UNITED NATIONS
UNIVERSITY
UNU-WIDER

This paper is a draft submission to

Inequality—Measurement, trends, impacts, and policies

5–6 September 2014 Helsinki, Finland

Reproductive Health Inequality in India at Sub-National Level: Trend, Differential and Determinants

Gargi Bhattacharya
Assistant Professor, Economics Department
Mahadevananda Mahavidyalaya, Barrackpore- Kolkata-700120,India
Email: g.b82here@gmail.com

Sushil K. Haldar
Associate Professor, Department of Economics
Jadavpur University, Kolkata-700032, India
Email: sushil.haldar@gmail.com

ABSTRACT:

The present paper seeks to explore the movement of inequality of the deprivation of reproductive health status of 15 major states in India from 1992-93 to 2007-8. It is found that inequality in overall reproductive health status is rising over time, but parameter specific inequality study gives us mixed results. High as well as rising trend of regional inequality in respect of reproductive health is expected to have long-term social and economic consequences. Panel data regression confirms that female literacy rate and female labor force participation are the two demand side variables affecting deprivation of reproductive health status whereas two supply side factors like health infrastructure gap and social sector spending appear as significant predictors of deprivation of reproductive health. Our central planning authority should take a serious note on this issue of regional imbalance otherwise; our future development path may be jeopardized due to poor reproductive health.

Key words: Reproductive and Child Health, Deprivation Index, Health Infrastructure

JEL Classification: **C43, D63, I18**

Introduction:

India is the 2nd largest populous country possessing about 2.4 percent of the total land area of the world but she has to support about 17 percent of the global population; global disease burden is also disproportionately high--it is quite alarming to note that 36 percent of world's poor and 30 percent of world's tuberculosis patients live in India. India contributes to largest sum of births per year (27 million) in the world and alone accounts for 20 percent of global maternal deaths, 23 percent under five mortality rate and 26 percent deaths preventable with childhood vaccinations (World Health Organization 2008). Very recently some organizations like United Nations' Population Division (UNPD) and Population Reference Bureau have predicted that India at the aggregate is going to enjoy the benefit of "Demographic Dividend" roughly after 2025.Achievement of this future demographic dividend which is expected to be enjoyed during 2025 largely depends on rapid fertility decline of our country accompanied by changes in the ratio between the economically active population and dependent population. As fertility falls, a larger proportion of the population is in the age range 15–65, compared with the under 15 and over 65 categories. India has started to reap the benefit of demographic advantage around the mid 1970s and declining fertility rates have changed the age structure of India's population in favour of the share of working age people. With this bulge of the working age cohort India can expect a spinoff in terms of growth within 2025 as 'demographic bonus' ought to be associated with increased economic output in near future. But recent employment statistics of India suggest that absorption of the Indian youth in labour force is not so high that one would expect due to poor employability of the work force which is severely affected by the poor health and educational status of the working population. Because in the development perspective, the strategic policy issues related to population not only centered round the quantitative problems of population pressure but also the quality of the people in their aggregate socio-economic backdrop. This quality can be attained through effective human capital formation and in this respect health of the reproductive mother belonging to the reproductive age cohort is also very much important. Incidence, depth as well as severity of malnourished children is found to be maximum

in India in the world. One of the important causes of such malnourishment is due to poor health status of the reproductive mothers. Moreover, proper childhood development depends to a large extent on the prenatal care for the reproductive mothers so that child births can take place under adequate medical supervision. There is an important linkage between improvement in maternal health and development process as poor maternal health may negatively affect child health, reduce women productive capacity, lowers participation in economic activities and sabotages the process of the effective human capital formation and finally retards economic growth. However, it is quite disheartening that the major health challenges posed by the specific phase of the demographic transition that India is going through is related to infant mortality and reproductive health. Therefore, in the context of getting real benefit of demographic dividend in near future, we must know about the present health status of the mothers and to explore the regional variation of Reproductive Health Status of India so that appropriate measures can be undertaken at the disaggregate level towards alleviation of this kind of short falls of reproductive health with a view to ensure social justice, equity and inclusive growth.

Paradigm shift has taken place in India's population policies from the earlier methods mix target approach to the target free approach (TFA) in April 1996 subsequently renamed as the community's need assessment (CNA) approach at late 1997. These shifts have duly emphasized the reproductive and child health (RCH) quality services package which is geared towards an improvement in the quality of life having implicit implications for a reduction in infant and maternal mortality. The immediate objective of National Population Policy (NPP)-2000 is to address the unmet needs for contraception, healthcare infrastructure and health personnel and to provide an integrated service delivery for basic reproductive and child health care (MHFW 2000) . The availability and accessibility to the reproductive and child health package of quality services would facilitate a reduction in infant and maternal mortality and would improve not only the quality of life but also lead to a faster reduction in the unwanted fertility component of the total fertility. Meeting this immediate objective is essential in order to attain the medium term objective of bringing down fertility to replacement level and population stabilization by 2045.

Reproductive and child health has a multidimensional sphere which generally includes pregnancy, child birth and post partum care, maternal and infant nutrition, breast feeding, sexual behaviours, STDs and HIV/AIDS, reproductive rights, freedom, women's status and empowerment. Under these circumstances there has been an increasing thinking in the scientific

community about the need to give stress on maternal health in essence of their reproductive health problems (Pachauri 1995). Utilization of reproductive health services (RHS) and their linkages with basic demographic parameters and socioeconomic developmental factors have often been argued and highlighted in the theoretical and empirical literature. The National Population Policy-2000 affirms the provision of quality RHS and an informed choice of contraception along with women empowerment characterized by improvements in women's educational standards, working conditions and autonomy. These improvements are expected to bring about changes in their quality of life, standards of living and to facilitate a faster control and an early stabilization of population.

Since the inception of family welfare programmes in First Five Year Plan (1951-1956), Government of India has taken various steps to strengthen the maternal and child health. Maternal and child health and nutrition were integrated with family planning programme during Fifth Five Year Plan (1974-1979). In the year 1992-1993, programme was renamed as child survival and safe motherhood programme (CSSM) with a view to improve quality and utilization of MCH services. In the year 1997, the programme was again renovated and renamed as Reproductive and Child Health (RCH) which incorporates all components of CSSM and some additional components like reproductive tract infections and sexually transmitted diseases. Broadly, the programme aims to universalize immunization, antenatal care, skilled attendance during delivery as well as for common childhood elements. A step further of new endeavor of Govt. of India, National Rural Health Mission (NRHM 2009) outlines its objectives to promote 'equity, efficiency, quality and accountability of public health services through community driven approaches, decentralization and improving local governance to rural population, particularly among poor, underserved women and children.

Despite of all the programmes and efforts taken by the Government, some studies have revealed that reproductive and child health situation in India is quite alarming, especially in Northern states. In some major states (viz. Uttar Pradesh, Madhya Pradesh, Bihar and Rajasthan), the utilization of Govt. health facilities for delivery was poor that is only 5 to 16 percent, whereas home deliveries were widely prevalent and largely attended by untrained birth attendants that is 80 to 92 percent with greater probability of high risk of maternal morbidity and mortality (Raju, 2002).

With this overall scenario, an urge is felt to explore the inter-state variation in Reproductive Health (RH) indicators of India. This study is thus aimed to examine the variation in the reproductive health status among the 15 major states of India in five points of time viz. 1992-93, 1998-99, 2003-04, 2005-06 and 2007-08 using NFHS and DLHS Survey results. An attempt here is made to explore the plausible causes of such inter-state disparities of RH status in India.

Objectives / Major Research Questions Addressed:

Keeping in mind the importance of health in general and reproductive health in particular in social development paradigm, the following are the research objectives:

- Since reproductive health has a multidimensional sphere including a number of variables, therefore, our first objective is to estimate an appropriate index namely RH deprivation index (RH-DI) in order to determine the relative positions of the 15 major states of India in respect of the overall RH status.
- Secondly we have tried to examine whether the states are converging or diverging in respect of deprivation indices (and its RH components) over time using two inequality measures like Generalized Entropy and Atkinson Index.
- To find out what are the possible reasons of low performance of some states in respect of selected RH parameters. Is it due to supply side factors or demand side factors or both?
- To explore the role of rural public healthcare infrastructure in determining the differential RH outcome and to find out the status of 3-tier rural healthcare infrastructure among the states of India. Is the inequality of rural healthcare infrastructure rising over time?

Data and Methodology:

The present paper uses the dataset of District Level Household and Facility Survey (DLHS: Round-II: 2003-04 and Round-III: 2007-08) and National Family Health Survey (NFHS: ROUND I-1992-93, Round-II: 1997-98 and Round-III: 2005-06) conducted by Ministry of Health and Family Welfare, Government of India. In our analysis we have considered 15 major states of India and have chosen 5 key RH indicators which are found to be commonly available in five points of time for our present study. These are:

i) Percentage of less than 2nd and higher order births reported(X_1)

ii) Percentage of institutional delivery(X_2)

iii) Percentage of pregnant women who had TT twice and mothers who had at least 3 antenatal care visits during last pregnancy(X_3)

iv) Percentage of women who are current users of any family planning method(X_4)

v) Percentage of women not suffering from anemia (X_5)

Construction of RH Deprivation Indices:

Different indices may be computed to study the pattern of reproductive health status in the states of India. One can estimate the RH achievement index using Range Equalization Formula or simple Relative Distance Methodology, generally used in the construction of human development index (HDI) but if we try to understand how far and to what extent the states are deprived from the above cited key RH parameters, the Human Poverty Index formula developed by Anand and Sen (1997) is assumed to be much more relevant towards formulation of policy prescription.

It is to be mentioned here that a state with higher achievement (AI) generally manifests lower deprivation but it may always not hold good because of the power of the average (α). Thus, in order to find out the Deprivation Index in respect of the RH parameter, we subtract each parameter from 100, since all are positive developmental parameters given in percentage terms. Thus, following Anand and Sen (1997), we consider the following function:

$$RH\text{-}DI(\alpha)=[\sum\omega_i.P_i^{\alpha}/\sum\omega_i]^{1/\alpha} \quad \ldots\ldots\ldots\ldots(1)$$

where, $P_i=(100-X_i)$, α stands for the order of the average, ω_i be the weights attached to $(100-X_i)$ parameter, i=1,2…5.

Equation (1) does follow some important properties of a good index. It is to be mentioned here that the RH-DI(α) does also suffer from the problem of the choice of the dimensions, aggregation, overlapping and multicollinearity multicollinearity (Alkire 2007, Krishnaji 1997, Rippin 2009, Roy and Haldar 2010). Moreover, the arbitrary weightage scheme is unscientific. In order to overcome this problem, we employ the Principal Component Analysis (PCA) through which we can reduce the number of variables in one hand and take care of the weights of the PCs on the other hand[1]. Here, the weights are not arbitrarily given; it is determined endogenously

from the data matrix (Raychaudhuri and Haldar 2010, Bhattacharya and Haldar 2012). We assume, the weights of the PCs are the corresponding Eigen Values (λ). Thus, we can have two DI(α) –one can be estimated using equation (1) where $\omega_1 = \omega_2 = \ldots = \omega_7 = 1$ and the other one can be estimated using PCA (using the same logic of eqn. 1) which is termed as weighted reproductive health deprivation index (WRHDI) of order α as given in equation (2). Here, in our analysis, we estimate WRHDI using PCA assuming α=3.

$WRHDI_j(\alpha) = [\omega_1 * \{(PC_1)_j\}^{\alpha} + \omega_2 * \{(PC_2)_j\}^{\alpha}]^{1/\alpha}$ ……(2) where, $\omega_1 = \lambda_1/(\lambda_1 + \lambda_2)$ and $\omega_2 = \lambda_2/(\lambda_1 + \lambda_2)$. PC_1=first principal component and PC_2=second principal component. In this paper, we have reported only the weighted RH-DI. In our analysis, we have extracted at most two PCs based on Kaiser Normalization and Scree Tests criteria.

Methods to study the Inequality of the Indices and the selected RCH parameters:

The inequalities are analyzed using two different inequality measures. These are:

Generalized Entropy Class of measure (GE)

Atkinson Class of measures

The Lorenz Class like Gini Coefficient is not applied here because of non-monetary values of the RH parameter. The GEM and Atkinson inequality measures give different implications for the distribution to be analyzed. The Generalized Entropy class of measures, for example, GE(0) or mean log deviation is more sensitive to the changes in the lower tail of the distribution. GE(1) or Theil index applies equal weights to entire distribution. GE(2) is ½ of the squared coefficient of variation(CV). This index is more sensitive to the upper tail of the distribution.

The Atkinson measure (AT) is originated from the social welfare point of view. Inequality aversion parameter (ε) ranges from zero to infinity, with 0 representing no preference for equality. This index is a measurement of inequality that explicitly incorporates normative judgement about social welfare.

$$GE(0)=Theil(0) = \frac{1}{n}\left[\sum_{i=1}^{n} \log \frac{\bar{y}}{y_i}\right] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(3)$$

$$GE(1)=Theil(1)= \frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i}{\bar{y}}.\log\frac{y_i}{\bar{y}}\right) \ldots\ldots\ldots\ldots(4)$$

$$GE(2)= (½)*CV^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

$$AT= 1-\left[\frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i}{\bar{y}}\right)^{1-\epsilon}\right]^{\frac{1}{1-\epsilon}} \quad \ldots\ldots\ldots\ldots\ldots(6)$$

Here, n=number of states=15, $y_i=P_i$=RH parameter/indicator, ε=inequality aversion parameter. In our analysis, we have used α=0, 1 and 2 for calculation of GEM; while the Atkinson Index is estimated for different values (viz. 0.5, 1 and 2) of the inequality aversion parameter (ε).

Selection of the Variables, Model Specification in Panel Data Regression towards Determining RH deprivation index across the 15 major states in India:

In order to find out the determinants of RH-DI across the 15 states of India we have carried out a panel data regression using the following socio-economic and infrastructural variables . These are: Female Literacy Rate, Female Labor Force Participation, Income measured by Per Capita SDP, Per capita Social Sector Expenditure comprising education and healthcare lagged by 5 years (since human capital investment (viz. SSE) does not give instantaneous return) , Rural Public Healthcare Infrastructure measured[2] by Gap of Community Health Centre, Primary Health Centre where the gaps have been calculated by the difference between actual and required number of CHC, PHC in each state on the basis of the 1983 Health Policy. Initially, we have incorporated other variables like proportion of backward community (viz. SC and ST) and Minority but finally, all are dropped from the model because of very marginal and insignificant explanatory power of the variables. Data on Female Literacy Rate and Female Labor Force Participation Rate are estimated from the decadal values given in different Census Reports, Govt. of India. SDP (Per Capita) is drawn from CSO, GoI. Data on rural healthcare infrastructure are collected from Rural Health Statistics, Ministry of Health and Family Welfare, Govt of India. Per Capita Social Sector Expenditure (PCSSE) is collected from Statistical Abstract-Central Statistical Organization, Govt. of India. We have 15 states and 5 time points; WRH-DI has been considered as dependent variable in the model. therefore, we consider the following panel data regression model:

$$WDI_{it}=\beta_1.(FLR_{it})^{\beta 2}.(FLFPP_{it})^{\beta 3}.(PCSDP_{it})^{\beta 4}.(PCSSE_{it-5})^{\beta 5}.(PCSSE_{it-10})^{\beta 6}.(GCHC_{it})^{\beta 7}.(GPHC_{it})^{\beta 8}(e)^{uit} \ldots..(7)$$

Where, i=1,2,3…15; t=1,2,…,5; WDI=weighted deprivation index, FLR=female literacy rate, PCSDP=per capita state domestic product, GCHC=gap of community health centre, GPHC=gap

of primary health centre, $PCSSE_{it-5}$= per capita social sector expenditure lagged by 5 years, $PCSSE_{it-10}$= per capita social sector expenditure lagged by 10 years , u_{it} be the error term.

We apply the unrestricted or unconstrained regression, this is because the dependent variable is composed of many variables and it is artificially created, does not exactly reflect any specific variable.

Findings:

Following the above cited methodology, we have estimated the weighted reproductive health deprivation index (RHDI) for 15 major states at five points of time as given in the following Table-1:

Table 1: RHDI in the 15 States of India: 1992-93, 1997-98, 2003-04, 2005-06 and 2007-08

States	RHDI(1992-93)	RHDI(1997-98)	RHDI(2003-04)	RHDI(2005-06)	RHDI(2007-08)
Andhra Pradesh	185.15(12)	143.85(13)	128.97(13)	108.25(13)	61.65(13)
Assam	293.34(02)	258.99(03)	258.74(03)	234.66(03)	163.40(03)
Bihar	296.29(01)	290.02(01)	290.13(01)	288.25(01)	184.77(02)
Gujrat	196.63(09)	172.04(09)	172.92(08)	155.63(09)	107.89(08)
Haryana	229.72(07)	198.91(06)	190.68(07)	166.20(07)	93.68(10)
Karnataka	192.90(10)	156.45(11)	136.91(12)	127.01(11)	79.67(11)
Kerala	94.85(15)	82.41(15)	69.14(15)	75.22(15)	52.79(15)
Madhya Pradesh	271.54(5)	193.49(07)	223.70(05)	195.81(05)	139.87(04)
Maharastra	180.97(13)	153.39(12)	147.99(11)	121.71(12)	74.98(12)
Orissa	258.77(06)	217.45(05)	201.74(06)	183.29(06)	124.0(06)
Punjab	191.52(11)	162.76(10)	170.87(09)	139.44(10)	95.09(09)
Rajasthan	285.63(04)	244.58(04)	230.80(04)	208.47(04)	139.41(05)
Tamil Nadu	159.22(14)	124.13(14)	98.79(14)	89.16(14)	53.45(14)
Uttar Pradesh	291.44(03)	281.29(02)	262.32(02)	242.32(02)	188.77(01)
West Bengal	225.13(08)	184.66(08)	167.80(10)	162.28(08)	109.83(07)

Note: Values in parentheses represents rank. Higher values mean lower rank.

We have found that there exists wide range differential across the states of India in terms of overall reproductive health deprivation and utilization of reproductive health services. Four laggard states (Bihar, Uttar Pradesh, Rajasthan and Madhya Pradesh), which are collectively known as BIMARU states are relatively more deprived compared to others in all the selected 5 time points.

Study of Inequality across the states in respect of RH –WDI and all five Key Parameters for five points of time in India:

The extent of inequality of RH –WDI and its five components is given in Table 2.The results show that the Weighted Deprivation Index is found to be rising over time. Does it mean that all the states are diverging in all the five deprivation parameters? Since, WDI is composed of all the five parameters; we need to estimate the inequality of all the parameters in 5 points of time.

Although inequality in overall reproductive health status is rising over time, parameter specific inequality study gives us mixed results. It has been found that regional inequality is more pronounced in case of institutional delivery of the mothers and higher order births. It is to be noted that Govt. of India has enacted Janani Suraksha Yojona (Safe Motherhood Programme) in 2005 to encourage institutional delivery by providing some cash incentive to pregnant women if they deliver in medical facilities; but till date (according to DLHS-3), many states as well as districts fail to achieve 100 percent safe delivery.

Table 2: Inequality Measurement of the WDI and Five Deprivation Parameters

Parameters	Year	GE(0)	GE(1)	GE(2)	AT(0.5)	AT(1)	AT(2)
Weighted Deprivation Index(WDI)	1992-93	.0391	.0349	.0349	.0183	.0384	.0845
	1998-99	.0486	.0454	.0475	.0232	.0474	.0989
	2003-04	.0633	.0569	.0580	.0295	.0614	.1312
	2005-06	.0638	.0606	.0647	.0306	.0618	.1239
	2007-08	.0793	.0754	.0808	.0380	.0762	.1498
Parameter 1	1992-93	.3037	.2278	.2296	.1227	.2619	.5428
	1998-99	.3002	.2635	.3034	.1318	.2594	.4755
	2003-04	.3233	.2788	.3273	.1397	.2762	.5086
	2005-06	.3411	.2821	.4044	.1423	.2833	.5161
	2007-08	.3217	.2765	.3721	.1388	.2801	.5173
Parameter 2	1992-93	.0931	.0618	.0516	.0367	.0889	.2612
	1998-99	.1378	.0889	.0748	.0529	.1288	.3673
	2003-04	.1807	.1203	.0934	.0602	.1653	.5054
	2005-06	.2035	.1456	.1245	.0741	.1892	.6021
	2007-08	.2317	.1592	.1558	.0923	.2004	.5697
Parameter 3	1992-93	.0169	.0171	.0187	.0084	.0167	.0326
	1998-99	.0256	.0266	.0300	.0130	.0253	.0478
	2003-04	.0272	.0313	.0337	.0130	.0268	.0520
	2005-06	.0291	..0382	.0786	.0211	.0307	.0655
	2007-08	.0322	.0402	.0448	.0303	.0356	.0587
Parameter 4	1992-93	.0197	.0182	.0185	.0094	.0195	.0417
	1998-99	.0338	.0334	.0364	.0166	.0332	.0659
	2003-04	.0430	.0331	.0392	.0229	.0421	.0809
	2005-06	.0524	.0408	.0579	.0317	.0552	.0909
	2007-08	.0592	.0506	.0691	.0366	.0729	.0833
Parameter 5	1992-93	.0279	.0255	.0258	.0132	.0275	.0596
	1998-99	.0293	.0243	.0226	.0132	.0289	.0697
	2003-04	.1102	.0569	.0516	.0456	.1043	.3156
	2005-06	.1533	.0721	.0158	.0656	.1456	.3582
	2007-08	.1755	.0922	.0275	.0537	.1722	.3244

Source: Authors estimation.

Determinants of Deprivation Index of Reproductive Health Parameters: A Panel Data Regression

Table-3 Results of the Random Effects Model of Equation (7)

Dependent Variable=lnDI_RH

Exogeneous Variables ↓	Coefficient	Standard Error	t value	P[|Z|>z
Constant	8.8660	0.7181	12.334	0.0000
lnPCNSDP	-0.0738	0.0578	-1.227	0.2016
lnFLFPR	-0.2119	0.1184	-1.788	0.0737
lnFLR	-0.4934	0.1142	-4.319	0.0000
lnGCHC	0.0765	0.0849	0.9010	0.3670
lnGPHC	0.0950	0.0461	2.0670	0.0450
lnPCSSE(-5)	-0.2783	0.0651	-4.2710	0.0000
lnPCSSE(-10)	-0.1477	0.0813	-1.8171	0.0693
Regression Diagnostic R^2=0.6814				
LM Test (Pooling Vs. Panel)=32.71 (p=0.000 at 1d.f)				
Hausman Test(Fixed Vs. Random) =10.81 (p=0.1469 at 7d.f)				
N=75				

LM test suggests panel over pooling; Hausman test suggests random effect model.

From the panel data regression model, it is found that the panel is more appropriate than pooling (or CLRM). Moreover, the Hausman tests suggest the random effect rather than fixed effects. It is observed that female literacy, female labor force participation rate appear to be an important predictor in reducing the WRHDI and this result is quite obvious; the PCSDP is found to be in expected direction but insignificant. PCSSE comprising education and health care both lagged by 5 and 10 years are found to be significant predictors for reducinf reproductive health deprivation. In 3-tier rural public healthcare infrastructure, only the gap of PHC is revealed to be significant but the other healthcare infrastructure does not show any significant impact on WRHDI. The

above model may suffer from multicollinearity problem but the VIF do not show any severity of multicollinearity problem.

Rural Healthcare Infrastructure in the 15 major states of India

All the states have been experiencing a wide range of gap in respect of 3-tier rural healthcare infrastructure. This gap is estimated from the required number (as laid down in 1983 Health Policy) and existing number of healthcare infrastructure (viz. CHC, PHC and SC). We are not reporting here the gap of Community Health Centre (CHC), Primary Health Centre (PHC) and Sub-Centre (SC) across the states over time but we mention here the inequality (viz. GE (2)) among the states in 3-tire rural healthcare in five reference points of time as given in the following Table-4.

Table-4: Inequality of the Gap of Rural Healthcare Infrastructure across the 15 major states of India over time

Year	Gap of CHC	Gap of PHC	Gap of SC
1992-93	0.1553	0.2904	0.2187
1998-99	0.1551	0.2863	0.2163
2003-04	0.1567	0.2726	0.2019
2005-06	0.1545	0.2547	0.2175
2007-08	0.1504	0.2471	0.3015

Note: Inequality is measured by GE (2). Gap is the difference between required number (as laid down in 1983 Health Policy) and existing or actual number. Source: Data on CHC, PHC and SC and Medical Bed per lakh population are drawn from Rural Health Statistics, Ministry of Health and Family Welfare, Govt of India.

Our present study also reveals the fact that all the 15 major states in India are suffering from inadequate health care facilities in all the 3 categories of 3-tier rural healthcare infrastructure.From the above Table-4, it is clear that the gap of inequality is found maximum in PHC and SC, whereas it is found the least in the gap of CHC. The inequality of the gap of PHC and CHC is found falling but it is rising in respect of SC. Sub-Centre plays an important role in rural public health infrastructure and a rising trend of the gap of inequality is a great concern for the Govt. from the social welfare point of view.

Moreover inequality of the shortfalls in these 3 categories is also widening over time. Except FLR, the inequality of the variables included in our model show a rising trend- this implies that Indian economy has not been experiencing inclusive growth in respect of social sector development.

Concluding Observations and Policy Implications:

The policy basis of "Health for All" enshrined in WHO's constitution defines the objective of the organizations as "the attainment by all peoples of the highest possible level of health". The goal of health for all by the year 2000 embodied that objective. The strategy of health for all emphasizes that there will be an even distribution among the population of whatever resources for health are available. It does mean that essential health care will be accessible to all individuals and families, in an acceptable and affordable way, and with their full involvement.

Our present study has elicited RH deprivation status indices for all the 15 major states of India. Different absolute values of the indices show that by and large states like Bihar, UP, MP, Rajasthan are found to be comparatively more deprived in terms of overall RH status and utilization of RH services. The broad idea of this paper has also been to capture the inequality in access to and utilization of various RH services viz. ante natal care, safe delivery for maternal care and higher order birth. The results of inequality measurement of various deprivation indices are suggestive enough to the clear pattern of unequal utilization of RH services emerging from this analysis. Inequality in utilization of maternal health care services is more pronounced in the case of higher order birth and safe delivery of the mother. Panel study reports that important predictor like women's literacy has significant impact on the RH status. Women's education and employment help towards fertility reduction, higher contraceptive usage, higher utilization of reproductive health care. Social sector expenditure has been appeared as important predictor of the panel data regression model.

Nevertheless, it is an accepted view that for preventive services, that for maternal healthcare, there is enormous dependence on public sector. The international conference on primary healthcare, held in Alma-Ata in 1978, issued the declaration of Alma-Ata which stated that primary healthcare is the key to attaining 'Health for All'. The National Health Policy (2002) for rural area is based on a combination of preventive, promotive and curative services. The rural healthcare structure is vertical in nature comprising three tiers: community health centre (CHC), primary health centre (PHC), and sub centres (SC). Our present study also establishes the fact that the gap of PHC is revealed to play a significant role for widening the RH deprivation in the states of India. Therefore, in this respect a substantial rise in the expenditure related to reproductive health of the women and adequate investment in public healthcare infrastructure can be suggested to ensure better and safer RH facilities. In this respect, Central Govt. can take

an initiative to remove reproductive health deprivation by disbursing some kind of development grants for better utilization of RH services with a view to alleviate the regional variation.

Government of India has already identified some backward regions based on selected education and health parameters which are quite arbitrary. Allocation of fund disbursement should be formulated on the basis of degree of deprivation in each state and in this context the reproductive deprivation index estimated in our study can be considered for the measurement of the degree or intensity of reproductive health deprivation . A proportional and scientific rule of disbursement of fund by the Central Govt. is suggested to the states in such a way that states with higher deprivation of RH status should get more and states with least deprivation should get minimum amount. This is to be done with a view to ensure social justice and for attaining inclusive growth. Lastly, a close co-ordination between our health policies and our poverty eradication programmes is required for getting desired health outcomes although in-depth study pertaining to empirical verification of "Health- Poverty" nexus in reproductive health dimension is beyond the scope of our present study. Public Healthcare expenditure is about 1 percent of National Income of India, therefore, how the Central Govt. will reach "Health for All" programme? It seems to be an elusive and distant dream! Since, health sector is absolutely state's responsibility; the backward states are facing a deep rooted problem towards improving the health status of the general mass and reproductive health in particular. If we do not seriously address this issue, our future real demographic dividend will become bleak and uncertain.

Notes:

[l]Following Pett et al (2003), Johnson et al(2006) and Raychaudhuri and Haldar (2009), we can say that the method of PCA is the construction out of a set of variables, P_i(i=1, 2, 3…..7) of new variables (PC_j) called principal components, which are linear combinations of the P's and these are artificial as well as orthogonal in nature:

$PC_1=a_{11}P_1 + a_{12}P_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots+a_{17}P_7\ldots\ldots\ldots\ldots$.(1a)
$PC_2=a_{21}P_1 + a_{22}P_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots+a_{27}P_7\ldots\ldots\ldots\ldots$.(1b)
…….
…….
$PC_7=a_{71}P_1 + a_{72}P_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots+a_{77}P_7\ldots\ldots\ldots\ldots$.(1g)

Where, PC_j=Principal Component of j-th indicator, j=1,2..7; $P_i=(100-X_i)$=RCH Deprivation Parameter, $a_{ij}=r(PC_i,P_j)$=Factor Loading of the j-th original variable/parameter in the i-th PC. This represents the correlation between PC and the original variable/parameter (viz. P_i). The square of this term represents the proportion of variance captured by P_j indicator in the i-th Principal Component.

$r(PC_j, PC_i)=0 \quad i\neq j$

It is to be mentioned here that the PCA is applied to the standardized values of the original P's. The a's, called factor loading, are chosen in such a way that the constructed PCs satisfy two conditions:

(i)The PCs are uncorrelated i.e., orthogonal and
(ii) the first PC i.e., PC_1 absorbs and accounts for the maximum possible proportion of the total variation in the set of all P's, the 2nd PC (i.e., PC_2) absorbs the maximum of the remaining variation in the P's (after allowing for the variation accounted for by the first PC) and so on.

Following Kaiser's criterion, principal components (PCs) having latent root (i.e., Eigen value) greater than one are considered as essential and should be retained in the analysis. Cattell's Scree Test is also applied for selection of the optimum number of PCs. In 'Scree Test', we plot the latent roots against the order of extraction of the PCs and we use the shape of the resulting curve to judge how many PCs to retain in the analysis. The decision rule is to retain the PCs up to the point where the resulting curve has some curvature and reject the PCs for which the curve becomes a straight line.

[2]There exits a standard national norm regarding rural health infrastructure in 1983 National Health Policy. This is laid down as follows for plain area:

(1) There should be one Community Health Centre(CHC) or Rural Hospital(RH) per100000-120000 population
(2) There should be one Primary Health Centre(PHC) per 30,000 population
(3) There should be one Sub-Centre (SC) per 5000 population.

References.

Alkire, S.(2007). *Choosing Dimensions: The Capability Approach and the Multidimensional Poverty, Working Paper 88,* Chronic Poverty Research Centre, August.

Anand, Sudhir and A.K.Sen.(1997). *Concepts of Human Development and Poverty: A Multidimensional Perspective,* Background Papers for Human Development Report.

Atkinson, A.B(1970): *On the Measurement of Inequality*, Journal of Economic Theory, 2(3): 244-63

Bhattacharya, G. and Haldar, S.K.(2012). *Composite Health Deprivation Index (CHDI) on Reproductive and Child Health Parameters(RCH) from District Level Household Survey(DLHS)- Districts of West Bengal in India, A Case Study, presented at the 31st CIRET Conference on 'Economic Tendency Surveys and Economic Policy- with a Special Topic on Measurement beyond GDP-the use of Surveys,* WIFO, Vienna, Austria, Sept. 5- Sept.8.

District Level Household and Facility Survey (2003-04): *Ministry of Health and Family Welfare, Govt. of India,* data available at IIPS, Mumbai

……(2007-08). *Ministry of Health and Family Welfare, Govt. of India,* data available at IIPS, Mumbai

Johnson, Richard A. and D.W. Wichern.(2006). *Applied Multivariate Statistical Analysis,* Pearson Education, New Delhi.

Haldar, S.K.(2005). Health and Health Care Facilities in Rural West Bengal: Some Issues, In A. Mondol(ed.) *Rural Development in West Bengal,* Northern Book Centre, New Delhi. pp. 230-245

Krishnaji, N.(1997). Human Poverty Index: A Critique, Economic and Political Weekly, *Vol.32, No. 35(Aug. 30-Sept.5).* pp. 2202-2205

Lakshmana, C.M (2010). A Study on Healthcare Infrastructure for Children in Karnataka: A District-wise Analysis', *Journal of Health Management, 12(4): 423-443.*

Litchfield, J.A (1999): *Inequality: Methods and Tools*. World Bank, March. Retrieved from http://www.worldbank.org/poverty/inequal/index.htm

MHFW(2000): Year Book, Ministry of Health and Family Welfare, Government of India, New Delhi.

National Family Health Survey (1992-93*): Ministry of Health and Family Welfare*, Government of India.

National Family Health Survey (1997-98): *Ministry of Health and Family Welfare*, Government of India.

National Family Health Survey (2005-06): *Ministry of Health and Family Welfare*, Government of India.

National Health Policy (2002): *Ministry of Health and Family Welfare*, Govt of India, New Delhi

National Population Policy: (2000): *Ministry of Health and Family Welfare*, Govt. of India, New Delhi

NRHM (2009): *MIS Report, April;* Govt. of West Bengal, Retrieved July 28, *2009*, from http://

health.nic.in/NRHM/Documents/Mission_Document.pdf Ministry.

Pachauri, S. (1995). Defining a Reproductive Health Package for India: A Proposed Framework. Regional Working Paper, Number 4. The Population Council, New York.

Krishnaraj (eds.), *Gender, Population and Development (pp. 310-339),* Oxford University Press, New Delhi.

Pett, Marjorie A., Nancy R.Lackey and John J.Sulllivan (2003). *Making Sense of Factor Analysis,* Sage Publications, New Delhi.

Population Reference Bureau.(2007): *The Future Population of India: A Long Range Demographic View, available at: www.prb.org./pdf07.*

Raju, S. (2002): *Health Status of the Urban Elderly: A Medico- Social Study,* B. R. Publications, New Delhi

Raychaudhuri, A. and Haldar, S.K. (2009). *An Investigation into the Inter-District Disparity in West Bengal, 1991-2005, Economic and Political Weekly, Vol. XLIV (26 &27), June 27, pp. 258-263*

…… (2010). *'Construction of Composite Human Deprivation Innex', paper presented at the Workshop on 'Construction of Index and Unit for Backwardness' organized by the Ministry of Panchayati Raj*, Govt. of India held on 13th Jan, at New Delhi.

Rippin, N.(2009). *The Concept of Multidimensional Poverty: Accounting for Dimensional Poverty*, Dicussion Paper No.179, Ibero-America Institute for Economic Research, Platz des Göttinger Sieben 3, 37073 Göttingen. pp. 1-27

Roy, K. and Haldar, S.K. (2010). Measuring Poverty and Socio-Economic Deprivation Inequalities in India at Sub-National Level, *Asia-Pacific Social Science Review* 10(1), pp. 59-84

Sample Registration Scheme (2004). *Report on Vital Statistics in India, Registrar General*, Government of India, New Delhi.

……(2007). *Report on Vital Statistics in India, Registrar General*, Government of India, New Delhi.

……(2008). *Report on Vital Statistics in India, Registrar General*, Government of India, New Delhi

World Health Organization (2008). *World Health Report, World Health Organization.* Monograph. Geneva.