

Major Research Project on
Paying for Healthcare in India: Financing Challenges and Long-term
projection of Healthcare Cost

Submitted By:

Bhawna Mehta

2K17/MBA/020

Under Guidance of:

Dr Archana Singh

Delhi School of Management

Delhi Technological University



DELHI SCHOOL OF MANAGEMENT

Delhi Technological University

Bawana Road Delhi 110042

I. INTRODUCTION

A. *Land of India at Glance*

India, one of the world's most promising developing nations of the world and the largest democracy, is a country of diversity as well as rich cultural heritage. It is a Lower middle-income country in the South Asia region (data.worldbank.org, Country Profile: India) The entire land of 3.3 million square km area witnesses an overall tropical monsoon climate marked by relatively high temperatures and dry winters.

1) *India A Macro-economic view:*

India's current Gross Domestic Product is US\$2.601 trillion as of 2017. It is projected to grow at over 7% per year. (data.worldbank.org, Country Profile: India) World Bank's estimate of India's GINI index in the year 2011 was **35.1**. "Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. A Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality." (World Bank)

% Income Share held by various income groups India

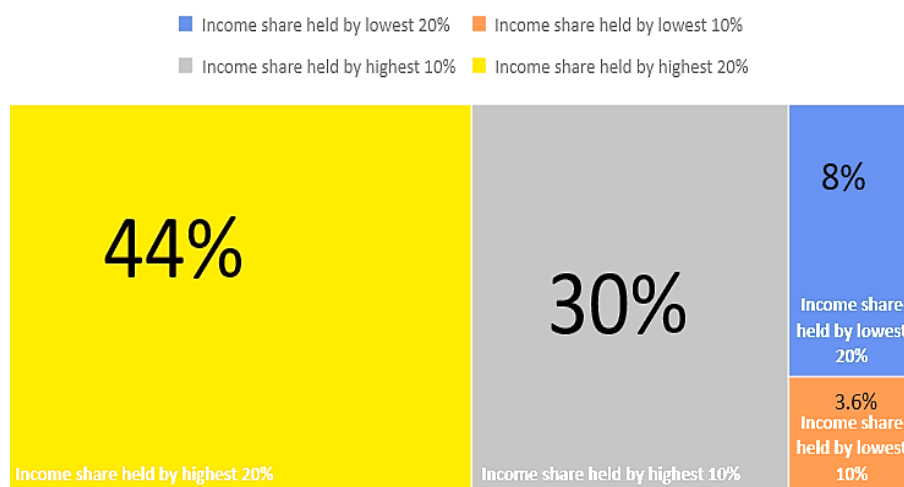


Fig. 1: % income share held by the different quartiles of the population based on income

2) *Demographic*

Characteristics:

According to the National portal of India india.gov.in, it has a population of 1,210,193,422 (623.7 million-male and 586.4 million-female) as on the

last census of 2011. This is equivalent to 17.8% of the world's population. Fig. 2 shows below an increasing trend in the decadal growth rate which is kind of stabilizing around 2011. Despite that the population density is enough to garner inequities in the kind of healthcare that all can receive.

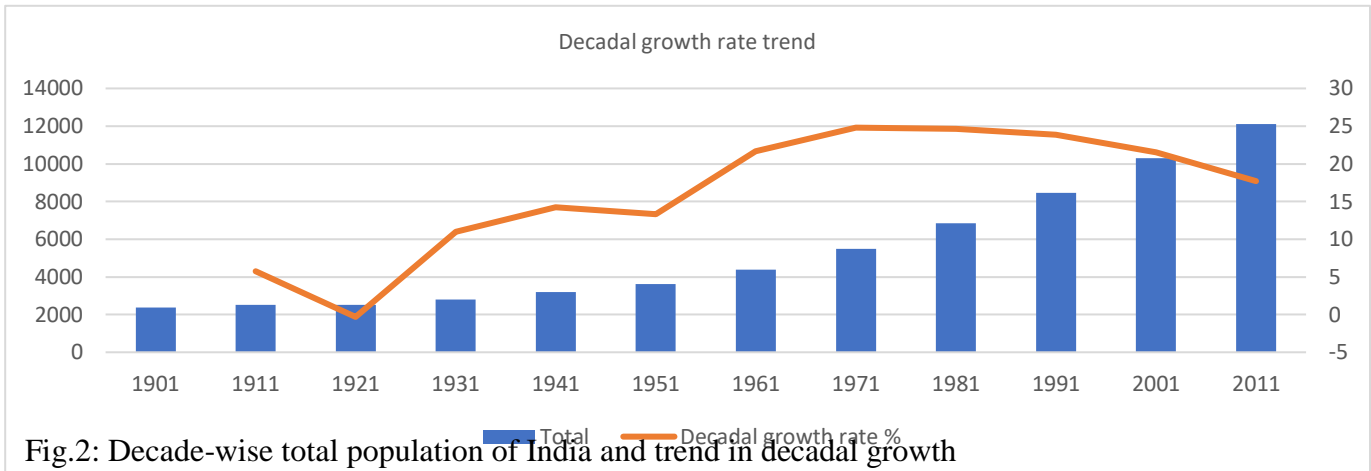
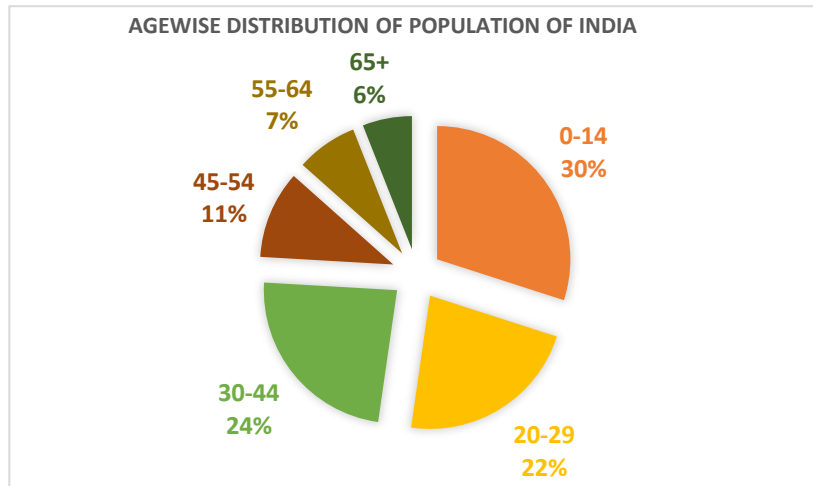


Fig.2: Decade-wise total population of India and trend in decadal growth

The individuals in the age groups 0-14 and 65 and above together make up 36% of the total population. This segment is the major contributing factor towards the ailments and healthcare requirements and hence the trend in this composition might critically affect the trend in healthcare expenditure.



Data Source: SRS Statistical Report, 2016

Fig. 3: Age-wise distribution of the population

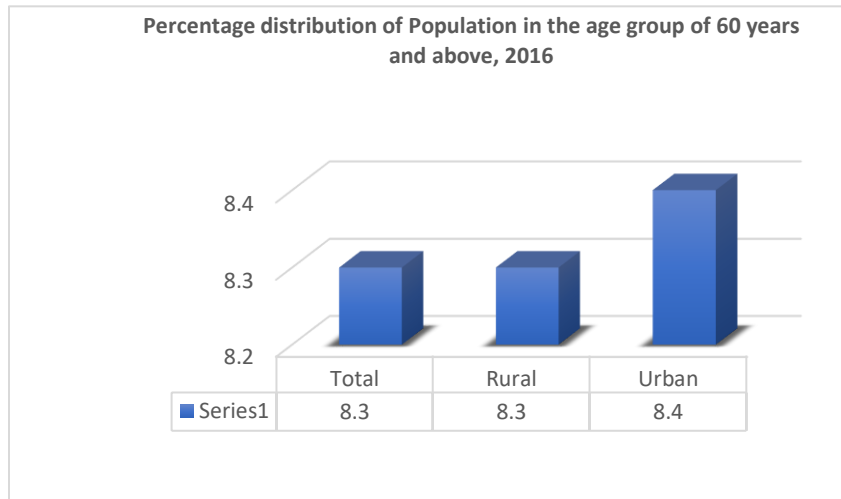


Fig. 4: Trend in the share of population aged 60 and above in the total population

The India Story

India is one of the top countries in the world facing a large disease burden. As the chart below shows, India fares worse than the developed nations like US and its neighbour China and the gap is huge when it comes to the total number of years lost due to disease burden. While among the developing countries India fares better than Pakistan only, Bhutan, Nepal and Bangladesh all being at a better position. Zimbabwe is one country which has been able to greatly reduce its disease burden in the 12 years in review.

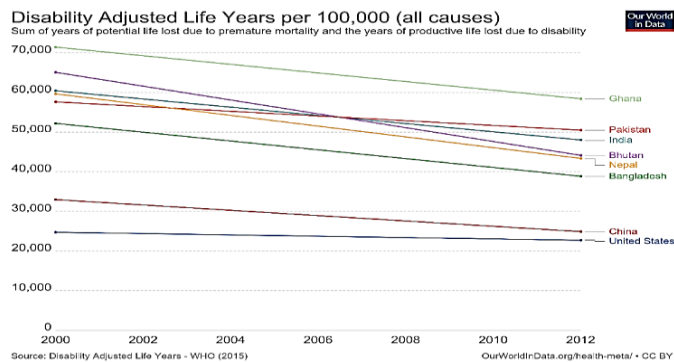


Fig. 5: A comparison of few countries from different income groups for disease burden

As is the case with low-and-middle income countries around the world India also suffers from the same problem of very low public spending on healthcare and inadequate Government intervention despite the high disease burden and poor access to healthcare services in the country. Though recent years have seen progress by the State to achieve Universal Healthcare Access, there is still a long way to go.

General barriers to Healthcare in India

- Poor transportation and road infrastructure
- Unawareness of rights and facilities available
- No or poor access in rural and suburban areas
- Plethora of services limited to high income groups
- Market imperfections in the healthcare value chain
- Huge gap in the product and service pricing of Public and Private sector

The entire value chain of healthcare in India spans all the way from patients with symptoms to healthcare providers, doctors, nurses, medicine and medical suppliers, manufacturers, Government and back to cured patients. Highly evolved standards of medical care in private hospitals in India due to advancements in medical technology and practice and innovation at cost effective prices continue to lure patients who desire treatment and recovery at Indian private sector. On the other hand, domestic patient is still far from receiving high quality healthcare services at affordable prices.

Broadly, the health financing models prevalent in India are “Central Government Health Scheme by the Government of India, Social Health Insurance by Public or Private facilities, Community based Health Insurance-Pooling, Voluntary Private Health Insurance, Out of Pocket payments.” (Pablo Gottret, 2005)

1) *The Supply Side:*

According to data from ibef.org/industry/healthcare-india (Indian Brand Equity Foundation), Healthcare is quite a huge market in India with expected size of USD 372 billion by the end of 2022 wherein the hospital industry is to grow at an expected CAGR of 16-17%.

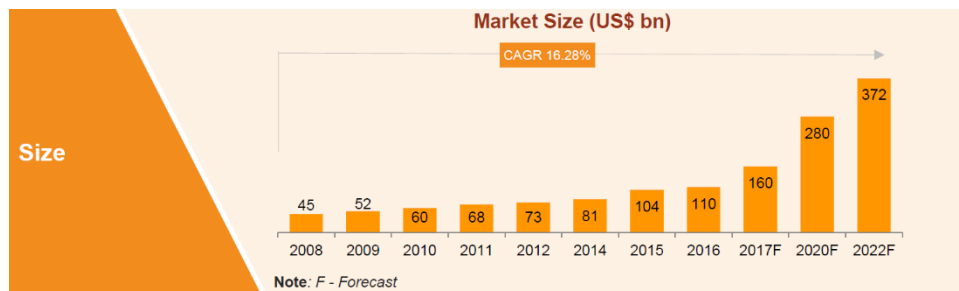


Fig. 6: Market size of healthcare US\$ billion and growth in 10 years

The two major healthcare providers in the country are the Public and the Private sector. While there is a huge difference in the cost as well as quality of care in the two. “The public providers for health care include government hospitals, clinics, dispensaries, Primary Health Centres (PHCs) and the Community Health Centres (CHCs), Mobile Medical Unit (MMU) and the state and central government assisted ESI hospitals and dispensaries. The ‘private’ sources of healthcare providers include private doctors, nursing homes, private hospitals, charitable institutions.” (NSSO Survey, 2014) Four alternatives are eventually available to a diverse population of India: Big Private hospitals, Public hospitals, Private nursing homes and Medical quacks. (Esposito, M., Kapoor, A. and Goyal, S., 2012) Figure shows the percentage of deaths after receiving medical attention at either Private or Government hospitals. Throughout the years the percentage is consistently higher in Urban areas.

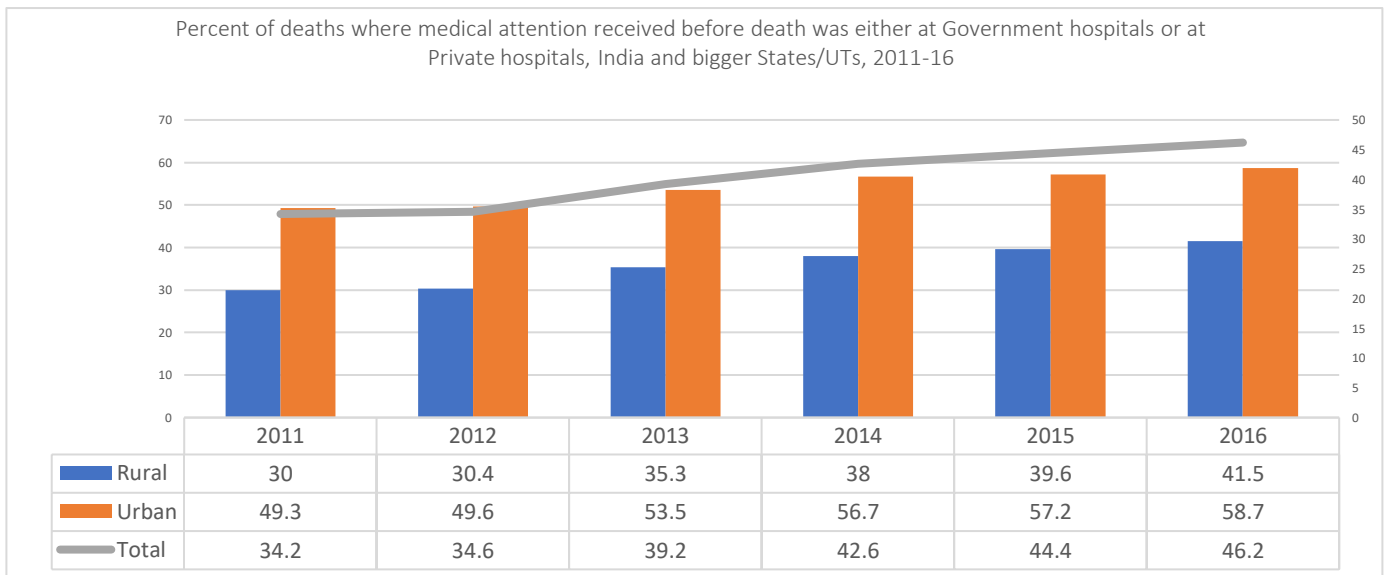


Fig. 7: Comparison of percentage of deaths after receiving medical attention at hospitals in Urban and rural areas

There is a total of 346 CGHS wellness centres across the country which consist of about 2300 doctors hosting both ayurvedic and allopathic treatment.

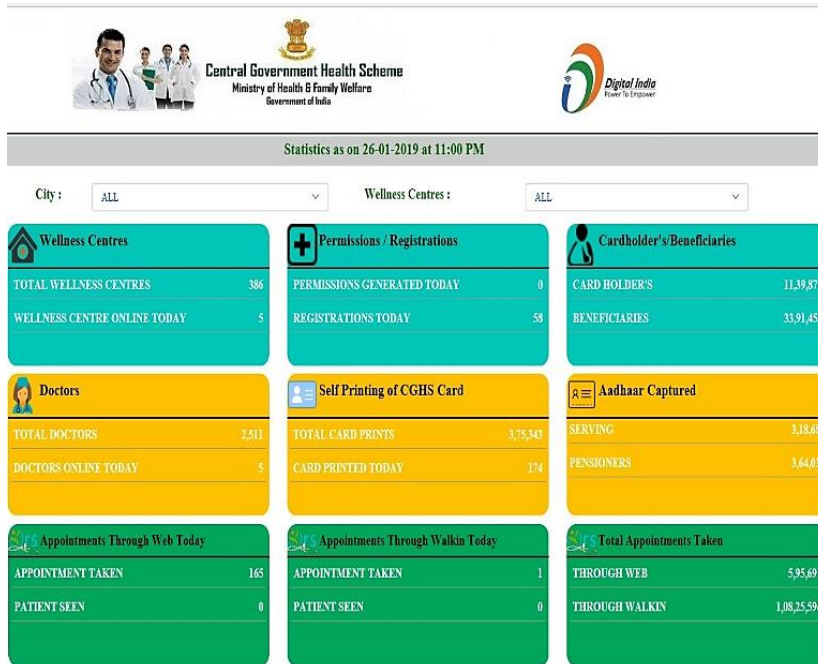


Fig. 8 A view of the CGHS page showing the count of operating wellness centres, beneficiaries statistics on a day

Various sections of the population are forced to forgo good quality care owing to the infrastructure not being robust as to support prompt financing, payments, medical equipment, hospital beds, doctors and nurses. A distrust in the public sector facilities and services is also existent as is validated by a survey conducted as a part of this study.

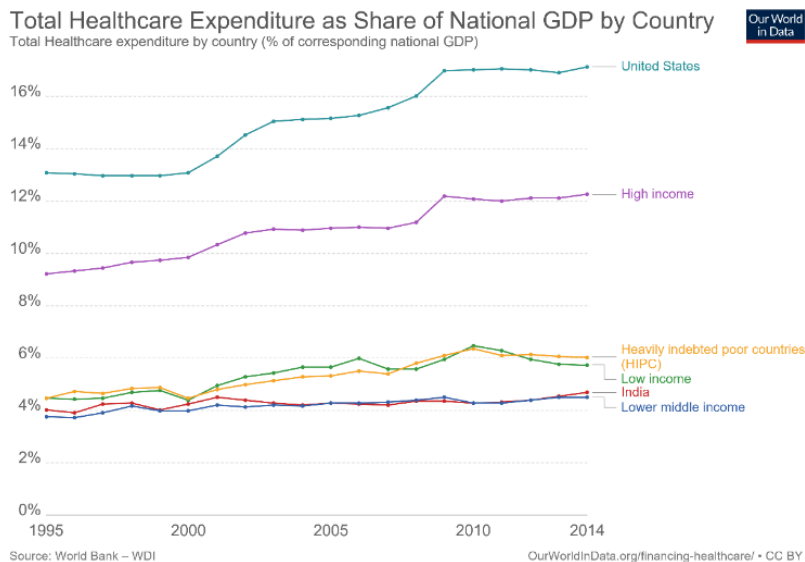


Fig. 9: Comparison of different countries for healthcare spending as a share of GDP

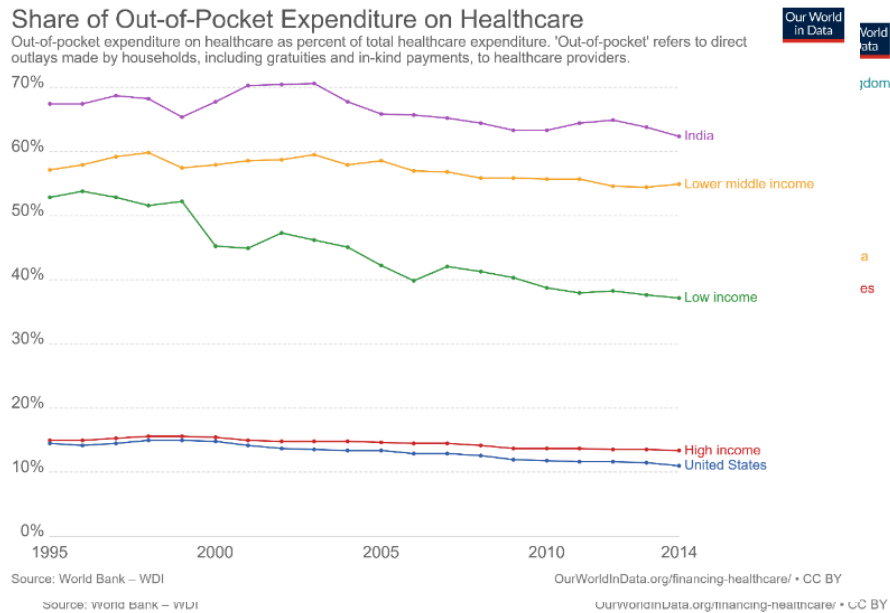


Fig. 10: Trend of public spending as a share of total healthcare expenditure; a comparison of countries across the worlds

Fig. 11: Comparison of countries on share of Out of Pocket expenditure in total health spending

2) *The Demand Side:*

When we take a panoramic view of the world, there is a stark difference in how different countries belonging to distinct Nation groups (with respect to national income) have changed the way of embracing healthcare expenditure.

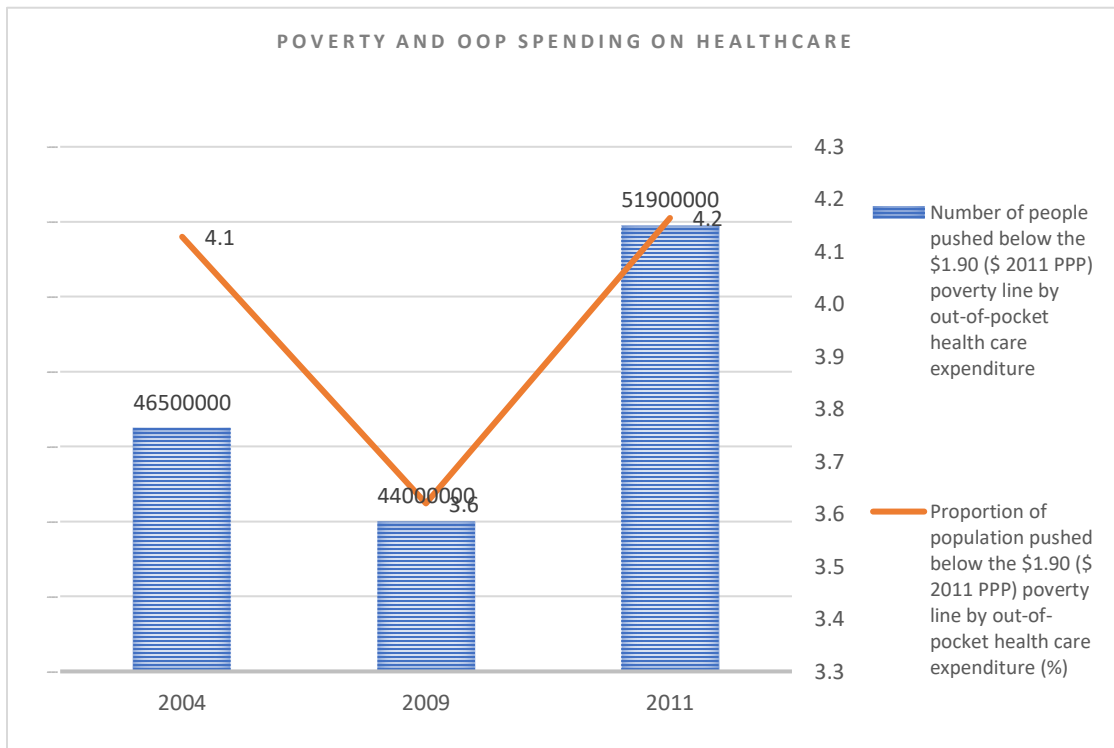


Fig. 12: Share of population pushed into poverty due to Out of pocket spending

3) *Is a Health insurance enough:*

The problem with the health insurance industry in India is that it is very much fragmented. A health insurance policy is a contract between the insurer and the insured. Owing to the private insurance providers there is a plethora of customized products available for persons seeking relief against unanticipated medical expenses at some future time.

Despite that over 70% of people in the country are not covered by any type of health insurance as evidenced by primary and secondary research. Furthermore, the nature of these insurance products is so that the present infrastructure is not able to fully benefit those taking it. In most of the cases, the reimbursement covers only in-patient expenses and hospitalization expenses. The major kinds of health insurance policies available in India

- Hospitalization Health Insurance Policy
- Critical Illness Health Insurance Policy
- Hospital Daily Cash Bonus Policy
- Personal Accidental Insurance Policy
- Tax Saving Health Insurance Policy
- Family Floater Health Insurance Policy
- Group Health Insurance Policy
- Disease specific Health Insurance Policy

RESEARCH OBJECTIVES

This paper does not intend to comment on the healthcare infrastructure in detail. The infrastructure which consists of the networks and linkages in the healthcare ecosystem is assumed to be consisting of healthcare delivery organizations; patients; supporting elements-pharmaceutical and the medical equipment suppliers and manufacturers.

The research work seeks to fulfil two objectives:

[1] To determine the most significant sources of financing healthcare by Indian households.

The first objective seeks to determine a few aspects of health financing from the demand side i.e. the general individual through objectively analysing their outlook towards treatment of ailments at healthcare providers and sources of financing the costs involved. The sensitivity of different age groups, gender, income classes, and rural/ urban region dwellers is different to healthcare expenditure and choice of allocation of budget.

Though health financing includes the Bottom of Pyramid section of the country, but this aspect is concerned with provision of healthcare services such that minimum requisite levels are reached. We assume that a basic level of primary healthcare is existing and accessible to all.

[2] To predict the long-term healthcare expenditure and the trend in healthcare costs.

II. RESEARCH METHODOLOGY

To achieve the objectives mentioned above, a survey was administered to a representative sample of the population. Relevant studies, research papers, industry reports and public databases were consulted for secondary data and prior work and insights on alternative solutions and existing scenario. A survey was administered to a sample of 115 individuals from various age groups, residential locations, income groups and occupations to analyze their outlook on healthcare services and health financing. Short interactions with professionals from healthcare as well as some segments of population whose participation is more significant

For the purpose of computing the dependent variable CHEanngrowthpercent (annual growth rate in current health expenditure) as a function of the independent variables: GDPanngrowthpercent (percentage change in GDP); Inflation (the rate of inflation); the average of Life_expectancy(percentage change in life expectancy (years) year-on-year) and Mortality_rate (Percentage change

in mortality rate year-on-year) as med_tech, the requisite historical data was collected from Global Health Expenditure database and World Bank Data, Country Profile, India.

QUANTITATIVE ANALYSIS

Multiple Regression technique was used to model the relationship between the dependent variable, Current per capita health expenditure and the independent variables: GDP per capita, Inflation rate, Annual growth rate in population aged 65 years and above. Following tools and tests were used to verify the model assumptions and analyse the data.

Coefficient of Multiple regression, R-Squared

Correlation Analysis

Frequency Analysis

Tests for checking stationarity of time series data-Unit Root Test

Granger's Causality Test

III. ANALYSIS AND DISCUSSION

The basic question that the survey sought to address was whether health expenditure is a significant factor impacting a general household in India and if Out of Pocket spending was a prominent source of health payments as claimed in various research papers and reports. NSSO report makes it clear that in the past 30 years, private hospitals have treated more number of in-patients than the public hospitals and there is no significant difference in Rural and Urban areas in this regard.

type of hospital	percentage of hospitalised cases in					
	rural			urban		
	1995-96	2004	2014	1995-96	2004	2014
(1)	(2)	(3)	(4)	(5)	(6)	(7)
public	44	42	42	43	38	32
private	56	58	58	57	62	68
all	100	100	100	100	100	100

Fig. 15: Hospitalised cases treated at public and private hospitals in urban and rural areas

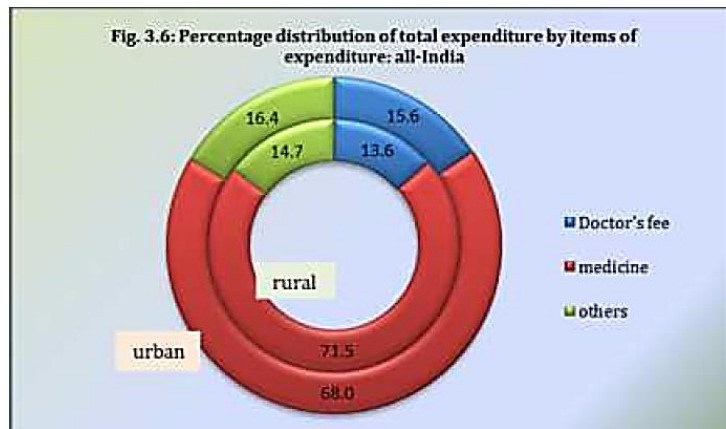
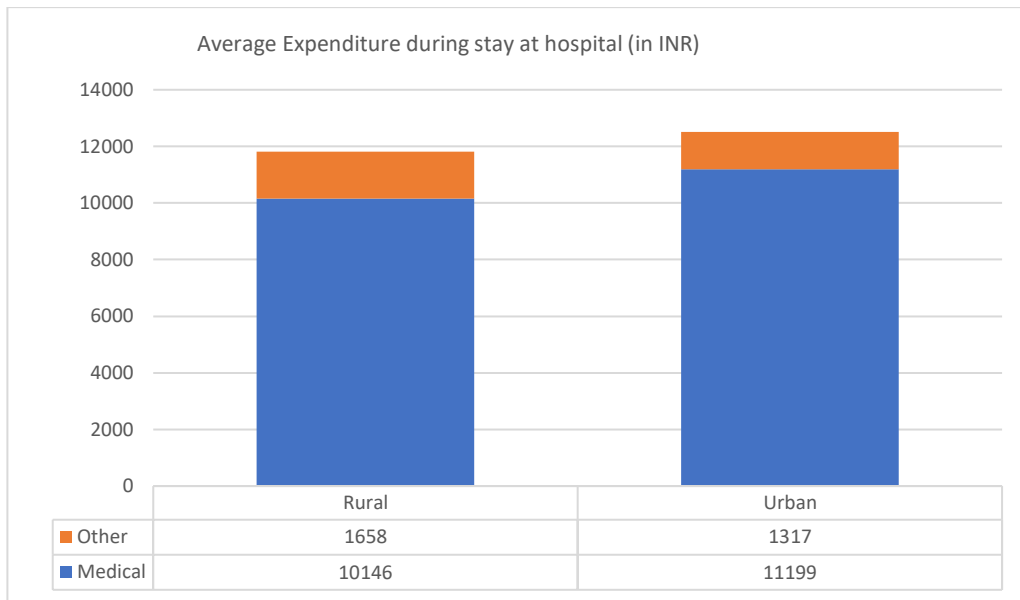


Fig. 16: Major heads under total health expenditure as reported in the survey by NSSO

“At all-India level around 72% in rural sector and 68% in urban sector of the total medical expenditure was done for purchasing ‘medicine’. Second in this list for both for rural (15%) and urban sector (16%) was ‘Diagnostic test and other expenditure’, followed by ‘doctor’s fee’.”



Data source: Key Indicators of Social Consumption in India Health, NSS 71st Round, Jan-Jun 2014

Fig. 18: Average expenditure during stay at hospital (medical and non-medical)

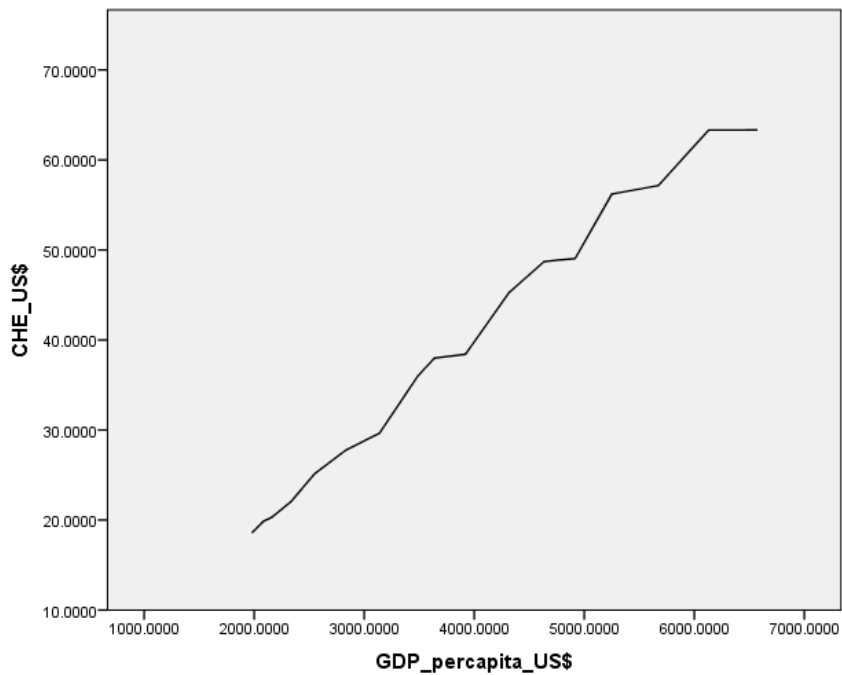


Fig. 19: Relationship between total health expenditure and GDP per capita

In 2014, average medical expenditure attributed to hospitalization was 63.6% more in Urban areas as compared to the rural areas while non-medical expenses during hospitalization were 1% lower in urban areas.

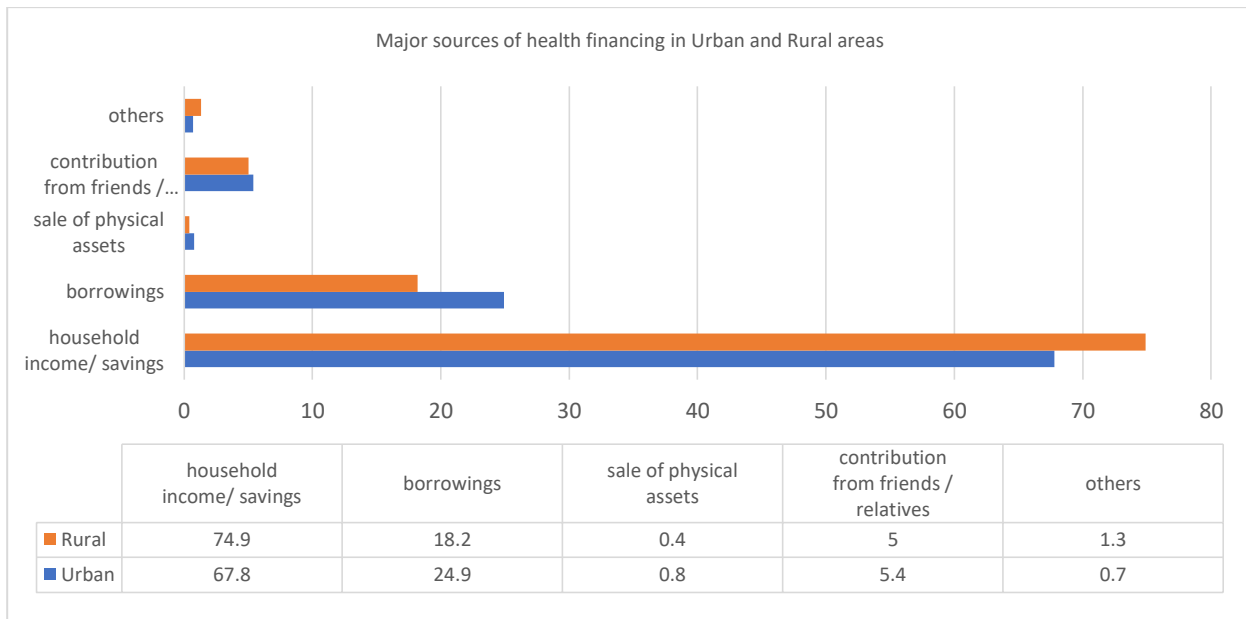


Fig. 20: Sources of health financing in urban and rural areas

Our survey says 66.66% of individuals in rural areas are not covered under any health insurance scheme while the corresponding percentage is 37% in the Urban regions.

Row Labels	Count of Are you covered by any type of health plan?
No	53
Rural	22
Urban	31
Yes	64
Rural	11
Urban	53
Grand Total	117

Fig. 21: Coverage of health plans in Rural and Urban areas as per survey conducted

The survey also tried to gauge if there was a significant impact of health expenditure on the budget of households.

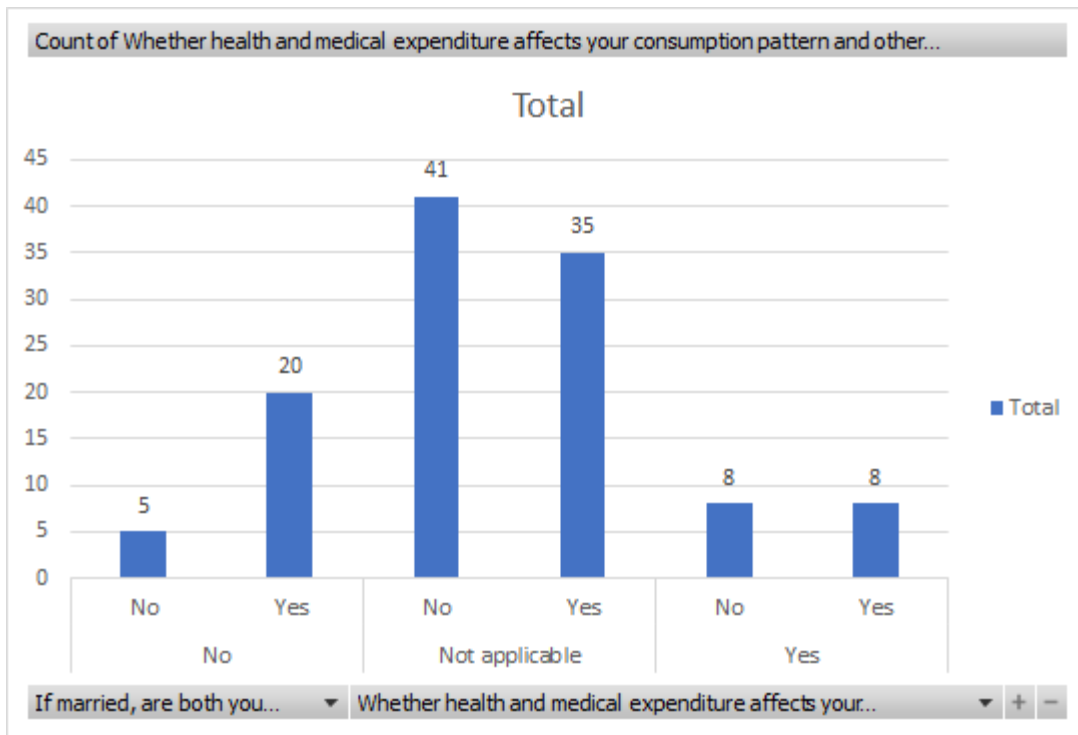


Fig. 22: Whether medical expenditure is significant: Both spouses earn, One of the spouse earns, Unmarried

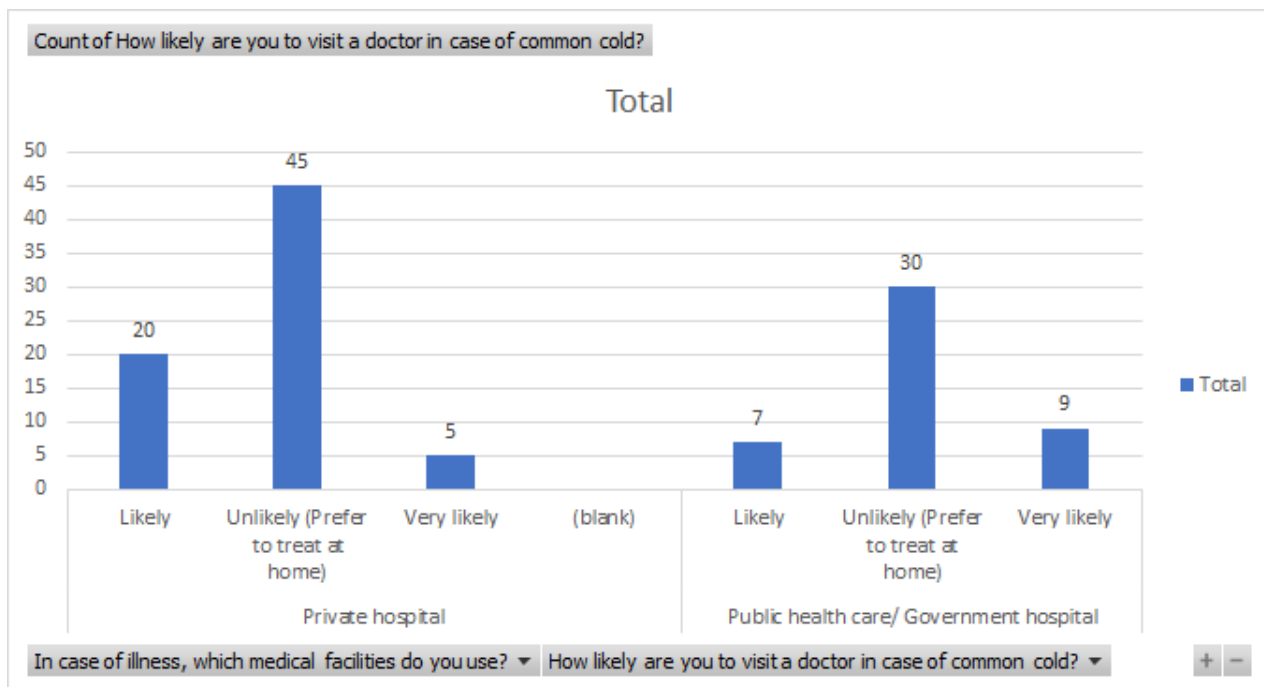


Fig. 23: Frequency of hospital visits compared for respondents using Private and Public facilities

A. Modeling of future healthcare costs

Deriving from the model developed by Thomas E. Getzen (2007) to predict long-term healthcare costs in US, we attempt to predict the Current per capita health expenditure in India using the historical longitudinal data for health expenditure, macro-economic and demographic factors.

Here, the Current Health Expenditure per capita is the sum total of domestic public and private health expenditure including “others”. Professor Thomas E. Getzen in his model used the variables: growth in real income (GDP); Inflation rate (Consumer price index) and the baseline value of share of GDP equivalent to Healthcare.

For the purpose of estimating the dependent variable CHE_US\$ (current health expenditure per capita) as a function of the independent variables: GDP (per capita GDP); Inflation (the rate of inflation in the economy); and annual growth rate of population aged 65 years and above, then adjusted for medical costs growth due to changes in technology and innovation using the average of Life_expectancy(percentage change in life expectancy (years) year-on-year) and Mortality_rate (Percentage change in mortality rate year-on-year) as proxy med_tech, the requisite historical data was collected from Global health Expenditure database and World Bank Data, Country Profile, India.

Following assumptions were made and (and few are verified statistically) in continuation with and in addition to the Thomas Getzen model:

- i. Basic structure of medical practice in India will not suddenly undergo radical change.
- ii. Current and historical figures are sound basis for projecting future expectations in healthcare expenditure rates.
- iii. Life expectancy and mortality rate are together sufficiently able to predict trend due medical technology and innovation.

Assumptions of linear regression:

- i. Multicollinearity

To check multicollinearity, Variance Inflation Factor for all independent variables was computed in SPSS. there is no multicollinearity in GDP_percapita_US\$ and Inflation, Pop_aged_ann_growth is slightly multi-collinear with CHE_US\$.

The data then was assumed to have no multicollinearity.

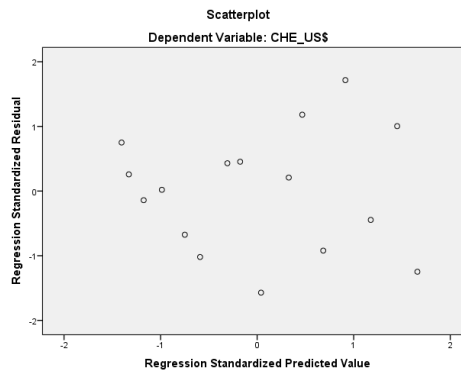
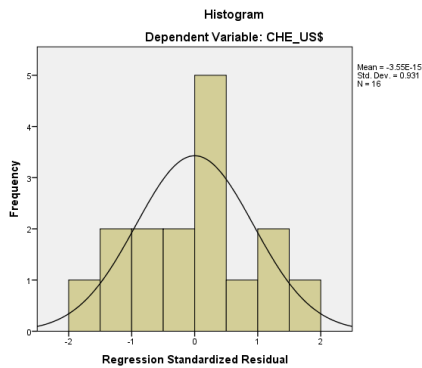
Coefficients^a

Model		Collinearity Statistics	
		Tolerance	VIF
1	GDP_percapita_US\$.446	2.242
	Inflation	.512	1.954
	Pop_aged_ann_growth	.310	3.225

a. Dependent Variable: CHE_US\$

ii. Heteroscedasticity

Breusch-Pagan Test and Koenker Test were used to test heteroscedasticity in the data



The scatter plot visualisation shows that there is homoscedasticity.

iii. Autocorrelation

To test for autocorrelation, the Durbin-Watson statistic was computed in SPSS. The Durbin-Watson statistic was found to be 2.656. Therefore, no significant autocorrelation was found in the data.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.996 ^a	.993	.991	1.4562269	2.656

a. Predictors: (Constant), Pop_aged_ann_growth, Inflation,

b. Dependent Variable: CHE_US\$

IV. FINDINGS AND RECOMMENDATIONS

A. Health financing sources and impact on household expenditure

Mean Out of Pocket Spending on healthcare per person in India was 26.27 USD (equivalent to INR 1865) between 2000 and 2016.

Nature of health insurance scheme/plan

116 responses

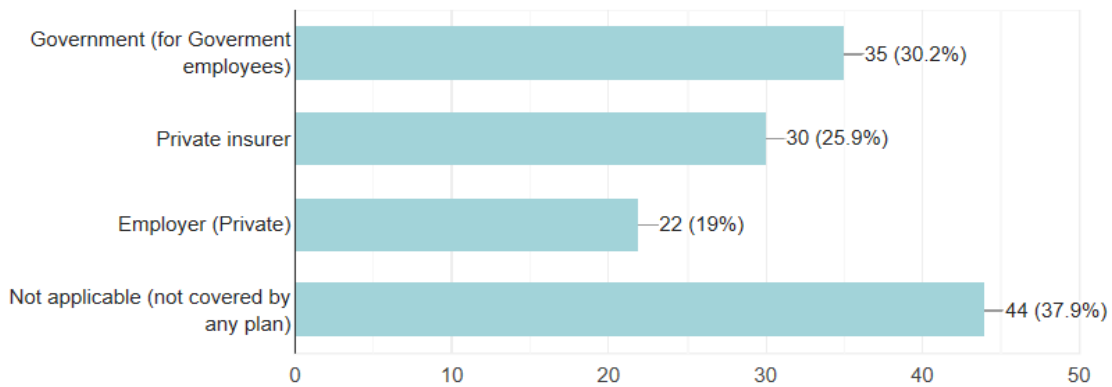


Fig. 24: Bar chart depicting coverage of the sample individuals (respondents) under different health plans (Both Urban and Rural areas)

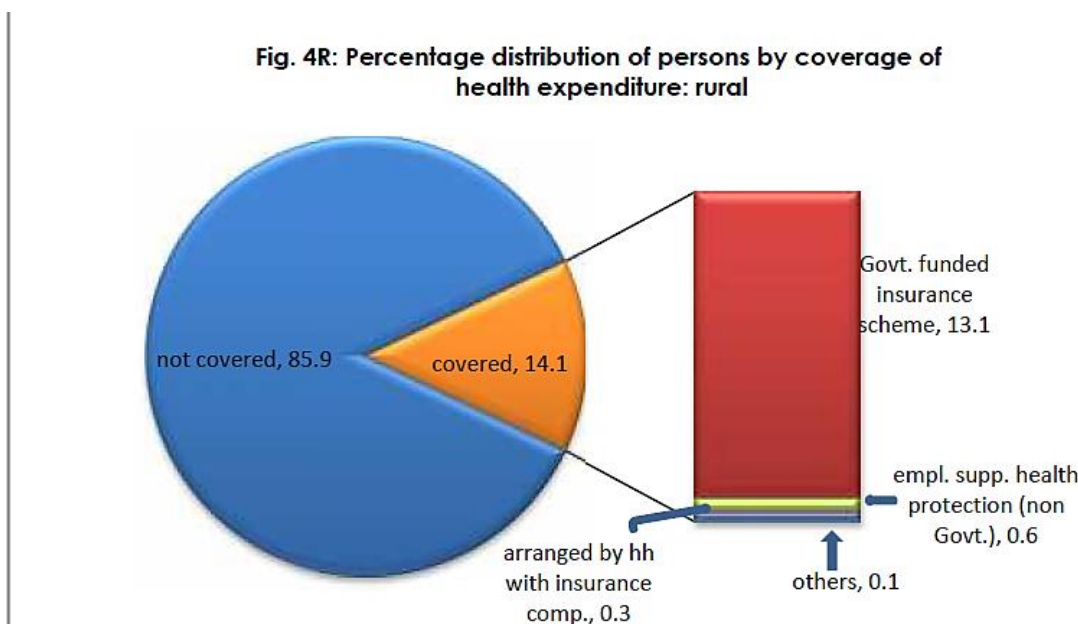
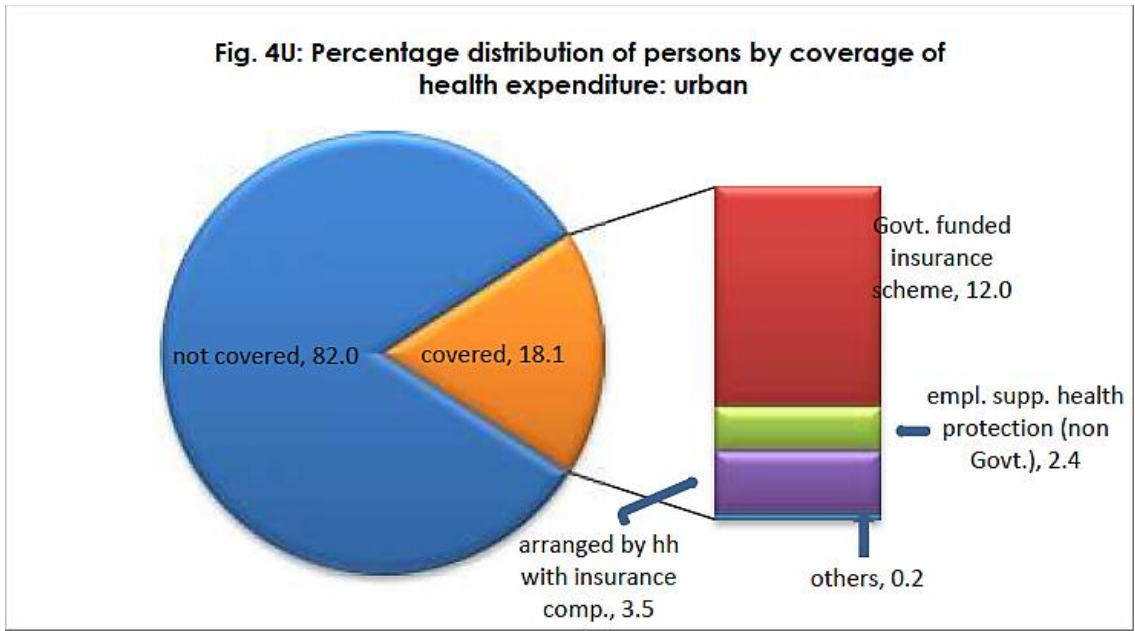


Fig. 25: Percentage distribution of persons by coverage of health expenditure in rural areas, NSSO report



Source: NSSO Survey 71st Round Report, 2014

Fig. 26: Percentage distribution of persons by coverage of health expenditure in urban areas, NSSO report

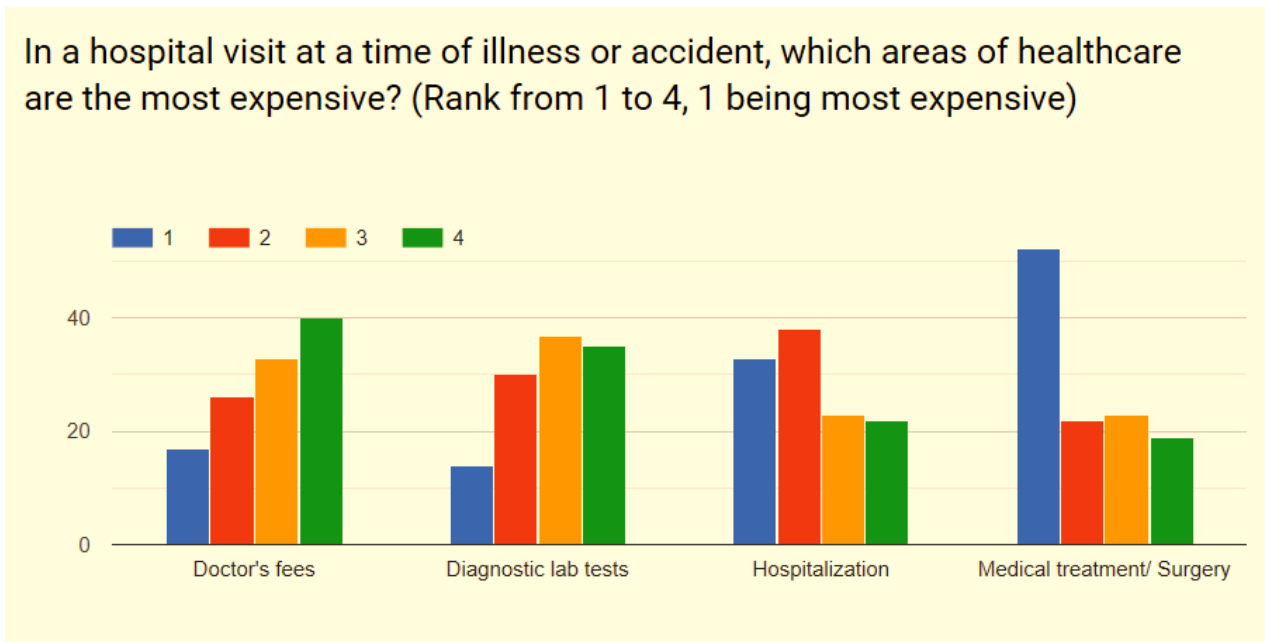
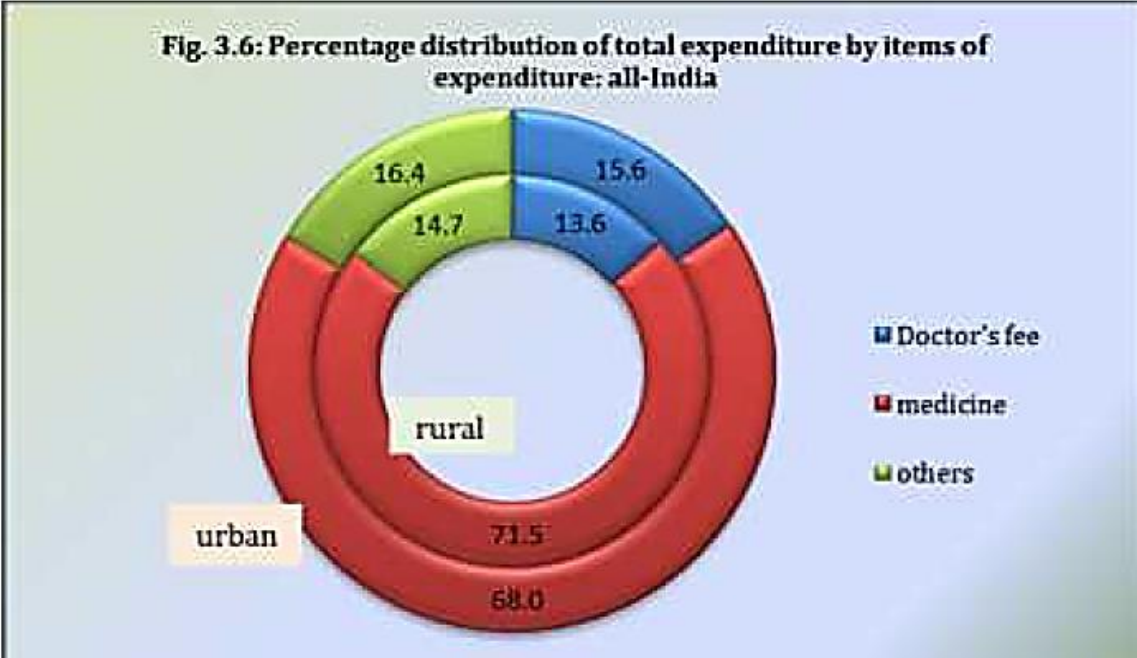


Fig. 27: Survey results showing outlook of sample towards most expensive areas of healthcare administration



Source: NSSO Survey 71st Round Report, 2014

Fig. 28: Actual percentage distribution of total expenditure by items of expenditure

On an average, a much higher amount was spent for treatment per hospitalised case by people in the private (25850) than in the public sector (6120). The highest expenditure was recorded for Cancer (56712) followed by Cardio-vascular diseases (31647).

What is your relied source of funds if long term care is required at a later point in time for you or some member of your household?

116 responses

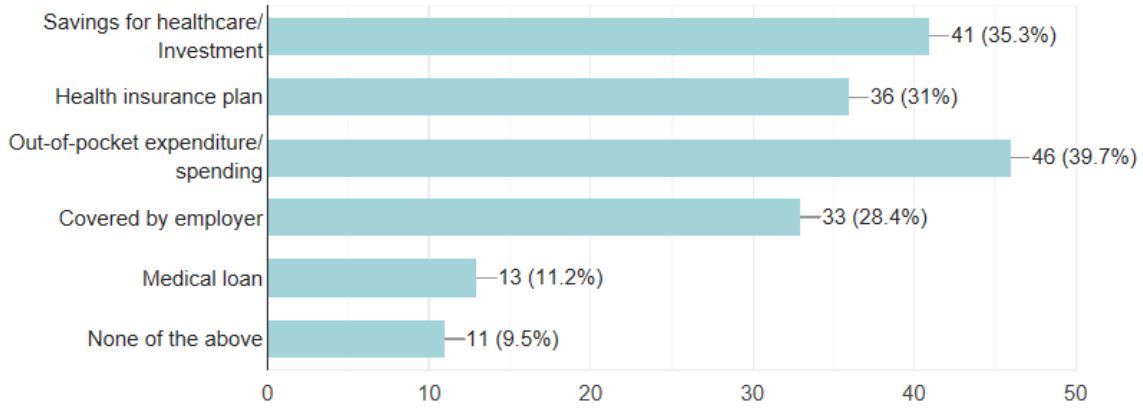
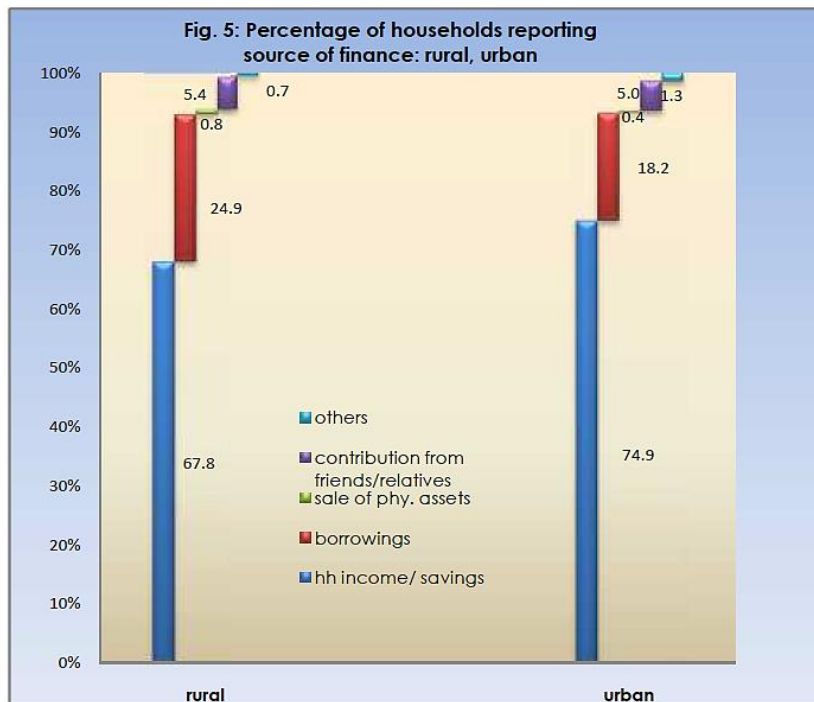


Fig. 29: Perception of individuals about most reliable sources of health financing



Source: NSSO Survey 71st Round Report, 2014

Fig. 30: Actual percentage of households reporting sources of health financing

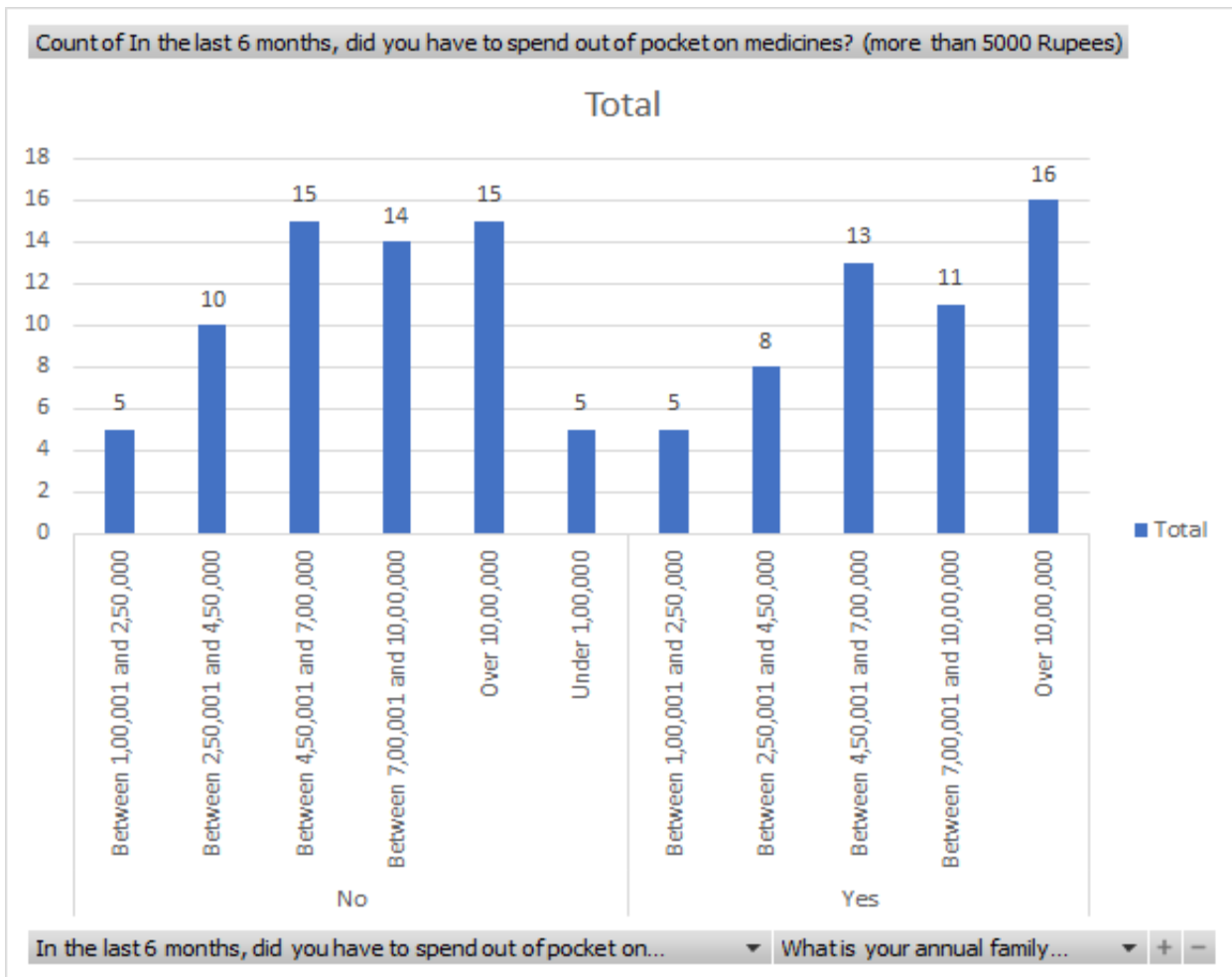


Fig. 31: Income group wise out of pocket expenditure on medicine (in the 6 months before the survey)

B. Model of future healthcare costs

After testing for the assumptions and analysing the data for developing the model, the following regression equation was arrived at for estimating the Health expenditure value in future.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.986 ^a	.972	.961	2.9801606	1.731

a. Predictors: (Constant), GDPanngrowthpercent, Inflation, med_tech, Pop_aged_ann_growth

b. Dependent Variable: CHE_US\$

Fig. 32: Coefficient of determination and Durbin-Watson statistic for the model

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-92.837	7.130		-13.021	.000					
	Inflation	.193	.516	.028	.373	.716	.036	.112	.019	.461	2.169
	Pop_aged_ann_growth	9.036	2.689	.277	3.361	.006	.575	.712	.171	.378	2.644
	med_tech	46.424	3.949	.822	11.755	.000	.957	.962	.597	.528	1.895
	GDPanngrowthpercent	.928	.410	.123	2.262	.045	.202	.563	.115	.872	1.147

a. Dependent Variable: CHE_US\$

Fig. 33: Coefficients of the independent variables and their t values at significance level computed in spss

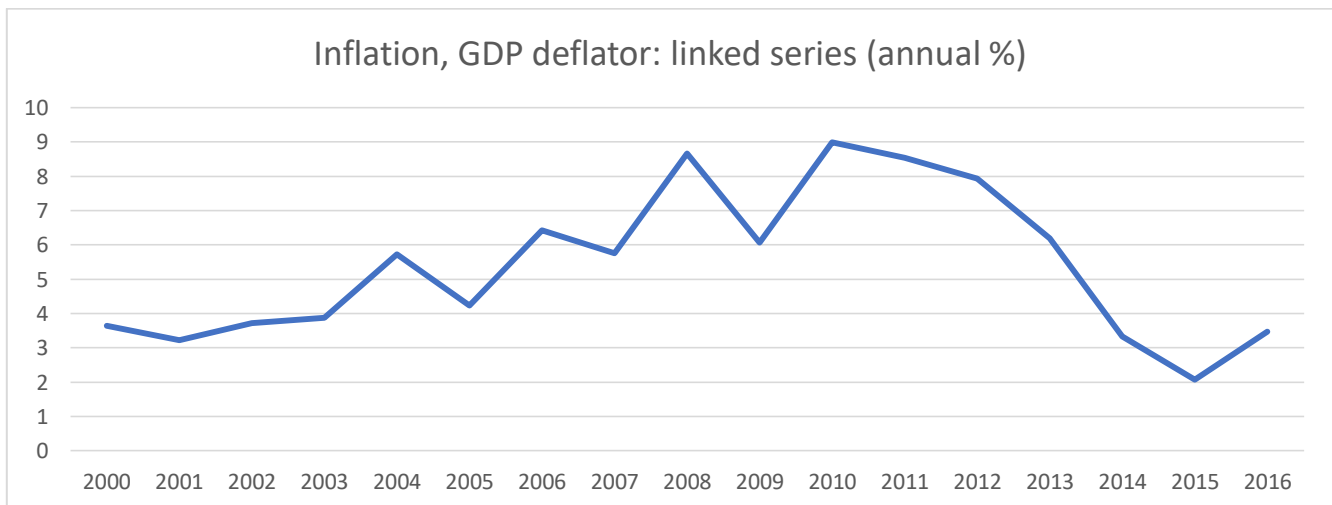
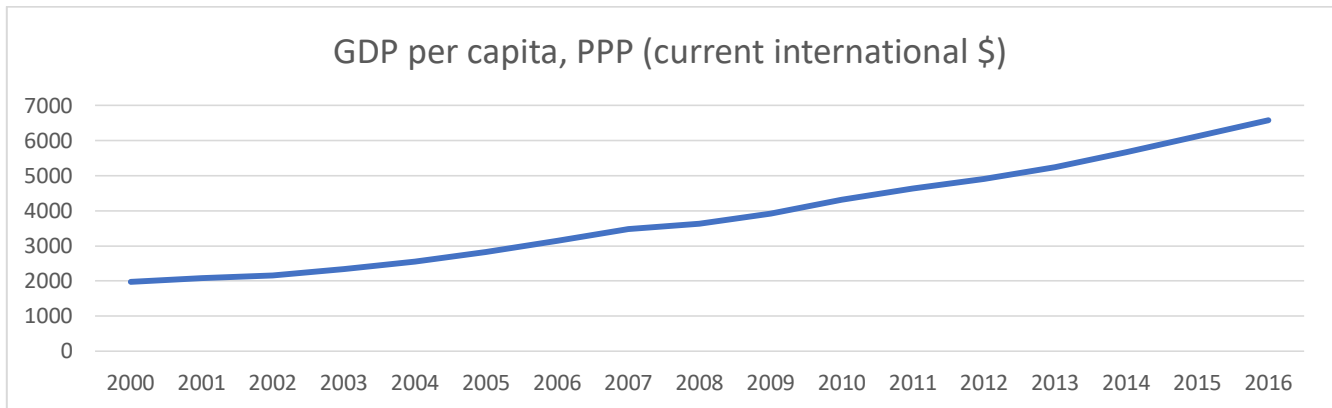
Short-term values were calculated using the values of factors as inputs. These values were taken from the figures reported and forecasted by organisations.

	CHE_US\$	Inflation	Pop_aged_ann_growth	med_tech	GDPanngrowthpercent
	Y	%	%	%	
		x1	x2	x3	x4
2017	39.66620289	3.6	1.763692	2.362413	6.68
2018	41.17836049	4.74	1.753009	2.381339	7.23
2019	41.93094632	4.89	1.743208	2.401434	7.1
2020	42.97490188	4.57	1.739564	2.423959	7.2

Fig. 34: Per capita Health Expenditure values till 2020

The 22 year average growth rate of GDP is 1.69%. (tradingeconomics.com/india/gdp-growth)

Expected Inflation rate through 2021 averages around 3% , Adjusting for income growth, we assume a constant inflation rate of 5% till 2071.



	CHE_US\$	Inflation	Pop_aged_ann_growth	med_tech	GDPanngrowthpercent
	Y	x1	x2	x3	x4
2017	39.66620289	3.6	1.763692	2.362413	6.68
2018	41.17836049	4.74	1.753009	2.381339	7.23
2019	41.93094632	4.89	1.743208	2.401434	7.1
2020	42.97490188	4.57	1.739564	2.423959	7.2
2021	43.3909634	4.57457	1.75	2.429835	7.25184
2022	43.71474497	4.579145	1.75	2.435739	7.304429
2023	44.04057147	4.583724	1.75	2.441672	7.357784
2024	44.36846825	4.588307	1.75	2.447634	7.411921
2025	44.69846119	4.592896	1.75	2.453625	7.466857
2026	45.03057676	4.597489	1.75	2.459645	7.522611
2027	45.36484202	4.602086	1.75	2.465695	7.579201
2028	45.70128462	4.606688	1.75	2.471774	7.636645
2029	46.03993286	4.611295	1.75	2.477884	7.694964
2030	46.38081568	4.615906	1.75	2.484024	7.754176
2031	46.72396272	4.620522	1.75	2.490194	7.814303
2032	47.06940429	4.625143	1.75	2.496395	7.875367
2033	47.41717143	4.629768	1.75	2.502627	7.937388
2034	47.76729593	4.634398	1.75	2.508891	8.00039
2035	48.11981037	4.639032	1.75	2.515185	8.064397
2036	48.4747481	4.643671	1.75	2.521511	8.129431
2037	48.83214334	4.648315	1.75	2.527869	8.195519
2038	49.19203115	4.652963	1.75	2.534259	8.262685
2039	49.55444748	4.657616	1.75	2.540682	8.330957
2040	50.05779325	4.662274	1.765313	2.547137	8.400362
2041	50.56617424	4.666936	1.780894	2.553625	8.470928
2042	51.07969383	4.671603	1.796752	2.560146	8.542685
2043	51.59845867	4.676274	1.812894	2.5667	8.615662
2044	52.12257895	4.680951	1.829327	2.573288	8.689892
2045	52.65216846	4.685632	1.846059	2.57991	8.765406
2046	53.18734477	4.690317	1.863098	2.586566	8.842238
2047	53.72822943	4.695008	1.880454	2.593256	8.920424
2048	54.27494812	4.699703	1.898135	2.599981	8.999998
2049	54.82763084	4.704402	1.916149	2.606741	9.080997

2050	55.3864121	4.709107	1.934507	2.613536	9.163462
2051	55.95143115	4.713816	1.953219	2.620367	9.247431
2052	56.52283219	4.71853	1.972294	2.627233	9.332946
2053	57.10076457	4.723248	1.991744	2.634135	9.42005
2054	57.68538311	4.727971	2.011579	2.641074	9.508787
2055	58.27684829	4.732699	2.031811	2.648049	9.599204
2056	58.87532656	4.737432	2.052453	2.655062	9.691349
2057	59.48099062	4.742169	2.073516	2.662111	9.785271
2058	60.09401973	4.746912	2.095013	2.669198	9.881023
2059	60.71460006	4.751659	2.116958	2.676322	9.978657
2060	61.34292502	4.75641	2.139366	2.683485	10.07823
2061	61.97919561	4.761167	2.16225	2.690686	10.1798
2062	62.62362086	4.765928	2.185627	2.697926	10.28343
2063	63.27641822	4.770694	2.209512	2.705205	10.38918
2064	63.93781399	4.775464	2.233921	2.712523	10.49711
2065	64.60804385	4.78024	2.258873	2.719881	10.6073
2066	65.28735329	4.78502	2.284386	2.727278	10.71982
2067	65.97599822	4.789805	2.310478	2.734716	10.83473
2068	66.6742455	4.794595	2.33717	2.742195	10.95212
2069	67.38237355	4.799389	2.364481	2.749715	11.07207
2070	68.10067305	4.804189	2.392435	2.757276	11.19466
2071	68.8294476	4.808993	2.421054	2.764878	11.31998

Fig. 35: Long term forecast of Health expenditure till 2071

V. CONCLUSION

The challenges outlined almost 25 years ago included inequity in resource allocation in the healthcare sector, an extremely high disease burden, fee-for-service reimbursement to medical providers and utilization of Information Technology at a nascent stage among others. While much of it is still relevant today, India has come a long way having increased the Government expenditure on healthcare almost 3 times in absolute value terms but a meagre 1.26% growth in share of Government expenditure in Total health expenditure. (still a very long way to go!) The situation calls for serious efforts by Government and innovators to search for alternative ways of reducing the cost burden on the patients in India.

VI. LIMITATIONS

Sample for the survey could not be chosen to be fully representative of the population. Sample size was small. Life expectancy and mortality rate have been used as proxies for growth in medical technology and innovation trends. The chosen variables might not be sufficiently enough correlated with medical technology growth trends. The variables chosen are not exhaustive, though multiple regression accounts for the error due to incorrect inclusion of variable bias, a strong exogenous influencer with significant impact on health expenditure might be left-out. Due to unavailability and other issues unstructured interview with industry professionals could not be conducted.