



UNDERSTANDING THE DETERMINANTS OF PUBLIC HEALTHCARE EXPENDITURE IN INDIAN STATES

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ABSTRACT

Background: Public health expenditure plays an important role in facilitating health infrastructure and improving health outcome in India. Despite several policy initiatives, significant interstate variation continues to persist in public health expenditure across Indian states. Against this backdrop, the present study examines the determinants of public health expenditure (PHE) in Indian states using panel data econometric techniques. The study analysis the influence of economic, demographic and political factors on percapita public health expenditure over time.

Data and methodology: To understand the determinants of PHE, the study make use of the panel data models including pooled OLS, fixed effect and random effect. Hausman test is used to understand the effective model. The variables included in the analysis are Gross state domestic product (GSDP), population ageing, Effective number of political parties (ENPP), Electoral turnout and total government expenditure.

Findings: The findings reveals that the GSDP, Population Ageing, and Electoral turnout determines PHE in Indian states, while ENPP or political fragmentation negatively affects PHE. Total government expenditure found to be insignificant across fixed effect and random effect models. The Hausman test confirmed the Fixed effect model is the most appropriate model specification for the analysis.

KEYWORDS: Public Health Expenditure, Panel data analysis, Gross State Domestic Product (GSDP). Electoral Turnout, Effective Number of Political Parties (ENPP), Population Ageing

1. INTRODUCTION

Public healthcare expenditure (PHE) is one of the most important components for the provision of health infrastructure, leading to better health outcomes. In the case of India, the country has made some notable improvements in healthcare since independence. Life expectancy at birth has risen to around 70 years up from 58 years in 1990 and 41 years in 1960. The under-five mortality rate is 37 per 1,000 live births; suggesting that at current trends, India is on track for attaining the 2030 SDG target of 25. Infant, under-five, and maternal mortality rate are all very close to the global average for India's income level. The maternal mortality ratio has improved from 556 per 100,000 live births in 1990 to 130 in 2016. The total fertility rate (TFR) is 2.3, almost at replacement; several states including Andhra Pradesh, Kerala, and Tamil Nadu have TFR rates below replacement level. Institutional deliveries and immunization have improved and bridged the rural-urban gap over the years. Despite these achievements, when compare to other countries in the world, India seems to be far from satisfactory in many health indices which are based on the performance of health outcomes (Table 1). For instance, India ranked 94 out of 107 countries in the Global Hunger Index 2020. Out of 189 countries, India ranked 131 on the Human Development Index 2020. With an HDI value of 0.645, the country is places at the medium human development category. India ranks 60 in the achievement of the Sustainable Development Goals in 2019-20.

India's failure in the healthcare system has been rightly assembled in much of the literature and are largely attributed to the lack of public spending, poor health infrastructure, lack of resources, poor governance, inadequate access to healthcare, urban-rural disparities, poor infrastructure, mushrooming private healthcare providers and other associated problems such as lack of education, poor sanitation and hygiene, poor access to drinking water and so on (Das et.al 2018; Rao et.al., 2012; Bali and Ramesh, 2015). Public healthcare expenditure of India is hovers around 1 percent of GDP in last many decades (Hooda, 2015). In terms of per capita state health expenditure, Himachal Pradesh spends Rs. 3386 and Kerala spends Rs. 2514 in 2020; however, states such as Uttar Pradesh and Bihar spend only Rs 932 and Rs 748, respectively.

**Table 1: Health Outcomes: India and its Neighbouring Countries**

Country	Population (million)	Fertility (Children per women)	Life Expectancy (years)	Under Five Mortality Rate (per 1000 live births)	Maternal Mortality (per 100000 births)	Child Stunting (%)
Bangladesh	167	2.1	72	30	173	36
Brazil	210	1.7	75	14	60	7
China	1400	1.7	76	9	29	8
India	1352	2.2	69	37	130	38
Indonesia	267	2.3	71	25	177	36
Malaysia	33	2	76	8	29	21
Russia	147	1.8	72	7	17	5
South Africa	59	2.4	64	34	119	27
Sri Lanka	22	2.2	77	7	36	17
Thailand	68	1.5	77	9	37	11
Vietnam	95	2	75	21	43	25

Source: Fifteenth Finance Commission, Main Report, 2020

Hooda (2015) observed that the regions with high public healthcare expenditure have better health outcomes compared to those having low public healthcare expenditure. The size of public healthcare expenditure is essential for securing a better health outcome. As regards the macroeconomic conditions, the adverse conditions are likely to have a serious effect on the overall finances of the states and thus, might have an impact especially on the expenditure on social sectors such as healthcare and education. The impact, however, depends on how the government has conferred priority to the healthcare sector. The spending pattern of states in the health sector is entirely determined by the priority they assign to it, as well as the respective states' economic and demographic patterns. Against this backdrop, this paper tries to analyse the inter-state differences in health expenditures and the factors contributing to healthcare spending across the states.

2. DATA AND METHODOLOGY

The study makes use of annual panel data of 16 major states in India for the period ranges from 2005 to 2019 based on the data availability¹. The states under consideration are Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. Since the states are varied in many indicators, we normalized the data with population and GSDP deflator of the respective states. The variables include per capita Public Health Expenditure (PHE), Gross State Domestic Product (GSDP), population ageing, Effective Number of Political Parties (ENPP), electoral turnout, and total government expenditure. This exercise is largely based on secondary data sources, collected from the State Finance Accounts, CAG; State Finance: A Study of Budget, Reserve, Bank of India and EPWRF Time Series Database; Database of Election Commission of India.

2.1. METHODOLOGY

The analysis is based on panel data techniques using Pooled Ordinary Least Squares (Pooled OLS), Fixed Effects (FE), and Random Effects (RE) models. The analysis begins with descriptive statistics of the variables included in the study, followed by estimation results of the econometric models. Finally, the Hausman specification test is used to identify the most appropriate model for interpretation and policy discussion. The specification of estimated equation is as follows:

$$PHE_{it} = \alpha_i + \beta_1 GSDP_{it} + \beta_2 AGE_{it} + \beta_3 ENPP_{it} + \beta_4 EVT_{it} + \beta_5 TE_{it} + \mu_{it} + \epsilon_{it}$$

PHE_{it} = Per capita Public Health Expenditure of state i in year t

$GSDP_{it}$ = Gross State Domestic Product per capita

AGE_{it} = Ageing population (percentage of population aged 60 years and above)

$ENPP_{it}$ = Effective Number of Political Parties

EVT_{it} = Electoral turnout

TE_{it} = Total government expenditure

α_i = Intercept term

β_1 = Slope coefficients of explanatory variables

μ_{it} = Unobserved state-specific effects

ϵ_{it} = Random error term

¹ In India, the Financial year begins from 1st April to March 31st. Therefore, the year 2000 means the financial year 2000 -2001 and so on.



3. RESULT AND ANALYSIS

This section deals about the results and analysis. The study progress with descriptive statistics followed by the Pooled OLS, Fixed, Random effect and Hausman test.

3.1. DESCRIPTIVE STATISTICS

Table 2: Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max
PHE (₹ per capita)	820.45	465.27	147.62	2431.2
GSDP (₹ per capita)	104245	28120	35600	211000
Ageing (% population 60+)	8.4	2.1	4.9	12.6
ENPP (index)	3.52	0.77	2.1	5.3
Electoral Turnout (%)	71.4	6.5	58.2	85.9
Total Government Expenditure (₹)	8740	2050	5100	15100

Source: Author's computation

The Table 2 gives a descriptive analysis of the selected variables. The Mean per capita PHE among Indian states was ₹820.45, with substantial variation across the states with a minimum value of Rs. 147 and a maximum of Rs. 2431. It indicates that there is considerable variation in PHE across Indian states. Similar is with GSDP, reflecting unequal levels of economic development among Indian states.

The data also suggesting moderate demographic transition with an ageing population averaged 8.4 percent of the total population. Electoral turnout had a relatively high mean of 71.4 percent, indicating strong voter participation at state level. The ENPP variable showed moderate variation, implying differences in political competition across states. Varied government expenditure also reflects the differences in fiscal capacity and expenditure priorities among states.

3.2. POOLED OLS ESTIMATION

The Pooled OLS model estimates the average relationship between PHE and the explanatory variables by assuming homogeneity across states and time periods.

Table 3 Pooled OLS Estimates

Variable	Coefficient	Std. Error	t-Value	p-Value
GSDP	0.0052 ***	0.0012	4.33	<0.001
Ageing	21.45 ***	4.15	5.17	<0.001
ENPP	-18.20 **	8.72	-2.09	0.037
Electoral Turnout	6.74 ***	1.82	3.71	<0.001
Total Government Expenditure	0.0045	0.0039	1.15	0.251
Constant	245.32	81.26	3.02	0.003

*Source: Author's computation; Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

The results indicate that GSDP has a positive and statistically significant relationship with percapita PHE. This implies that higher income spends more on healthcare and vice versa. An increase in GSDP improves fiscal capacity and allows governments to allocate greater resources towards healthcare. The population ageing variable is also positive and highly significant indicates that states with a higher proportion of elderly population tend to allocate more funds to healthcare due to increased demand for medical care. The coefficient of ENPP is negative and statistically significant, suggesting that higher political fragmentation may reduce the priority towards spending in healthcare. Coalition politics and fragmented political systems may delay policy implementation or reduce consensus regarding health sector priorities. Whereas, Electoral turnout has a positive and significant effect on PHE. This indicates that greater political participation may increase government accountability and encourage higher spending on healthcare. However, total expenditure does not show statistical significance in the pooled model. This suggests that merely increasing aggregate government expenditure does not automatically translate into higher public health spending unless there is a deliberate policy focus on the health sector.

Although the Pooled OLS model provides initial insights, it ignores unobserved state-specific characteristics such as governance quality, institutional structure, health infrastructure, and administrative efficiency. Therefore, panel-specific models are required for more robust estimation.

3.3. FIXED EFFECTS MODEL

The Fixed Effects model controls for unobserved state-specific heterogeneity by allowing each state to have its own intercept. This model is appropriate when omitted characteristics are correlated with the explanatory variables.

**Table 4 Fixed Effects Model Estimates**

Variable	Coefficient	p-value
GSDP	0.0061***	<0.001
Ageing	18.29***	<0.001
ENPP	-22.50**	0.015
Electoral Turnout	5.11**	0.014
Total Government Expenditure	0.0026	0.216
R ² = 0.61		

Source: Author's computation

The Fixed Effects model results confirm the findings of the Pooled OLS model. GSDP remains positive and statistically significant, indicating that income continues to play a critical role in determining healthcare expenditure even after controlling for state specific characteristics. The coefficient of population ageing remains positive and highly significant, reinforcing the argument that demographic transition increases the fiscal burden on public healthcare. States experiencing higher ageing trends are compelled to increase expenditure on healthcare services and health infrastructure. ENPP continues to show a negative and significant relationship with PHE. This suggests that political fragmentation may adversely affect spending on healthcare. Electoral turnout also remains positive and statistically significant. Total expenditure again remains statistically insignificant. This indicates that overall fiscal expansion alone is insufficient to explain healthcare spending patterns across Indian states. Instead, targeted fiscal commitment toward health appears to be more important. The within R² value of 0.61 indicates that the explanatory variables account for a substantial proportion of the variation in PHE within states over time.

3.4. RANDOM EFFECTS MODEL

The Random Effects model assumes that unobserved state-specific effects are uncorrelated with the explanatory variables.

Table 5 Random Effects Model Estimates

Variable	Coefficient	p-value
GSDP	0.0059***	<0.001
Ageing	19.01***	<0.001
ENPP	-20.70**	0.017
Electoral Turnout	5.66***	0.004
Total Government Expenditure	0.0031	0.317
R ² = 0.58		

Source: Author's computation

The Random Effects estimates are broadly similar to the Fixed Effects results as shown in Table 5. GSDP, Population ageing, and electoral participation positively affects PHE, while ENPP or the political fragmentation negatively affects it. The consistency in coefficient signs across models suggests robustness in the relationships acknowledged. However, the Random Effects model relies on the assumption that state specific unobserved factors are uncorrelated with explanatory variables, which may not hold in the context of Indian states where institutional and governance differences are likely associated with fiscal and political variables.

3.5. HAUSMAN TEST

To determine the appropriate panel model, the Hausman specification test was conducted (Table 6).

Table 6 Hausman Test Results

Test	Statistic	p-value
Hausman Test	36.86	0.000

Source: Author's computation

The Hausman test statistic is statistically significant at 1 percent level. It means the rejection of the null hypothesis that the Random Effects estimator is consistent. Therefore, the Fixed Effects model is considered the more appropriate specification for this study. This result shows that the unobserved state specific characteristics are correlated with the explanatory variables. Consequently, the Fixed Effects model provides more reliable and unbiased estimates for analysing the determinants of PHE in Indian states.

4. DISCUSSION OF FINDINGS

The findings demonstrate that the economic, demographic, and political factors significantly influence PHE across Indian states. Economic growth, represented by GSDP, consistently shows a positive impact on healthcare expenditure across fixed effect and random effect models. Higher income states have higher fiscal capacity and are able to invest more on healthcare. This finding well aligns with the broader public finance literature, which suggests that economic growth enhances the capacity of the government to spend more. The positive relationship between ageing and PHE highlights the growing importance of demographic transition in shaping health policy. As the elderly population increases, states face higher demand for healthcare services, particularly for chronic



diseases, long-term care, and geriatric support systems. Political factors also play a crucial role in determining healthcare. Higher electoral turnout contributes positively to healthcare spending, suggesting that democratic participation strengthens welfare responsiveness. Governments or political party on power may allocate more resources toward healthcare to meet voter expectations and improve political legitimacy. Whereas, ENPP or the political fragmentation negatively affects healthcare expenditure in Indian states. The total government expenditure is insignificant in both the models, indicates that overall fiscal expansion alone does not ensure greater spending towards healthcare. The allocation priorities of governments are equally important. States may increase expenditure in sectors other than health, limiting the impact on public healthcare spending. Overall, the findings suggest that strengthening the fiscal capacity of the states, improving democratic accountability and political stability are important for enhancing PHE in Indian states.

5. CONCLUSION

This paper analysed the factors affecting PHE in Indian states using panel data regression. The findings reveal that GSDP has a positive and statistically significant impact on PHE. It indicates that the higher income states allocate more resources on healthcare. Population ageing also indicates a positive influence on PHE, reflects the growing healthcare needs associated with demographic transition. Electoral turnout too positively associated with PHE. On the other hand, ENPP negatively affects PHE, indicating the fragmented political parties lowers health priorities at state level. Government total expenditure found to be statistically insignificant. The Hausman test confirms that the Fixed effect model is the most appropriate specification of the analysis. It indicates that the presence of state specific heterogeneity correlates with explanatory variables. The study concludes that income, ageing, and political factors are important determinants of public health expenditure in Indian states. The study highlights the need for stronger fiscal commitments to improve health expenditure in India.

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