



RURAL- URBAN DIFFERENCES IN HEALTH OUTCOMES IN INDIA: AN INTER STATE ANALYSIS

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Article DOI: <https://doi.org/10.36713/epra10220>

DOI No: 10.36713/epra10220

ABSTRACT

The present paper provides an overview of rural- urban differences in health outcomes. The study explained the relevance of rural urban variations and deal with the determinants of rural - urban health variation. It tried attempting to examine the rural-urban Differentials across the major states of India. To investigate the rural -urban Differentials for this purpose, Twenty States have been considered. This analysis has been restricted only within child health, therefore only IMR has been taken into account. The study deals with the rural - urban trend in IMR and made a composite index of Health Determinants on the basis of health outcomes variables, by using the principal component analysis for major twenty states of India. It is quite evident that in case of IMAL, there exists much difference between the rural and urban areas in almost all the states. The states which have done well in urban areas have also performed well in rural areas. For the southern states namely Kerala, Karnataka, Tamil Nadu and Andhra Pradesh have really done well in IMHC, Goa's performance in this index is also very commendable. As usual, EAG states lag behind the other states in IMHC in both rural and urban areas.

KEYWORDS: Rural Urban Health, IMR and Rural Urban variation in Socio-economic variables of health outcome.

INTRODUCTION

Right to health is not a fundamental right in the Indian constitution. It is basically a human right that flows from the right to life. The Indian constitution deal with the right to life as a fundamental right under Article 21. It is the duty of the state to provide proper healthcare services to its people. Right to health ensures universal access to healthcare without any discrimination, but India's real scenario is quite different from that. There is a substantial difference in accessing health care between rural and urban areas of developing countries like India. Availability of health care services in rural areas is often very limited. Unavailability of proper medical care in rural areas, especially during the time of delivery, sometimes put both mother and child at a risk, if complication arises. Children are the worst affected, as limited health care services adversely influence their growth and development. Some important health outcomes related to child mortality such as Neonatal Mortality Rate, Infant Mortality Rate, under- five Mortality rate reflected this reality. Children are the future of the nation and today, the future of the nation is really at a stake. Percentage of children who are underweight varies quite significantly between rural and urban areas across the states. Other health outcomes such as life expectancy at Birth, crude death rate, total fertility rate etc also reveal the reality of rural urban differential persistent in India. This gap between the rural urban health outcomes because of poor health infrastructure and weak socio economic indicators i.e. sanitation and education in rural areas (Dar 2017).

OBJECTIVES

1. To examined the rural-urban variation across the major states of India.
2. To study the rural - urban trend in IMR and analyzed a composite index of health determinants on the basis of health outcomes variables.



HYPOTHESIS

In order to explain rural urban differential in health performance, a number of indicators mainly concerning to child health are taken into consideration. For this purpose, null and alternative hypotheses have been formed which are as follows:

H0: There is no significant difference between rural and urban health performance.

H1: There is significant difference between rural and urban health performance.

To test the hypotheses 't' test is to be applied on these indicators to gauge the difference between rural and urban areas in terms of health parameters.

3) Again, in order to understand the rate of decline in IMR of India in rural and urban areas over time, following hypotheses have been formed.

H0: There is no difference in rate of decline in rural and urban IMR over a period of 46 years.

H1: There is difference in rate of decline in rural and urban IMR over a period of 46 years.

To test the hypothesis, $\log((\text{Rural IMR})/(\text{Urban IMR}))$ are considered as a function of time such that $\log((\text{Rural IMR})/(\text{Urban IMR})) = f(\text{Time})$.

METHODOLOGY

Health an important aspect of life is influenced by different factors such as social, economic, demographic, and environmental. The study deals with the rural - urban trend in IMR and made a composite index of Health Determinants on the basis of health outcomes variables, by using the principal component analysis for major twenty states of India.

The principal component analysis enables us to determine a vector known as the principal component, linearly dependent on the standardized constituent variables and having the maximum sum of squared correlation with the variables. There can be as many principal components as there are variables. The aim of the method of principal component is the construction of new variables P called 'Principal Components' which are linear combination of X's such that:

$$P_1 = a_{11} X_1 + a_{12} X_2 + \dots + a_{1k} X_k$$

:

$$P_k = a_{k1} X_1 + a_{k2} X_2 + \dots + a_{kk} X_k$$

The a_{ij} 's called loadings are chosen so that the constructed principal components satisfy to conditions: (a) the principal components are uncorrelated and (b) the first principal component P_1 absorbs and account for the maximum possible proportion of the variation, in the set of all X's, the second principal component absorbs the maximum of remaining variation and so on.

The variables X_j are first **standardized** using the simple formula:

$$Z_j = (X_j - \bar{X}) / \sigma_x$$

Where, σ_x is the standard deviation of X_j with standardized values Z_i , then the first principal component P_1 can be written as:

$$P_1 = a_{11} z_1 + a_{12} z_2 + \dots + a_{1n} z_n$$

$$\text{Where, } a_{1i} = \frac{\sum_{i=1}^n r_{xixj}}{\sqrt{\sum_{j=1}^n \sum_{i=1}^n r_{xixj}}}$$



With r indicating the coefficient of correlation. The coefficient of Z_i in the equation giving the first principal component are referred to as loading and are also denoted by l_{1i} with λ_1 the latent root of the first principal component defined as :

$$\lambda_1 = \sum_{i=1}^n l_{1i}^2$$

The percentage contribution of P1 in the total variance in the standardized

Variables is defined by:

$$\frac{\lambda_1}{n} \times 100$$

The second principal component is computed from a residual co-relation matrix, obtained by deducting $a_{1i} a_{1j}$ from $r_{xi} x_j$ in each cell (i,j) in the original correlation matrix, with subsequent principal components being computed from residual correlation matrices, similarly obtained at each stage.

RURAL URBAN VARIATION IN HEALTH OUTCOMES

Social and economic development of a nation is often reflected by the existing infant and child mortality rates. India has made significant strides in reducing both infant mortality (29.8 per thousands). And Under five mortality (42 per thousand live births) but has been unable to Territories of India. Socio economic, maternal health and environmental disparities have been associated with the variations across various states and social groups infant mortality has been observed to be higher among scheduled tribe families than the general population. A child born to a schedule tribe family has 19 per cent higher risk of dying in the neonatal period compared with other social classes. To improve child survival and ensure proper health, several initiatives and programmes have been undertaken among general as well as vulnerable population including scheduled tribes under the National Rural Health Mission (NRHM). Specifically, to minimize the rural urban differentials, a cycle approach has been adopted by the government (Sahoo 2015).

Child health is both a key measure of a society's development and an indicator of future labour productivity. As the developing world's urban population increases from 2.7 billion in 2011 to a projected 6.3 billion in 2050 (U.N. 2018), we need to understand how child health and its determinants differ between rural and urban areas in order to design effective policies. However, demographic and health surveys (DHS) data covering 20 states show little difference between areas in determinants of child nutritional status for factors such as women's schooling, safe water and sanitation access, and household economic status.

TABLE:1. RURAL URBAN VARIATION IN HEALTH OUTCOMES, INDIA

MAJOR HEALTH OUTCOMES	RURAL	URBAN
IMR (2020)	36.0	23.0
NMR (2015)	29.0	15.0
U5MR (2019)	56.0	34.0
LEB (2020)	68.0	72.6
TFR (2019)	2.2	1.8
CBR (2020)	21.6	16.7
CDR (2020)	6.7	5.1
% CHILDREN UNDERWEIGHT (BELOW- 2 S.D.) (2019-21)	38.3	29.1
% WOMEN ANAEMIC (<11G/DI) (2019-21)	54.3	45.7

Source: Nfhs-4, Various Srs Bullitins.

Note: % CHILDREN UNDERWEIGHT (BELOW- 2 S.D.) (2019-21), % WOMEN ANAEMIC (<11G/DI) (2019-21) ARE TAKEN FROM NFHS 5

Table:1. showed the rural - urban variations in some selected health outcomes of major states of India. A more disparity seen in Infant Mortality Rate. IMR in rural India is double to the Urban i.e. 45 and 23 in the year 2019 in India. NMR i.e.29.0 and 15.0, TFR i.e.2.2 and 1.8, and U5MR i. e.56 and 34 in the year 2019 also very wide differences between rural and urban India. LEB variation in rural and urban India i.e. 68.0 and 72.6 in the year



2020. A large amount of variation is found in case of underweight children between rural and urban which are 38.3 and 29.1. The considerable a number of women suffers from any kind of anemia in both the rural and urban i.e. 54.3 and 45.7.

RURAL URBAN DISPARITY RESULTS

India is a large country of unusual socioeconomic and cultural diversity with vast variations among the states and regions. Inter - state rural urban variation in health outcomes is a natural phenomenon and is quite evident from different health related estimates given by SRS,NFHS, DLHS etc. On one side India has better performing states like Kerala, Tamil Nadu, Delhi, Goa who have better health outcomes and on the other side it has poor performing states like Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Utter Pradesh, Uttarakhand. As a whole, India is characterized by huge diversity in terms of health performance.

Paired t -test has been applied on these indicators to gauge the difference between rural and urban areas in terms of health parameters 't' values and 'p' values are given in table 3

Table: 3 Rural Urban Disparity: Results of t Test

Sr. No.	INDICATORS	't' Value	Confidence Interval(95%)	'P' value
1.	B.O.	8.026	(0.579-1.058)	0.000
2.	NMR	3.024	(0.456-3.210)	0.007
3.	PNMR	4.479	(0.522-3.949)	0.000
4.	IMR	6.391	(1.036-9.643)	0.000
5.	U5MR	7.119	(1.152-9.298)	0.000
6.	MANC	13.834	(1.248-(11.126)	0.000
7.	SANC	13.834	(1.248-(11.126)	0.000
8.	HA-3	12.396	(1.295-(-2.540)	0.000
9.	HA-2	-0.828	(1.295-(-2.540)	0.000
10.	WH-3	4.848	(0.272-5.940)	0.000
11.	WH-2	2.639	(0.974- 0.183)	0.016
12.	WA-2	5.076	(0.379-15.185)	0.000
13.	W-OWT	3.941	(0.765-(-4.594)	0.001
14.	TO-TH	8.551	(0.499-(-3.010)	0.000
15.	STH	20.128	(1.101-(-8.554)	0.000
16.	MANW	5.849	(0.741-15.983)	0.000
17.	SANW	2.803	(0.751-15.910)	0.000
18.	PBMS	2.253	(0.056-2.663)	0.037
19.	PVMS	3.864	(0.622-11.104)	0.001
20.	HI	3.020	(0.697-5.438)	0.000
21.	LI-T	-3.181	(1.601-(64.296)	0.000
22.	LI-F	15.630	(0.389-55.319)	0.000
23.	GM18	5.870	(0.405-6.371)	0.000
24.	FPANMT	-2.005	(1.243-(16.419)	0.060
25.	FP-MOD	6.360	(0.552-23.077)	0.000
26.	ANC3	6.2433	(-0.582-0.143)	0.000
27.	FANC	-2.1881	(-0.174-(-0.470)	0.042
28.	INSD	-1.312	(1.202-(25.518)	0.000
29.	DELH	1.164	(0.586-1.186)	0.268
30.	SDEL	11.656	(0.742-53.579)	0.000
31.	PNC	-2.597	(1.285-(-1.713)	0.019
32.	CFIMMN	6.576	(0.902-6.334)	0.000
33.	CNVAC	9.870	(0.446-76.226)	0.000
34.	CBF	18.719	(1.025-(-0.020)	0.000
35.	Safe Wat	-4.702	(6.790-(42.390)	0.000
36.	Impv San	2.751	6.790-(-42.390)	0.014
37.	Pucca Ho	17.360	(0.347-55.094)	0.000

Note N=20



It is quite evident that all the t values are highly significant except for severe Anaemia among children (SANC), Weight for Height below-3 S.D.(W-H(-3)) and children under 3 years Breastfed within One Hour of Birth(CBF). Thus, statically highly significant t values for most of the indicators imply that there is significant difference between rural and urban health.

RURAL VERSUS URBAN TREND IN IMR

To examine the trend in the ratio of rural IMR to urban IMR from 1971 to 2017, values of log (Rural IMR/ Urban IMR) have been regressed on Time, i.e., regression has been taking log (Rural IMR/ Urban IMR) as dependent variable and Time as independent variable. The result is as follows.

Table 4 Result of Rural-Urban Trend in IMR(1970-2018)

R^2	0.374
D-W value	1.827
Beta	-0.662
t statics	-5.389
Sign.	0.000

Table 4 shows that the result is statistically highly significant. The values of R^2 and Adjusted R^2 are quite satisfactory. The negative sign of regression coefficient shows that over time ratio of rural IMR to urban IMR i.e. (Rural IMR/Urban IMR) has been decreasing. It can happen in three situations: firstly, when the rate of fall in rural IMR is more than the rate of fall in urban IMR; secondly, when both rural and urban IMR are increasing but the rate of increase in urban IMR is greater than the rate of increase in rural IMR; and thirdly, when the rural IMR remains stagnant and urban IMR increases. However, from the Figure 6.4 clearly evident that in this case negative regression coefficient implies that both the rural and urban IMR are falling. So, it concluded that the rate of fall in rural IMR is more than the rate of fall in urban IMR. Thus, it can be easily said that through there exists a significant difference between rural and urban IMR of India, but fortunately both are decreasing.

Since a long time, series has been used, it is appropriate to look into D-W value which being 1.743 quite satisfactorily points to non-auto correlated data. Beta coefficient is not only significant at one per cent level but its value is also quite high. Though it needs mention here that time alone cannot explain the decline. In the present study, combining different factors, indices have been prepared which effectively mean that 30 factors have been taken into account.

The present exercise running regression only on time factor is justified as it peeps into the rate of decline of the ratio of rural to urban IMR over time. In a period of 48 years the ratio has significantly declined. Which factors lead to this declined may be the matter of further investigation. With government programmes targeted at reducing skewed access to health care facilities, such result is a source of satisfaction.

COMPOSITE INDICES OF HEALTH DETERMINANTS

In Order to grasp the reality of health status of the people living in rural and urban areas, different indicators have been considered from both the rural and urban areas. PCA has been carried out on these indicators to prepare composite indices. The indices are index of Malnutrition (IMAL), Index of Maternal Health care (IMHC), Index of child health Immunization (ICHI), Index of socio- economic determinants (ISED) and Index of demographic Factor (IDF). The indicators and some important values corresponding to PCA are given in Table 5.

Table5 : Different Indices with their Indicators and Relevant Values

INDEX	IMAL	IDF	ISED	ICHI	IMHC
INDICATORS	MANC, H-A (-2), W-H (-2), TO-TH, MANW	GM18, B.O.	LI-T LI-F, Safe Wat, ImpvSan	CFIMN, CBF	ANC3, FANC, INSD, SDEL, PNC
KMO-R	0.748	0.490	0.566	0.483	0.778
KMO-U	0.775	0.417	0.480	0.450	0.629
Bralette's-R	84.926 (.000)	20.779 (.002)	17.603 (.007)	9.871 (.020)	74.350 (.000)
Bralette's-U	32.745 (0.05)	38.011 (.000)	1.383 (.710)	9.368 (.025)	64.300 (.000)



Variance Explained-R	55.74%	50.03%	52.47%	59.48%	76.45%
Variance Explained- U	51.26 %	59.62%	42.41 %	61.15%	66.27%

Now different states can easily be ranked on the basis of PCA Values. PCA values and corresponding ranks of the states, along with IMR values are presented in Table6 and7.

Table:6 PCA Values for different Indices and IMR

States	Imal		Idf		Ised		Ichi		Imhc		Imr	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Karnataka	0.888	0.863	0.669	0.447	-0.101	-0.265	0.333	-1.498	0.294	-0.709	27	22
Tamil Nadu	-0.785	-1.359	-0.338	-0.308	0.305	0.603	0.262	0.667	1.246	0.624	19	14
West Bengal	0.375	0.133	3.850	4.009	-0.476	0.489	1.278	0.601	-0.518	-0.786	24	22
Maharashtra	1.224	1.231	0.796	0.569	0.232	0.752	-1.420	-1.608	1.052	0.665	23	14
Madhya Pradesh	2.335	2.307	0.206	-0.873	-1.189	-1.258	-3.398	-1.506	-2.910	-2.087	51	32
Goa	-	-	-1.499	0.146	2.359	1.539	2.458	2.580	3.726	3.736	*	*
Bihar	2.175	3.305	1.448	1.811	-3.186	-2.247	-0.553	-0.151	-4.121	-4.313	36	31
Andhra Pradesh	-0.528	0.242	1.302	1.857	-0.402	0.558	-0.150	-0.074	1.694	1.883	36	23
Haryana	0.206	1.030	-0.388	0.401	-0.015	-0.297	-0.220	-1.105	-0.468	-1.629	32	25
Rajasthan	1.112	0.601	0.472	0.009	-0.950	-0.374	-1.604	-0.804	-1.875	-1.392	42	28
Orrisa	0.354	-0.606	0.372	1.274	0.163	-0.181	1.457	0.463	-0.493	-0.934	42	32
Punjab	-1.916	-1.802	-1.684	-1.730	1.305	0.802	0.856	1.413	1.936	1.457	22	19
Gujarat	2.185	1.405	0.414	0.122	1.199	0.252	-1.130	-1.832	-0.148	0.280	36	22
Chhattisgarh	1.110	0.170	-0.292	-0.316	0.059	0.025	0.610	1.344	1.582	1.239	40	32
HP	-1.952	-1.937	-1.442	-1.581	1.538	2.576	0.010	-1.565	0.917	2.126	27.1	*
UP	0.620	0.475	-1.686	-2.663	-1.374	-1.943	*	*	-2.958	-2.075	44	33
J&K	-2.073	-2.534	-1.158	-1.800	0.502	0.438	0.356	1.397	0.059	0.899	24	19
Delhi	-4.416	-1.480	-1.556	-1.000	0.046	-0.982	*	-0.355	*	-0.745	12	16
Jharkhand	2.876	2.340	1.777	0.535	-1.971	-2.555	-0.744	0.271	-2.924	-1.837	30	24
Kerala	3.794	-4.387	-1.262	-0.916	1.953	2.066	1.598	1.761	3.909	3.595	9	10

Source: Data taken from **National Family Health Survey-4**, Ministry of Health and Family Welfare, GOI

Note * NA data

TABLE: 7 Ranking of the states based on different Indices and IMR

States	Imal		Idf		Isecd		Ichi		Mh		Imr	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Karnataka	12	13	14	14	13	13	8	16	9	14	9	8
Tamil Nadu	6	6	9	9	6	7	9	8	6	9	3	2
West Bengal	11	8	20	20	15	9	4	9	12	12	7	9
Maharashtra	15	15	15	16	8	4	16	18	7	8	6	3
Madhya Pradesh	18	17	10	7	17	18	18	14	16	19	20	15
Goa	-	-	3	12	1	8	1	1	2	1	*	*



Bihar	16	19	17	17	20	19	13	12	19	20	14	14
Andhra Pradesh	7	10	16	18	14	5	11	11	4	4	13	10
Haryana	8	14	8	14	12	14	12	15	13	15	12	12
Rajasthan	14	12	13	10	16	15	17	14	15	16	17	13
Orissa	9	7	11	13	9	12	3	10	14	11	18	16
Punjab	5	4	1	2	4	3	5	4	3	5	4	6
Gujarat	17	16	12	11	5	11	15	19	11	10	15	7
Chhattisgarh	13	9	7	8	10	10	6	6	5	6	16	17
HP	4	3	4	3	3	1	10	17	8	3	10	*
UP	10	11	18	19	19	16	*	*	18	18	19	18
J&K	3	2	6	1	7	6	7	5	10	7	8	5
Delhi	1	5	2	4	11	17	*	13	*	13	2	4
Jharkhand	19	18	19	15	18	20	14	7	17	17	11	11
Kerala	2	1	5	6	2	2	2	2	1	2	1	1

Note: Based on table 6

Comparing the rural and urban ranks of different states (Table 7). It is quite evident that in case of IMAL, there exists much difference between the rural and urban areas in almost all the states. As far as IMHC is concerned, it is seen that there is not much difference between rural and urban areas for different states. The states which have done well in urban areas have also performed well in rural areas. For example, the southern states namely Kerala, Karnataka, Tamil Nadu and Andhra Pradesh have really done well in IMHC, Goa's performance in this index is also very commendable. As usual, EAG states lag behind the other states in IMHC in both rural and urban areas.

Index of Demographic Factors is another index, where not much difference between rural and urban areas is found. Most of the states have got close or same ranks. Performance of states like Goa, Himachal Pradesh, Kerala, Tamil Nadu, Punjab are good performer. All the EAG states namely Bihar Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan and Utter Pradesh fall under the poor performing states category.

Thus, it is revealed from the above discussion that the states which have really achieved good health outcomes have been successful in doing this in both the rural and urban areas. The poor performing states are really poor in different health indicators irrespective Comparing the rural and urban ranks of different states (Table 8). It is quite evident that in case of IMAL, there exists much difference between the rural and urban areas in almost all the states. As far as IMHC is concerned, it is seen that there is not much difference between rural and urban areas for different states. The states which have done well in urban areas have also performed well in rural areas. For example, the southern states namely Kerala, Karnataka, Tamil Nadu and Andhra Pradesh have really done well in IMHC, Goa's performance in this index is also very commendable. As usual, EAG states lag behind the other states in IMHC in both rural and urban areas.

CONCLUSION

Children are the most precious assets of a nation. Being the supreme asset, anything which improves the chances of their survival, development and protection cannot be ignored. Unfortunately, there exists highly significant difference between rural urban health's indicators particularly related to child health. Though both rural and urban IMR are falling, the rate of decline of rural IMR is greater than the rate of decline of urban IMR. However, it should not be the matter of complacencies for the government due to the fact that statistically significant t values of different health indicators signify that rural areas still lag behind urban areas putting a question mark on the success of programmes, efforts put in, investment made and the policies implementation.

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