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Article

Rural Healthcare Spending at the Household Level: Evidence from India's Major States

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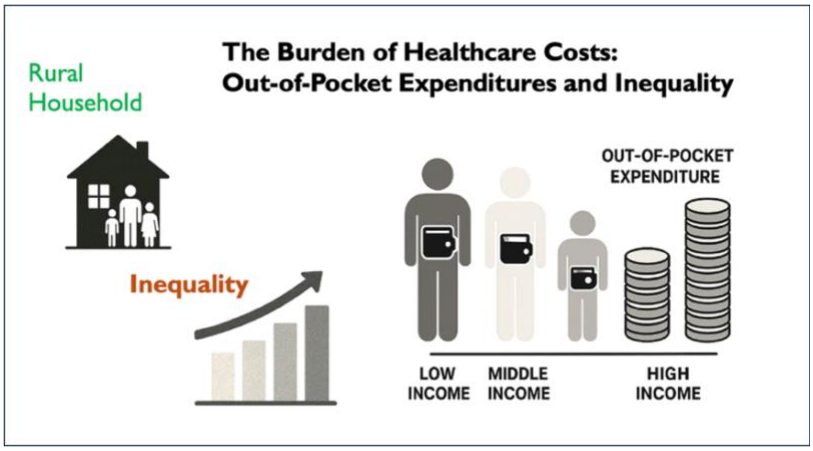
Graphical abstract



Highlights

- Rural household healthcare expenses have increased in most of the developing countries, including India.
- Inequality in out-of-pocket health expenditures in rural India increased during 2004-05 and 2011-12.
- Education, female work force participation, non-farm employment, and health infrastructure are the major determinants of consumer health expenses.
- Age, education, non-farm employment, and household size are key drivers of healthcare expense inequality.

Abstract

During the period of economic reforms, the Indian economy witnessed an enormous growth with a highly skewed distribution of consumer healthcare expenses. Reduction in public expenditure on the social sector during the period of economic reforms has also adversely affected the rural poor and vulnerable sections of society. This paper attempts to examine the pattern of rural healthcare expenses at the household level and to examine the extent of inequality that prevails in the distribution of healthcare spending across different groups of people in India. Hospitalization and out-patient expenditures are analyzed separately. Gini-coefficient and Palma ratio have been used to measure the degree of inequality. Factors determining the rural healthcare expenses have been identified and examined by using econometric techniques. Consumer Expenditure Survey (CES) data for the 61st round (2004-05) and 68th round (2011-12) collected by the National Sample Survey Organization (NSSO) of India have been used. Education, rural non-farm employment, female participation in the workforce and availability of health infrastructure appear highly significant in determining rural consumer healthcare spending in Indian states. The outcome of this study highlights the need for an increase in fiscal expenditure for the improvement of public sector healthcare facilities, including manpower so that poor people can attain quality healthcare without suffering any financial distress.

Keywords: Health expenditures; Inequality; Gini-coefficient; Social determinants; Pooled regression.

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1 Introduction

Long and healthy life of an individual raises productive capacity and enhances the level of human wellbeing. It augments basic capabilities and range of choices of the individuals so that they can attain their own welfare level. Attainment in health in an economy thus results in higher human development of the economy concerned (Sultana et al., 2022). Improved health status is conducive to the economic development of a country (Fumagalli et al., 2024). In the context of developing economies, improved health status of people is directly related to the healthcare expenditure at the individual level, extent of public health expenses, and environmental quality. More healthcare expenditure by the household members implies more attainment in healthcare services which reflects the capacity of the people to incur the expenses for attaining healthcare services (Raghupathi and Raghupathi, 2020). Hence, healthcare expenditure at the household level is directly linked to improved health attainment among the population, and consequently, to the overall development of the country. Healthcare spending at the household level consists of all spending on medical care, disease prevention, rehabilitation, health administration and regulations (Polsky et al., 2014; Larjow, 2018). Consumer health expenses may be broadly categorized into institutional or hospitalization expenses and non-institutional or out-patient expenses. When healthcare expenditure is enormously high compared to individual's total expenditure and earning, it becomes catastrophic and imposes an unprecedented financial burden to the households.

A large share of consumer spending on healthcare to the aggregate consumer expenditure has been a concern for the policymakers in the Indian economy during the post-reform era. Consumer health expenses are the amount of expenditure that is directly incurred by the household members for receiving healthcare services. In other words, consumer expenditure on healthcare services is the uncovered and direct medical expenditure of the household members. It becomes a burden for households when it consists of a large share of total monthly consumption expenses (Mohanty et al., 2016; Thakur et al., 2018; Ud Din et al., 2023). Indian economy witnessed an enormous economic growth after economic reforms, which entails the per capita income and the per capita expenditure to rise (Rodrik and Subramanian, 2005). But so far as the question of pattern of income/expenditure distribution, after more than seventy years of independence the economy is still at a soaring level of inequality. Being an important component of consumer aggregate expenditure, healthcare spending at the individual level has increased no doubt but as a percentage of overall expenses has become almost same during a long period of time. Moreover, during the process of structural reforms in India, social sector expenditure has gone down. Public health care expenditure as percentage of Gross Domestic Product (GDP) has declined. Decline in public health expenditure may cause high out-of-pocket expenditure for healthcare in India (Rao and Choudhury, 2012). The rural healthcare system is quite different in India than its urban counterpart (Rudrappa et al., 2019). Major healthcare access points in the rural sector are primary health centers and then community health centers, those are mainly public sector care providers. Not every person gets access to quality and quick healthcare services in their proximity in need. Therefore, health expenditure in rural regions is very different compared to the urban regions both in terms of affordability and accessibility. In Ghana, Angko (2013) showed that health status and age combination among citizens are important determinants of healthcare expenses.

Good environment is also a precondition for low healthcare spending at the household level (Sinha and Roy, 2015). The use of safe drinking water, availability of proper sanitation facility and fuel used in cooking are important environmental factors to affect the health status and hence the health expenditures at household level (Sinha and Roy, 2015). Fuel such as wood, cow dung and charcoal cause air pollution and in effect respiratory diseases would develop (Idowu et al., 2023). Hence, this kind of fuels use induces health hazards to the people and hence health expenses for households would increase. Moreover, improper sanitation facilities may cause the spread of infectious disease which raises cost of healthcare. Prasad (2013) stated that the poverty leads to poor health in urban regions due to poor living condition. Communicable diseases spread rapidly due to lack of proper sanitation measures such as regular garbage disposal, availability of toilets, and good hygiene; therefore, improving these conditions is essential to prevent outbreaks (Challa et al., 2022).

Many studies focused on the issue of household health expenses and its inequality in the global context (Raghfar and Gholami, 2014; Zhou et al., 2020; Al-Hanawi and Njagi, 2022; Fu, 2022; Gaddam and Rao, 2023). Chou and Wang (2009) showed that income inequality and government budget deficit are the two key reasons for regional disparities in healthcare spending in China. Inequalities in out-of-pocket healthcare payments rely more on private payments than public funding (Shaltynov et al., 2024). Christopher et al. (2018) revealed that income inequality in the United States of America (USA) rose due to the inclusion of the payments for healthcare. Inclusion of healthcare payment also had increased the number of people below poverty line. In the USA, healthcare sector is characterized by high spending but limited coverage, though the growth in inflation adjusted real healthcare spending declined steeply between 2000 and 2011 compared to other OECD (Organization for Economic Co-operation and Development) countries (Lorenzoni et al., 2014; Yetim et al., 2021). In the global context, healthcare spending in USA is inequality inducing (Virk and Holmes, 2022). However, Ke et al. (2011) explained that the trajectory of economic growth and pattern of health expenses vary across the countries at different stages of economic development.

Pattern of consumption expenditure and the inequality issues is a serious concern to the policy makers for most of the developing countries including India. Various researchers have contributed to the study of rural-urban disparity in consumer

expenditures (Chaudhuri and Gupta, 2009; Das and Pathak, 2012; Siddalingappa et al., 2015; Sangar et al., 2018). Several studies attempted to examine the consumption expenditure issues in the context of Indian economy. Jha et al. (2006) revealed that although average consumption expenses in rural India are higher than the poverty line, however, inequality level in the distribution is also high. Bhaumik and Chakravarty (2006) highlighted the extent of income inequality across different castes in India after economic reforms because of disparity in educational attainment and experience as people get older. Chandrashekhar and Mukhopadhyay (2008) studied the incidence of poverty and increased socio-economic inequality in urban regions which was due to rapid urbanization in India. Sen and Das (2018) showed that consumer expenditure on non-food expenditure in India is pro-rich while expense on essential food is regressive or pro-poor. Inequality in health expenditure across regions is a concern in many countries. In India, most studies analyzed spending patterns and the degree of inequality using aggregated income or consumption data. However, studies on health expenses at the individual level across states Indian states are scarce.

Balarajan et al. (2011) documented that most of the Indian population is not covered under any type of social or private health insurance. Hence, high out-of-pocket costs are associated with inequalities among households. Rising inequality in out-of-pocket health expenditure is a major concern for policymakers (Njagi et al., 2020). Mukherjee et al. (2011) documented that caste-based inequality in spending on healthcare has been observed in the southern Indian states. Therefore, uneven health outcomes have been visible among different castes in these states. Low health expenditure in some states often results in inequality in achieving desired health outcomes among households in Indian states (Kumar, 2021a). Akhtar et al. (2020) opined that inadequate coverage of health insurance, inter-regional differences, household income and household size are the major causes of inequality in the occurrence of catastrophic expenditure on healthcare. Social and economic deprivation based on caste, religion and income class is one of the reasons for prevailing inequalities in accessing health services in India (Baru et al., 2010).

Previous studies have dealt with various issues related to the pattern of aggregate consumption expenditure in India and its constituent states along with the degree of inequality that prevails in the consumption structures. Some studies discussed the health expenses, health outcome and the issues of regional differences in the Indian context. But studies on the inequality in out-of-pocket expenses of the household members in the rural regions of India are almost rare. This paper attempts to examine the pattern of rural healthcare expenses at the household level and to examine the extent of inequality that prevails in the distribution of healthcare spending among different income/expenditure groups in India. This paper also attempts to examine the determinants of rural healthcare expenditure across Indian major states. Drivers of inequality in rural health expenses across population groups are identified and examined by using econometric techniques.

2 Data and methodology

This study has used the quinquennial consumer expenditure survey data of the 61st (2004-05) and 68th (2011-12) rounds collected by the National Sample Survey Organization (NSSO) (NSSO, 2006; NSSO, 2014). Other survey reports such as Employment and Unemployment Situation in India and National Family Health Survey reports (IIPS, 2007; IIPS, 2017) have been used for data on several explanatory factors. In order to measure the degree of inequality in consumer healthcare expenses, two popular measures as Gini coefficient and Palma ratio are used.

2.1 Gini coefficient

The Gini coefficient is a popular measure which is widely used to measure the extent of inequality or disparity in the distribution of income or expenditure (Rogerson, 2013). The population is ordered from the poorest to the richest to calculate the Gini coefficient (G). Gini coefficient is defined as:

$$G = 1 - 2\int_0^1 L(x)dx$$

Where, L(x) represents the Lorenz curve. It is the graphical representation of the cumulative proportion of the population and the cumulative proportion of the distribution of the income or expenditure variable. Lorenz curve has the following properties: L(x) is non-decreasing, i.e., $L'(x) \geq 0$ and L(x) is concave upward, i.e., $L''(x) \geq 0$

L(x) = x implies a perfect equality line where the Gini coefficient equals zero (Catalano et al., 2009). The value of Gini coefficient ranges between zero and one such that zero indicates complete equality whereas the value one implies complete inequality.

2.2 Palma ratio

According to Palma (2014), Palma (2019) and Palma and Stiglitz (2016), Gini Index is more sensitive to the variation in the middle of the entire income or expenditure distribution and relatively insensitive for the higher income class. Palma (2019) developed a ratio to assess the extent of inequality between the poorest and richest population in a society. Palma ratio was

used to measure the level of inequality in consumer health expenditure between the poorest and richest section. Palma ratio (δ_p) is expressed as:

$$\delta_p = \frac{S_R}{S_P}$$

Where, S_R is the share of richest 10 percent of population in per capita healthcare expenditure and S_p is the share of poorest 40 percent of population.

2.3 Econometric models

In order to examine the determinants of rural healthcare spending, some econometric models are specified where the dependent variable is the rural consumer healthcare spending (RCHS). Explanatory variables have been categorized into demand and supply sides. Nine factors from the demand side and two factors from the supply side are considered for this study. These explanatory factors are as follows:

Education (*Edu*): Population having an education level of 12th standard in senior high school or above is considered as an indicator for educational attainment. It is quite expected that educational attainment raises health awareness among the rural population as they would get more information in order to increase the quality of living. Hence, demand for healthcare utilization is likely to rise among educated individuals.

Household size (*HHsize*): Health expenditure is likely to increase with the increase in household size.

Female workforce participation rate (*FWFPR*): Female workforce participation rate is one of the important indicators of women empowerment. When women members in the family become financially independent, they can take decisions regarding healthcare expenditures for themselves as well as for their family members. Hence workforce participation rate may affect positively to the healthcare expenditure of the households.

Rural non-farm employment rate (*RNFE*): Rural non-farm employment is an alternative job opportunity for the rural people besides agriculture. RNFE includes full-time or part-time jobs in small-scale industries, hotels and restaurants, transport, construction, mining and quarrying, and manufacturing. Agriculture in our country is mostly seasonal in character. Hence, non-farm employment opportunities in the rural economy serve as survival for the rural poor by providing earning stability. Expenditure on healthcare is likely to rise as there is an increase in rural non-farm employment.

Health insurance enrolment (*HHIns*): Insurance reduces the intensity and financial burden of out-of-pocket expenditure on health. Percentage of households enrolled in at least one social security scheme, or any type of health insurance has been taken as an indicator for health insurance enrollment. Health insurance might affect out-of-pocket expenses of the people.

Healthcare services from public health center (*PubHS*): Healthcare services from public health centers are an important factor affecting the amount of out-of-pocket health expenses. More the healthcare services from public health centers less will be the own health expenses in an average. Percentage of people receiving healthcare services from public health centers has been taken as the indicator for public healthcare services.

Composite health infrastructure (HinfraIndex): Improved health infrastructure expectedly affects the individual health expenses by reducing it. A composite health infrastructure index has been formed to have the extent of infrastructural facilities for different cross section units. The composite health infrastructure index is a geometric mean of two indices: infrastructure index and manpower index. The infrastructure index includes the number of sub-centers, public health centers, and community health centers in the rural regions of each state. Manpower includes the availability of female health workers or nurses and doctors at primary health centers (PHCs), specialists and radiographers at Clinical Health Centers (CHCs), nursing staff at PHCs and CHCs and lab technicians. Rescaling of each indicator of infrastructure and manpower has been done by following United Nations Development Programme (UNDP's) min-max normalization method as i.e.,

$$X = \frac{Actual\ Value - minimum\ value}{Maximum\ value - minimum\ value}$$

Where, X denotes the value of the index. Both the infrastructure index and manpower index have been calculated here as the simple arithmetic mean of the indices of respective indicators. Finally, the HinfraIndex has been calculated by the geometric mean of two component indices, i.e.,

$$\text{HinfraIndex} = (\text{infrastructure index} * \text{manpower index})^{1/2}$$

Public expenditure on health (SHGSDP): Public expenditure on health as a percentage of gross state domestic product is another supply size indicator which represents access to health services of individual at lower cost or free of cost.

Index of environmental pollution effect (HHpol_Index): Environmental pollution is directly related to the health hazards of the people. Adverse environmental quality generally led to more health problems to the household members. Environmental pollution effect at the household level may be captured in terms of an index of environmental pollution effect (HHpol_Index). HHpol_Index is calculated as the geometric mean of the indices based on three indicators reflecting the effect of bad environmental quality. The percentage of the population using water from non-improved water sources, the percentage using an unimproved sanitation facility and the kinds of fuel causing air pollution at home are the three indicators used to calculate the pollution index at the household level using the previously stated UNDP methodology.

$$\text{HHpol\_Index} = (\text{Nonimproved watersource index} * \text{nonimproved sanitation index} * \text{cooking fuel source index})^{1/3}$$

A high percentage of households in rural India use wood, agricultural crop waste and cow dung as cooking fuel. These materials cause air pollution and serious health hazard while using over a long period of time.

Effect of environmental pollution leads to serious health hazards to the household members. Hence high degree of bad environmental quality is expected to enhance the health expenditure level of the household at the concerned cross-section unit.

2.4 Model specifications

2.4.1 Determinants of rural healthcare spending

In order to examine the determinants of rural healthcare spending we have formulated and estimated multiple regression econometric models. The dependent variable, rural consumer healthcare spending (RCHS), is the per capita monthly consumer expenditure on healthcare. Several explanatory variables are taken alternatively to remove multicollinearity problems. Hence, the log-level pooled regression models are specified as:

Model 1:

$$\ln(RCHS)_{iR} = b_0 + b_1(Edu)_i + b_2(HHsize)_i + b_3(FWFPR)_i + b_4(RNFE)_i + b_5(PubHS)_i + b_6(HHIns)_i + b_7(LnHinfraIndex)_i + \varepsilon_i$$

Model 2:

$$\ln(RCHS)_{iR} = b_0 + b_1(Edu)_i + b_2(HHsize)_i + b_3(FWFPR)_i + b_4(RNFE)_i + b_5(PubHS)_i + b_6(HHIns)_i + b_7(LnHinfraIndex)_i + b_8(SHGSDP)_i + b_9(HHpol\_Index)_i + \varepsilon_i$$

Here, b_is measures the percentage change in healthcare spending (RCHS) if there is one unit change or proportional change in any predictor, holding other variables constant.

2.4.2 Determinants of inequality in rural healthcare expenses

As discussed earlier, high inequality in consumer expenditure prevails in almost all the developing countries in the world. In case of average healthcare spending at the household inequality level is more elevated. In order to examine the drivers of such soaring level of inequality in out-of-pocket healthcare expenditure we have formulated and estimated econometric models as stated below. In order to capture the influence of several explanatory variables on inequality in rural consumer healthcare spending (InqRCHS) at the household level in rural healthcare spending, linear pooled regression models are specified as:

Model 3:

$$InqRCHS_{iR} = h_0 + h_1(AGE60)_i + h_2(HinfraIndex)_i + h_3(SHExp)_i + h_4(HHsize)_i + h_5(FWPR)_i + h_6(RNFE)_i + h_7(EduIndex)_i + \varphi_i$$

Model 4:

$$InqRCHS_{iR} = h_0 + h_1(AGE60)_i + h_2(HinfraIndex)_i + h_3(SHExp)_i + h_4(HHsize)_i + h_5(FWPR)_i + h_6(RNFE)_i + h_7(EduIndex)_i + h_8(SHGSDP)_i + \varphi_i$$

Here, h_is measures the degree of variations in health expenses inequality when any predictor changes by one unit or a proportion, keeping other predictors constant.

3 Results and discussion

3.1 Real healthcare spending at the household level

Health expenditure is an important component of monthly consumption expenditure of the consumers in the non-food category. Consumers spend a proportion of their monthly disposable income on healthcare. This study shows that the rural per capita real healthcare spending is highest in Kerala followed by Punjab among all the states and is lowest in Assam followed by Bihar and Orissa. Hospitalization or in-patient (IP) expenditure is an imperative component of total health spending as it is one of the reasons for the catastrophic financial burden incurred by households. In rural regions, the top three states having the highest per capita hospitalization expenses are Kerala, Punjab and Haryana whereas the bottom three states are Bihar, Assam and Orissa in 2004-05. In 2011-12, the value of real per capita hospitalization expenses has increased in all the states except Assam and Haryana. The top three states in this period (2011-12) are Kerala, Punjab, and Maharashtra and the bottom-most states are Assam, Bihar and Orissa (**Table 1**).

Monthly per capita out-patient (OP) expenditure is relatively higher than the IP expenses in all the major Indian states irrespective of regions. In case of rural region, real mean OP expenses are highest in Kerala followed by Punjab and Haryana in 2004-05. The lowest expense is observed in the case of rural Assam followed by Bihar and Karnataka. OP expenditure has increased over time while the ranking of Kerala and Punjab remain unaltered. AP has reached the third position by replacing Haryana. Three states such as Assam, Bihar and Orissa show the lowest OP expenses in 2011-12.

The data showed an increase in average real health expenses at the household level throughout India irrespective of different regions. Extent of healthcare spending by household members at the global level shows almost same picture. Monthly per-capita spending on private healthcare in countries like USA, Australia is almost seven times higher than India in 2004 (**Fig. 1**). Other Asian countries such as Japan and China have higher health expenses whereas Indonesia and Bangladesh have lower expenses compared to India. Health expenses have increased disproportionately in these countries in 2012. Health expense gap between India and other developed nations have decreased in later period (Mahumud et al., 2017).

Table 1. *Per capita monthly rural healthcare spending (at constant price with 2004-05 as base year) in Indian States. Source: NSSO, 2006 and NSSO, 2014.*

States	Hospitalization expense		OP Expense		Total health expenses	
	2004-05	2011-12	2004-05	2011-12	2004-05	2011-12
Andhra Pradesh	8.46	18.76	31.11	54.47	39.57	73.23
Assam	2.1	1.96	9.28	14.02	11.38	15.98
Bihar	1.42	7.5	12.13	22.15	13.55	29.65
Gujarat	13.19	19.78	22.06	27.1	35.25	46.88
Haryana	16.68	13.22	34.22	37.94	50.9	51.16
Karnataka	6.23	21.59	16.38	28.27	22.61	49.86
Kerala	40.53	52.12	61.22	81.47	101.75	133.59
Madhya Pradesh	5.6	8.38	25.78	27.91	31.38	36.28
Maharashtra	15.02	32.9	29.38	35.73	44.4	68.63
Orissa	4.75	8.3	17.1	24.49	21.85	32.79
Punjab	20.79	35.99	42.15	72.75	62.94	108.74
Rajasthan	7.73	13.9	23.33	36.23	31.06	50.13
Tamil Nadu	10.46	21.24	26.82	47.72	37.28	68.95
Uttar Pradesh	10.05	19.12	21.2	38.36	31.25	57.48
West Bengal	9.29	13.5	30.38	37.92	39.67	51.42
All India	9.41	16.67	26.93	35.49	36.34	52.16

3.2 Inequality in consumer health expenses

Several initiatives were undertaken by the Govt. of India to improve health outcomes in Indian states since economic reforms (Grover and Singh, 2020). But an intensive health sector development was started with the launch of the National Rural Health Mission in 2005 (Kumar, 2021b). However, we observe that consumer healthcare spending has continuously become skewed in the major states since economic reforms. **Table 2** shows that the degree of inequality in consumer healthcare spending (RCHS) has increased in rural India during the reform period. In 2004-05, the highest inequality in rural health expenses of individuals was recorded in rural Tamil Nadu followed by Andhra Pradesh and West Bengal. The lowest value of the Gini coefficient was recorded in Assam followed by Haryana and Bihar. Inequality has increased in the rural areas of all the states except Tamil Nadu and Rajasthan. Tamil Nadu has remained at the highest rank in 2011-12 in terms of the inequality in health expenses followed by Maharashtra, Karnataka and Uttar Pradesh.

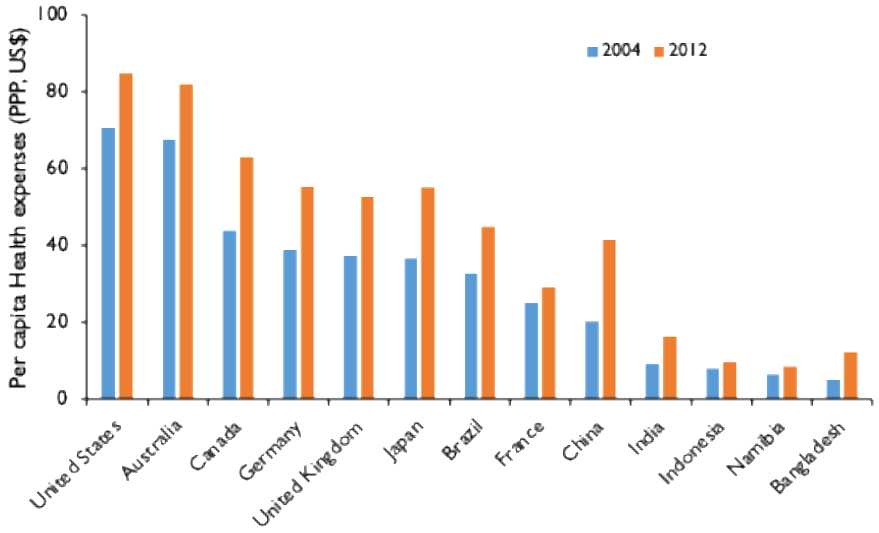

Figure 1. *Monthly per capita health expenses in some selected countries (in PPP US$). PPP: Purchasing Power Parity. Data source: World Bank, 2024.*

Table 2. *Inequality in rural consumer healthcare spending in India: Gini coefficient and Palma ratio. Data source: NSSO, 2006 and NSSO, 2014.*

States	Gini coefficient (G)		Palma ratio (Ω)	
	2004-05	2011-12	2004-05	2011-12
Andhra Pradesh	0.468	0.442	2.63	2.23
Assam	0.300	0.358	2.05	1.39
Bihar	0.341	0.380	1.26	1.72
Gujarat	0.373	0.449	1.89	2.50
Haryana	0.306	0.338	1.69	1.43
Karnataka	0.400	0.478	1.76	3.00
Kerala	0.351	0.454	2.50	2.40
Madhya Pradesh	0.446	0.465	3.45	2.54
Maharashtra	0.436	0.495	2.55	3.18
Orissa	0.438	0.454	1.76	2.60
Punjab	0.408	0.424	3.49	2.33
Rajasthan	0.402	0.396	2.42	1.78
Tamil Nadu	0.554	0.499	5.50	3.22
Uttar Pradesh	0.385	0.478	1.28	2.99
West Bengal	0.449	0.474	2.96	2.75
All India	0.448	0.474	2.37	2.81

In both periods, Palma ratio (Ω) is greater than 1 which implies that the health expenditure shares of the richest 10 percent population (rural region) are greater than that of the poorest 40 percent in all the major states of India. In 2004-05, the highest gap between richest 10 percent and poorest 40 percent is observed in rural Tamil Nadu followed by Punjab and Madhya Pradesh. The gap is lowest in Bihar, Orissa and Karnataka. In 2011-12, Palma ratio has declined in the rural areas of Andhra Pradesh, Assam, Haryana, Kerala, Punjab, Tamil Nadu and West Bengal. However, rural Tamil Nadu has remained at rank one in terms of the gap between richest and poorest groups in 2011-12. The gap between the poorest and richest groups is declining although the overall inequality level shows an increasing trend.

3.3 Determinants of healthcare spending at the household level

Regression results shows that rural non-farm employment, education, and female workforce participation rate are the three most significant variables that influence rural consumer healthcare spending [RCHS] (**Table 3**). Increase in the proportion of people with educational attainment level at higher secondary (HS) have a positive

significant influence on healthcare costs in the rural sector. Education has a direct positive impact on household health expenses as it raises awareness regarding health and hygiene (Olasehinde and Olaniyan, 2017). People are expected to spend more on protective as well as curative healthcare. FWFPR is an important indicator of the empowerment of rural women. Any kind of employment enables women to make their own decisions regarding the care of their health and their children. Enrolment of additional female members in the workforce would increase the RCHS significantly. RNFE, which indicates that a one-unit increase in rural non-farm employment can increase RCHS by more than three percent. Over the years, the percentage of RNFE has increased in the rural economy of India due to changes in the occupational pattern. Agricultural employment is seasonal in nature in India. Therefore, RNFE has emerged as an alternative and stable job opportunity for rural landless people or marginal farmers. It is thus predicted that stability in the job and an alternative source of income enable people to access more healthcare services. Coefficient of RNFE shows positive and significant values in both the models.

Table 3. *Determinants of consumer health expenses in rural India: pooled regression results. *** p < 0.001, ** p < 0.01, * p < 0.05; values in parentheses are standard error. Notes: NA = not applicable. Data source: NSSO, 2006 and NSSO, 2014.*

Predictors	Model 1		Model 2	
	Coefficient	t-values	Coefficient	t-values
Edu	0.113*** (0.025)	4.58	0.096** (0.029)	3.28
HHsize	0.106 (0.140)	0.75	0.154 (0.141)	1.09
FWFPR	0.021*** (0.005)	4.16	0.018** (0.005)	3.29
RNFE	0.035*** (0.006)	6.24	0.039*** (0.007)	5.84
PubHS	-0.007** (0.002)	-2.96	-0.007* (0.003)	-2.43
HHIns	0.004 (0.003)	1.25	0.005 (0.003)	1.44
HHpol_Index	NA	NA	.1501 (0.342)	0.44
HinfraIndex	0.203* (0.083)	2.45	0.247** (0.842)	2.94
SHGSDP	NA	NA	-0.406* (0.222)	-1.83
Constant	1.38	1.56	1.401	1.61
***n* = 30**	F (7, 22) = 16.75 Adj. R^2 = 0.79 RMSE = 0.260		F (9, 20) = 14.24 Adj. R^2 =0.80 RMSE = 0.252	

Coefficient of PubHS is negative and significant which is always expected. It indicates that if people receive services from public healthcare institutions in rural regions, the percentage of out-of-pocket expenditures is likely to drop. Household size has a positive coefficient, indicating an increase in one member in the household may increase healthcare costs. Nevertheless, this variable has appeared to be not insignificant in both models. Rural households having health insurance also turn out to be ineffective in influencing OOPHE in this model. Though pollution generated at home escalates the health expenses of the households as indicated by the positive coefficient, the result is insignificant in the chosen model.

From the supply side, the composite health infrastructure index has appeared as the significant predictor of out-of-pocket health expenses displayed in **Table 3**. Improvement in health infrastructure would lead to a rise in service utilization, especially in-patient expenditures, which in turn cause out-of-pocket expenses to rise. Higher service utilization may lead to better health outcomes in the rural sector. Therefore, improvement in health infrastructure further increases the demand for healthcare utilization. The significance level improves in the second model, when addition variables are introduced. State expenditure on the health sector as a percentage of state GDP appears as a significant predictor (at 10 percent level) in the second model. The negative coefficient indicates increase in state expenses in health sector may reduce out-of-pocket expenditures on health by the consumers for rural Indians.

3.4 Determinants of inequality in consumer healthcare spending

Inequality in consumer healthcare spending has increased over the years in the Indian economy and it has increased more than the increase in overall expenditure inequality (Gaddam and Rao, 2023). Hence it is important to examine the drivers of variations in inequality in consumer health expenses. The pooled regression results of the determinants of inequality in consumer healthcare spending are presented in **Table 4**.

Age (AGE60), household size (HHSize), rural non-farm employment (RNFE) and educational attainment have appeared as the important predictors for inequality in rural consumer healthcare spending in India (**Table 4**). Age coefficient is positive and significant which reflects an increase in inequality with an increase in age. A family with an aged member is likely to incur more healthcare expenditures than other households. Inequality in RCHE decreases in the rural sector with increased household size, rural non-farm employment and education level. Employment opportunity in the non-farm sector increases the chances of earning more consistently. As over a period, rural people are increasingly involved in the non-farm employment, their capacity to pay is growing which may in turn reducing inequality in healthcare expenditure. Education plays a crucial role for the rural population in reducing disparity in their spending patterns. Education can make people aware of the need for expenditure on both preventive and curative health. Rural people can learn the value of maintaining good health and raise their demand for developing health infrastructure in their locality. Conventional higher education and health-related education can change the pattern of health expenditure and help to reduce inequality in spending patterns.

Table 4. *Consumer health expenses inequality determinants in rural India. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$; values in parentheses are standard error. NA = not applicable. Data source: NSSO, 2006 and NSSO, 2014.*

Predictors	Model 3		Model 4	
	Coefficient	t-values	Coefficient	t-values
AGE60	0.21* (0.05)	3.6	0.212* (0.063)	3.37
HINfra	0.07 (0.063)	1.1	0.069 (0.062)	1.1
SHExp	0.026 (0.035)	0.73	0.025 (0.037)	0.7
HHSize	-0.12* (0.046)	-2.53	-0.118* (0.048)	-2.46
FWPR	-0.077 (0.054)	-1.42	-0.077 (0.054)	-1.41
RNFE	-0.114* (0.048)	-2.33	-0.115* (0.055)	-2.1
Edu	-0.153** (0.06)	-2.55	-0.151** (0.062)	-2.44
SHGSDP	NA	NA	0.004 (0.036)	0.11
Constant	0.49	8.81	0.494	8.84
***n* = 30**	F (7, 22) = 5.8 Adj. R^2 = 0.60 RMSE = 0.044		F (8, 21) = 5.13 Adj. R^2 =0.60 RMSE = 0.045	

4 Conclusion

This study shows an increase in average real health expenses at the household level irrespective of regions across India. Average hospitalization expense has also increased in all the states except Assam and Haryana. Inequality in rural consumer health expenses has increased in almost all the states of India during the reform period. The gap between richest 10 percent and poorest 40 percent has increased in six states including India as a whole. Rise in overall inequality in healthcare spending varies across states. People belonging to the lower fractile groups in rural areas are still exposed to low out-of-pocket costs. Rural non-farm employment, education, female workforce, and health infrastructure have appeared as the most significant variables that influence rural consumer healthcare spending. Age, household size, rural non-farm employment, and education has appeared as the important predictors for inequality in rural consumer healthcare spending in India.

Access to basic medical facilities should be available at affordable costs to all citizens irrespective of their economic status. It is recommended to increase fiscal expenditure by the state to enable poor people to avail quality healthcare without suffering any financial distress. A comprehensive insurance policy could be designed to link with the ability to pay to eliminate the co-payment for economically vulnerable population. Besides this, structural change in rural employment and the generation of alternative job opportunities may create a significant impact on healthcare spending. Female empowerment in decision-making and financial independence of women creates a significant difference in social outcomes. Therefore, the government must take initiatives to increase the rural female participation rate in the society. In rural India, access of clean and improved sanitation facility, supply of safe drinking water and availability of clean cooking fuel are essential for sustainable livelihood.

5 Data availability statement

The data that supports this research will be shared upon reasonable request to the corresponding authors.

6 Author contributions

JS: conceptualization, data curation, project administration, supervision, and writing – review & editing. PG: formal analysis, investigation, and writing – original draft. All authors approved the final version of the manuscript.

7 Conflict of interest

The authors declare no conflict of interest related to this study.

8 Ethical statements

Not applicable.

9 Copyright statement

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