

CHAPTER 5

REGIONAL HEALTH INEQUALITY IN INDIA

5.1 Introduction

WHO (2008) observes, “Social inequalities are killing people on a grand scale. The toxic combination of bad policies, economics, and politics is in large measure responsible for the fact that a majority of people in the world do not enjoy the good health that is biologically possible”.

Governments and international organizations have recognized the need to reduce health inequalities between social and economic groups. India even committed herself to the pursuit of achieving the goal of health for all by 2000 in accordance with the declaration of 1978. More than thirty years have passed since then but health for all remains an elusive goal and still there is bias in terms of gender, economic condition, status and availability of welfare funds in India (Feinstein 1993; IIPS and Macro International 2005-06; Joe et al. 2008). In developing countries, gap in the demographic and health-related outcomes between the rich and poor are large (Baker et al. 1993; Gwatkin, 2000; Leon et al. Wagstaff, 2002; Joe et. al. 2008).

“Poor economic status emerges as a critical determinant of child nutrition; and mother’s illiteracy is the key determinant for children not being fully immunized. However, child underweight is more sensitive to changes in socioeconomic inequalities and has a less pronounced association with development” (Arokiasamy et al. 2012).

It is recognized that excessive inequality is not just unfair, but in addition is health-damaging. Societies which have fewer variations in housing standards, better working conditions and less inequality in income seem to have less health inequalities between socio-economic groups.

Health equality is an important goal for the society as the poor have access to limited health care facilities due to low incomes and, therefore, tend to have higher rates of mortality. Equality of health is mostly measured as inequalities in health outcomes,

health services utilization, out-of-pocket expenditure and use of public sector subsidies between the poor and non-poor. In this chapter we focus on health inequalities that can be seen through health outcomes like IMR, UFMR and immunization (IMM).

5.2 Regional Disparities in India

Table 5.1 lists different states and union territories to show disparities in attaining levels of per capita income, female literacy rate and health status in terms of IMR, UFMR and IMM in 2005-06. There are large differences in the levels of per capita income in various regions across India, ranging from Rs. 7,813 in Bihar to Rs. 80,844 in Goa.

Table 5.1 Regional Disparities in India, 2005-06					
States	**PCNSDP	*Female Literacy Rate	IMR	UFMR	IMM
Delhi	69128	75.0	39.8	46.7	63.2
Haryana	40628	56.3	41.7	52.3	65.3
Himachal Pradesh	35806	68.0	36.1	41.5	74.2
Jammu & Kashmir	22406	41.8	44.7	51.2	66.7
Punjab	34096	63.5	41.7	52.0	60.1
Rajasthan	19445	44.3	65.3	85.4	26.5
Madhya Pradesh	15927	50.3	69.5	94.2	40.3
Uttar Pradesh	13445	42.9	72.7	96.4	23.0
Bihar	7813	33.6	61.7	84.8	32.8
Orissa	18194	50.9	64.7	90.6	51.8
Bengal	23808	60.2	48.0	59.6	64.3
Arunachal Pradesh	26759	44.2	60.7	87.7	28.4
Assam	17050	56.0	66.1	85.0	31.4
Manipur	19479	59.7	29.7	41.9	46.8
Meghalaya	25642	60.4	44.6	70.5	32.9
Mizoram	25826	Na	34.1	52.9	46.5
Nagaland	33072	61.9	38.3	64.7	21.0
Tripura	25688	65.4	51.5	59.2	49.7
Goa	80844	75.5	15.3	20.3	78.6
Gujarat	36102	58.6	49.7	60.9	45.2
Maharashtra	40947	67.5	37.5	46.7	58.8
Andhra Pradesh	27486	51.2	53.5	63.2	46.0
Karnataka	29295	57.4	43.2	54.7	55.0
Kerala	34837	87.8	15.3	16.3	75.3
Tamil Nadu	34126	64.5	30.4	35.5	80.9

Source: National Family Health Survey (NFHS-3), ** Reserve Bank of India, 2012, * Census, PCNSDP: Per Capita Net State Domestic Product (at factor cost, at constant prices 2004-2005, in Rupees).

Similarly, there are regional differences in health status in terms of IMR, UFMR and IMM. In Uttar Pradesh the per capita income is around twice the per capita income in Bihar. However, it has the highest IMR at 72.7, whereas Goa is a Union Territory (UT) with the least IMR at 15.3. The UFMR was the highest in Uttar Pradesh, while it was the least in Kerala. Similarly, the percentage of full immunization was the highest in Tamil Nadu and least in Nagaland. In addition to this, there were substantial variations in terms of female literacy rate ranging from 41.8 per cent in Jammu and Kashmir to 87.9 per cent in Kerala.

States	Rate of decline of IMR, 1992-93 to 2010-11	Rate of decline of UFMR, 1992-93 to 2005-06	Rate of increase in IMM, 1992-93 to 2009
Delhi	-57.2	-43.8	-12.3
Haryana	-39.9	-47.0	-20.2
Himachal Pradesh	-31.8	-39.9	-4.1
Jammu & Kashmir	-9.7	-13.2	-8.7
Punjab	-44.1	-23.5	-14.0
Rajasthan	-28.4	-16.7	13.7
Madhya Pradesh	-30.7	-27.7	56.8
Uttar Pradesh	-42.9	-31.8	81.3
Bihar	-50.6	-33.5	302.8
Orissa	-49.1	-30.8	61.5
West Bengal	-57.5	-39.9	127.5
Arunachal Pradesh	-20.0	21.8	86.2
Assam	-38.0	-40.2	244.8
Manipur	-74.0	-32.0	120.3
Meghalaya	-19.0	-18.9	557.7
Mizoram	132.9	80.5	38.1
Nagaland	22.0	212.5	1084.2
Tripura	-61.7	-43.4	299.5
Goa	-65.5	-47.8	-19.1
Gujarat	-40.3	-41.4	-0.6
Maharashtra	-50.5	-33.6	4.8
Andhra Pradesh	-38.9	-30.7	44.2
Karnataka	-46.5	-37.3	-0.4
Kerala	-49.6	-49.0	45.2
Tamil Nadu	-67.5	-58.7	-31.0

Source: Based on the author's calculation.

From Table 5.2 it is obvious that there were substantial differences in the rate of change in various health indicators since 1992-93 in different regions in India. The rate of change in IMR ranged from -9.6 per cent in Jammu and Kashmir to 132.7 per cent in Mizoram. It means the lowest decline of IMR in Jammu & Kashmir. Mizoram and Nagaland showed a positive rate. This means that IMR in Mizoram and Nagaland increased in 2010. Manipur had the highest rate of decline in IMR in 2010 (72.05 per cent).

Likewise, the rate of decline in UFMR for the period 1992-93 to 2005-06 (for some regions there are data for 2010). The decline ranged from 16.7 per cent in Rajasthan to a positive rate in Nagaland. This shows a vast disparity in health status in various regions in India. On the one hand, some states are growing at a rapid pace in improving the health quality and, on the other hand, remaining states have lagged behind in improving the mortality rates. The differences are not just in absolute terms but also in the growth rates of health status.

The rate of increase in full immunization from 1992-93 to 2009 indicates that the rate of change was from -0.31 in Tamil Nadu, to around 1,084 in Nagaland. It was negative in states like Tamil Nadu, Haryana, Goa, Punjab, Delhi, Jammu & Kashmir, Himachal Pradesh and Karnataka. The lowest rate of increase was in Maharashtra (4.8) and highest in Nagaland. The range of change was very high in immunization which showed a variety of changes in different regions and it was not uniform.

Therefore, in this chapter, we aim to analyse differences in income, female literacy rate and health status in India during the period 1992-93 to 2010-11. The objective is to understand whether the differences had decreased over time or it is that the gap between the richer and poorer states is increasing.

Inequalities in terms of Gini Coefficient

Table 5.3 shows inequalities in terms of per capita net state domestic product (PCNSDP), female literacy rate and health status at four points of time. The values are calculated by the covariance method by taking different regions of India in these time periods.

Inequalities in female literacy declined from 1992-93 to 2010-11. This implies that the gap in terms of literacy levels reduced and the overall health inequalities have fallen. There is a slight increase in inequality in terms of IMR. Income inequalities showed an increasing trend. This implies that the gap between the richer and poorer states increased.

Table 5.3 Gini Coefficient					
By covariance method					
Year	PCNSDP	IMR	UFMR	IMM	Female Literacy
1992-93	0.24	0.23	0.23	0.30	0.20
1998-99	0.27	0.19	0.21	0.31	0.16
2005-06	0.27	0.19	0.21	0.21	0.12
2010-11	0.28	0.23	0.23	0.14	0.09

Source: Based on the author's calculation.

The gap between the rich and poor states is widening, but the disparity in regions in terms of female literacy is shrinking. Additionally, health inequality increased from 2005-06 to 2010-11 in terms of IMR and UFMR. This is strange because since the launching of NRHM in 2005, the health status in India has improved. Full immunization inequality decreased in 2011. However, the results given above show that inequality increased. This means that there is a kind of trade-off between health inequality and improvement of health services to provide effective, equitable and affordable health services. Even though the initiatives have improved mortality rates in India, disparities across states have increased.

Inequalities Measured by Concentration Index

The concentration index helps to measure the socio-economic health inequality. This index depends only on the relationship between the health variable and the rank of living standards variable, and not in the living standards variable itself. In other words, it means that a change in the degree of income inequality need not affect the concentration index measure of income related to health inequality. Similarly, a change in female literacy rate inequality need not affect the concentration index measure of female literacy rate-related health inequality.

Table 5.4 shows inequalities by measuring the concentration index of health by using the covariance method. It shows the categorizations of states with respect to per capita NSDP and female literacy rate respectively for each year to calculate the income-related health inequality and female literacy-related health inequality. The Table also shows whether these inequalities have reduced over time.

This index indicates the direction of relationship between health indicator and socio-economic factor. First we look at the concentration index when rank is given according to income.

In Table 5.4, in the left section, the index shows a negative sign for IMR and UFMR. For instance, in 1992-93 the concentration index for IMR is -0.15. This implies that the higher IMR is more among the poorer states. In 1998-99 the value of index decreased which means that the concentration of high levels of IMR declined among the poorer states. However, in 2005-06 the value of index rose and then declined in 2010-11. From 1992-93 to 2010-11, the concentration of IMR among the poorer states declined. But as it was negative, it showed that the higher mortality rates still prevailed among the poorer states.

Table 5.4 Concentration Index for Measuring Socio-economic Related Health Inequality							
By convenient covariance method							
With respect to PCNSDP				With respect to Female Literacy Rate			
Year	For IMR	For UFMR	For IMM	Year	For IMR	For UFMR	For IMM
1992-93	-0.15 (24)	-0.15 (24)	0.19 (24)	1992-93	-0.10 (24)	-0.11 (24)	0.06 (24)
1998-99	-0.12 (23)	-0.14 (23)	0.23 (23)	1998-99	-0.14 (24)	-0.16 (24)	0.13 (24)
2005-06	-0.14 (25)	-0.16 (25)	0.13 (25)	2005-06	-0.16 (24)	-0.17 (24)	0.13 (24)
2010-11	-0.13 (25)	-0.17 (18)	0.15 (25)	2010-11	-0.16 (25)	-0.16 (18)	0.09 (25)

Source: Based on the author's calculation. The parentheses show the number of the states.

Further, the index values for UFMR show negative value of the index over time which means that the higher UFMR values are among the poorer states. They are increasing except for a slight decline in 1998-99. This means that the concentration of higher UFMR is more among the poorer states. Observing the index values for immunization, it shows a positive sign. This means that the percentage of full immunization is more concentrated among the richer states across India. In 1998-99, the concentration index went up which means that immunization increased more in richer states. In 2005-06, the value of index declined but was still positive. In 2010-11, it increased again. This shows that there were income-related health inequalities across India. The richer states enjoyed better health outcome as compared with the poorer states. The level of inequality reduced to some extent in terms of IMR, but rose with respect to UFMR and immunization.

The other section of Table 5.4 shows literacy-related inequality by concentrating on female literacy rate in India. Both IMR and UFMR have a negative sign implying that higher mortality rates are among the poorer states. It is striking to see that the value of index is rising consistently for IMR over time. This proves that inequality between the states with more female literacy and less female literacy has increased. This shows that the impact of female literacy rate is higher in controlling the levels of IMR. Further, the concentration index increased overtime for UFMR with a slight fall in its rate in 2010-11. The index value for immunization increased and was positive. This implies that the states with better education were more immunized. Since the value of index was increasing, it indicates that the concentration of percentage of full immunization increased among the states with more educated women. This suggests that the female literacy rate is a relevant indicator to improve the health status. If there are policy implications in the states with lower literacy rate, then they may also improve welfare in terms of health and the gap of health inequality across regions may reduce.

Convergence models for Health inequality

a) Unconditional Beta Convergence

Here we run an ordinary least squares cross section regression with the respective samples of IMR, UFMR and immunization. The equations fitted are as follows:

$$g_{imr} = a_1 + \beta_1 (\text{initial IMR}) + \mu_{1t} \quad (1)$$

$$g_{ufmr} = a_2 + \beta_2 (\text{initial UFMR}) + \mu_{2t} \quad (2)$$

$$g_{imm} = a_3 + \beta_3 (\text{initial immunization}) + \mu_{3t} \quad (3)$$

Where g_{imr} and g_{ufmr} are the rate of decline of IMR and UFMR respectively and g_{imm} is the positive rate of growth in immunization. The initial levels of IMR, UFMR and immunization are for 1992-93, and μ_{it} is the error term where $i= 1, 2$ and 3 respectively.

Table 5.5 Test for Unconditional Convergence					
	Diagnostic tests				
	Constant	B	r sq.	Functional form	Heteroskedasticity
Regression 1 (for IMR)	-45.06 (0.929)	0.015 (0.001)*	0.0004	F(3,18) = 0.25 Prob> F = 0.8578	LM = 4.301793, p-value= .03807
Regression 2 (for UFMR)	-39.89 (0.0)*	0.048 (0.561)	0.4427	F(3, 17) = 1.73 Prob> F = 0.1980	LM = 1.7098246, p-value= .19101
Regression 3 (for IMM)	201.77 (0.0)*	-3.424 (0.001)*	0.4427	F(3,16) = 32.58 Prob> F = 0.000	LM = 4.5921185, p-value = .032123

Numbers in the parentheses are p-values. * represent statistical significance at 5 per cent level. Functional form is measured by Ramsey RESET test using powers of the fitted values of rate with Ho: model has no omitted variables. Heteroskedasticity is measured by Breusch-Pagan test under the null hypothesis of homoskedasticity.

Source: Based on the author's calculation.

The β coefficient is statistically significant in regressions 1 and 3, and insignificant in regression 2. In regression 1, the sign is negative and gives the rejection of null hypothesis of no convergence and divergence. This means that in terms of IMR and immunisation, there is unconditional convergence. Regression 2 does not reject the null hypothesis and, therefore, shows no unconditional convergence and there is no convergence or divergence taking place in a majority of the states.

The unconditional convergence model is more of a static nature model as it does not include other factors that change health over time. In reality, the economies are more dynamic due to changes and innovations. Therefore, we look next at the conditional convergence/divergence.

b) Conditional β Convergence/Divergence

As seen above, there is no unconditional convergence/divergence taking place between health and its rate over time (except in IMR). However, there may be conditional convergence on its own steady path, holding the constant variables that may affect the rates other than their own respective initial levels. In analysing such convergence, we have taken PCNSDP and female literacy rate (FLR) as the control variables because there is extensive literature that considers the two factors as important in improving the quality of life. The equation is as follows:

$$g_{imr} = a_1 + \beta_1 (\text{initial IMR}) + b_1(\text{PCNSDP}) + b_2(\text{FLR}) + \mu_{1t} \quad (4)$$

$$g_{ufmr} = a_2 + \beta_2 (\text{initial UFMR}) + c_1(\text{PCNSDP}) + c_2(\text{FLR}) + \mu_{2t} \quad (5)$$

$$g_{imm} = a_3 + \beta_3 (\text{initial IMM}) + d_1(\text{PCNSDP}) + d_2(\text{FLR}) + \mu_{3t} \quad (6)$$

Table 5.6 Test for Conditional Convergence					
Regression 4 (IMR)	Constant	β	PCNSDP	Female Literacy	R sq.
	44.15 (0.173)	-0.25 (0.144)***	-0.00007 (0.656)	-0.987 (0.022)*	0.341
Diagnostic tests Functional form: $F(9, 10) = 0.53$; Prob> F = 0.8204 Heteroskedasticity: LM = 4.7046522, p-value = .1947462					
Regression 5 (UFMR)	Constant	β	PCNSDP	Female Literacy	R sq.
	26.69 (0.154)***	-0.19 (0.04)*	-0.00015 (0.342)	-0.686 (0.009)*	0.488
Diagnostic tests Functional form: $F(3, 15) = 1.10$; Prob> F = 0.3814 Heteroskedasticity: LM = .03708086, p-value = .9981219					
Regression 6 (IMM)	Constant	β	PCNSDP	Female Literacy	R sq.
	-37.36 (0.764)	-4.41 (0.0)*	0.00058 (0.58)	3.650 (0.081)**	0.60
Diagnostic tests Functional form: $F(9, 8) = 13.14$; Prob> F = 0.0007 Heteroskedasticity: LM = 4.3172578, p-value = .22918122					

Note: The numbers in parentheses are p-values; *, **, *** represent statistical significance at 5, 10 & 20 per cent levels. Functional form is measured by Ramsey RESET test using powers of the fitted values of rate with H_0 : model has no omitted variables. Heteroskedasticity is measured by Breusch-Pagan test under the null hypothesis of homoskedasticity. Source: Based on the author's calculation.

The sign of coefficients of PCNSDP and female literacy rate are expected to be negative in equations 4 and 5, but expected to be positive in equation 6. This would mean that the rate of decline increased in IMR and UFMR with increase in income and female literacy rate. The rate of immunization increased with income and female literacy rate.

The results of the fitted regressions 4, 5 and 6 are shown in Table 5.6. In terms of UFMR and immunisation, the result rejects the null hypothesis and shows evidence of conditional convergence. Regression 4 shows very weak evidence of conditional convergence at 20 per cent confidence interval. The sign of PCNSDP and female literacy rate are found to be negative for regressions 4 and 5 as expected and a positive sign for immunisation rate. However, PCNSDP is not statistically significant.

Overall, the regression result explains that there is conditional convergence in the respective health rates with their initial absolute values across regions.

c) Sigma Convergence

It is known that β convergence is not a sufficient condition for the standard deviation (SD) or coefficient of variation (CV) of regional health indicators to converge because of random shocks and also because the steady state levels may diverge through time. Therefore, we need to directly estimate the Sigma Convergence of health indicators for the given samples.

In analysing the Sigma Convergence, we have divided the regions in two sub-groups on the basis of the average of initial per capita NSDP as high income regions and low income regions. By doing so, we have tried to analyse if the convergence is taking place, that is, if the regional disparities in terms of health are declining and, if so, then which of the two sub-groups is responsible for it. The results are shown in Table 5.7.

The time trend for the all regions and for groups 1 and 2 regions is significantly negative. This means that there is a decline in sigma inequality in India which is driven by a decrease in inequality in both the sub-groups defined as richer and poorer income regions.

Table 5.7 Sigma Convergence	Standard Deviation (SD)	R ²
With IMR		
All regions	SD=98.0688-0.48473t (0.0) (0.0)	0.9065
Group 1 (richer regions)	SD=15.93299-0.39722t (0.003) (0.0)	0.4055
Group 2 (poorer regions)	SD=23.3717-0.45462t (0.0) (0.0)	0.9671
With UFRMR		
All regions	SD=33.83301-0.78279t (0.0) (0.0)	0.9708
Group 1 (richer regions)	SD=23.85587-0.83179t (0.0) (0.0)	0.6655
Group 2 (poorer regions)	SD=33.59497-0.63291t (0.0) (0.0)	0.9499
With Immunization		
All regions	SD=25.83718-0.53719t (0.0) (0.0)	0.7542
Group 1 (richer regions)	SD=23.75879-0.52246t (0.0) (0.0)	0.9032
Group 2 (poorer regions)	SD=24.30542-0.38705t (0.0) (0.0)	0.5469

Source: Based on the author's calculation.

Thus, it can be concluded that as per Gini coefficient, health inequalities have more or less declined over the two decades, apart from a slight increase since 2005. However, inequalities of health are mainly concentrated in the poorer states. In terms of ranking based on female literacy, the states with higher female literacy enjoy more healthy life and the higher mortality rate is among the states that are less literate. In addition to these inequalities, there is evidence of conditional beta and sigma convergence.