urban divide across states as well; it is 2 times in Kerala and 36 times in Madhya Pradesh. Only 10 per cent of government beds and 30 per cent of private beds are in rural areas. This disparity in government health spending varies between 3 times in Punjab and 11 ties in Andhra Pradesh. As a result, rural people spend 5 per cent of their income on health compared to 2.3 per cent by urban people. For the poorest 42 per cent of their health expenditure is met from loans.

2.1 Gauging government health care expenditure in India

India does not have a formal National Health Accounts (NHA) structure. Internationally, the first major comparative study of health expenditure was done by Abel Smith for Sri Lanka and Chile in 1960s. After that several country specific studies were conducted under the WHO and World Bank auspices in the 1970s and the 1980s. The WDR 1993 report 'Investing in Health' reported national health expenditures for 127 countries by public and private sources. Before the 1990s only the USA had developed the system of NHA. In the 1990s countries like Mexico, Columbia, Thailand, Philippines, China, and Bangladesh too showed growing interest in designing and developing their systems.

Health expenditures internationally are defined as all expenditures or outlays for prevention, promotion rehabilitation and care; population activities; medical relief

programmes with specific objectives of improving health for both individuals as well as populations. Activities with multiple objectives like nutrition, food subsidy programs, water supply and sanitation, which indirectly help to improve health are not included in health expenditures. Expenditures on medical education, training and research are also included in NHA for many countries.

In India, the most blanket definition of government health care expenditure was employed by Reddy and Selvaraju (1994), in the study by National Institute of Public Finance and Policy (NIPFP). It included expenditures by the Central and State level governments on medical, public health; family welfare; water supply and sanitation; nutrition; and child and handicapped welfare. Apart from this there were other studies by the government and other agencies and institutions to compute the government health care expenditure in India.

The Central Statistical Organisation (CSO), Government of India has been publishing figures in National Accounts Statistics, under the headings of "economic health care". It excludes expenditure on medical education welfare services, community services, water supply and so forth, which are mostly health related.

The Office of Comptroller and Auditor General of India (CAGO) has been publishing figures in its publication "Combined Finance and Revenue Account of Central and State Governments" annually, by dividing the health care sector into:

1. Medical (medical relief, medical education and research, hospitals and dispensaries, ESIS, CGHS etc.)
2. Public health (communicable disease control, primary health care, water supply and sanitation etc.)
3. Family Welfare (family planning, maternal and child health immunization etc.)

In the above expenditure on nutrition, control of pollution, child and handicapped welfare which are health related are excluded although they help improve health status considerably.

In the same way, the Department of Economic Affairs, Ministry of Finance (DEAMF), government of India has been publishing data on

1. Medical, public health, sanitation and water supply
2. Family Welfare

3. Social security and welfare.

This data is published in the "Indian Economic Statistics" brought out annually, for the central, state and union territory governments combined. No details about the composition of each of the items are available nor are the break about the composition of health care expenditure by individual state and union territory governments available separately. According to Reddy and Selvaraju (1994) there is no compatibility of the figures.

There were some studies on the estimates of health care expenditure by private and public sectors put together. The studies made by Duggal (1986), Foundation for Research in Community Health (FRCH, 1987), Indian Institute of Management (IIM,1987), Operation Research Group (ORG, 1987), Subba Rao and Ravishankar 91989) and World Bank (1993) are worth mentioning. here too according to Reddy and Selvaraju (1994), there is lack of common ground in their estimates.

3. Health care distribution in India

National Council of Applied Economic Research (NCAER) did a report on the 52nd Round of National Sample Survey conducted during 1995-96. It was a nationally representative survey covering nearly 121,000 households both in rural and urban areas. It was only the first time in 10 years and third time in its 50 year history that NSSO (National Sample Survey Organization) administered a health related questionnaire in its national survey. The objective of the report was to evaluate the distribution of health subsidies among different segments of the population. The approach adopted is known as Benefit Incidence Analysis. Essentially it involves the allocation of public subsidies on health to different members of the population, based on their utilization of the public health system. It requires knowledge of utilization pattern of health care, the costs of producing these services, and finally any amount recovered fro m the users as fees. The user fees are deducted from the costs of producing health services to obtain an estimate of the subsidy per unit of care.

The results were limited to 16 states/ regions that comprise the bulk of the Indian population about 97% of the total. These include Andhra Pradesh, Bihar, Gujarat, Haryana, Himachal Pradesh, Kerala, Karnataka, Madhya Pradesh, Maharashtra, North-East, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. The North East included Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Tripura.

The key findings of the study were:

- Nearly 56% of the hospitalizations were in private facilities. During 1995-96, an estimated 88.5 million inpatient days were utilized in public facilities, the bulk of it about 95% in public hospitals the remainder in primary health centres.
- There existed inequality in the share of inpatient days among the various expenditure quintiles. The difference was more marked in the rural areas.
- The share of SC/ST group in total inpatient days was similar to the share in total population both in terms of inpatient and outpatient days
- BIMARU states and Orissa had the most unequal distributions of inpatient days

- About 6.8 million outpatient treatments at public facilities were reported 15 days prior to the survey, amounting to 165.4 million treatments on an annual basis.
- Greater equality in outpatient treatments compared to inpatient treatments
- Distribution of outpatient was more unequal in rural than urban areas
- No significant differences by gender in terms of number of doses of immunization received by a child.
- Number of immunization doses per child went up along the quintiles.
- Bulk of immunizations were provided by the government with nearly 80% of urban doses and 90% of rural doses. However the number of doses from the private sector went up with economic status
- The 52nd round of the NSS survey treated any inpatient days related to childbirth as separate from hospitalizations related to other causes. Nearly 16 million inpatient days were under the obstetric care category.
- About 40% of the 16 million inpatient days were in the urban areas.
- There was a large share of the upper expenditure quintiles in obstetric care given that the share of children decline sharply with increases in per capita expenditure
- More than 90% of all births attended by Auxiliary Nurse Midwives were in the rural areas
- About 60% of ante natal and post natal care were accounted for by the public facilities
- Rural residents accounted for the major share in all ante natal and post natal visits in the public sector.
- Public health subsidies are disproportionately distributed in favor of the richer groups
- 85% of all the subsidies were provided at the public hospitals
- Subsidies for care provided at primary health care centres, public dispensaries, and health sub centres are more evenly distributed than for public hospitals, but form too small a percentage of the total subsidies
- 695 of all subsidies accrued to the people living in rural areas a little lesss than the actual number of people living in rural areas (75%)

- A key finding was the overall share of women in subsidies within a quintile typically exceeded that of men
- People living below the poverty line (36%) of the population accounted for 27% of the subsidies in health
- There was inter-state variations in distribution of subsidies. The most egalitarian states were Maharashtra, Gujarat, Punjab, Andhra Pradesh, Kerala and Tamil Nadu. Kerala and Tamil Nadu also demonstrated highly egalitariam distribution of subsidies across the rural populations
- Various policy conclusions were summed up at the end of the study: health subsidies were not well targeted towards the poor in India, especially those living in poorer or rural areas
- The distribution of health subsidies across different quintiles is primarily driven by the magnitude of subsidies and utilization patterns related to hospital based care.

3.1 Health systems of India

Health care is provided through a number of hospitals and dispensaries located at different places. In the rural sector numerous programmes and shemes are being implemented under the minimum Needs Programme for Primary Health Care relevant to the actual needs of the community in the rural areas. These health scheme facilities in the rural areas are:

Sub-centre: a sub-centre is established on the basis of one center for every 5000 population in general and for every 3000 population in hilly, tribal and backward areas.
Primary health centres: One PHC is established for every 30,000 population in the plains and for every 20,000 population in the hilly, tribal and backward areas. PHCs provide all ambulatory illness treatment services, routine personal preventive care, such as ante-natal visits, well baby check-ups, immunization and other personal disease prophylaxis; maternity care on an outpatient basis; and public health disease and vector control measures. The focus is on all central and state government services and private

services provided by all types of health care providers. It includes personal curative services but does not include treatment as an inpatient in a hospital. Laboratory facilities are also provided at PHCs and rural dispensaries.

Community health centre: a CHC is established for every 80,000 to 1.2 lakh of population so as to serve as a referral institution, having a minimum of 30 beds and 4 specialists for 4 primary health centres. CHCs mainly provide specialized specialized curative services in gynaecology, pediatrics, surgery and medicine.

Provision by state-owned enterprises: State-owned enterprises, such as railways and defence offer in-house hospital facilities to their employees. Generally, the expenses for running in-house hospitals are met by these enterprises from their own budgets. Financing for hospitals in railways, mines, defence come from both the employee and the employer which would be government itself.

Private sector provision: When an individual falls ill in the urban areas majority of them seek care from private rather than from public providers for outpatient care. For inpatient care, a sizeable section of the population seek care from public facilities but accessing these facilities too involves considerable out-of-pocket expenditures which may take the form of payment for medicines, laboratory tests, dressing, linen and food. Numerous studies have shown that even consumers from the lowest quintile of income distribution often incur considerable out-of-pocket expenses for curative treatment by public providers [Uplekar and George; Sundar 1995].

Broadly speaking, in the private sector, health care is provided through individual physicians, dispensaries and clinics, charitable (not-for-profit) private hospitals, and private (for-profit) corporate hospitals. Dispensaries and clinics are run by individual physicians (or by group of physicians) and provide health care on a fee-for-service basis and for profit. Charitable hospitals are run by trusts and some provide outpatient health care free of any charges while some others provide the service on a feee-for –service basis but without the profit motive; nevertheless, to the extent they want to expand the services available to the people, the price they charge would be much higher than what it

costs them. Private corporate hospitals, registered under the Indian Companies Act are owned by shareholders and are run, such as any other private limited company. Their motive is profit and they operate on a fee-for-service basis.

3.2 Health Insurance Schemes

In the Indian context, health insurance is provided by the government, employers and private agents. The government provided schemes are the health schemes of the central and the state governments, certain autonomous institutions supported by government grants and public sector undertakings with a free or partly paid coverage of the employees and their dependants by the medical infrastructure built by the employers, and health schemes run by the private agents. Of the three, insurance coverage by the government and the corporate sectors are the predominant ones. They cover employees below a certain salary of the government sector under the CGHS and employees of the corporate sector under the ESIS. Further, GIC too offers health insurance schemes for individuals and groups. Below I present a brief description of some of the key means of health insurance in India:

Employees state insurance scheme (ESIS)

The ESIS was established in 1948 as an insurance system providing both cash and medical benefits to its members. The scheme was inaugurated in 1952 and subsequently it was extended in a phased manner to cover several industrial areas spread all over the country.

The ESIS offers three types of medical benefits: full, expanded and restricted medical care. Full medical care covers outpatient treatment, specialist consultation and hospitalization for the insured person and his family members. Expanded care does not cover hospitalization, and restricted care covers only outpatient treatment. However, there is no difference in premium rates between these three types of coverage. The package of benefits operative in an area simply depends on the level of coverage facilities available. Broadly, there are seven types of coverage available to each insured person. These are: medical benefit, sickness benefit, maternity benefit, disablement benefit,

dependant's benefit, funeral expenses and rehabilitation allowance. Apart from medical benefit, a majority of other benefits are actually cash benefits to compensate for the wages lost owing to medical reasons.

The levels of expenditure on ESIS vary considerably across different states in the country. States with high expenditure on ESIS are usually associated with relatively larger share of the country's organized sector. They also rank higher in indicators of development and in various measures of industrilisation. States exhibiting lower expenditure on ESIS usually have a relatively smaller share of organised workers, and rank lower on indicators of development and industrialization (VHAI 1993).

Central government health scheme (CGHS)

The Central Government Health Scheme was introduced on 1 July 1954 as "Contributory Health Scheme" in Delhi, with a view to providing comprehensive medical care facilities to the central government employees and members of their families.

The facilities under the scheme include outpatients care provided through a network of allopathic and ayurvedic/homeopathic/unani dispensaries, supply of medicines, laboratory and x-ray investigations, domicialiary visits, emergency treatment, ante-natal care, confinement and post-natal care, advice on family welfare, specialists consultations and hospitalization facilities in government hospitals as well as in private hospitals recognized under CGHS.

General Insurance Corporation of India

The general insurance business including health insurance in India is owned by the government. It was nationalized in 1973 and has four subsidiaries: the National Insurance Corporation (Calcutta), New India Assurance Company (Mumbai), Oriental Insurance Company (New Delhi) and United India Insurance Company (Chennai). Prior to 1986, GIC offered medical insurance only to corporate bodies on a group insurance basis. In

1986, health insurance cover under the brand name Hospitalisation and Domicially Hospitalisation was introduced to cover groups as well as individuals. The scheme was again revised in 1991 and was marketed under the brand name Mediclaim with the main difference that separate limits for major and minor surgeries were abolished.

The mediclaim scheme

The Mediclaim policy is marketed by the four subsidiaries of General insurance Corporation and covers hospitalization and domiciliary hospitalization expenses for groups as well as individuals. Domiciliary hospitalization means treatment for those illness that normally require hospitalization but treated at home under compelling circumstances as per doctor's advice. The policy is an annual one.

Group mediclaim insurance policy

The group Mediclaim policy is available to any group/association/coporate body of more than 50 persons provided it has a central administration point. Each insurance policy should cover all eligible members under one group only. In other words, different categories of eligible members are not allowed to be covered under different policies. The policy is issued in the name of the group/ association/institute/corporate body with a schedule of names of the members including eligible family members forming a part of the policy. Group discounts on a slab basis are available for groups of 100 and above. There is a provision for bonus/ malus depending on the claim ratio.

Jan arogya bima policy

The Mediclaim policy is generally perceived to be a policy for the upper-income groups. In order to relieve the burden of cost of treatment of disease to the common man, a medicare policy for the common man was introduced in July 1996 by GIC under the brand name Jan Arogya Bima Policy.

Health care schemes of the corporate sector

A significant proportion of total health spending in the private sector is represented by corporate health expenditure. Although a large number of employees in the corporate sector get covered under the ESIS scheme, many companies have separate health care plans for covering employees earning more than the ESIS limit. Health care schemes available in most of the corporate offices can be grouped into four categories. These are:

Group health insurance pan (GHIP)

This is a scheme in which a company negotiates an insurance policy to cover the employees and their families for hospitalization and other medical expenses with various benefit limits. There are no specific standards set by the insurance company for premium and amount of coverage permissible. It depends upon the agreement between the company and the insurance firm. Mostly, the amount of premium is decided on the basis of two factors: the volume of insurance business and the number of employees, the lower is the premium that the company pays per employee. There may be different rates of premium that the company pays per employee. There may be different rates of premium and extent of coverage for different grades of employees.

Reimbursement of actual expenses

Under this scheme, a company reimburses the actual medical expenses incurred by its employees. Some companies set an upper limit that can be claimed by an employee in a financial year according to his basic salary, while some meet the medical expenses of their employees on the production of vouchers without any limits.

4. Public v/s private role in health care expenditure

The most significant and widespread global trend in health care over the past decade and more has been the increasing share of 'for profit' health care and its marketisation across societies. This process in the health care sector has paralleled the process of economic globalization and is intrinsically linked to it.

While private medical practice and the dispensation of medical care for a price has been known for a long time, the commercialization, corporatisation and marketisation of health care are a phenomenon of the last quarter of the 20th century. The process received a boost during the late 1970s and the early 1980s thanks to a global recession, which enveloped both developed and developing countries, imposed a fiscal constraint on government budgets and encouraged them to cut back on public expenditure in the social sectors. This increased the space for growth of the private sector in provisioning of health care. This process was accelerated during the 1980s and 1990s with the growth of the pharmaceutical and medical equipment industries and their seeking out markets for their products. The marketisation of health care in the 1990s is characterized by the increased [illegible] by the influence of multinational corporations in the pharmaceuticals industry, the emergent exporters of hi-tech medical technology, international insurance firms and health care corporations. These corporations have influence on multilateral institutions and global policy regimes as well as national policies, particularly in the health sector, multinational corporations have systematically targeted them for policy influence, defining priorities for disease control programmes, provisioning of health care, and medical research at national level. Typically, MNCs have influenced national policies in key areas such as provisioning and research in health care and research in health care through multilateral agencies like the World Bank, WHO and WTO. Through the bank they have influenced development funding in the social sectors, securing focus for programmes with a higher curative content. The policies have not only encouraged marketisation of health services but has also sought to restructure public services by applying market principles. Through WHO, the pharmaceutical industries have influenced the technical and research aspects of the various disease control programmes. Through WTO the policy framework for intellectual property protection aimed at protecting pharmaceutical bottom lines and helping them generate super profits have

been put in place. Such policy interventionism has ensured the funding of specific programmes, the creation of a market for drugs and equipment and the freeing of state controls on the market. During the 1990s WHO has increasingly gone in for partnerships with industry, especially for the tropical disease programmes.

The increased influence of global drug multinationals in 1990s has been facilitated by the recent trend towards mergers and the increased concentration of selling power within the pharmaceuticals industry. As a result of these mergers, a few corporations account for the bulk of pharmaceutical sales around the world. Many of these companies export drugs, vaccines and biological instruments to developed and developing countries. The major pharmaceutical, equipment and insurance multinational companies are based in the US and during the 1990s have expanded their markets across several developing and developed countries. This process has also been accompanied by the increased importance of 'for-profit' health care.

The experience of privatization of health services across the globe shows some common trends and also differences across countries. This variation in trends can be explained as an outcome of the interaction between global capital, and multilateral and bilateral agencies in conjunction with the history and socio-political contexts of individual nations. The processes that influence privatistaion include:

- Global actors including bilateral and multilateral agencies, pharmaceutical, medical equipment industries, insurance companies and research institutions these actors have played a critical role in shaping health policies around the world.
- The role of the state in each country, especially in terms of investments in public health services, the patterns of allocation, accessibility, availability of health services.
- The role of domestic capital in the provisioning of ehalth services, pharmaceutical, medical equipment and insurance sectors in each ofthese countries.
- The growth of the middle class and their influence on both the supply and demand side of private health services.

The worldwide economic recession of the late 1970s resulted in reduced spending on social sectors, which provided an impetus to the growth of the private sector. Across the

four countries, one observes stagnation or in some cases a decline in public spending for health and public health service institutions during the 1980s. during the 1980s and 1990s, the World Bank and the IMF put in place a agenda that promoted privatization both in the industrial and services sectors, including social sectors, referred to as the structural adjustment programme for the health sector these included cutbacks on public spending, encouraging the growth of private services and restructuring public institutions on principles of the market. Thus the process of privatization, which received a push after the global recession during the late 1970s, was further accelerated under the structural adjustment programme. This has resulted in a larger role for the markets, namely pharmaceutical, medical equipment and insurance corporations. In addition, the respective states have offered concessions and subsidies for these corporations.

In India, governmental concessions and subsidies were given for the import of medical equipment in the 1980s and since then it registered a sharp increase till the late 1990s. During this period, corporations like Philips, Siemens, General Electric, Becaton and Dickinson and Company entered the Indian market. A number of multinational corporations also set up units to assemble equipment in India. This trend is not seen in other countries in the South Asian region.

A study was done by Globerman and Vining in 1998 to investigate the operation of a "mixed" health care financial system. The "mixed" refers to the existence of both private as well as public methods of financing health care. The study examines whether private financing erodes support for maintaining health care budgets in the public sector. It also examines the hypothesis that private financing reduces the real value of nominal government health care budgets by contributing to higher health care costs. The analysis focused on a set of OECD countries for the 1980s.

Importance in private funding has been criticized in the developed country too on both philosophical and economic grounds. The most severe line of criticism being that the growth of private financing jeopardizes equivalent access to health care across individuals with different income levels.

The two main types of public plans are social insurance and tax financed systems. Social insurance systems are based on statutory sickness funds that are overseen and tightly

regulated by the government. Risks are pooled in the fund, and premiums are income related over some range. Membership is compulsory for certain groups, for example those with lower incomes and in some cases cover the entire population. In tax financed schemes, the state finances health care as a part of its budget. Provision can be delegated to lower levels of government or to (usually) non-profit suppliers. Public sector health provisions dominates in almost all developed countries, however private insurance plays a significant role in most countries.

The results provide little support for arguments that private financing contributes to reduced access to publicly financed health care. The findings provide support for the view that attempts to restrict the availability of private financing will erode the support for a public plan that is operating with excess demand. However this result may obtain only under specific circumstances; namely, when governments cut back public funding while attempting to constrain opportunities for private spending, thereby creating excess demand and related quality degradation. The adverse impacts of private financing would appear only at relatively high levels of private to total financing. Though this hypothesis is unsupported by historical evidence. Specifically, publicly financed health care in most developed countries was introduced into environments characterized by an almost reliance on private health care financing. Over time, public provision came into dominate, or completely displace private insurance schemes. The suggestion that higher ratios of private financing imply higher overall costs does not receive historical support. Most supporters of the argument cite the U.S as an illustration of the adverse cost consequences of privately financed care. While there is no gainsay that U.S health care cost increases have out paced those of other countries, it can be argues that costs accelerated sharply after the introduction of the major federal government programmes, Medicare and Medicaid. As well, U.S health care specific inflation rates may be particularly over stated by a failure to control for equality, including speed of access to services.

A study by Wagstaff and van Doorslaer (1992) had arrived at the result that differences in access to health care are smaller when public funding is a larger share of total funding.

Role of state and the private sector in the major SAARC countries

Sri Lanka

The Bhore committee report, 1946 provided the vision and influenced state policy in the financing, provisioning and administration of services post independence in Pakistan, Bangladesh and India. The history of the healthcare evolution is different in Sri Lanka.

In Sri Lanka, the public health system enjoyed widespread support. From the time of independence the socialist government in Sri Lanka provided for universal and free welfare services, which included the provision of free rice, education and health services to all its citizens. The public health system in Sri Lanka had widespread support across all social groups, and the amount of investment during this periods resulted in the expansion of public health services across the country.

From 1945s to 1960s, there was considerable growth of welfare services with an emphasis on food security, maternal and child health services and an expansion of health services at the primary, secondary and tertiary levels of care. Public investments were made in both service provisioning and training of human resources. The expenditure on health as a percentage of total government expenditure was 5.5% in 1977; it declined to 3.2% in 1981, and rose to 5.5% and peaked to 6.5% in 1989. During the 1990s, it declined from 5% to 4.1%. Health services were evenly distributed and physical access in terms of roads and transportation was good. However, indirect costs in terms of transportation, drugs and other incidental expenses were issues of concern for the poor in both urban and rural areas. After the economy was restructured in the late 1970s, all universal welfare programmes became targeted ones and food subsidies were largely withdrawn.

There was a shift in government health policy in 1977, when medical officers and other technical officers within the state health sector were allowed to practice privately, outside their working hours.

The private sector has a sizeable presence in providing ambulatory care but is limited when it comes to secondary and tertiary levels of care. The public sector dominates these levels. Utilization of private services is related to income levels.

Bangladesh

Prior to its separation from Pakistan, both Bangladesh and Pakistan shared a common history for health services development. Since Bhore committee report recommended the framework for health services for both these countries too, the state was to play an important role in the provisioning, financing and administration of services. During the 1960s, the investments in health were skewed in favor of West Pakistan and tis was reflected in institutions, beds and manpower.

The growth rate of hospitals was 7% during 1959-66 for East Pakistan while it was 16.27% for West Pakistan. The growth rate of public beds was 15.61% in East Pakistan while it was 56.17% in West Pakistan [Rahman 1999]. Thus health services were underdeveloped in East Pakistan. After liberation the first government of Bangladesh affirmed the state's responsibility in providing free health services to its citizens. 1975 onwards in the regime of Zia ul-Haq efforts were made to encourage the private sector in the development of private sector by offering low interest rates to set up private hospitals, clinics and nursing homes. It is during the early 1980s that the private sector was actively encouraged. It was during this period that the famous Drug Policy of Bangladesh was passed which gave importance to and protected the indigenous drug industry.

In Bangladesh the percentage of outlay for health to total outlay was 4.4% in 1975-76, it declined to 3.7% in 1980-85 to 3.05% in 1990-95 and 3.17% in 1997-2002 [Rahman 1999]. Government spending on health care constitutes only 34% of total expenditure on health, private expenditure accounts for 64% and the remaining 1% from NGOs [MOHFW 1998].

Till the late 1970s there was a steady growth in institutions and manpower. However, stagnation in the growth crept in after that. Thus the quality of services by the public sector was affected. In 1996, the government took initiatives to reform the health sector. The health policy sought a more prominent role for the private sector and NGOs in the provisioning of services. It also allowed and encouraged private practice by government doctors.

The growth of the private sector as mentioned above began in the mid-1980s and more than 71% of the hospitals and 67% of beds were located in urban areas [Rahman 1999].

Pakistan

In Pakistan, investments in the public sector were minimal and largely urban based. Government investments in health have witnessed a steady decline. Investments in public health services have been inadequate. More than 45% of the population does not have access to basic health facilities. The urban-rural divide is very marked and of the total public health services available in Pakistan, only 18% are located in rural areas.

The private sector is dominated by ambulatory services and a range of traditional practitioners. There were about 500 hospitals in 2003 and most of these hospitals were located in urban areas. Pakistan under went its structural adjustment programme in 1988. Public expenditure of health was tightened. This resulted in little expansion of facilities and manpower. Private medical colleges were encouraged for training of doctors. There were also moves to pivatise government hospitals, rural health centres and basic health units by selling or renting them to doctors or a group of doctors. The pharmaceutical industry in Pakistan is controlled by MNCs.

5. Papers of interest- Literature Survey

An attempt was made by Reddy and Selvaraju (1994) to determine the impact of the government health care expenditure on health status. The health status indicator used in this exercise is Life Expectancy at Birth (LEB). The World Bank had observed in the World Development Report, 1993 that:

i. Pursuit of economic growth strategies that reduce poverty
ii. Implementation of public health and essential clinical care packages
iii. Increased investment in schooling for girls would enormously improve health status in developing countries.

An attempt was made in the study to find to what extent was this applicable to India. The empirical evaluation of the same was done for fifteen major states on India for 1990-91. The hypothesis of the regression states that health status (measured in terms of LEB) is positively associated with per capita income (PINC) - a proxy for economic development, per –capita health care expenditure by government (PHEXG), and female literacy (FLIT) and negatively associated with percentage of people below the poverty line (POVT)- a proxy for income distribution. PINC is obtained by dividing the NSDP by respective state populations; PHEXG is obtained by diving expenditure on medical and public health, family welfare, water supply and sanitation, nutrition and child and handicapped welfare defrayed by the State governments by their respective populations. FLIT was obtained from 1991 Census documents and POVT is obtained from Planning Commission documents. The correlation matrix between the various variables was as follows:

Variables	LEB	PINC	PHEXG	FLIT	POVT
LEB	1.000				
PINC	0.745	1.000			
PHEXG	0.67	0.796	1.000		
FLIT	0.615	0.482	0.525	1.000	
POVT	-0.673	-0.760	-0.668	-0.443	1.000

To estimate the independent and joint influence of explanatory variables on LEB, step-wise regression analysis was attempted. The following functional equations were employed with Life Expectancy at Birth (LEB) as dependent variable.

[illegible]

[illegible]

3. $LMB = \alpha + \beta 1$ [illegible]

4. [illegible]

5. $LEB = \alpha + \beta 1$ PINC +

The results of the OLS step wise regression were

- The effect of income on health status is positive and significant and remained more or less same even when other variables were included.
- Health care expenditure, either independently or jointly with othe\r variables, did not have significant influence on health status in India
- Female literacy had a positive and significant impact on health status. Like income, its effect also remained same to a large extent when other variables were included
- Poverty or income distribution (measured in terms of population below poverty line) did not have significant influence on health status even though it assumed a negative sign as expected.

The policy implications of the exercise above as stated in the report were:

- Since per capita income plays a crucial role in improving the health status, policies have to be directed towards economic growth and alleviation of poverty. The strategy of the planning has to be growth with social justice or growth with increase in real income of the poor.
- Since female literacy has a significant bearing on health status, there is an urgent need to step-up expenditure on women's education. It may not help improve health status in the short run, but may help increase human capital and productivity and thereby economic growth.
- Since per-capita health care expenditure by government does not have significant influence on health status, reprioritization of resources in health sector in favour

- of the poor, and elimination of wastages in the use of resources through cost effective techniques, have to be attempted. If possible, higher per-capita allocations towards health care have to be made.
- Further, level of poverty cannot be ignored simply because of lack of statistical support. In the overall development of health status, attention has to be paid to alleviation of poverty. In fact, in a study for twenty two selected developing countries, the World Bank (1993) found a significant negative relationship between poverty and the alleviation of the former. Further, poverty has to be seen in conjunction with income. A decline in income would aggravate the level of poverty and deteriorate the level of health status. In other words, income influences health status through poverty and hence, poverty alleviation programmes – income generation in particular – should be given priority in order to improve the overall health status.

However, Reddy and Selvaraju cited limitations of the study. The analysis was based on cross section study for one year (1991) and the correspondence between dependent variable and explanatory variables may not hold in other circumstances. Also, health status is not the function of current income, current health expenditure, and current female literacy and current income distribution but also the function of past income, past health care expenditure, past female literacy and past income distribution. They had tried to overcome this limitation by using lagged variables but did not succeed in removing it on account of multicollinearity problem.

Various studies have taken place to evaluate the impact/efficiency of public or government health care expenditure on health. One of the most recent studies was by **Deepa Sankar & Vinish Kathuria** (2004) to analyse the performance of rural public health systems of 16 major states in India using the techniques from stochastic production frontier and panel data literature. The idea of an 'efficient' health facility is derived from the neoclassical production model in which agents choose inputs to minimize costs. There is a maximum level of Life Expectancy at Birth (LEB), Infant Mortality Rate (IMR) or Net Birth Rate (NBR) i.e. the various indicators of health that are achievable

given a certain level of inputs being used. This is the frontier, or the maximum possible level of goal that could be obtained for a given level of inputs. In a majority of the cases, the system in reality functions below the frontier and could have achieved better outcomes with the resources that it has invested in the health system and in the other determinants of health outcome. Sankar and Kathuria used access and availability of health care infrastructure as the inputs into the health sector to achieve the output health (IMR). Efficiency reflects whether health programmes and interventions are produced at the lowest cost (technical efficiency), but also whether the health system achieves the most within the given level of expenditure (referred to as allocative efficiency in health economics). Both technical and allocative together give the economic efficiency of the health system. Sankar and Kathuria focused only on the technical efficiency aspect. The estimation was done in two stages, in the first stage data on health inputs and outcome of the health inputs are employed to generate a vector of state-specific efficiency indices for each state using techniques from the stochastic production frontier and panel data. In the second stage, these efficiency indices are compared with the most efficient state (MES) to generate the relative efficiency of states and what factors determine the relative efficiency of states. Physical inputs like number of primary health centres, number of doctors, number of paramedical staff, number of hospital beds available and per cent of institutional deliveries were the input variables. The output variable was Infant Mortality Rate (IMR). Monetary variables like average public expenditure on health per capita was not used as it was not available for all the years and there was difficulty encountered in finding an appropriate time lag, as the impact of monetary variables are not felt immediately. The results were a bit surprising with states like Tamil Nadu scoring lower than Bihar on the efficiency index. The most efficient state was Kerala. The efficiency indices were arrived at for the fixed effects, random effects and Maximum Likelihood models separately. The results show that not all states with better health indicators have efficient health systems. The study concludes that investment in the health sector alone would not result in better health indicators. Efficient management of investment is required.

Rising per capita income has been associated with better health and lower fertility all over the world. At any given level of income, infant mortality levels have declined

markedly over time, for at least the past 40 years. In the paper by **Measham, Rao, Jamison, Wang and Singh** they have explored the relationship between income, infant mortality and fertility of 17 states of India and 115 low and middle income countries from 1975 to 1990. Given the importance of both income and time (or technical progress) as determinants of IMR and total fertility rates (TFR), the model was developed as follows:

$$Y_{i,t} = \alpha + \beta_1 (\ln RGDP_{i,t}) + \sum \beta_{2,t} (TIME_t) + \beta_3 (INDIA) + \beta_4 (\ln RGDP_{i,t} * INDIA) + \beta_{5,t} (\ln RGDP_{i,t} * TIME_t) + \varepsilon_t$$

The main predictors of infant mortality and total fertility are real per capita income, time and various interaction variables to isolate time and country effects. $Y_{i,t}$ is the natural log of the indicator (IMR, TFR) in country/state I and year t. the coefficient of the income variable is an elasticity showing the change in the mortality or fertility rate due to a change in real per capita income. Since the comparative analysis is done for only 3 years (1975, 1980, 1985 and 1990), t =1 to 3 ($TIME_0$= 1975 is the base year). The coefficients of the time indicators can be interpreted as the main effects of technical progress relative to 1975.

The results of the analysis yielded that the inverse per capita income- IMR/TFR relationship is inconsistent in India; however it supported the conclusion that income has a significant influence on IMR and TFR. In terms of reducing TFR, income effect is greater in India than in other low and middle income countries. Though it has been argued in others [Dreze and Sen 1995], that the rapid growth in incomes has led to increase in life expectancy. It was found that in most Indian states incomes' role may have been more modest. From the above model it was found that in India most states income growth is only one third as important as improvements over time in reducing infant mortality and fertility.

An analysis was undertaken by **Gerdtham, Soggard, Andersen and Jonsson**, to empirically examine the determinants of aggregate health care expenditure. The study was based on a cross section of 19 OECD countries for 1987. It explored the effects of aggregate income, institutional and socio-economic factors on health care expenditure. The significant regressors were found to be per capita income (GDP), urbanisation, share

of public financing to total expenditure, share of inaptient care expenditure to total expenditure and a dummy variable for countries wit fee-for-service as the dominant remuneration in out patient care. The GDP elasticity is significantly above one (1.33). another significant finding was countries with a larger share of public financing seem to be characterized by higher health care expenditure. It was found that when the share of public health care expenditure increases by 10%, health care expenditure is predicted to fall by 5%. The reason cited for the same was health systems which rely more on inpatient care relative to other types of care are more expensive. Another interesting finding was 'fee-for-service' had a significant impact on health care expenditure. The health care expenditure is 11% higher in countries with fee for services as the dominant form of remuneration in outpatient care. The elasticity of urbanization did not yield the anticipated positive sign. However it was also stated that argument for a positive effect at the aggregate level is weak and the measure of urbanization was nery rough.

Anindita Chakrabarti and D.N.Rao did a study on the role played by income in determining the extent of funds allocated by Indian states for improvement of health of its population. The study was done for fourteen major states on India over a span of twenty three financial years (1974-75 to 1996-97. this paper used the recent advancements in panel data time series analysis. The two variables under scrutiny were government health care expenditure and state domestic product in real (1960-61) per capita terms and expressed in natural logarithm. Both the series are found to be non-stationary, not only for individual states but for the entire panel of fourteen states. Using recent developments in time series econometrics, it was found that the real per capita public health expenditure and real per capita state domestic product are cointegrated in a panel context though not in time series context for individual states. However for the entire panel there exists a long run relationship between the two. It was also stated that in the short run the concerned variables deviate from the equilibrium relationship because of external shocks. To find the long run elasticity between the two variables fully modified least squares (FM OLS) was used. This methodology was followed to obtain unbiased estimates of the cointegrating vector, as the asymptotic distribution of the least squares estimator suffered from nuisance parameter arising from regressor endogeneity and serial correlation of the

errors. The FMOLS estimates revealed that in the absence of of contemporaneous shock the long run elasticity is significantly greater than one. This is primarily because of the comparatively higher elasticity values for the BIMARU states vis-a vis the other states. In the presence of time dummies though public health expenditure is inelastic to changes in income for the fourteen major states on the whole and the BIMARU group in particular. This highlights the importance of including time specific effects while testing for non-stationarity and cointegration. Short run dynamics was analysed using the panel error correction mechanism. The coefficient of the error correction term corroborates the long run findings. This paper also tested for the significance of other non-income factors in determining the health care expenditure growth differentials across the Indian states. Apart from income, ageing of the population and proportion of population residing in rural areas are the only other factor found to have significant positive impact.

6. Econometric Analysis

6.1 Data

The study comprises of sixteen major states of India and spans fourteen financial years from 1990-91 to 2003-04. The two variables of interest in the study are Infant Mortality Rate (IMR) and the per capita government health care expenditure of states.

Figures on the total expenditure on health (incorporating expenses on revenue and capital account) were taken from the various issues of the Reserve Bank of India Bulletin. The data on IMR was taken from the Sample Registration System (SRS) Bulletin, Volume 37 No.1 April 2003, Registrar General, India.

As mentioned earlier in Chapters 2 and 3, there exists difference of opinion regarding what constitutes health care expenditure in India. At one extreme there is the narrow and conventional definition, which includes only items (such as medical, public health and family welfare) that can be charged to the Ministry of Health and Family Welfare. On the other extreme, all items of expenditure that are likely to have an impact on the quality of life are included. Such a definition would include items, apart from the ones included in the former case, expenditure on nutrition, child welfare, control of pollution, water supply and sanitation etc.

I have adhered to the middle path and include expenses on medical (medical relief, education and research, hospitals and dispensaries etc.), public health (communicable disease control, primary health acre centre etc.), family welfare (family planning, maternal and child health, immunization), water supply and sanitation and nutrition.

Summary statistics on the two series, namely per capita government health care expenditure (hereafter HE) and Infant Mortality Rate (IMR). Health care expenditure are measured in real (1990-91) per capita terms, and IMR is expressed as the infant mortality per thousand live births. In keeping with the norm both are expressed in natural logarithm. For arriving at the per capita health care expenditure, I took the decadal figures for population across the states and then applying CAGR on the base 1981 value extrapolated the population figures for 1990, using the base value of 1991 the population for the intervening years between 1991 and 2001 were extrapolated. For 2002 and 2003

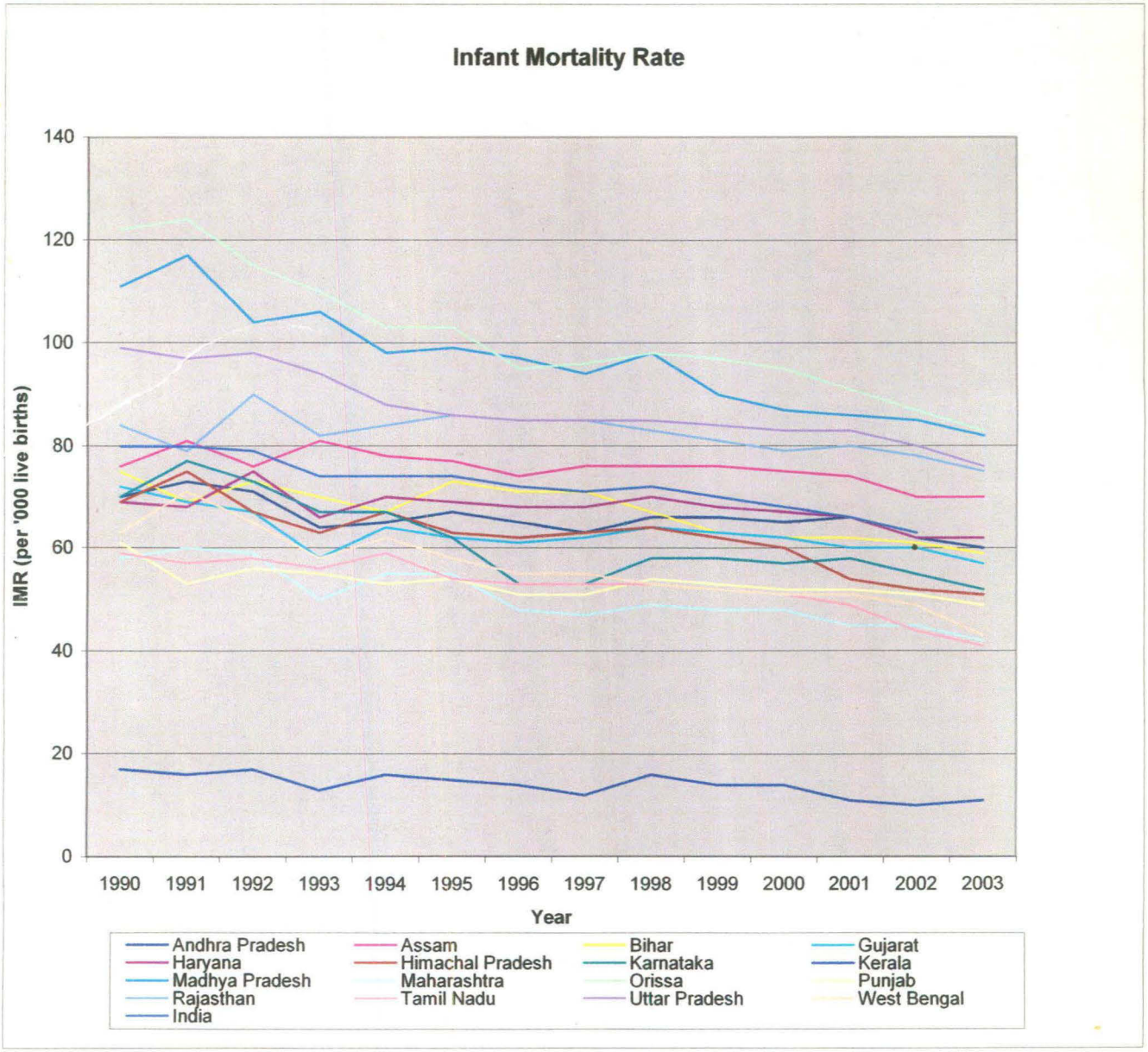
the projected growth rate of population was used on the 2001 population. For 1991 and 2001 actual population for the states were used.

Summary statistics of both the variables in absolute terms are given in the table below:

Descriptive Statistics on Infant Mortality Rate (IMR) and Real Per Capita Health Care Expenditure (HE)

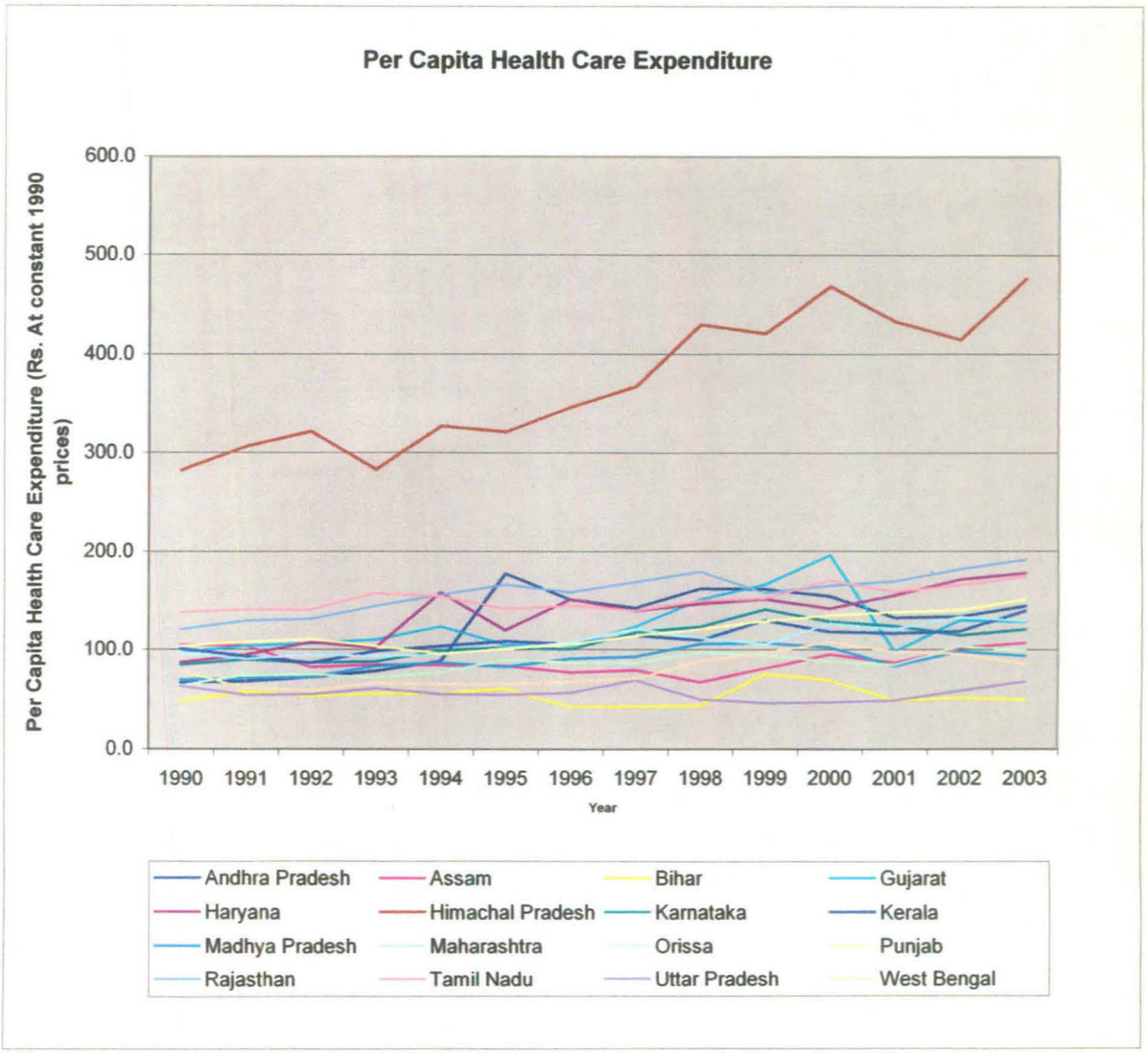
State	IMR		HE	
	Average (1990-2003)	Rate of growth (1990-2003)	Average (1990-2003)	Rate of growth (1990-2003)
Andhra Pradesh	65.9	-14.29%	123.7	115.50%
Assam	74.9	-22.37%	88.5	1.58%
Bihar	67.4	-21.33%	54.0	3.38%
Gujarat	62.9	-20.83%	124.4	32.26%
Haryana	67.7	-10.14%	136.0	103.82%
Himachal Pradesh	62.3	-26.09%	371.5	68.84%
Karnataka	61.4	-25.71%	108.5	42.22%
Kerala	14.2	-35.29%	108.0	38.09%
Madhya Pradesh	96.7	-26.13%	88.5	34.89%
Maharashtra	50.6	-27.59%	109.1	33.44%
Orissa	101.4	-31.97%	85.2	55.16%
Punjab	53.2	-19.67%	118.2	45.34%
Rajasthan	82.2	-10.71%	158.6	58.63%
Tamil Nadu	52.8	-30.51%	152.1	26.04%
Uttar Pradesh	87.4	-23.23%	56.3	7.64%
West Bengal	56.1	-31.75%	78.9	9.75%

The behaviour of the IMR and HE would become clearer on examination of the two graphs below which depict their absolute values over 1990-2003.



The above graph depicts the IMR for the 16 states of the study over 1990-2003. As observed from the above table and graph the IMR across states have on an average been declining. For some states the decline has been higher than the rest when expressed in rates of growth. The best performer among the states has been Kerala, which has the lowest IMR in the country and the IMR has declined by 35% since 1990 till 2003. The worst performer in terms of rate of decline has been Rajasthan. Its IMR declined only by 10.71% from 84 to 75 from 1990 to 2003. The highest IMR in 2003 was that of Orissa followed by Madhya Pradesh and Uttar Pradesh.

Following is a graph depicting the per capita health care expenditure for all the states over 1990-2003:



The outlier in the above graph in terms of the per capita expenditure is Himachal Pradesh, which right from 1990 to 2003 has the highest government spend on health. A reason behind this is the steep cost of medical care in the state, due to the topography and high travel cost. In 2003 the HE of Himachal Pradesh was RS.477. The state with the second highest spend lagged way behind at Rs192. The state with the lowest HE in 2003 was

the projected growth rate of population was used on the 2001 population. For 1991 and 2001 actual population for the states were used.

Summary statistics of both the variables in absolute terms are given in the table below:

Descriptive Statistics on Infant Mortality Rate (IMR) and Real Per Capita Health Care Expenditure (HE)

State	IMR		HE	
	Average (1990-2003)	Rate of growth (1990-2003)	Average (1990-2003)	Rate of growth (1990-2003)
Andhra Pradesh	65.9	-14.29%	123.7	115.50%
Assam	74.9	-22.37%	88.5	1.58%
Bihar	67.4	-21.33%	54.0	3.38%
Gujarat	62.9	-20.83%	124.4	32.26%
Haryana	67.7	-10.14%	136.0	103.82%
Himachal Pradesh	62.3	-26.09%	371.5	68.84%
Karnataka	61.4	-25.71%	108.5	42.22%
Kerala	14.2	-35.29%	108.0	38.09%
Madhya Pradesh	96.7	-26.13%	88.5	34.89%
Maharashtra	50.6	-27.59%	109.1	33.44%
Orissa	101.4	-31.97%	85.2	55.16%
Punjab	53.2	-19.67%	118.2	45.34%
Rajasthan	82.2	-10.71%	158.6	58.63%
Tamil Nadu	52.8	-30.51%	152.1	26.04%
Uttar Pradesh	87.4	-23.23%	56.3	7.64%
West Bengal	56.1	-31.75%	78.9	9.75%

The behaviour of the IMR and HE would become clearer on examination of the two graphs below which depict their absolute values over 1990-2003.

Bihar, with a He of Rs.50 and an IMR of 59. Bihar has witnessed the lowest growth of 3.4% in HE since 1990. Andhra Pradesh and Haryana are among the top two states who witnessed highest growth in per capita health care expenditure at constant 1990 prices (HE).

Thus in the light of the above interesting observations, it kindled my interest further to undertake an investigation at the state level, as to how the two variables can be linked.

Below I describe the broad methodology I used in my analysis:

6.2 Methodology

Both the data series are time series data series from 1990 to 2003. I explore the relationship between the IMR and HE for every state over this period of time.
My aim in the empirical exercise was to test for the validity of a long run relationship between both the variables and then if it exists what is the relationship between the both. There were various primarily two tests that I had to run for each state: test for non stationarity and test for co-integration. To arrive at the appropriate number of lags I used Akaike Information Criteria. Below I provide a brief description regarding each of these econometric concepts:

Akaike Information Criteria (AIC)

Akaike Information Criteria is a measure of fit. Like R^2, it places a premium on achieving a given fit with a smaller number of parameters (K) per observation, K/n. the measure reported by most software are AIC (K) = log (e'e/n) + 2K/n.

In timed series data, lags of variables play an important role. AIC can be used in this context to identify the right number of lags for a model.

Let us assume a dynamic model like:

$Y_t = \alpha + \Sigma \beta_i x_{t-i} + \varepsilon_t$

Let us suppose there is an appropriate, "true" value of $p > 0$ that weseek. A simple to general approach to finding the right lag would depart from a model with only the current value of independent variable in the regression, and add deeper lags until a simple t test suggested that the last one added is statistically insignificant. The problem with such an approach is that any level at which number of included lags variables is less than p, the estimator of the coefficient vector is biased and inconsistent. The asymptotic covariance matrix is biased as well, so statistical inference on this basis is unlikely to be successful. A genera;-to simple approach would begin from a model that contains more than p lagged values- it is assumed that though the precise value of p is unknown, the analysts can posit a maintained vale that should be larger than p. least squares or instrumental variables regression of y on a constant and (p+d) lagged values of x consistently estimates $\theta = [\alpha, \beta_0, \beta_1 \ldots\ldots\ldots\ldots \beta_p, 0,0\ldots\ldots\ldots]$. Since models with lagged values are often used for forecasting, researchers have tended to look for measures that have produces better results for assessing "out of sample" prediction properties. The adjusted R^2 is one possibility. Others include AIC (p).

$$AIC\ (p) = \ln (e'e/T) + 2p/T$$

If some maximum P is known, then $p < P$ can be chosen to minimise AIC (p). Akaike Information Criteria retains a positive probability of leading to over fitting even as $T \rightarrow \infty$.

Non-stationarity

Emperical work based on time series assumes that the under-lying time series is stationary. The absence of the same is known as non-stationarity.

Any time series data can be thought of as being generated by a stochastic or a random process; and concrete set of data can be regarded as a (particular0 realization (i.e. a sample) of the underlying stochastic process. The distinction between the stochastic process and its realization is akin to the distinction between population and sample in cross-sectional data. Just as sample data is used to draw inferences about a population, in time series the realization is used to draw inferences about the underlying stochastic

process. A stochastic process is said to be stationary if its mean and variance are constant over time and the value of covariance between two periods, depends only on the distance lag between the two time periods and not on the actual time at which the covariance is calculated.

Let Y_t be a stochastic time series with these properties:

Mean: $E(Y_t) = \mu$

Variance: $var(Y_t) = (Y_t - \mu)^2 = \sigma^2$

Covariance: $\gamma_k = E[(Y_t - \mu)(Y_{t+k} - \mu)]$

Where γ_k, , the covariance (or auto-covariance) at lag k, is the covariance between the values of Y_t and Y_{t+k} , that is, between two Y values k periods apart. Suppose we shift the origin from Y_t to Y_{t+m}. now if Y_t is to be stationary, the mean, variance, and auto-covariances of Y_{t+m} must be the same as those of Y_t. in short if a time series is stationary, its mean, variance, and autocovariance (at various lags) remains the same no matter at what time we measure them. If a time series is not stationary in the sense just defined, it is called a nonstationary time series.

Test for stationarity

A test of stationarity that has gained popularity over the recent years is the Augmented Dickey-Fuller test (ADF).

Let us assume: $Y_t = Y_{t-1} + \mu_t$, an AR(1) process

Where μ_t is the stochastic error that follows the classical assumptions, namely, it has zero mean, constant variance σ^2 , and is nonautocorrelated. Such an error term is known as the white noise error term. If the coefficient of Y_{t-1} is equal to 1, we face what is known as a unit root problem i.e. a nonstationary situation. In econometrics, a time series that has a unit root is known as a random walk. A random walk is an example of a nonstationary time series.

To find out if a time series is stationary, we can run the regression $Y_t = \rho Y_{t-1} + \mu_t$

Under the null hypothesis that $\rho = 1$, the conventionally computed t statistic is known as the τ (tau) statistic, where critical values have been tabulated by Dickey Fuller on the

Monte Carlo simulations. Note that, if the null hypothesis that $\rho = 1$ is rejected (i.e., the time series is stationary), we can use the usual (Student's) t test.

For theoretical and practical reasons, the Dickey-Fuller test applied to regressions in the following forms:

$\Delta Y_t = \delta Y_{t-1} + \mu_t$

$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \mu_t$

$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \mu_t$

Where t is the time or trend variable. In each case the null hypothesis is that $\delta = 0$, that is, there is a unit root. If the error term μ_t is autocorrelated, one modifies the above regression as follows:

$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-i} + \mu_t$

The number of lagged differences to be used is determined by AIC. When the DF test is applied to models which include multiple lagged terms it is called augmented Dickey-Fuller (ADF) test.

If the original series has to be differenced once for the series to become stationary, the original series is said to be integrated of order one. It is denoted by I(1). Similarly, if the original series has to be differenced twice, for it to become stationary, the original series is said to be integrated of order 2, or I(2).

Test for Co-integration

Even if two variables (independent and dependent) are both non stationary, a linear combination of these variables might be stationary. Then these two variables are said to be cointegrated. If in a regression, series Y and series X are integrated of the same order they can be cointegrated. If two variables are cointegrated we do not loose any valuable long-term information and the traditional regression methodology (including t and F tests) hold. In the language of cointegration theory, such an equation is known as cointegrating regression and the δ parameter (as slope coeffiecient of the independent variable) is known as the cointegrating parameter.

The most popular test for cointegration is the Engle Granger (EG) test. This test involves a simple methodology of estimating a traditional regression like $Y_t = \alpha + \beta x_t + \varepsilon_t$ and

check whether the residuals of the same are stationary or not by running a ADF on the same. The critical values for an EG or AEG test do not correspond to that of an ADF test since it involves residuals. However, most of the software packages give critical values for the ADF as well as EG and AEG tests.

Then, I delved into the effect of per capita government health care expenditure on IMR, for the cointegrated states. I reviewed two sets of traditional OLS regressions, one without lag and another with lag operators defined by the AIC. The results for both are highlighted in the next section.

Lastly, I reviewed regression on the first differences on the non cointegrated tests, with lags with the help of AIC criterion.

6.3 Results

The relationship I explore in the analysis is:

$IMR_t = \alpha_i + \beta_{t-p} HE_{t-p} + \mu_t$, where p is the lag operator which is employed. I test for this relationship for each of the 16 states of my study separately.
I have restricted the number of independent variable to one due to the loss of degrees of freedom on increasing the number of independent variables given the fixed length of the time series for IMR and HE.

IMR_t is the natural logarithm of Infant Mortality Rate at time t for a state.
HE_t is the natural logarithm of real per capita health expenditure for a state at time t for a state.

Since both the above mentioned series are across time, they need to be checked for stationarity. For testing the same the Augmented Dickey Fuller test (ADF) is employed. The methodology for an ADF is given in the preceding section. Thus the ADF was employed to check the stationarity for both the series of each state separately. The

number of lags that are employed in the states is determined by minimizing the Akaike Information Criteria (AIC) for each individual series across states separately.

The following tables give the ADF statistics along with the number of lags for IMR and HE separately for each state, for the ADF tests with trend and without trend.

Augmented Dickey Fuller Test Results (with trend)

States	IMR (in log)		Per Capita Real Health Expenditure (in log)	
	ADF test statistic	Lags	ADF test statistic	Lags
Andhra Pradesh	-2.40	2	-1.27	1
Assam	-0.27	2	-1.38	1
Bihar	-1.87	1	-2.87	1
Gujarat	-2.53	1	-2.24	1
Haryana	-1.86	1	-1.73	2
Himachal Pradesh	-0.65	2	-1.94	1
Karnataka	-1.28	2	-1.30	1
Kerala	-1.70	1	-2.54	2
Maharashtra	-2.60	1	-2.93	2
Madhya Pradesh	-2.24	2	-1.36	2
Orissa	-2.65	1	-2.41	1
Punjab	-1.90	2	-2.53	2
Rajasthan	-0.39	2	-1.88	2
Tamil Nadu	0.01	1	-0.70	1
Uttar Pradesh	-0.35	1	-2.22	1
West Bengal	-1.98	2	-1.15	2

Note: The number of lags are selected using Akaike Information Criteria. The null hypothesis is the nonstationarity of the time series. The critical values for the univariate unit root tests are taken from MacKinnon (1991). For 14 observations, the critical values at the 0.01, 0.05 and 0.10 levels of significance are -4.38, -3.6 and -3.24 respectively.

Augmented Dickey Fuller Test Results (no trend)

States	IMR (in log)		Per Capita Real Health Expenditure (in log)	
	ADF test statistic	Lags	ADF test statistic	Lags
Andhra Pradesh	-2.05	2	-1.77	1
Assam	1.33	2	-1.68	1
Bihar	0.12	1	-3.02	1
Gujarat	-2.24	1	-1.84	1
Haryana	0.09	1	-1.55	2
Himachal Pradesh	0.89	2	-0.06	2
Karnataka	-1.33	2	-1.13	1
Kerala	-0.30	1	-1.00	2
Maharashtra	-0.98	1	-0.23	2
Madhya Pradesh	-0.58	2	-0.23	2
Orissa	-0.66	1	-140.00	1
Punjab	-0.58	2	-0.05	2
Rajasthan	1.32	2	-1.27	2
Tamil Nadu	2.07	1	-0.70	1
Uttar Pradesh	-0.33	1	-2.28	1
West Bengal	-0.21	2	-1.66	2

Note: The number of lags are selected using Akaike Information Criteria. The null hypothesis is the nonstationarity of the time series. The critical values for the univariate unit root tests are taken from MacKinnon (1991). For 14 observations, the critical values at the 0.01, 0.05 and 0.10 levels of significance are –3.75, -3 and -2.63 respectively.

The computed Augmented Dickey Fuller test statistic for each series for each of the states yielded that they were non stationary. None of the ADF test statistics for any of the states was found to be significant.

On inspection of the test statistics we find both the series are non stationary. Both IMR and HE are found to be integrated of order one (i.e. both need to be differenced once to become stationary). However, even if two variables are non-stationary there may be a long run equilibrium relationship between the two if two variables are cointegrated. A necessary condition for cointegration to prevail is both the series must be integrated of the same order. In our case, both IMR and HE are integrated of the same order.

Test for cointegration

Separate Engle-Granger tests for cointegration were performed for IMR_t and HE_t for each state separately. The results of the same are given in the table below:

Results from Engle Granger Co-integration tests

States	ADF test statistic	Lags
Andhra Pradesh	-3.19	2
Assam	0.86	2
Bihar	-3.11	1
Gujarat	-2.65	2
Haryana	-4.86*	1
Himachal Pradesh	-3.57**	2
Karnataka	-2.50	2
Kerala	-2.20	1
Maharashtra	-5.70*	1
Madhya Pradesh	-3.22**	2
Orissa	-1.30	1
Punjab	-3.80**	2
Rajasthan	-4.11*	2
Tamil Nadu	-0.93	1
Uttar Pradesh	2.81***	2
West Bengal	-2.69	2

Note: * denotes significance at the 0.01 level, ** denotes significance at the 0.05 level and *** denotes significance at 0.10 level

Note: The number of lags are selected using Akaike Information Criteria. The null hypothesis is the nonstationarity of the estimated residuals. The critical values for the univariate unit root tests are taken from MacKinnon (1991). For 14 observations, the critical values at the 0.01, 0.05 and 0.10 levels of significance are –3.77, -3.02 and -2.71 respectively.

According to the results of the individual co-integration the IMR and per capita government health care expenditure: the null hypothesis of unit root in the residual is rejected for three (Haryana, Maharashtra, Rajasthan) states at the .10, .05 and .01 levels of significance, the null hypothesis of unit root in the residual can be rejected for three

(Himachal Pradesh, Punjab and Madhya Pradesh) states at the .05 and .10 significance levels, the null hypothesis for the residual can be rejected at the .10 level for one (Uttar Pradesh) state. No long term relationship among the IMR and HE existed for the remaining states. This can due to the limitations of the length of our time series.

The linear combination of IMR and HE (the residuals) for the above mentioned states (Haryana, Maharashtra, Rajasthan, Himachal Pradesh, Punjab, Madhya Pradesh and Uttar Pradesh) are stationary i.e. IMR and HE are cointegrated. This means that the "trends" in IMR and HE cancel out. In such a scenario traditional regressions on the levels of the two variables is meaningful (i.e. not spurious), and we do not lose any long term information, which would result if we were to use their first differences instead. Thus the usual t and F tests are applicable for these states, for the relationship I analyse.

$IMR_t = \alpha_i + \beta_{t-p} HE_{t-p} + \mu_t$, where p is the lag operator which is employed

In the language of co-integration theory, such a regression is known as a co-integrating regression and the parameter β (slope coefficient) is known as the co-integrating parameter.

I then analysed the relationship, separately for cointegrated states and non cointegrated states. For cointegrated states OLS regressions were carried out. For non cointegrated states I carried out the analysis using their first differences instead of the IMR_t and HE_t. The results for the set of regressions are given below.

Co-integrated states

The results of the traditional regression for $IMR_t = \alpha + \beta_{t-p} HE_{t-p} + \mu_t$, for the co-integrated states are given below:

Regression results (no lag)

	Intercept Coefficient (α)	Slope coefficient (β)	R square
Haryana	4.71 (17.9)*	(-)0.102 (-1.90)*	0.3
Himachal Pradesh	6.65 (9.67)*	(-)0.42 (-3.68)*	0.53
Madhya Pradesh	6.97 (-3.72)*	(-)0.42 (10.78)*	0.55
Maharashtra	7.32 (12.68)*	(-)0.72 (-5.9)*	0.74
Rajasthan	5.2 (11.54)*	(-)0.15 (-1.76)	0.2
Punjab	4.9 (11.74)*	(-)0.204 (-2.31)*	0.3
Uttar Pradesh	4.4 (6.02)*	0.018 (.10)	0.009

Note: * denotes significance at 0.05 level.

Regression results (with lags)

	Nos. of lags	Intercept Coefficient (α)	Slope coefficient (β)	R square
Haryana	1	4.8 (17.5)*	- 0.127 (-2.25)*	0.31
Himachal Pradesh	2	6.7 (13.02)*	-0.45 (-5.13)*	0.72
Madhya Pradesh	1	7.03 (13.13)*	-0.55 (-4.63)*	0.66
Maharashtra	1	7.27 (11.39)*	-0.72 (-5.27)*	0.71
Rajasthan	2	5.7 (12.19)*	.09 (-2.82)*	0.44
Punjab	1	4.6 (13.3)*	-0.14 (-1.92)	0.25
Uttar Pradesh	2	3.3 (5.49)*	0.287 (1.92)	0.27

Note: * denotes significance at 0.05 level

Two sets of regressions have been run, one set where no lags in the independent variable have been employed. In the second set of regressions the dependent variable (IMR_t) is regressed on the lagged values of the independent variable (HE_t). The optimal numbers of lags have identified using the Akaike Information Criteria (AIC).

From the first set of the above regressions we can conclude that apart from Uttar Pradesh, the slope coefficients of all the other states are significant and conform to the notion of a negative relationship between IMR and HE (higher levels of per capita government health expenditure results in higher IMR). Similarly, the R^2 value for Uttar Pradesh are

very low at 0.009 in comparison to the other states. Thus though the IMR and HE for Uttar Pradesh are co-integrated (residuals are stationary at 10% level of significance), the R^2 of the traditional regression is abysmally low at 0.09.

For Himachal Pradesh, Madhya Pradesh and Maharashtra the R^2 values are high at .53, .55 and .74 respectively. The slope and intercept coefficients too are significant at 5% level. This signifies the presence of a robust long tern relationship between the IMR and per capita government health care expenditure of these states.

From the second set of regressions for each state, with lags selected by the AIC, the R^2 values for Himachal Pradesh, Madhya Pradesh, Rajasthan and Uttar Pradesh improve. The values decline slightly for the other states though. For Punjab the R^2 declines from .3 to.25 and further the slope coefficient which was significant earlier becomes insignificant.

For Uttar Pradesh, though the sign of the slope coefficient of health care expenditures do not conform to our expectations, in both the cases it is insignificant. In terms of the cointegrating relationship between the two variables, Uttar Pradesh was cointegrated only at the 10% level, not 5% as the other states.

Thus from the above results we can conclude that apart from Uttar Pradesh the IMR of each state is affected by the per capita public health care expenditure, by varying degrees.

Non cointegrated states

For the other states for which co-integration is not present between the concerned variables, I have attempted OLS regressions on their first differences and obtained the following results:

Regression results

	Nos. of lags	Intercept Coefficient (α)	Slope coefficient (β)	R square
Andhra Pradesh	1	-0.15 (-1.22)	0.056 (.96)	0.07
Asssam	1	-0.027 (-1.87)	-0.247 (-2.1)	0.3
Bihar	1	-0.01 (-1.41)	-.06 (-0.98)	0.08
Gujarat	1	-0.19 (-1.26)	.059 (0.9)	0.06
Karnataka	2	- 0.30 (-1.52)	0.291 (1.15)	0.1
Kerala	2	- 0.6 (-1.38)	1.27 (2.48)*	0.4
Orissa	1	-0.3 (-3.37)*	0.131 (1.23)	0.12
Tamil Nadu	2	-0.31 (-2.51)	.29 (1.47)	0.17
West Bengal	2	-0.46 (-3.51)	.273 (2.38)	0.36

Note: * denotes significance at 0.05 levels. The figures in the parentheses are the values of t statistic.

Among all the non cointegrated states, the slope coefficient of only one state Kerala is significant. While the intercept coefficient for only one state, Orissa is significant.

Thus from all of the above analyses, presence of robust and significant long run relationship exists for Haryana, Maharashtra, Himachal Pradesh, Rajasthan and Punjab. In the long run the per capita public health care expenditure of these states affects the IMR negatively. This means a higher level of per capita public health care expenditure results in lower IMR.

Though the IMR and per capital public expenditure on health are cointegrated for Uttar Pradesh. The relationship between both is not significant.

7. Conclusion

The empirical analysis shows the presence of varying degrees of relationship (effect of per capita health acre expenditure on IMR) for the 16 states I studied. For the states of Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Rajasthan, Punjab and Uttar Pradesh there is the presence of a long term relationship between the two. For all of them excluding Uttar Pradesh, there exists a significant negative relationship between both, as expected.
For the remaining states no relationship could be established. One reason for this could be the short span of the time series data of only 14 years.

Critics of the study can point out the absence of other explanatory variables as a limitation of the study. However, I have done that on purpose. My curiosity was geared towards testing if at all there exists any sort of a relationship between a health status indicator and government health care expenditure. In light of the growing importance of IMR both at the world stage (as given in the MDG programme) and India level too, I chose IMR as my dependent variable. My analysis did prove that government health care expenditure does have an important relationship in affecting the health of its population, a rise in the expenditure levels do have a significant impact on the IMR of states.

My finding reinstates the importance of government health care expenditure. In this era of shrinking government commitments towards socio economic parameters, where the focus is on curtailing the budget deficit it adds force to Samuelson's statement, "It is socially optimal for the government to finance and possibly provide public and merit goods." This coupled with the strong linkages that exist between the health of a country's population and its economic development; it also makes great economic sense.

Given the state of our health systems, means of financing health care expenditure for the mass of population, the existing health status including the disparity between various geographical regions and goals in terms of health status to be achieved-government expenditure on health is extremely critical.

8. Appendix -Tables

Per Capita government Health Care Expenditure at 1990 constant prices

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Andhra Pradesh	66.9	68.0	71.9	78.3	88.1	177.2	150.9	142.3	162.1	161.6	153.9	132.3	133.6	144.1
Assam	105.1	104.1	82.2	84.7	84.1	83.6	76.8	79.1	67.3	80.9	94.9	87.1	102.0	106.7
Bihar	48.6	57.4	53.0	55.7	55.5	60.5	42.4	43.0	43.8	75.4	69.5	49.1	51.9	50.2
Gujarat	96.9	103.7	106.4	109.9	123.2	104.7	104.3	122.9	151.1	166.2	195.8	98.0	129.7	128.2
Haryana	87.2	94.8	107.3	102.0	158.5	119.5	151.3	139.3	146.7	151.3	141.6	155.2	171.3	177.8
Himachal Pradesh	282.4	306.6	321.8	283.2	327.2	321.5	346.4	367.1	430.0	420.7	468.7	433.0	414.9	476.9
Karnataka	84.6	90.0	86.8	87.9	98.9	101.9	100.4	117.4	123.1	140.6	128.4	123.8	114.5	120.4
Kerala	101.0	93.1	86.7	98.4	103.4	108.3	105.7	114.3	109.8	129.6	118.0	116.5	118.5	139.5
Madhya Pradesh	69.6	70.7	71.9	83.2	86.6	82.6	90.8	92.9	105.7	106.7	102.2	83.7	98.4	93.9
Maharashtra	96.9	90.7	94.8	93.5	95.1	101.4	107.2	120.7	111.9	105.3	126.4	120.7	133.2	129.3
Orissa	63.9	74.2	74.8	72.0	77.1	89.8	87.3	86.5	97.9	94.0	88.1	84.9	103.3	99.1
Punjab	103.8	107.9	110.6	103.3	96.0	100.7	105.4	114.0	129.9	128.6	144.4	137.8	170.1	168.9
Rajasthan	120.9	129.4	131.3	144.4	156.0	166.1	158.5	168.8	179.1	157.7	164.9	169.4	181.9	191.8
Tamil Nadu	138.2	141.2	140.9	157.8	154.2	141.5	144.6	139.7	149.4	152.0	170.5	158.6	165.9	174.2
Uttar Pradesh	63.4	54.1	55.0	60.7	55.1	54.4	56.4	69.4	49.9	46.5	47.2	49.0	59.0	68.2
West Bengal	78.2	61.2	58.5	66.0	65.0	65.2	67.4	70.4	88.1	96.8	107.6	97.8	96.1	85.8

Per Capita government Health Care Expenditure as a percentage of NSDP at constant prices														
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Andhra Pradesh	3.25%	3.19%	3.53%	1.06%	1.14%	2.20%	1.77%	1.74%	1.77%	1.71%	1.51%	1.25%	1.26%	1.27%
Assam	6.81%	6.61%	5.28%	1.48%	1.47%	1.45%	1.33%	1.37%	1.19%	1.40%	1.60%	1.44%	1.64%	1.64%
Bihar	4.06%	5.20%	5.21%	1.83%	1.68%	2.22%	1.27%	1.39%	1.37%	2.30%	1.79%	1.38%	1.28%	1.36%
Gujarat	3.67%	4.35%	3.44%	1.12%	1.07%	0.90%	0.79%	0.94%	1.10%	1.25%	1.57%	0.74%	0.89%	0.76%
Haryana	2.49%	2.71%	3.14%	0.92%	1.37%	1.03%	1.20%	1.12%	1.15%	1.14%	1.02%	1.09%	1.17%	1.13%
Himachal Pradesh	12.60%	13.85%	14.20%	3.60%	3.85%	3.65%	3.79%	3.81%	4.24%	3.81%	4.25%	3.80%	3.51%	-
Karnataka	4.15%	3.98%	3.81%	1.12%	1.22%	1.22%	1.12%	1.25%	1.17%	1.29%	1.08%	1.07%	0.97%	-
Kerala	5.57%	5.10%	4.49%	1.24%	1.21%	1.24%	1.18%	1.26%	1.14%	1.27%	1.12%	1.09%	1.04%	1.15%
Madhya Pradesh	4.11%	4.60%	4.45%	1.26%	1.32%	1.22%	1.28%	1.27%	1.39%	1.29%	1.42%	1.09%	1.40%	1.13%
Maharashtra	2.78%	2.67%	2.47%	0.77%	0.78%	0.77%	0.80%	0.87%	0.79%	0.69%	0.89%	0.82%	0.86%	0.81%
Orissa	4.62%	4.85%	5.07%	1.47%	1.53%	1.73%	1.83%	1.61%	1.79%	1.64%	1.58%	1.43%	1.77%	1.54%
Punjab	2.78%	2.82%	2.81%	0.81%	0.75%	0.77%	0.77%	0.83%	0.91%	0.87%	0.96%	0.91%	1.11%	1.07%
Rajasthan	6.22%	7.37%	6.65%	2.34%	2.19%	2.30%	2.02%	1.96%	2.05%	1.84%	2.04%	1.98%	2.39%	2.24%
Tamil Nadu	2.77%	2.44%	2.11%	1.76%	1.47%	1.20%	1.09%	0.91%	0.86%	0.83%	0.84%	0.78%	0.77%	0.74%
Uttar Pradesh	1.77%	1.33%	1.27%	1.20%	0.96%	0.86%	0.75%	0.89%	0.59%	0.52%	0.51%	0.50%	0.57%	-
West Bengal	1.67%	1.15%	1.06%	0.98%	0.84%	0.72%	0.68%	0.60%	0.65%	0.65%	0.67%	0.55%	0.51%	0.45%

State-wise Projected Levels of Expectation of Life at Birth in India (1996-2001 to 2011-2016)								
	Male				Female			
States	1996-2001	2001-2006	2006-2011	2011-2016	1996-2001	2001-2006	2006-2011	2011-2016
Andhra Pradesh	61.55	62.79	63.92	64.94	63.74	65	66.16	67.23
Assam	57.34	58.96	60.44	61.77	58.84	60.87	62.7	64.36
Bihar	63.55	65.66	67.46	69.98	62.07	64.79	67.09	69.05
Gujarat	61.53	63.12	64.6	65.76	62.77	64.1	65.49	66.45
Haryana	63.87	64.64	65.5	66.03	67.39	69.3	70	70
Karnataka	61.73	62.43	63.1	63.73	65.36	66.44	67.43	68.35
Kerala	70.69	71.67	72	72	75	75	75	75
Madhya Pradesh	56.02	59.1	59.2	60.7	57.21	58.01	59.8	61.4
Maharashtra	65.31	66.75	67.68	69.02	68.19	69.76	71.13	72
Orissa	58.52	60.05	61.44	62.7	58.07	59.71	61.23	62.63
Punjab	68.39	69.78	70.88	71.74	71.4	72	72	72
Rajasthan	60.32	62.17	63.79	65.21	61.36	62.8	65.22	66.84
Tamil Nadu	65.21	67	68.45	69.64	67.58	69.75	71.54	72
Uttar Pradesh	61.2	63.54	65.48	67.1	60.1	64.09	66.6	68.72
West Bengal	64.5	66.08	67.42	68.57	67.2	69.34	71.11	72
India (Pooled) *	**62.3**	**63.87**	**65.65**	**67.04**	**65.27**	**66.91**	**67.67**	**69.18**
India	**62.36**	**64.11**	**65.63**	**66.93**	**63.39**	**65.43**	**67.22**	**68.8**

Source: Population Projection for India and states, 1996-2016, Registrar General, Ministry of Home Affairs

State-wise Life Expectancy at Birth by Sex in India

(1992-1996, 1993-1997, 1994-1998, 1995-1999, 1996-2001 and 2001-2006)

	1992-96		1993-97		1994-98		1995-99		1996-01		2001-06	
States/UTs	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
India #	**60.1**	**61.4**	**60.4**	**61.8**	**60.6**	**62.2**	**60.8**	**62.5**	**62.4**	**63.4**	**64.1**	**65.4**
Andhra Pradesh	60.8	63	61.2	63.5	61.4	63.7	61.6	64.1	61.5	63.7	62.8	65
Arunachal Pradesh	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Assam	56.1	56.6	56.6	57.1	56.9	57.4	57.1	57.6	57.3	58.8	59	60.9
Bihar	60.2	58.2	60.4	58.4	60.5	58.7	60.7	58.9	63.6	62.1	65.7	64.8
Goa	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Gujarat	60.5	62.5	60.9	62.9	61.4	63.3	61.9	63.7	61.5	62.8	63.1	64.1
Haryana	63.4	64.3	63.7	64.6	63.9	64.8	64.1	65	63.9	67.4	64.6	69.3
Himachal Pradesh	64.4	65	64.6	65.2	64.8	65.5	65.1	65.8	NA	NA	-	-
Jammu & Kashmir	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Karnataka	61.1	64.5	61.6	64.9	62	65.3	62.4	65.5	61.7	65.4	62.4	66.4
Kerala	70.2	75.8	70.4	75.9	7.5	76	70.6	76.1	70.7	75	71.7	75
Madhya Pradesh	55.1	54.7	55.6	55.2	56	55.7	56.5	56.2	56.8	57.2	59.2	58
Maharashtra	63.8	66.2	64.1	66.6	64.3	66.8	64.5	67	65.3	68.1	66.8	69.8
Manipur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Meghalaya	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Mizoram	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Nagaland	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Orissa	56.9	56.6	57.1	57	57.4	57.5	57.6	57.8	58.5	58.1	60.1	59.7
Punjab	66.4	68.6	66.7	68.8	66.8	69	66.9	69.1	68.4	71.4	69.8	72
Rajasthan	58.6	59.6	59.1	60.1	59.4	60.4	59.8	60.9	60.3	61.4	62.2	62.8
Sikkim	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Tamil Nadu	62.8	64.8	63.2	65.1	63.5	65.5	63.7	65.7	65.2	67.6	67	69.8
Tripura	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Uttar	57.7	56.4	58.1	56.9	58.5	57.3	58.9	57.7	61.2	61.1	63.5	64.1

Pradesh												
West Bengal	61.8	63.1	62.2	63.6	62.5	63.9	62.8	64.3	64.5	67.2	66.1	69.3
Andaman & Nicobar Islands	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Chandigarh	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Dadra & Nagar Haveli	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Daman & Diu	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Delhi	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Lakshadweep	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-
Pondicherry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-

Source: Sample Registration Survey, Registrar General of India

Projected Levels of Infant Mortality Rate (1996-2016)								
	Males				Females			
States	1996-2001	2001-2006	2006-2011	2011-2016	1996-2001	2001-2006	2006-2011	2011-2016
Andhra Pradesh	65	59	53	48	56	50	44	39
Assam	64	53	44	36	61	51	43	36
Bihar	54	43	35	28	55	44	35	28
Gujarat	46	34	26	21	44	33	25	19
Haryana	54	46	39	34	57	46	38	31
Karnataka	76	76	76	75	67	66	65	64
Kerala	13	10	9	9	9	8	8	8
Madhya Pradesh	99	91	83	76	101	94	88	83
Maharashtra	46	39	33	29	46	40	34	30
Orissa	106	97	89	81	105	98	93	87
Punjab	44	39	34	30	51	45	40	36
Rajasthan	64	53	44	37	65	52	43	35
Tamil Nadu	46	38	31	26	43	34	28	23
Uttar Pradesh	64	49	37	29	74	57	45	36
West Bengal	54	46	40	35	56	51	47	43
India (Pooled)	60	50	42	35	61	51	43	36
India	63	53	45	38	64	54	45	39

Source: Population Projection for India and states, 1996-2016, Registrar General of India

State-wise Infant Mortality Rate in India (1990-2003)														
States	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Andhra Pradesh	70	73	71	64	65	67	65	63	66	66	65	66	62	60
Assam	76	81	76	81	78	77	74	76	76	76	75	74	70	70
Bihar	75	69	73	70	67	73	71	71	67	63	62	62	61	59
Gujarat	72	69	67	58	64	62	61	62	64	63	62	60	60	57
Haryana	69	68	75	66	70	69	68	68	70	68	67	66	62	62
Himachal Pradesh	69	75	67	63	67	63	62	63	64	62	60	54	52	51
Karnataka	70	77	73	67	67	62	53	53	58	58	57	58	55	52
Kerala	17	16	17	13	16	15	14	12	16	14	14	11	10	11
Madhya Pradesh	111	117	104	106	98	99	97	94	98	90	87	86	85	82
Maharashtra	58	60	59	50	55	55	48	47	49	48	48	45	45	42
Orissa	122	124	115	110	103	103	95	96	98	97	95	91	87	83
Punjab	61	53	56	55	53	54	51	51	54	53	52	52	51	49
Rajasthan	84	79	90	82	84	86	85	85	83	81	79	80	78	75
Tamil Nadu	59	57	58	56	59	54	53	53	53	52	51	49	44	41
Uttar Pradesh	99	97	98	94	88	86	85	85	85	84	83	83	80	76
West Bengal	63	71	65	58	62	58	55	55	53	52	51	51	49	43
Chhatisgarh	NA	NA	NA	NA	NA	NA	NA	NA	94	78	79	77	73	72
Jharkhand	NA	NA	NA	NA	NA	NA	NA	NA	62	71	70	62	51	50
Delhi	NA	NA	NA	NA	NA	NA	NA	NA	36	31	32	29	30	30
Goa	NA	NA	NA	NA	NA	NA	NA	NA	23	21	23	19	17	17

Arunachal Pradesh	NA	NA	NA	NA	NA	NA	NA	NA	44	43	44	39	37	34
Jammu & Kashmir	70	NA	NA	NA	NA	NA	NA	NA	45	52	50	48	45	49
Manipur	NA	NA	NA	NA	NA	NA	NA	NA	25	25	23	20	14	44
Meghalaya	NA	NA	NA	NA	NA	NA	NA	NA	52	56	58	56	61	16
Mizoram	NA	NA	NA	NA	NA	NA	NA	NA	23	19	21	19	14	57
Nagaland	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	N.A.	N.A.	N.A.	N.A.
Sikkim	NA	NA	NA	NA	NA	NA	NA	NA	52	49	49	42	34	33
Tripura	NA	NA	NA	NA	NA	NA	NA	NA	49	42	41	39	34	32
Uttaranchal	NA	NA	NA	NA	NA	NA	NA	NA	58	52	50	48	41	41
Andaman & Nicobar Islands	NA	NA	NA	NA	NA	NA	NA	NA	30	25	23	18	15	18
Chandigarh	NA	NA	NA	NA	NA	NA	NA	NA	32	28	28	24	21	19
Dadra & Nagar Haveli	NA	NA	NA	NA	NA	NA	NA	NA	61	56	58	58	56	54
Daman & Diu	NA	NA	NA	NA	NA	NA	NA	NA	51	35	48	40	42	39
Lakshadweep	NA	NA	NA	NA	NA	NA	NA	NA	26	32	27	33	25	26
Pondicherry	NA	NA	NA	NA	NA	NA	NA	NA	21	22	23	22	22	24
India	**80**	**80**	**79**	**74**	**74**	**74**	**72**	**71**	**72**	**70**	**68**	**66**	**63**	**61**

Source: Sample Registration Survey, Registrar General of India

9. Bibliography

Acharya and Ranson (2005) 'Health Financing for the poor', Economic and Political Weekly, Pages- 4141- 4150

Ahuja and De (20004) 'Health Insurance for the poor', Economic and Political Weekly- www.epw.org.in

Ahuja.R (2004) 'Health Insurance fro the Poor in India' , Working Paper No. 123, Indian Council for Research on International Economic Relations

Banerji (2005) 'Politics of Rural Health in India', Economic and Political Weekly – www.epw.org.in

Chakrabarti and Rao (2006), 'Variation in health expenditures: is it just income or other factors? Emperical investigation using a panel of Indian states', Journal of Quantative Economics, Pages 158-179

Duggal (2006) 'Is the trend in Helath Changing', Economic and Political Weekly- www.epw.org.in

Eliis, Alam and Gupta (2000) 'Health Insurance in India Pages 207- 2217

Gerdtham, Soggard, Andersson and Johsson (1992) 'An Econometric analysis of health care expenditure: A cross –section study of the OECD countries' Journal of Health Economics issue no.11 Pages 63-84

Gujarati 'Basic Econometrics', McGraw-Hill International Editions

Globerman and Vining (1998) 'A Policy Perspective on "mixed" Health Care Financial Systems of Business and Economics', Journal of risk and Insurance, Vol. 65, No.1, 57-80

Hollingsworth and Wildman (2002) 'Efficiency of Health Production: Reestimating the WHO Panel Data Using Parametric and Nonparametric Approaches to provide additional information', Working Paper No.131. Centre for health programme evaluation, Monash University, Australia

Jamison, D T, M Sandbu, J Wang (2001) 'Cross Country Variation in Mortality Decilne, 1962-87: The Role of Country Specific Technical Progress', CMH Working Paper Series Paper No. WGI: 4, Commision of Macroeconomics and Health , WHO

Meashram, Rao, Jamison, Wang and Singh (1999) 'Economic and Political Weekly' – epw.org.in

National Council of Applied Economic Research 'Who Benefits from Public Health Spending in India'

Rao.S (2004) 'Health Insurance- Concepts, Issues and Challenges', Pages- 3835 to 3844

Reddy and Selvaraju (1994) 'Health Care Financing by Government in India', National Institute of Public Finance and Policy, New Delhi

Sankar and Kathuria (2004), 'Health System Performance in Rural India, Efficiency Estimates across States', economic and Political Weekly Pages 1427-1433

Vartharajan, Godwin and Arun (2004) 'Unimaginative Tinkering' Economic and Political Weekly, Pages 3671- 3674

Visaria,P and A.Gumber (1994). Utilisation and Expenditure on Healthcare in India: 1986-87, Gujarat Institute of Dvelopment Research, Ahmedabead, India

World Bank (1987) 'Financing Health Services in Developing Countries: An agenda for reform' World Bank, Washington

World Bank (2005) 'The World Development Indicators'