Income elasticity of demand for health care and it's change over time: Across the income groups and levels of health expenditure in India

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Abstract

This study computes income elasticity of out-of-pocket healthcare expenditures of Indian households both across the income groups using the Spline regression model and across the level of health expenditure based on the Quintile regression technique using survey data collected in 2014 and 2018. Healthcare is found to be a necessary good in all cases, with significant decline in its income elasticity over time. The changes from 2014 to 2018 makes income elasticity higher for lowest income group compared to other income groups for all forms of health expenditure in rural areas and for outpatient and non-medical expenditure in urban areas. The overall trend for total health expenditure and outpatient expenditure implies that in times of severe health crisis needing expensive treatments, any income increase would lead to higher increase in health expenditure compared to minor health care needs, leading catastrophic health expenditure and impoverishment in case of poor households.

Keywords: Healthcare expenditure, Income Elasticity, Spline Estimation, Catastrophe, Quintile Regression

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Introduction

In the field of health economics research, ample studies are dealing with the estimation of elasticity, given its implication in understanding the nature of demand for health care. A broad category of literature deals with the long-run relationship between national income and national health expenditure in a macroeconomic framework, eventually measuring income elasticity of health care (McCoskey and Selden, 1998; Parkin et al., 1987). Extensive research has been carried out for the USA, OECD, and other developed country where the debate goes around weather health expenditure is a luxury economic commodity or not. Advance econometric modelling techniques have been applied to either single country macroeconomic series or cross country panel data. For the developed countries some of these papers estimate the income elasticity of health care to be greater than one indicating that health care is a luxury commodity, whereas few also challenged this view (Blomqvist and Carter, 1997; Parkin et al., 1987; Newhouse, 1977; Roberts, 1999; McCoskey and Selden, 1998; Moscone and Tosetti, 2010; Jewell et al., 2003; Freeman, 2003; Chou, 2007) . A more general idea about health being a luxury or necessity, particularly in the context of developed countries is found in the study by Di Matteo (2003), which argues that the said relationship between health expenditure and income is not linear and income elasticity of health expenditure is sensitive to the level of analysis, range of income and other economic factors. Non-parametric estimations suggest that low-income states of the USA have elasticity more than one. However, it becomes inelastic for high-income states, and similar results are found for Canadian province-level data and OECD countries (Di Matteo, 2003). In the macroeconomic framework, the estimation of elasticity has also been done for the developing economies. A comprehensive panel data analysis, which includes data for 143 countries over 14 years, shows that health expenditure is inelastic and grows at a slower rate compared to national income (Ke et al., 2011).The elasticity estimations in the macro approach are useful for inter-country comparison, but the scope of this study requires more disaggregated data.

Out of pocket expenditure as a significant component of national health expenditure depends upon households demand for health care for a given level of infrastructure and cost of services (Musgrove, 1983). Demand for health care is a derived demand for goods such as medicine, therapy, and other related services, depending on the economic and demographic characteristics of the household (Parker and Wong, 1997). According to Grossman (1972a) derived demand of health comprises of direct consumption (curative expense) and also investment (preventive expense) on human capital, which encourages overall productivity of a utility-maximizing individual. A resource constrained agent spends on health care along with other consumptions, up to the extent that prevents the disutility produced due to sickness. So at the optimum, demand for health care depends upon income allocated to both curative and preventive medical care (Wagstaff, 1986b). Grossman (1972b) induced further empirical research on characterizing utility function and deriving elasticity properties of health demand (Koç, 2004a,b,c). A more direct empirical estimation of Grossman's utility function is provided by (Wagstaff, 1986a) with particular

emphasis on the pure consumption model to conclude statistically that demand for health care depends on wage rate (or income), age, and education another demographic characteristics (Grossman,1972a). Grossmans theoretical approach has become the basis of several studies intended to analyze the determinants of health expenditure using the microdata on household expenditure collected through surveys undertaken worldwide (Wagstaff et al., 2017). Apart from health expenditure, household surveys also collect information on income, employment, demographic characteristics, and insurance status. The availability of such pieces of information allows to the formulation of the demand function for household health care and estimates the elasticity of health expenditure to decide further whether health is a luxury or a necessity commodity in a microeconomic framework(Musgrove, 1983; Parker and Wong, 1997; Wedig, 1988). As pointed out by Okunade et al. (2010), the magnitude of income elasticity for health care at household level is always lower than those estimated under the microeconomic framework. The existing literature also brings out some interesting observations like that opting for private providers causes elasticity to be greater than one and, in the absence of public providers, the out-of-pocket expenses surge (Musgrove, 1983). Parker and Wong (1997) shows how increasing economic inequality hinders expenditure on health for low-income groups who also dont have any health insurance coverage. It also elaborates on the significance of demographic characteristics and the geographical location of households crucial to determine elasticity. Classifying health service as luxury or necessity also depends upon the type of service demanded and severity of illness for a given level of income (Ringel et al., 2002). For instance, a cardiac surgery may fall under necessary expenditure and a plastic surgery may be considered to be a luxury. Common to all the studies in this field is evaluating the role of prepayment or risk pooling mechanism and its impact on households demand behaviour for health care. Whereas health insurance coverage protects households from the adverse economic impacts, in developing countries the presence of such schemes majorly provided by the government being minimal , generally fails to target the needy (Xu et al., 2006). However, in the presence of a competitive insurance market, especially in the rich countries, it significantly reduces the burden of out-of-pocket healthcare expenditure (OOPE). Manning et al. (1987) is an early work on elasticity measurement which uses RAND Health Insurance Experiment data to establish the role of insurance. Although competitive markets can provide a variety of cost-sharing plans, it leads to provide lucrative policies only to the rich if not regulated by the government (Abraham et al., 2017; Duarte, 2012) and causes a highly elastic response. Cameron et al. (1988) pointed out that the health insurance premium is more sensitive to the change in income compared to the consumption of health care, which is subject to health status.

A comprehensive measurement of elasticity which requires a detailed study of OOPE expenditure and its economic and demographic determinants (Correa-Burrows, 2012), is vital to commence policy reforms in the health sector particularly for targeting population groups according to the demand of various medical services (Zare et al., 2013). The literature suggests that income elasticity for health care has been studied enormously for high income and middle-income countries from various

perspectives. However, in the developing countries, especially for the Asian region, only a handful numbers of studies are available with most of the studies focussing on the role of OOPE, the principal source of funding and being mostly catastrophic, in impoverishment of the marginalized section (van Doorslaer et al., 2006). With serious gap in literature analyzing households behaviour towards health care expenditure expressed via elasticity estimates in case of developing countries and particularly in case of India , this study aims to fill the gap by analyzing the case of India.

According to the latest National Health Policy, 2017, both the state and central governments are committed to providing quality health care with no financial hardship for all citizens. Despite achieving improved health outcomes over time, India is still lagging behind its pre-committed millennium goals. With public expenditure being stagnant at 1.3% of GDP, poor state of infrastructure, inaccessibility and poor quality of care in public facilities, existence of unregulated and expensive private facilities and their domination in health care market, health care needs impose an excessive financial burden to the users and leave many with unfulfilled health care demand (Patel et al., 2015; Ladusingh and Pandey, 2013; Ghosh; Raban et al., 2013; Pandey et al., 2018) and increase poverty by an additional 8 percent compared to the official record during 2014-15 (Choudhury et al., 2019). According to the National Health Accounting Estimates of India (2018), an estimated 64.9 percent of current health expenditure have been spent directly out of the pocket of the consumers during the financial year of 2015-16. Thus like many developing countries, due to Indias significantly high OOPE exposing the households to the risk of consumption distortion, institutional barriers to access health infrastructure and high cost of treatment, households demand for health care is majorly need-based and their response to uncertain health situations is sensitive to the level of income.

With this background the current study using household expenditure data from two recent surveys in India estimates the income elasticities of out-of-pocket healthcare spending of various types like total health expenditure, inpatient expenditure, outpatient expenditure and non-medical expenditure across the different income groups for rural and urban areas separately between 2014 to 2018. Secondly, the sensitivity of health care expenditure to income also varies by the level of health care needs and thus the level of health care expenditure. Some episodes of sickness can be addressed through primary or secondary level of care and treatment might be less expensive, whereas others might require serious attention like hospitalization and more cost-incurring treatments. The study estimates income elasticity separately for all the forms of health expenditure like total health expenditure, inpatient, outpatient, and non-medical expenditures along the different quantiles of health expenditure level in both rural and urban areas between 2014 to 2018.

Data and Methodology

Two waves of household survey data, 71st round in 2014 and 75th round in 2018, conducted by National sample survey organization (NSSO) on social consumption of health care, have been used in this research. The survey uses a stratified ran-

domization technique to collect samples that represent national and regional levels. With widespread geographical and rural-urban coverage across the country, the micro dataset collects numerous household-level information on demographic characteristics and incidence of illness with particular focus on the various dimensions of out-of-pocket healthcare expenditure.

The empirical estimation of elasticity in the standard form is calculated from a log linear relationship between the expenditure on a good and levels of income. Following similar formulation, we analyze separately four forms of health expenditure. Dependent variables of the analysis are total health care expenditure, inpatient expenditure, outpatient expenditure, non-medical expenditure (for example transport, etc.), and the main independent variable is households usual consumer expenditure used as a proxy of income as self-reported survey response is unable to capture the household's income appropriately due to heterogeneous demographic set up. Depending on the nature of the occupation, many households do not have a smooth income pattern. Also, while reporting information on income the likelihood of under-reporting results in volatile inferences. Thus usual consumption expenditure is a more reliable indicator of household income (Deaton, 1992). Consumption expenditure enables us to divide the sample households into income quintile groups. The sensitivity of health expenditure to income has been analyzed separately for rural and urban areas using the two waves of data for all the income quintiles. For comparison, the price adjustment of the variables measured in monetary units has been done using suitable price indices. All the expenditures have been converted in constant prices of 2012 using a dual deflation method. To do this, I have used a monthly series of consumer price indexes to compute the average consumer price index to deflate the usual consumption expenditure variable and I have taken price index series designed for the health sector to derive health care expenditure at constant prices.

The survey records the usual consumption expenditure for a recall period of 30 days, inpatient expenditure for a recall period of 365 days and outpatient expenditure for a recall period of 15 days. Recall period heterogeneity has been controlled by evaluating all the expenditure variables for an average of 30 days.

Demand for health care arises when the households are consuming at least one of the two kinds of medical services, inpatient and outpatient services, by making either zero or positive monetary payment. The descriptive statistics in Table1 show that total average health expenditure is biased towards the rich and suitably represent the upper-tilted households of the fourth quintile in rural areas, lower-tilted households of the same quintile in urban areas. Average health expenditure also increases as we move up the income quintile classes but not as fast as average income, resulting in higher health expenditure-income ratio among the poor, which aggravates their already existing intense financial hardship. With the higher level of income and availability of services, higher health expenditure in urban areas is intrinsic, but non-medical expenditure associated with health care is higher in rural areas showing supply-side limitations. While comparing the changes in expenditure

patterns over the two waves, the analysis found that there is a significant decline in demand for health care for each income group. In aggregate the fall in demand for medical care is above 5% in rural area and slightly above 7% in urban areas. This

Table-1a: Average (per household) consumption and health expenditure

		Income quintile classes					All-Hhs
		0-20%	**20-40%**	**40-60%**	**60-80%**	**Top 20%**	
Rural							
Wave-1	Consumption Expenditure	3037	3908	4771	5508	7680	5105
	Health Expenditure						
	Total	1330	1442	1298	1607	2462	1702
	Inpatient	749	862	886	1207	2144	1259
	Outpatient	1486	1538	1290	1458	1881	1567
	Non-medical	221	214	201	213	299	235
Wave-2	Consumption Expenditure	3328	4643	5201	6085	7918	5600
	Health Expenditure						
	Total	1019	1286	1369	1392	1954	1468
	Inpatient	658	871	911	1077	1652	1084
	Outpatient	1186	1393	1481	1352	1705	1469
	Non-medical	167	182	185	207	251	205
Urban							
Wave-1	Consumption Expenditure	4209	5709	6765	8474	13445	8392
	Health Expenditure						
	Total	1488	1697	1896	2655	3397	2356
	Inpatient	929	1295	1623	2406	3980	2155
	Outpatient	1474	1464	1562	2090	2303	1853
	Non-medical	195	179	193	286	271	231
Wave-2	Consumption Expenditure	5156	7014	8691	10319	14096	9595
	Health Expenditure						
	Total	1379	1722	1998	2029	2748	2015
	Inpatient	944	1312	1774	1959	3122	1821
	Outpatient	1442	1604	1699	1655	2033	1714
	Non-medical	161	190	161	179	194	178

Table-1b: Pattern for demand for health care

		Income quintile classes					
		0-20%	**20-40%**	**40-60%**	**60-80%**	**Top 20%**	**All-Hhs**
Rural	Wave-1						
Wave-1	Demand	34.92	34.61	37.90	38.71	44.01	38.29
	Insurance	12.44	13.40	14.25	17.98	22.77	16.52
	Private Care	53.20	58.20	63.93	69.95	74.98	65.35
	NCD	49.97	55.14	54.21	58.50	69.31	58.54
Wave-2	Demand	28.89	30.82	32.52	33.20	38.18	33.06
	Insurance	11.55	10.68	14.77	18.31	24.31	16.49
	Private Care	48.05	54.34	59.06	61.76	67.26	59.36
	NCD	35.69	45.44	44.10	52.56	63.21	50.09
Urban							
Wave-1	Demand	39.69	43.20	45.99	41.37	40.03	41.96
	Insurance	9.90	14.09	17.43	20.65	32.82	20.62
	Private Care	63.84	72.71	77.89	82.86	86.02	78.19
	NCD	58.42	63.89	69.18	72.57	78.20	69.81
Wave-2	Demand	37.30	37.61	36.58	34.70	29.51	34.63
	Insurance	11.66	15.08	21.08	20.86	33.59	21.76
	Private Care	58.34	63.74	73.38	78.12	84.24	72.27
	NCD	48.44	57.39	62.37	66.15	69.15	61.32

fall in demand also translated into lowering down of average OOPE as the average health expenditure declined by almost 15% in both rural and urban area over the period of study. It also releases the financial pressure for all quintile classes, and the change in health expenditure-income ratio is almost above 7% in case of both the rural and urban areas.

Apart from economic factors, other demographic covariates affect the demand for health care. The model studies the relationship between health care expenditure and income, controlled for a set of such covariates. Table-2 of descriptive statistics provides a summary of these variables. These covariates are household size and gender, age, education, marital status of the head of the households. It has often been observed that the household head turns out to be the earning member of the household too and this increases the decision making power of the household head. Some studies have found that the magnitude of OOPE is correlated with the gender, age, education and occupation of the household head (Okunade et al., 2010; Rous and Hotchkiss, 2003). Household size also directly affects the OOPE level of households. The preliminary findings suggest that on aggregate approximately 12 percent of households are women-headed with an average age of above 45 years. With an average household size of 4.6, households in rural areas comprise more

Table-2: Descriptive Statistics

	Variable	Definition	Rural			Urban		
			Obs	Mean	SD	Obs	Mean	SD
Wave-1								
Dependent variables	lntotexp	log- Health expenditure	27988	6.535	1.46	23165	6.789	1.49
	lnipexp	log-Inpateint expenditure	25511	6.030	1.56	20947	6.497	1.66
	lnopexp	log-Outpatient expenditure	10538	6.669	1.27	9985	6.711	1.35
	lnnmexp	log-Non medical expenditure	26854	4.905	1.23	21539	4.803	1.31
Independent variables	lnuexp	log-Consumption expenditure	36480	8.376	0.58	29452	8.826	0.65
Control covariates	age	Age	36480	47	13.34	29452	46	13.72
	hhsize	HH Size	36480	4.685	2.16	29452	4.155	2.10
Ref:	sex	=1 if Male	36480	0.882		29452	0.876	
		=1 if Female	36480	0.118		29452	0.124	
Ref:	edu1	=1 if Illiterate	12859	0.400		5104	0.165	
	edu2	=1 if Primary	4717	0.121		2601	0.085	
	edu3	=1 if Secondary	17112	0.432		15590	0.525	
	edu4	=1 if High Sec/ Diploma/Collage	1792	0.046		6157	0.225	
Ref:	marital1	=1 if Married	31670	0.858		24774	0.822	
	marital2	=1 if Unmarried/ Widowed/Divorced	4810	0.142		4678	0.178	
Ref:	caste1	=1 if General	6255	0.120		2127	0.032	
	caste2	=1 if SC	6988	0.213		4070	0.132	
	caste3	=1 if ST	14355	0.437		11487	0.423	
	caste4	=1 if OBC	8882	0.230		11768	0.412	
	ins	=1 if Insured	5833	0.165		6106	0.206	
	pvt	=1 if treatment in private facility	15378	0.654		15918	0.782	
	ncd	=1 if ailment is non-communicable	14429	0.585		13460	0.698	

members than urban areas. Data from the second wave (2018) show that in case of 64 percent of households, the household head has some educational attainment in rural areas and in urban areas this share is significantly high at around 87 percent.

The model has also been controlled for health insurance coverage, household's preference over the type of care in terms of public and private facilities, ailment type, geographical location of the households. The database reveals that only 14% of households in rural areas and 17% in urban areas have access to health insurance and these shares improved negligibly in the recent wave of data. Treatment in private facilities accounts for higher out of pocket expenses, but around 60 per-

Table-2: *Cont.*

			Rural			Urban		
	Variable	**Definition**	**Obs**	**Mean**	**SD**	**Obs**	**Mean**	**SD**
Wave-2								
Dependent variables	lntotexp	log-Health expenditure	49771	6.284	1.49	38329	6.677	1.47
	lnipexp	log-Inpateint expenditure	46337	5.793	1.58	35256	6.333	1.67
	lnopexp	log-Outpatient expenditure	13661	6.520	1.28	12502	6.712	1.28
	lnnmexp	log-Non medical expenditure	48546	4.747	1.23	36827	4.670	1.22
Independent variables	lnuexp	log-Consumption expenditure	64552	8.480	0.57	49271	8.972	0.65
Control	age	Age	64552	46.452	13.05	49271	45.007	14.45
covariates	hhsize	HH Size	64552	4.564	2.07	49271	3.911	2.06
Ref:	sex	=1 if Male	64552	0.887		49271	0.859	
	sex	=1 if Female	64552	0.113		49271	0.141	
Ref:	edu1	=1 if Illiterate	20462	0.360		6909	0.127	
	edu2	=1 if Primary	7117	0.103		3311	0.068	
	edu3	=1 if Secondary	33354	0.488		26773	0.538	
	edu4	=1 if High Sec/ Diploma/Collage	3619	0.050		12278	0.266	
Ref:	marital1	=1 if Married	56247	0.144		41115	0.216	
	marital2	=1 if Unmarried/ Widowed/Divorced	8305	0.856		8156	0.784	
Ref:	caste1	=1 if General	11401	0.120		3844	0.030	
	caste2	=1 if SC	12703	0.217		6519	0.142	
	caste3	=1 if ST	25510	0.448		19451	0.439	
	caste4	=1 if OBC	14938	0.215		19457	0.390	
	ins	=1 if Insured	12086	0.165		10736	0.218	
	pvt	=1 if treatment in private facility	23259	0.594		24546	0.723	
	ncd	= 1 if ailment is non-communicable	20844	0.501		18598	0.613	

cent of rural households and 72 percent of urban households are found to be opting for private facilities due to the notion of accessible quality treatment during the first wave. While the proportion of public facility users has gone up in the second wave, the utilization of private care is still overwhelming. It is noteworthy that in literature analyzing OOPE, discussion on the type of illness and epidemiological structure is somewhat ignored, except few studies focussing on it (Correa-Burrows, 2012; Hwang et al., 2001). The analysis finds that more than 50% of households demanding health care, sought medical services to treat NCDs in rural areas in both the waves. Similarly this share is more than 60% in urban areas in both the waves. However there is a decline in the proportion of households with NCDs in aggregate. . The treatment cost for NCDs is generally higher than communicable diseases, and it also captures the severity of the health condition. Access and utilization of health care is also sensitive to the geographical location due to the variation in income and availability of health services across the states of India. Also, states are capable of designing their policies regarding the reforms in health

Following Koenker and Bassett (1978) a quantile regression model assumes a linear relationship between various quantiles of dependent variable y over a vector of regressors x_i and derive coefficients analogous to OLS models which are interpreted as the rate of return for a specific conditional quantile of the distribution of y. Melly (2005) defines the inverse conditional quantile function as

$$F_{y|x}^{-1} = x_i\beta(\tau)\forall\tau \in (0,1) \qquad (1)$$

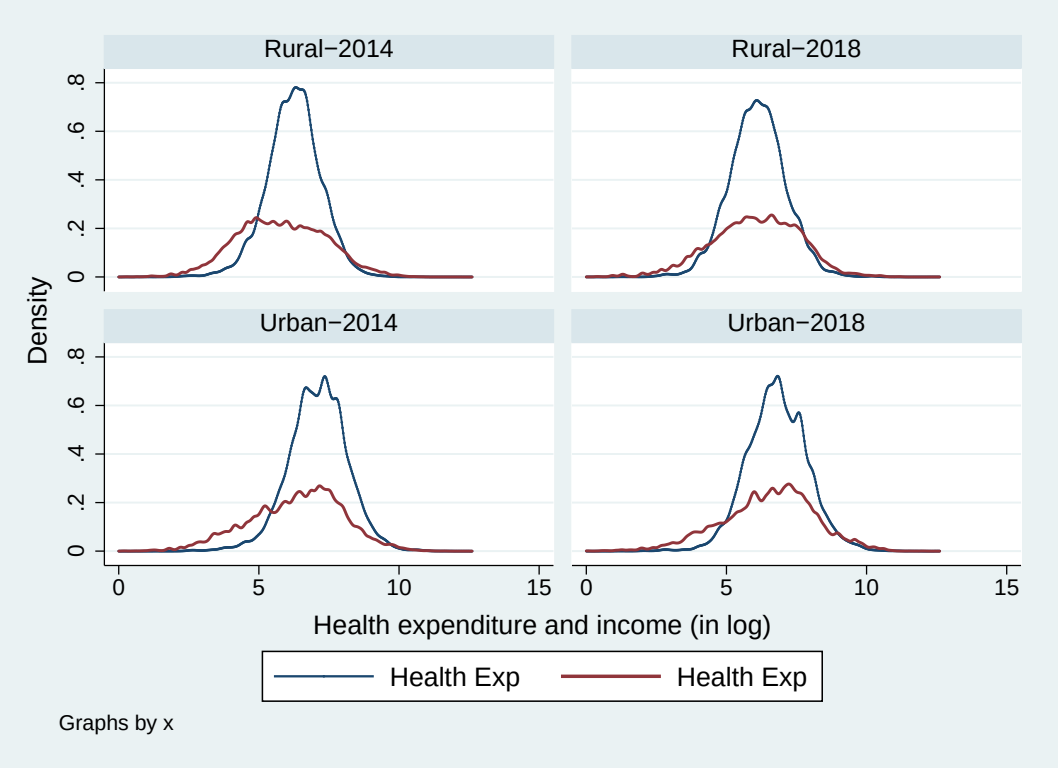
where $\beta(\tau)$ can be derived by the minimization problem given in (2) for a given quantile τ.

$$\hat{\beta(\tau)} = min_b \frac{1}{N}\sum_{i=}^{N}(y_i - x_i b)(\tau - I(y_i \leq x_i b)) \qquad (2)$$

Where $I(.)$ is an indicator function which is either 1 in the event of $y_i \leq x_i b$ else equal to zero.

Estimation Results

The econometric methods explained in the previous section have been executed to the micro dataset for each wave separately for rural and urban areas. The results of the spline model, reported in table-3, show the income elasticity of health expenditure for four types of health expenditure like total health expenditure, inpatient expenditure, outpatient expenditure and non-medical expenditure for the three income-groups partitioned by two knots at 20% and 80% of the income distribution for rural and urban areas separately for both the waves. Table-3 also includes coefficients derived by the ordinary least square method as baseline estimates of elasticity for comparison. Results of QR model presented in table 4, report the income elasticity of health expenditure at varying levels of health expenditure. It shows the income elasticity for four types of health expenditure, total health expenditure, inpatient expenditure, outpatient expenditure and non-medical expenditure for seven



Distribution function of income and health expenditure

quantiles of incurred health care expenditure values ($\tau = .10\ .20\ .40\ .50\ .60\ .80\ .90$). The complete regression result of the OLS model is presented in Appendix.

Spline Estimates

The income elasticity of health expenditure turned out to be statistically significant, positive, and below unitary value for all the types of health expenditure and for all the income groups. Thus it indicates that health expenditure of all types is a necessary good for all the income groups and it increases as income increases but at a lower rate than income. The coefficients' magnitudes allow us to compare the sensitivity of health expenditure to income among the income groups. The results show that health expenses are relatively income inelastic for the middle-income bracket in almost every scenario.

The separate spline estimates for inpatient, outpatient, and non-medical expenditure allows us to understand the demand for primary and tertiary health care separately. The findings from the first wave in rural areas suggest that inpatient expenditure is comparatively much more elastic for both the poorest and the richest section, whereas the elasticity is moderately low in the middle-income group. For the uppermost income group, the elasticity is 0.91, which surpasses the elasticities for all the other forms of health expenditure in both the rural and urban areas. In

Table 3: Income elasticity of health expenditure by level of Income (Spline model)

	Descriptive Statistics			Spline estimates			OLS	
	Variable	Mean	SE	0-20%	20-80%	80-100%	Coeff.	MSE
Rural								
Wave-1(2014)								
	lntotexp	6.53	.008	.432***	.376***	.841***	.514***	1.21
				(.054)	(.029)	(.039)	(.017)	
	lnipexp	6.02	.009	.785***	.378***	.914***	.615***	1.17
				(.064)	(.031)	(.035)	(.017)	
	lnopexp	6.66	.012	.326***	.315***	.529***	.377***	1.17
				(.085)	(.047)	(.061)	(.028)	
	lnnmexp	4.90	.007	.392***	.191***	.615***	.343***	1.15
				(.055)	(.029)	(.037)	(.017)	
Wave-2(2018)								
	lntotexp	6.28	.006	.481***	.146***	.288***	.266***	1.2
				(.032)	(.023)	(.032)	(.014)	
	lnipexp	5.79	.007	.326***	.214***	.359***	.275***	1.07
				(.039)	(.022)	(.028)	(.013)	
	lnopexp	6.51	.010	.543***	.088**	.183***	.241***	1.19
				(.056)	(.045)	(.061)	(.026)	
	lnnmexp	4.74	.005	.215***	.080***	.205***	.144***	1.14
				(.031)	(.022)	(.030)	(.013)	
Urban								
Wave-1(2014)								
	lntotexp	6.78	.009	.153***	.388***	.717***	.409***	1.28
				(.052)	(.028)	(.051)	(.018)	
	lnipexp	6.49	.011	.570***	.536***	.659***	.570***	1.26
				(.061)	(.029)	(.049)	(.019)	
	lnopexp	6.71	.013	.158**	.304***	.543***	.322***	1.22
				(.073)	(.041)	(.076)	(.026)	
	lnnmexp	4.80	.008	.013	.155***	.429***	.180***	1.24
				(.050)	(.028)	(.052)	(.018)	
Wave-2(2018)								
	lntotexp	6.67	.007	.397***	.108***	.471***	.247***	1.2
				(.037)	(.022)	(.036)	(.013)	
	lnipexp	6.33	.008	.222***	.229***	.534***	.300***	1.15
				(.043)	(.021)	(.033)	(.013)	
	lnopexp	6.71	.011	.495***	.043	.366***	.216***	1.16
				(.059)	(.038)	(.060)	(.022)	
	lnnmexp	4.66	.006	.325***	-.01	.205***	.099***	1.15
				(.038)	(.021)	(.035)	(.013)	

the lowest income group, for inpatient expenditure the value of income elasticity is also high with a magnitude equal to 0.79. It implies that demand for tertiary health care is highly sensitive to income among the poorer households. The income elasticity of outpatient expenditure for the uppermost income group, although lower than their income elasticity for inpatient expenses, is higher compared to other income groups. For lowest income group, outpatient expenditure is less elastic in comparison to the uppermost income group but the elasticity value certainly exceeds that of the middle-income group by a small margin. Non-medical expenditure follows a similar trend as outpatient expenditure with the fact that the elasticity value for non-medical expenditure for the middle income group is even lower than that of outpatient expenditure. The results from the first wave in rural areas show that for poorer households various types of health expenditure are less responsive to income in comparison to the uppermost income group, and their income elasticity is highest for tertiary care. The trend is similar in urban areas, but magnitudes of the elasticities are smaller for the income groups.

Moreover, the pattern of elasticity that prevailed in 2018, by and large, differs from the pattern in 2014. As a result the previous conclusion about increasing income elasticity of various forms of health expenditure with the level of income doesnt hold in 2018. For the highest income group, the income elasticity of total health expenditure drops from 0.84 in 2014 to 0.29 in 2018 for rural areas and from 0.72 to 0.47 for urban areas. For the middle income group too, the income elasticity of total health expenditure has fallen from 0.38 in 2014 to0.15 in 2018 for rural areas and from 0.39 in 2014 to 0.11 in 2018 for urban areas. The results indicate that total health care expenditure increases at slower rate with income for the highest income group and middle income group in 2018 compared to 2014. But for the lowest income group, the income elasticity of total health expenditure went up from 0.43 to 0.48 in rural areas and a sharper rise from 0.15 in 2014 to 0.4 in 2018 for urban areas. The sensitivity of demand for tertiary medical care to income has fallen for all the income groups in 2018 sharply in rural areas and moderately in urban areas. In other words, for all the households, the demand for inpatient care became less sensitive to income over 2014 to 2018. But the decline in value of elasticity has been highest for the uppermost income group particularly in rural areas. A decline in values of income elasticity of outpatient expenditure has taken place for the middle and top income groups. The decline, especially in the middle bracket, is extremely high. However, the lowest income group observes a demand reversal for outpatient services with a rise in value of income elasticity in both rural and urban areas, making the demand for outpatient services more income elastic for them in comparison to other income groups. The magnitudes of income elasticities for various forms of health expenditure except inpatient expenditure turn out to be higher for lowest income group compared to others in rural areas. In case of urban areas too, the income elasticities are higher in case of outpatient and non-medical expenditure for the lowest income group compared to other income groups and the gap in values of income elasticities between the lowest and uppermost income groups comes down for total health expenditure. These results have an adverse implication for the poorest section particularly residing in rural India as they are the ones for

whom health expenditure increases at a faster rate with income compared to any other group. expenditure for all the income groups together. If the spline estimates of elasticities of health expenditure for different income groups are compared to the mean outcome given by the OLS estimates, it is clear that the OLS coefficients alone cant capture the huge difference in income sensitivity of health expenditure in different income groups, indicating the importance of income group specific estimation.

Quintile Regression Estimates

The study applies the quantile regression (QR) model on the log-linear equation system to estimate the relationship between households health expenditure and income at the different levels of health care needs. QR technique can measure elasticity on the entire locus of health expenditure distribution and not merely around the mean value. The method divides households based on their level of health expenditure and captures the change in income elasticity accordingly. Like spline estimates, the study implements a QR model on various quantiles of health expenditure of all kinds of health expenditure like total health expenditure, inpatient, outpatient and non-medical expenditure.

Table-4 is a matrix type representation of 112 different elasticity values (four dependent variable×four sub-samples×seven quantile values). In almost all cases, the income elasticities are statistically significant, positive, and below unitary value such that the outcome is theory consistent. It suggests that, independent of the level of health care expenditure, health care expenditure is a necessary commodity for all the households. Apart from the general inference, we are also interested in knowing how the magnitude of elasticity differed at different quantiles and the rate of departure from the mean outcome which is the elasticity obtained from the least square estimates.

The elasticity of total health expenditure for rural households during the first wave at $\tau = .10$ is higher than elasticity at $\tau = .20$, but afterward, with increasing levels of quantiles, it increases monotonically. This pattern is similar in case of both inpatient and outpatient expenditure. It shows that at the lowest health care needs the expenditure is more income elastic than the next level of health care needs but as we move up to higher quantiles of health expenditure, the income sensitivity of health expenditure increases for the high spending households, and for the households with low health care spending, health expenditure is relatively inelastic. Assuming that expensive health care is associated with critical health crises, any increase in income in this situation would attract comparatively higher additional expenses than the cases requiring low health care expenses. Hence, poor households with such health requirement would have a faster impoverishment impact. The magnitude of elasticity in inpatient expenditure lies in a close range for all income groups compared to the total expenditure. The less disperse values of elasticity reflect that at different levels of inpatient expenditure, households expenditure is almost equally sensitive to the income change. On the other hand, in case of outpatient expenditure, for households incurring expensive outpatient treatments

Table-4: Income elasticity of health expenditure at various quantiles (QR Model)

		Quantiles of health expenditure						
Year	**Variable**	**.10**	**.20**	**.40**	**.50**	**.60**	**.80**	**.90**
Rural								
Wave-1(2014)								
	lntotexp	.427***	.411***	.477***	.542***	.575***	.580***	.524***
		(.050)	(.038)	(.041)	(.050)	(.049)	(.032)	(.048)
	lnipexp	.556***	.490***	.566***	.568***	.569***	.580***	.594***
		(.039)	(.035)	(.037)	(.031)	(.035)	(.043)	(.040)
	lnopexp	.228***	.181**	.366***	.405***	.354***	.442***	.496***
		(.055)	(.055)	(.050)	(.057)	(.064)	(.045)	(.046)
	lnnmexp	.276***	.317***	.304***	.336***	.297***	.393***	.380***
		(.040)	(.039)	(.034)	(.049)	(.044)	(.048)	(.058)
Wave-2(2018)								
	lntotexp	.181***	.227***	.286***	.272***	.263***	.262***	.258***
		(.041)	(.048)	(.029)	(.047)	(.045)	(.047)	(.045)
	lnipexp	.210***	.277***	.266***	.252***	.266***	.229***	.195***
		(.040)	(.032)	(.029)	(.031)	(.030)	(.033)	(.033)
	lnopexp	.140*	.112*	.247***	.238***	.272***	.284***	.277***
		(.061)	(.049)	(.050)	(.064)	(.054)	(.061)	(.040)
	lnnmexp	.096*	.129**	.187***	.158***	.158***	.111**	.058
		(.045)	(.040)	(.042)	(.042)	(.040)	(.038)	(.046)
Urban								
Wave-1(2014)								
	lntotexp	.126**	.272***	.388***	.459***	.428***	.473***	.573***
		(.045)	(.040)	(.045)	(.052)	(.048)	(.043)	(.048)
	lnipexp	.455***	.477***	.533***	.512***	.605***	.648***	.662***
		(.030)	(.042)	(.036)	(.032)	(.038)	(.032)	(.041)
	lnopexp	.020	.241***	.328***	.305***	.362***	.415***	.386***
		(.088)	(.042)	(.056)	(.050)	(.056)	(.045)	(.036)
	lnnmexp	.193***	.101*	.099*	.116*	.140***	.168**	.214***
		(.040)	(.046)	(.039)	(.048)	(.032)	(.053)	(.050)
Wave-2(2018)								
	lntotexp	.325***	.222***	.189***	.212***	.211***	.214***	.266***
		(.027)	(.040)	(.035)	(.042)	(.038)	(.033)	(.033)
	lnipexp	.263***	.303***	.317***	.318***	.305***	.284***	.302***
		(.042)	(.032)	(.029)	(.031)	(.030)	(.033)	(.019)
	lnopexp	.312***	.190***	.200***	.153**	.112**	.157**	.170**
		(.047)	(.049)	(.054)	(.050)	(.038)	(.057)	(.053)
	lnnmexp	.103*	.177***	.087*	.086*	.074	.080	.104*
		(.046)	(.033)	(.044)	(.037)	(.039)	(.045)	(.046)

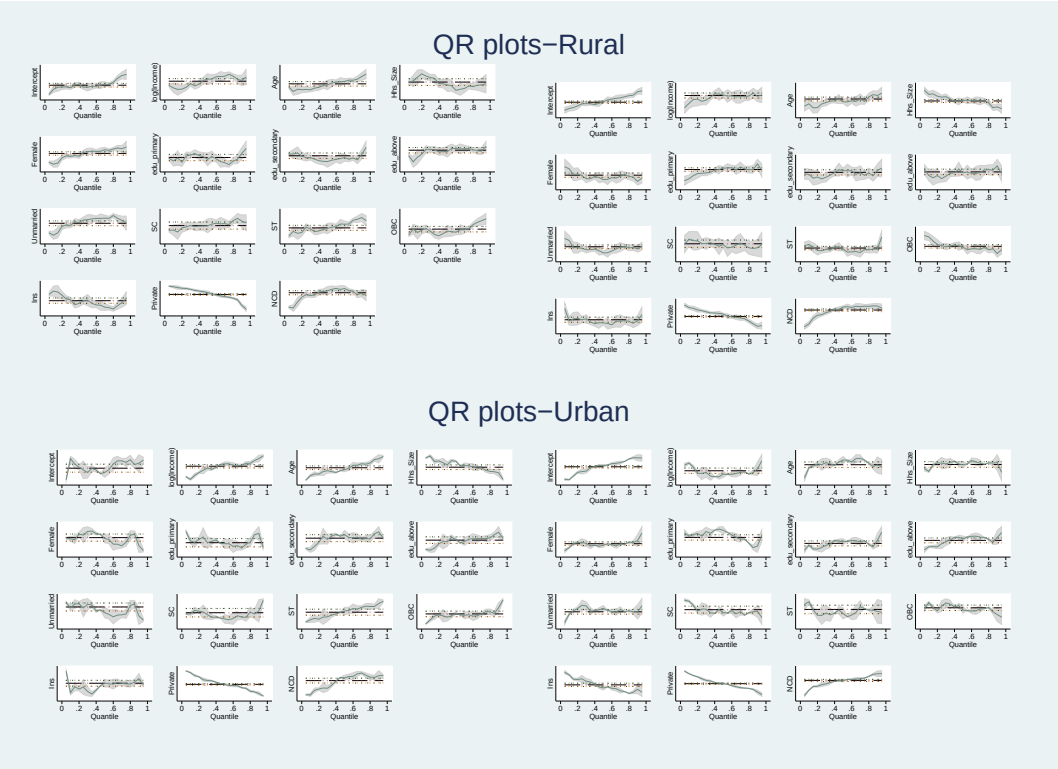
the income elasticity of outpatient health expenditure is higher compared to households incurring less expensive outpatient treatments, and the trend is similar in case of total expenditure. Thus a similar conclusion that for critical health crisis needing high level of outpatient expenses, any increase in income would attract a comparatively higher increase in outpatient expenditure compared to those cases needing low outpatient expenditure, implying faster impoverishment for poorer households with such health needs. Finally, there is no strict consistent trend in non-medical expenditure, but the magnitude of the income elasticity is higher at higher ranges of non medical expenditure compared to the lower range.

In urban areas during 2014, the magnitude of income elasticity for total health expenditure increases monotonically from low to high levels of total health expenditure leading to a substantive gap between highest and lowest quantile. In case of both the inpatient and outpatient expenditure, the income elasticities are increasing over the quantiles, however, at any quantile level, inpatient expenditure is more sensitive to change in income, and the elasticity values are falling in a close range over the different quantiles than the case of outpatient expenditure. This implies that although in case of inpatient expenditure at any quantile of expenditure level any increase in income would attract a comparatively higher increase in health expenditure than the case of outpatient expenditure. The less disperse values of the income elasticities in case of inpatient expenditure indicates that the increase in expenditure due to an increase in income would vary less among the health needs requiring different levels of expenditure in comparison to outpatient expenditure. Income elasticity of non-medical expenditure for urban areas during 2014 is strictly increasing over the quintiles. However, the magnitude of income elasticity for non-medical expenses is relatively lower in urban areas compared to rural areas because of the higher availability of medical facilities, which lower down expenses like transport.

QR estimates of elasticity in wave-2 are comparatively smaller in magnitude for most of the cases in rural areas implying that at every level of health expenditure of all kinds any increase in income would lead to comparatively lower rise in expenditure in 2018 than in 2014. In rural areas the movement of income elasticity of total health expenditure from lower to higher quantile is not strictly increasing. The income elasticity of total expenditure increases rapidly from lower quantile to the median class, but afterward, it decreases gradually implying that for the health care needs requiring mid-level of total health expenditure, any increase in income would lead to comparatively higher increase in health expenditure compared to other health care needs. In case of inpatient expenditure, the pattern is noisy as there is no clear trend in elasticity value while moving from lower to upper quantile levels. For instance, median level inpatient expenses are more inelastic compared to preceding quantile ($\tau = .40$) as well as succeeding quantile ($\tau = .60$). In the remaining two forms of health expenditure, elasticity is weakly monotonic. With some fluctuation in the middle quintiles of healthcare expenditure, income elasticity of outpatient spending is increasing, but with similar variations in the middle

quintiles, income elasticity of non-medical expenditure decreases.

Findings for urban households show that elasticity of total expenditure in the second wave is mostly decreasing as we move up the health expenditure quantile levels with some up and down in the middle range. Inpatient elasticity is stable in a close range with an overall low magnitude. Elasticity of outpatient expenditure is strictly decreasing over the health expenditure quantile values. Income elasticity of non-medical health expenditure is also falling over quintiles, and it became inelastic especially in the higher range of expenditure.



Quantile regression plot of total health expenditure

Like the case of spline estimates, we are comparing elasticity derived from the QR model with the least square estimates. Figure-2 shows an exhilarating way to compare the results by plotting the covariates' partial effects on the conditional distribution of total health expenditure after estimating the QR model. The left panel of the QR plot is obtained from wave-1 data, whereas the right panel is from wave-2 data, with upper and lower part plotting for rural and urban areas. The solid line between the shaded region representing the confidence interval, is QR estimate at various quantile levels and the line parallel to x-axis represent the OLS estimate with other two lines above and below showing the confidence band of OLS estimates. Each of the covariates at some range of quantile lies outside the confidence interval of OLS estimates, and therefore, independent variables affect the conditional distribution of the dependent variable differently at various levels.

In each of the models, intercepts represent the conditional quantile distribution of total expenditure for an average household. Figure-2 also enables us to understand the effect of individual covariates on the income elasticity of total health expenditure. Evidently, higher consumption expenditure is associated with higher values of elasticity in the upper quintiles of health expenditure. Similarly, in all the four cases, the age of head of the household is positively associated with larger values of income elasticities in higher income quintiles, whereas the bigger households result in smaller values of elasticity in higher income quintiles. There is no definite impact of gender and marital status on the elasticity values compared to the different scenarios, but education positively affects elasticity values in the upper income quintile. The effect of social groups (caste) on elasticity is higher at higher income quintile; however, in most of the cases, these covariates are in close vicinity of the confidence interval of least square estimates. Health insurance coverage is associated with higher income elasticity values at the lower quintile of health expenditure, but with changing quintile level, the association is reasonable. Treatment in private facilities has a sharp and negative association with elasticity while moving from lower to upper income quintile, whereas the presence of NCD has the exact opposite effect.

Discussion

In this study, an attempt has been made to compute the income elasticity of out of pocket health expenditure using the latest available microdata of Indian households and assess the changes in demand pattern over the two waves between rural and urban sectors. The study provides two types of estimates of income elasticity to get a thorough understanding of the matter. The first type of estimates categorises the households by the level of income, and the second type of estimates groups the households by the level of health expenditure. The analysis establishes that the expenditure on health care is a necessary good among all the income groups and at all levels of health care expenditure. The conclusion is also true for all kinds of health expenditure like total health expenditure, inpatient, outpatient, and non-medical expenditure, and the findings are consistent with previous research (Zare et al., 2013). However, the magnitudes of elasticity vary widely among the different income groups and levels of health expenditure.

As explained by Di Matteo (2003), variation in the magnitude of elasticity is due to the existence of a non-linear relationship between income and health expenditure, and his study on OECD countries suggest that elasticity in low-income groups is higher compared to high-income groups. Conversely, a long-term study on Iranian households depicts lower elasticity value for low-income groups compared to high-income groups (Zare et al., 2013). In the present analysis, a non-uniform pattern emerged in terms of the magnitude of elasticities across different income groups and confirmed the non-linearity between income and expenditure. The non-uniformity is starker when we compare the income elasticity of health expenditure over the two waves, among the different types of health services and between rural and urban areas. As per the findings presented in table-3, this study does not fully

confirm the view of previous results. All forms health expenditures are relatively inelastic for the middle-income group except for those residing in the urban sector reported during the first wave. The difference in the magnitude of elasticity between the poorest and richest section is also meandering. A one to one comparison of elasticities confirms in the case of the first wave (both rural and urban) that the smallest income group have relatively inelastic demand compared to the rich corroborating the findings of Zare et al., 2012. However, during the second wave, the estimates show a mix of both views. In general, the demand for health care in all forms has become relatively inelastic during the second wave. The non-uniform pattern of income elasticity of health expenditure across the income groups arises due to the variation in demand for health care across the income groups. For example often non-medical expenditure either leads to the postponement of hospital treatment as the real cost of inpatient treatment goes up way above the paying capacity, or increases the risk of catastrophic expenditure and distortion in other consumption by forcing to adopt coping mechanisms, in severe health circumstances (Flores et al., 2008; Pradhan and Prescott, 2002; Zare et al., 2013). As a result, either poorer households face inelastic health care demand due to unfulfilled health requirements or face elastic demand, but with hidden financial hardship. Also the over-dependence of households on private facilities due to structural barriers in public facilities, requiring hefty payments, makes health care demand for poorer income groups either inelastic or elastic with risk of impoverishment. The phenomena explain the need for robust policy intervention, particularly for those in the marginal income groups.

The estimates of the QR model give the income elasticity of health expenditure at various levels of health care demand. Healthcare expenditure volume indicates the level of need and severity of sickness irrespective of the household income, and optimal allocation of household resources on health care does not follow Engel's law (Parkin et al., 1987). QR estimates suggests that all forms of health expenditure at all levels of health need are necessary goods for the households. The magnitude of income elasticity of total healthcare expenditure obtained by the QR model found to be increasing over the quintiles during 2014. The larger value of income elasticity in higher healthcare expenditure quintiles implies that critical sickness treatments attract more income and result in higher out-of-pocket expenditure. In this circumstance, even affluent households would have a catastrophic impact. However,for the low-income families it will lead to impoverishments, which justify the need for public policy to provide cheaper treatment for a severe ailment. Note that QR estimates yield income elasticities that lie in the close interval across the quintiles of inpatient health expenses in both rural and urban areas in 2014 and 2018. Income sensitivity is similar for different levels of tertiary health care,. Income elasticity of outpatient expenditure, as reported in table-4, has a rising trend and higher dispersion among the quintiles in almost all the scenarios excluding the urban area in 2018. Note that outpatient visits are more frequent than inpatient, and treatment is available mostly at private facilities where even simpler clinical procedures are expensive. Hence, the role of primary and secondary care to augment the financial hardship is also significant. Taking into account the entire set of income elasticities Compared

to the demographic characteristics, health care expenditure is more responsive to the covariates that have direct impact on it. The role of insurance, private care and non-communicable disease while determining the elasticity of health expenditure is found to have some significant implications (Figure-2). Firstly, access to insurance causes health expenditure to be more income elastic at all levels of health requirements, and thus such policies have some positive impact on meeting health care demand. Seeking treatment in a private facility is associated with higher income elasticity for minor health care needs but with lower income elasticity at higher health expenditure levels. In case of non-communicable diseases, treatment is associated with low income elasticity at lower expenditure level and higher income elasticity at higher expenditure level and it may imply that given other factors at a constant level, postponement of treatment leads to catastrophic expenditure.

Another interesting observation of this study is that elasticity estimates by both the methods (Spline and QR models) show a downwards shift in magnitude during the latest wave of the survey. In the second wave, average consumption expenditure has gone up, and there is an occurrence of financial ease in terms of reduced average expenditure on health care, which has happened in aggregate and for all income groups, and the net impact leads to a reduction in elasticity. Average real household health expenditure has reduced by almost 15% in both rural and urban areas due to a sharp fall in demand for health care and lowered the health care payment levels. Nevertheless, out of pocket expenditure at the aggregate level is quite sizeable as the self-financing mechanism is still the foremost method for seeking health care. Also it is requisite to understand that the principle objective of the NSSO survey on health is to account for expenditure during the incidence of ailment, which is self-reported and based on the respondent's payment records. The database is ill-equipped with information regarding the health status. Therefore, it is not conclusively arguable that the fall in demand is due to improved health status in the overall population. However, this incidence draws attention for further research regarding epidemiological shifts over time, given India's high burden of disease. Under-reporting of ailments is another possibility of low health care demand given the absence of affordable care, and it also raises serious questions regarding the sample coverage and data quality.

Conclusion

The model presented in this study determines the health-seeking behaviour of Indian households by classifying them into different income groups and levels of health care need. While this study does not intend to investigate government policies, the result can be seen in the light of WHO recommendations to reduce out of pocket expenses. A few of these recommendations that need to be implemented through national policies are targeting the vulnerable population, abolishing user fees, and promoting cashless service delivery. Recently revised National Health Policy (2017) in India assures universal health coverage with accessible quality services without financial austerity. It is essential to increase public expenditure with robust governance and widespread risk pooling mechanisms (Patel et al. 2015) to achieve

this goal. A newly launched insurance-based government scheme, named Pradhan Mantri Jan Arogrya Yojana (PMJAY), is a welcome idea as it assures monetary compensation of half a million rupees per annum for those households who live below poverty line seeking institutional medical care. The policy aims to benefit more than one-third of the Indian population in the coming times. However, the drawbacks, as recognized by (Mondal and Dubey, 2020) are in terms of its feasibility of implementation and the massive financial cost. The eligibility criteria for enrolment are not friendly, which lead to the risk of leaving out the neediest. The programme does not include the middle-income group and the need of outpatient treatments. Listed morbidities and clinical procedures do not significantly cover the perennial health problems. Hence the goals seem to be far to be attained.

References

Jean Abraham, Coleman Drake, Daniel W. Sacks, and Kosali Simon. Demand for health insurance marketplace plans was highly elastic in 20142015. *Economics Letters*, 159:69–73, oct 2017. ISSN 01651765. doi: 10.1016/j.econlet.2017.07.002.

Å G. Blomqvist and R. A.L. Carter. Is health care really a luxury? *Journal of Health Economics*, 16(2):207–229, apr 1997. ISSN 01676296. doi: 10.1016/S0167-6296(96)00534-6.

A. C. Cameron, P. K. Trivedi, Frank Milne, and J. Piggott. A Microeconometric Model of the Demand for Health Care and Health Insurance in Australia. *The Review of Economic Studies*, 55(1): 85, jan 1988. ISSN 00346527. doi: 10.2307/2297531. URL `https://academic.oup.com/restud/article-lookup/doi/10.2307/2297531`.

Win Lin Chou. Explaining China's regional health expenditures using LM-type unit root tests. *Journal of Health Economics*, 26(4):682–698, jul 2007. ISSN 01676296. doi: 10.1016/j.jhealeco.2006.12.002.

Mita Choudhury, Jay Dev Dubey, and Bidisha Mondal. Analyzing Household Expenditure on Health from the 71 st Round of Survey by the National Sample Survey Organization in India. Technical report, 2019.

Paulina Correa-Burrows. Out-Of-Pocket Health Care Spending by the Chronically Ill in Chile. *Procedia Economics and Finance*, 1:88–97, jan 2012. ISSN 22125671. doi: 10.1016/s2212-5671(12)00012-3.

Angus Deaton. *Understanding Consumption*. Oxford University Press, 1992. URL `https://EconPapers.repec.org/RePEc:oxp:obooks:9780198288244`.

Livio Di Matteo. The income elasticity of health care spending: A comparison of parametric and nonparametric approaches. *European Journal of Health Economics*, 4(1):20–29, 2003. ISSN 16187598. doi: 10.1007/s10198-002-0141-6. URL `https://link.springer.com/article/10.1007/s10198-002-0141-6`.

Fabian Duarte. Price elasticity of expenditure across health care services. *Journal of Health Economics*, 31(6):824–841, dec 2012. ISSN 01676296. doi: 10.1016/j.jhealeco.2012.07.002.

Gabriela Flores, Jaya Krishnakumar, Owen O'Donnell, and Eddy Van Doorslaer. Coping with health-care costs: Implications for the measurement of catastrophic expenditures and poverty. *Health Economics*, 17 (12):1393–1412, 2008. ISSN 10579230. doi: 10.1002/hec.1338. URL https://pubmed.ncbi.nlm.nih.gov/18246595/.

Donald G. Freeman. Is health care a necessity or a luxury? Pooled estimates of income elasticity from US state-level data. *Applied Economics*, 35(5):495–502, mar 2003. ISSN 00036846. doi: 10.1080/00036840210138374. URL https://www.tandfonline.com/doi/abs/10.1080/00036840210138374.

Soumitra Ghosh. Catastrophic Payments and Impoverishment due to Out-of-Pocket Health Spending.

Michael Grossman. On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy*, 80(2):223–255, mar 1972a. ISSN 0022-3808. doi: 10.1086/259880.

Michael Grossman. *The Pure Consumption Model*, pages 31–38. NBER, 1972b. URL http://www.nber.org/chapters/c3487.

Wenke Hwang, Wendy Weller, Henry Ireys, and Gerard Anderson. Out-of-pocket medical spending for care of chronic conditions. *Health Affairs*, 20(6):267–278, aug 2001. ISSN 02782715. doi: 10.1377/hlthaff.20.6.267.

Todd Jewell, Junsoo Lee, Margie Tieslau, and Mark C. Strazicich. Stationarity of health expenditures and GDP: Evidence from panel unit root tests with heterogeneous structural breaks. *Journal of Health Economics*, 22(2):313–323, mar 2003. ISSN 01676296. doi: 10.1016/S0167-6296(02)00122-4.

Xu Ke, Priyanka Saksena, and Alberto Holly. The Determinants of Health Expenditure: A Country-Level Panel Data Analysis. Technical report, 2011. URL https://www.who.int/health_financing/documents/report_en_11_deter-he.pdf.

Çaatay Koç. The productivity of health care and health production functions. *Health Economics*, 13(8):739–747, aug 2004a. ISSN 1057-9230. doi: 10.1002/hec.855. URL http://doi.wiley.com/10.1002/hec.855.

Çaatay Koç. The Effects of Uncertainty on the Demand for Health Insurance. *Journal of Risk and Insurance*, 71(1):41–61, mar 2004b. ISSN 0022-4367. doi: 10.1111/j.0022-4367.2004.00078.x. URL https://onlinelibrary.wiley.com/doi/abs/10.1111/j.0022-4367.2004.00078.x.

Çagatay Koç. A theoretical rationale for an inelastic demand for health care. *Economics Letters*, 82(1):9–14, jan 2004c. ISSN 01651765. doi: 10.1016/j.econlet.2003.09.003.

Roger Koenker and Gilbert Bassett. Regression Quantiles. *Econometrica*, 46(1):33, jan 1978. ISSN 00129682. doi: 10.2307/1913643. URL https://www.jstor.org/stable/1913643.

Laishram Ladusingh and Anamika Pandey. Health Expenditure and Impoverishment in India. *Journal of Health Management*, 15(1):57–74, mar 2013. ISSN 0972-0634. doi: 10.1177/0972063413486031. URL http://journals.sagepub.com/doi/10.1177/0972063413486031.

W. G. Manning, J. P. Newhouse, N. Duan, E. B. Keeler, A. Leibowitz, and M. S. Marquis. Health insurance and the demand for medical care: evidence from a randomized experiment. *American Economic Review*, 77 (3):251–277, jun 1987. ISSN 00028282. doi: 10.2307/1804094. URL https://www.jstor.org/stable/1804094.

Suzanne K. McCoskey and Thomas M. Selden. Health care expenditures and GDP: Panel data unit root test results. *Journal of Health Economics*, 17(3):369–376, jun 1998. ISSN 01676296. doi: 10.1016/S0167-6296(97)00040-4.

Blaise Melly. Decomposition of differences in distribution using quantile regression. *Labour Economics*, 12(4):577–590, aug 2005. ISSN 09275371. doi: 10.1016/j.labeco.2005.05.006.

Bidisha Mondal and Jay Dev Dubey. Gender discrimination in health-care expenditure: An analysis across the age-groups with special focus on the elderly. *Social Science and Medicine*, 258:113089, aug 2020. ISSN 18735347. doi: 10.1016/j.socscimed.2020.113089.

F. Moscone and E. Tosetti. Health expenditure and income in the United States. *Health Economics*, 19(12):1385–1403, dec 2010. ISSN 1057-9230. doi: 10.1002/hec.1552. URL https://onlinelibrary.wiley.com/doi/abs/10.1002/hec.1552.

Philip Musgrove. Family health care spending in Latin America. *Journal of Health Economics*, 2(3):245–257, dec 1983. ISSN 01676296. doi: 10.1016/S0167-6296(83)80004-6.

J. P. Newhouse. Medical-care expenditure: a cross-national survey. *The Journal of human resources*, 12(1):115–125, 1977. ISSN 0022166X. doi: 10.2307/145602. URL https://www.jstor.org/stable/145602.

Albert A. Okunade, Chutima Suraratdecha, and David A. Benson. Determinants of Thailand household healthcare expenditure: the relevance of permanent resources and other correlates. *Health Economics*, 19(3):365–376, mar 2010. ISSN 10579230. doi: 10.1002/hec.1471. URL http://doi.wiley.com/10.1002/hec.1471.

Anamika Pandey, George B. Ploubidis, Lynda Clarke, and Lalit Dandona. Trends in catastrophic health expenditure in india: 1993 to 2014. *Bulletin of the World Health Organization*, 96(1):18–28, jan 2018. ISSN 15640604. doi:

10.2471/BLT.17.191759. URL /pmc/articles/PMC5791868/?report=abstract https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5791868/.

Susan W. Parker and Rebeca Wong. Household income and health care expenditures in Mexico. *Health Policy*, 40(3):237–255, jun 1997. ISSN 01688510. doi: 10.1016/S0168-8510(97)00011-0.

David Parkin, Alistair McGuire, and Brian Yule. Aggregate health care expenditures and national income. Is health care a luxury good? *Journal of Health Economics*, 6(2):109–127, jun 1987. ISSN 01676296. doi: 10.1016/0167-6296(87)90002-6.

Vikram Patel, Rachana Parikh, Sunil Nandraj, Priya Balasubramaniam, Kavita Narayan, Vinod K. Paul, A. K.Shiva Kumar, Mirai Chatterjee, and K. Srinath Reddy. Assuring health coverage for all in India. *The Lancet*, 386(10011):2422–2435, dec 2015. ISSN 1474547X. doi: 10.1016/S0140-6736(15)00955-1.

Menno Pradhan and Nicholas Prescott. Social risk management options for medical care in Indonesia. *Health Economics*, 11(5):431–446, jul 2002. ISSN 1057-9230. doi: 10.1002/hec.689. URL http://doi.wiley.com/10.1002/hec.689.

Magdalena Z Raban, Rakhi Dandona, and Lalit Dandona. Variations in catastrophic health expenditure estimates from household surveys in India. *Bulletin of the World Health Organization*, 91(10):726–735, oct 2013. ISSN 0042-9686. doi: 10.2471/BLT.12.113100. URL http://www.who.int/entity/bulletin/volumes/91/10/12-113100.pdf.

Jeanne S. Ringel, Susan D. Hosek, Ben a. Vollard, and Sergej Mahnovski. The Elasticity of Demand for Health Care: A Review of the Literature and Its Application to the Military Health System. Technical Report 1355, 2002. URL http://www.rand.org/pubs/monograph_reports/2005/MR1355.pdf.

Jennifer Roberts. Sensitivity of elasticity estimates for OECD health care spending: analysis of a dynamic heterogeneous data field. *Health Economics*, 8(5):459–472, aug 1999. ISSN 1099-1050. doi: 10.1002/(SICI)1099-1050(199908)8:5¡459::AID-HEC454¿3.0.CO;2-U.

Jeffrey J. Rous and David R. Hotchkiss. Estimation of the determinants of household health care expenditures in Nepal with controls for endogenous illness and provider choice. *Health Economics*, 12(6):431–451, jun 2003. ISSN 1057-9230. doi: 10.1002/hec.727. URL http://doi.wiley.com/10.1002/hec.727.

Eddy van Doorslaer, Owen O'Donnell, Ravi P. Rannan-Eliya, Aparnaa Somanathan, Shiva Raj Adhikari, Charu C. Garg, Deni Harbianto, Alejandro N. Herrin, Mohammed Nazmul Huq, Shamsia Ibragimova, Anup Karan, Chiu Wan Ng, Badri Raj Pande, Rachel Racelis, Sihai Tao, Keith Tin, Kanjana Tisayaticom, Laksono Trisnantoro, Chitpranee Vasavid, and Yuxin Zhao. Effect of payments for health care on poverty estimates in 11 countries in Asia: an analysis of household survey data. *Lancet*, 368(9544):1357–1364, oct 2006. ISSN 01406736. doi: 10.1016/S0140-6736(06)69560-3.

Adam Wagstaff. The demand for health. Some new empirical evidence. *Journal of Health Economics*, 5(3):195–233, sep 1986a. ISSN 01676296. doi: 10.1016/0167-6296(86)90015-9.

Adam Wagstaff. THE DEMAND FOR HEALTH: A SIMPLIFIED GROSSMAN MODEL. *Bulletin of Economic Research*, 38(1):93–95, jan 1986b. ISSN 0307-3378. doi: 10.1111/j.1467-8586.1986.tb00206.x. URL http://doi.wiley.com/10.1111/j.1467-8586.1986.tb00206.x.

Adam Wagstaff, Gabriela Flores, Justine Hsu, Marc François Smitz, Kateryna Chepynoga, Leander R. Buisman, Kim van Wilgenburg, and Patrick Eozenou. Progress on catastrophic health spending in 133 countries: a retrospective observational study. *The Lancet Global Health*, 6(2):e169–e179, feb 2017. ISSN 2214109X. doi: 10.1016/S2214-109X(17)30429-1.

Gerard J. Wedig. Health status and the demand for health. Results on price elasticities. *Journal of Health Economics*, 7(2):151–163, jun 1988. ISSN 01676296. doi: 10.1016/0167-6296(88)90013-6.

Ke Xu, Guy Carrin, Nguyen Thi Kim Phuong, Nguyen Hoang Long, Dorjsuren Bayarsaikhan, and Ana Mylena Aguilar. Health service utilization and the financial burden on households in Vietnam: The impact of social health insurance. *World Health Organization*, pages 1–28, 2006.

Hossein Zare, Antonio J. Trujillo, Eva Leidman, and Christine Buttorff. Income elasticity of health expenditures in Iran. *Health Policy and Planning*, 28(6):665–679, 2013. ISSN 02681080. doi: 10.1093/heapol/czs106.

Appendix:Income elasticity of Health Care expenditure: OLS estimates

Variable	Definition	Wave-1(2014)		Wave-2(2018)	
		Rural	Urban	Rural	Urban
lnuexp		.514***	.409***	.266***	.247***
		(.017)	(.018)	(.014)	(.013)
Age		.002***	.009***	.010***	.010***
		(.000)	(.000)	(.000)	(.000)
Household Size		-.02***	.009**	-.00***	.004
		(.004)	(.004)	(.003)	(.003)
Gender (Ref:Category)	= 1 if Male				
	= 1 if Female	-.01	.021	.033	-.03
		(.031)	(.036)	(.024)	(.026)
Education (Ref: Category)	= 1 , Illiterate				
	= 1, Primary	.016	.063*	.082***	.045*
		(.023)	(.034)	(.019)	(.027)
	= 1 , Secondary	-.02	.149***	.087***	.201***
		(.017)	(.025)	(.013)	(.019)
	= 1 HigherSecondary/	-.03	.213***	.250***	.281***
	Diploma/Collage	(.037)	(.033)	(.025)	(.023)
Marital (Ref : Category)	= 1 if Married				
	= 1 if Unmarried/	-.05*	-.07**	.140***	.002
	Widowed/Divorced	(.030)	(.034)	(.022)	(.024)
Caste (Ref : Category)	= 1 if General				
	= 1 if SC	-.17***	.146**	-.15***	.034
		(.030)	(.059)	(.023)	(.044)
	= 1 if ST	-.14***	-.16***	-.03**	-.07***
		(.022)	(.028)	(.016)	(.019)
	= 1 if OBC	-.08***	.045**	-.02	-.04***
		(.019)	(.021)	(.014)	(.015)
Insurance	= 1 if Insured				
	= 1 if Not Insured	.080***	.026	.056***	-.08***
		(.022)	(.021)	(.017)	(.016)
pvt	=1 if if treatment in	1.40***	1.43***	1.50***	1.55***
	private facility	(.016)	(.021)	(.011)	(.015)
ncd	=1 if ailment is non	.483***	.263***	.449***	.392***
	communicable	(.015)	(.019)	(.011)	(.013)
	constant	.947***	1.34***	2.15***	2.62***
		(.145)	(.158)	(.116)	(.115)
	Observation	27987	23163	49771	38329
	$R^2 adjusted$	.313	.259	.343	.331

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