Multi-Dimensional Poverty in India with Special Reference to West Bengal: A Socio-Economic Analysis

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This Thesis Dedicated to
My father Late Naba Kumar Ray
&
My daughter Akashleena Roy

CERTIFIED THAT THE THESIS ENTITLED

"Multi-Dimensional Poverty in India with Special Reference to West Bengal: A Socio-Economic Analysis" submitted by me for the award of the Degree of Doctor of Philosophy in Arts at Jadavpur University is based upon my own work carried out under the Supervision of **Prof. Sushil Kumar Haldar** & **Dr. Poulomi Roy**. Neither this thesis nor any part of it has been submitted before for any degree or diploma anywhere/ elsewhere.

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Contents

List of Tables

Page No.

List of Figures

Page No.

List of Maps

Page No.

List of Abbreviations

1. AGL: Agricultural Laborer
2. AP: Andhra Pradesh
3. AR: Approach Road
4. Aru P: Arunachal Pradesh
5. BNA: Basic Needs Approach
6. BRGF: Backward Region Grant Fun
7. CUL: Cultivators
8. DHC: Distance of Primary School
9. DMK: Distance of Permanent Marketplace
10. DS: Deprivation Score
11. DWCRA: Development of Women and Children in Rural Areas
12. FB: Financial Benefit
13. FE: Fixed Effect
14. FGT Index: Foster–Greer–Thorbecke Index
15. GDI: Gender Development Index
16. GE: Generalized Entropy
17. GMM: Generalized Method of Moments
18. GNP: Gross National Product
19. HCR: Head Count Ratio
20. HDI: Human Development Index
21. HDR: Human Development Report
22. H.P: Himachal Pradesh

23. HPI: Human Poverty Index
24. IAY: Indira Awaas Yojana
25. IRDP: Integrated Rural Development Programme
26. IHDS: Indian Human Development Survey
27. IIPS: International Institute for Population Science
28. JGSY: Jawahar Gram Samriddhi Yojana
29. JRY: Jawahar Rozgar Yojana
30. MGNREGA: Mahatma Gandhi National Rural Employment Act
31. M.P: Madhya Pradesh
32. MPI: Multidimensional Poverty Index
33. NBA: Nirmal Bharat Aviyan
34. NFHS: National Family Health Survey
35. NFWP: National Food for Work Programme
36. NRDWP: National Rural Drinking Water Programme
37. SGRY: Sampoorna Gramin Rozgar Yojona
38. SHG: Self Help Group
39. NSS: National Sample Survey
40. OBC: Other Backward Class
41. OPHI: Oxford Poverty & Human Development Initiative
42. PCA: Principal Component Analysis
43. PCEE: Par Capita Education Expenditure
44. PCHE: Par Capita Health Expenditure
45. PHC: Primary Healthcare Center
46. PMAY: Pradhan Mantri Awas Yojana

47. PMUY: Pradhan Mantri UjjwalaYojana

48. PS: Primary School

49. RBI: Reserve Bank of India

50. RD: Road Length

51. RE: Random Effect

52. SBC: Share of Backward Community

53. SC: Schedule Caste

54. SDG: Sustainable Development Goals

55. SMP: Semi Medical Practitioner

56. ST: Schedule Tribe

57. SITRA: Supply Improved Toolkits for Rural Artisans

58. TRYSEM: Training for rural youth for Self-Employment

59. UNDP: United Nations Development Programme

60. U.P: Uttar Pradesh

61. W.B: West Bengal

CHAPTER-1

INTRODUCTION

INTRODUCTION

1.1 The Origin of Multidimensional Poverty

The aggregate income or growth of income of any country fails to capture some of the important issues like inequality of income, the distribution of income, the extent of consumption or income-poverty. The human deprivation is not captured by the growth of income [Streeten 1994; Ranis et al. 2000]. The literature on poverty is vast and multifaceted, I will concentrate on multidimensional human deprivation as popularized by United Nations Development Programme(UNDP]. The origin of the multidimensional poverty was traced back in the works of Rowntree[1][1901]. His work on poverty highlights both absolute and relative poverty[2]; it is generally argued that the absolute poverty or the situation of destitute is applicable to less developed countries of Sub-Saharan Africa and South Asia. The absolute poverty is synonymous to malnutrition and hunger as argued by Sen [1981]; Sen [1981] has defined absolute poverty based on minimum calorie requirement, which is termed as 'biological approach' to absolute poverty[3]. According to Sen (1983, 1985), poverty can be viewed as capability failure[4]. The basic capability is of three types which is well grounded by human development: to be healthy, to be knowledgeable so that a person can communicate with others and to maintain a descent standard of living. Capability shortfalls means when people are unable to reach a certain level of essential human achievement or functioning [HDR1996]. Unlike capability shortfalls, absolute poverty can also be measured by income or expenditure method; a minimum or critical level of income is required to escape from poverty which gives rise to the concept of poverty line.[5] Therefore, we can argue that the origin of multidimensional poverty is capability failure.

1.2 Basic Human Needs and Basic Capability: A Multidimensional View

The Basic Needs Approach (BNA) to development was introduced in the World Employment Conference held in 1976 that aims to eradicate mass human deprivation from the word especially from the less developed economies. The BNA consists of two parts- one is private consumption and other one is publicly provided basic services that is expected to facilitate the private consumption. The first part includes adequate food, clothing, housing; minimum requirement of households' furniture etc. and the second

part includes heath services, educational services, sanitation, transportation etc. The second part is extremely important because the nature of the services is mostly merit goods. The market for such goods and services create asymmetric information. Therefore, the government should provide all these goods and services. The BNA has emphasized on commodity requirements of the households; that vary over seasons, time, demographic composition of the households, and residential status of the households. The human development concept introduced by UNDP in 1990 is no doubt is influenced by BNA but the UNDP (1990) has given emphasis on people's basic choices.

Sen (1984) argues that the capability approach can be seen as a replacement of the BNA. Sen outlines five critiques of BNA as given below:

"1. Basic needs 'are defined in terms of commodities ……even though the contingent nature of commodity requirements is fully acknowledged. 2. 'Individual commodity requirements for specific capabilities may not be independently decidable for each person due to social interdependence. 3. The BNA confines attention to minima and is useful mainly for poor countries. 4. Needs is a more passive concept than 'Capability', and it is arguable that the perspective of positive freedom links naturally with capabilities (what can the person do?) rather than with the fulfillment of their needs (what can be done for the person?) 5. The BNA neglects philosophical foundations – conceptions of 'the good life'."

1.2.1 Doyal and Gough [1993]: Intermediate Needs

The 'intermediate needs' was developed by Doyal and Gough [1993] which is based on 11 needs such as:

Nutritional foods including safe drinking water, housing, work, physical environment, healthcare, childhood security, physical security, primary societal relationships, economic security, safe birth control and child bearing, basic education.

The above indicators are well grounded from the private as well as social benefit approach. The reproductive security has been an important issue that was first pointed out by Doyal and Gough(1993). Lack of social, financial and reproductive securities generates disutility or dissatisfaction to a person that negatively affects individual's overall well-being. Therefore, the 'intermediate needs' as proposed by Doyal and Gough

is comprehensive basic needs that not only considers commodity requirement but also gives emphasis on freedom. Phychological well –being is incorporated in 'intermediate needs'.

1.2.2 Basic Capability as proposed by Sen [1984]:

The UNDP's human development is based on basic capability as proposed by Sen (1985). There are basic capabilities that a person should possess. According to Sen (1985), a capability to avoid malnourishment; a capability to be educated; a capability to have the opportunities to maintain a decent standard of living. The set of basic capabilities might be thought of as capabilities to meet basic human needs.

1.3 Capability Poverty Measure: The Genesis of Multidimensional Poverty

The objectives of development are not confined by the indicators of simple economic growth parameters, rather it is quite broad which include to reduce poverty, hunger and malnutrition and to ensure social justice and equity. According to Sen (1990), it is defined as the encouragement and expansion of important capabilities. The UNDP's human development report is heavily influenced by Senian concept of development and deprivation.

The capability poverty measure is based on three dimensions of human deprivation:

Health Dimension
Knowledge Dimension
Standard of Living Dimension

The three corresponding indicators used for capturing the shortfalls of basic capabilities are:

Health dimension is captured by the children under five who are underweight (%)
Knowledge dimension is captured by the adult females who are illiterate (%)
Standard of living dimension is captured by the non-institutional delivery (%)

The simple average of the above three indicators give Capability Poverty Measure (CPM)[UNDP 1996]. The CPM is gender sensitized basic capability failure as it includes female illiteracy rate. It is generally argued that countries with higher human

development index(HDI) manifest lower CPM; however, it may not be true always because HDI includes income but our CPM does not take any monetary measure. It is purely a non-monetary measure of social or human deprivation that is gender sensitized. The cross-country data show that some countries have done relatively better in raising average capabilities than in reducing CPM and others have done relatively better in reducing CPM than in raising average capabilities. This is because the HDI is based on relative distance methodology whereas the CPM does not take into account relative distance or range-equalization method [Sen 1990]. The CPM is simple arithmetic Mean (AM) giving equal weights in three indicators[6].

The World Bank's 'Voices of the Poor' studies [Narayan et al 2000] and World Development Report-2002/2003 have emphasized the goal of 'poverty reduction' or to an end of human poverty from the countries in the world. Sen's proposition of individual advantage in the space of capabilities rather than economic growth or primary goods is also highlighted in the UNDP's Human Development Report-2003 as 'Millennium Development Goals'.

1.4 The Human Poverty Index (HPI): A Measure of Multidimensional Human Deprivation

Anand and Sen [1997] have formulated an index in order to measure capability deprivation in basic three dimensions of human life already reflected in the human development index. The human poverty index (HPI) captures the shortfalls in basic capabilities of human development:

- Health Deprivation or longevity deprivation is captured by early death, the corresponding indicator of longevity deprivation is people who die before attaining age 40.
- Knowledge deprivation is measured by illiteracy rate
- Deprivation of descent standard of living is captured by the three indicators like malnourished children, inaccessibility of safe drinking water and basic healthcare

The HPI combines basic dimensions of human poverty and reveals interesting contrasts with money-metric poverty. Is there any relationship between money-metric and non-money metric poverty as captured by HPI? This is an interesting question that needs to

be explained. Does higher HDI lead to lower HPI? Generally, it happens but cross-country data may give different results. This is because the HDI includes income but the HPI is purely non-monetary in nature. The HDI measures average achievement over a range of outcomes of indicators whereas the HPI captures deprivations in basic dimensions of human development. Moreover, the methodology of measuring HPI and HDI is not identical. The HPI takes into account 'Output' (or attainment) and 'Input' (or process) indicators[7] but the HDI only considers outcome or attainment.

1.4.1 HPI: A Formal Measure of Multidimensional Human Deprivation

The Human Poverty Index was introduced by UNDP in Human Development Report (1997). It is multidimensional concept of poverty, which was developed by Sen and Anand. The Human Poverty Index (HPI) concentrates on deprivation in three essential elements of human life already reflected in HDI – Longevity, Knowledge and a decent standard of living. The first deprivation relates to survival – the vulnerability to death at a relatively early age. The second relates to knowledge – being excluded from the world of reading and communication. The third relates to a decent standard of living in terms of overall economic provisioning.

In constructing the HPI (applicable to the underdeveloped countries in the world), the deprivation in longevity (P_1) is represented by the percentage of people not expected to survive to age 40, the deprivation in knowledge (P_2) by the percentage of adults who are illiterate. The deprivation in a decent living standard in terms of overall economic provisioning (P_3) is represented by a composite of three variables – the percentage of people without access to safe water (P_{31}), the percentage of people without access to health services (P_{32}) and the percentage of moderately and severely underweight children under five (P_{33}). The composite variable P_3 is constructed by taking a simple average of the three variables P_{31}, P_{32} and P_{33}. Thus:

$$P_3 = \frac{P_{31} + P_{32} + P_{33}}{3}$$

The HPI [P(α)] is a weighted mean of order α of α. Thus, letting $w_i > 0$ be the weight on $P_i(\geq 0)$, for i=1,2,3, we define the generalized mean P(α) as:

$$P(\alpha)=\left[\frac{W_1}{\sum_{i=1}^{3}W_i}.P_1^{\alpha}+\frac{W_2}{\sum_{i=1}^{3}W_i}.P_2^{\alpha}+\frac{W_3}{\sum_{i=1}^{3}W_i}.P_3^{\alpha}\right]^{1/\alpha} \quad (1.1)$$

The weighted mean reduces to the ordinary mean of order α where $W_i=1$ for every i. With $W_1=W_2=W_3=1$, we have simply:

$$P(\alpha)=\left[\frac{1}{3}.P_1^{\alpha}+\frac{1}{3}.P_2^{\alpha}+\frac{1}{3}.P_3^{\alpha}\right]^{1/\alpha} \quad (1.2)$$

The mean of order 1(α=1) is the simple weighted or un-weighted arithmetic mean of P_1, P_2 and P_3. Thus:

$$P(1)=\left[\frac{1}{3}.P_1+\frac{1}{3}.P_2+\frac{1}{3}.P_3\right] \quad (1.3)$$

The HPI does satisfy the following properties:

1. $Min\{P_1,P_2,P_3\}\le P(\alpha)\le Max\{P_1,P_2,P_3\}$
2. $As\,\alpha\to\infty, P(\alpha)\to Max\{P_1,P_2,P_3\}$
3. P(α) is homogeneous of degree 1 in $\{P_1,P_2,P_3\}$
4. For each i=1,2, 3; $\frac{\partial P(\alpha)}{\partial P_i}>0$
5. P(α) is convex with respect to P_i for each i=1,2,3. This means $\frac{\partial^2 P(\alpha)}{\partial P_i^2}>0$
6. For any i, $\frac{\partial P(\alpha)}{\partial W_i}\ge 0$ as $P_i\ge P(\alpha)$, similarly, $\frac{\partial P(\alpha)}{\partial W_i}\le 0$ as $P_i\le P(\alpha)$
7. For given P_1, P_2 and P_3 that are not equal, if $\alpha>\gamma>0$, then $P(\alpha)>P(\gamma)$
8. The P(α) is not sub-group decomposable, this means that $\sum_j \frac{n_j}{n}.P_j(\alpha)\ge P(\alpha)$. Where, *j*=1, 2, 3 …m number of population sub-groups. Assume *n* be the total population of the economy as a whole, therefore, we can write, $\sum_j^m n_j=n$ .Assume

that the groups are mutually exclusive and exhaustive; P_{1j}, P_{2j} and P_{3j} are the parameters of the *j*-th group.

9. The elasticity of substitution (σ) between any two poverty sub-indices of P(α), that is, between any two of P_1,P_2 and P_3, is constant and equal to $\frac{1}{\alpha - 1}$

1.4.2 Limitations of HPI [P(α)]

HPI [P (α)] cannot be considered as head-count ratio (HCR). This is because of power mean of P(α) that suffers from the problem of disjointness as well as over-lapping; there is no guarantee that a particular person will simultaneously suffer from all dimensions, that is over-lapping case only considers HCR. Generally, we find disjointness in real data that does never consider HCR.

In case of overlapping, if the incidence of poverty happened to be the identical in every dimension, then and only then the HPI can be considered as HCR, that rarely happens in case of large data:

$$P(\alpha) = \left[\frac{W_1}{\sum_{i=1}^{3} W_i} . P^{\alpha} + \frac{W_2}{\sum_{i=1}^{3} W_i} . P^{\alpha} + \frac{W_3}{\sum_{i=1}^{3} W_i} . P^{\alpha} \right]^{1/\alpha} = P$$

In reality, it does not generally happen in case of large population. The P(α) does also suffer from the problem of aggregation, choice of the dimensions, overlapping and multicollinearity (Alkire 2002, Krishnaji 1997, Alkire 2002; Pillai 2004, Haldar and Roy 2010; Haldar, Hembram and Das 2021). The intensity, depth and severity of poverty cannot be estimated from the HPI; moreover, we cannot determine the contribution of each dimension in HPI (Alkire and Foster 2008). Moreover, the assignments of equal weights are also arbitrary and unscientific. In order to overcome this problem, one can employ principal component analysis (PCA) through which one can reduce the number of variables in one hand and take care of the weights of the PCs on other hand (Johnson and Wichern 2006, Haldar and Raychaudhuri 2009, 2015; Haldar et al 2021). The P(α) is applicable for large population where the units of analysis may be a district (of a state), state (of a country) or country as a whole but at the household level, it is extremely

difficult to implement (UNDP 2010). Moreover, the P(α) is not sub-group decomposable[8].

1.5 The Multidimensional Poverty Index (MPI): A Measure of Multidimensional Poverty

The methodology in measuring multidimensional poverty(MP) using fuzzy sets was developed by Cerioli and Zani [1990], later on, it is extended by many like Martinetti [1996, 2000]; Chakravarty [2006]; Alkire et al. [2009, 2015]. Following their works on fuzzy sets approach of MP, I am simply presenting the MP:

Notations used:

Person= i (1…to n), indicators ($d>2$) = j, deprivation cut-off= z_j, attainment of individual i in j^{th} indicator= y_{ij}. The person is said to be poor if $y_{ij} < z_j$. The identification function is defined as follows:

$I_{y_i z} = 1$ if $i \in S_j$; $I_{y_i z} = 0$ if $i \in (S / S_j)$, where $Card(S) = n$ and $S = S_j \cup ((S / S_j) \forall j \in d$.

In the case of unidimensional measurement of poverty (like income or consumption criterion), one can easily estimate who are poor and who are non-poor. But, here, we have j (j=1, 2, ..., d) number of indicators, therefore, besides 0 and 1, we might have intermediate values ranging between 0 and 1. Following Cerioli and Zani (1990), Alkire and Foster(2011), the multidimensional deprivation can be uniquely captured as:

To make it simple, we assume that all elements in y_{ij} the matrix are ordinal.

Let dimension j has an K_j category and let $k_j \subset K_j$ is the subset which denotes deprivation set. In that case:

$I_{y_i z} = 1$ if $i \in k_j$

$= 0$ If $i \in (K_j / k_j)$. If we have all the elements in y_{ij} cardinal, we have the cut-off value z_j of the jth indicator, where, $j \in d$ In this case:

$I_{y_i z} = 1$ if $y_{ij} < z_j \ \forall j \in d$

$= 0$ if $y_{ij} \geq z_j \ \forall j \in d$

Here j includes three dimensions namely, education, health and living standard.

In reality, the elements of the matrix y_{ij} may be a mixture of both cardinal and ordinal, and we have to apply both for identification of poor or non-poor. There are two ways, for the identification of poverty: Union approach and Intersection Approach. In Union approach, a person is said to be poor if he/she is deprived at least in one indicator:

$I_{iP}^{U} = \sum_{j=1}^{d} I_{ij} \geq 1$.

Intersection approach assumes that the person is poor in all characteristics; it's a general case of severity of poverty. The overlapping case is obtained in Intersection approach:

$I_{iP}^{O} = \sum_{j=1}^{d} I_{ij} = d$. In the claim of a common situation, the poor is defined as:

$$I_{iP}^{IM} = \sum_{j=1}^{d} I_{ij} = d : m \in (1, d)$$

For empirical estimation, a weight is attached in each case: For Union approach: $I_{iP}^{UW} = \sum_{j=1}^{d} (I_{ij} * W_j) \geq \frac{\sum_j W_j}{j}$ for Intersection approach: $I_{iP}^{OW} = \sum_j W_j$ For Intermediate path: $I_{iP}^{IMW} = \overline{W} \in \left(\frac{\sum_j W_j}{j}, \sum W_j \right)$ Element of an indicator vector is defined by: $H_i = 1$ If $I_{iP}^{UW} \geq \frac{\sum_j W_j}{j}$, $H_i = 0$ otherwise. Then the column sum $\sum H_i = q$ is nothing but the headcount of the poor and $H = \frac{q}{n}$ is the headcount ratio. It is to be noted that each entry of the vector I_{iP} is the amount of deprivation of *i*-th individual. Therefore, the average deprivation proportion among the poor is given by:

$A = \sum_{i=1}^{n} \frac{I_{iP}}{qd}$. Thus, the multidimensional poverty index (for ordinal data) is defined as: $\boldsymbol{M = H \times A}$

We have followed the methodology provided by Alkire et al. (2009) and Alkire et al (2015) in calculating the deprivation score and MPI.

Two indicators such as malnutrition and child death are used under health, again years of schooling and school attendance are used as sub-indicators under education dimension. The living standard includes sub indicators such as no electricity connection in the household, no access to safe drinking water in the household, no access to improved sanitation in the household, house has dirt wall/floor in the family, household uses dirty cooking fuel (dung, firewood or charcoal), household has no car and does not own at least one of the items like bicycle, motorcycle, radio, refrigerator, telephone or television.

The weights assigned to each indicator under each dimension are given in the following Table-1.1

Table-1.1 Dimensions and Indicators of Multidimensional Poverty at the Household Level

Dimension (Weight)	**Indicators**	**Weight**
Health **(100/3)=33.33**	1] At least one member suffers from malnutrition 2] One or more child have died during last five years	16.67 16.67
Education **(100/3)=33.33**	1] No one has completed five years of schooling 2] At least one school-age child not enrolled in school	16.67 16.67
Living Condition **(100/3)=33.33**	1] No electricity 2] No access to safe drinking water 3] No access to improved sanitation 4] House has dirt wall/floor 5] Household uses dirty cooking fuel (dung, firewood or charcoal) 6] Household has no car and does not own at least one of: bicycle, motorcycle, radio, refrigerator, telephone or television	5.56 5.56 5.56 5.56 5.56 5.56
Total Weight **33.333 x 3=100**		**100**

Source: Compiled from UNDP Human Development Report, 2010

The sub-indicator will take value equal to one if the household is deprived of that characteristic and zero otherwise. Deprivation score varies between zero and hundred.

According to UNDP(2010), a household is said to be multi-dimensionally poor if the sum of weighted deprivation score for a household is 33.33 or more. Following Alkire and Foster (2009, 2015); Alkire and Santosh (2010) and UNDP (2010), we explain the calculation of multidimensional poverty index (MPI), incidence of poverty, contribution of each dimension to MPI etc. as follows:

Headcount ratio (H) measures the share of the multi-dimensionally poor people in total population. Therefore,

$$H = q / n = HCR \tag{1.4}$$

A household is multidimensionally poor if deprivation score of the household exceeds 33.33.

$$A = \sum_{i}^{q} c_i / q \tag{1.5}$$

the total deprivation scores of the households whose deprivation score exceeds 33.33 divided by total poor is the intensity of poverty (*A*). The deprivation score (c) of a person is the sum of deprivations in each indicator *j* (*j* = 1, 2, 3), $c = c_1 + c_2 + c_3$. Deprivation score take value equal to one if the household is deprived according to the sub-dimension and zero otherwise Finally, the MPI is obtained by multiplying the multi-dimensionally poverty headcount ratio (*H*) with the intensity of MP (*A*). Therefore,

$$MPI = H \times A \tag{1.6}$$

The contribution of each indicator *j* (*j*=1, 2 and 3) in MP is as follows:

$$Contribution_j = \frac{\sum_{1}^{q} c_j}{\frac{n}{MPI}} \tag{1.7}$$

1.6 Importance of the Study

India has been sharing about 17.5% and 28% of total world's population and multidimensionally poor respectively; eight Indian states that have a similar number of poor as in 25 African countries are Bihar, Jharkhand, Madhya Pradesh, Uttar Pradesh, Chattisgarh, Odisha, Rajasthan and West Bengal [OPHI 2018]. India's economic

performance at the national level was not so bad during the last two decades, however, India has been ranked very low, 97th among the 118 countries in 2016 on Global Hunger Index [IFRI 2016]. A wide range of anti-poverty policies have been initiated since independence in India but still human poverty in some of the states remain high especially after initiation of structural adjustment programme (SAP) in 1991 [Ghosh 2008; Kar et al 2011; Hembram et al 2019a,b]. In order to reduce regional imbalance and to achieve inclusive growth, an expert committee (which was appointed by the Finance Commission, Government of India in 2013 under the chairmanship of the Governor of RBI, Raghuram Rajan) suggested a rule of allocation of development funds across states based on needs. This allocation rule is criticized on the grounds of arbitrary choice of the parameters; methodology used in construction of underdevelopment index, arbitrary and higher weights attached to population of state etc [Haldar and Raychaudhuri 2016]. Therefore, an in-depth analysis of multidimensional human deprivation needs to be carried out with a view to understand the dynamics and spatial distribution of the incidence, extent and severity of multidimensional poverty at the disaggregate level in India. Such study may be helpful to the development practitioners for policy intervention at the disaggregate level.

1.7 Review of the Literature Based on Broad Perspectives and Scope of My Research Study

The Indian scenario has also evoked an animated discussion on the issues of income or consumption poverty but non-monetary measure of poverty are few in numbers. In order to explore the scope of my current research, I objectively skip the income or consumption poverty rather I try to highlight the existing research on multidimensional poverty. Inter-state economic and social disparities in India have been increasing especially after the structural adjustment programme (SAP) inn1991 in spite of various governmental measures to develop backward areas [Sen and Himanshu 2004; Ghosh 2008; Roy and Haldar 2010; Hembram et al 2020]. Research shows that the human development index (HDI) across 15 major states does not show the same increase in regional inequality, as in the case of per capita state domestic product [Singh et al 2003; Ghosh 2008]. In order to find the research gap, I would like to mention the most important studies so far conducted in India on multidimensional poverty in a systematic way as follows:

- Mehta and Shah [2003] have identified the poverty at the district level using multidimensional indicators that reflect deprivations such as illiteracy, infant mortality, low level of agricultural productivity and poor infrastructure. Their study have identified 50-60 districts are mostly deprived and these are mainly belong to Orissa, Bihar, MP, UP. The major limitations of this study are related to the constructions of the deprivation indices and determination of cut-off level of deprivation which are assumed to be arbitrary.
- Roy and Haldar [2010] have examined the inequality of income, poverty and socio-economic variables manifesting human deprivation across 16 major states in India at different points of time; they observe a positive trend of inequality in income and poverty (both monetary and non-monetary viz human poverty index (HPI)) at three time points (viz. 1981, 1991 and 2001) but could not explore its underlying factors. This study gives a macro-picture of major Indian states but it cannot be used for policy intervention.
- Using NFHS (1, 2 and 3), Chaudhuri et al [2013] have estimated multidimensional poverty index (MPI) following the methodology of Alkire and Foster [2009] across the states in India with rural urban break up; they have observed wide range of regional variations of MPI. The study could not explore the determinants of state level variations of MPI; moreover, what is happening within states cannot be assessed from this study.
- An interesting study based on NFHS-2 and NFHS-3 data is done by Alkire and Seth [2013]; they estimate MPI across states, caste with rural urban break up over two time points; they notice a sharp decline of MPI and standard of living deprivation parameters like electricity, housing condition, safe drinking water, improved sanitation etc., however they strongly argue that the reduction of MPI is not uniform across the states and it is less pro-poor. This study is helpful for policy intervention based on social caste level, but not at the other disaggregation level like districts in each state.
- Mishra and Ray [2013] have estimated the change in MPI at the regional level and socio-ethnic groups using NSS and NFHS data over two time points (1992/93 and 2004/05). The important features of their study are to consider both monetary and non-monetary measures of human deprivation. The use of

decomposable deprivation measures allows the identification of regions, socio economic groups and deprivation dimensions that are contributing more than others to total deprivation.

- Using unit level data of Indian Human Development Survey (IHDS-II), Dehury and Mohanty [2015] have studied MPI across the states in India and have found that 43% of India's populations are multidimensional poor with large regional variations; the average intensity of poverty was 45.5% with MPI value of 19.3. Six states in India—Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha and West Bengal who have a share of 45% of the total population account for 58% of the multidimensional poor.

- Alkire, Oldigs and Kanagaratnam [2018] have used NFHS-3 and NFHS-4 data to estimate MPI across states (as well as districts) and social groups and find a remarkable reduction of MPI over the decade; they observe that the reduction of MPI is hardly correlated with the state level growth in GDP. This study helps the development planners to identify the most backward states (in respect of MPI) and socio-ethnic groups but the study could not estimate the contribution of different dimensions of MPI at the district level.

- Tripathi and Yenneti [2019] have estimated multidimensional poverty considering the National Sample Survey data of 2004-05 and 2011-12; they notice 23.8 unit reductions in MPI between the two time points, additionally they conclude a sharp reduction in multidimensional poverty in rural areas than urban. They find that lack of educational attainment is the main reason behind the multidimensional poverty. The major limitations of this study are due to the lack of policy issues at the sub-national and sub-state level.

- Recently, Mothkoor and Badgaiyan [2021] have carried out an interesting study on MPI based on NSSO data of two rounds (2014-15 and 2016-17) . They observe that the multidimensional headcount has declined at 13.75 over the period; the study reveals that 20 states witness less than 10% of multidimensional poverty whereas the rest 90% of poverty originates from 6 states. They also find that the reduction of multidimensional poverty is higher in rural areas compared to urban. This result is not fully consistent with the study already undertaken by Alkire et al [2018]. The underlying reason may be due to differences of data

sources of the two studies. Mothkoor et al [2021] have included income or consumption expenditure to capture the standard of living dimension, this violated the basic principle of MPI developed by Alkire et al [2008, 2009] and UNDP [2010].

- The most recent work on multidimensional poverty at sub-national level is done by Haldar, Hembram and Das [2021]. Keeping in mind the limitations of MPI like arbitrary weights in each dimensions (and the corresponding indicators), they have developed a new measure of human deprivation (MHDI) using principal component method (PCA) and compared it with HPI (of Anand and Sen, 1997) and MPI (as suggested by Alkire et al 2008, 2009). They find that the weighted MHDI is consistent with the HPI and MPI. Their findings suggest that most of the states in India have been experiencing a decline of the incidence of MHDI but club convergence clearly proves that five major states like Rajasthan, MP, Bihar, UP and Odisha are found consistently to be stable in the higher group of MHDI. This study has identified the chronic trap of multidimensional deprivation and it does carry some importance from the policy issues at the sub-national level. However, nothing is mentioned about the sub-state level, socio-ethnic and religious groups. This is criticized because their MHDI is not sub-group decomposable, as a result, we cannot estimate the contribution of dimensions in multidimensional poverty.

1.7.1 Research Gap and My Contribution

A comprehensive study on multidimensional poverty focusing policy perspectives at the disaggregate level is missing from the survey of recent literature. My research is primarily motivated by Alkire et al [2013; 2018] work. Their study measure the incidence and contribution of different dimensions of MPI at the state with a rural urban and socio-religious groups using NFHS-4 data but could not estimate the contributions of different dimensions and the corresponding indicators of multidimensional poverty at the district level, though they have estimated MPI at the district level in 2018. Since the NFHS data do not provide us the income of the household, which is assumed to be important limitations of MPI as pointed out by Ravallion [2010], I have used primary data at the household level (in West Bengal) to study the impact of income on multidimensional deprivation score. This is because poverty is caused by consumption

shortfall in basic needs. However, I follow the same methodology of measuring MPI used by UNDP [2010] which is purely non-monetary measure of human deprivation in basic capabilities.

My study on multidimensional poverty is disaggregated in nature- state level, district level and household level (in West Bengal); moreover, disaggregation is also carried out at the socio-ethnic and religious groups. I have estimated HCR, intensity, contribution of different dimensions (along with indicators) of MPI across 614 districts. This is the novelty of my research. I expect my research outcomes may help the development planners of both central and state governments to implement need based strategic policies to eradicate multidimensional poverty with a view to achieve sustainable development goals (SDG) of 2030. The additional exercise done by me in this research is to estimate the percentage of deprived population in each indicator of MPI in each district of 29 states in India. This work is extended to different socio-ethnic and religious groups in India. The special feature of my research is household level analysis of the deprivation score of multidimensional poverty in West Bengal. I must clarify why West Bengal is chosen for primary data when district specific data were available in West Bengal from NFHS-4. There are multiple reasons of choosing the primary data generated from household level survey in three distinct regions in West Bengal. The NFHS-4 data do not provide the information about the income, access to publicly provided health, educational services, road accessibility (measured in distances), market accessibility from the residence.. The second reason is that West Bengal is distinct from other Indian states in respect of geo-spatial, socio-political, demographic and agro-climatic conditions. West Bengal occupies the highest population density (903/sq. km according to 2011 Census) among the Indian states; once the state belonged to the group of richer states but over the four decades, it failed to retain its position in respect of key socio-economic development parameters (Bagchi 2004, Sarker 2006; Khasnobis 2008). West Bengal has been sharing three international borders (with Nepal, Bhutan and Bangladesh) and five national borders with the states like Sikkim, Assam, Bihar, Jharkhand and Orissa. Interestingly, all the border sharing states (except Sikkim) lag behind West Bengal in respect of human development outcomes (UNDP India 2017). West Bengal was the only state in India where a stable Left-Front Government ruled about three decades and during this regime the ‘land reform’ was implemented; there was an expansion in irrigation and technological change as well. But, West Bengal could

Table-A2: Non Income Mobility of States as per NFHS 2,3 &4

NFHS2_HCR 1989-99	NFHS3_HCR 2005-06	NFHS4_HCR 2015-16
Goa	Kerala	Kerala
Punjab	Goa	Sikkim
Kerala	Punjab	Punjab
Mizoram	Mizoram	Goa
H.P	H.P	Tamil Nadu
Sikkim	Tamil Nadu	Mizoram
Haryana	Sikkim	Haryana
Tamil Nadu	Jammu & Kasmir	A.P
Manipur	Manipur	H.P
Jammu & Kasmir	Haryana	Jammu & Kasmir
Maharashtra	Maharashtra	Karnataka
Aru.P	Gujarat	Maharashtra
Gujarat	Karnataka	Uttarakhand
Nagaland	A.P	Tripura
Karnataka	Uttarakhand	Manipur
Tripura	Nagaland	Aru.P
A.P	Tripura	Gujarat
W.B	Aru.P	Nagaland
Rajasthan	W.B	W.B
U.P	Assam	Meghalaya
Uttarakhand	Meghalaya	Rajasthan
Assam	Odisha	Odisha
Meghalaya	Rajasthan	Assam
Chhattisgarh	U.P	Chhattisgarh
M.P	Jharkhand	M.P
Odisha	M.P	U.P
Bihar	Chhattisgarh	Jharkhand
Jharkhand	Bihar	Bihar

Source: Estimated by the author

Low MPI_ Head Count Ratiio → *High MPI_Head Count Ratiio*

Table-A3: Income Mobility of States

Poverty_HCR 1999	Poverty_HCR 2005	Poverty_HCR 2015
Jammu & Kasmir	Nagaland	Goa
Goa	Jammu & Kasmir	Kerala
Punjab	Mizoram	Sikkim
H.P	Meghalaya	Tamil Nadu
Haryana	Kerala	Jammu & Kasmir
Kerala	Punjab	Haryana
Gujarat	H.P	Meghalaya
Rajasthan	Haryana	Uttarakhand
A.P	Goa	Punjab
Mizoram	Tamil Nadu	H.P
Karnataka	A.P	Rajasthan
Tamil Nadu	Aru.P	Tripura
Maharashtra	Sikkim	Maharashtra
W.B	Gujarat	A.P
Manipur	Uttarakhand	W.B
U.P	Karnataka	Bihar
Uttarakhand	W.B	Gujarat
Nagaland	Rajasthan	Nagaland
Aru.P	Assam	Karnataka
Meghalaya	Manipur	Mizoram
Tripura	Maharashtra	Aru.P
Assam	Tripura	U.P
Sikkim	U.P	Assam
Chhattisgarh	Jharkhand	M.P
M.P	M.P	Manipur
Bihar	Chhattisgarh	Odisha
Jharkhand	Bihar	Chhattisgarh
Odisha	Odisha	Jharkhand

Source: Estimated by the author

Low Poverty_ Head Count Ratiio → *High Poverty_ Head Count Ratiio*

Table-A4: Over time Relative progress asper NFHS 2,3 & 4

State-wise Growth Over-time		
NFHS2	**NFHS3**	**NFHS4**
Goa	Kerala	Kerala
Punjab	Goa	Sikkim
Kerala	Punjab	Punjab
Mizoram	Mizoram	Goa
H.P	H.P	Tamil Nadu
Sikkim	Tamil Nadu	Mizoram
Haryana	Sikkim	Haryana
Tamil Nadu	Manipur	A.P
Manipur	Jammu & Kasmir	H.P
Jammu & Kasmir	Haryana	Jammu & Kasmir
Maharashtra	Maharashtra	Karnataka
Aru.P	Gujarat	Maharashtra
Gujarat	Karnataka	Uttarakhand
Nagaland	A.P	Tripura
Karnataka	Uttarakhand	Manipur
Tripura	Nagaland	Aru.P
A.P	Tripura	Gujarat
W.B	Aru.P	Nagaland
Rajasthan	W.B	W.B
U.P	Assam	Meghalaya
Uttarakhand	Meghalaya	Rajasthan
Assam	Rajasthan	Odisha
Meghalaya	Odisha	Assam
Chhattisgarh	U.P	Chhattisgarh
M.P	Jharkhand	M.P
Odisha	M.P	U.P
Bihar	Chhattisgarh	Jharkhand
Jharkhand	Bihar	Bihar

Source: Estimated by the author

Low MPI_ Head Count Ratiio → ***High MPI_Head Count Ratiio***

No Red Colour States as per NFHS 4

poverty, a brief review of literature to focus on my research and to explore research gaps, major research questions, data and methodology. Chapter-2 does contain two parts- the first part deals with national level performance in the context of poverty reduction both monetary and non-monetary with rural urban break up. The first part also deals with the issues of rank correlation between money-metric and non-monetary measure of poverty. The 2nd part deals with the issues of monetary and non-monetary measure of poverty at the sub-national level. The chapter highlights the depth, severity and contribution of dimensions (along with indicators) of multidimensional poverty. The state level performance in reducing the multidimensional poverty and income poverty over time is studied in this chapter. The determinants of MPI are studied at the state level using both static and dynamic pane data framework in this chapter. The inequality of poverty (both monetary and non-monetary) is also carried out in this chapter. The third chapter deals with district level analysis of MPI. Which districts are worse-off in respect of dimensions (as well as indicators) are mentioned in this chapter. In this chapter, I propose an allocation rule of development grants among the poorer districts if the development grant is provided by the central government. The fourth chapter discusses the incidence, depth and severity of multidimensional poverty among different socio-ethnic and religious groups. This chapter also highlights the sources of inequality of deprivation score of multidimensional poverty. Chapter-5 is developed to understand the underlying reasons of the variations of the deprivation score at the household level in West Bengal. Overall conclusion and policy options are mentioned in chapter-6.

Notes:

[1] According to Rowntree [1901], poverty measure is based on lack of physical efficiency which is due to lack of biological requirement. If a family fails to earn a minimum level of income required to maintain physical efficiency is said to be poor. The income earning of an individual is assumed to be random over his/her life cycle.

[2] The relative poverty is based on comparison of an individual to other individuals in a society in respect of standard of living. This means that a person can be poor in the relative sense but may not be poor in absolute sense. The question does emerge in respect of standard of comparison. Fuchs [1967] has defined relative poverty considering median income as standard. According to Fuchs [1967] a household is said to be relatively poor if a household earns money income less than ½ of the median household income. This means Fuchs has considered positional average as standard. Relative poverty is subjective that incorporates some sense of deprivation as pointed out by Townsend [1974].

[3] The biological approach to poverty is criticized on many grounds. The calorie intake of an individual does vary in respect of age, race, occupation, type of work, gender, space, food composition and genetic factors [Sukhatme 1979, 1981]. Therefore, the minimum calorie norm is vague which can either be obtained by taking only carbohydrate or protein or fat; the concept of balanced diet is missing in minimum calorie requirement of defining poverty.

[4] Capability means an individual's freedom to enjoy functioning. It expands choices but there are three choices which are assumed to be fundamental for daily life. Good health with knowledge endowment and possessing a minimum income are essential requirements of basic needs or basic capability [Sen 1992]. If these three choices are not met, the individual cannot enjoy other options of choices. According to Senian concept, choices must be interlinked with the freedom- political, social, economic, transparency guarantees along with reproductive securities and freedom [Sen 1992, 1997, 1999; Alkire 2002].

[5] The poverty line income is defined as the cut-off or threshold level of income that is needed to maintain a subsistence level of income. A person is defined as poor if he/she fails to earn that level of money income. This is equivalent to expenditure method; sometimes it is defined as the consumption poverty- if a person fails to earn the critical level of income that is required to ensure minimum calorie. The monetary value of calorie requirement is the poverty line consumption or expenditure [Dandekar et al 1971; Bardhan 1974, Sen 1976; Deaton 1994]

[6] The capability poverty measure (CPM) is purely multidimensional human deprivation-it includes health, education and standard of living deprivation. It is comprehensive measure of human poverty and it is well grounded by the capability shortfalls. Moreover, inclusion of

female illiteracy rate adds a new dimension of CPM. The earlier poverty measure is assumed to be gender insensitive. One can easily estimate the CPM across different geographical areas and thereby appropriate policy can be adopted to tackle the mass human deprivation [UNDP 1996]

[7] One should be careful in formulating any development or deprivation index. Simultaneous inclusion of any outcome and input variable can lead to misleading results. For example, births attended by untrained health professions may lead to higher maternal or infant mortality. Therefore, we should not consider IMR along with non-institutional delivery. Similarly, immunization of children reduces the child mortality, therefore, either we should consider the outcome (attainment) or input (viz. process) variables while creatinfg an index [Kamdar and Basak 2005; Hembram et al 2020]

[8] Following UNDP (1997) and Anand and Sen(1997), we can prove that the P(α) is not sub-group decomposable. This is illustrated as follows.

Let there be *j*=1, 2, 3 …m number of population sub-groups. Assume *n* be the total population of the economy as a whole, therefore, we can write, $\sum_{j}^{m} n_j = n$ .Assume that the groups are mutually exclusive and exhaustive. We assume that P_{1j}, P_{2j} and P_{3j} are the parameters of the *j*-th group. Now, we examine the relationship between aggregate P(α) and all Pj (α) [$\forall j = 1,2..m$].

$$P_{1Aggregate} = \sum_{j=1}^{m} \frac{n_j}{n} P_{1j} \rightarrow \frac{w_1}{\sum_i w_i} (P_1)^{\alpha}_{Aggregate} = \frac{w_1}{\sum_i w_i} \left[\sum_j \frac{n_j}{n} P_{1j} \right]^{\alpha}$$

$$P_{2Aggregate} = \sum_{j=1}^{m} \frac{n_j}{n} P_{2j} \rightarrow \frac{w_1}{\sum_i w_i} (P_2)^{\alpha}_{Aggregate} = \frac{w_1}{\sum_i w_i} \left[\sum_j \frac{n_j}{n} P_{2j} \right]^{\alpha}$$

$$P_{3Aggregate} = \sum_{j=1}^{m} \frac{n_j}{n} P_{3j} \rightarrow \frac{w_1}{\sum_i w_i} (P_3)^{\alpha}_{Aggregate} = \frac{w_1}{\sum_i w_i} \left[\sum_j \frac{n_j}{n} P_{3j} \right]^{\alpha}$$

Now, for each j=1, 2, 3, …m, we know:

$$\frac{n_j}{n} P_j(\alpha) = \left[\frac{w_1}{\sum_i w_i} \left(\frac{n_j}{n} P_{1j} \right)^{\alpha} + \frac{w_2}{\sum_i w_i} \left(\frac{n_j}{n} P_{2j} \right)^{\alpha} + \frac{w_3}{\sum_i w_i} \left(\frac{n_j}{n} P_{3j} \right)^{\alpha} \right]$$, Now, we apply the standard Murkowski's inequality condition:

$$\sum \left[\frac{w_1}{\sum_i w_i} \left(\frac{n_j}{n} P_{1j} \right)^{\alpha} + \frac{w_2}{\sum_i w_i} \left(\frac{n_j}{n} P_{2j} \right)^{\alpha} + \frac{w_3}{\sum_i w_i} \left(\frac{n_j}{n} P_{3j} \right)^{\alpha} \right]^{1/\alpha} \geq$$

$$\left[\frac{w_1}{\sum_i w_i} \left(\sum \frac{n_j}{n} P_{1j} \right)^{\alpha} + \frac{w_2}{\sum_i w_i} \left(\sum \frac{n_j}{n} P_{2j} \right)^{\alpha} + \frac{w_3}{\sum_i w_i} \left(\sum \frac{n_j}{n} P_{3j} \right)^{\alpha} \right]^{1/\alpha}$$

$$\sum \left[\frac{w_1}{\sum_i w_i} \left(\frac{n_j}{n} P_{1j} \right)^{\alpha} + \frac{w_2}{\sum_i w_i} \left(\frac{n_j}{n} P_{2j} \right)^{\alpha} + \frac{w_3}{\sum_i w_i} \left(\frac{n_j}{n} P_{3j} \right)^{\alpha} \right]^{1/\alpha} \geq \left[\frac{w_1}{\sum_i w_i} \left(P_{1A} \right)^{\alpha} + \frac{w_2}{\sum_i w_i} \left(P_{2A} \right)^{\alpha} + \frac{w_3}{\sum_i w_i} \left(P_{3Aj} \right)^{\alpha} \right]^{1/\alpha} \text{H}$$

ere, A=Aggregate. Therefore, we can write:

$$\sum \left[\frac{w_1}{\sum_i w_i} \left(\frac{n_j}{n} P_{1j} \right)^{\alpha} + \frac{w_2}{\sum_i w_i} \left(\frac{n_j}{n} P_{2j} \right)^{\alpha} + \frac{w_3}{\sum_i w_i} \left(\frac{n_j}{n} P_{3j} \right)^{\alpha} \right]^{1/\alpha} \geq P(\alpha)$$

This proves that HPI is not sub-group decomposable, $\sum_j \frac{n_j}{n} . P_j(\alpha) \neq P(\alpha)$

CHAPTER-2

Multidimensional Poverty in India: A Sub-national Analysis

Multidimensional Poverty in India: A Sub-National Analysis

2.1 Introduction:

One of the major objectives of our national planning is to ensure inclusive growth. The term inclusive growth has many dimensions; however one of the important features of inclusive growth is to reduce inequality among the states because regional imbalance creates social tension, political instability and hinders equity and social justice. Numerous studies have highlighted the regional inequality especially at the sub-national level in respect of income, money-metric poverty and social development; majority of the studies support the evidence of rising inequality especially after initiation of structural adjustment programme [Jha 2000; Deaton and Dreze 2002; Singh et al 2004; Pal and Ghosh 2007; Roy and Haldar 2008; Saikia 2012; Bhattacharya et al 2015; Banerjee and Kuri 2015; Chauhan et al 2016] but very few have attempted to analyze the dynamics of multidimensional poverty across the states in India.

I am trying to mention some important similar types of studies already undertaken in Indian backdrop at the sub-national level before to highlight my contribution in this chapter. An interesting study based on NSSO data (2004-05 and 2009-10) is done by Bhattacharya et al [2015] across 28 states (and 87 regions) and 7 Union Territories of India to explore India's cross-regional and cross-state variations of money-metric poverty and income inequality but their study could not deal with multidimensional poverty; however, their findings clearly show wide range of regional imbalance in respect of income-poverty. A similar study is undertaken by Chauhan et al [2016] but they have considered 81 regions and observed a marginal decline of money-metric poverty during 1993-2012 but a rising trend of the inequality of poverty measured by Gini coefficient; Gini of poverty has increased from 0.38 in 1993 to 0.68 in 2012.

Roy and Haldar (2010) examine the inequality of income, poverty and human deprivations of sixteen major states of India for 7 time points from 1973 to 2004-05. They have observed a positive trend in inequality overtime but there is a sharp increase in inequality after 1994-95; the inequality of human deprivation (as captured by human poverty index (HPI)) is found rising over time. They have noticed that Kerala has been consistently ranked in the top (in reducing HPI) the states over time, whereas Bihar has

been performing very badly in respect of HPI. Radhakrishna and Mishra (2020) have found more or less the same results of the study done by Roy et al (2008); they observe a rising trend of inequality in wellbeing, income and nutritional attainment across the states; they have ranked the states in respect of multiple deprivation. Alkire and Seth (2013) have estimated the MPI based on NFHS-2 and 3 and they have calculated the change in multidimensional poverty across the states, social categories as well as geographical subgroups (like rural and urban) and they notice a sharp decline in multidimensional poverty. They observe an improvement of the standard of living parameters like electricity, housing condition, safe drinking water and sanitation. Moreover, they find that poorer subgroups have a slower progress. A state level regional variation (with rural urban break up) of multidimensional study is studied by Chaudhuri et al (2015) using three rounds of NFHS (1,2 and 3) data; they conclude that contrary to the results of income poverty that shows a systematic decrease of poverty in all states in India, the MPI calculations shows an increase in few states like Arunachal Pradesh, Tripura and Manipur by 4.7%, 5% and 0.7 % respectively during 1992-93 and 2005-06. Dehury and Mohanty (2015) have estimated multidimensional poverty in 82 geographically different regions based on IHDS (2011-12) data. They include the direct economic variable like consumption expenditure, work and employment to capture the living standard dimensions and conclude that 43% of Indian population is multidimensionally deprived; whereas the major states like Bihar, Chhattisgarh, Orissa, M.P, and W.B are occupying 58% of poor population. The study done by Dehury et al (2015) is criticized because it is not purely non-monetary measure of poverty; the MPI gets biased to monetary measure of poverty if we consider consumption or employment in multidimensional poverty. Alkire, Oldigs and Kanagaratnam (2018) have carried out an interesting study on MPI using NFHS-3 and 4; their study is disaggregate in nature-that covers across states, among socio-ethnic groups, different age cohort and rural-urban break up. This paper finds a strong reduction of multidimensional poverty between two decades. They argue that the reduction of MPI is hardly correlated with the state level growth of GDP. But the significant achievement is that 271 million fewer persons are living in the multidimensional poverty.

Tripathi and Yenneti (2019) have measured multidimensional poverty considering the NSS data of 2004-05 and 2011-12; their state level analysis show that Jharkhand, Uttar Pradesh, Rajasthan, Orissa, Bihar, Chhattisgarh, and Arunachal Pradesh, have a higher

poverty head count ratio while Kerala, Mizoram, Nagaland, Punjab, Himachal Pradesh, and Haryana have lower poverty rate. A similar study is conducted by Mothkoor and Badgaiyan (2021) using data from NSS data of 2014-15 and 2016-17; they observe that the multidimensional headcount declined at 13.75 over the period, moreover, they find that 20 states reports less than 10% of multidimensional poverty whereas the rest 90% of poverty comes mainly from the major states like UP, Jharkhand, Orissa, Bihar, Chhattishgarh, MP and Rajathan and West Bengal. Surprisingly, they find that poverty decline in rural areas are more than urban population. Haldar, Hembram and Das (2021) have recently developed a paper on multidimensional human deprivation at the state level using NFHS-1, 2, 3 and 4 data. They have criticized the Sen's HPI and Alkire's MPI on the grounds of arbitrary weights attached to each sub-dimension. They have used principal component analysis (PCA) to estimate the weights of the indicators used in their multidimensional poverty measure. They observe a rising trend of inequality of multidimensional poverty; however, all the states have been experiencing a decline of multidimensional poverty. The most important findings of their study is related to the exploration of the existence of chronic poverty trap which are found to exist among five major states like Rajasthan, MP, Bihar, UP and Odisha. This is explored by distribution dynamic approach like kernel density and Markov process of probability transition.

2.2 Research Gaps and Objectives

My study is influenced by Alkire et al (2018); however they could not estimate the (a) inequality of deprivation score of multidimensional poverty within states, (b) contribution of dimensions (and the indicators) of multidimensional poverty in each state and (c) decomposition of deprivation score of multidimensional poverty between and within states and (d) the depth and severity of deprivation score (DS) in each state. Earlier studies could not suggest which state is backward in which dimension of multidimensional poverty. In the same way, we cannot get a clear picture of any state regarding contribution of each indicator of each dimension of multidimensional poverty. Thus, my present state level study tries to address this issue in a more disaggregated way. After reviewing the literature, I think there is a need to study the multidimensional poverty in a systematic way for designing appropriate policies in each state. The recent study undertaken by Haldar et al [2021] is criticized on the grounds of sub-group decomposability of their poverty measure. Moreover, the contribution of each sub-index

cannot be estimated from their new measure of multidimensional poverty. Therefore, I have followed the same methodology as developed by Alkire et al [2008, 2009] in my poverty estimation. The objective of this chapter is to answer the following questions:

- How does India perform in reducing multidimensional poverty over time corresponding to NFHS Survey at the national level?
- Does multidimensional poverty differ significantly between geographical regions (Rural and Urban)?
- How is money-metric poverty responsive to multidimensional poverty?
- How does the rank of the states change over time in respect of both measures of poverty?
- How did the states experience the change of HCR, intensity and MPI over three time points corresponding to NFHS-2, 3 and 4?
- How do the inequalities of deprivation score of multidimensional poverty (within state) vary across states? What are the sources of inequality of deprivation score? Is it due to within states or between states?
- How does depth and severity of deprivation score (DS) of multidimensional poverty vary within each state?
- What are the factors determining the multidimensional poverty at the state level? Does past period poverty matter to the current poverty?

2.3 Data and Methods

The description about NFHS data has already mentioned in Chapter-1; however, I must give a note about the data of other variables used in my Theses. The money metric poverty is based on different rounds of NSS data. This is systematically compiled by NITI AYOG (Panning Commission), Government of India. The different rounds of NFHS were conducted by Ministry of Health and Family Welfare, GoI and it is systematically recorded by the IIPS Mumbai. The money-metric poverty is indirectly estimated for 3 time points (viz. 1998-99, 2005-06 and 2015-16) corresponding to NFHS (1-4). The data on per capita health and education expenditure, different infrastructure are drawn from RBI website.

In order to understand a visual inspection of the dispersions of poverty, I have used Radar diagram and for drawing the Maps, I have used GeoDa software. I have used the following Gini coefficient for measuring the inequality:

$$Gini = \frac{2}{\overline{X}} Cov(X, F(X)) \tag{2.1}$$

The covariance (Cov) between poverty levels X and the cumulative distribution of the same poverty F(X) and $\overline{X}$ is average poverty. Since Gini is not perfectly decomposable, I have used generalized entropy (GE) for decomposition of deprivation score of multidimensional poverty within states and rural and urban areas: The GE measure of inequality is shown by equation 2.2:

$$GE(\alpha) = \frac{1}{n(\alpha^2 - \alpha)} \sum \left[\left(\frac{X_i}{\overline{X}} \right)^{\alpha} - 1 \right] \tag{2.2}$$

Here, α is the sensitivity parameter capturing different parts of any distribution. If α=0, it is more sensitive to the lower-tail of the distribution. The Theil Index corresponds to GE(0), which is known as Mean Log Deviation. One cannot directly derive Theil Index just inserting the value of α=0 in equation 2.2; the limiting value of GE(0) can be estimated by applying L Hospital's rule [Cowell 2009]. The Theil Index is shown by equation 2.3:

$$GE(\alpha)\big|_{\alpha=0} = -\frac{\sum \ln\left(\frac{X_i}{\overline{X}} \right)}{n} = \frac{\sum \ln\left(\frac{\overline{X}}{X_i} \right)}{n}. \tag{2.3}$$

Now, in order to find out the sources of inequality, we decompose the GE(α) measures as follows:

$$GE(\alpha) = \frac{1}{n(\alpha^2 - \alpha)} \sum_{j=1}^{k} \sum_{i=1}^{n_j} \frac{DS_{ij}}{\overline{DS}} \left[\left(\frac{DS_{ij}}{\overline{DS}} \right)^{\alpha} - 1 \right] = GE(\alpha)_W + GE(\alpha)_B \tag{2.4}$$

where, k be the number of states (groups), n_j be the number of population in the j-th state (group), given that $\sum_{j=1}^{k} n_j = n$; $GE(\alpha)_W$ and $GE(\alpha)_B$ are within and between inequality of

deprivation score (DS) respectively. The $GE(\alpha)_W$ and $GE(\alpha)_B$ are defined as follows where $\overline{DS_j}$ be the mean of DS of *j*-th group.

$$GE(\alpha)_W = \sum_{j=1}^{k} \frac{n_j.\overline{DS}_j}{n.\overline{DS}} \left(\frac{\overline{DS}_j}{\overline{DS}} \right)^{\alpha} .GE(\alpha)_{Wj} \quad \text{and}$$

$$GE(\alpha)_B = \frac{1}{(\alpha^2 - \alpha)} \sum_{j=1}^{k} \frac{n_j.\overline{DS}_j}{n.\overline{DS}} \left[\left(\frac{\overline{DS}_j}{\overline{DS}} \right)^{\alpha} - 1 \right]$$

I have considered 28 states (groups) in my study for NFHS-3 and NFHS-4. Now, the most important feature of my study is to apply the Foster-Greer –Thorbecke (FGT) Index with a view to explore the depth and severity of deprivation score (DS) of multidimensional poverty. This is illustrated as follows:

Foster- Greer and Thorbecke (1984) have developed an Index which is considered as a generalized measure of poverty because it captures incidence, depth and severity of poverty for various values of sensitivity parameter (α).

The FGT Index is defined as:

$$FGT(x; x^*, \alpha) = \frac{\sum_{x_i < x^*} (x_i - x^*)^{\alpha}}{n(x^*)^{\alpha}} \qquad (2.5),$$

x_i be the DS of the *i*-th poor (household), x^* is defined earlier (in chapter-1) as cut-off value (viz. 33.33) which is exogenously given, α stands for sensitivity parameter defining the FGT Index. In our case, if we insert, α=0, we can get the "incidence" of poverty, thus, $FGT(0) = HCR = \frac{n^*}{n}$ (2.6)

if α=1, we obtain the second measure of poverty, viz., the poverty gap index (**PGI**) which indicates the "depth" of poverty:

$$FGT(1) = PGI = \frac{n^* (\bar{x}_p - x^*)}{nx^*} = HCR.R \qquad (2.7)$$

When α=2, we get the poverty measure that reflects the "severity" of poverty and is given by:

$$FGT(2) = HCR\left[R^2 + (1-R)^2 CVP^2\right] \quad (2.8)$$

Here CVP is the coefficient of variation of DS of the poor households. The CVP is defined as:

$$CVP = \frac{SD}{Mean} = \frac{\left[\frac{1}{n*}\sum_i (x_i - \bar{x}_p)^2\right]^{1/2}}{\bar{x}_p}, \quad \text{the square of CVP is:}$$

$$CVP^2 = \frac{\left[\frac{1}{n*}\sum_i (x_i - \bar{x}_p)^2\right]}{(\bar{x}_p)^2}$$

The measures of depth and severity of multidimensional poverty provide complementary information on the incidence of poverty. It might be the case that some groups have a high poverty incidence but low poverty gap (when numerous members are just near the poverty line (viz. DS(=33.33)), while other groups have a low poverty incidence but a high poverty gap for those who are poor (when relatively few members are below the poverty line but with extremely high levels of DS).

2.3.1 Determinants of Multidimensional Human Deprivation

In order to find out the determinants of MPI, the following econometric model is developed:

$$MPI_{it} = \beta_0 + \beta_1 MPI_{i(t-j)} + \beta_2 X_{it} + \eta_i + \mu_t + \varepsilon_{it} \quad (2.9)$$

i=1,2……N, t=1,2…..T. (T<N), variables like, X_{it} is the vector of explanatory variables that affect current MPI, η_i be the time invariant fixed effect capturing heterogeneity of state specific characters, μ_t be the time dummies; ε be white noise errors terms. We consider *N*=25 as cross-section units and t=3 (1998-1999, 2005-06 and 2015-16).

Model (2.9) has been considered as standard dynamic panel data regression model but I shall build up different models using various public infrastructure and social sector spending like education and health. How does history regarding lagged MPI matter in the

current value of MPI across states? This question can be answered by the dynamic panel data regression model.

2.4 Analysis of Multidimensional Poverty: National Level

Keeping in mind the above questions, I have tried to analyze the national level picture of multidimensional poverty before analyzing the sub-national level (state level). According to Global MPI **2020**, **India** is 62nd among 107 countries with an MPI score of 0.123 and 27.91% headcount ratio, based on the NFHS- 4 (2015/16) data [OPHI 2020]. I have estimated the HCR, intensity, MPI, depth and severity of multidimensional poverty as shown in Table-2.1. My estimation of HCR is slightly higher than that of OPHI; however, the MPI is found to be more or less same. The two additional features of multidimensional poverty is estimated by me using FGT Index as outlined earlier. These are depth and severity.

Table-2.1: HCR, Intensity, MPI, Depth and Severity of Multidimensional Poverty in India

	NFHS:2((1998-99)	**NFHS:3((2005-06)**	**NFHS:4((2015-16)**
HCR	0.568	0.461	0.291
Intensity of Poverty	52.9	51.35	44.48
MPI	**30.02**	**23.68**	**12.94**
Depth (FGT, α = 1)	0.339	0.2532	0.1674
Severity (FGT, α = 2)	0.321	0.2520	0.1483

Source: Author's calculation

The HCR and MPI of multidimensional poverty have reduced significantly during 10 years (between NFHS-3 and NFHS-4) at the national level but it is not concomitant with the reduction of intensity, depth and severity. In order to get a clearer picture, I have estimated indicator specific contribution in MPI. This clearly gives an idea where should we need to improve.

Table: 2.2 Indicator specific contributions to the Multidimensional Poverty overtime

Indicators	NFHS-2	NFHS-3	NFHS-4
Electricity	6.1%	4.2%	2.1%
Drinking Water	3.3%	2.4%	1.6%
Sanitation	10.1%	7.9%	7.7%
Cooking Fuel	10.0%	8.8%	8.5%
Floor	8.3%	6.8%	6.3%
Asset	7.9%	3.7%	3.1%
Malnutrition	19.7%	38.6%	50%
Child Mortality	12.5%	2.4%	1.7%
6yrs of Schooling	11.7%	15.9%	15.3%
School Attendance	10.6%	9.3%	3.7%

Source: Author's calculation

The percentage contribution in each indicator differs because of the differential weights attached in measuring multidimensional poverty; the standard of living dimension consists of six indicators, therefore, their weights are low compared to health and education dimension (each consists of two indicators). We have witnessed some improvements during 2005-06(NFHS-3) to 2015-16(NFHS-4) in standard of living dimension; the corresponding indicators are electricity and drinking water. The contributions of other indicators under standard of living dimension are found to be more or less same as compared to NFHS-3. Under health dimension, the contribution of child mortality is reduced over the decades but a dismal and bleak picture is come out in respect of malnutrition; it shares 50 percent of total weights in NFHS-4. Therefore, we need to improve a lot in malnutrition. The percentage contribution of school attendance is reduced significantly but in other parameter (under education dimension) like six years of schooling remains unaltered during the decade.

The percentage change of deprivation in each indicator over time (NFHS-2 to NFHS-4) is estimated as shown in Table-2.3. The maximum and minimum improvement is noticed in asset indicator (under standard of living dimension) and six years of schooling (under education dimension) respectively during 2005-6 to 2015-16; however, we notice some improvement in all the indicators.

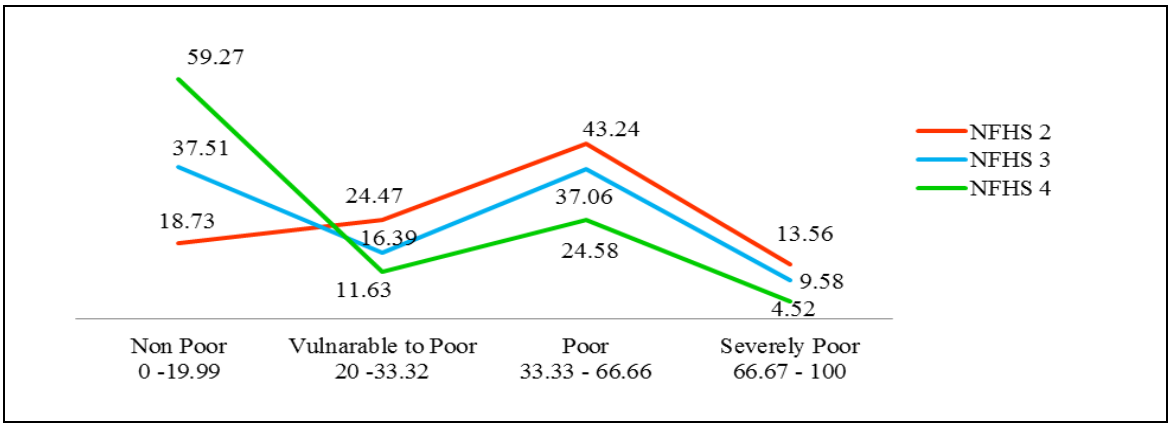
Table 2.3: Change in Deprivation overall Households over time in Ten Indicators

Indicators	NFHS- 2 (1998-99)	Absolute change between NFHS 2 & 3	NFHS- 3 (2005-06)	Absolute change between NFHS 3&4	NFHS- 4 (2015-16)
Electricity	39.2	-6.4	32.8	-20.8	11.94
Drinking Water	23.2	-7.4	15.8	-3.1	12.72
Sanitation	81.1	-11.6	69.5	-19.0	50.47
Cooking Fuel	76.3	-2.5	73.8	-13.7	60.11
Floor	59.5	-11.9	47.6	-5.7	41.92
Asset	55.3	-6.6	48.7	-26.6	22.12
Malnutrition	40.8	-4.0	36.8	-10.6	26.19
Child Mortality	25.4	-4.8	20.6	-15.9	4.73
6yrs of Schooling	22.9	-4.6	18.3	-0.5	17.82
School Attendance	21.8	-6.0	15.8	-11.9	3.91

Source: Author's calculation

If we can identify the population groups based on the deprivation scores that would be more helpful for eradication of poverty. I analyze the household level data of NFHS-2, 3 and based on the deprivation score of multidimensional poverty and split the households into four categories- Non-Poor, Vulnerable to Poor, Poor and Severely Poor. This helps us to understand the dynamics of poverty (DS) over time as shown in Fig.2.1.

Figure 2.1: percentage Population Share in respect of Deprivation Score



Source: Author's estimation

The severely poor populations need more attention for policy intervention. We need to identify the deprivation pattern of the poor households. Which indicator do they need more attention? If we identify the indicator specific deprivation, that will help to eradicate the multi-dimensional poverty from the grassroots.

In table 4, we capture the percentage of multidimensional poor households, are deprived in each indicator. In that case for large number of multidimensional poor population are deprived in standard of living indicators, like cooking fuel, sanitation, floor material and malnutrition (under health dimension).

Table 2.4: The Indicator Specific Poverty Scenario of Poor Households

	Deprivation of Multi-Dimensionally Poor Households		
Indicators	**NFHS2**	**NFHS3**	**NFHS4**
Electricity	57.8%	53.4%	20.3%
Drinking Water	31.0%	25.8%	14.5%
Sanitation	96.0%	84.7%	65.8%
Cooking Fuel	95.4%	92.2%	75.7%
Floor	78.6%	75.1%	57.3%
Asset	74.9%	72.7%	33.9%
Malnutrition	62.4%	69.3%	65.9%
Child Mortality	39.6%	12.6%	4.5%
6yrs of Schooling	37.2%	35.7%	22.1%
School Attendance	33.5%	35.9%	8.4%

Source: Authors' calculation

I disaggregate the national level multidimensional poverty between rural and urban areas. The HCR, intensity, MPI, depth and severity of deprivation score are estimated using NFHS-2, 3 and 4 and the results are given in Table-2.5. It is observed that poverty HCR is found to be higher in rural compared to urban in all the three time points but the rate of decline of rural poverty is higher than that of urban. The intensity of multidimensional poverty is found to be declining in urban whereas it is found to be more or less stable in rural. The MPI in urban is quite low (8.96 in 2015-16) whereas it is 2.6 times higher in ruralareas, though rural poverty has declined significantly but still it is high. Health dimension contributes the maximum share of MPI in both the rural and urban areas and over time the share of health is found to be rising compared to other two dimensions. The depth and severity of deprivation score of multidimensional poverty declines gradually over time (from NFHS-2 to BFHS-4) in both rural and urban areas but still it is high in rural areas.

Table 2.5: Multidimensional Poverty in India: Rural vs. Urban

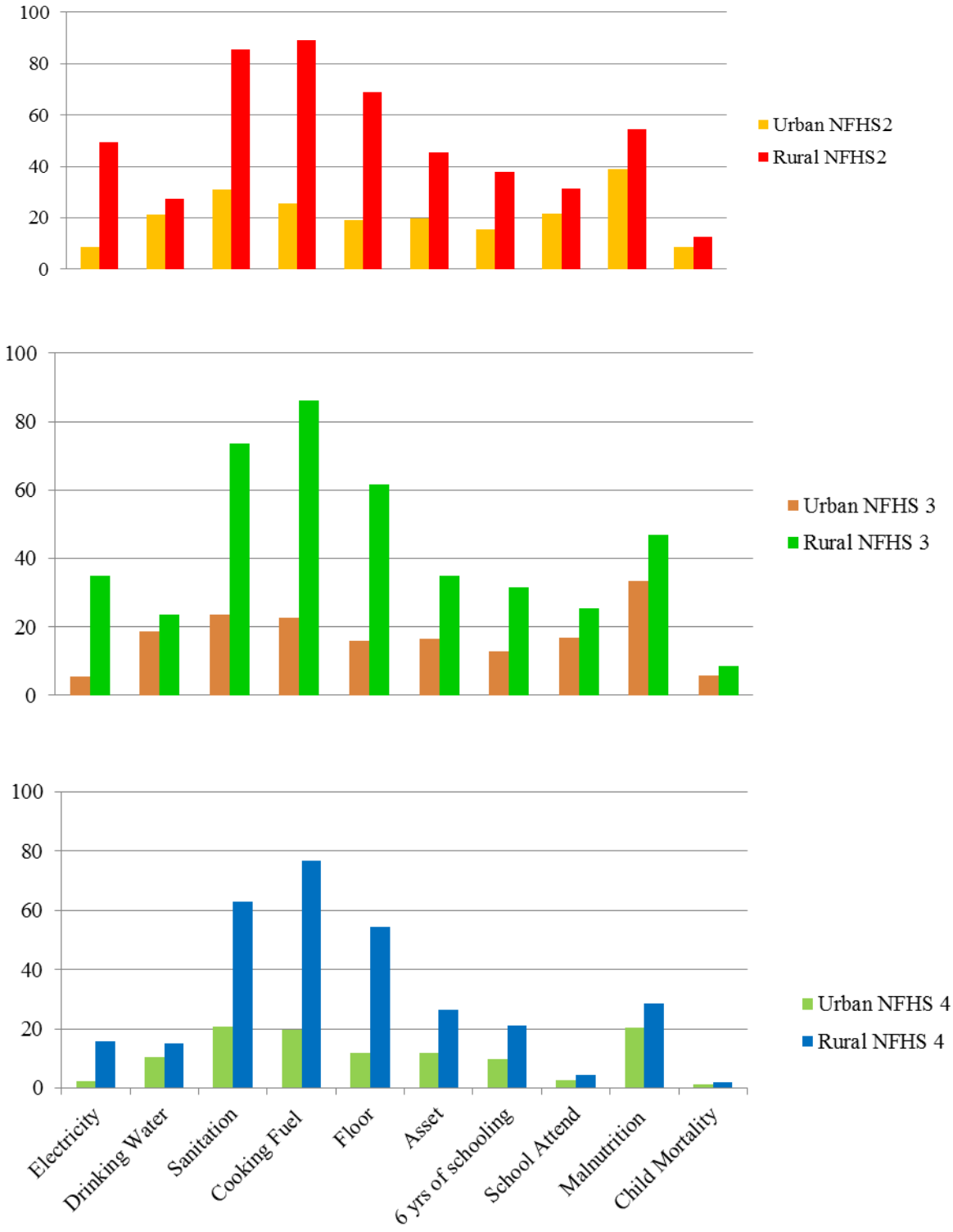
	Urban			Rural		
	NFHS2	**NFHS3**	**NFHS4**	**NFHS2**	**NFHS3**	**NFHS4**
Papulation Share	26.7	29.56	29.25	73.3	70.44	70.75
HCR	24.4	29.60	26.70	68.6	58.40	45.79
Intensity of Poverty	47.4	44.41	41.50	53.6	53.99	51.47
MPI	**11.6**	**11.03**	**8.96**	**36.8**	**31.53**	**23.57**
Education contribution	0.274	0.244	0.165	0.290	0.251	0.196
Health Contribution	0.421	0.544	0.684	0.298	0.366	0.484
Std. Contribution	0.305	0.201	0.149	0.412	0.383	0.319
Depth	0.159	0.097	0.068	0.503	0.377	0.250
Severity	0.117	0.082	0.049	0.454	0.387	0.217

Source: Author's calculation

The indicator specific deprived households are estimated using NFHS-2, 3 and 4 data between rural and urban areas. This is shown in Fig-2.2. It roughly shows that the gap between rural and urban areas in each indicator is narrowing down; however, a higher deviation is noticed in respect of standard of living indicators.

Some of the standard of living indicators like sanitation, cooking fuel, floor material; rural households are more deprived than urban. Till date, rural households do not use improved cooking fuel, like LPG or kerosene; still they use cow dung cake, wood or charcoal for cooking purposes. These products generate CO_2, CO, SO_2 which are unhealthy and creates respiratory problems among the children, women and aged persons. This is extremely harmful to new born babies and expected mothers. Therefore, health status of the rural mass can be improved by providing cooking fuel. The Government of India has initiated a time bound appropriate policy for the rural mass by providing free LPG.

Figure-2.2: Indicator Specific Deprived Households over time [NFHS 2, 3 & 4]



2.5 Analysis of Multidimensional Poverty: Sub-National Level

In order to understand the change in the ranks of the states over time in respect of MPI, I have estimated the rank correlation coefficient of MPI of the states between different

rounds of NFHS as shown in Table-2.6. The results clearly indicate that the ranks of the states do not change drastically, rather the values of the rank correlation are found to be extremely high but it is not 1. This clearly gives us some idea about the stability of the states or the relative positions of the states remain unaltered over time, however, some marginal changes are noticed over time. The most interesting point is that the rank correlation of the states in respect of money-metric and MPI is estimated over three time points corresponding to NFHS-2, 3 and 4 (as shown in Table 2.7). We observe that the rank correlation is high and statistically significant but it is not perfectly one.

Table-2.6 The Rank Correlation Coefficient of the states in respect of MPI between different Rounds of NFHS-2, 3 and 4.

	NFHS-2	**NFHS-3**	**NFHS-4**
NFHS-2	1	0.9515***	0.9162***
NFHS-3		1	0.9385***
NFHS-4			1

*Note: *** significant at 1%, ** significant at 5%. N=25; Source: Author's estimation*

Table-2.7 Rank Correlation between Money-Metric and Non Money-Metric Poverty (MPI) over different Time Points (1998-99, 2005-06 and 2015-16)

	NFHS-2(Money-Metric-HCR)	**NFHS-3(Money-Metric-HCR**	**NFHS-4(Money-Metric-HCR**
NFHS-2(MPI-HCR)	0.67***		
NFHS-3(MPI-HCR)		0.53**	
NFHS-4(MPI-HCR)			0.72***

*Note: *** significant at 1%, ** significant at 5%. N=25 (in NFHS-2), N=28 in NFHS-3 and 4. Source: Author's estimation*

The incidence, intensity, MPI, depth and severity of multidimensional poverty are found to be declining at the national level; does it ensure inclusivity? I try to understand this by estimating the Gini Coefficient of MPI of states over time. The results of Gini of MPI over time across states clearly show an upward trend that means states are diverging in reducing the MPI, the inequality in MPI is aggravating over time. Our result is consistent with earlier findings of Haldar et al [2021]. I find the values of Gini of MPI are 0.201, 0.276 and 0.350 in 1998-99 (NFHS-2), 2005-06 (NFHS-3) and 2015-16 (NFHS-4)

respectively. Following the methodology of GE(α) as outlined earlier, I decompose the GE(0) for three time points in order to understand the sources of inequality. The decomposition results clearly indicate that the major sources of inequality come from within states; this is mentioned in Table-2.8.

Table-2.8 Decomposition of Inequality of Deprivation Score (DS) measured by Theil Index (GE(0)) for Different Time Points.

NFHS-Round (Year)	Total	Within States	Between States
NFHS-2(1998-99)	0.196	0.184	0.011
NFHS-3(2005-06)	0.233	0.205	0.028
NFHS-3(2015-16)	0.262	0.236	0.026

Source: Author's estimation

I have split the MPI of each state in respect of geographical location- rural and urban to understand the progress of each state over time (1998-99 to 2015-16). I find that all the states have been witnessing a decline of MPI but the pace of decline does vary to a large extent; this is evidenced by the rising inequality of MPI over time. The relative progress towards decline of MPI (with rural urban break up) of the states over different rounds of NFHS is shown in Fig-2.3 and 2.4.

Figure 2.3: State-wise change in Rural Poverty (MPI)

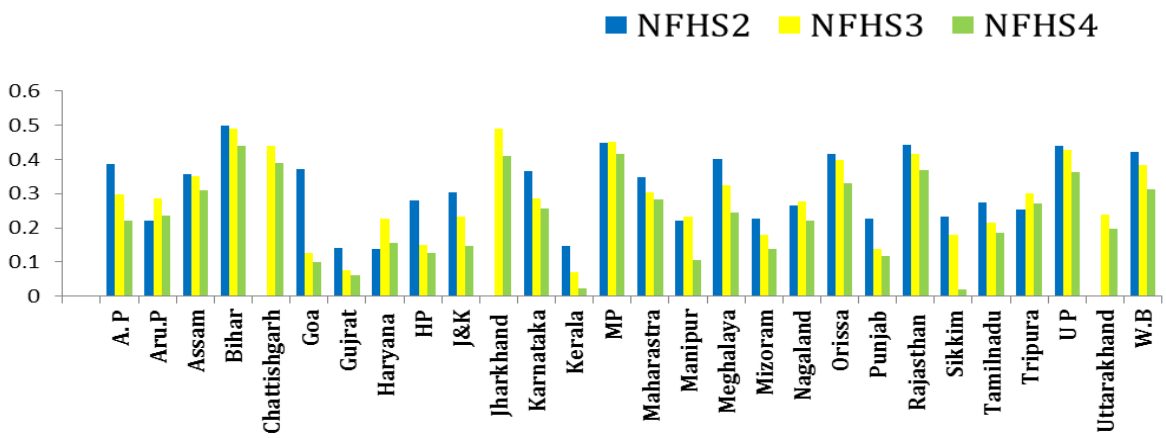
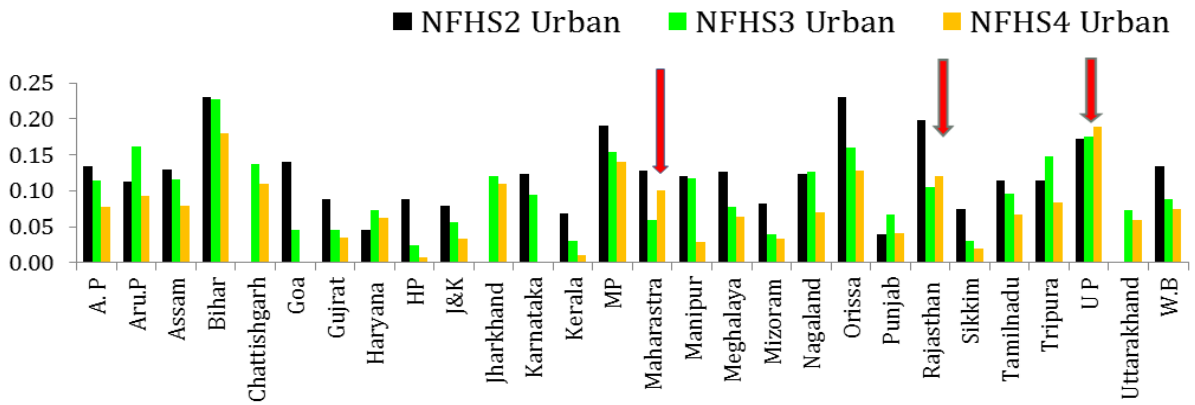


Figure 2.4: State-wise change in Urban Poverty



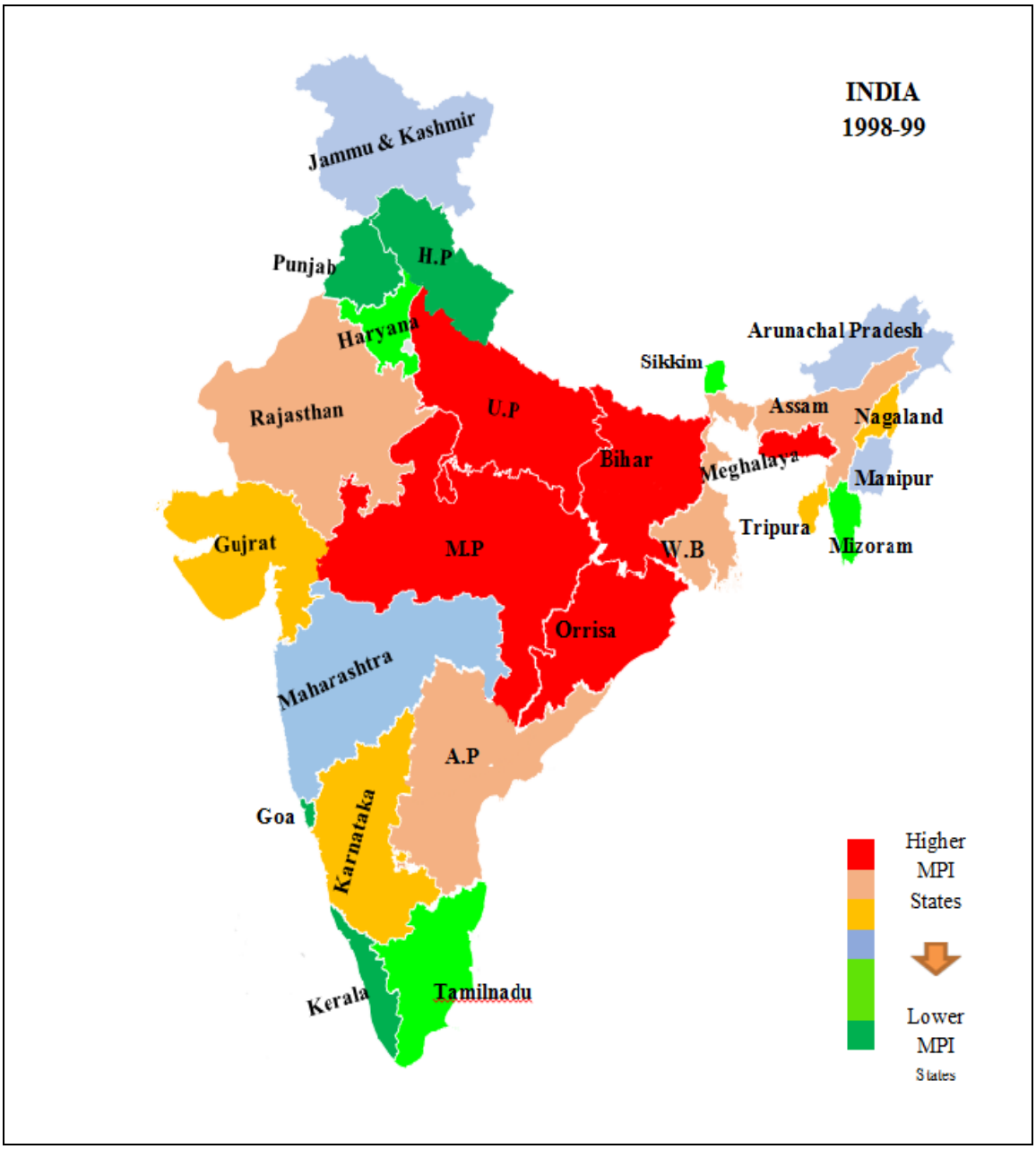
Source: Different Rounds of NFHS Data

2.5.1 Spatial Distribution of Multidimensional Poverty

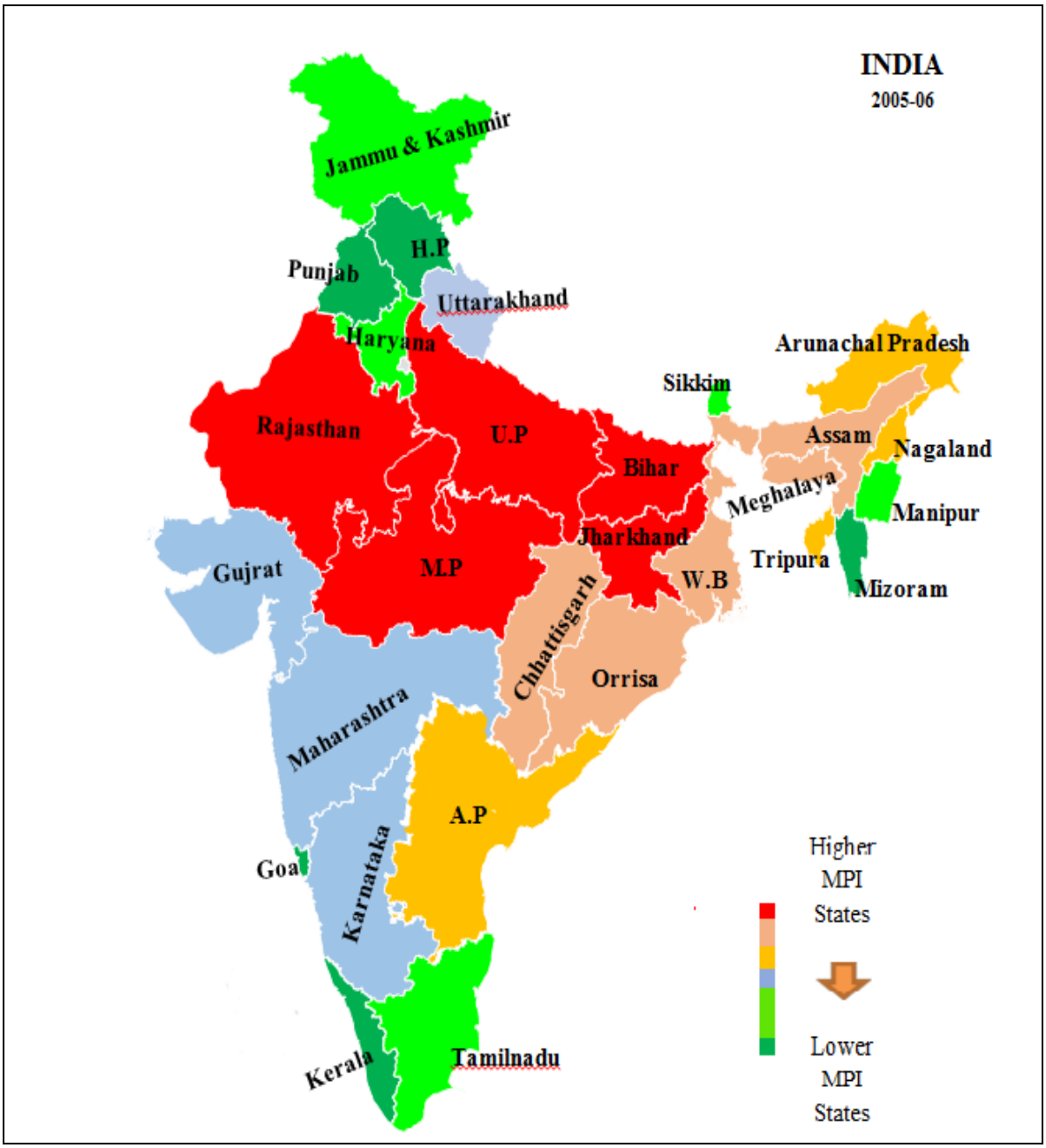
I have drawn three maps of the Indian states for a visual inspection of the extent of multidimensional poverty over different rounds of NFHS. The spatial distribution of multidimensional poverty clearly gives some indication that the space does matter towards formation of clustering of multidimensional poverty. Such spatial clustering of poverty can be explored by using spatial econometric analysis. This is beyond of my research area; however, a visual inspection gives sufficient hints that poverty is not space neutral; it is very much space dependent.

My analysis is based on 25 states for NFHS-2, 28 states for NFHS-3 and 29 states for NFHS-4. The number of nationally representative households in NFHS-2, 3 and 4 were 91196, 109041 and 601,509 respectively. I notice as per NFHS-4 data comprising 601,509 households which belong to 29 states and 7 union territories, among them 29.10% of households are multi-dimensionally poor, whereas most of the poor households belong to Bihar, Jharkhand, Chhattisgarh, UP and MP. The maps show visually how the MPI varies across regions overtime; it divides states in six categories, reddish shade indicates a higher MPI, while green indicates a lower MPI states. States like Bihar, Jharkhand, M.P, U.P and Chhattisgarh are portraying the red color for all the time points with a very high MPI values. Bihar is recognized as the poorest of the poor state. In respect of MPI ranking, Kerala, Sikkim, Goa, Punjab and Mizoram show a lower MPI and in the following Maps these are represented by green color. Very few states change their relative positions in respect of MPI over time as shown in Map-2.1, 2.2 and 2.3.

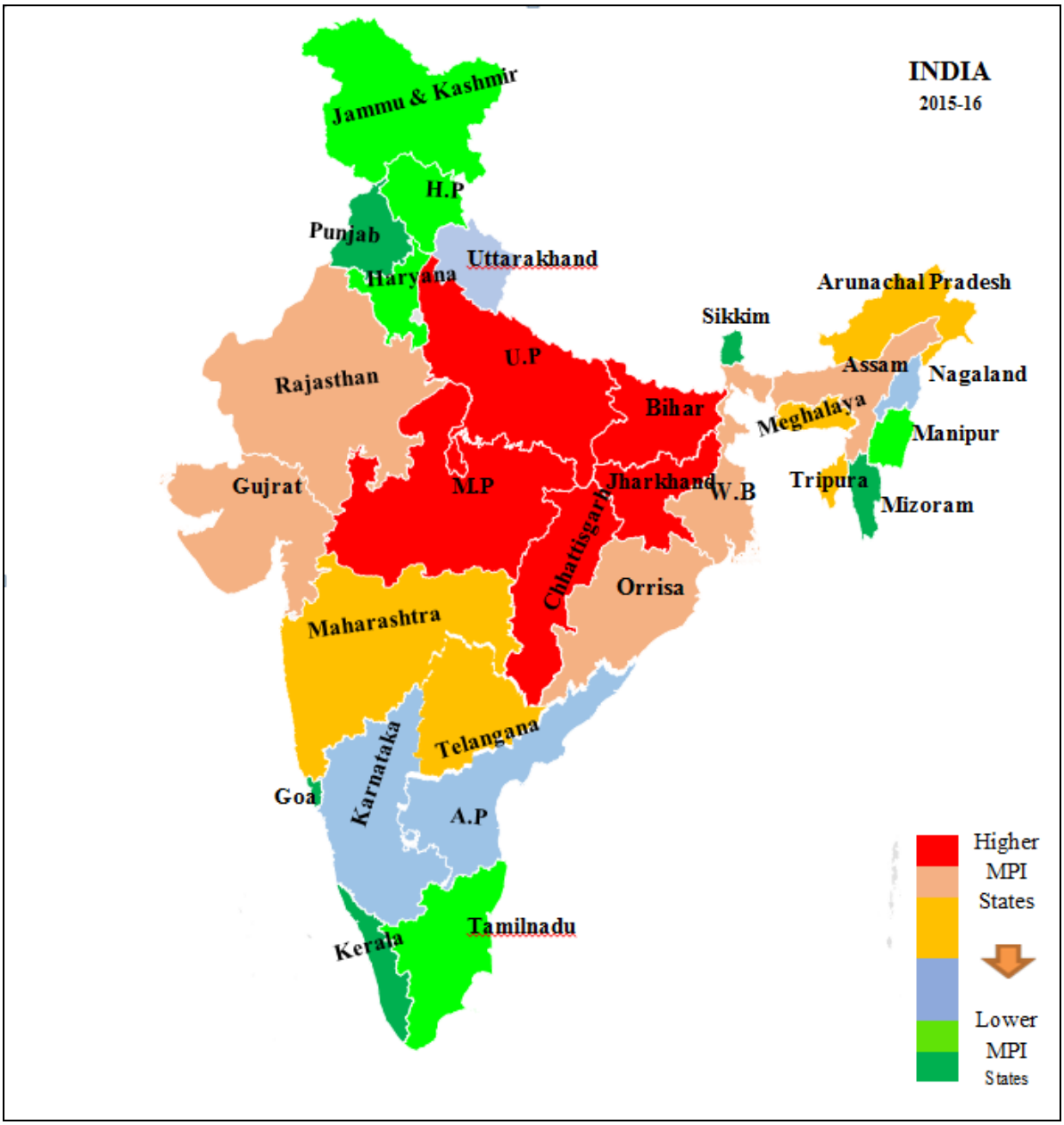
Map 2.1: Spatial distribution of MPI based on NFHS 2 (based on MPI Rank)



Map 2.2: Spatial distribution of MPI based on NFHS 3 (based on MPI Rank)



Map 2.3: Spatial distribution of MPI based on NFHS 4 (based on MPI Rank)



2.5.2 Poverty Reduction across States over Time: A Relative Measure

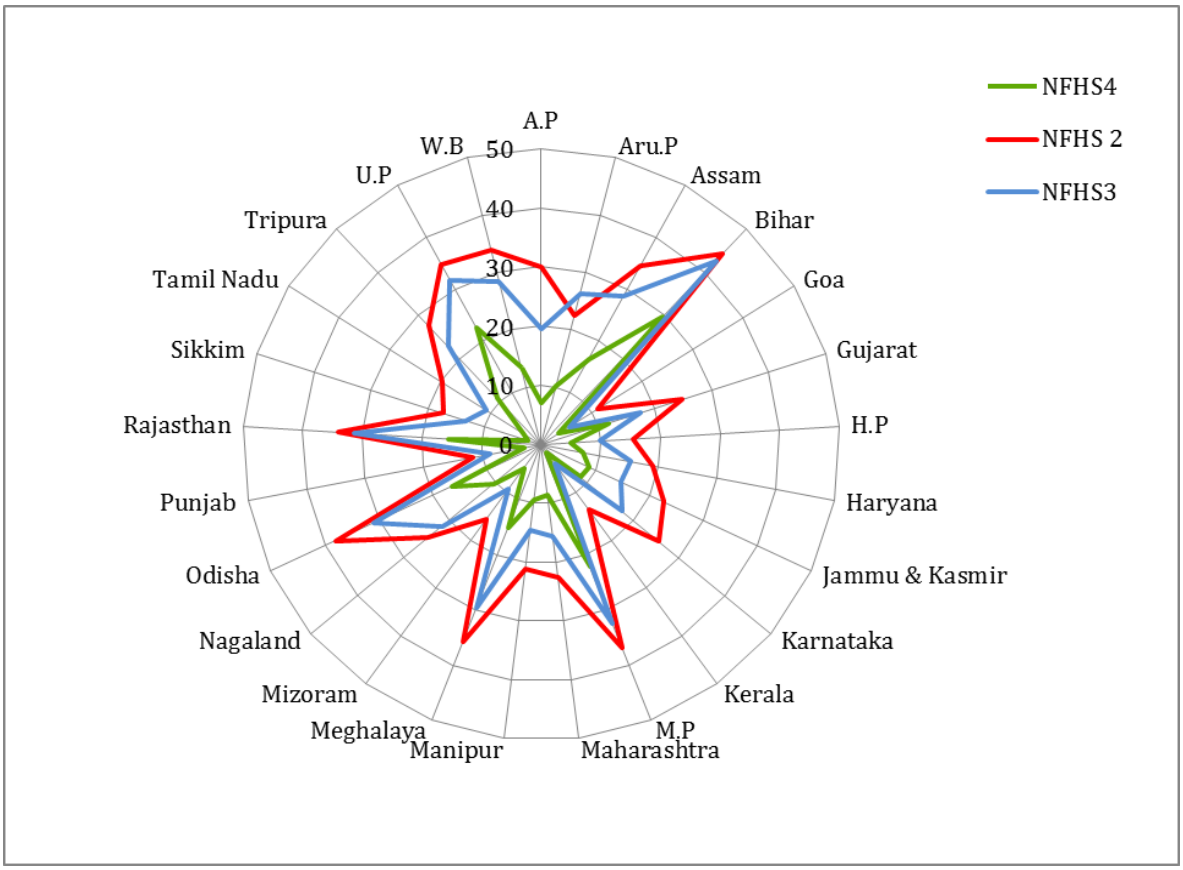
How do we measure the relative progress of poverty reduction across states over time (from 1998-99 to 2015-16)? In order to measure the relative progress of poverty reduction in both money-metric and MPI, I have normalized the values of poverty by using following rule (UNDP 1995):

$$H_{ijt} = \frac{\underset{i,t}{Max} H_{ijt} - Actual H_{ijt}}{\underset{i,t}{Max} H_{ijt} - \underset{i,t}{Min} H_{ijt}}$$ *i*=state; *j*=1, 2(Money-Metric HCR and MPI); *t*=1998-99, 2005-06, 2015-16. The maximum and minimum values of each *H* are chosen over time (1990-2018) and across all the states. Now, I estimate the value of HCR(money-metric) and MPI at each time point for each state and normalize the value in such a way that it lies between 0-100, thereafter, I classify the values (of poverty) into 5 equal space (groups). The mobility of a particular state from one group to other over time gives us relative progress (deterioration). This is clearly represented by the colored Table-2.9 and 2.10.

All the states, in general, have been performing well in reducing the poverty (money-metric and non-money metric); however, Jharkhan and Bihar are found to be stuck by poverty trap in money-metric. Interesting the neighbouring states of Bihar (and Jharkhand) like West Bengal, Orissa, UP and Chattrishgarh could manage to escape from this relative poverty trap. Majority of states quickly move from higher group to lower group (of MPI) in 2015-16. No one state does belong to extreme poverty (shown by red color) in 2015-16 in respect of MPI. But, it does not hold good in respect of HCR (Money metric). The mobility of states in respect of income and non-income dimensions of poverty show that over time the states are found to be capable to reduce poverty but very few states are unable to perform in the reduction of poverty. The states are all landlocked, though Orissa has coastal areas but poverty is found to be high compared to national average. In the next section, I shall try to explore the underlying reasons of the variations of multidimensional poverty. **2.5.3 Dispersion of MPI across States: NFHS-2, 3 and 4**

The dispersion of the states in respect of MPI is presented in the following Radar diagram 2.5.

Fig. 2.5 Dispersion of states in respect of MPI: NFHS-2, 3 and 4



Source: Author's estimation

A visual inspection of Fig. 2.5 clearly shows that the MPI vary to a large extent across the states over time (viz. 1998-99, 2005-06 and 2015-16). It is interesting to note that smaller states like Goa, Kerala, Sikkim, Mizoram have been consistently performing well in reducing the MPI over time but the bigger states could not perform well in reducing the MPI. However, the dispersion of MPI is not reducing as a result the inequality of MPI across states are found to be rising. This goes against the national agenda of inclusivity.

2.5.3.1 Depth, Severity and Contributions of Multidimensional Poverty: A Sub-National Analysis Based on NFHS-4

The most important aspect of this chapter is to explore the depth, severity and contribution of dimensions (and indicators) of multidimensional poverty. This is shown in Table-2.11. We notice that states having higher incidence of HCR (of multidimensional poverty) have higher depth and severity. In case of poverty

contributions, health plays an important and major role; majority of the states need special attention in health dimension compared to education and standard of living.

Table 2.9: State level Poverty: Depth, Severity and Contribution based on NFHS-4

States	Poverty Depth	Poverty Severity	Education Contribution	Health Contribution	Std. Living Contribution
A.P	0.14	0.09	0.25	0.56	0.20
Aru.P	0.16	0.13	0.29	0.39	0.32
Assam	0.26	0.25	0.18	0.47	0.35
Bihar	0.38	0.39	0.22	0.44	0.34
Chhattisgarh	0.25	0.21	0.17	0.53	0.30
Goa	0.04	0.02	0.12	0.75	0.13
Gujarat	0.18	0.14	0.15	0.59	0.26
Haryana	0.09	0.06	0.15	0.65	0.21
H.P	0.08	0.04	0.11	0.69	0.20
J & K	0.11	0.08	0.15	0.57	0.29
Jharkhand	0.31	0.28	0.18	0.49	0.33
Karnataka	0.13	0.09	0.16	0.61	0.23
Kerala	0.02	0.01	0.11	0.76	0.14
M.P	0.27	0.24	0.19	0.50	0.31
Maharashtra	0.14	0.10	0.12	0.64	0.25
Manipur	0.12	0.09	0.16	0.46	0.39
Meghalaya	0.18	0.15	0.26	0.39	0.35
Mizoram	0.08	0.06	0.21	0.52	0.27
Nagaland	0.15	0.12	0.24	0.45	0.31
Odisha	0.27	0.24	0.21	0.48	0.32
Punjab	0.06	0.04	0.19	0.65	0.16
Rajasthan	0.23	0.20	0.20	0.52	0.28
Sikkim	0.04	0.02	0.28	0.56	0.15
Tamil Nadu	0.07	0.04	0.17	0.66	0.17
Telangana	0.16	0.12	0.22	0.57	0.21
Tripura	0.18	0.16	0.18	0.47	0.35
U.P	0.26	0.22	0.20	0.50	0.30
Uttarakhand	0.12	0.09	0.16	0.60	0.24
W.B	0.21	0.18	0.21	0.50	0.29

Source: Author's calculation

The depth and severity of deprivation score of multidimensional poverty is found to be high among the major states like Bihar,Jharkhand, Chhattisgarh, UP, Orissa, MP, Assam, Rajasthan and West Bengal. How do the respective states eradicate deprivation? Where and in what dimensions to be given more weightage? The depth and severity of deprivation score is not uniformly distributed across the states. This is analyzed in details in the following Table-2.12.

Table 2.10: State-wise Deprivation Picture (% of Households who are deprived in each Indicator in each Dimension)

States	Pop	EL	DW	San	CF	Floor	Asset	Schoolin	School Attend	Mal	CM
Andhra Pradesh	1.75	1.32	29.33	43.13	37.99	6.72	15.31	21.68	1.75	22.39	1.05
Arunachal Pradesh	2.49	11.80	12.81	44.12	57.82	62.74	26.54	23.94	3.58	15.13	0.78
Assam	4.19	22.40	18.81	67.30	75.90	72.42	24.39	18.58	4.21	29.00	1.96
Bihar	6.27	39.76	2.44	71.30	81.92	71.23	39.84	30.04	7.53	36.18	3.26
Chhattisgarh	3.46	6.00	9.67	63.60	74.51	58.87	19.27	20.42	3.11	32.45	2.43
Goa	0.27	0.19	4.66	15.99	16.94	10.89	6.23	6.86	0.38	15.68	0.38
Gujarat	3.50	5.84	13.92	42.35	53.72	25.32	21.96	15.34	3.98	30.64	1.31
Haryana	2.96	1.43	6.89	31.36	50.78	16.31	8.45	8.98	2.53	20.97	1.49
Himachal Pradesh	1.57	0.77	10.44	20.36	60.35	20.73	11.02	8.48	0.72	19.34	1.04
Jammu & Kashmir	3.05	3.59	20.71	50.55	50.53	31.03	20.56	10.00	2.75	19.44	1.51
Jharkhand	4.39	20.82	24.12	72.57	67.34	61.23	26.59	22.66	4.77	34.16	2.08
Karnataka	4.07	2.59	14.11	55.87	51.93	13.32	15.77	14.82	2.17	24.59	0.92
Kerala	1.97	1.03	6.78	10.83	44.58	2.08	5.86	4.09	0.20	10.65	0.16
Madhya Pradesh	8.88	10.43	15.62	63.23	70.89	53.66	26.70	21.53	5.68	32.27	2.38
Maharashtra	4.59	7.71	11.55	42.65	48.89	28.39	22.78	11.57	1.93	27.81	0.86
Manipur	2.00	8.24	65.68	53.40	63.78	72.64	19.80	8.60	1.64	13.29	1.16
Meghalaya	1.25	8.78	41.22	45.42	77.23	39.51	30.56	22.41	4.05	18.06	1.92
Mizoram	1.94	3.46	17.16	22.46	38.05	45.65	19.28	11.99	1.92	13.52	1.86
Nagaland	1.91	2.70	34.80	19.94	71.66	55.36	38.15	17.93	2.75	17.07	1.35
Orissa	5.16	13.98	12.45	71.84	77.98	49.51	27.01	21.03	3.25	28.88	1.57
Punjab	2.81	0.48	4.87	17.10	35.90	16.33	5.20	10.02	1.62	16.27	0.98
Rajasthan	5.96	9.11	16.13	52.35	67.27	27.55	26.97	21.55	5.36	30.91	2.02
Sikkim	0.80	0.51	5.28	2.45	42.86	16.73	10.12	11.50	1.09	8.88	0.62
Tamil Nadu	4.44	1.41	9.22	45.99	28.36	9.07	4.49	12.22	0.61	17.94	0.70
Telangana	1.33	2.11	23.84	43.71	36.63	15.81	20.65	22.76	1.61	27.02	0.94
Tripura	0.77	8.41	17.25	64.94	62.51	64.43	24.52	14.83	1.24	21.35	0.80
Uttar Pradesh	13.01	27.09	4.10	55.86	66.83	58.00	24.82	21.35	7.69	30.68	3.30
Uttarakhand	2.59	3.01	12.18	36.41	54.17	31.42	21.75	12.83	2.25	21.71	1.44
West Bengal	2.62	6.82	7.41	51.03	69.66	51.98	22.29	20.27	2.73	26.55	0.98

Note: Pop=population, EL=Electricity, DW=Drinking water, San=sanitation, CF=cooking fuel, Mal=malnutrition, CM=child mortality. Source: Author's calculation

The indicator specific deprived households under each dimension help the state government to adopt appropriate policy to eradicate human poverty. In order to attain inclusivity and to reduce regional disparity, special attention is to be given some major states like Bihar, Jharkhand, UP, MP, Orissa, Assam and Chhattisgarh where the incidence, depth and severity of multidimensional poverty are found to be high.

In order to corroborate the disaggregated results of the states (as outlined in Table-2.12), I like to consider two states like Bihar and Jharkhand for comparison. Both the two states share border and have some common feature in respect of agro-climatic condition and poverty; but, Bihar needs to improve a lot in cooking fuel, whereas Jharkhand should prioritize sanitation.

2.5.3.2 Inequality of Deprivation Score of MPI: A Sub-National Analysis

Table 2.11: Inequality of Deprivation Scores

	NFHS 3		NFHS 4	
	Theil Index	**Pop. Share**	**Theil Index**	**Pop. Share**
Rural/ Urban				
Rural	0.651	0.226	0.225	0.797
Urban	0.348	0.229	0.272	0.202
States				
Andhra Pradesh	0.236	0.442	0.282	0.017
Arunachal Pradesh	0.201	0.015	0.227	0.024
Assam	0.187	0.035	0.212	0.045
Bihar	0.153	0.032	0.174	0.07
Chhattisgarh	0.173	0.032	0.194	0.035
Gujarat	0.212	0.028	0.268	0.032
Haryana	0.229	0.023	0.229	0.025
Himachal Pradesh	0.207	0.021	0.315	0.014
Jammu & Kashmir	0.222	0.024	0.32	0.028
Jharkhand	0.168	0.026	0.18	0.046
Karnataka	0.231	0.052	0.267	0.039
Kerala	0.286	0.014	0.381	0.013
Madhya Pradesh	0.181	0.052	0.183	0.09
Maharashtra	0.2	0.059	0.231	0.041
Manipur	0.217	0.039	0.225	0.022
Meghalaya	0.232	0.017	0.244	0.013
Mizoram	0.258	0.012	0.296	0.016
Nagaland	0.231	0.036	0.247	0.055
Orissa	0.195	0.042	0.225	0.003
Punjab	0.257	0.026	0.292	0.019
Rajasthan	0.173	0.034	0.218	0.059
Sikkim	0.222	0.032	0.329	0.005
Tamil Nadu	0.289	0.015	0.298	0.036
Telangana	--	--	0.253	0.013
Tripura	0.209	0.018	0.239	0.007
Uttar Pradesh	0.18	0.099	0.196	0.134
Uttarakhand	0.193	0.022	0.253	0.023
West Bengal	0.197	0.05	0.237	0.026

Source: Author's calculation

The inequality of deprivation score is found to be higher among those states manifesting lower MPI. For example, if we compare between Bihar and Sikkim, we find a contrasting picture; Bihar had witnessed an increase in inequality of DS from 0.153(in NFHS-3) to 0.174 (in NFHS-4) whereas Sikkim had witnessed just opposite phenomena. Another interesting feature is noticed that the inequality of DS of the rural area across all the states has reduced over time but this phenomena was not observed in urban areas of the states in general.

2.6 Determinants of MPI: A Panel Data Analysis

The human capital outcomes are captured by MPI because it constitutes two important dimensions like education and health. Therefore, one can argue that poor health and

education outcomes as reflected in MPI are due to poor investment in human capital. Why are the states poor? Is it due to poor public expenditure on health and education? Is it due to lack of adequate infrastructure? Some one can argue that due to lack of infrastructure people fail to acquire human capital. Keeping in mind the importance of infrastructure on economic growth and human capital accumulation (see the literature developed by Agenor 2006), I have objectively chosen some selected infrastructure to study the impact of infrastructure on multidimensional poverty. I have done both static and dynamic panel data regression. How does past poverty of states affect current poverty? Does history matter? The cumulative causation of poverty can well be captured by the dynamic panel data regression model. The low level development trap caused by higher incidence of multidimensional poverty is identified by the dynamic panel data regression model The strict exogeneity of the regressor is violated if we include a lagged dependent variable as a regressor. This is because the lagged dependent variable is necessarily correlated with the error term, because of this applying GLS or OLS estimators are biased and inconsistent [Greene 2005]. The panel data regression is helpful because it captures both the fixed and random effect. Is the fixed effect better than the random effect? This is solved by the Hausman specification test [Greene 2005]. The state specific heterogeneity is well captured by fixed effect. Keeping in mind the limitations of GLS and OLS under dynamic panel data regression model, Bundell and Bond (1998) derived a condition under which it is possible to use an addition of setting of moment conditions. These additional moment conditions can be used to improve the small sample performance of Arellano-Bond estimator. Since we know that application of GLS and OLS are likely to be biased and the result will be inconsistent, in the Arellano-Bond estimator; we use Bundell and Bond (1998) GMM estimation technique in our dynamic panel data regression. I have not included per capita NSDP of the states as one of the regressor in our model because of possible endogeneity between income and poverty. In the same way, current per capita expenditure on health and education may create endogeneity problem in the model; keeping in mind this problem, I have used lagged expenditure of education and health as regressors. Moreover, the infrastrure are many in numbers, some are related to physical and some are related to social. Therefore, due to collinearity problem, it is not desirable to include all the infrastrure in a single model. However, many have used principal component method to create infrastructural stock index and they study the impact of such index on the dependent variable [Ghosh

and De 1998, 2005; Raychaudhuri and Haldar 2009; Haldar et al 2021]. The major problem of using such index is that we cannot study the individual influence of each infrastructure to the dependent variable. Thus, keeping in mind all these issues, I have developed various models as outlined in Table-2.14. The impact of rail, banks availability, irrigation facility do not appear significant in regression, this is why they are not included in my regression model. The variables used in my regression models are mentioned in Table-2.13.

Table-2.12 Variables, Definition, Abbreviations and Data Source of Regression

Definition	Abbreviation	Source
Multidimensional Poverty	MPI	NFHS-2, 3 and 4. Already discussed earlier.
Per Capita Education expenditure	PCEE	Various Issues of Handbook of Statistics on State Government Finances and State Finances: A Study of State Budgets, Reserve Bank of India.
Per Capita Health Expenditure	PCHE	Various Issues of Handbook of Statistics on State Government Finances and State Finances: A Study of State Budgets, Reserve Bank of India.
Road length per 1000 Sq. Km	RD	Ministry of Road Transport and Highways, Govt. of India (ON1605) & Past Issues
No of primary schools per 30000 population in the age group 5-14	PS	Compiled from Ministry of Human Resource Development, GOI
No of Primary healthcare centre per 80000 population	PHC	Health & Family Welfare Statistics in India, MoH&FW,2015 Rural Health Statistics 2014-15

I have developed three models (separately) under static and dynamic panel data regression. In Model-1 under static panel data, I find a significant impact of education expenditure (lagged by five years, PCEE) and road length (RD) but health expenditure does not appear significant in reducing the MPI; it supports random effect. Model-2 (under static panel) considers schools availability as one of the infrastructure but it is not significantly reduce the MPI though its sign is expected, the impact of PCEE is same as Model-1; it supports fixed effect. Model-3 (under static) separately includes PHC as one of the health infrastructure and it significantly reduces the MPI and the role of PCEE remains the same as Model-1 and 2; however, it supports fixed effect.

Table-2.13 Determinants of Multidimensional Poverty: A Panel Data Analysis

	Dynamic Panel			Static Panel		
Explanatory Variables	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Constant	2.471***	1.214***	1.115***	2.568***	2.612***	2.588***
	(0.369)	(0.342)	(0.350)	(0.1196)	(0.1478)	(0.1481)
Lag_MPI	0.349***	0.859***	0.907***			
	(0.137)	(0.134)	(0.142)			
PCEE_5	-0.117***	-0.137***	-0.130***	-0.215***	-0.188***	-0.188***
	(0.021)	(0.025)	(0.027)	(0.019)	(0.0165)	(0.0167)
PCHE_5	-0.067	-0.204**	-0.231**	-0.122	-0.046	-0.053
	(0.086)	(0.103)	(0.104)	(0.069)	(0.0766)	(0.0778)
RD	-0.282***			-0.017***		
	(0.056)			(0.0098)		
PS		-0.085***			-0.064	
		(0.031)			(0.0235)	
PHC			-0.089***			-0.064***
			(0.0363)			(0.0262)
No. of Observation	50	50	50	75	75	75
Wald chi2(4)	536.56	309.83	295.09	284.49		
Within R^2				0.8010	0.8124	0.8088
Between R^2				0.2421	0.0837	0.0581
Overall R^2				0.4188	0.3083	0.2825
F-test					99.59	97.26
Hausman Test				4.05RE	20.94FE	38.77FE

*Notes: FE=Fixed Effect, RE=Random Effect; *** and ** mean significant at 1% and 5% level of significance. Source: Authors estimation.*

The dynamic panel data regression clearly supports that the history does matter towards chronic presence of poverty. The current MPI is significantly influenced by the lagged MPI; it is interesting to note that all the infrastructure appear to be significant in reducing the MPI; the per capita public health expenditure (PCHE) that appears insignificant in static model, now in dynamic model it becomes significant at 5 percent level.

2.7 Major Findings

The national level performance towards reduction of money-metric and multidimensional poverty is not disappointing; however, the major concern is raising inequality of poverty across the states. The money-metric and non-money metric poverty

move in the same direction but it does not ensure perfect collinearity. The sources of inequality of deprivation score comes from within states rather than between states. There are some major states like Bihar, Jharkhand, Chhattisgarh, Orissa, UP, MP, Rajasthan and Assam are stuck by multidimensional poverty. Dimension specific study of multidimensional poverty across the states clearly suggests that major improvement is required in health sector followed by standard of living dimension. Indicator specific study across the states shows that majority of households do suffer from cooking fuel and sanitation. The depth and severity of deprivation score (of multidimensional poverty) across states show some disappointing results; the depth and severity is found to be high among some major states like Bihar, Jharkhand, Chhattisgarh, MP, UP, Rajasthan, Assam and West Bengal. All these states share roughly about 50 percent of India's population. Moreover, the total fertility rate is found to be higher in all these states compared to national average, except West Bengal. The determinants of poverty clearly suggests that past period poverty aggravates current poverty, this indirectly support the hypotheses of 'low level trap' developed by Nurkse[1952], Nelson[1956] and Myrdal [1957]. Poor performance due to lack of adequate investment in human capital like health and education along with poor infrastructure in reducing multidimensional poverty in the poorer states has been a major obstacle to ensure inclusivity since all these states contribute roughly about 50 percent of India's population.

CHAPTER-3

Multidimensional Poverty in India: A Sub-State Analysis

Multidimensional Poverty in India: A Sub-State Analysis

3.1 Introduction

In Chapter-2, we have discussed the multidimensional poverty at the sub-national level. But, the sub-national analysis cannot provide the real picture of the state because the population, density of population and area of the states differ widely across the states; there exists lots of heterogeneity within a state. A state cannot capture intra-state variations of socio-economic and demographic outcomes, it provides a broad picture. Spatial variations of socio-economic and demographic factors can well be captured by districts. As a result it becomes difficult to implement appropriate anti-poverty programmes within a state.

For example, in our state level study we find that Kerala, Sikkim, Punjab do experience a very low MPI but all the districts of these states are not found to be equal. In case of Punjab, Jalandhar is one of the districts where multidimensional poverty is extremely low, on the other hand, Mansa and Sahib Zada Ajit Singh Nagar are those districts where on an average 22% of the population are found to be multidimentionally poor. Therefore, to eradicate the multidimensional poverty, district level policy prescription is assumed to be more important and justified.

I could not find an in-depth aggregate district level study in India on multidimensional poverty except Alkire et al (2018). Alkire et al (2018) could not deal with the issues of distribution of MPI, contributions of indicators of MPI and their work does not highlight the issues of policy prescription towards allocation of development grants. This is why I have developed this chapter.

District is assumed to be an administrative territory of Indian states. According to 2011 Census, we have 640 districts. The NFHS-4 is unique in the sense that for the first time, we get the district level information on multidimensional poverty, which is very much important for the disaggregate level of study and policy implementation. The corresponding estimates of MPI across the districts in India are shown in end note.

3.2 Objectives and my contribution

The following research questions are addressed in this chapter:

- How does the MPI distribute among the 640 districts in India?
- How many districts do exceed the national average of MPI? How is it distributed? Which districts are designated as 'poorest of the poor'? Are all come from a particular state like Bihar or Jharkhand?
- How does the well-off district (below the national average of MPI) scatter in respect of the MPI? How are the districts distributed among the better off states in respect of MPI?
- Should we consider all the districts for allocating development grants of the Central Government? Should we focus only the 'poorest of the poor' districts of MPI or all poorer districts (exceeding national average of MPI) or all 640 districts? How do we allocate development grants among the districts? What principle should we adopt to eradicate MPI?
- How do we justify the rationale of Backward Region Grant Fund in respect of MPI where district is to be chosen as unit?

3.3 Methodological Issues

Firstly, I estimate the MPI across all the districts of India using unit level data of NFHS-4. Among 640 districts, 617 districts belong to 29 states and rest of the districts is parts of the Union Territories. However, the distribution of multidimensional poverty is studied on 617 districts. The minimum and the maximum values of MPI are found to be 2.59 and 47.77 respectively.

Secondly, I study the distribution of MPI of the districts taking equal interval as shown in Fig.5.1

Thirdly, I normalize the MPI of the districts exceeding the national average (viz. 20.38). The normalized value is estimated as follows: $\frac{Actual[MPI] - Min[MPI]}{Max[MPI] - Min[MPI]}$ (3.1) The Minimum MPI is the national average, 20.38 and the maximum MPI is 47.77.

Fourthly, I split the normalized value of MPI into four categories: poorest of the poor, extremely poor, poorer and poor. These categories help us to prioritize intervention with a view to ensure equity by way of eradicating poverty.

In the same way, I classify the districts lying below the national average of MPI (20.38) into four categories: lowest poor, lower poor, moderately poor and vulnerable to poor. The following normalization formula is adopted:

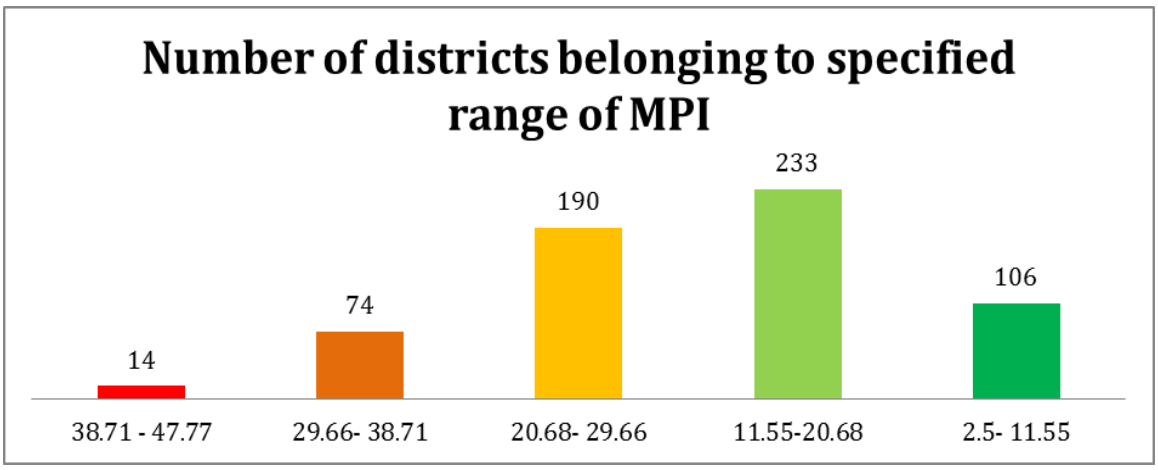
$$\frac{Maximum[MPI] - Actual[MPI]}{Max[MPI] - Min[MPI]} \tag{3.2}$$

In equation (3.2), the maximum value is the national average, 20.38 and the minimum value is 2.59.

In order to give more focus, I consider only the 'poorest of poor' districts as an example of the distribution of Central Government funds. However, I have already estimated the MPI, deprivation score, contribution etc of all districts in each state. Keeping in mind the volume of the work, I have considered only those districts which belong to the 'poorest of the poor group'. A more disaggregate study is reported in chapter-5 considering West Bengal, as case study.

3.4 Results

Figure 3.1 Number of districts belonging to specified range of MPI



Note: Drawn by me from NFHS-4 unit level data

The distribution of MPI across 617 districts is shown in Fig.3.1. It clearly shows that majority of the districts fall in the range 11.55-20.68. If we check the distribution it

clearly shows a positively skewed distribution (from lower value to higher value of MPI).

Indeed it is good sign that majority of the districts are clustered around lower value of MPI. But, this figure does not portray the real picture of the distribution and inequality of poverty scattered around the states vis a vis districts. Extreme value of MPI (38.71-47.77) is found among 14 districts and these districts belong to five states like MP, UP, Bihar, Orissa and Chhatishgarh. Three districts like Alirajpur, Barwani, Jhabua belong to MP; three districts like Shrawasti, Bahraich, Balarampur belong to UP; six districts like Araria, Purnia, Madhepura, Sitamarhi, Kishanganj, Supaul come from Bihar; one district like Malkangiri belongs to Orissa and one district like like Dakshin Bastar Dantewada belongs to Chhattishgarh. The national average of MPI is estimated at 20.38. Now, following the above methodology, I try to explain the distribution of districts above the national average value of MPI (20.38). Here, I assume the threshold value, 20.38 as standard (national average of MPI) for comparing good and bad performers of districts.

After measuring the multidimensional poverty index (MPI) for 614 districts from 29 states, I notice that 285 districts are found to be above the national average (20.38) and 332 districts are found to be below the national average (20.38).

I have estimated the districts (in each state) exceeding the national average of MPI as shown in Table-3.1. I observe that 54 districts belong to U.P, 44 districts belong to M.P, 37 districts belong to Bihar etc. This means that 97.4% of districts of Bihar are above the standard national average; 88% districts of MP and 87.5% of Jharkhand districts are found to be above the national average of MPI.

Some of the states like Andhra Pradesh, Goa, Himachal Pradesh, Kerala, Manipur, Mizoram, Punjab, Sikkim, Tamil Nadu, Uttarakhand are well off in respect of national average of MPI; all the districts of these states lie below the national mean of MPI.

After normalization the multidimensional poverty index (MPI) of the districts exceeding the national average, I have split those into 4 categories (poor, poorer, poorest and poorest of the poor) to capture the real picture of multidimensional poverty. This is illustrated in Table-3.2. I have shown the districts manifesting the degree of multidimensional poverty in the MAP-3.1. The spatial distribution of multidimensional poverty (as shown in Map-3.1) clearly shows that the MPI is highly concentrated among the central and western zone of India.

Table 3.1: Number of Districts exceeding National Average (20.38) of MPI

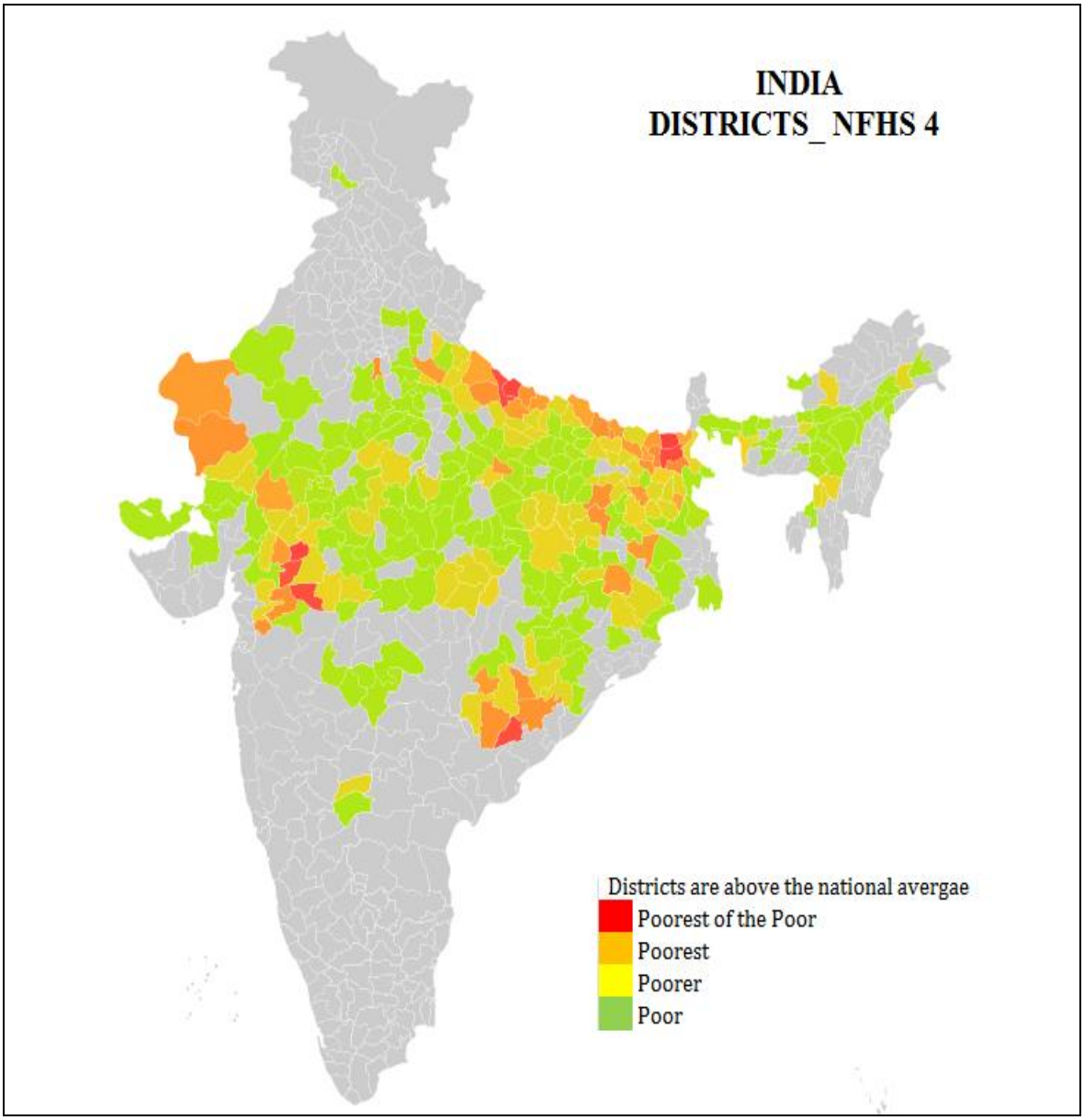
State	Total No of Districts	No of Districts above the National Average(20.38)	% of Districts above the National Average(20.38)
A.P	11	0	0.0
Aru P	16	3	18.8
Assam	27	20	74.1
Bihar	38	37	97.4
Chattishgarh	18	14	77.8
Goa	2	0	0.0
Gujrat	26	12	46.2
Harayana	21	1	4.8
H P	12	0	0.0
J&K	22	2	9.1
Jharkhand	24	21	87.5
Karnataka	30	2	6.7
Kerala	14	0	0.0
M.P	50	44	88.0
Maharashtra	35	7	20.0
Manipur	9	0	0.0
Meghalaya	7	3	42.9
Mizoram	8	0	0.0
Nagaland	11	1	9.1
Orissa	30	20	66.7
Punjab	20	0	0.0
Rajasthan	33	23	69.7
Sikkim	4	0	0.0
Tamilnadu	32	0	0.0
Telengana	10	4	40.0
Tripura	4	1	25.0
UP	71	54	77.9
Uttarakhand	13	0	0.0
West Bengal	19	11	57.9

Note: Author's estimation

The UP is a state comprising 71 districts in which 54 districts lie above the national average that means 54 districts are considered as poor, but when I split those district into

4 categories as per the MPI score(based on normalized value), only two district Bahraich and Shrawasti are belonging to the 'poorest of the poor' category. Similarly in case of M.P, 88% of districts lie above the national average, but when I classify, I find only 3 districts in the extreme category (viz. poorest of the poor) as shown in Table 3.2.

Map 3.1: Districts of Poor group above the national average MPI (20.38)



The categories are poorest of the poor, poorest, poorer and poor as descending order of multidimensional poverty index.

Table 3.2: Classification of Districts exceeding National Average MPI

States	Poor	Poorer	Poorest	Poorest of the Poor
A.P	0	0	0	0
Aru.P	(2) Tawang,Lohit	(1)East Kam	0	0
Assam	(14) Udalgiri, Dima Has, Golaghat, Jorhat, Sonitpur, Chirang, Karbi an, Kokrajha, Sivasaga, Nagaon, Dibrugarh, Goalpara, Morigaon, Barpeta	(6) Darrang, Karimgan, Cachar, Dhubri, Tinsukia, Hailakan	0	0
Bihar	(8) Rohtas,Bhojpur,Siwan,Munger, Buxar,Aurangabad,Gopalganj,Kaimur (bhabua)	(14)Saran, Arwal, Lakhisarai, Jehanabad, Bhagalpur, Nalanda, Muzaffarpur, Vaishali,Bbanka, Nawada, Begusarai, Madhubani, Sheikhpura, Samastipur	(13)Darbhanga, Khagaria, Gaya, Pashchim Champaran, Purba Champaran, Katihar, Jamui, Sheohar, Saharsa, Supaul, Kishanganj, Madhepura, Sitamarhi	(2) Purnia, Araria
Chattishgarh	(8) Janjgir - Champa, Dhamtari,Korea (koriya),Mahasamund,Korba,Raigarh,Uttar bastar kanker,jashpur	(4) Bijapur, Kabirdham, Surguja, Bastar	(2) Narayanpur, Dakshin bastar dantewada	0
Goa	0	0	0	0
Gujrat	(7) Vadodara, Kachchh, Surendranagar, Sabarkantha, Patan, Kheda, Banaskantha	(3) Tapi, Panchmahal, Narm	(2) Dohad, The dangs	0
Harayana	0	0	(1) Mewat	0
H P	0	0	0	0
J&K	(2) Doda, Ramban	0	0	0
Jharkhand	(7) Bokaro, Dhanbad, Kodarma, Gumla, Hazaribagh, Khunti, Saraikela kharsawan	(11) Simdega, Lohardaga, Palamu, Deoghar, Godda, Jamtara, Garhwa, Giridih, Latehar, Dumka, Sahibganj	(3) Chatra, Pashchimi Singhbhum, Pakur	0
Karnataka	(1) Raichur	(1) Yadgir	0	0
Kerala	0	0	0	0
M.P	(27) Sehore, Bhind, Ujjain, Harda, Morena, Narsimhapur, Sagar, Chhindwara, Dewas, Rewa, Raisen, Datia, Shajapur, Anuppur, Katni, Betul, Burhanpur, Shahdol, Neemuch, Panna, Vidisha, Umaria, Damoh, mandsaur, sidhi, tikamgarh, ashoknagar	Seoni, Rajgarh, Shivpuri, Chhatarpur, Singrauli, Balaghat, Mandla, Ratlam, Guna, Dhar, Khandwa (east nimar), Khargone (west nimar), Dindori, Sheopur	0	(3) Jhabua, Barwani, Alirajpur
Maharashtra	(6) Yavatmal, Parbhani, Hingoli, Nanded, Jalna, Dhule	0	(1) Nandurbar	0

Contd.

States	Poor	Poorer	Poorest	Poorest of the Poor
Manipur	0	0	0	0
Meghalaya	(4) East garo hills, Jaintia hills, Ribhoi	0	0	0
Mizoram	0	0	0	0
Nagaland	(1) Mon	0	0	0
Orissa	(12) Sundargarh, Baleshwar, Bargarh, Bhadrak, Sambalpur, Dhenkanal, Subarnapur, Baudh, Balangir, Debagarh, Gajapati, Kandhamal	(5) Kendujhar, Mayurbhanj, Nuapada, Kalahandi, Rayagada	(2) Koraput, Nabarangapur	(1) Malkangiri
Punjab	0	0	0	0
Rajasthan	(15) Alwar, Bikaner, Nagaur, Bhilwara, tonk, pali, rajsamand, chittaurgarh, jhalawar, sawai madhopur, bharatpur, baran, dhaulpur, karauli, bundi	(5) Sirohi, Jalor, Dungarpur, Banswara, Pratapgarh	(3) Udaipur, Jaisalmer, Barmer	0
Sikkim	0	0	0	0
Tamilnadu	0	0	0	0
Telengana	(4) Nizamabad, Medak, Mahbubnagar, Adilabad	0	0	0
Tripura	(1) North Tripura	0	0	0
UP	(34) Mahamaya Nagar, Firozabad, Muzaffarnagar, Agra, Aligarh, Banda, Kanpur dehat, Hamirpur, Bulandshahr, Bijnor, Gorakhpur, Etah, Saharanpur, Ballia, Allahabad, Azamgarh, Lalitpur, Deoria, Farrukhabad, Rae bareli, Jaunpur, Moradabad, Mau, Sant ravidas nagar (bhadohi), Chandauli, Mahoba, Mirzapur, Kannauj, Pratapgarh, Jyotiba phule nagar, Fatehpur, Bareilly, Unnao, Ghazipur	(15) Ambedkar nagar, Sultanpur, Faizabad, Basti, Kushinagar, Pilibhit, Sonbhadra, Sant kabir nagar, Bara banki, Rampur, Shahjahanpur, Kanshiram nagar, Chitrakoot, Mahrajganj, Hardoi	(3) Sitapur, Siddharth nagar, Gonda	(2) Bahraich, Shrawasti
Uttarakhand	0		0	0
West Bengal	(9) South 24 parganas, Dakshin dinajpur, Jalpaiguri, Murshidabad, Coach bihar, Paschim medinipur, Maldah, Bankura, Birbhum	(1) Uttar dinajpur	0	0

Source: Author's estimation using NFHS-4 Data

Out of 614 districts, 285 districts belong to the poor category, which lie above the national average. Among those 8 districts are categorized as 'poorest of the poor', these are belonging to the states like Bihar, M.P, Orissa and U.P. More than 70% of total

populations are found to be multidimensionaly poor. Alirajpur , a district of Madhya Pradesh(MP) exhibits the highest MPI where HCR(of MPI) is around 78%.

The next group is defined as poorest; I find 30 districts in this category in which 13 districts of Bihar belong to the 'poorest group'. To eradicate the multidimensional poverty, the policy maker should be given more focus on these extremely poor districts. This category wise classification is very much important for policy prescription in a phased manner. I have MPI of 617 districts, but just to narrow down the work, here, I am just focusing on the 'poorest of the poor' group of districts. In order to implement policy, we must know in which dimension (and the indicators) people are more deprived. This is illustrated in Table-3.3. Generally, one can assume that the districts belonging to the 'poorest of the poor' group are similar in respect of MPI but dimension (as well as indicator) specific analysis gives us more interesting results that are useful for policy formulations. Surprisingly, we find enormous differences across the districts falling in this category; if we notice the deprivational pattern of the districts, there exits lots of differences. For example, Araria and Purnia districts of Bihar are extremely well-off in drinking water dimension; in Araria 0.75% of households are deprived, whereas no household of Purnia is found to be deprived in drinking water. Contrary to this fact, districts of MP like Barwani, Jhabua need improvements in drinking water. Similarly, the extremely poor district is Alirajpur(of MP), in which only 9.57% of households are not having any access to electricity, but, for same indicator a contrasting picture is found in the districts of Bihar. The districts of Bihar like Purnia and Araria around 55% of population are found to be deprived in electricity connection. So, for implementing policy, we must take care of dimension as well as indicator specific deprivational aspects.

Table 3.3: Deprivation Picture of the 'Poorest of the Poor' Districts (Percentage of population deprived in each indicator)

State	District	6yrs of Schooling	Child enrollment	Malnutrition	Child mortality	Electricity	Sanitation	Cooking Fuel	Drinking Water	Asset	Floor
Bihar	Araria	64.18	27.86	69.92	6.42	54.78	91.34	98.36	0.75	41.04	93.88
	Purnia	61.64	26.8	70.52	8.98	57.38	89.19	97.41	0	41.4	92.54
M.P	**Alirajpur**	63.93	60.37	65.3	5.85	9.75	90.53	95.13	13.93	40.39	88.72
	Barwani	55.61	54.62	75.72	4.7	13.64	90.61	89.55	18.03	47.88	81.97
	Jhabua	65.39	55.04	63.37	4.44	15.16	94.33	97.07	16.54	57.43	87.75
Orissa	Malkangiri	61.94	34.07	75.87	5.89	17.04	91.24	97.93	11.78	36.15	80.1
UP	Bahraich	67.09	38.68	65.98	6.8	76.9	89.24	87.82	2.22	32.12	89.24
	Shrawas	68.5	46.91	59.35	9.22	79.42	92.47	94.01	2.46	39.78	92.47

Note: Author's estimation

3.5 Classification of Districts: Below the National Average MPI (20.38)

I am now considering the districts that lie below the national average. There are 329 districts that lie below the national average; among them 23 districts are quite well off manifesting a very low MPI. These are distributed across different states. For example, Panchkula and Ambala come from Haryana; Srinagar and Leh belong to Jammu & Kashmir; nine districts come from Kerala (like, Kottayam, Ernakulum, Kollam, Thrissur, Pathanamthitta, Thiruvananthapuram, Idukki, Alappuzha and Malappuram); South Garo Hills come from Meghalaya; Aizawl beongs to Mizoram, Jalandhar from Punjab; all districts of Sikkim; Chennai and Kanyakumari belong to Tamil Nadu. This is illustrated in Table-3.4.

Table 3.4 Distribution of well-off districts compared to national average of MPI (20.38)

State	Lowest Poor	Low Poor	Modaretely Poor	Vulnarable to Poor
A.P	0	0	(5) Krishna, Ghuntur, West god, East god, Chittor	(6) Anantapur, Visakhapattanam, y.s.r, Sri Pott, Kurnool, Prakashm
Aru.P	0	(1) East sia	(7) West Sia, Dibang V, Upper Si, Tirap, Lower Su, Papumper, Anjaw	(5) Changlan, Lower Di, West Kam, Upper Su, Kurung K
Assam	0	0	(1) Kamrup m	(6) Nalbari, Dhemaji, Baksa,Lakhimpur, Kamrup, Bongaiga
Bihar	0	0	0	(1) Patna
Chattishgarh	0	0	0	(4) Durg, Bilaspur, Rajnandgaon, Raipur
Goa	0	(2) South Goa, North Goa	0	0
Gujrat	0	0	(6) Porbandar, Junagadh, Rajkot, Amreli, Surat, Ahmadabad	(8) Mahesana, Jamnagar, Navsari, Bhavnagar, Valsad, Anand, Gandhinagar, Bharuch
Harayana	(2) Panchkula, Ambala	(11) Kurukshetra, Panipat, Karnal, Sonipat, Jhajjar, Yamunanagar, Hisar, Gurgaon, Kaithal, Rohtak, Jind	(4) Mahendragarh, Bhiwani, Rewari, Faridabad	(3) Fatehabad, Sirsa, Palwal
H P	0	(7) Hamirpur, Kinnaur, Mandi, Lahul and Spiti, Shimla, Kullu, Kangra	(5) Bilaspur, Una, Solan, Sirmaur, Chamba	0
J&K	(2) Srinagar, Leh	(7) Pulwama, Shupiyan, Jammu, Kulgam, Anantnag, Badgam, Baramula	(7) Ganderbal, Kathua, Samba, Kargil, Bandipore, Kupwara, Reasi	(4) Punch, Kishtwar, Rajouri, Udhampur
Jharkhand	0	0	0	(4) Purbi singhbhum, Ranchi, Ramgarh
Karnataka	0	(1) Bangalore	(13) Dharwad, Mysore, Hassan, Kodagu, Mandya, Shimoga, Chikmagalur, Bangalore rural, Ramanagara, Belgaum, Davanagere, Tumkur, Kolar	(14) Dakshina kannada, Haveri, Chitradurga, Bagalkot, Chikkaballapura, Gadag, Gulbarga, Bijapur, Uttara kannada, Udupi, Bidar, Bellary, Chamarajanagar, Koppal
Kerala	(9) Kottayam, Ernakulam, Kollam, Thrissur, Pathanamthitta, Thiruvananthapuram, Idukki, Alappuzha, Malappuram	(5) Palakkad, Kozhikode, Kannur, Kasaragod, Wayanad	0	0
M.P	0		(2) Indore, Bhopal	(4) Hoshangabad, Jabalpur, Gwalior, Satna

Contd.

State	Lowest Poor	Low Poor	Modaretely Poor	Vulnarable to Poor
Maharashtra	0	(2) Mumbai suburban, Pune	(12) Nagpur, Mumbai, Kolhapur, Solapur, Sangli, Jalgaon, Aurangabad, Wardha, Osmanabad, Akola, Chandrapur, Amravati	(14) Raigarh, Ahmadnagar, Bhandara, Thane, Indhudurg, Satara, Bid, Washim, Latur, Buldana, Nashik, Gadchiroli, Ratnagiri, Gondiya
Manipur	0	(4) Imphal west, Imphal east, Thoubal, Bishnupur	(4) Churachandpur, Chandel, Ukhrul, Senapati	(1) Tamenglong
Meghalaya	(1) South garo hills		(1) East khasi hills	(2) West garo hills, West khasi hills
Mizoram	(1) Aizawl	(5) Champhai, Serchhip, Saiha, Lunglei, Kolasib,	0	(2) Mamit, Lawngtlai
Nagaland	0	(1) Kohima	(6) Zunheboto, Mokokchung, Phek, Wokha, Peren, Dimapur	(3) longleng, kiphire, tuensang
Orissa	0	puri	(4) jagatsinghapur, khordha, cuttack, nayagarh	(5) kendrapara, jharsuguda,anugul, ganjam, jajapur
Punjab	(1) jalandhar	(16) ludhiana, gurdaspur,patiala, hoshiarpur, kapurthala, rupnagar, sangrur, faridkot, bathinda, moga, barnala, amritsar, fatehgarh sahib, shahid bhagat singh nagar, sahibzada ajit singh nagar, tarn taran	(3) firozpur, muktsar, mansa	0
Rajasthan	0	0	(1) jhunjhunun	(9) ajmer, jaipur, ganganagar, sikar, kota, churu, hanumangarh, jodhpur, dausa
Sikkim	(4) south district,north district,west district,east district	0	0	0
Tamilnadu	(2) chennai, kanniyakumari	(15) coimbatore, kancheepuram, thiruvallur, the nilgiris, namakkal, tiruppur, erode, vellore, tiruchirappalli, theni, salem, karur, dindigul, madurai, thanjavur	(15) thoothukkudi, sivaganga, cuddalore, tiruvannamalai, virudhunagar, dharmapuri, thiruvarur, perambalur, ramanathapuram, tirunelveli, ariyalur, viluppuram, krishnagiri, nagapattinam, pudukkottai	0
Telengana	0	0	(2) hyderabad, rangareddy	(4) karimnagar, khammam, warangal, nalgonda
Tripura	0	0	(2) west tripura, south tripura	(1) dhalai
UP	0	0	(3) kanpur nagar, gautam buddha nagar, lucknow	(10) ghaziabad, jhansi, auraiya, baghpat, meerut, jalaun, etawah, varanasi, mainpuri, mathura
Uttarakhand	0	(2) dehradun, rudraprayag	(5) chamoli, nainital, garhwal, pithoragarh, uttarkashi	(6) tehri garhwal, bageshwar, champawat, almora, udham singh nagar, hardwar
West Bengal	0	(1) kolkata	(5) north 24 parganas, darjiling, nadia, hugli, purba medinipur	(2) haora, barddhaman

Source: Author's estimation using NFHS-4 Data

The vulnerable to poor group is assumed to be the most vital group, these districts are just below the national average line that means the probability of entering into the poor category (based on national average) is very high. The exogenous change of national average directly affects these districts. I find 117 districts belong to the 'vulnerable to

poor group'. The maximum districts of this vulnerable to poor group come from Karnataka, Maharashtra and UP.

3.6 Allocation of Development Grant: A Proposed Principle

One of the major objectives of our national planning process is to reduce regional imbalance in various dimensions of level of living of the people scattered around different geographical regions.

Strategy of inclusive growth covers various areas; however, here we have mentioned some important areas of intervention in connection with our problem in which our central government has been trying to address in different Plans:

- Reduction of regional imbalance across states (vis a vis districts) in respect of social (including healthcare institutions and educational infrastructure) and physical infrastructure (like road length, railway connectivity, availability of financial institutions and irrigation facility, availability of sustained power supply)
- Reduction of poverty especially mass human deprivation and to give equal access to opportunity in elementary education and health to all.
- Ensure social justice, equal opportunity and people participation in social, economic and political spheres of life.
- Reduction of social disparity and empowerment of marginalized community like Scheduled Caste, Scheduled Tribe, OBC and to ensure Gender equality

For example, an Expert Committee on decentralized planning for areas not covered under parts IX and IXA of the Constitution was set up by the Ministry of Panchayat Raj in September, 2006 and the Committee has identified about half of total number of districts in India (about 250 districts) are backward based on certain criterion as set by the Expert Group. This Backward Region Grant Fund (BRGF) aims to reduce regional imbalance in India by filling up critical gaps in local infrastructure and local needs, strengthening capabilities, facilitating participatory planning. The BRGF has fixed criteria towards allocating grants. In 2013, an expert committee under the chairmanship of Raghuram Rajan, the then Governor of RBI has formulated an allocation rule of fund[1] and it was submitted to the Ministry of Finance, Govt. of India [2014]. Allocation of

development grant among the states as suggested by the expert committee is based on (1) actual needs measured by underdevelopment index (which is derived from the outcomes of development parameters) weighted by population and area shares of respective states, (2) performance of the states and (3) a fixed share of the total development grant.

Devolution of fund adopted by the Finance Commission is more realistic compared to earlier BRGF rule of allocation, however it is criticized in many grounds like arbitrary selection of development parameters, differential weights assigned to different components of allocation of fund [Haldar and Raychaudhuri 2016; Bhattacharya and Haldar 2017]. Following the limitations of BRGF, I try to propose a rule of allocation that is expected to reduce regional imbalance across the districts in respect of multidimensional poverty. However, my present proposed rule of allocation of development grant is motivated by the works done by Haldar et al [2016] and Bhattacharya et al [2017] but I could not adopt their methodology since it is beyond the scope of my research.

Case-1: Assume that in our federal structure only the central government allocates development grant. I also assume that development grant is extremely limited and only few districts can get it. How does the central planning authority disburse the fixed amount among the competing districts?

Under such circumstances, only few districts are entitled to have such limited funds. These are eight in numbers originated from Bihar, UP, MP and Orissa as mentioned earlier (Table 3.3). The multidimensional HCR of eight districts are known.

Total number of poor households of 8 districts is identified. Therefore, we follow the simple rule of allocation:

$$G_i = \frac{M_i}{\sum_{i=1}^{8} M_i} \times F \qquad (3.3)$$

where i=1, 2….8. M_i stands for number of multidimensionally poor households of the i-th district. F stands for total amount of central fund, G_i is the amount of grant received by the i-th district. If we consider the concentration of backward communities (SC, ST, OBC) as a criteria of allocating development grant, the above equation (3.3) needs

modification. Indeed, this is case of overlapping but such overlapping only ensures more allocation grant to the backward communities. In my subsequent chapter (viz. Chapter—4), I find that the proportion of multidimensionally poor is disproportionately concentrated among the backward communities. Therefore, I can suggest the following rule of allocating development grant in order to ensure justice:

$$G_m = \lambda\left(\frac{M_i}{\sum_i M_i}\right).\times F + (1-\lambda).SBC_i \times F \qquad (3.4),$$

where, $0<\lambda<1$ and share of backward community (SBC) of the i-th district is defined as:

$$SBC_i = \left[\frac{P_{SC_i} + P_{ST_i} + P_{OBC_i}}{\sum_i P_{SC_i} + \sum_i P_{ST_i} + \sum_i P_{OBC_i}}\right] \qquad (3.5)$$

Where, P_{SC}=total number of SC households, P_{ST}= total number of ST households and P_{OBC}=total number of OBC households.

Case-2 Assume that the development grant is not sufficient enough to cover all the districts lying above the cut-off value of MPI, 20.38. Our federal fund can accommodate more number of districts. In this case additional 30 districts are to be included along with earlier 8 districts. These 30 districts are identified from Table-3.2 (4^{th} column). Now, the same rule as suggested above (case-1) be implemented.

Case-3 Under this case, we assume that the central fund is sufficient enough. Therefore, all the districts (285) lying above the cut-off value are suggested to be included. The same rule of allocation is to be implemented as mentioned in case 1 and 2.

Now, how does a particular district allocate the development grant once it receives the federal fund? Once the district has received the fund following the above principle, that district can easily allocate that fixed amount of fund under different heads or dimensions like health, education and standard of living. Suppose the district *i* receives F_0 amount. How will the district allocate that F_0 among the three dimensions?

We have the data pertaining to number of poor households in each dimension, health, education and standard of living. Therefore, the district *i* will allocate the F_0 fund among the three dimensions using the following rule:

$$\text{Allocation of fund of District (i) in respect of education dimension} = \frac{P_E}{P_{Di}} \times F_0$$

$$\text{Allocation of fund of District (i) in respect of health dimension} = \frac{P_H}{P_{Di}} \times F_0$$

$$\text{Allocation of fund of District (i) in respect of health dimension} = \frac{P_{STD}}{P_{Di}} \times F_0$$

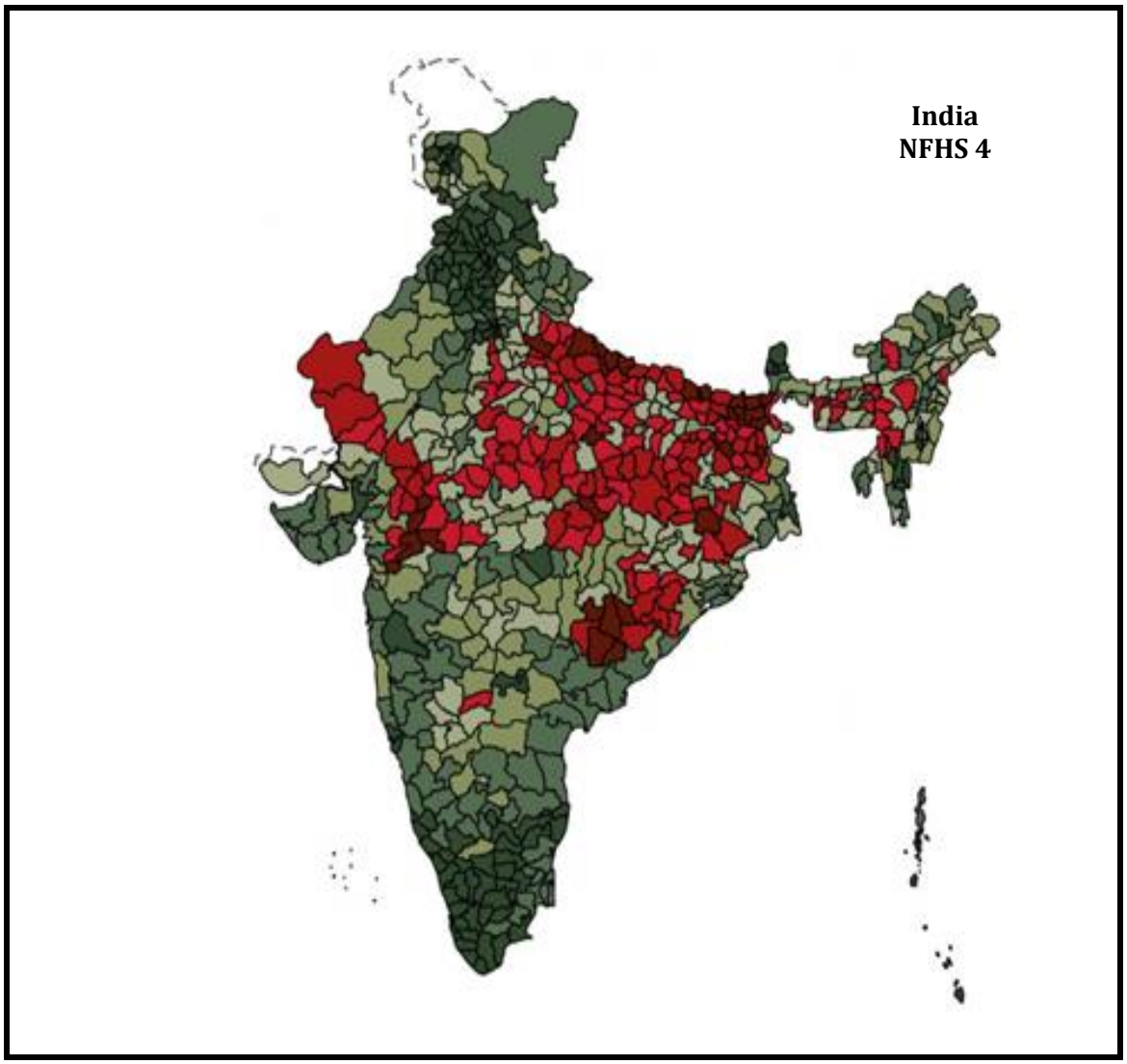
Where P_E=number of poor households in education dimension, P_H=number of poor household in health dimension, P_{STD}=number of poor households in standard of living dimensions and P_{Di}=total number of poor households in district *i.*

Case-4. The federal fund is well enough that can meet all the poor. Under these circumstances, we need to include all the 617 districts in the denominator in equation 3.4 and 3.5.

3.7 Summary

In this chapter, I have estimated the MPI and contribution of MPI across 617 districts in India. I find wide range of regional disparity in respect of MPI. The extremely poor districts are mainly located in Central and Western India like UP, Bihar, MP, Chhattisgarh, Jharkhand and Rajasthan. The multidimensional poverty among the more prosperous states is quite low, but Gujrat and Maharashtra are economically well of but I find some of the districts have been suffering from high MPI. The southern states in India are better-off in respect of concentration of MPI. I have suggested a rule of allocation of development grant that is practically feasible to implement. I believe if the fund is allocated according to my suggested principle, the question of social justice and equity may be ensured.

[1]Mapping of Districts MPI: Based on NFHS-4



As per NFHS-4 we can see 640 districts in India.

[2]Keeping regional backwardness as multidimensional in nature, an Expert Committee appointed by the Finance Commission (2013) first allocates funds across states based on needs in line with recommendations of the previous committees. Need is based upon simple index (using relative distance methodology) of underdevelopment comprising 10 parameters such as (i) monthly per capita consumption expenditure, (ii) education, (iii) health, (iv) household amenities, (v) poverty, (vi) female literacy rate, (vii) percent of SC/ST population, (viii) urbanization (ix) financial inclusion and (x) connectivity. The Committee proposes allocations based on index with allocations increasing more than linearly to the most underdeveloped states. In order to allocate more to

underdevelopment, it was recommended to assign 80 percent weight to the share of population and 20 percent share of area respectively to total. An incentive scheme known as performance of the states is also introduced. States experiencing in reducing underdevelopment over time are to be rewarded more compared to the states whose performance is bad. Given that poor administration or weak governance in a recipient state can fritter away allocated resources to the detriment of the population, there should be some recognition for effective governance and the efficiency of resource use.

CHAPTER-4

Multidimensional Poverty in India: Analysis Based on Socio-Ethnic and Religious Groups

Multidimensional Poverty in India: Analysis Based on Socio-Ethnic and Religious Groups

4.1 Introduction:

India has been witnessing high economic growth since the 1980s, and such a spectacular economic growth certainly contributes to the reduction of monetary poverty; even the poorer states experience a moderate reduction of money-metric poverty [Datt and Ravallion 2002; Agrawal 2015]; however, the reduction of poverty is not uniform across the states [Datt, Ravallion and Murgai 2016]. Numerous studies have conducted in India on money-metric poverty among different social groups and most of the studies unambiguously support that poverty is disproportionately concentrated among the backward communities [Haan 1997; Sundram and Tendulkar 2002; Thorat 2004a, 2004b, 2006; Thorat and Sadana 2009; Thorat and Dubey 2013; Gang, Sen and Yun 2008; Panagariya and Mukim 2013; Deb 2020]. But, very few studies have attempted to analyze multidimensional poverty among different socio---ethnic and religious groups in India. Therefore, I will first give a brief review of literature on multidimensional poverty among different social groups and thereafter try to explore the scope of my study by way of finding the research gaps.

I have analyzed the multidimensional poverty across states and districts in chapter-2 and 3 respectively. The factors contributing to multidimensional poverty are not a unique set for the entire country and do vary from state to state and even across the districts within a state. This chapter tries to highlight the issue of multidimensional poverty among different socio-ethnic and religious groups. Despite the reduction of multidimensional poverty over the decade (NFHS-3 to NFHS-4), some social issues remain unsolved, posing a serious threat to the future inclusive growth and social stability in the country. The major problem is that of exclusion of people from the provisioning of essential commodities and services, due to their lack of economic affordability. At the policy level, the concern about exclusion and discrimination is primarily because of its consequences for intergroup inequality and deprivation, in particular for the marginalized and socially excluded groups. Social exclusion essentially involve the process through which individuals or groups are wholly or partially excluded from full participation in the society within which they live, in this sense, it is social exclusion or opposite of social integration [Haan 1999]. In India, exclusion involves social processes that

exclude, discriminate, isolate and deprive some groups on the basis of group characteristics like caste and ethnicity [Thorat 2006]. The under privileged group is exploited and discriminated by other affluent group belonging to higher social hierarchy. A number of such oppressed social groups exist in India constituting a significant proportion of the population. These include untouchables, tribals, nomadic, semi-nomadic. The Scheduled Castes (SCs) and Scheduled Tribes (STs) constitute 16.2 and 8.2 per cent of India's population respectively [RGI, 2011]. However, the recent survey shows a higher proportion of SC and ST communities in India; the population of India is divided into several groups based on social, educational, and financial statuses. The formation of these groups is a result of the historical social structure of the country. As of 2019, Other Backward Class (OBC) constituted the largest part of the Indian population accounting for more than 40 percent; on the other hand, SC and ST formed 20 and 9 per cent of the population respectively [Statista 2019]. Using NFHS-2 and 3 data, Alkire and Seth [2015] have analyzed the reduction of multidimensional poverty across different population sub-groups like caste (viz. SC, ST) and religion. They find a strong reduction in national poverty and each of its dimensions, but this has not been uniform across regions, castes, or religions; they notice slower progress for most of the poorest groups and the poorest group belongs to backward communities [Alkire and Seth 2015].

4.2 Scope and Objectives of the Present Study

It is generally argued that the SC and ST communities are mostly socio- economically backward; as a result the poverty is also found to be high among them. In the previous chapter where I have found that the incidence of multidimensional poverty is disproportionately high in some of the states like Bihar, Jharkhand, and Madhya Pradesh and it persists over time, but what I have found that, poorer states do not always manifest higher concentration of backward community. From NFHS-3 and NFHS-4 data, I have found that Sikkim is one of the smaller states which score very low in respect of MPI and has been performing well compared to the other states. But Sikkim constitutes 46% of SC and 11% of ST of its total population. That means total 57% of Sikkim's population belongs to the backward communities, however, Sikkim has performed very well in reducing the MPI. Alkire et al (2018) already studied the poverty scenario among the social (SC, ST, OBC and Others) and religious (Hindu, Muslim, Christian and Other) groups using NFHS-3 and NFHS-4. They have identified high multidimensional HCR

among SC (32.9%), and ST (50%); whereas 31% of Muslim populations are multidimensionally poor. Moreover, they observe that the poverty head count among Hindu and Christian are low [Hindu community 27.7% and Christian 16.1% according to NFHS-4]. They have noticed a significant progress of multidimensional poverty among the Muslims.

But, I find some limitations of their study. They could not find the multidimensional poverty contributions, the deprivation patterns of socio-ethnic and religious groups. Moreover they could not study the inequality of deprivation score among these socio-ethnic groups. I am trying to highlight these issues in respect of policy perspective, the target groups, where the appropriate measures are to be taken. Which social groups' need more attention in which indicator? This is to be explored in this chapter.

4.3 Empirical Analysis

4.3.1 Multidimensional Poverty among Socio-Ethnic Groups

India is a country with full of diversity where different types of cast and religions play a crucial role in framing the social development. Various development programmes had already been undertaken based on casts and religions to ensure inclusivity. Now, I am trying to understand the relative progress of poverty reduction among the social groups over time (NFHS-3 to NFHS-4). Following the methodology as outlined earlier (in Chapter-1 and 2), I have estimated multidimensional HCR, intensity, MPI, depth, severity and contributions of different dimensions of MPI among the social groups over two time points. This is reported in Table-4.1.

Table 4.1: Multidimensional Poverty among SC, ST, OBC and General

	SC		**ST**		**OBC**		**GEN**	
	NFHS 3	**NFHS 4**	**NFHS3**	**NFHS 4**	**NFHS 3**	**NFHS 4**	**NFHS 3**	**NFHS 4**
HCR	55.06	46.03	56.70	45.71	49.44	42.22	34.76	32.03
Intensity of Poverty	52.46	50.65	55.63	53.16	51.26	48.67	47.89	45.44
MPI	28.89	23.31	31.55	24.30	25.34	20.57	16.65	14.54
Depth	0.328	0.241	0.390	0.271	0.266	0.191	0.153	0.111
Severity	0.331	0.208	0.431	0.250	0.257	0.156	0.140	0.086
Education contribution	0.250	0.200	0.297	0.230	0.248	0.178	0.214	0.148
Health Contribution	0.404	0.498	0.308	0.429	0.414	0.543	0.486	0.613
Standard of Living Contribution	0.344	0.300	0.394	0.340	0.337	0.278	0.299	0.238

Author's estimation

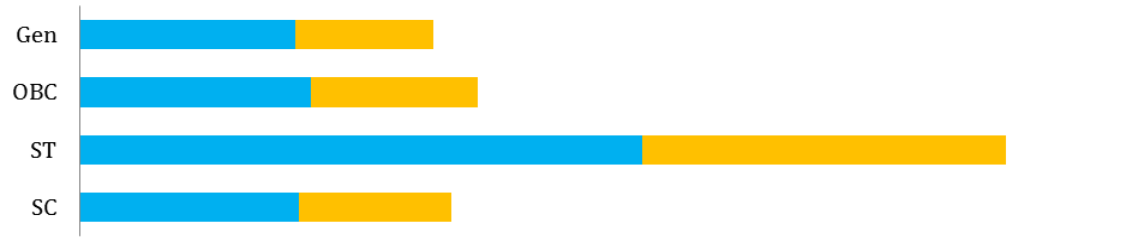
All the socio-ethnic communities have experienced a decline of the multidimensional poverty HCR; however, the rate of decline is not found to be uniform. This is due to higher initial base values. All the backward communities still have been witnessing a higher HCR (above 40 percent). The general communities (comprising Muslims) do have a lower HCR compared to backward communities. During NFHS-3 to NFHS-4, neither of any social groups is capable to reduce the intensity of poverty less than 45 including the general category. The intensity of poverty exceeds 50 in SC and ST community; however, a slight improvement was noticed among OBC community. The MPI is reduced remarkably among the SC and ST communities during the decade (NFHS-3 and Nhhs-4). Our results are consistent with the earlier findings of Alkire et at 2018. The maximum depth of deprivation score of multidimensional poverty is found among the ST community followed by SC; however, the maximum reduction was witnessed among the ST community. The minimum depth and severity of deprivation score was noticed among the general category. The interesting phenomena are that the depth and severity of deprivation score (DS) move in the same direction. This is a major concern and it creates a major obstacle towards attaining inclusivity. The analysis of multidimensional poverty contribution unambiguously supports that health contributes a major share of deprivation in MPI and it is invariant over socio-ethnic groups and over time (NFHS-3 and 4). The 2nd contributing factor is standard of living which is disproportionately found among the ST and SC communities. What is the striking result in assessing the contribution of three dimensions of MPI over time? The most surprising and alarming fact is that the contribution of health in MPI has been increased over time across all socio-ethnic groups though all the groups have experienced a decline of MPI over time!

4.3.1.1 Indicator Specific Deprivation among Socio-Ethnic Groups over Time (NFHS-3 to NFHS-4)

Using unit level data of NFHS-3 and 4, I have estimated percentage of households deprived in each indicator under each of three dimensions. This is analyzed across different socio-ethnic groups as mentioned above. Indicator specific relative progress (or deterioration or stagnation) over time across social groups is helpful for policy formulation. Which community does need to improve more and in what indicator? We can easily identify from the following analysis.

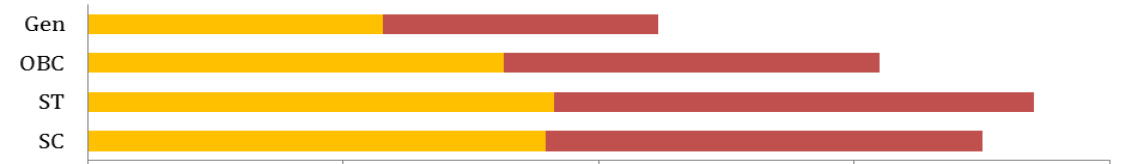
Deprivation Pattern among socio-ethnic groups under Standard of Living Dimension over time (NFHS-3 to NFHS-4).

Fig. 4.1 Households Not access to safe Drinking Water(%)



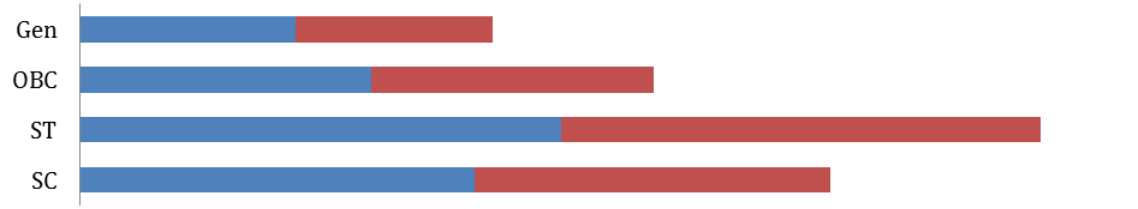
	SC	ST	OBC	Gen
NFHS 3	15%	37%	15%	14%
NFHS 4	10%	24%	11%	9%

Fig. 4.2 Households Using 'Dirty' Cooking Fuel(%)



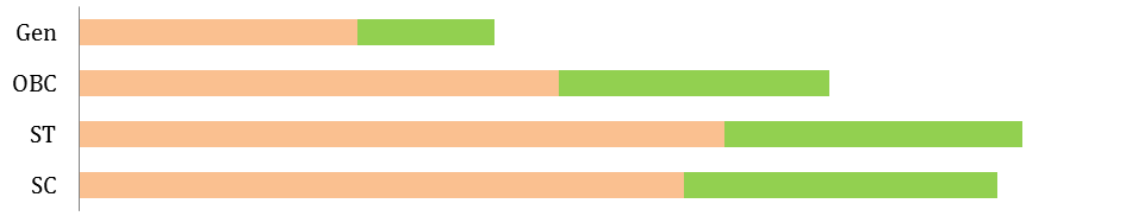
	SC	ST	OBC	Gen
NFHS 3	72%	73%	65%	46%
NFHS 4	68%	75%	59%	43%

Fig.4.3 Households having Dirt Floor Material(%)



	SC	ST	OBC	Gen
NFHS 3	52%	64%	39%	29%
NFHS 4	47%	64%	38%	26%

Fig. 4.4 Households having no access to electricity(%)

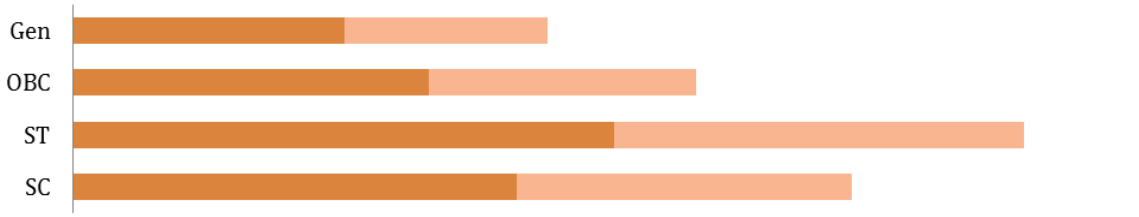


	SC	ST	OBC	Gen
NFHS 3	29%	31%	23%	13%
NFHS 4	15%	14%	13%	6%

Fig. 4.5 Household not having access to improved Sanitation(%)

	SC	ST	OBC	Gen
NFHS 3	65%	64%	59%	35%
NFHS 4	61%	60%	51%	30%

Fig. 4.6 Households Asset Deprivation(%)

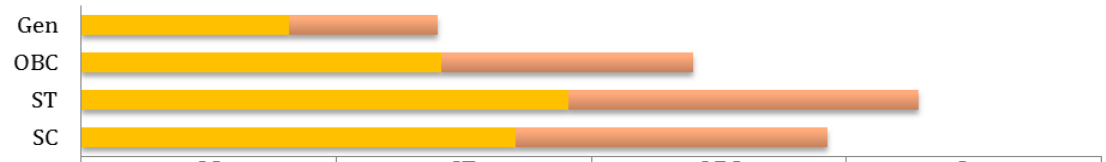


	SC	ST	OBC	Gen
NFHS 3	34%	41%	27%	21%
NFHS 4	25%	31%	20%	15%

The indicator specific analysis of deprivation patterns over time (NFHS-3(2005-06) to NFHS-4(2015-16)) clearly show that all the groups have performed well except ST community in respect of few indicators. The percentage of household using dirty cooking fuel is found to be rising over the decade in ST community; no improvement was noticed in respect of 'dirt floor'. The OBC community could not improve its position in respect of 'dirt floor' indicator. Now, I investigate the picture in respect of education dimension as shown in Fig. 4.7 and 4.8.

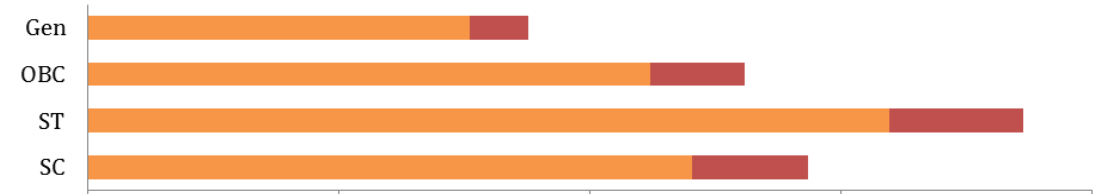
Deprivation Pattern among socio-ethnic groups under Education Dimension over time (NFHS-3 to NFHS-4)

Fig. 4.7 Households not yet completted 6 yrs of Schooling(%)



	SC	ST	OBC	Gen
NFHS 3	30%	33%	25%	14%
NFHS 4	21%	24%	17%	10%

Fig. 4.8 Households experience non-enrolment of school-aged child(%)

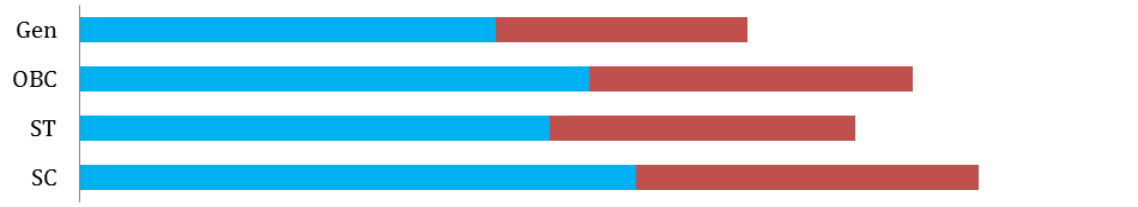


	SC	ST	OBC	Gen
NFHS 3	24%	32%	22%	15%
NFHS 4	5%	5%	4%	2%

The households have drastically improved in indicators under education dimension; however, much improvement is needed in respect of the indicator of '6 years of schooling' among the SC and ST community. The indicators under heath dimension are shown in Fig. 4.9 and 4.10. All the communities were capable to improve their positions over the decade in respect of health dimension of MPI; however, much improvement is needed among the backward communities in respect of nutritional status of the children.

Deprivation Pattern among socio-ethnic groups under Health Dimension over time (NFHS-3 to NFHS-4

Fig. 4.9 Households experiencing deprivations in Malnutrition(%)



	SC	ST	OBC	Gen
NFHS 3	48%	40%	44%	36%
NFHS 4	29%	26%	28%	22%

4.10 Households experiencing child Mortality

	SC	ST	OBC	Gen
NFHS 3	9%	9%	8%	6%
NFHS 4	2%	2%	2%	1%

It is surprising to note that the proportion of malnourished children is high among the SC and OBC group compared to ST community in NFHS-4. The proportion of households experienced a very low mortality in NFHS-4 compared to NFHS-3. Indeed it is a welcome move in our health sector. The mortality figure do not vary across the social groups, it is found to be equal (2%) in all groups except general category.

4.3.1.2 Inequality of Deprivation Score (DS) among Socio-Ethnic Groups

Decomposition of inequality of deprivation scores (DS) among the socio-ethnic groups reveals that within-group inequality is more pronounced and robust compared to between groups. Disaggregated results about the inequality of deprivation score reveal exciting findings. The inequality of deprivation score is found to be increasing with social hierarchy; it is found to be maximum among the general caste (viz. higher caste in our

society) followed by OBC, the least inequality of deprivation score is found among the ST community.

Table-4.2 Decomposition of Inequality of Deprivation Score (DS)

	NFHS 3		NFHS 4	
Caste	**Within Inequality**	**Between Inequality**	**Within Inequality**	**Between Inequality**
	0.204	0.002	0.292	0.003
Caste-wise Group	**Theil Index**	**Pop. Share**	**Theil Index**	**Pop. Share**
General	0.221	0.292	0.270	0.180
OBC	0.203	0.347	0.235	0.391
SC	0.181	0.191	0.222	0.202
ST	0.183	0.159	0.217	0.219

Source: Author's estimation

I could not analyze the underlying reasons of such results. During a decade (from 2005-6 to 2015-16), within inequality of deprivation score (DS) has increased but all the socio-ethnic groups have experienced a decline of multidimensional poverty! This is a striking result which needs to be taken seriously from policy issues. One plausible explanation could be the differential variations of multidimensional poverty in one hand and differential initial (base) values of poverty among different population sub-groups on the other hand. The inequality of deprivation score among the households belonging to SC and ST communities are found to be low (compared to general and OBC) because of the homogeneity of socio-economic profiles.

4.3.2 Multidimensional Poverty among Religious Groups

In this section, I study multidimensional poverty among the different religious groups over time using NFHS-3 and NFHS4. This is a disaggregate study based on religion and it helps us to understand the dynamics of multidimensional poverty among the religious groups in India. This is shown in Table-4.3. For the sake of simplicity, we have classified the total population into four different religious groups: Hindu, Muslim Christian and others. Under the 'Other' religion category, we have included Sikh, Buddhist, Jain, Jewish, Parsi etc. In the NFHS-4 survey data, around 75% of households are Hindu whereas 12% is Muslims, 8.16% is Christians and the rests are comprised of different religions.

Table 4.3: Multidimensional Poverty among Religious Groups

	Hindu		Muslim		Christian		Other	
	NFHS 3	NFHS 4	NFHS 3	NFHS 4	NFHS 3	NFHS 4	NFHS 3	NFHS 4
Population Share	73.39	74.55	12.25	12.15	9.21	8.16	5.15	5.14
HCR	46.86	42.20	50.28	45.06	38.72	29.80	36.83	27.10
Intensity of Poverty	51.31	49.66	52.81	49.63	49.94	48.07	49.02	43.99
MPI	**24.04**	**20.97**	**26.55**	**22.65**	**19.33**	**14.35**	**18.05**	**11.92**
Depth	0.254	0.204	0.307	0.220	0.185	0.137	0.178	0.093
Severity	0.257	0.173	0.315	0.203	0.168	0.109	0.168	0.065
Education contribution	0.227	0.177	0.326	0.239	0.284	0.225	0.274	0.211
Health Contribution	0.432	0.527	0.359	0.496	0.323	0.452	0.390	0.560
Standard of Living Contribtn	0.340	0.294	0.314	0.264	0.392	0.321	0.335	0.228

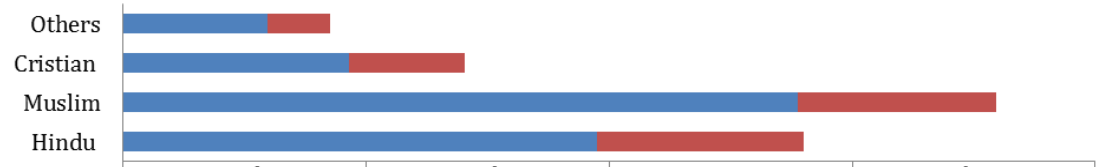
Source: Author's estimation

We find that the head count ratio (HCR) as well as the MPI is found to be maximum in Muslim community followed by Hindu; it is comparatively low among the Christian and 'Other' communities. Similarly, the depth and severity of poverty is also high in Muslim community whereas it is found to be low among the Christian and others. It is interesting to note that the SC and ST belong to Hindu religion; whereas OBC category belongs to both Hindu and Muslim. This disaggregated picture highlights that the multidimensional poverty is high among the OBC category (as pointed out earlier) where the case of overlapping of religion does exist. The health component plays a major role towards contribution of MPI and it is found to be true across all religious groups. Over time, all the religious groups have improved their positions but the relative progress towards reduction of multidimensional poverty suggests that the Muslim community needs to improve.

4.3.2.1 Indicator Specific Deprivation among Religious Groups over Time (NFHS-3 to NFHS-4)

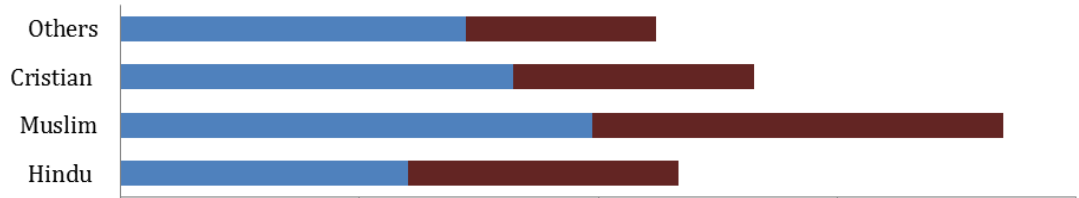
Now, we go for analyzing indicator specific deprivation of multidimensional poverty across the religious groups. The Muslim community could not progress well in respect of sanitation, dirt floor, 6 years of schooling and malnutrition during the decade (NFHS-3 to NFHS-4) though the community has remarkably performed in reducing deprivation of electricity, safe drinking water, asset owning, school enrolment and child mortality.

Fig. 4.11 Households having no access to Electricity(%)



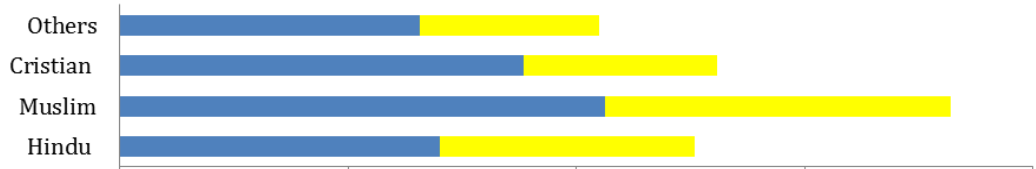
	Hindu	Muslim	Cristian	Others
NFHS 3	29.28	41.61	13.96	8.94
NFHS 4	12.75	12.25	7.11	3.84

Fig. 4.12 Households not having access to improved sanitation(%)



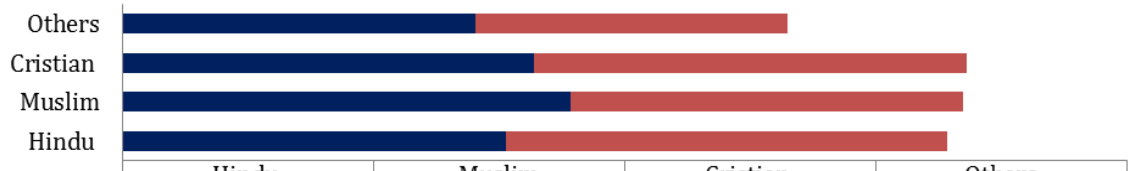
	Hindu	Muslim	Cristian	Others
NFHS 3	30.12	49.33	41.05	36.21
NFHS 4	28.27	42.96	25.23	19.84

Fig. 4.13 Households using dirt floor meterial (%)



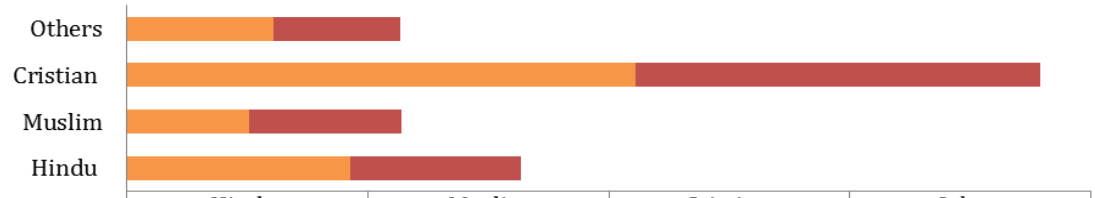
	Hindu	Muslim	Cristian	Others
NFHS 3	35.01	53.13	44.23	32.87
NFHS 4	27.92	37.85	21.23	19.67

Fig. 4.14 Households using dirty cooking fuel(%)



	Hindu	Muslim	Cristian	Others
NFHS 3	53.41	62.45	57.39	49.19
NFHS 4	61.61	54.75	60.27	43.61

Fig. 4.15 Household not access to having safe drinking water(%)

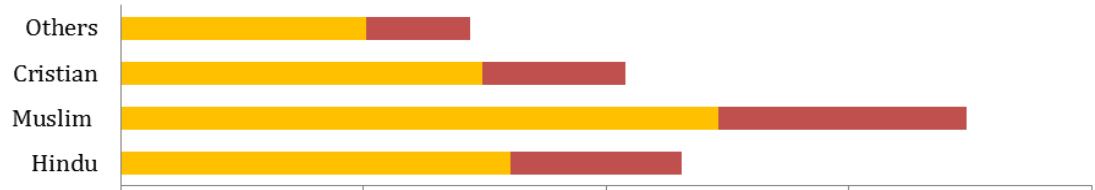


	Hindu	Muslim	Cristian	Others
NFHS 3	16.22	8.93	36.94	10.66
NFHS 4	12.39	11	29.37	9.2

Fig. 4.16 Households facing asset deprivation(%)

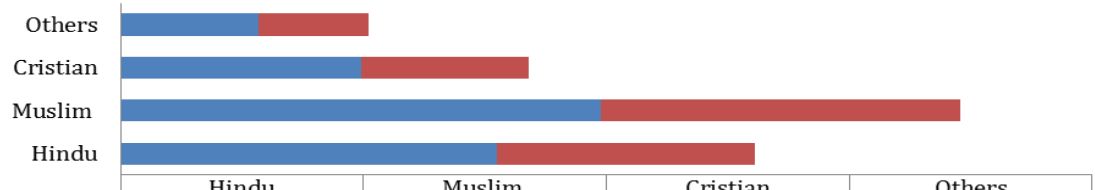
	Hindu	Muslim	Cristian	Others
NFHS 3	21.04	36.35	31.91	17.75
NFHS 4	21.45	25.56	26.47	11.51

Fig. 4.17 School aged child not enrolled(%)



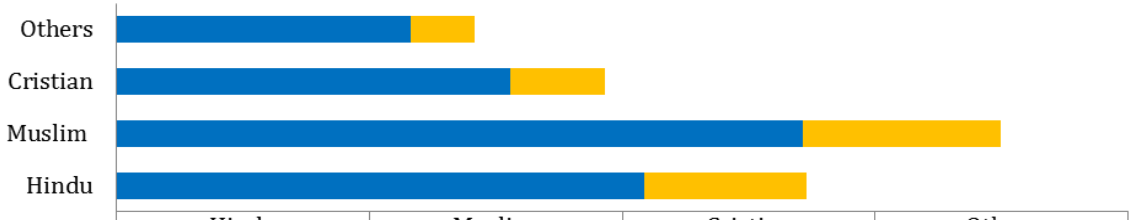
	Hindu	Muslim	Cristian	Others
NFHS 3	24%	37%	22%	15%
NFHS 4	11%	15%	9%	6%

Fig. 4.18 Households Not yet completted 6 yrs of schooling(%)



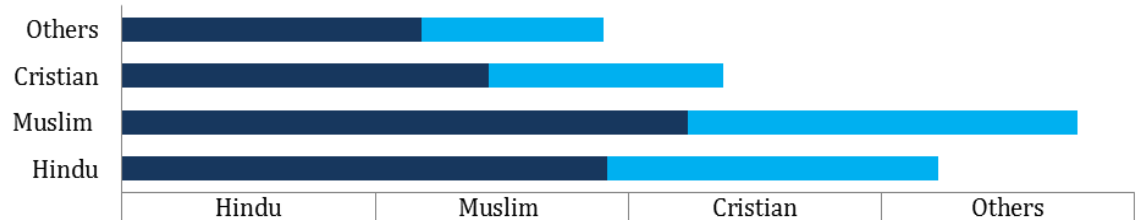
	Hindu	Muslim	Cristian	Others
NFHS 3	39%	49%	25%	14%
NFHS 4	26%	37%	17%	11%

Fig. 4.19 Households Experiencing Child Mortality(%)



	Hindu	Muslim	Cristian	Others
NFHS 3	10%	14%	8%	6%
NFHS 4	3%	4%	2%	1%

Fig. 4.20 Households Experiencing Malnutrition(%)



	Hindu	Muslim	Cristian	Others
NFHS 3	58%	67%	44%	36%
NFHS 4	39%	46%	28%	22%

4.3.2.2 Inequality of Deprivation Score of Multidimensional Poverty among different Religious Groups over Time (NFHS-3 to NFHS-4)

Just like previous section, we have estimated inequality of deprivation score (DS) of multidimensional poverty. It is revealed that the inequality of DS in 2015-16 (NFHS-4) has increased marginally compared to 2005-06 (NFHS-3). This is due to increase in within (religion) inequality compared to between (religions). We have estimated population share of the surveyed households of each religion of NFHS-3 and 4 as shown in column 3 and 5 in Table-4.4.

Table-4.4 Decomposition of inequality of Deprivation Score (DS) of Multidimensional Poverty based on Religious Groups: NFHS-3 and NFHS-4

	NFHS 3		**NFHS 4**	
	Within Inequality	**Between Inequality**	**Within Inequality**	**Between Inequality**
	0.225	0.002	0.236	0.001
Religious Group	**Theil Index**	**Pop. Share**	**Theil Index**	**Pop. Share**
Hindu	0.224	0.725	0.234	0.749
Muslim	0.221	0.133	0.231	0.121
Christian	0.243	0.091	0.255	0.082
Others	0.188	0.089	0.229	0.068

Source: Author's estimati

Chapter-5

Multidimensional Poverty in West Bengal: A Sub-State and Households Level Analysis

Multidimensional Poverty in West Bengal: A Sub-State and Households Level Analysis

5.1. Introduction:

In our district level analysis, we find that 11 districts lie above the national mean of MPI (viz. 20.38) out of 19 districts in West Bengal; this means that 57.8% districts of **West Bengal (WB)** are poor compared to national average. I must mention why West Bengal is chosen for our household level analysis of multidimensional poverty. I have chosen **WB,** because it is distinct from other Indian states especially in respect of geo-political, socio-cultural and agro-climatic conditions. The state WB has been sharing three international borders (with Nepal, Bhutan and Bangladesh) and five national borders with the states like Sikkim, Assam, Bihar, Jharkhand and Orissa. No other states in India do possess such unique features. Interestingly, all the border sharing states (except Sikkim) lag behind WB in respect of human development outcomes [UNDP India 2017]. This state was the only state in India where a stable Left-Front Government ruled about three decades and during this regime the 'land reform' was implemented; there was an expansion in irrigation and technological change as well. These reforms along with the assured crop share and bargadar's augmented venture in the land led to an increase in agricultural output [Banerjee and Ghatak 1998; Bagchi 1998, 2004; Khasnabis 2009]. Moreover, the prime objective of the Left-Front Government was to ensure equity and social justice, to protect the poor and under-privileged class of the society; therefore, it is expected that over time inclusive growth is to be ensured but WB has failed to achieve the desired goal of inclusivity in respect of social development outcomes. Alkire and Robles [2017] have estimated about 440million poor (multidimensionally) live in eight large Indian states; the eight Indian states that have a similar number of poor of 25 African countries are Bihar, Jharkhand, Madhya Pradesh, Uttar Pradesh, Chattisgarh, Odisha, Rajasthan and **WB**. It is disappointing to note that WB ranks 28th out of 36 states(including UT) in human development index [UNDP India 2017].Moreover, the state WB is full of socio-economic, ethnic, religious and geographic diversity that creates multiple clubs or groups of districts; space does matter towards formation of such clubs of districts [Hembram et al 2020] .Keeping in mind all these issues, we have carried out an indepth study of multidimensional poverty in WB where both districts as well as households are assumed to be the unit of analysis respectively.

The multidimensional poverty can be used as an analytical tool to identify the most vulnerable socio-religious groups; the present chapter is developed with a view to explore the most deprived zones in West Bengal. Moreover, the factors are identified that affect the probability of falling into multidimensional poverty at the household level. This can enable policy makers as well as development planners to identify the target groups, zones, the areas (viz. dimensions of MPI) and the factors in which priority is to be given in order to tackle the mass human deprivation.

5.2 Objectives:

Firstly, I have drawn the actual multidimensional poverty picture of the districts of West Bengal from NFHS-4 data which gives us the overview of the districts of WB in respect of multidimensional poverty.

My 2ndobjective is to estimate the incidence, depth and severity of multidimensional human deprivation score among different socio-ethnic groups and spatial zones in rural West Bengal. This is based on primary data.

The 3rdobjective is to explore the variations of deprivation score within and between different social groups and geographic zones.

The 4thobjective is to find out the determinants of multidimensional poverty among the surveyed households keeping in mind the problem of endogeneity.

5.3. Data, Sample Design and Econometric Model:

The present chapter uses both the secondary and primary data. The secondary data source is NFHS-4.Here I have considered 19 districts of WB.

The Primary Data relating to the household level characteristics are collected using multi-stage random sampling method as outlined below: I must mention here that the results of my primary data on MPI are drawn from our published paper [Roy, Ray and Haldar 2019] on multidimensional poverty.

Stage-1: We I have divide 19districts of West Bengal into three distinct geographical zones based on agro-climatic conditions, these are: Northern, Western and Southern. There are 7 districts in the Northern Zone, 5 districts belong to Western and rests belong to Southern Zone. Stage-2: Two districts are randomly chosen from each Zone. From the

Northern Region, we select Alipurduar and Coochbehar; from the West Region, we select PaschimMidnapore and Bankura and from the Southern Region, we choose South and North 24 Parganas.

Stage-3: We randomly choose one CD Block from each chosen district. The chosen CD Blocks: Sandeshkhali from North 24Parganas, Patharpratima from South 24 Parganas, Daspur-1 from West Midnapore, Hirbandh from Bankura, Kalchini from Alipurduar and Dinhata from Cooch Behar.

Stage-4: Once the Blocks are randomly chosen, we purposively choose two Gram Panchayats (administrative village units)-one is the most developed and the other is the least developed based on female literacy rate for the year 2011 Census, Government of India.

Stage-5: We employ systematic sampling in choosing 5 villages (from each Gram Panchayat) so that adequate distance is ensured from one village to another.

Stage-6(Final): Finally, we randomly choose 20 households having at least one living child from each chosen village. Thus, from one district, we have selected 200 (=2 x 5 x 20) households. Since we have six districts, therefore, the total sample size is **6 x 200=1200**.

To calculate the multidimensional poverty, incidence, depth and severity, we have used the same methodology as outlined in my earlier chapters. If the household's deprivation scores on multidimensional poverty lie between 0 to 33.33, then the household will not be treated as multidimensional poor(MP). Thus, the MP scores for poor household vary from 33.33 to 10.

Under such circumstances, we apply Foster-Greer-Thorbecke (FGT) Index, assuming deprivation cut-off, 33.33(=x^*). The FGT Index is considered as a generalized measure of poverty because it captures incidence, depth and severity of poverty for various values of sensitivity parameter (α)[Foster-Greer-Thorbecke 1984; Roy et al 2019].

The FGT Index is defined as:

$$FGT\left(x;x^{*},\alpha\right)=\frac{\sum_{x_i>x^{*}}\left(x_i-x^{*}\right)^{\alpha}}{n\left(x^{*}\right)^{\alpha}} \tag{5.1}$$

x_i be the deprivation score of the i-th poor, x^{*} is defined earlier (=33.33) which is exogenously given, α stands for sensitivity parameter defining the FGT Index.

If we insert, α=0, we can get the "incidence" of poverty, thus,

$$FGT\left(0\right)=HCR=\frac{n^{*}}{n}\ldots. \tag{5.2}$$

if α=1, we obtain the second measure of poverty, viz., the poverty gap index(PGI) which indicates the "depth" of poverty:

$$FGT(1)=PGI=\frac{n^{*}\left(\bar{x}_p-x^{*}\right)}{nx^{*}}=HCR.R \tag{5.3}$$

where, $R=\frac{\bar{x}_P-x^{*}}{x^{*}}$, the mean deprivation score (DS) of poor households is $\bar{x}_P$.

When α=2, we get the poverty measure that reflects the "severity" of poverty and is given by:

$$FGT(2)=HCR\left[R^2+(1-R)^2CVP^2\right] \tag{5.4}$$

Here CVP is the coefficient of variation of deprivation score of the poor households. It can be proved that if α tends to infinity, then FGT will capture only one person who is the poorest of the poor. Following Roy et al (2019), we can proceed as:

FGT(α) can be expressed as:

$$FGT(\alpha)=\frac{\sum_{x^{*}>x_i}(x_i-x^{*})^{\alpha}}{n(x^{*})^{\alpha}}=\frac{1}{n}\sum_{i=1}^{n^{*}}\left(\frac{g_i}{x^{*}}\right)^{\alpha} \tag{5.5}$$

here $g_i=x_i-x^{*}$, and x_i is the deprivation score of the i-th poor. Equation (3.4) can be expressed as:

$$FGT(\alpha) = \frac{1}{n}\sum_{i=1}^{n^*}\left(\frac{g_i}{x^*}\right)^{\alpha} = \frac{1}{n}\sum_{i=1}^{n^*}K_i^{\alpha} \quad (5.6),$$

here, $K_i = \frac{g_i}{x^*}$

If incomes of the poor are arranged as $x_1 < x_2 < ....x_{n^*-1} < x_{n^*}$, therefore, $FGT(\alpha)_1$is defined as:

$$FGT(\alpha)_1 = \frac{1}{n}\left(\frac{g_1}{x*}\right)^{\alpha} = \frac{1}{n}K_1^{\alpha} \quad (5.7),$$

thus: $\frac{FGT(\alpha)_1}{FGT(\alpha)} = \frac{\frac{1}{n}K_1^{\alpha}}{\frac{1}{n}\sum_{i=1}^{n^*}K_i^{\alpha}} = \frac{K_1^{\alpha}}{K_1^{\alpha}+K_2^{\alpha}+.....K_{n^*}^{\alpha}}\ldots$ (5.8).

We obtain:

$\frac{FGT(\alpha)_1}{FGT(\alpha)} = \left[1+\left(\frac{K_2}{K_1}\right)^{\alpha}+\left(\frac{K_3}{K_1}\right)^{\alpha}+.....\left(\frac{K_{n^*}}{K_1}\right)^{\alpha}\right]^{-1}$ ….(5.8) Expanding (5.8) and taking the limit

$\alpha\rightarrow\infty, \frac{FGT(\alpha)_1}{FGT(\alpha)} = 1$, this proves that $FGT(\alpha)_1$=FGT(α). Here, $FGT(\alpha)_1$ stands for the poorest of the poor.

Now, in order to find out the determinants of MPI among different socio-ethnic groups, the following IV Probit regression is to be applied:

$$\Pr(poor = 1) = \Phi\begin{pmatrix}\beta_0 + \beta X + \gamma Y + \delta_1 D_1 + \delta_2 D_2 + \delta_3 D_3 + \delta_4 D_4 + \delta_5 D_5 + \delta_6 D_6 + \delta_7 D_7 \\ + \delta_8 D_8 + \delta_9 D_9 + \delta_{10} D_{10} + \delta_{11} D_{11} + \delta_{12} D_{12}\end{pmatrix}$$

Φ *is the cumulative normal distribution,*

We define a household is multidimensional poor, poor=1, if multidimensional deprivation score exceeds 33.3 and 0 otherwise.

Here, Y_i=Per capita consumption,

$$x = \begin{bmatrix}\text{AGM}\\ \text{DHC}\\ \text{PHC}\\ \text{DMK}\\ \text{NEAR}\end{bmatrix}$$

AGM=mean age at marriage of the females in a family , We also hypothesize that probability of being poor in *MP* is influenced by publicly provided infrastructure like distance of primary school (DHC), distance of PHC (primary health centre), distance of permanent market place (DMK) and number of earning members (NEAR).

There are 3 socio-ethnic groups, SC, ST, and others; therefore we introduce two dummies, D_1 and D_2 in the above ivprobit model. We expect that existence of a ofpucca-road/motorable road from residence (AR) will reduce the probability of MDP. The dummy variable D_3 =1, if there is a pucca/motorable road and zero otherwise. We have introduced two occupational dummies (D_5 and D_6) for agricultularlabourer (AGR) and for cultivators (CUL) respectively, assuming other occupations as reference category. We have also introduced two regional dummies D_7(for North) and D_8(for West) assuming south region as reference category. Membership of the female member to any self-help group (SHG) is expected to affect MPI. Thus, D_9=1 if any female member of the family is attached to Self Help Group, 0 otherwise. If a family member has received any financial benefit (FB) from the government then that should reduce the probability of being multi-dimensionally poor. D_{10}=1 if the family as whole or any family member has received any financial benefit from the government, 0 otherwise. We assume that treatment received from types of medical practitioner affect MPI. For this reason we have introduced two dummies D_1 and $D_{12}$for treatment received from semi medical practitioner (SMP) and quack respectively assuming others as reference category. Here, household is to be taken as unit of analysis; the parameters of the probit are to be estimated by MLE method. The problem of endogeneity between income and MPI is also addressed here.

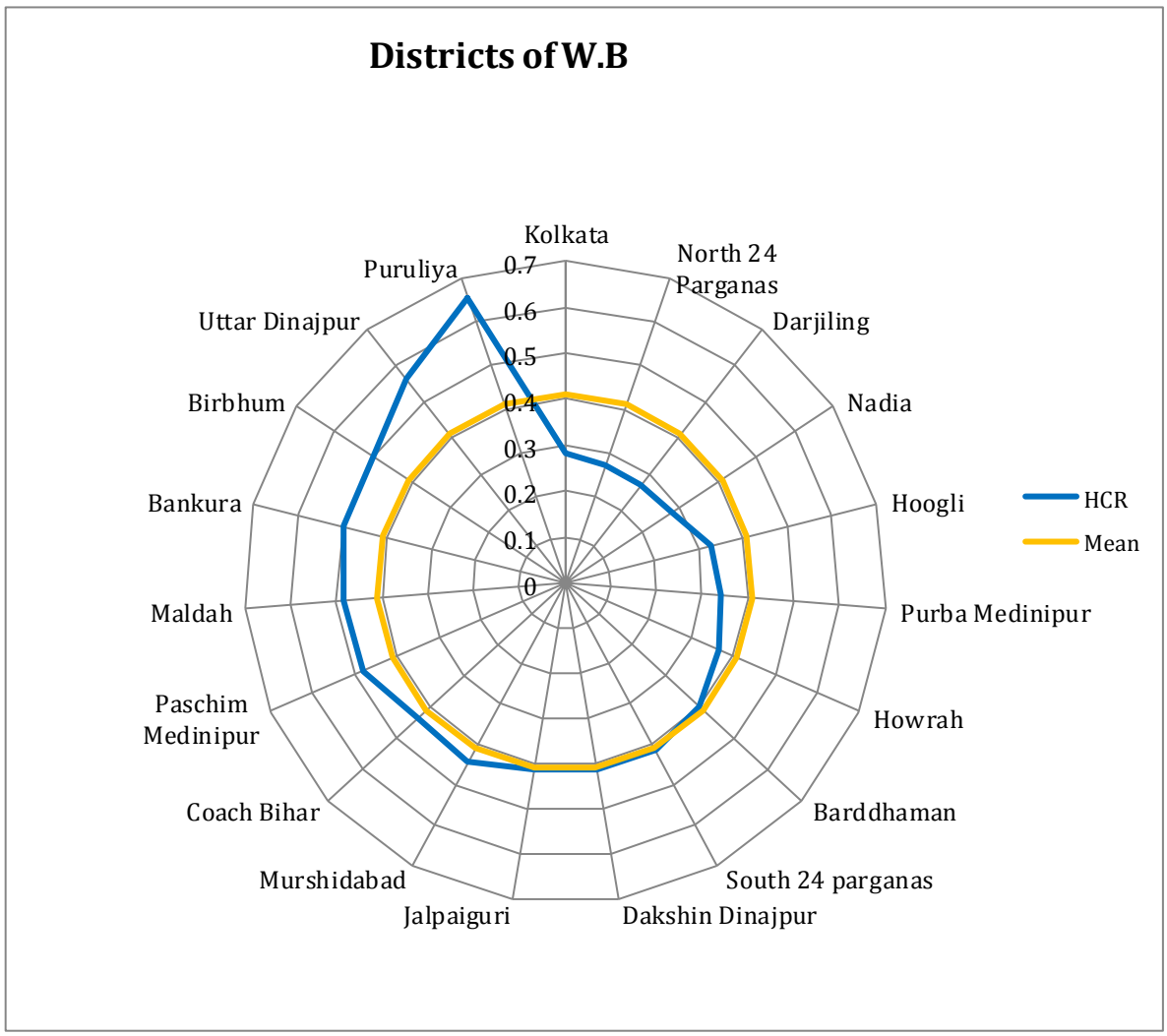
5.4. Findings from District Level Data [NFHS-4]

I have calculated the MPI and its components for 19 districts of West Bengal and divide them into four categories in respect of MPI score using NFHS-4 Data. Except the lowest MPI category, each category has 5 districts in each group.

Puruliya, Uttar Dinajpur, Bankura, Birhum and Maldah are the districts belonging to the highest MPI group, and they are having more than 50% of their population are multidimensional poor except Maldah.

On the other hand Kolkata, Darjeeling, North 24 Parganas and Nadia are the lowest MPI districts.

Fig. 5.1 Dispersion of Districts over mean HCR



Map-5.1 District wise Incidence of Multidimensional Poverty

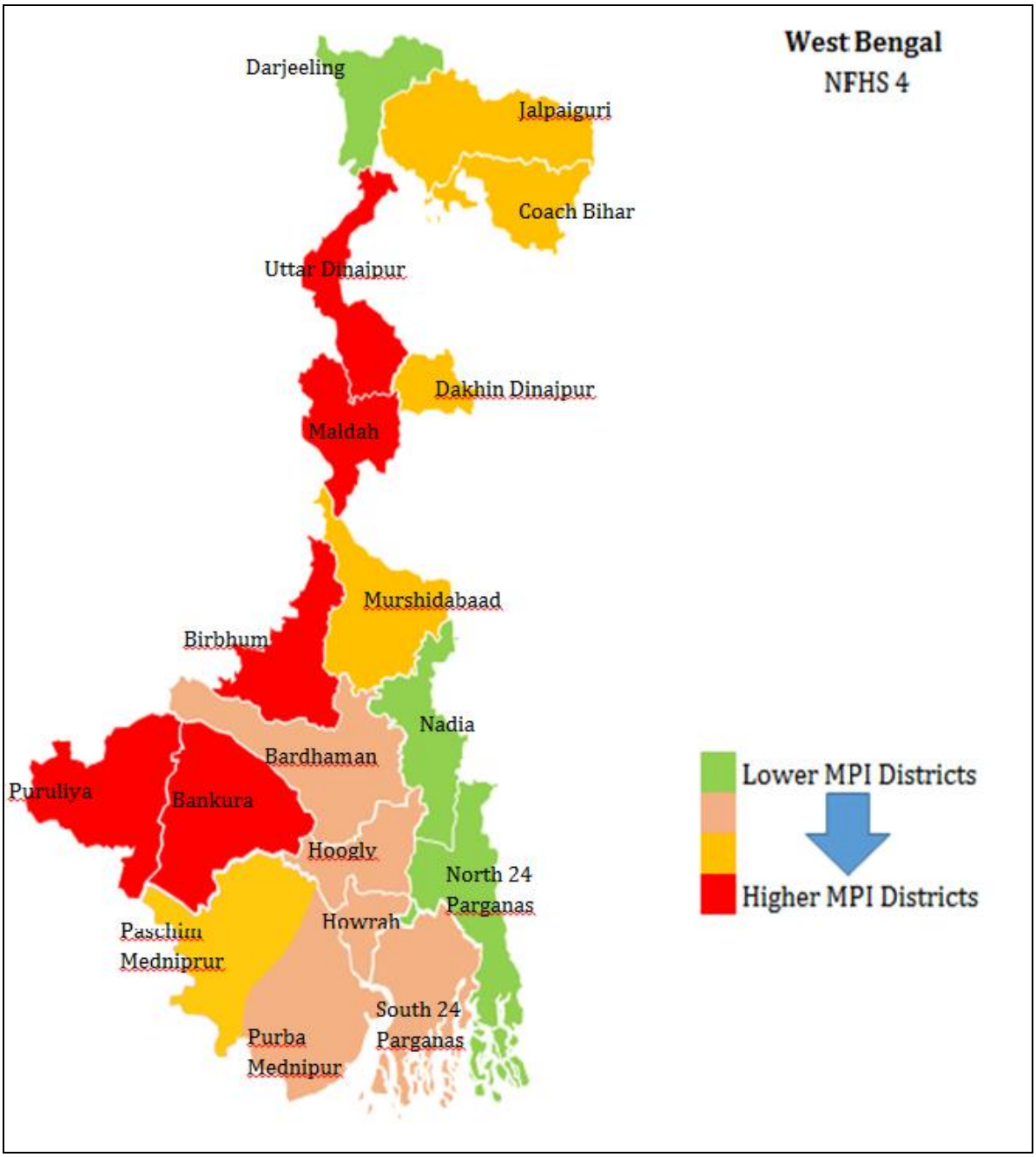


Table 5.1: District level Multidimensional HCR, Intensity, MPI, Depth and Severity across 19 Districts in West Bengal.

District	HCR	Intensity	MPI	Depth	Severity
Darjiling	0.27	45.211	12.161	0.106	0.094
Jalpaiguri	0.41	51.394	21.124	0.227	0.192
Coach bihar	0.44	51.44	22.477	0.263	0.235
Uttar dinajpur	0.56	51.989	29.291	0.319	0.309
Dakshindinajpur	0.41	50.372	20.769	0.235	0.187
Maldah	0.48	50.457	24.337	0.27	0.221
Murshidabad	0.45	49.014	21.812	0.216	0.168
Birbhum	0.5	51.518	25.797	0.297	0.266
Barddhaman	0.4	48.41	19.256	0.195	0.179
Nadia	0.28	45.34	12.69	0.112	0.071
North 24 parganas	0.27	42.953	11.677	0.077	0.047
Hugli	0.33	45.644	14.983	0.125	0.095
Bankura	0.5	50.878	25.385	0.281	0.239
Puruliya	0.66	55.699	36.608	0.458	0.449
Haora	0.37	44.805	16.481	0.125	0.098
Kolkata	0.28	38.282	10.879	0.043	0.025
South 24 parganas	0.42	49.189	20.472	0.199	0.148
Paschimmedinipur	0.48	50.331	24.127	0.255	0.196
Purbamedinipur	0.34	46.683	15.834	0.15	0.1

Source: Authors' estimation from NFHS-4 Data.

After analyzing the poverty scenario of the above 19 districts, I have noticed that like different states the deprivation patterns of the districts also vary to a large extent. To eradicate the poverty, poverty contribution (Appendix 5.1) and deprivation patterns are very much important for policy prescription.

In the next table (Table 5.2) where I have identified two districts belonging to the highest MPI groups, Uttar dinajpur and Birbhum, but there exists a wide range of disparity in deprivational pattern. In Uttar Dinajpur, 46.43% of population is deprived in cooking fuel, whereas 82.22 % populations are deprived in same category in Birbhum. Not only cooking fuel but also in sanitation, asset, or many more indicators show huge differences. Each and every district has different deprivation pattern.

Similarly, I have noticed the differences of deprivation among the districts belonging to the lowest MPI group (like Kolkata, Darjeeling). A considerable size of the population of Darjeeling is deprived in cooking fuel, whereas the deprivation scenario of Kolkata in cooking fuel is quite better.

Table 5.2: percentage of population deprived in each Indicator

W. B districts	Electricity	Drinking Water	Sanitation	Cooking Fuel	Floor	Asset	6yrs of Schooling	School Attend	Mal-nutrition	Child Mortality
Darjeeling	6.92	36.92	63.85	92.19	51.94	47.69	26.15	2.31	17.6	6.36
Jalpaiguri	37.08	35.96	66.29	90.45	62.15	43.82	19.66	1.69	19.99	9.93
Uttar Dinajpur	7.14	2.38	39.52	46.43	61.95	56.67	19.05	1.6	37.5	1.8
Maldah	43.86	10.53	74.12	92.07	82.82	44.3	42.54	3.95	22.17	9.76
Murshidabadh	11.21	17.91	55.05	75.93	32.88	34.06	15.61	2.11	24.85	5.01
Birbhum	10.87	21.54	67.21	82.22	37.36	36.19	16.88	2.17	25.9	5.51
Bardwan	15.04	18.16	61.83	72.81	40.09	32.75	16.31	1.33	26.75	6.27
Nadia	9.22	21.11	51.29	60.63	28.43	28.04	16.78	0.86	21.75	5.45
North 24 Parg	3.91	14.83	45.96	68.47	33.42	22.85	12.56	0.94	18.27	4.09
Hugli	5.59	29	60.04	67.01	27.94	31.54	19.07	2.67	26.89	5.53
Bankura	6.67	21.72	62.93	73.31	30.12	32.88	12.54	1.49	29.3	5.76
Haorah	10.07	25.4	58.54	63.6	26.6	30.05	15.81	1.49	22.75	4.13
Kolkata	11.95	20.25	52.69	58.84	34.06	35.2	14.06	2.37	18.83	2.54
South 24 Parg	6.22	26.53	59.96	60.84	21.62	30.94	17.19	3.14	24.25	3.27

Source: Author's estimation from NFHS-4 Data.

5.5. Findings from Primary data

Scheduled Tribe and Scheduled Caste are the two backward classes and the Northern zone is the most backward zone of West Bengal in respect of socio-economic development. I have considered two districts from each zone of West Bengal and find that 28.56 percent of households from the Northern zone are poor from multidimensional perspective. Among the social class, I find that the MPI is highest among the Scheduled Tribes followed by Scheduled Castes and least among the higher classes. Table 5.3 indicates that the multidimensional poverty varies inversely with the social class status of the households and the Northern part of West Bengal is the most backward in terms multidimensional poverty.

Table 5.3 Region and caste-wise multi-dimensional poverty in West Bengal

Category	MPI	EDUCATION	HEALTH	LIVING
West Bengal	16.527	0.2951	0.3274	0.3775
North zone	28.560	0.3359	0.3270	0.3371
West zone	11.875	0.1620	0.3704	0.4676
South zone	11.049	0.355633	0.2793685	0.365
Scheduled Caste	18.586	0.3135	0.3240	0.3625
Scheduled Tribe	22.989	0.2907	0.2972	0.4120
Higher Caste	11.832	0.283762	0.3625	0.3537

Source: Authors' own calculation

Next, I try to identify the contribution of different dimensions of MPI in total MPI. Overall West Bengal's scenario indicates that living standard is contributing the most to MPI followed by health and education, however, the contribution of different dimension vary across the regions. In Northern zone education, health and living standard are more or less equally contributed in MPI. The Western region requires more attention in improving living standard and health conditions; educational deprivation is relatively low in this region. The health dimension is relatively better in Southern region and education and living standard are contributing 1/3rd of overall MPI. We fail to pinpoint any particular factor as a sole cause of multidimensional poverty across all the regions of West Bengal. The empirical findings as reported in Table-5.1 help us in identifying the problem areas of a particular district of West Bengal. We identify that no particular dimension is solely responsible for multidimensional poverty.

The next objective was to test whether backward classes are deprived of any particular dimension of poverty or not. Living standard is identified as the main reason behind multidimensional poverty in the households belonging to backward classes (such as, Scheduled Caste and Scheduled Tribes). Educational deprivation is the least among all social groups. This result suggests that improving the living standard of the backward classes could be the key to reduction in multidimensional poverty among Scheduled

The Poorest of the poor of belongs to the Northern region. This again proves that the multidimensional poverty varies across regions and over the dimensions. Interestingly, proportion of poor households in terms of living standard is higher in the Western region compared to the Southern region of West Bengal. Incidence of poverty among the ST category is found to be very high over all dimensions of poverty. This again highlights that the ST is the most backward class in West Bengal.

Table 5.4 Region and caste-wise incidence, depth and severity of MPI in West Bengal

Category	Components of MPI	Incidence	Depth	Severity
West Bengal	Living	0.71167	0.34557	0.30152
	Health	0.4475	0.061	0.05523
	Education	0.34	0.05031	0.04616
	Overall	0.39083	0.12983	0.08921
North zone	living	0.765	0.40672	0.42264
	health	0.58	0.11388	0.10853
	Education	0.5275	0.12301	0.11934
	Overall	0.57	0.265	0.19968
West zone	Living	0.775	0.41313	0.31882
	Health	0.395	0.04888	0.04348
	Education	0.14750	0.00301	0.00006
	Overall	0.335	0.06123	0.03338
South zone	Living	0.595	0.21687	0.16311
	Health	0.3675	0.02026	0.01369
	Education	0.345	0.0249	0.01909
	Overall	0.2675	0.06325	0.03457
Scheduled caste	Living	0.6854	0.3767	0.3770
	Health	0.4143	0.0816	0.0777
	Education	0.3925	0.0716	0.0676
	Overall	0.4019	0.1776	0.1524
Scheduled tribe	Living	0.8838	0..5248	0.4583
	Health	0.4679	0.0751	0.0697
	Education	0.4159	0.0459	0.0399
	Overall	0.5413	0.1720	0.1023
Higher caste	Living	0.625	0.2213	0.1648
	Health	0.4547	0.0407	0.0335
	Education	0.2645	0.0405	0.0374
	Overall	0.3184	0.0831	0.0482

Source: Authors' own calculation from primary survey.

Decomposition of inequality of deprivation scores in various socio-ethnic and regional groups reveal that within-group disparity is more robust compared to between-group inequality. The population-weighted inequality of deprivation scores of different sub-groups (or strata) in respect of social class, viz: SC/ST/Other and region (North/ West

/South) are estimated as reported in Table 5.5. Disaggregated results about inequality of deprivation score reveal exciting findings.

The inequality of deprivation score is found to be the highest among the SC households followed by higher caste and least among the ST households. This is because the households belonging to ST communities are more or less homogenous compared to the households belonging to other communities. The inequality in deprivation score increases as we move from the North to West and from West to South. Thus, though we do not find any significant difference in deprivation score between the West and the Southern region but inequality in deprivation score is higher in Southern zone compared to the Western zone.

Table-5.5 Population-weighted Inequality of multidimensional deprivation score of different strata of Socio-Economic Groups

Socio-Economic Groups	Theil Index	Within group inequality	Between group inequality	Population Share
Social Class		0.151928	0.007945	
Scheduled Caste(SC)	0.199396			0.261139
Scheduled Tribe(ST)	0.104408			0.267155
Other caste	0.157329			0.471705
Region/Zone		0.137224	0.023075	
North	0.122935			0.297048
West	0.131572			0.354202
South	0.160904			0.348750
West Bengal	0.159245			

Source: Authors' estimation from the primary survey data of CAS-Economics, JU Project.

The empirical findings of the determinants of poverty are reported in Table-5.6. It shows that public infrastructure, Caste of the household, region and treatment from type of medical practitioner are important determinants of multidimensional poverty in West Bengal. Probability of falling into multidimensional poverty significantly increases with the increase in travelling distance to primary school and primary health center.

Table 5.6 IV Probit Estimates of determinants of Multidimensional poverty (Dependent variable: pr(poor=1) if deprivation score>=0.3333 & 0 otherwise)

Variables	Coefficient (Std. Err.)
Per capita monthly expenditure	-0.0006 (.0001)***
Age at marriage	-0.0135 (0.0137)
Public infrastructure	
Distance of Primary Health Centre	0.0243 (0.012)**
Distance of Primary School	0.1378 (0.0485)***
Approach road (No=1, Yes=0)	0.2171 (0.0882)**
Caste	
Scheduled caste dummy	0.0102 (.1003)
Scheduled tribe dummy	0.4780 (.0984)***
Medicaltreatment	
Quack	0.2668 (0.1483)*
Semi Medical Practitioner	0.2580 (0.0994)***
Number of earning members	-0.2414 (0.0662)***
Occupation	
Agricultural labourer	0.0621 (0.1409)
Cultivator	0.1085 (0.1456)
Distance of Market	0.0493 (0.0223)**
Member of self help group(Yes=1, No=0)	-0.0152 (0.0924)
Financial benefit received(Yes=1, No=0)	-0.0993 (0.0933)
Region	
North zone	0.9055 (.1101)***
West zone	-0.1523 (.1361)
Constant	0.1573 (.2886)
Number of obs = 1200, Log likelihood = -10246.30	Wald chi2(17) = 215.74**
Wald test of exogeneity (/athrho = 0): chi2(1) = 4.34 Prob> chi2 = 0.0373	

*Source: Author's own calculation from primary data of a project funded by CAS-Economics, JU. Note: Wald test of Exogeneity (H0:No Endogeneity) reject H0 at 95% level of confidence Instrumented: per capita monthly expenditure.*** significant at 99%; **significant at 95%; *significant at 90%*

The non-availability of concrete approach road also raises the chance of falling into multidimensional poverty. In the above analysis, we have identified that theprobability of MPI increases by 0.4780 points if a household belongs to the ST community compared to higher caste; practice of not going to visit to the registered medical practitioner also raises the chance of falling into multidimensional poverty. In West Bengal, the Northern zone is the most deprived zone in terms of multi-dimensional poverty**.**

The estimates (in Table 5.6) are therefore, consistent with the hypothesis that the problem of multidimensional poverty can be addressed not only by increasing the number of primary schools, primary health center all over West Bengal but government must concentrate on especially in Northern zone and Scheduled Tribe households**.** Age at marriage and membership of SHG do not play any significant important role in explaining multidimensional poverty of West Bengal. The 'Kanyashree' (popular scheme to raise women education by deferring early marriage) or any microfinance schemes are not found to be sufficient enough in reducing multidimensional poverty in West Bengal. The present study identifies that building new schools, hospitals and availability to registered medical practitioner in those hospitals are key to tackle the problem of multidimensional poverty.

5.6 Summary

There exits wide range of disparity of HCR (of MPI) across the districts of West Bengal. The maximum HCR (viz. 66%) is found in Purulia which belongs to Western zone of West Bengal, followed by Uttar Dinajpur where the HCR was found to be 56% and it belongs to Northern zone. The depth and severity of deprivation score (of poverty) captured by FGT Index clearly shows that the two districts like Purulia and Uttar Dinajpur are mostly deprived. It is to be mentioned here that the Uttar Dinajpur District is dominated by Muslim community whereas a considerable share of population of Purulia belongs to ST. Therefore, special care needs to be undertaken by the government to eradicate mass human deprivation found among the marginalized communities.

We can argue that same HCR or MPI of two or more districts may experience differential outcomes in dimension specific deprivation or indicator specific deprivations. The unique example is Birbhum and Uttar Dinajpur.

From our primary survey, we can conclude that the non-monetary measure of poverty (viz. MPI) is also caused by household income. The publicly provided infrastructure (school, PHC, road connectivity etc.) plays a significant role in reducing the MPI including the distance of market place from the residence (viz. higher the distance greater is the chance of falling into poverty). We find that households who visit semi medical practioners reduce the probability of falling into poverty; this is not a surprising result because of income effect; income indirectly plays a significant role in this context. The same result is found in case of number of earning members in a family. The probability of falling into poverty increases if the household belongs to ST community.

5.7 Fund Allocation

The Government of West Bengal can adopt the principle of allocation of funds across the districts. Here, I propose the same allocation rule (as mentioned in Chapter-3). The districts experiencing higher MPI (or HCR) compared to the mean of MPI (or HCR) are entitled to get more funds. The higher the MPI (or HCR) the more is the share of the fund. The population share of backward community needs to be taken care of while disbursing the funds. I can suggest 50 percent share is to be disbursed on the basis of share of aggregate poverty and the rest 50 percent is to be given based on population share of backward communities of the districts. Only those districts are to be considered that exhibit more than mean MPI(or HCR) of the state. However, if the fund is adequate and sufficient enough, then we can suggest all the districts in West Bengal.

Chapter 6

Concluding Observations

and

Policy Implications

Concluding Observations and Policy Implications

6.1 Conclusion

The overall study of multidimensional poverty in India with special reference to West Bengal is assumed to be comprehensive in nature. I have tried my level best to study the multidimensional poverty at the disaggregate level so that the policy makers can easily intervene adopting an appropriate policy with a view to reduce multidimensional poverty and to ensure inclusivity.

In Chapter-2, I have examined how India and her 29 states performed in reducing MPI over time asper NFHS data. The dynamics of MPI across states are studied in Chapter-2. The analysis of poverty has identified that Bihar, Chhattisgarh, Jharkhand, M.P and U.P are the five topmost states in respect of multidimensional poverty. The Rank Correlation Coefficient of the states in respect of MPI between different Rounds of NFHS-2, 3 and 4 are found to be highly (statistically) significant. The depth and severity of multidimensional poverty are also found to be very high among these states. But, the inequality of deprivation score is found to be different. The inequality of deprivation score is low among the high MPI states. In the dimension specific study of multidimensional poverty across the states convey that the contribution of health in multidimensional poverty is found to be higher compared to other two dimensions; but when we check the actual percentage of deprivation, we notice sanitation and cooking fuel are the indicators (of standard of living) in which maximum households are deprived. In case of identifying the determining factors of multidimensional poverty index, infrastructural development appears to be significant in reducing MPI. The physical infrastructure like road length and social infrastructure like primary health centre (PHC) play a significant role in reducing the MPI. However, the two flow variables like per capita education (PCEE) and health expenditure (PCHE) also reduce the MPI though PCHE does not appear to be significant in static panel data regression. The dynamic panel data regression clearly suggests that history does matter towards explaining multidimensional poverty. This means that current poverty is well explained by past periods poverty. The result of dynamic panel data regression helps us to understand the dynamics of vicious cycle of poverty. Fewer states in India do really suffer from the multidimensional poverty trap, though we could not prove this. However,

the extremely high value of rank correlation coefficient between MPI of states over the three rounds of NFHS clearly gives sufficient hints of poverty trap. The rank correlation coefficient between money-metric poverty and multidimensional poverty across the states over three time points (corresponding to NFHS-2, 3 and 4) is found to be positive and statistically significant but the relationship is not perfect. Generally, we can conclude that if a state exhibiting higher incidence of money-metric poverty experiences higher incidence of multidimensional poverty. The decomposition of inequality of deprivation score suggests that it mainly originates from within states rather than between states.

Indeed all the 24 states have experienced a decline of MPI but the major concern emerges due to poor performance of some major states like Bihar, Jharkhand, Chhattishgarh, MP, UP and Orissa. The incidence of multidimensional poverty is not only high in all these states rather the depth as well as severity of poverty is also high. Therefore, our conjecture of the existence of low level human development trap is, to some extent, valid because of the prevalence of higher values of depth and severity of multidimensional deprivation score among these states. It is interesting to note that all these states are spatially integrated. Therefore, development practitioner should keep this in mind of spatial dependence of multidimensional poverty while implementing any development programme.

Inadequate spending on health and education along with poor infrastructural availability aggravates the MPI; under federal structure the central government should have to take initiative to reduce mass human deprivation found in some major states like Bihar, Jharkhand, Chattishgarh, MP, UP, Orissa and Assam. Therefore, our success of attaining inclusive growth largely depends on the poverty reduction of poorer states since all these states contribute roughly about 50 percent of India's population.

The state level study of MPI has some obvious limitations; the variations and heterogeneity of MPI within a state are not captured. The heterogeneity of political affiliation of the districts in a particular state sometimes yields misallocation of development grants. The political conflict may emerge within a state that may lead to misallocation of development grant if the district administration (viz. Zilla Parishad) is ruled by the opponent political party of the state assembly. Thus, allocation of fund should be given to the district instead of state. This is why I have carried out the district level study of multidimensional poverty in Chater-3. This is important for policy

intervention- both the central and state government can take initiative considering district as unit of analysis. This is because the health sector in India is the state's subject but education belongs to the concurrent list. The government of India under the Ministry of Panchayat and Rural Development has identified the backward districts based on certain deprivation criterion in 2006 but it is discontinued now. The backward region grant fund (BRGF) was criticized in several aspects. My 3rd Chapter tries to address the issue of allocation of central fund across the districts. The district level HCR along with the proportion of SC, ST and OBC Communities help us to allocate development grant fund with a view to ensure equity, social justice and inclusive growth. The 4th Chapter complements my 3rd Chapter. Why should we consider the backward community while allocating development grant? The incidence, depth and severity of multidimensional poverty are disproportionately concentrated among the SC, ST and OBC communities in India. This is why I have included the share of backward community as criteria of receiving development grant.

In Chapter-3, I have considered 617 districts from 29 states, among them 285 districts lie above the national average of MPI (viz. 20.38). It is surprising to note that 97.4%, 88% and 87% districts of Bihar, M.P and Jharkhand respectively lie above the national average MPI. I have identified 'poorest of the poor' districts; the number of districts belong to this category is 8. The extremely poor districts mainly belong to Bihar, Jharkhand, MP, Chattishgarh and Rajasthan. Keeping in mind the availability of fund and severity of poverty, I have suggested some rule of allocation development grant. I suggest the allocation rule (under different heads) when a particular district receives the development grant from the central authority. Priority should be given to road connectivity, irrigation facility, building primary schools and strengthening the primary healthcare institutions.

In Chapter-4, I have studied the multidimensional poverty among different social groups. Historically, the backward community is found to be economically poor. This is found to be true for multidimensional poverty also. All the socio-ethnic groups have experienced a decline of multidimensional poverty over a decade (from NFHS-3 to NFHS-4) but the pace of decline does vary widely across the social groups. The multidimensional HCR is found to be the maximum among the SC followed by the ST but the depth and severity of poverty is found to be the maximum among the ST community. The minimum depth

and severity of deprivation score is noticed among the general category, this is quite expected.

I find that the socio-ethnic groups are not found to be poor in the same dimensions as well as same indicators of deprivation; however, the analysis of multidimensional poverty contribution unambiguously supports that health contributes a major share of deprivation in MPI and it is invariant over socio-ethnic groups and over time (NFHS-3 and 4). The most surprising and alarming fact is that the contribution of health in MPI has been increased over time across all socio-ethnic groups though all the social groups have experienced a decline of MPI over time! It is surprising to note that the proportion of malnourished children is high among the SC and OBC group compared to ST community in NFHS-4. The proportion of households experienced a very low mortality in NFHS-4 compared to NFHS-3. Indeed it is a welcome move in our health sector. The mortality figure do not vary across the social groups, it is found to be equal (2%) in all groups except general category. This means that uniform strategy of anti-poverty programme does not always ensure desired result; rather community specific need based programmes are much more effective. This is because the children belonging to the SC and OBC category are more vulnerable to malnutrition compared to the children belonging to the ST and General community.

It is surprising to note that the inequality of deprivation score (DS) of multidimensional poverty over the decades (NFHS-3 to NFHS-4) has increased irrespective of socio-ethnic class. Moreover, the decomposition of inequality of DS results show that within inequality of DS is found to be higher than between inequality. This means that the performance of poverty reduction vary to a large extent within each social group.

We find that the incidence, depth and severity of poverty is found to be maximum among the Muslim community followed by Hindu; it is comparatively low among the Christian and 'Other' communities. It is interesting to note that the SC and ST belong to Hindu religion; whereas OBC category belongs to both Hindu and Muslim. This disaggregated picture highlights that the multidimensional poverty is high among the OBC category (as pointed out earlier) where the case of overlapping of religion does exist. The health component plays a major role towards contribution of MPI and it is found to be true across all religious groups; however, the relative progress towards

reduction of multidimensional poverty suggests that the Muslim community needs to improve.

Chapter-5 is developed with a view to understand the inter-district variations of MPI in one hand and to explore the determinants of poverty on the other hand using NFHS-4 and CAS Project data respectively. In our district level analysis, we find that 11 districts lie above the national average MPI (viz. 20.38) out of 19 districts in West Bengal; this means that 57.8% districts of **West Bengal (WB)** are poor compared to national average. I have already mentioned the underlying reasons of choosing of WB in our Theses.

The NFHS-4 district level data (of WB) show that there exists wide range of variations of DS (of MPI) across the districts; the incidence, depth and severity of multidimensional poverty is found to be the maximum in Purulia followed by Uttar Dinajpur. It is interesting to note that the maximum proportion of ST community belongs to Purulia whereas Uttar Dinajpur is dominated by minority (viz. Muslim) community. Uniform policy of poverty reduction across the districts (of WB) is not applicable because the contributions of poverty (dimension specific as well as indicator specific) differ widely across the districts. My primary survey results show that the publicly provided infrastructure (school, PHC, road connectivity etc.) plays a significant role in reducing the MPI including the distance of market place from the residence (viz. higher the distance greater is the chance of falling into poverty). Keeping in mind the problem of endogeneity between DS (of MPI) and income, we can argue that the probability of falling into poverty decreases with the money income(of the household) and it increases if the household belongs to ST community.

Policy Implications:

Eradication of poverty (especially multidimensional poverty) has been a major challenge of our planned economic development. A moderate reduction of poverty at the national level was noticed during NFHS-3 (2005-06) to NFHS-4(2015-16). However, regional variation of poverty has been aggravated. Experiences of different states with economic growth and poverty reduction have been so varied that it is difficult to offer any general policy prescription. The central government has been initiated dozens of anti-poverty programmes[1] since independence; however, a major anti-poverty programme is

Integrated Rural Development Programme (IRDP) which was launched in 1980 but this programme is uniformly applicable across all the districts in India.

The central government has recently adopted direct benefit transfer (DBT) scheme to bring transparency and terminate pilferage from distribution of funds. In DBT, benefit or subsidy will be directly transferred to the citizens living below poverty line. My research has some policy implications as outlined in Chapter-3 and DBT can be implemented to ensure regional equality. I have categorized the districts based on MPI and which districts need more funds that are explored in my research. Therefore, I must suggest implementing the allocation rule as outlined in my research. The state government can also implement the allocation principle to eradicate regional imbalance at the district level.

Notes

[1] In 1980 Integrated Rural Development Programme (**IRDP**) was introduced to generate self-employment opportunities and to improve women and children of the rural areas. To take care of the specific needs, under the IRDP scheme, three sub-programmes are there Training for rural youth for self employment (**TRYSEM**)
Supply improved toolkits for rural artisans (**SITRA**)
Development of women and children in rural areas (**DWCRA**)
Indira Awaas Yojana (**IAY**) was introduced in 1985-86; in 2015 it was renamed as Pradhan Mantri Awas Yojana (**PMAY**). Initially the Programme has aimed to provide free housing to the BPL and SC/ST families of rural areas but under the **PMAY** scheme they brought the urban population also under the scheme, because the huge number of populations from urban slums they don't have roof over their head.
Jawahar Rozgar Yojana (**JRY**) was launched in 1989 which is revamped from 1st April 1999 as Jawahar Gram Samriddhi Yojana (**JGSY**). It is a programme for rural economic infrastructure with employment generation. The employment generation programme like Sampoorna Gramin Rozgar Yojona (**SGRY**) was adopted in 2001. The main objective of the scheme is to generate of wage employment, creation of durable economic infrastructure in rural areas and provision of food and nutrition security for the poor. There is another National Food for Work Programme (**NFWP**) introduced in 2004 for the most backward 150 districts to provide additional resources, the programme **NFWP** was fully central funded.
Mahatma Gandhi National Rural Employment Act (**MGNREGA**) was enacted in 2005 to ensure a minimum income by providing 100 days work including women. Nirmal Bharat Aviyan (**NBA**) was introduced in 1999 which shifts to Swachh Bharat Mission (SBM) in 2014 to provide the full sanitation coverage by 2nd Oct. 2019. That everyone can declare them as "Open Defecation Free", so to provide the sanitation facilities for maintaining the hygiene behavior which improve the health parameter.
National Rural Drinking Water Programme (**NRDWP**) was introduced in 2009 that aims to provide safe and adequate water for drinking, cooking and other domestic needs to every rural person, which also renamed and launched as **SWAJAL** Scheme in 2018.
To improve the cooking fuel, central govt. launched Pradhan Mantri UjjwalaYojana (PMUY) by providing LPG connection to the women who are below the poverty line.

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Appendices

Table-A1: Population Share, MPI and its components across all states in India

	NFHS2 (1989-99)				NFHS3 (2005-06)				NFHS4(2015-16)			
States	Pop Share	HCR	Intensity	MPI (Rank)	Pop Share	HCR	Intensity	MPI (Rank)	Pop Share	HCR	Intensity	MPI (Rank)
A.P	8.3	57	52.7	29.9 (9)	6.47	42	46.6	19.57 (14)	1.75	16	44.58	7.13 (20)
Aru.P	0.1	47	47.8	22.6 (14)	2.04	52	50.6	26.31 (11)	2.49	24	42.25	10.14 (14)
Assam	2.5	66	52.5	34.5 (6)	3.94	55	51.9	28.54 (9)	4.19	37	44.65	16.52 (7)
Bihar	10.4	76	58.1	44.2 (1)	4.5	72	59.29	42.68 (1)	6.27	54	55.06	29.73 (1)
Chhattisgarh	----	----	----	----	3.38	70	52.52	36.76 (2)	3.46	42	50.08	21.03 (5)
Goa	0.1	24	45.8	11.2 (25)	1.57	13	42.8	5.56 (27)	0.27	9	39.3	3.53 (26)
Gujarat	4.9	48	51.8	24.8 (12)	3.27	36	48.6	17.49 (17)	3.5	25	47.46	11.86 (11)
Haryana	2.1	40	47.2	19.0 (19)	1.81	33	46.5	9.88 (24)	1.57	12	42.13	5.05 (23)
H.P	0.6	36	42.4	15.4 (22)	1.54	24	41.2	15.34 (19)	2.96	16	44.02	7.04 (21)
Jammu & Kasmir	0.9	46	49.2	22.6 (15)	1.28	32	46.2	14.78 (20)	3.05	19	46.71	8.87 (16)
Jharkhand	----	----	----	----	2.86	62	53.85	33.38 (3)	4.39	49	49.45	24.23 (2)
Karnataka	5.3	51	50.3	25.5 (11)	5.87	38	46.2	17.55 (16)	4.07	19	44.93	8.54 (18)
Kerala	3.3	33	41.7	13.6 (23)	1.76	10	39.9	3.99 (28)	1.97	4	38.79	1.55 (29)
M.P	8.3	68	54.5	36.8 (3)	6.39	62	52.6	32.61 (4)	8.88	43	51.29	22.05 (4)
Maharashtra	9.7	46	49.1	22.6 (16)	5.98	33	47	15.51 (18)	4.59	19	45.32	8.61 (17)
Manipur	0.2	45	47.6	21.2 (17)	2.44	32	45.7	14.62 (21)	2	23	40.79	9.38 (15)
Meghalaya	0.2	67	53.2	35.8 (4)	2.44	55	53.9	29.64 (8)	1.25	34	44.64	15.17 (9)
Mizoram	0.1	33	47.5	15.5 (21)	2.05	21	44.2	9.28 (25)	1.94	11	44.36	4.88 (24)
Nagaland	0.2	50	48.8	24.6 (13)	1.89	44	49.1	21.60 (13)	1.91	25	41.7	10.42 (13)
Odisha	3.8	71	53.8	38.1 (2)	5.17	59	52.6	31.03 (7)	5.16	35	47.21	16.52 (6)
Punjab	2.4	26	45.6	11.7 (24)	1.06	19	45.8	8.70 (26)	2.81	7	41.22	2.88 (27)
Rajasthan	5.3	64	53.7	34.1 (7)	4.71	59	53	31.27 (6)	5.96	34	45.55	15.48 (8)
Sikkim	0.1	36	48.0	17.3 (20)	2.01	29	45.6	13.22 (22)	0.8	6	38.91	2.33 (28)
Tamil Nadu	6.6	43	45.6	19.5 (18)	4.84	26	41.7	10.84 (23)	4.44	9	40.24	3.62 (25)
Telangana	----	----	----	----	----	----	----	----	1.33	16	42.31	6.77 (22)
Tripura	0.4	56	49.7	27.6 (10)	1.99	47	48.6	22.84 (12)	0.77	21	51.07	10.72 (12)
U.P	14.7	65	53.6	34.8 (5)	10.76	60	52.8	31.68 (5)	13.01	44	51.02	22.45 (3)
Uttarakhand	----	----	----	----	2.267	43	44.86	19.28 (15)	2.59	19	41.54	7.89 (19)
W.B	8.3	61	55.7	33.9 (8)	5.66	54	52.6	28.40 (10)	2.62	31	43.41	13.46 (10)

Source: Estimated by the author

Table-A2: Non Income Mobility of States as per NFHS 2,3 &4

NFHS2_HCR 1989-99	NFHS3_HCR 2005-06	NFHS4_HCR 2015-16
Goa	Kerala	Kerala
Punjab	Goa	Sikkim
Kerala	Punjab	Punjab
Mizoram	Mizoram	Goa
H.P	H.P	Tamil Nadu
Sikkim	Tamil Nadu	Mizoram
Haryana	Sikkim	Haryana
Tamil Nadu	Jammu & Kasmir	A.P
Manipur	Manipur	H.P
Jammu & Kasmir	Haryana	Jammu & Kasmir
Maharashtra	Maharashtra	Karnataka
Aru.P	Gujarat	Maharashtra
Gujarat	Karnataka	Uttarakhand
Nagaland	A.P	Tripura
Karnataka	Uttarakhand	Manipur
Tripura	Nagaland	Aru.P
A.P	Tripura	Gujarat
W.B	Aru.P	Nagaland
Rajasthan	W.B	W.B
U.P	Assam	Meghalaya
Uttarakhand	Meghalaya	Rajasthan
Assam	Odisha	Odisha
Meghalaya	Rajasthan	Assam
Chhattisgarh	U.P	Chhattisgarh
M.P	Jharkhand	M.P
Odisha	M.P	U.P
Bihar	Chhattisgarh	Jharkhand
Jharkhand	Bihar	Bihar

Source: Estimated by the author

Low MPI_ Head Count Ratiio → *High MPI_Head Count Ratiio*

Table-A3: Income Mobility of States

Poverty_HCR 1999	Poverty_HCR 2005	Poverty_HCR 2015
Jammu & Kasmir	Nagaland	Goa
Goa	Jammu & Kasmir	Kerala
Punjab	Mizoram	Sikkim
H.P	Meghalaya	Tamil Nadu
Haryana	Kerala	Jammu & Kasmir
Kerala	Punjab	Haryana
Gujarat	H.P	Meghalaya
Rajasthan	Haryana	Uttarakhand
A.P	Goa	Punjab
Mizoram	Tamil Nadu	H.P
Karnataka	A.P	Rajasthan
Tamil Nadu	Aru.P	Tripura
Maharashtra	Sikkim	Maharashtra
W.B	Gujarat	A.P
Manipur	Uttarakhand	W.B
U.P	Karnataka	Bihar
Uttarakhand	W.B	Gujarat
Nagaland	Rajasthan	Nagaland
Aru.P	Assam	Karnataka
Meghalaya	Manipur	Mizoram
Tripura	Maharashtra	Aru.P
Assam	Tripura	U.P
Sikkim	U.P	Assam
Chhattisgarh	Jharkhand	M.P
M.P	M.P	Manipur
Bihar	Chhattisgarh	Odisha
Jharkhand	Bihar	Chhattisgarh
Odisha	Odisha	Jharkhand

Source: Estimated by the author

Low Poverty_ Head Count Ratiio → *High Poverty_ Head Count Ratiio*

Table-A4: Over time Relative progress asper NFHS 2,3 & 4

State-wise Growth Over-time		
NFHS2	**NFHS3**	**NFHS4**
Goa	Kerala	Kerala
Punjab	Goa	Sikkim
Kerala	Punjab	Punjab
Mizoram	Mizoram	Goa
H.P	H.P	Tamil Nadu
Sikkim	Tamil Nadu	Mizoram
Haryana	Sikkim	Haryana
Tamil Nadu	Manipur	A.P
Manipur	Jammu & Kasmir	H.P
Jammu & Kasmir	Haryana	Jammu & Kasmir
Maharashtra	Maharashtra	Karnataka
Aru.P	Gujarat	Maharashtra
Gujarat	Karnataka	Uttarakhand
Nagaland	A.P	Tripura
Karnataka	Uttarakhand	Manipur
Tripura	Nagaland	Aru.P
A.P	Tripura	Gujarat
W.B	Aru.P	Nagaland
Rajasthan	W.B	W.B
U.P	Assam	Meghalaya
Uttarakhand	Meghalaya	Rajasthan
Assam	Rajasthan	Odisha
Meghalaya	Odisha	Assam
Chhattisgarh	U.P	Chhattisgarh
M.P	Jharkhand	M.P
Odisha	M.P	U.P
Bihar	Chhattisgarh	Jharkhand
Jharkhand	Bihar	Bihar

Source: Estimated by the author

Low MPI_ Head Count Ratiio → ***High MPI_Head Count Ratiio***

No Red Colour States as per NFHS 4

Table-A5: Monetary and Non-Monetary Headcount _Ratio

State	NFHS 2 MPI_HCR 1989-99	Poverty Rate HCR 1999	NFHS 3 MPI_HCR 2005-6	Poverty HCR 2004-05	NFHS 4 MPI_HCR 2015-16	Poverty HCR 2015
A.P	56.7	15.77	41.6	29.9	16	12.3
Aru.P	47.2	33.47	51.5	31.1	24	20.7
Assam	65.7	36.09	54.9	34.4	37	26.06
Bihar	76.1	42.6	72	54.4	54	13.98
Chhattisgarh	------	-------	0.574	49.4	42	31.16
Goa	24.4	4.4	13.2	25	9	1.48
Gujarat	47.9	14.07	36	31.8	25	14.2
Haryana	40.3	8.74	33.1	24.1	12	8.94
H.P	36.3	7.63	24.3	22.9	16	6.62
J & K	46	3.8	31.7	13.2	19	5.6
Jharkhand	----	----	62.4	45.3	49	34.82
Karnataka	50.8	20.04	37.5	33.4	19	18.22
Kerala	32.6	12.72	9.5	19.7	4	4.3
M.P	67.6	37.43	62.4	48.6	43	26.6
Maharashtra	46	25.02	32.9	38.1	19	10.9
Manipur	44.6	28.54	32.4	38	23	26.68
Meghalaya	67.4	33.87	55.2	16.1	34	6.64
Mizoram	32.6	19.47	21.1	15.3	11	19.7
Nagaland	50.4	32.67	44.4	9	25	16.86
Odisha	70.8	47.15	58.7	57.2	35	28.18
Punjab	25.7	6.16	19.2	20.9	7	7.64
Rajasthan	63.5	15.28	58.5	34.4	34	10.09
Sikkim	36.1	36.55	28.9	31.1	6	4.91
Tamil Nadu	42.8	21.12	26.4	28.9	9	5.46
Tripura	55.5	34.44	46.6	40.6	21	10.7
U.P	64.9	31.15	59.5	40.9	44	21.16
Uttarakhand	----	-----	42.5	32.7	19	6.74
W.B	60.8	27.02	53.8	34.3	31	13.26

Source: Estimated by the author

Table-A6: State level poverty depth, Severity and Poverty Contributions based on NFHS 4

States	Poverty Depth	Severity	Education Contribution	Health Contribution	Std. Living Contribution
A.P	0.14	0.09	0.25	0.56	0.20
Aru.P	0.16	0.13	0.29	0.39	0.32
Assam	0.26	0.25	0.18	0.47	0.35
Bihar	0.37	0.39	0.22	0.44	0.34
Chhattisgarh	0.25	0.21	0.17	0.53	0.30
Goa	0.04	0.02	0.12	0.75	0.13
Gujarat	0.18	0.14	0.15	0.59	0.26
Haryana	0.09	0.06	0.15	0.65	0.21
H.P	0.08	0.04	0.11	0.69	0.20
J & K	0.11	0.08	0.15	0.57	0.29
Jharkhand	0.31	0.28	0.18	0.49	0.33
Karnataka	0.13	0.09	0.16	0.61	0.23
Kerala	0.02	0.01	0.11	0.76	0.14
M.P	0.27	0.24	0.19	0.50	0.31
Maharashtra	0.14	0.10	0.12	0.64	0.25
Manipur	0.12	0.09	0.16	0.46	0.39
Meghalaya	0.18	0.15	0.26	0.39	0.35
Mizoram	0.08	0.06	0.21	0.52	0.27
Nagaland	0.15	0.12	0.24	0.45	0.31
Odisha	0.27	0.24	0.21	0.48	0.32
Punjab	0.06	0.04	0.19	0.65	0.16
Rajasthan	0.23	0.20	0.20	0.52	0.28
Sikkim	0.04	0.02	0.28	0.56	0.15
Tamil Nadu	0.07	0.04	0.17	0.66	0.17
Telangana	0.16	0.12	0.22	0.57	0.21
Tripura	0.18	0.16	0.18	0.47	0.35
U.P	0.26	0.22	0.20	0.50	0.30
Uttarakhand	0.12	0.09	0.16	0.60	0.24
W.B	0.21	0.18	0.21	0.50	0.29

Source: Estimated by the author

Table-A7: Socio-economic and infrastructural variables at the state level-NFHS-2

States	Year	No. of Primary School	No. of Middle School	No. of Secondary School	No. of institutes for higher education	No. of Sub Centre	No. of Primary Health Centre	No. of Coumminity Health Centre
Andhra Pradesh	NFHS2	5.34	7.77	13.75	12.35	4.22	1.07	2.76
Arunachal Pradesh	NFHS2	8.21	23.21	15.57	5.31	6.28	2.54	8.45
Assam	NFHS2	7.90	17.88	15.56	11.46	5.87	1.40	3.83
Bihar	NFHS2	3.97	9.60	5.92	11.77	5.58	1.66	1.86
Delhi	NFHS2	1.55	3.75	9.11	5.31	0.10	0.04	0.00
Goa	NFHS2	7.10	5.00	56.17	23.81	3.93	0.78	3.81
Gujarat	NFHS2	2.86	30.61	11.31	6.87	4.45	1.18	3.78
Haryana	NFHS2	4.06	6.21	15.12	8.77	3.39	1.18	3.10
HP	NFHS2	10.02	11.05	21.02	11.92	9.98	2.62	7.06
J&K	NFHS2	7.89	24.64	11.84	4.39	5.24	2.07	4.63
Karnataka	NFHS2	3.82	33.00	18.32	1.35	4.73	1.86	4.69
Kerala	NFHS2	2.20	7.70	11.06	8.82	4.85	1.79	2.54
MP	NFHS2	8.17	18.78	12.20	8.29	6.10	1.73	3.37
Maharashtra	NFHS2	3.97	18.38	14.27	9.57	3.09	1.08	3.18
Manipur	NFHS2	8.69	20.08	35.35	24.22	5.48	1.80	6.96
Meghalaya	NFHS2	13.37	30.20	20.82	11.23	5.08	2.18	4.49
Mizoram	NFHS2	11.17	55.47	50.41	24.88	11.25	3.82	6.94
Nagaland	NFHS2	6.80	22.79	15.55	13.32	3.97	1.07	2.71
Odisha	NFHS2	10.51	24.92	18.27	15.40	4.93	1.83	4.35
Punjab	NFHS2	4.84	8.25	12.81	7.50	3.61	1.23	4.44
Rajasthan	NFHS2	4.88	19.36	9.61	5.75	5.18	1.78	4.79
Sikkim	NFHS2	6.72	15.23	20.94	4.20	8.58	2.80	3.89
Tamil Nadu	NFHS2	4.90	7.13	11.07	6.07	4.24	0.02	1.17
Tripura	NFHS2	4.14	8.83	21.29	4.34	5.07	27.11	3.46
Uttar Pradesh	NFHS2	4.21	8.56	4.20	4.76	3.76	1.40	1.63
WB	NFHS2	5.28	2.68	8.26	5.57	2.99	0.96	1.13

States	Year	Road Length	Rail way Route	PCEE	PCHE	SII	PII	PCEE(log)	PCHE(log)	Social Infrastucture Index(log)	Physical Infrasturature Index (log)
Andhra Pradesh	NFHS2	1172.17	630.17	2.04	0.53	26.70	1652.75	0.31	-0.27	1.43	3.22
Arunachal Pradesh	NFHS2	218.79	0.24	6.99	2.46	48.62	200.85	0.84	0.39	1.69	2.30
Assam	NFHS2	1280.17	641.53	4.07	0.40	40.57	1762.20	0.61	-0.40	1.61	3.25
Bihar	NFHS2	816.32	731.07	2.82	0.70	21.02	1418.96	0.45	-0.16	1.32	3.15
Delhi	NFHS2	15693.86	2697.24	2.35	0.50	11.96	16864.64	0.37	-0.30	1.08	4.23
Goa	NFHS2	2567.26	372.77	4.83	1.22	61.10	2696.01	0.68	0.09	1.79	3.43
Gujarat	NFHS2	700.33	541.97	2.46	0.28	42.81	1139.19	0.39	-0.56	1.63	3.06
Haryana	NFHS2	635.42	700.26	4.49	0.46	25.16	1224.82	0.65	-0.34	1.40	3.09
HP	NFHS2	528.05	96.64	4.92	1.29	45.81	572.83	0.69	0.11	1.66	2.76
J&K	NFHS2	549.23	45.45	3.93	1.49	43.32	545.32	0.59	0.17	1.64	2.74
Karnataka	NFHS2	792.88	310.13	2.97	0.69	52.13	1011.46	0.47	-0.16	1.72	3.00
Kerala	NFHS2	3812.13	540.36	3.81	0.73	22.19	3991.24	0.58	-0.14	1.35	3.60
MP	NFHS2	526.55	310.46	2.12	0.70	38.64	767.54	0.33	-0.16	1.59	2.89
Maharashtra	NFHS2	841.23	354.81	4.50	0.61	34.52	1096.77	0.65	-0.22	1.54	3.04
Manipur	NFHS2	512.12	0.90	6.63	0.73	61.11	470.43	0.82	-0.14	1.79	2.67
Meghalaya	NFHS2	417.32	0.89	5.22	1.60	59.59	383.50	0.72	0.20	1.78	2.58
Mizoram	NFHS2	224.42	1.90	11.48	3.41	109.10	207.53	1.06	0.53	2.04	2.32
Nagaland	NFHS2	1267.57	15.68	7.70	3.48	41.84	1176.74	0.89	0.54	1.62	3.07
Odisha	NFHS2	1516.19	296.58	1.98	0.45	50.56	1662.32	0.30	-0.35	1.70	3.22
Punjab	NFHS2	1216.69	834.76	3.40	0.69	26.64	1881.18	0.53	-0.16	1.43	3.27
Rajasthan	NFHS2	412.15	346.31	3.11	0.60	34.68	695.51	0.49	-0.22	1.54	2.84
Sikkim	NFHS2	269.31	2.82	9.07	0.17	43.62	249.54	0.96	-0.76	1.64	2.40
Tamil Nadu	NFHS2	1227.96	644.02	2.99	0.71	22.60	1716.61	0.48	-0.15	1.35	3.23
Tripura	NFHS2	1411.50	85.83	6.50	0.60	33.84	1373.05	0.81	-0.22	1.53	3.14
Uttar Pradesh	NFHS2	998.83	711.58	2.06	0.34	17.58	1568.45	0.31	-0.47	1.25	3.20
WB	NFHS2	1000.74	825.22	1.78	0.47	15.99	1674.41	0.25	-0.33	1.20	3.22

Source: Data Collected from the secondary source

Table-A8: Socio-economic and infrastructural variables at the state level-NFHS-3

States	Year	No. of Primary School	No. of Middle School	No. of Secondary School	No. of institutes for higher education	No. of Sub Centre	No. of Primary Health Centre	No. of Coumminity Health Centre
A P	NFHS3	8.14	17.22	28.64	30.49	4.67	1.17	2.04
Aru.P	NFHS3	10.86	29.89	22.30	11.68	9.72	4.36	26.50
Assam	NFHS3	8.30	12.53	21.73	12.00	5.28	1.26	3.45
Bihar	NFHS3	3.35	7.86	4.38	9.98	3.41	1.09	1.11
Delhi	NFHS3	1.31	3.13	13.30	281.19	0.08	0.03	0.00
Goa	NFHS3	5.18	1.95	39.82	0.85	3.36	0.74	3.26
Gujarat	NFHS3	2.51	22.66	17.18	31.23	3.98	1.17	4.96
Haryana	NFHS3	3.52	3.87	25.72	30.86	3.17	1.07	3.12
H P	NFHS3	18.83	32.67	41.83	11.24	9.66	4.14	10.27
J & K	NFHS3	11.12	38.82	26.33	2.75	4.86	1.93	6.03
Karnataka	NFHS3	4.39	26.95	25.26	36.80	4.35	1.79	4.52
Kerala	NFHS3	2.04	7.33	24.10	17.80	4.55	1.62	3.16
MP	NFHS3	10.92	29.44	14.58	39.90	3.99	1.03	3.43
Maharashtra	NFHS3	3.54	16.87	22.92	21.89	3.01	1.04	3.67
Manipur	NFHS3	9.36	18.93	34.90	59.01	4.92	1.69	6.25
Meghalaya	NFHS3	15.29	24.39	28.98	27.35	4.86	2.50	9.70
Mizoram	NFHS3	16.20	66.99	65.89	40.08	11.50	3.58	9.42
Nagaland	NFHS3	9.01	19.90	19.78	14.89	5.54	2.36	9.85
Odisha	NFHS3	11.58	26.25	27.47	30.60	4.55	1.97	5.92
Punjab	NFHS3	4.64	6.41	18.65	16.21	3.30	1.12	4.47
Rajasthan	NFHS3	6.78	27.40	19.97	16.08	5.05	1.44	5.22
Sikkim	NFHS3	11.15	24.48	30.00	17.81	7.60	2.48	6.90
Tamil Nadu	NFHS3	6.36	11.74	20.32	22.29	3.99	0.02	0.54
Tripura	NFHS3	4.90	21.44	21.66	5.70	4.73	20.71	2.92
Uttar Pradesh	NFHS3	5.73	11.55	8.16	10.69	3.35	1.19	2.10
WB	NFHS3	5.71	1.12	12.09	6.15	3.62	0.64	1.11

States	Year	Road Length	Rail way Route	PCEE	PCHE	SII	PII	PCEE(log)	PCHE(log)	Social Infrastucture Index(log)	Physical Infrasturature Index (log)
A P	NFHS3	2067.73	636.306	4.90727	1.73415	48.9855	2479.6	0.69084	0.23909	1.69007	3.39438
Aru.P	NFHS3	205.581	0.23883	7.02951	5.4918	75.9852	188.737	0.84692	0.73971	1.88073	2.27586
Assam	NFHS3	2751.46	582.371	7.30006	1.3455	40.8013	3057.12	0.86333	0.12888	1.61067	3.48531
Bihar	NFHS3	1275.73	707.284	4.83886	1.20461	15.8886	1818.43	0.68474	0.08085	1.20109	3.2597
Delhi	NFHS3	19866.5	2764.67	8.02586	3.8269	14.6615	20752.8	0.90449	0.58285	1.16618	4.31708
Goa	NFHS3	2814.69	372.771	17.3203	6.40415	42.8319	2922.91	1.23856	0.80646	1.63177	3.46581
Gujarat	NFHS3	738.568	539.016	7.29372	1.82343	41.1037	1171.54	0.86295	0.26089	1.61388	3.06876
Haryana	NFHS3	657.175	721.524	6.32402	1.4294	31.3414	1264.27	0.80099	0.15515	1.49612	3.10184
H P	NFHS3	424.155	102.384	14.8659	4.89701	90.1001	482.836	1.17219	0.68993	1.95473	2.6838
J & K	NFHS3	521.839	65.3394	8.56683	3.78175	70.4562	538.443	0.93282	0.57769	1.84792	2.73114
Karnataka	NFHS3	1116.9	313.049	6.58555	1.89753	52.8251	1311.26	0.81859	0.27819	1.72284	3.11769
Kerala	NFHS3	4815.56	540.36	8.25916	2.18868	32.6703	4911.38	0.91694	0.34018	1.51415	3.6912
MP	NFHS3	534.631	318.116	4.57117	1.43024	50.449	781.969	0.66003	0.15541	1.70285	2.89319
Maharashtra	NFHS3	716.405	359.296	9.71561	1.69914	40.2831	986.417	0.98747	0.23023	1.60512	2.99406
Manipur	NFHS3	739.105	0.89578	12.8732	3.05898	59.4747	678.581	1.10969	0.48558	1.77433	2.8316
Meghalaya	NFHS3	432.075	0.8917	10.1934	3.43872	66.2066	397.03	1.00832	0.5364	1.8209	2.59882
Mizoram	NFHS3	283.383	1.89744	23.4709	7.82362	137.356	261.602	1.37053	0.89341	2.13785	2.41764
Nagaland	NFHS3	1332.11	15.6825	12.7251	4.79497	50.3558	1235.92	1.10466	0.68079	1.70205	3.09199
Odisha	NFHS3	1382.17	292.986	4.77238	1.26063	60.8675	1536.12	0.67873	0.10059	1.78439	3.18643
Punjab	NFHS3	896.807	847.464	7.64667	2.60682	29.5346	1599.5	0.88347	0.41611	1.47033	3.20398
Rajasthan	NFHS3	445.405	341.165	5.82029	1.60987	51.6989	721.285	0.76494	0.20679	1.71348	2.85811
Sikkim	NFHS3	298.478	2.81849	24.8566	6.47671	63.7483	276.289	1.39544	0.81135	1.80447	2.44136
Tamil Nadu	NFHS3	1378.98	641.406	7.04846	1.91875	34.6699	1852.7	0.84809	0.28302	1.53995	3.2678
Tripura	NFHS3	3026.03	122.068	12.8807	2.66958	44.8244	2886.81	1.10994	0.42644	1.65151	3.46042
Uttar Pradesh	NFHS3	1093.92	709.424	3.70787	0.88283	24.6184	1653.66	0.56912	-0.0541	1.39126	3.21845
WB	NFHS3	2242.79	881.332	5.70334	1.86776	18.5532	2864.82	0.75613	0.27132	1.26842	3.4571

Source: Data Collected from the secondary source

Table-A9: Socio-economic and infrastructural variables at the state level-NFHS-4

States	Year	No. of Primary School	No. of Middle School	No. of Secondary School	No. of institutes for higher education	No. of Sub Centre	No. of Primary Health Centre	No. of Coumminity Health Centre
A P	NFHS4	9.24	19.87	42.62	46.14	4.47	1.34	3.48
Aru P	NFHS4	13.54	81.37	35.80	22.98	5.88	5.88	35.64
Assam	NFHS4	13.84	36.57	38.57	15.08	4.18	1.83	4.55
Bihar	NFHS4	2.89	24.67	9.73	6.72	2.56	1.00	0.61
Delhi	NFHS4	1.62	5.37	15.73	9.57	0.04	0.02	8.30
Goa	NFHS4	8.06	5.85	51.68	32.89	4.15	0.95	2.65
Gujarat	NFHS4	2.04	41.21	24.14	28.83	3.71	1.28	4.91
Haryana	NFHS4	3.91	15.43	37.49	36.17	2.81	0.80	3.97
H P	NFHS4	19.26	41.36	79.42	50.71	8.65	4.51	10.90
J & K	NFHS4	10.05	59.41	45.32	25.77	5.27	2.96	6.51
Karnataka	NFHS4	5.10	48.63	43.44	51.15	4.33	2.20	3.21
Kerala	NFHS4	3.26	12.42	22.19	43.75	3.97	1.47	6.42
MP	NFHS4	10.32	47.38	24.67	26.03	3.50	0.89	4.24
Maharashtra	NFHS4	5.18	24.28	30.75	34.68	2.67	0.92	3.03
Manipur	NFHS4	11.18	38.53	61.38	31.50	4.19	1.69	5.64
Meghalaya	NFHS4	24.08	107.25	63.60	21.34	4.10	2.09	8.63
Mizoram	NFHS4	13.21	147.58	94.86	24.67	9.59	2.96	7.78
Nagaland	NFHS4	5.29	37.80	43.72	28.05	5.70	3.62	10.07
Odisha	NFHS4	9.28	48.46	36.64	23.64	4.65	1.78	8.74
Punjab	NFHS4	5.87	18.18	45.75	33.57	3.04	0.89	5.15
Rajasthan	NFHS4	5.17	42.29	48.12	35.38	5.82	1.68	7.65
Sikkim	NFHS4	11.94	58.57	47.57	29.43	6.85	2.24	3.11
Tamil Nadu	NFHS4	6.39	13.13	27.24	33.75	3.50	0.02	5.16
Tripura	NFHS4	7.56	39.85	40.60	12.39	7.88	21.09	5.16
Uttar Pradesh	NFHS4	5.68	25.46	13.24	26.55	2.85	1.01	3.58
WB	NFHS4	9.78	9.71	15.74	10.25	3.27	0.58	3.65

States	Year	Road Length	Rail way Route	PCEE	PCHE	SII	PII	PCEE(log)	PCHE(log)	Social Infrastucture Index(log)	Physical Infrasturature Index (log)
A P	NFHS4	1069.92	454.43	10.04	3.92	64.40	1397.83	1.00	0.59	1.81	3.15
Aru P	NFHS4	366.50	2.87	51.48	17.72	136.15	338.71	1.71	1.25	2.13	2.53
Assam	NFHS4	4201.03	622.91	13.40	4.66	79.37	4423.55	1.13	0.67	1.90	3.65
Bihar	NFHS4	2192.84	792.46	7.93	1.53	33.21	2737.51	0.90	0.19	1.52	3.44
Delhi	NFHS4	11884.69	2467.97	22.02	10.81	24.21	13161.39	1.34	1.03	1.38	4.12
Goa	NFHS4	4339.01	372.77	44.08	16.57	58.30	4320.70	1.64	1.22	1.77	3.64
Gujarat	NFHS4	913.89	536.57	14.11	3.88	61.89	1330.07	1.15	0.59	1.79	3.12
Haryana	NFHS4	1096.58	774.00	20.86	4.35	51.39	1715.32	1.32	0.64	1.71	3.23
H P	NFHS4	1001.54	106.34	33.67	9.91	128.39	1015.93	1.53	1.00	2.11	3.01
J & K	NFHS4	1176.96	141.10	21.72	9.99	103.14	1208.66	1.34	1.00	2.01	3.08
Karnataka	NFHS4	1801.52	342.14	14.84	3.81	85.75	1965.74	1.17	0.58	1.93	3.29
Kerala	NFHS4	5167.07	537.79	17.42	4.98	38.12	5231.36	1.24	0.70	1.58	3.72
MP	NFHS4	940.59	324.41	9.01	2.29	73.60	1160.01	0.95	0.36	1.87	3.06
Maharashtra	NFHS4	1993.47	373.40	19.91	3.44	53.65	2170.42	1.30	0.54	1.73	3.34
Manipur	NFHS4	1109.69	0.90	22.96	8.49	98.33	1018.41	1.36	0.93	1.99	3.01
Meghalaya	NFHS4	968.70	8.03	21.65	8.78	170.42	895.66	1.34	0.94	2.23	2.95
Mizoram	NFHS4	384.61	1.90	52.37	24.96	224.43	354.43	1.72	1.40	2.35	2.55
Nagaland	NFHS4	2178.30	13.27	22.71	7.84	82.37	2009.67	1.36	0.89	1.92	3.30
Odisha	NFHS4	1850.16	330.36	13.64	2.85	87.21	1999.54	1.13	0.45	1.94	3.30
Punjab	NFHS4	2152.00	901.08	13.80	3.62	62.98	2799.67	1.14	0.56	1.80	3.45
Rajasthan	NFHS4	742.99	344.38	13.66	3.45	88.18	997.11	1.14	0.54	1.95	3.00
Sikkim	NFHS4	1161.64	2.82	71.11	20.07	104.60	1067.81	1.85	1.30	2.02	3.03
Tamil Nadu	NFHS4	2007.07	619.26	16.39	5.18	44.25	2408.34	1.21	0.71	1.65	3.38
Tripura	NFHS4	3754.05	368.11	25.79	7.64	81.58	3780.02	1.41	0.88	1.91	3.58
Uttar Pradesh	NFHS4	1753.27	753.50	8.33	3.02	41.13	2298.71	0.92	0.48	1.61	3.36
WB	NFHS4	3568.71	931.81	13.47	3.65	33.50	4126.98	1.13	0.56	1.53	3.62

Source: Data Collected from the secondary source

Table-A10: Decomposition of Inequality of Deprivation Scores: Caste, Religion, Region (Rural/Urban) and States

	NFHS 3		NFHS 4	
	Within Inequality	**Between Inequality**	**Within Inequality**	**Between Inequality**
Caste	0.204	0.002	0.292	0.003
Religious Group	0.225	0.002	0.236	0.001
Rural/ Urban	0.213	0.018	0.291	0.002
States	0.205	0.028	0.236	0.026

Source: Estimated by the author

Table-B1: District Level Results of HCR, MPI and Depth of poverty: NFHS-4

State	District	HCR	Intensity	MPI	Depth
A P	Krishna	30.12	41.12	12.38	0.06
A P	Ghuntur	31.93	41.09	13.12	0.06
A P	West god	34.66	41.11	14.25	0.08
A P	East god	34.31	42.39	14.54	0.07
A P	Chittor	35.28	44.72	15.78	0.07
A P	Anantapur	35.14	45.52	15.99	0.08
A P	Visakhapattanam	34.79		16.07	0.08
A P	y.s.r	38.8	42.28	16.4	0.09
A P	Sri Pott	37.2	44.95	16.72	0.09
A P	Kurnool	40.26	46.09	18.56	0.12
A P	Prakashm	39.36	47.56	18.72	0.14
Aru P	East sia	19.36	46.54	9.01	0.17
Aru P	West Sia	24.71	46.6	11.51	0.1
Aru P	Dibang V	24.49	48.15	11.77	0.14
Aru P	Upper Si	26.17	47.8	12.51	0.69
Aru P	Tirap	27.57	46.94	12.94	0.12
Aru P	Lower Su	31.32	43.69	13.69	0.11
Aru P	Papumper	35.02	43.13	15.1	0.092
Aru P	Anjaw	30.79	49.54	15.25	0.17
Aru P	Changlan	32.2	50.17	16.15	0.16
Aru P	Lower Di	34.07	47.67	16.21	0.15
Aru P	West Kam	35.12	46.62	16.37	
Aru P	Upper Su	37.14	48.45	18.03	0.2
Aru P	Kurung K	40.01	48.7	19.48	0.2
Aru P	Tawang	44.48	48.9	21.75	
Aru P	Lohit	40.88	53.87	21.99	0.25
Aru P	East Kam	60.18	51.81	31.18	
Assam	Kamrup m	31.90	42.97	13.71	0.10
Assam	Nalbari	35.90	48.86	17.54	0.17
Assam	Dhemaji	35.22	51.81	18.25	0.20
Assam	Baksa	37.50	50.38	18.89	0.19
Assam	Lakhimpur	36.78	52.03	19.14	0.21
Assam	Kamrup	41.04	48.49	19.90	0.18
Assam	Bongaiga	39.04	51.38	20.06	0.21
Assam	Udalgiri	39.84	51.57	20.54	0.23
Assam	Dima Has	39.69	52.12	20.69	0.23
Assam	Golaghat	40.68	50.96	20.73	0.23
Assam	Jorhat	42.74	49.44	21.13	0.20
Assam	Sonitpur	39.45	53.64	21.16	0.24
Assam	Chirang	42.46	52.71	22.38	0.26
Assam	Karbi an	42.70	52.45	22.40	0.25
Assam	Kokrajha	43.32	52.76	22.86	0.26
Assam	Sivasaga	42.45	55.15	23.41	0.28
Assam	Nagaon	48.28	51.25	24.74	0.26

State	District	HCR	Intensity	MPI	Depth
Assam	Dibrugarh	47.76	53.41	25.51	0.29
Assam	Morigaon	49.93	52.83	26.38	0.29
Assam	Barpeta	49.65	53.79	26.70	0.30
Assam	Darrang	52.06	52.66	27.42	0.29
Assam	Karimgan	53.52	55.69	29.80	0.36
Assam	Cachar	53.76	56.66	30.46	0.36
Assam	Dhubri	56.57	55.95	31.65	0.39
Assam	Tinsukia	57.05	55.69	31.78	0.38
Assam	Hailakan	57.98	57.03	33.07	0.41
Bihar	Patna	0.42	47.91	20.23	0.19
Bihar	Rohtas	0.48	49.05	23.78	0.23
Bihar	Bhojpur	0.47	51.03	24.13	0.25
Bihar	Siwan	0.49	50.91	24.69	0.26
Bihar	Munger	0.47	52.63	24.92	0.27
Bihar	Buxar	0.48	51.55	24.95	0.27
Bihar	aurangabad	0.50	52.74	26.54	0.29
Bihar	Gopalganj	0.50	52.82	26.61	0.30
Bihar	kaimur (bhabua)	0.52	51.84	26.92	0.29
Bihar	Saran	0.52	52.17	27.32	0.30
Bihar	Arwal	0.52	53.98	28.10	0.33
Bihar	llakhisarai	0.54	52.97	28.45	0.32
Bihar	Jehanabad	0.55	53.45	29.22	0.35
Bihar	Bhagalpur	0.53	55.14	29.43	0.36
Bihar	Nalanda	0.55	53.50	29.49	0.33
Bihar	Muzaffarpur	0.54	54.77	29.74	0.35
Bihar	Vaishali	0.57	53.74	30.76	0.36
Bihar	Banka	0.57	56.00	32.10	0.40
Bihar	Nawada	0.60	54.18	32.43	0.37
Bihar	Begusarai	0.59	54.94	32.46	0.38
Bihar	Madhubani	0.59	55.45	32.92	0.41
Bihar	Sheikhpura	0.61	54.75	33.48	0.39
Bihar	Samastipur	0.58	58.12	33.98	0.44
Bihar	Darbhanga	0.61	56.23	34.14	0.41
Bihar	Khagaria	0.60	57.19	34.32	0.43
Bihar	Gaya	0.64	54.37	35.06	0.41
Bihar	Pashchim Champaran	0.62	57.16	35.30	0.44
Bihar	Purba Champaran	0.65	57.24	37.10	0.48
Bihar	Katihar	0.64	58.59	37.52	0.50
Bihar	Jamui	0.67	57.00	38.38	0.48
Bihar	Sheohar	0.69	55.52	38.57	0.47
Bihar	Saharsa	0.65	59.24	38.68	0.50
Bihar	Supaul	0.68	57.37	38.87	0.50
Bihar	Kishanganj	0.67	58.97	39.48	0.54
Bihar	Madhepura	0.68	58.67	40.04	0.52
Bihar	Sitamarhi	0.70	57.97	40.51	0.52
Bihar	Purnia	0.70	59.38	41.57	0.56

State	District	HCR	Intensity	MPI	Depth
Chattishgarh	Durg	0.38	43.92	16.59	0.13
Chattishgarh	Bilaspur	0.36	46.75	17.00	0.15
Chattishgarh	Rajnandgaon	0.38	46.39	17.75	0.16
Chattishgarh	Raipur	0.40	45.51	18.21	0.17
Chattishgarh	Janjgir - champa	0.44	46.77	20.55	0.19
Chattishgarh	Dhamtari	0.46	45.30	20.95	0.18
Chattishgarh	Korea (koriya)	0.44	49.87	21.70	0.23
Chattishgarh	Mahasamund	0.45	48.84	22.20	0.23
Chattishgarh	Korba	0.46	48.96	22.32	0.22
Chattishgarh	Raigarh	0.44	51.45	22.75	0.26
Chattishgarh	Uttar Bastar Kanker	0.51	48.57	25.00	0.25
Chattishgarh	Jashpur	0.48	54.38	26.16	0.31
Chattishgarh	Bijapur	0.56	52.16	29.03	0.33
Chattishgarh	Kabirdham	0.57	51.60	29.48	0.32
Chattishgarh	Surguja	0.58	55.30	32.17	0.41
Chattishgarh	Bastar	0.62	53.91	33.32	0.41
Chattishgarh	Narayanpur	0.64	54.99	35.06	0.42
Chattishgarh	Dakshin Bastar Dantewada	0.71	56.56	40.00	0.50
Goa	South Goa	0.21	39.58	8.21	0.04
Goa	North Goa	0.24	39.07	9.48	0.04
Gujrat	Porbandar	0.28	42.55	11.99	0.09
Gujrat	Junagadh	0.28	43.34	12.19	0.08
Gujrat	Rajkot	0.29	42.26	12.45	0.09
Gujrat	Amreli	0.30	43.38	12.98	0.10
Gujrat	Surat	0.32	41.13	13.10	0.08
Gujrat	Ahmadabad	0.36	37.47	13.34	0.05
Gujrat	Mahesana	0.37	42.97	15.95	0.11
Gujrat	Jamnagar	0.35	47.38	16.51	0.14
Gujrat	Navsari	0.38	44.80	16.82	0.13
Gujrat	Bhavnagar	0.38	44.16	16.99	0.11
Gujrat	Valsad	0.39	46.20	17.95	0.15
Gujrat	Anand	0.43	42.81	18.55	0.12
Gujrat	Gandhinagar	0.45	43.92	19.80	0.14
Gujrat	Bharuch	0.45	44.99	20.24	0.16
Gujrat	Vadodara	0.45	48.11	21.67	0.19
Gujrat	Kachchh	0.45	48.50	21.69	0.18
Gujrat	Surendranagar	0.48	48.84	23.53	0.22
Gujrat	Sabarkantha	0.49	47.86	23.58	0.21
Gujrat	Patan	0.52	46.94	24.27	0.21
Gujrat	Kheda	0.53	46.37	24.52	0.21
Gujrat	Banaskantha	0.54	48.79	26.46	0.25
Gujrat	Tapi	0.56	49.39	27.71	0.29
Gujrat	Panchmahal	0.61	52.88	32.19	0.33
Gujrat	Narmada	0.62	51.65	32.26	0.34
Gujrat	Dohad	0.66	54.78	36.02	0.41
Harayana	Panchkula	0.13	40.63	5.45	0.03

State	District	HCR	Intensity	MPI	Depth
Harayana	Ambala	0.15	39.19	6.06	0.03
Harayana	Kurukshetra	0.18	40.95	7.53	0.04
Harayana	Panipat	0.19	39.82	7.72	0.04
Harayana	Karnal	0.21	39.58	8.44	0.04
Harayana	Sonipat	0.22	40.65	8.91	0.05
Harayana	Jhajjar	0.23	41.98	9.54	0.06
Harayana	Yamunanagar	0.25	40.79	10.08	0.06
Harayana	Hisar	0.25	41.83	10.33	0.06
Harayana	Gurgaon	0.27	41.24	10.97	0.06
Harayana	Kaithal	0.27	42.30	11.31	0.08
Harayana	Rohtak	0.27	42.12	11.34	0.07
Harayana	Jind	0.27	41.55	11.40	0.07
Harayana	Mahendragarh	0.30	41.92	12.67	0.08
Harayana	Bhiwani	0.32	41.74	13.42	0.08
Harayana	Rewari	0.34	42.26	14.49	0.09
Harayana	Faridabad	0.37	41.75	15.49	0.09
Harayana	Fatehabad	0.37	44.29	16.24	0.12
Harayana	Sirsa	0.37	45.50	16.80	0.14
Harayana	Palwal	0.42	48.11	20.15	0.17
Harayana	Mewat	0.64	54.10	34.77	0.40
HP	Hamirpur	0.22	40.69	9.12	0.05
HP	Kinnaur	0.23	40.23	9.21	0.06
HP	Mandi	0.24	41.59	9.99	0.07
HP	lahul and spiti	0.23	44.54	10.07	0.10
HP	Shimla	0.25	41.13	10.44	0.05
HP	Kullu	0.26	42.55	10.85	0.08
HP	Kangra	0.28	40.26	11.10	0.06
HP	Bilaspur	0.28	42.80	11.87	0.08
HP	Una	0.30	40.71	12.08	0.06
HP	Solan	0.29	42.21	12.25	0.07
HP	Sirmaur	0.33	43.63	14.60	0.11
HP	Chamba	0.35	43.92	15.34	0.11
J&K	Srinagar	0.13	38.31	5.09	0.02
J&K	Leh	0.15	45.02	6.84	0.07
J&K	Pulwama	0.19	40.91	7.79	0.05
J&K	Shupiyan	0.21	42.81	8.96	0.06
J&K	Jammu	0.23	41.95	9.48	0.05
J&K	Kulgam	0.22	43.73	9.75	0.07
J&K	Anantnag	0.23	44.63	10.33	0.08
J&K	Badgam	0.25	43.23	10.63	0.08
J&K	Baramula	0.27	42.82	11.44	0.07
J&K	Ganderbal	0.27	43.46	11.79	0.08
J&K	Kathua	0.28	47.32	13.33	0.11
J&K	Samba	0.32	43.11	13.60	0.09
J&K	Bandipore	0.32	45.77	14.42	0.11
J&K	Kupwara	0.32	45.27	14.43	0.12

State	District	HCR	Intensity	MPI	Depth
J&K	Reasi	0.30	49.23	14.69	0.14
J&K	Punch	0.34	50.61	17.06	0.16
J&K	Kishtwar	0.34	49.55	17.07	0.17
J&K	Rajouri	0.37	49.54	18.53	0.17
J&K	Udhampur	0.38	51.55	19.45	0.20
J&K	Doda	0.41	50.80	20.83	0.20
J&K	Ramban	0.42	51.69	21.57	0.23
Jharkhand	Purbi singhbhum	0.35	48.49	17.12	0.17
Jharkhand	Ranchi	0.42	46.65	19.81	0.18
Jharkhand	Ramgarh	0.43	45.71	19.82	0.17
Jharkhand	Bokaro	0.43	48.64	20.78	0.21
Jharkhand	Dhanbad	0.47	47.12	22.37	0.20
Jharkhand	Kodarma	0.51	50.31	25.66	0.26
Jharkhand	Gumla	0.47	55.04	26.09	0.31
Jharkhand	Hazaribagh	0.53	49.16	26.15	0.25
Jharkhand	Khunti	0.49	54.44	26.72	0.33
Jharkhand	Saraikela kharsawan	0.51	53.19	27.07	0.31
Jharkhand	Simdega	0.52	54.35	28.18	0.34
Jharkhand	Lohardaga	0.55	52.85	28.86	0.32
Jharkhand	Palamu	0.52	56.87	29.51	0.36
Jharkhand	Deoghar	0.58	53.94	31.04	0.35
Jharkhand	Godda	0.58	54.00	31.41	0.38
Jharkhand	Jamtara	0.59	53.44	31.51	0.36
Jharkhand	Garhwa	0.57	55.43	31.55	0.38
Jharkhand	Giridih	0.60	52.62	31.77	0.36
Jharkhand	Latehar	0.56	57.25	31.86	0.42
Jharkhand	Dumka	0.60	55.10	33.13	0.42
Jharkhand	Sahibganj	0.59	56.19	33.34	0.43
Jharkhand	Chatra	0.61	57.24	34.97	0.45
Jharkhand	Pashchimi Singhbhum	0.62	57.33	35.37	0.45
Jharkhand	Pakur	0.68	56.27	38.08	0.48
Karnataka	Bangalore	0.21	36.15	7.74	0.02
Karnataka	Dharwad	0.29	43.37	12.47	0.09
Karnataka	Mysore	0.31	42.17	12.94	0.09
Karnataka	Hassan	0.31	42.07	13.17	0.10
Karnataka	Kodagu	0.31	43.26	13.44	0.10
Karnataka	Mandya	0.31	43.61	13.47	0.11
Karnataka	Shimoga	0.32	42.45	13.69	0.10
Karnataka	Chikmagalur	0.31	44.43	13.82	0.11
Karnataka	Bangalore rural	0.35	41.48	14.32	0.09
Karnataka	Ramanagara	0.35	41.25	14.46	0.10
Karnataka	Belgaum	0.34	42.71	14.70	0.11
Karnataka	Davanagere	0.35	42.62	14.82	0.09
Karnataka	Kolar	0.36	42.56	15.12	0.11
Karnataka	Dakshina Kannada	0.38	42.02	15.94	0.09
Karnataka	Haveri	0.35	45.66	15.95	0.14

State	District	HCR	Intensity	MPI	Depth
Karnataka	Chitradurga	0.34	46.67	16.03	0.14
Karnataka	Bagalkot	0.36	45.40	16.55	0.13
Karnataka	Chikkaballapura	0.38	45.17	17.39	0.16
Karnataka	Gadag	0.37	46.99	17.40	0.16
Karnataka	Gulbarga	0.39	45.75	17.87	0.15
Karnataka	Bijapur	0.39	46.71	18.00	0.16
Karnataka	Uttara Kannada	0.40	44.92	18.10	0.14
Karnataka	Udupi	0.43	43.78	18.78	0.12
Karnataka	Bidar	0.41	46.38	19.02	0.17
Karnataka	Bellary	0.42	45.97	19.40	0.15
Karnataka	Chamarajanagar	0.43	45.53	19.51	0.18
Karnataka	Koppal	0.43	46.09	19.83	0.16
Karnataka	Raichur	0.44	50.82	22.56	0.24
Karnataka	Yadgir	0.58	50.03	28.99	0.30
Kerala	Kottayam	0.07	37.11	2.60	0.01
Kerala	Ernakulam	0.10	35.83	3.50	0.01
Kerala	Kollam	0.11	38.65	4.14	0.02
Kerala	Thrissur	0.11	36.93	4.18	0.02
Kerala	Pathanamthitta	0.12	37.78	4.68	0.02
Kerala	Thiruvananthapuram	0.13	39.62	5.29	0.03
Kerala	Idukki	0.14	39.83	5.54	0.03
Kerala	Alappuzha	0.15	37.63	5.67	0.02
Kerala	Malappuram	0.16	39.77	6.41	0.03
Kerala	Palakkad	0.18	38.32	7.05	0.03
Kerala	Kozhikode	0.18	38.66	7.13	0.03
Kerala	Kannur	0.19	37.41	7.26	0.02
Kerala	Kasaragod	0.20	39.30	7.96	0.03
Kerala	Wayanad	0.22	41.99	9.07	0.05
M.P	Indore	0.30	39.91	11.86	0.05
M.P	Bhopal	0.34	41.29	14.10	0.08
M.P	Hoshangabad	0.37	45.38	16.88	0.14
M.P	Jabalpur	0.39	47.57	18.65	0.18
M.P	Gwalior	0.42	45.29	18.82	0.15
M.P	Satna	0.40	50.37	20.29	0.23
M.P	Sehore	0.43	47.69	20.71	0.19
M.P	Bhind	0.44	48.58	21.14	0.21
M.P	Ujjain	0.46	46.29	21.24	0.18
M.P	Harda	0.43	49.87	21.30	0.22
M.P	Morena	0.45	48.28	21.73	0.21
M.P	Narsimhapur	0.45	49.58	22.15	0.24
M.P	Sagar	0.45	50.21	22.82	0.25
M.P	Chhindwara	0.45	51.16	23.07	0.25
M.P	Rewa	0.47	50.97	23.92	0.26
M.P	Raisen	0.50	47.85	24.12	0.23
M.P	Datia	0.50	48.13	24.14	0.23
M.P	Shajapur	0.51	47.43	24.42	0.24

State	District	HCR	Intensity	MPI	Depth
M.P	Anuppur	0.46	52.86	24.46	0.29
M.P	Katni	0.48	51.05	24.60	0.26
M.P	Betul	0.49	50.71	24.68	0.26
M.P	Burhanpur	0.49	52.07	25.39	0.26
M.P	Shahdol	0.48	53.02	25.39	0.32
M.P	Neemuch	0.53	48.25	25.64	0.25
M.P	Panna	0.49	53.15	25.79	0.32
M.P	Vidisha	0.50	52.12	26.19	0.29
M.P	Umaria	0.49	53.30	26.32	0.33
M.P	Damoh	0.50	52.65	26.41	0.30
M.P	Mandsaur	0.53	49.93	26.58	0.28
M.P	Sidhi	0.50	53.52	26.81	0.32
M.P	Tikamgarh	0.52	52.32	27.15	0.30
M.P	Ashoknagar	0.53	51.35	27.20	0.29
M.P	Seoni	0.51	53.05	27.25	0.31
M.P	Rajgarh	0.53	52.17	27.66	0.31
M.P	Shivpuri	0.52	52.89	27.69	0.32
M.P	Chhatarpur	0.53	52.94	28.30	0.32
M.P	Singrauli	0.52	55.77	28.80	0.35
M.P	Balaghat	0.57	51.10	29.38	0.32
M.P	Mandla	0.54	54.93	29.87	0.37
M.P	Ratlam	0.58	51.64	30.00	0.34
M.P	Guna	0.59	51.64	30.21	0.33
M.P	Dhar	0.59	51.39	30.42	0.32
M.P	Khandwa (East Nimar)	0.60	52.19	31.26	0.34
M.P	Khargone (West Nimar)	0.60	51.81	31.26	0.33
M.P	Dindori	0.60	56.08	33.55	0.43
M.P	Sheopur	0.62	54.11	33.78	0.39
M.P	Jhabua	0.72	58.29	42.21	0.52
M.P	Barwani	0.73	61.22	44.71	0.56
M.P	Alirajpur	0.79	60.65	47.77	0.60
Maharashtra	Mumbai Suburban	0.27	37.25	10.09	0.03
Maharashtra	Pune	0.27	40.08	11.00	0.06
Maharashtra	Nagpur	0.31	38.93	12.26	0.06
Maharashtra	Mumbai	0.33	37.85	12.49	0.04
Maharashtra	Kolhapur	0.34	40.78	13.71	0.08
Maharashtra	Solapur	0.33	42.76	13.91	0.11
Maharashtra	Sangli	0.35	40.95	14.22	0.09
Maharashtra	Jalgaon	0.32	45.44	14.70	0.12
Maharashtra	Aurangabad	0.35	43.12	14.89	0.11
Maharashtra	Wardha	0.37	40.29	14.93	0.09
Maharashtra	Akola	0.36	42.41	15.40	0.10
Maharashtra	Chandrapur	0.35	45.05	15.73	0.13
Maharashtra	Amravati	0.37	42.28	15.83	0.11
Maharashtra	Raigarh	0.38	43.25	16.24	0.11
Maharashtra	Ahmadnagar	0.36	45.42	16.25	0.14

State	District	HCR	Intensity	MPI	Depth
Maharashtra	Bhandara	0.38	43.36	16.33	0.13
Maharashtra	Thane	0.34	48.12	16.45	0.13
Maharashtra	Sindhudurg	0.38	44.14	16.85	0.12
Maharashtra	Satara	0.40	42.17	16.92	0.11
Maharashtra	Bid	0.38	46.49	17.82	0.17
Maharashtra	Washim	0.40	45.41	18.22	0.16
Maharashtra	Latur	0.42	42.98	18.22	0.13
Maharashtra	Buldana	0.39	47.11	18.46	0.17
Maharashtra	Nashik	0.41	44.92	18.50	0.14
Maharashtra	Gadchiroli	0.40	47.36	19.02	0.19
Maharashtra	Ratnagiri	0.42	45.34	19.15	0.17
Maharashtra	Gondiya	0.42	47.52	20.05	0.19
Maharashtra	Yavatmal	0.44	46.82	20.45	0.18
Maharashtra	Parbhani	0.44	46.81	20.62	0.18
Maharashtra	Hingoli	0.47	46.82	22.05	0.20
Maharashtra	Nanded	0.47	46.92	22.06	0.21
Maharashtra	Jalna	0.47	48.16	22.69	0.23
Maharashtra	Dhule	0.50	50.39	25.16	0.23
Maharashtra	Nandurbar	0.66	57.73	38.11	0.47
Manipur	Imphal West	0.17	44.91	7.73	0.06
Manipur	Imphal East	0.20	49.88	10.08	0.10
Manipur	Thoubal	0.20	50.86	10.25	0.11
Manipur	Bishnupur	0.22	49.13	10.87	0.10
Manipur	Churachandpur	0.26	49.39	12.97	0.14
Manipur	Chandel	0.26	51.40	13.34	0.16
Manipur	Ukhrul	0.27	50.15	13.37	0.14
Manipur	Senapati	0.29	50.40	14.75	0.17
Manipur	Tamenglong	0.34	52.46	17.74	0.21
Meghalaya	South Garo Hills	0.14	43.76	6.04	0.05
Meghalaya	East Khasi Hills	0.32	46.01	14.87	0.12
Meghalaya	West Garo Hills	0.32	50.26	16.27	0.17
Meghalaya	West Khasi Hills	0.35	47.63	16.73	0.17
Meghalaya	East Garo Hills	0.42	53.87	22.59	0.27
Meghalaya	Jaintia hills	0.46	50.22	23.05	0.24
Meghalaya	Ribhoi	0.52	51.73	26.83	0.30
Mizoram	Aizawl	0.17	37.80	6.49	0.03
Mizoram	Champhai	0.18	42.75	7.59	0.06
Mizoram	Serchhip	0.20	40.40	8.19	0.05
Mizoram	Saiha	0.22	43.02	9.61	0.07
Mizoram	Lunglei	0.23	43.60	10.11	0.08
Mizoram	Mamit	0.34	49.42	16.81	0.17
Mizoram	Lawngtlai	0.40	50.66	20.24	0.22
Nagaland	Kohima	0.24	45.65	10.99	0.09
Nagaland	Zunheboto	0.26	46.96	12.20	0.12
Nagaland	Mokokchung	0.28	44.02	12.24	0.10
Nagaland	Phek	0.27	47.83	12.68	0.14

State	District	HCR	Intensity	MPI	Depth
Nagaland	Wokha	0.29	47.50	13.93	0.15
Nagaland	Peren	0.29	49.11	14.24	0.17
Nagaland	Dimapur	0.31	46.12	14.46	0.12
Nagaland	Longleng	0.34	52.76	17.88	0.21
Nagaland	Kiphire	0.38	50.34	18.93	0.21
Nagaland	Tuensang	0.40	47.97	19.40	0.20
Nagaland	Mon	0.47	53.93	25.59	0.29
Orissa	Puri	0.24	46.44	11.32	0.10
Orissa	Jagatsinghapur	0.28	47.74	13.13	0.13
Orissa	Khordha	0.28	46.52	13.25	0.11
Orissa	Cuttack	0.31	46.99	14.73	0.14
Orissa	Nayagarh	0.30	50.50	15.23	0.18
Orissa	Kendrapara	0.37	48.93	18.12	0.18
Orissa	Jharsuguda	0.39	47.85	18.63	0.17
Orissa	Anugul	0.39	50.30	19.67	0.21
Orissa	Ganjam	0.39	50.60	19.85	0.22
Orissa	Jajapur	0.41	49.11	20.09	0.20
Orissa	Sundargarh	0.42	49.67	20.90	0.21
Orissa	Baleshwar	0.42	51.18	21.28	0.22
Orissa	Bargarh	0.41	52.41	21.50	0.25
Orissa	Bhadrak	0.43	50.56	21.66	0.23
Orissa	Sambalpur	0.42	51.61	21.67	0.25
Orissa	Dhenkanal	0.42	53.17	22.21	0.26
Orissa	Subarnapur	0.45	52.11	23.27	0.27
Orissa	Baudh	0.46	53.20	24.28	0.30
Orissa	Balangir	0.47	52.86	24.76	0.29
Orissa	Debagarh	0.48	53.11	25.72	0.30
Orissa	Gajapati	0.49	53.70	26.06	0.32
Orissa	Kandhamal	0.49	55.50	27.08	0.34
Orissa	Kendujhar	0.49	56.24	27.82	0.36
Orissa	Mayurbhanj	0.52	54.79	28.71	0.34
Orissa	Nuapada	0.54	53.08	28.76	0.33
Orissa	Kalahandi	0.54	56.72	30.79	0.41
Orissa	Rayagada	0.59	57.43	33.65	0.44
Orissa	Koraput	0.64	57.43	36.63	0.47
Orissa	Nabarangapur	0.65	56.54	37.01	0.48
Orissa	Malkangiri	0.69	59.39	41.15	0.54
Punjab	Jalandhar	0.15	37.55	5.65	0.02
Punjab	Ludhiana	0.19	38.70	7.17	0.03
Punjab	Patiala	0.20	40.08	8.17	0.04
Punjab	Hoshiarpur	0.20	40.74	8.34	0.05
Punjab	Kapurthala	0.22	40.11	8.67	0.05
Punjab	Rupnagar	0.23	38.21	8.84	0.04
Punjab	Sangrur	0.23	39.46	9.09	0.04
Punjab	Faridkot	0.22	41.64	9.29	0.06
Punjab	Bathinda	0.22	43.15	9.68	0.07

State	District	HCR	Intensity	MPI	Depth
Punjab	Moga	0.24	43.37	10.27	0.07
Punjab	Barnala	0.25	41.47	10.39	0.06
Punjab	Amritsar	0.25	41.26	10.43	0.06
Punjab	Fatehgarh Sahib	0.28	37.95	10.49	0.04
Punjab	Shahid Bhagat Singh Nagar	0.26	41.02	10.63	0.06
Punjab	Sahibzada A.S Nagar	0.29	39.19	11.36	0.05
Punjab	Tarn Taran	0.26	43.23	11.42	0.08
Punjab	Firozpur	0.26	43.51	11.53	0.08
Punjab	Muktsar	0.29	43.49	12.64	0.09
Punjab	Mansa	0.32	44.36	14.09	0.11
Rajasthan	Jhunjhunun	0.35	42.48	15.00	0.09
Rajasthan	Ajmer	0.39	43.17	16.69	0.11
Rajasthan	Jaipur	0.39	43.48	16.77	0.11
Rajasthan	Ganganagar	0.38	47.30	18.12	0.17
Rajasthan	Sikar	0.42	43.20	18.30	0.13
Rajasthan	Kota	0.41	44.60	18.44	0.15
Rajasthan	Churu	0.42	46.06	19.25	0.17
Rajasthan	Hanumangarh	0.40	48.57	19.54	0.19
Rajasthan	Jodhpur	0.42	47.63	19.92	0.17
Rajasthan	Dausa	0.43	46.72	19.98	0.18
Rajasthan	Alwar	0.44	46.73	20.43	0.17
Rajasthan	Bikaner	0.44	46.56	20.67	0.16
Rajasthan	Nagaur	0.44	48.28	21.08	0.21
Rajasthan	Bhilwara	0.45	49.00	21.82	0.22
Rajasthan	Tonk	0.47	47.50	22.17	0.22
Rajasthan	Pali	0.48	47.38	22.90	0.21
Rajasthan	Rajsamand	0.49	48.98	24.17	0.25
Rajasthan	Chittaurgarh	0.48	51.37	24.73	0.28
Rajasthan	Jhalawar	0.49	50.57	24.82	0.26
Rajasthan	Sawai madhopur	0.51	49.19	24.90	0.25
Rajasthan	Bharatpur	0.48	52.37	25.07	0.25
Rajasthan	Baran	0.51	49.06	25.08	0.26
Rajasthan	Dhaulpur	0.51	49.66	25.29	0.26
Rajasthan	Karauli	0.53	49.78	26.26	0.27
Rajasthan	Bundi	0.52	51.39	26.68	0.29
Rajasthan	Sirohi	0.56	51.83	29.21	0.30
Rajasthan	Jalor	0.56	52.73	29.49	0.32
Rajasthan	Dungarpur	0.60	54.33	32.52	0.37
Rajasthan	Pratapgarh	0.60	56.24	33.57	0.41
Rajasthan	Udaipur	0.61	56.47	34.17	0.40
Rajasthan	Jaisalmer	0.60	57.48	34.24	0.41
Rajasthan	Barmer	0.63	57.86	36.34	0.46
Sikkim	South district	0.11	39.60	4.27	0.02
Sikkim	North district	0.14	41.13	5.65	0.04
Sikkim	West district	0.16	41.85	6.55	0.05
Sikkim	East district	0.18	39.12	6.98	0.03

State	District	HCR	Intensity	MPI	Depth
TamilNadu	Chennai	0.16	36.00	5.89	0.02
TamilNadu	Kanniyakumari	0.19	37.17	6.99	0.02
TamilNadu	Coimbatore	0.21	38.44	8.20	0.04
TamilNadu	Kancheepuram	0.21	39.75	8.33	0.05
TamilNadu	Thiruvallur	0.22	39.17	8.46	0.05
TamilNadu	The Nilgiris	0.22	38.69	8.48	0.04
TamilNadu	Namakkal	0.22	39.30	8.55	0.05
TamilNadu	Tiruppur	0.23	38.65	9.01	0.04
TamilNadu	Erode	0.24	38.24	9.08	0.05
TamilNadu	Vellore	0.25	39.49	10.05	0.06
TamilNadu	Tiruchirappalli	0.25	39.90	10.08	0.06
TamilNadu	Theni	0.24	42.23	10.24	0.08
TamilNadu	Salem	0.24	41.90	10.26	0.07
TamilNadu	Karur	0.26	39.42	10.31	0.05
TamilNadu	Dindigul	0.25	41.30	10.46	0.06
TamilNadu	Madurai	0.27	41.76	11.13	0.08
TamilNadu	Thanjavur	0.26	42.25	11.14	0.08
TamilNadu	Thoothukkudi	0.29	40.40	11.54	0.08
TamilNadu	Sivaganga	0.29	42.01	12.09	0.08
TamilNadu	Cuddalore	0.28	42.91	12.19	0.09
TamilNadu	Tiruvannamalai	0.29	42.02	12.21	0.09
TamilNadu	Virudhunagar	0.29	42.92	12.30	0.10
TamilNadu	Dharmapuri	0.30	41.07	12.36	0.08
TamilNadu	Thiruvarur	0.28	43.59	12.37	0.10
TamilNadu	Perambalur	0.30	42.34	12.58	0.09
TamilNadu	Ramanathapuram	0.30	42.31	12.84	0.09
TamilNadu	Tirunelveli	0.33	39.59	13.11	0.08
TamilNadu	Ariyalur	0.30	44.42	13.50	0.12
TamilNadu	Viluppuram	0.32	43.33	13.77	0.10
TamilNadu	Krishnagiri	0.33	41.46	13.82	0.09
TamilNadu	Nagapattinam	0.35	41.82	14.77	0.10
TamilNadu	Pudukkottai	0.35	44.05	15.42	0.12
Telengana	Hyderabad	0.32	37.32	11.86	0.04
Telengana	Rangareddy	0.37	39.66	14.63	0.08
Telengana	Karimnagar	0.39	42.66	16.45	0.14
Telengana	Khammam	0.37	44.90	16.80	0.15
Telengana	Warangal	0.41	44.94	18.57	0.17
Telengana	Nizamabad	0.45	46.17	20.91	0.19
Telengana	Medak	0.46	45.56	21.11	0.19
Telengana	Mahbubnagar	0.45	47.36	21.28	0.20
Telengana	Adilabad	0.51	50.41	25.77	0.28
Tripura	West Tripura	0.27	46.92	12.50	0.11
Tripura	South Tripura	0.32	48.86	15.79	0.17
Tripura	Dhalai	0.35	53.04	18.69	0.22
Tripura	North Tripura	0.48	55.26	26.26	0.31
UP	Kanpur Nagar	0.28	47.16	13.18	0.12

State	District	HCR	Intensity	MPI	Depth
UP	Gautam Buddha Nagar	0.32	43.28	13.71	0.09
UP	Lucknow	0.31	45.78	14.37	0.12
UP	Ghaziabad	0.36	44.13	15.88	0.11
UP	Jhansi	0.38	45.86	17.44	0.15
UP	Auraiya	0.35	50.42	17.62	0.18
UP	Baghpat	0.39	46.47	18.04	0.14
UP	Meerut	0.40	44.80	18.09	0.13
UP	Jalaun	0.37	50.14	18.41	0.18
UP	Etawah	0.39	47.11	18.41	0.16
UP	Varanasi	0.43	45.57	19.39	0.15
UP	Mainpuri	0.40	48.64	19.46	0.19
UP	Mathura	0.42	47.29	19.71	0.17
UP	Mahamaya Nagar	0.43	47.87	20.41	0.19
UP	Firozabad	0.43	47.46	20.62	0.19
UP	Muzaffarnagar	0.44	47.37	20.77	0.18
UP	Agra	0.43	48.16	20.79	0.18
UP	Aligarh	0.44	48.03	21.00	0.19
UP	Banda	0.40	52.65	21.26	0.25
UP	Kanpur Dehat	0.42	51.61	21.50	0.23
UP	Hamirpur	0.44	49.48	21.88	0.24
UP	Bulandshahr	0.46	47.98	21.91	0.20
UP	Bijnor	0.47	46.52	22.02	0.19
UP	Gorakhpur	0.46	48.62	22.14	0.23
UP	Etah	0.44	51.35	22.68	0.24
UP	Saharanpur	0.48	47.65	22.75	0.19
UP	Ballia	0.46	50.79	23.44	0.23
UP	Allahabad	0.48	49.44	23.57	0.23
UP	Azamgarh	0.48	49.40	23.63	0.24
UP	Lalitpur	0.47	50.41	23.84	0.26
UP	Deoria	0.47	50.47	23.89	0.24
UP	Farrukhabad	0.48	51.08	24.39	0.25
UP	Rae Bareli	0.47	52.01	24.43	0.29
UP	Jaunpur	0.50	49.92	24.83	0.25
UP	Moradabad	0.50	49.49	24.88	0.24
UP	Mau	0.49	51.03	24.93	0.25
UP	Sant Ravidas Nagar (Bhado)	0.51	49.01	24.93	0.25
UP	Mahoba	0.52	49.42	25.91	0.28
UP	Mirzapur	0.50	51.46	25.94	0.28
UP	Kannauj	0.50	52.18	26.16	0.29
UP	Pratapgarh	0.51	51.81	26.50	0.29
UP	Jyotiba Phule Nagar	0.53	50.10	26.51	0.26
UP	Fatehpur	0.50	53.19	26.66	0.30
UP	Bareilly	0.52	51.17	26.71	0.27
UP	Unnao	0.51	52.62	26.73	0.31
UP	Ghazipur	0.52	52.38	27.04	0.29
UP	Ambedkar Nagar	0.53	51.47	27.26	0.30

State	District	HCR	Intensity	MPI	Depth
UP	Sultanpur	0.51	53.51	27.55	0.32
UP	Faizabad	0.54	51.91	28.04	0.31
UP	Basti	0.53	52.56	28.11	0.32
UP	Kushinagar	0.54	52.32	28.18	0.32
UP	Pilibhit	0.52	54.49	28.40	0.33
UP	Sonbhadra	0.52	55.86	28.99	0.35
UP	Sant Kabir Nagar	0.56	52.63	29.31	0.33
UP	Bara Banki	0.54	54.54	29.42	0.37
UP	Rampur	0.57	52.24	29.77	0.31
UP	Shahjahanpur	0.57	53.15	30.14	0.33
UP	Kanshiram Nagar	0.57	54.09	30.68	0.37
UP	Chitrakoot	0.57	54.89	31.49	0.37
UP	Mahrajganj	0.60	53.16	32.15	0.38
UP	Hardoi	0.60	54.57	32.59	0.39
UP	Sitapur	0.61	56.81	34.93	0.44
UP	Siddharth Nagar	0.66	53.66	35.31	0.41
UP	Gonda	0.63	56.51	35.75	0.44
UP	Kaushambi	0.64	56.84	36.34	0.45
UP	Budaun	0.66	55.77	36.88	0.43
UP	Kheri	0.67	57.29	38.34	0.48
UP	Balrampur	0.70	58.00	40.59	0.54
UP	Bahraich	0.69	59.19	41.13	0.55
UP	Shrawasti	0.71	60.09	42.93	0.57
Uttarakhand	Dehradun	0.25	40.35	10.14	0.05
Uttarakhand	Rudraprayag	0.23	46.32	10.66	0.11
Uttarakhand	Chamoli	0.25	46.57	11.76	0.13
Uttarakhand	Nainital	0.29	42.23	12.20	0.07
Uttarakhand	Garhwal	0.27	45.26	12.36	0.11
Uttarakhand	Pithoragarh	0.26	47.03	12.39	0.12
Uttarakhand	Uttarkashi	0.32	47.97	15.48	0.15
Uttarakhand	Tehri Garhwal	0.36	45.59	16.21	0.14
Uttarakhand	Bageshwar	0.36	47.87	17.14	0.16
Uttarakhand	Champawat	0.35	49.77	17.41	0.19
Uttarakhand	Almora	0.37	46.96	17.60	0.16
Uttarakhand	Udham Singh Nagar	0.39	46.10	17.95	0.14
Uttarakhand	Haridwar	0.42	46.46	19.59	0.16
WB	Kolkata	0.28	38.28	10.88	0.04
WB	North 24 Parganas	0.27	42.95	11.68	0.08
WB	Darjiling	0.27	45.21	12.16	0.11
WB	Nadia	0.28	45.34	12.69	0.11
WB	Hugli	0.33	45.64	14.98	0.13
WB	Purba Medinipur	0.34	46.68	15.83	0.15
WB	Haora	0.37	44.81	16.48	0.13
WB	Barddhaman	0.40	48.41	19.26	0.19
WB	South 24 Parganas	0.42	49.19	20.47	0.20
WB	Dakshin Dinajpur	0.41	50.37	20.77	0.23

State	District	HCR	Intensity	MPI	Depth
WB	Jalpaiguri	0.41	51.39	21.12	0.23
WB	Murshidabad	0.45	49.01	21.81	0.22
WB	Koch Bihar	0.44	51.44	22.48	0.26
WB	Paschim Medinipur	0.48	50.33	24.13	0.26
WB	Maldah	0.48	50.46	24.34	0.27
WB	Bankura	0.50	50.88	25.39	0.28
WB	Birbhum	0.50	51.52	25.80	0.30
WB	Uttar Dinajpur	0.56	51.99	29.29	0.32
WB	Puruliya	0.66	55.70	36.61	0.46

Source: Estimated by the author

Table C 1: State wise population share of each sub-group asper NFHS 4

States	Pop Share	General	OBC	SC	ST
Andhra Pradesh	5.86	0.30	0.42	0.24	0.03
Arunachal Pradesh	0.4	0.11	0.03	0.02	0.84
Assam	2.45	0.49	0.30	0.08	0.13
Bihar	3.44	0.20	0.59	0.21	0.01
Chhattisgarh	2.83	0.12	0.50	0.11	0.26
Delhi	2.31	0.51	0.28	0.20	0.01
Goa	0.4	0.58	0.38	0.02	0.01
Gujrat	5	0.39	0.39	0.12	0.09
Haryana	3.89	0.39	0.31	0.28	0.01
Himachal Pradesh	3.3	0.60	0.09	0.27	0.04
Jammu & Kashmir	1.72	0.81	0.08	0.10	0.02
Jharkhand	2.22	0.20	0.42	0.11	0.27
Karnataka	9.68	0.17	0.57	0.17	0.09
Kerala	4.17	0.47	0.43	0.09	0.01
Maharashtra	7.71	0.20	0.44	0.21	0.16
Manipur	0.25	0.41	0.34	0.17	0.08
Meghalaya	0.39	0.09	0.90	0.01	0.00
Mizoram	0.25	0.17	0.04	0.07	0.71
MP	6.75	0.00	0.00	0.00	1.00
Nagaland	0.31	0.03	0.13	0.00	0.84
Orissa	4.97	0.16	0.45	0.21	0.18
Punjab	3.83	0.45	0.21	0.33	0.00
Rajasthan	5.98	0.29	0.40	0.23	0.08
Sikkim	0.22	0.25	0.18	0.46	0.11
Tamil Nadu	5.05	0.05	0.67	0.27	0.01
Tripura	0.55	0.33	0.21	0.17	0.28
UP	8.45	0.33	0.46	0.21	0.01
Uttarakhand	1.1	0.40	0.25	0.34	0.00
WB	5.73	0.57	0.10	0.29	0.04

Source: Estimated by the author

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