Association between Social Sector Expenditure and Health Status: A Study Based on NFHS-4 (2015-16) & NFHS-5 (2019-20)

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Abstract

The social sector outlay in India has witnessed a rising trend over the last couple of decades with the prime focus on bringing about improvements in the quality of life of people. The present work attempts to analyse the present state of social sector expenditure (SSE) across the states in India and examine its impact on health status. To obtain a measure of health status, a health deprivation score (SHDS) that comprised of adult health deprivation and child health deprivation for each state has been computed. A pooled regression model has been employed to consider the contribution of social sector expenditure on the health status. The result of the analysis indicated that the share of SSE of BIMARU states was 26 per cent in 2005-06, which increased to 29.5 per cent in 2019-20. Higher-income states and states with higher social spending were found to have significant favourable impact on SHDS.

Keywords: *Social Sector Expenditure, Health Outcomes, State Health Deprivation Score, BIMARU states, Pooled regression model*

JEL Classification: *H51, I12, I15, C51*

1. Introduction

In an era of limited national budgets and pressing health and social challenges, the need to focus on expenditures to achieve better outcomes is a widespread policy concern. 'Investing in

people' is now well recognised as the prime motive behind various development and poverty alleviation initiatives(Singh & Chudasama, 2018).The World Development Report 2003 also notes that one of the initiatives to promote sustainable development in a dynamic world is to empower underprivileged sections of the population by increasing their access to education and health (Dev, 2003).At the international level, one sees several initiatives in the 1990s aimed at sustainable economic and social development, which have finally culminated in the shape of the United Nations Millennium Declaration of September 2000, setting out various developmental goals influencing the well-being of people (Shafuda, 2015). Education and health sector goals have been recognised as crucial components of Sustainable Development goals. The importance being attached to these two sectors by the international community is associated with the changing perceptions about the desirability of human capital formation not only as a means but also as an end in itself. In recognition of the fact that economic prosperity, measured in terms of per capita income alone, does not always ensure enrichment in quality of life but it needs to exploit synergies between economic growth, desirable social attainments, and growing opportunities for all (Alam et al., 2010). In line with this broad thinking, it is envisaged that the Government's role will clearly have to expand in social sectors. Pallas et al. (2013) and Purohit (2014) found that spending on welfare programmes seems to be related to health outcomes in interesting ways. Countries that spend more on social programmes have better health outcomes. Suresh et al. (2016) have found that low level of economic growth does not have any effect on the formation of human capital, in the presence of social sector expenditure. The poor performance of the states in child mortality can be improved by enhancing the per capita income, which can be done by increasing public expenditure in social sectors [Agarwal (2015); Goswami & Bezbaruah (2011); Narayan (2017)]. Some international studies related to public spending on the health and education sectors conducted by Gupta et al. (2010) for 150 developed and developing countries; Doytch et al. (2010) for Latin America, the Caribbean, and low income countries; Darby & Melitz (2008) for 21 OECD countries; Arena & Revilla (2007) for Brazilian states; and Alam et al. (2010) for ten emerging Asian countries showed the existence of long-term dynamic relationship among expenditures on education, health and social security welfare along with fiscal deficit/surplus on economic growth. In developing nations, expenditure on health and education follows a pro-cyclical pattern, but in affluent nations, it follows a cyclical pattern. India is a large country consisting of 29 states and 7 Union territories. There are variations in the levels of socioeconomic development between the states. In the 1980s, Economist analyst Ashish Bose coined the term BIMARU, from the first letters of the names of Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh (Sharma, 2015). This terminology was used to define the despicable and morbid adverse state of the economy in these states. Odisha was also included in the list later. Several studies showed that the GDP growth rate of India was affected by the poor performance of the BIMRU states. The population growth in the BIMARU states was much higher than the Indian average population growth and the income disparity between the BIMARU states and India as a whole was also high (Goswami & Bezbaruah, 2011). The demographic characteristics of BIMARU states is its high fertility, high Infant Mortality Rate, high maternal mortality rates, high population growth rate and low literacy rate and high literacy gender differential (Yadav & Radhakrishnan, 2017). The BIMARU states that is, Uttar Pradesh, Madhya Pradesh, Bihar and Rajasthan have been striving hard in the last decade to get rid of their BIMARU label. They have made impressive progress in the field of health and education, and their efforts to boost growth and reduce poverty are worth noting. In the last decade, remarkable growth rates have been achieved by these states (Sharma, 2015 and Kawadia & Sheena, 2014). The social sector therefore is of prime importance for building up human capital as well as creating new opportunities and avenues (Joshi, 2006). Therefore, expenditure on social sector assumes greater importance in regions like the BIMARU states of India. For the present study, we define

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the social sector as the total expenditure on 'Social Services' and 'Rural Development' as given in Central and State budgets alike Dev & Mooij (2002). The expenditure accounts in India are generally divided into Revenue' and Capital' Accounts where both comprises of the heads named- Social Services and Economic Services. The social sector expenditures consist of (1) social services from – a) Education, sports, art and Culture, b) Medical and public health, c) Family welfare, d) Water-supply and sanitation, e) Housing, f) Urban Development, g) Welfare of SCs, STs and Minorities, h) Labour and labour welfare, i) Social Security and Welfare, j) Nutrition, k) Expenditure on natural calamities and l)others; and(2) economic services on a) Rural Development and b) Food storage and warehousing. There are a few studies in the literature that attempt to connect public spending with health outcomes using a single health indicator, such as mortality rate, morbidity rate, life expectancy, etc. Previous empirical investigations in this regard are insufficient. The study's contribution is substantial in many ways. - First, by accounting for a number of factors pertaining to both child and adult health, we produced a composite measure of health status at the sub-national level of India. Second, a comparison of changes in health status across Indian states has been done using data from the National Family Health Survey (NFHS) for the years 2005–2006, 2015–2016, and the most recent 2019–2021. Thirdly, we have highlighted the dynamics of health status particularly for the BIMARU states not considered previously. As social sector expenditure is supposed to have a bearing on the quality of life of the beneficiaries, the present study is extended to cover some analytical issues in related areas. In this backdrop, the purpose of this article is (1) To examine the trends and patterns of Social Sector Spend (SSE). (2) To examine the relationship between health outcomes and SSE across Indian states, with a particular emphasis on the BIMARU states. One of the pioneer models that we find in the literature that treats health as an outcome variable and investment in health as input is the Grossman model. In the Grossman, model health is viewed as a durable capital stock that produces an output of healthy time and individuals are assumed to inherit an initial stock of health. This initial stock depreciates with age but can be offset/ increased by investment/ expenditure activities. Therefore, in the model level of health is not exogenous but rather depends on the number of resources allocated to the production of health. The following section discusses the Grossman model of Health Demand.

1.1 The Demand for Health: Grossman Model

Grossman (1972a, b) in his human capital model explains the demand for medical care and other health inputs as derived from the basic demand for health. It is based on the household production theory by Becker (1965) and proposes that individuals, as they grow old, are left with a depreciating human capital stock in the form of health and therefore they use medical care and their own time to produce/reproduce their health capital. Expenditure/Investment in health production will be optimal when the marginal benefits of the improved health status equals the marginal cost of health production. Improved health status reduces sick time and therefore affects household utility directly – depicting the 'pure consumption' effect. Again, indirectly more 'healthy time' results in higher labour income which depicts the 'pure investment' effect. Following the model by Grossman (1972a, b) and Hartwig & Sturm (2017), it is assumed that individuals derive utility from consuming a commodity (Z) and disutility from 'sick time' (t^s). Disutility is a function of their stock of health capital H_t.

To choose the time paths for Ht and Zt we have to solve the following dynamic optimisation problem:

$\text{Max}\int_0^T [U(Z_t, t^s(H_t))]e^{-\rho t}dt$ (where ρ is a time discount factor) ----------(1)

here $\frac{\partial U_t}{\partial t^s} < 0$, $\frac{\partial U_t}{\partial Z_t} > 0$, $\frac{\partial t^s}{\partial H_t} < 0$

Subject to the following constraints:

$\dot{H}_t = I_t(M_t, t^i) - \delta_t H_t$ ----------(2)

Here $\frac{\partial I_t}{\partial M_t} > 0$, $\frac{\partial I_t}{\partial t^i} > 0$.

This implies that investment/ expenditure in health capital *I* is produced by medical care *M* and own time spent (t_i). On the other hand, health capital depreciates at a rate δ. Δ is exogenous and depends only on the individual's age (t_i).

$\dot{A}_t = rA_t + Y[t^s(H_t)] - \pi_t^H I_t - \pi_t^Z Z_t$----------(3)

where *A* is the stock of financial assets, *r* is the rate of interest, *Y* is earned income as a function of sick time. π^H and π^Z are the marginal (and average) cost of investment in health and consumption, respectively.

The boundary conditions are -

$H(0) = H_0$, ----------(4)

$A(0) = A_0$, ----------(5)

$H_t \geq H'$ ----------(6)

At ≥ 0 ----------(7)

where H' is the 'death stock' of health capital.

The current-valued Hamiltonian is

$H = U(Z_t, t^s(H_t)) + \Psi_t [I_t(M_t, t^i) - \delta_t H_t] + \lambda_t [rA_t + Y\{t^s(H_t)\} - \pi_t^H I_t - \pi_t^Z Z_t]$

Here Ψ and λ are the shadow prices

From the necessary condition for utility maximisation, we get

$\{\frac{\frac{\partial U_t}{\partial t^s}}{\lambda_t} e^{-(\rho - r)t} + \frac{\partial Y_t}{\partial t^s}\} \frac{\partial t^s}{\partial H_t} = \{r + \delta_t - \frac{\dot{\pi}_t^H}{\pi_t^H}\} \pi_t^H$ ----------(8)

Equation (8) implies that the marginal benefit of additional health capital as given by the expression on the left-hand side must be equal to the marginal cost of holding it, depicted by the expression on the right-hand side. An increase in health capital reduces sick time, which gives direct utility and forms the 'pure consumption' effect. It also increases labour income which forms the 'pure investment' effect. The marginal cost of investing in health capital increases with the rise in the depreciation rate δ and in the interest rate because of the increases in the opportunity cost. Whereas the rise in the value of the health capital in the future ($\dot{\pi}_t^H > 0$)lowers the relative cost of investment in the present. In our paper, social sector spending is treated as a input of human capital. Following Grossman's framework, health is viewed as a durable capital asset that produces healthy time. Individuals start with an initial stock of health, which decreases with age but can be enhanced through investment. Our study also investigating the relationship between social sector expenditure and health outcomes at the regional context of India.

2. Material And Methods

A key contribution of the present study is to find the link between the health outcomes and SSE of the BIMARU States. This study is based on secondary data and is obtained from 'Handbook of Statistics on Indian States' of Reserve Bank of India, Health Information of India, CBHI Government of India, and some other Publications. The data spans for the period 2005-06 to 2019-20 covers 28 states and to study the trend of Social Sector Expenditure we have used the Year-to-Year(Y-O-Y)i..and Compound Annual Growth Rate. ii.. formula. To compute the state health deprivation score (SHDS), we have used the latest three rounds of NFHS data i.e., NFHS 3 (2005-06), NFHS 4 (2015-16) and NFHS 5 (2019-20).

2.1 Development of State Health Deprivation Score (SHDS)

Health outcome of a state depends on the number of variables which are generally multidimensional in nature i.e. some of them are cultural, religious, geographical, demographic and economic factors. In literature, we found mortality rates - infant mortality rate (IMR) has been widely used as a measure of the health status of the population but also in some studies it has been used to measure the level of human development. Here in the present study, we have used a health deprivation score (SHDS)across states as the indicator of health outcome which is based on adult health as well as child health dimension.

2.1.1 Adult Health Deprivation:

Adult health deprivation has been estimated by body mass index (BMI) for men and women separately. 18.5 is considered to be the cut-off point and a score below it below is considered as thinness or acute undernutrition (Dasi et al., 2019; White et al., 2019; Subramanian & Smith, 2006; WHO, 2014 and Som et al. 2014).

2.1.2 Child Health Deprivation:

Child health deprivation is measured by the three separate indicators which comprise of the percentage of stunted children, the percentage of wasted children, and the mortality rate of children below the age group of 5 years. So, these indicators are a sign of caloric insufficiency and also meagre nutrition of the child and adult population (Wiesmann et al., 2015).

Table 1 Dimensions, Indicators, & weights of the State Health Deprivation Score (SHDS)

Dimension	Indicator	Weight
Adult Health Deprivation	Percentage of men whose BMI below 18.5 (kg/m^2).	1/4
	Percentage of women whose BMI below 18.5 (kg/m^2).	1/4
Child Health Deprivation	percentage of stunted children below the age of 5 years	1/6
	percentage of wasted children below the age of 5 years	1/6
	percentage of children who die below the age of five	1/6

SHDS are calculated by a three-step method based on three dimensions as specified in the previous section. Two-dimension is composed of five indicators.

Standardized Score of a variable (x)= $\frac{Original\ Value\ of\ the\ Variable(X_i)}{Threshold\ Value\ (s)} * 100$

State Health Deprivation Score (SHDS$_i$) =$\sum_{i=1}^{28}(W_i) * (X_{it})$

Where X_1 is the Standardised BMI of Men, $X_2$is the Standardised BMI of Women, X_3 is the Standardised score of Stunted Children, X_4 is the Standardised score of Wasted Children and X_5 is the Standardised score of Child Mortality of the i-th states. This calculation results in SHDI scores which is a 100-point scale. Where 0 defines the best outcome and 100 defines the worst. We can classify the degree of SHDS into three categories on the basis of the SHDS score which is given below.

Table 2. Classification of the State Health Deprivation Score (SHDS)

Score of SHDS	Level of Hunger
less than 9.9	Low Level
10.0 to 19.9	Moderate
20.0 & above	Serious

2.2 Determinants of State Health Deprivation Score (SHDS)

To capture the effect of SSE on health outcomes, we have used the Ratio of social sector expenditure to Gross State Domestic Product (SSE/GSDP) [Alam et al., 2010], Ratio of social sector expenditure to aggregate expenditure (SSE/AE) [Kaur and Ahmed, 2013] and the log of

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per capita state domestic Product (lnPCSDP) [Das & Basar, 2019]as an explanatory variable. We have applied Pooled regression model to consider the contribution of social sector expenditure on the health status. In the present study, data consist of i (= 28) states for the t years (2005-06, 2015-16and 2019-20). A State dummy D_i (=1 for BIMARU States and 0 for others) is also included in the model. The model is specified as follows.

$Y_{it} = \alpha_0 + \sum_{j=1}^{6} \beta_j X_{it} + \delta D_i + \varepsilon_{it}$..... (1)

Where,

Y_{it} is SHDS, X_{it} are regressors including the indicators of SSE/GSDP, SSE/AE, and lnPCSDP. α_0= constant, β and δ are the coefficients of the independent variables, and ε_{it} is the random error term.

We have also checked the robustness of estimated results with the Durbin-Watson test for serial correlation and normality test of estimated residuals by the Jarque–Bera test. To overcome the problem of heteroscedasticity we have also estimated the robust standard error of coefficients.

3. Results And Discussion

3.1 Pattern of Social Sector Expenditure (SSE)in India and BIMARU States

From the table-3 it can be observed that, in case of the BIMARU states SSE has increased by almost nine-fold between 2005-06 to 2019-20 in absolute terms. While the share of SSE of BIMARU states in total SSE of India was 26 per centin2005-06, it has increased to 29.5 per cent in 2019-20. But the growth rate of the SSE of the BIMARU states reflected a great variation. It has shown an upward trend, rising from 11.5 per cent in 2010-11 to 27.5 per cent in the year 2019-20. A similar type of conclusion was established by Das & Ivaldi (2020).

Table 3. Pattern of Social Sector Expenditure in the BIMARU States (Rs. Billion)

Year	SSE of the BIMARU States (in Crore)	SSE of India (in Crore)	Share of SSE of BIMARU States to India	Growth Rate of SSE of BIMARU States
2005-06	49149.5	189429.8	25.9	-
2006-07	58397.1	222988.2	26.2	18.8
2007-08	71104.4	265466.5	26.8	21.8
2008-09	89957.7	331538.2	27.1	26.5
2009-10	104323.4	392936.2	26.5	16.0
2010-11	116281.2	451937.1	25.7	11.5
2011-12	138737.8	523569.3	26.5	19.3
2012-13	165245.8	602942.7	27.4	19.1
2013-14	189115.8	679201.1	27.8	14.4
2014-15	227937.7	830055.8	27.5	20.5
2015-16	278716.0	968936.4	28.8	22.3
2016-17	323094.0	1128188.3	28.6	15.9
2017-18	336189.9	1200934.1	28.0	4.1
2018-19	371100.9	1342723.6	27.6	10.4
2019-20	473160.1	1605251.5	29.5	27.5

Source: https://www.rbi.org.in

It is obvious that Social Sector Expenditures have increased in the BIMARU states; however, the growth has not been uniform as seen in table 4 and figure 1. Uttar Pradesh, by virtue of being the largest economy in this category has its own unique position and is way ahead of others. The social sector expenditure in Uttar Pradesh had been around Rs. 20140.7 crore in 2005-06 which has increased more than four-fold toRs.172191.5 crores in2019-20. Rajasthan holds the second spot in SSE (absolute terms) for the entire period under consideration 2009-10 to 2019-20 except for 2019-20, when Bihar was ahead. Madhya Pradesh, one of the largest

economies of the region, lies at the nadir in absolute terms, but despite this, its progress has been impressive, from Rs. 176.3 billion to Rs. 854.1 billion. From this analysis it will not be incorrect to conclude that all the states have experienced an increasing trend in SSE albeit intermittent fluctuations. The compound annual growth rate (CAGR) of SSE across states have fluctuated over the years ranging from 11.9 (Kerala) to 19.2 (Bihar).

Table 4. Social Sector Expenditure across the States of India (Rs. Billion)

State/UT	SSE in Crore			Y-O-Y Growth Rate			
	2005-06	2015-16	2019-20	2005-06	2015-16	2019-20	CAGR Growth rate
Bihar	*8663.3*	*52709.9*	*121446.0*	*41.6*	*24.3*	*60.8*	*19.2*
Madhya Pradesh	*9425.5*	*55552.0*	*85412.3*	*29.7*	*25.2*	*11.5*	*15.8*
Rajasthan	*10920.0*	*62257.9*	*94110.4*	*10.9*	*13.6*	*11.4*	*15.4*
Uttar Pradesh	*20140.7*	*108196.3*	*172191.5*	*19.0*	*25.3*	*28.0*	*15.4*
Andhra Pradesh	14900.4	57520.0	80571.2	7.8	4.7	5.0	11.9
Arunachal Pradesh	741.6	3357.6	6210.3	14.1	9.9	-2.5	15.2
Assam	4452.3	20218.2	53316.2	-6.8	-0.9	76.3	18.0
Chhattisgarh	4295.4	27500.0	44482.8	18.2	16.1	37.1	16.9
Goa	880.1	3677.3	7367.3	10.3	15.9	43.2	15.2
Gujarat	10994.7	53458.6	76849.8	8.6	13.1	15.0	13.8
Haryana	4742.2	25504.7	46110.7	35.6	15.7	18.8	16.4
Himachal Pradesh	2804.1	9965.6	17377.2	20.4	9.9	22.3	12.9
Jharkhand	6155.8	21898.0	40246.2	20.1	23.5	33.2	13.3
Karnataka	11675.5	59432.9	91626.0	19.6	15.4	0.8	14.7
Kerala	7524.1	33088.4	40693.9	2.4	16.0	-7.2	11.9
Maharashtra	24268.2	93315.6	168826.1	18.8	5.7	33.1	13.8
Manipur	938.9	3071.9	7587.3	7.6	-1.8	69.8	14.9
Meghalaya	767.1	3236.7	7471.7	3.5	-2.0	42.5	16.4
Mizoram	722.5	2891.0	4933.6	11.7	-0.4	21.4	13.7
Nagaland	804.0	2725.2	5269.0	27.8	8.8	26.3	13.4
Odisha	5386.1	36253.1	65579.0	17.1	23.9	21.2	18.1
Punjab	4051.9	16284.1	24896.1	8.1	5.0	18.1	12.9
Sikkim	500.6	1603.6	3213.5	4.5	-9.5	23.6	13.2
Tamil Nadu	14297.5	70057.8	92185.7	5.0	11.6	6.9	13.2
Tripura	1121.4	5690.2	8650.9	0.0	12.1	35.7	14.6
Uttarakhand	2781.4	13402.0	17662.2	19.5	3.1	0.9	13.1
West Bengal	11444.9	67837.0	105365.7	17.6	18.5	11.3	16.0
Jammu and Kashmir	4029.6	15721.4	30766.2	29.8	36.0	30.5	14.5
India	**189429.8**	**968936.4**	**1605252.0**	**15.5**	**16.7**	**19.6**	**15.3**

Source: https://www.rbi.org.in

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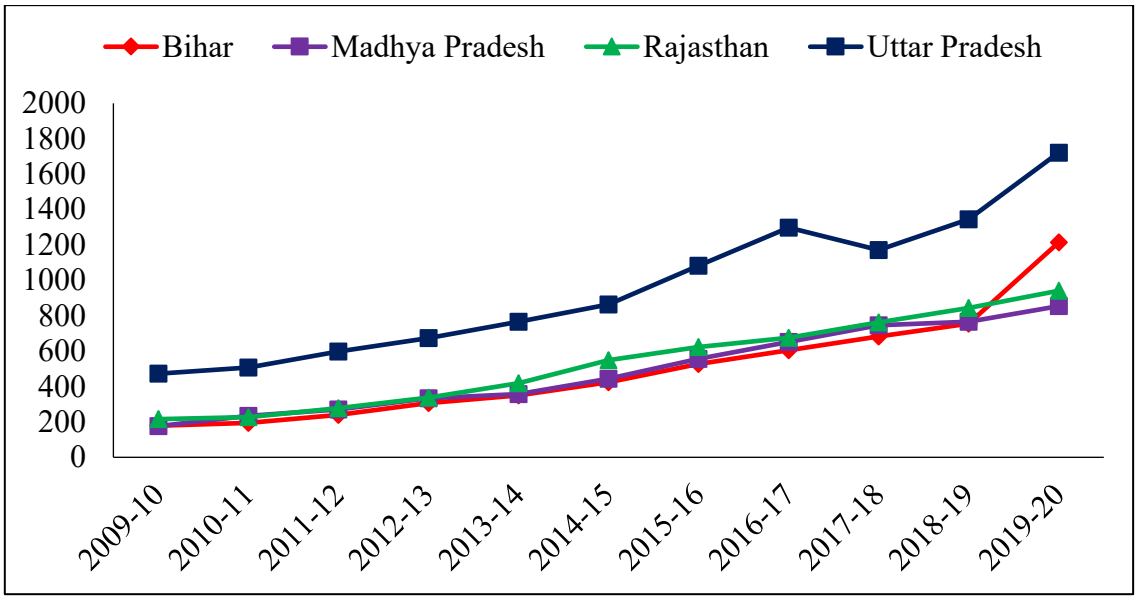
Figure 1. Social Sector Expenditures in the BIMARU States in 2004-05 Price



Source: https://www.rbi.org.in

Studies in the all-India context have shown that social sector expenditure, taken as a proportion of the GSDP has been declining for most of the states since the 1980s (Seeta & Iyer, 1997 and Chelliah & Sudarshan, 1999). Dev and Mooij (2005) also observed a similar trend in the 1990s. However, since 2009 onwards, India's spending on the social sector has stabilised at around 7 per cent. However, the proportion of SSE to GSDP is much larger in the BIMARU states. Interestingly, we find that the proportion of SSE to GSDP has increased for all the states. Bihar stands at the top among the NER states in this context. Her expenditure has consistently been in the vicinity of 20 per cent and the proportion has been highest for the period 2018-19 at 29.4 per cent. On the contrary, Rajasthan has the lowest proportion for the entire period, though it was observed that the share of SSE as a proportion to GSDP increased in the later periods. SSE accounts for more than 13 per cent of Madhya Pradesh and Uttar Pradesh (table 5).

Table 5. SSE/GSDP & SSE/TE of the BIMARU States of India

States	SSE/GSDP			SSE/TE		
	2005-06	2015-16	2019-20	2005-06	2015-16	2019-20
Bihar	10.2	8.0	12.8	38.4	46.9	55.8
Madhya Pradesh	7.5	10.5	11.7	32.5	44.6	44.4
Rajasthan	7.2	9.1	6.0	40.1	36.7	42.1
Uttar Pradesh	8.9	9.7	15.5	33.7	36.3	38.1
India	8.4	7.0	8.0	33.7	41.1	41.2

Source: As in Table 1

Considering the social sector expenditures as proportion of the Total expenditures (TE)/Aggregate Disbursement (AD) of the state, in Table 5, we find that for the period, 2005-06 to 2019-20, in the BIMARU states, such proportion ranged from 32.5 per cent for Madhya Pradesh in 2005-06 to 55.8 per cent for Bihar in 2019-20. The average proportion of SSE to TE for the entire period has been 40 per cent and the average proportion of the BIMARU states is higher than the all-India average.

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3.2 Heath Status of the BIMARU States vis-a vis Other States of India

The value of the state health deprivation score (SHDS) throughout Indian states is shown in Map 1 for the years 2005-2006, 2015-2016, and 2019-2020. In 2005-06, there were only four states in India that belonged to the 'low level' category namely Kerala, Manipur, Mizoram and Sikkim; four states were found in the 'serious' category namely Chhattisgarh, Bihar, Jharkhand and Madhya Pradesh. Whereas the remaining twenty states belonged to the ‘moderate’ category, they are the six northern region states (Punjab, Rajasthan, Uttarakhand, Haryana, Himachal Pradesh, and Jammu & Kashmir), one central region state (Uttar Pradesh), two eastern region states (West Bengal and Odisha), five northeast states (Arunachal Pradesh, Assam, Tripura, Meghalaya, and Nagaland), three west region states (Goa, Gujarat, and Maharashtra), and three south region states (Tamil Nadu, Andhra Pradesh and Karnataka). SHDS have improved in most of the states in 2015-2016 compared to their SHDS score in 2005-06. Out of 20 in the ‘moderate' category in 2005-2006 nine states improved their health component and moved to the 'low-level' group in 2015-16. In 2005-2006, all four ‘serious' category states improved their health parameter and moved to the ‘moderate' category in 2015-2016, resulting in zero states falling in the ‘serious' category. The SHDS in most states improved from 2015-16 to 2019-20. Seventeen states were found in the ‘low-level’ category and eleven states were found in the ‘moderate’ category among India’s 28 states. Of the BIMARU states Bihar and Madhya Pradesh were in the ‘serious’ category in 2005-2006 but after that these two states were elevated into the ‘moderate’ category. Map 1 and Map 2 depict the SHDS throughout Indian states at three distinct time points (2005-2006, 2015-2016, and 2019-20). It is easy to comprehend the various levels of health deprivation in India's regions with the help of these maps. The SHDS across states of India is effective to understand the regions having different levels of health deprivation.

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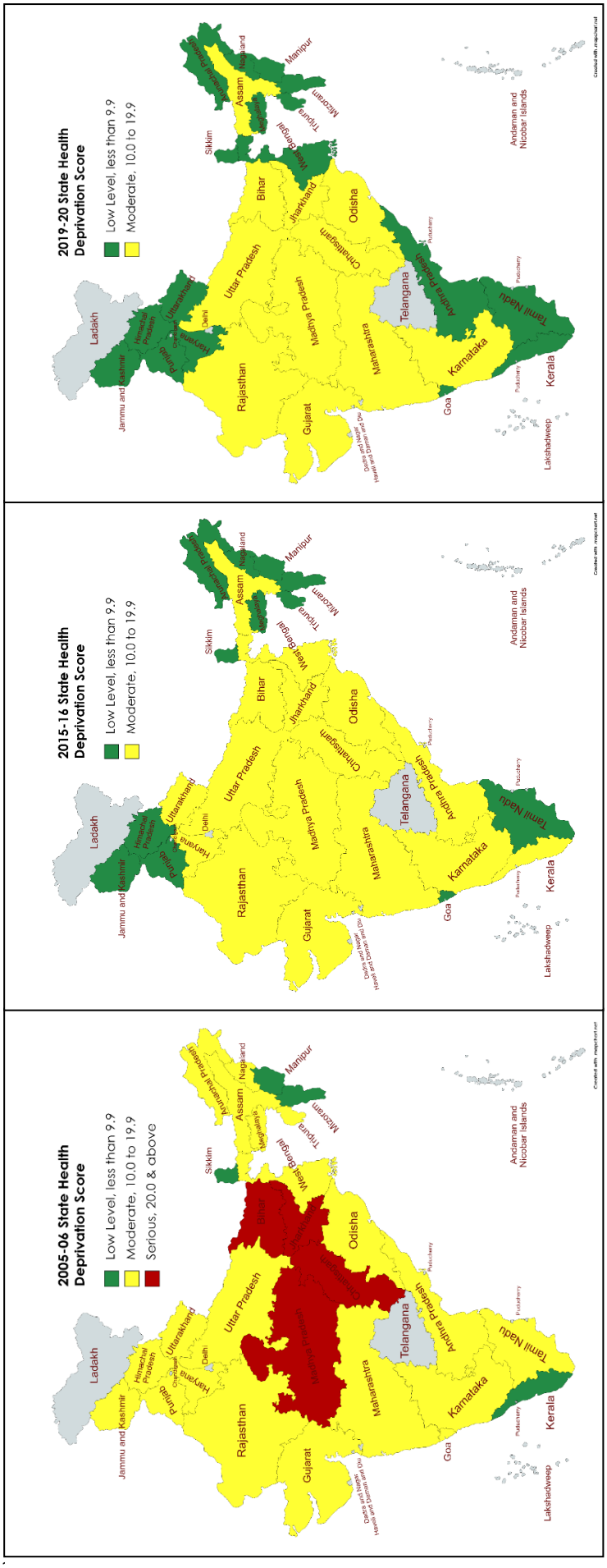
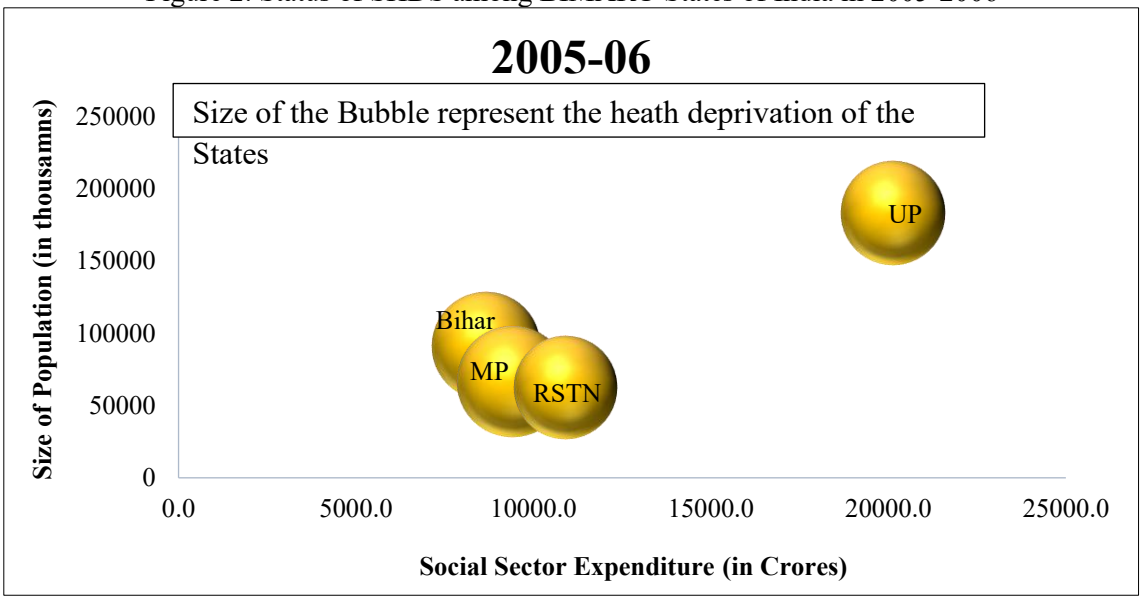
Map 1. Status of Health Deprivation Score across states in India, 2005-06, 2015-16 and 2019-20



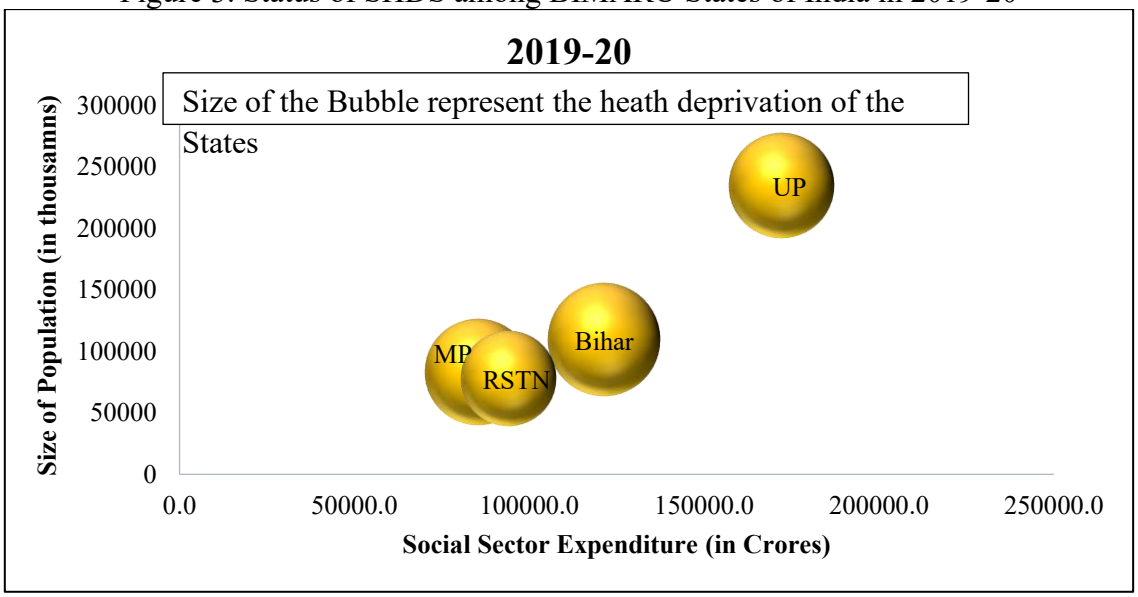
Source: Authors Calculation as in Table 1

Figure 2. Status of SHDS among BIMARU States of India in 2005-2006



Source: Authors Calculation as in Table 1
Notes: RSTN- Rajasthan, MP- Madhya Pradesh, UP- Uttar Pradesh

Figure 3. Status of SHDS among BIMARU States of India in 2019-20



Source: Authors Calculation as in Table 1
Notes: RSTN- Rajasthan, MP- Madhya Pradesh, UP- Uttar Pradesh

Table 6. Results of Pooled Regression Model

	Coef.	Robust Std. Err.	t Stat	P>t	VIF
SSE/AE	0.032	0.042	0.770	0.444	1.030
SSE/GSDP	-0.209	0.075	-2.780	0.007	1.010
lnPCSDP	-4.632	0.667	-6.950	0.000	1.280
BIMARU	1.198	1.083	1.110	0.272	1.300
Constant	61.564	7.428	8.290	0.000	

Number of Observations = 84
F (4, 79) = 23.16
Prob > F = 0.0000
R-squared = 0.5289
Root MSE = 2.9814
DW-Statistic (5, 84) = 1.09298
JB test: .6119 (0.7364)

Source: Authors Calculation as in Table 1

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The estimated result of pooled regression is reported in Table 6. The state health deprivation score (SHDS) is used as the dependent variable in this study. DW test statistics is 1.09 which implies that there is no autocorrelation. The estimated results are also free from heteroscedasticity (as we have estimated robust standard error) and the problem of multicollinearity (as VIFs are less than ten). The estimated residuals are also normally distributed as the JB test is statistically insignificant. The statistical significance of the time dummy variable implies that overtime SHDS has declined significantly. Among the indicators of SSE/GSDP and lnPCSDP have a significant favourable impact on SHDS. In the same lines with our findings, Farahani et al. (2010) had observed that increased public expenditure on health lowered the probability of death for all age groups. Bhalotra (2007) has found a significant effect of health expenditure on infant mortality rate in rural areas. Again, Gupta et al. (2003) has noted that public spending on health care has positive impacts and it matters more to poor than rich.

Conclusion and Policy Implications

The present article tries to examine the trends and patterns of social sector expenditure (SSE) as well as the relationship between health outcomes and SSE across Indian states, with a particular emphasis on the BIMARU states. From the analysis we can draw the following conclusions. The SSE of the BIMARU states have increased by almost nine-fold between 2005-06 to 2019-20 in absolute terms. The share of SSE of BIMARU states in total SSE of India was 26 per cent in 2005-06, it has increased to 29.5 per cent in 2019-20. The BIMARU states have witnessed increased the growth rate for SSE in the post reform period particularly in the sub-period 2014-15, 2015-16 and 2019-20. We have categorized Indian states based on the value of SHDS and found that in 2005-2006, only four states were identified in the low-level category, 20 states in the moderate category, and four states in the serious category. Out of 20 moderate category states in 2005-06, nine states moved to the low-level category in 2015-16. All four serious category states improved their health measures and moved to the moderate category in 2015-16. Four states moved to the low-level category in 2019-20 from the moderate category. In the 2005-06 fiscal year, two BIMARU states, Bihar and Madhya Pradesh, were classified as serious, but they were later upgraded to the moderate category. Regression results have also confirmed that Higher-income states, as well as states that spend a greater proportion of GDP on social spending, have a significant favorable impact on SHDS. Since the results indicate positive impact of increased public sector outlay on health status therefore in case of India to take demographic advantage of its large young population in the productive age group, enhancing the current levels of SSE is a must. Moreover, India's human development index rank of 132 among 191 countries in 2022 (UNDP, 2022) also highlights the importance of investing more in the social sector if India wants to gain from its demographic bulge. In India there is room for increasing SSE to fill up the infrastructure gap, for disease prevention, health promotion, maintaining the existing facilities and improving health services quality at the primary level. All these concerted efforts will expectedly result in a healthy population that will be more able to take advantage of educational opportunities, and an educated population in turn will make better-informed health choices. This study might be useful for the future researchers and policy makers intended to improve health status particularly in BIMARU states. Further comprehensive studies may be conducted using more complicated methods involving other relevant health indicators and economic variables. We could not perform time series analysis due to the unavailability of continuous time series data for the considered health indicators; prospective researchers may address this issue.

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Conflicts of interest
The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Note :

i..Year to Year Growth rate is obtained from $\left(\frac{(Y_t - Y_{t-1})}{Y_{t-1}}\right)$, Where Y_t and Y_{t-1} are the magnitude of the variable in period t and t-1 respectively.

ii..Compound annual growth rate of a variable is defined as $\left(\frac{Y_n}{Y_0}\right)^{\frac{1}{n}} - 1$; Where Y_n and Y_o are the magnitude of the variable in period n and base period respectively.

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