

# Asian Resonance

## Quantifying the Status of Child Health and Health Contributors in Assam

### Abstract

While quantifying the status of child health and health contributing factors at the district level for the state of Assam in India, this paper elicits Child Health Index and Index of Health Contributors. The paper finds that variations in the status child health are largely due to differentials in infant mortality, neonatal mortality and under-five mortality. The significant correlation between the child health index and the index of health contributors suggests that health status can be improved only through improvements in socio-demographic, economic and healthcare factors. Specifically, greater coverage of antenatal care, complete institutional delivery, control of fertility, realization of exclusive breastfeeding and full immunization are highly essential for overall uplift of the status of child health.

**Keywords:** Mortality, Morbidity, Child Health Index, Index of Health Contributors, Assam, India.

**JEL Classification:** I10, I12

### Introduction

In spite of the declines in mortality level, due largely to improvements in diagnosis and therapeutics of many infectious agents of disease and increasing access to healthcare services, the mortality rates among the infants and children in India are still high. World health statistics 2013 show that the infant mortality and under-five mortality rates in India were 47 and 61 per thousand live births respectively in 2011, whereas these rates at the global level were 37 and 51 respectively. Studies have shown that despite considerable increase in expenditure on health in India, pace of improvement in many reproductive and child health indicators is less in the post 1998 period than before (Srinivasan, Shekhar and Arokiasamy; 2007). Lack of coordination between policy makers and health personnel at the functioning level may be responsible for slow change in reproductive and child health condition (Bhutta, 2000).

Assam, one of the states of India located in the northeastern region of the country, occupies 2.4 per cent of the country's total geographical area that shelters 2.57 per cent of the population of the nation. With a growth of 16.93 per cent during the decade 2001-2011 against the national growth rate of 17.64 per cent, the total population of Assam was 311.69 lakh that is comprised of stupendously diverse ethnic, religious, linguistic and other socio-cultural traits. The state has altogether 27 districts including four districts under the Bodoland Territorial Council (viz Kokrajhar, Baksa, Udalguri and Chirang) and Kamrup (Metro) bifurcated from Kamrup. Among the districts, Nagaon is the most populated and Kamrup Metro is the most urbanized and literate, while Dhubri registered the highest growth rate in population.

In terms of Human Development Index, Assam falls in the low human development category. The birth and death rates of the state (22.5 and 7.9 respectively in 2012) have been found higher than those of the country as a whole (21.6 and 7.0 respectively in 2012), even though there has been a declining trend. The childhood mortality and morbidity rates registered in Assam are among the highest in India. SRS Bulletin, September 2013 reports that Assam registered second highest infant mortality rate among all the states of India. The infant mortality rate in Assam (55) is not only much higher than that of some developed states of the country, like Goa (10), Kerala (12), Tamil Nadu (21) etc., but also than what its neighboring states like, Manipur (10), Nagaland (18), Sikkim (24) etc. have experienced. Likewise, the neonatal mortality rate and under-five mortality rate in Assam are well above the national rates. Moreover, there exist inter-district variations in the mortality, morbidity and healthcare conditions among the children in Assam. With this backdrop this paper attempts to quantify the status of child health and health contributing factors in Assam, exploring thereby the inter-district

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variations therein and ranking the districts accordingly. The study also tries to find out if the realized status of child health is related to the health influencing variables. To monitor the achievement of the healthcare programmes, indicators of child health status and child healthcare services need to be examined. As district-level indices will enable to verify the differentials in the status of health and will help in identifying the districts that need to be focused upon to bring about overall improvement in the status of health, a study on the health and healthcare across the districts of Assam is undertaken.

Including the introductory section, the paper has been articulated in six sections. Section 2 conceptualizes the status of health and the health contributing factors while section 3 elaborates the data source and the methodology adopted in dealing with the objectives of the study. While the inter-district variations in child health indicators are explained in the section 4, the variations in performance concerning health contributors across the districts have been dealt with in the section 5. The final section makes concluding remarks.

## Conceptual background

The status of child health is indicated by some mortality and morbidity measures. The mortality indicators frequently used in the demographic health study are infant mortality rate, neonatal mortality rate and under-five mortality rate. Infant mortality rate refers to the number of deaths of babies within the first year of life per thousand live births and is an indicator of the health status and the quality of life. Though the mortality rate is always high in the infant age, yet the probability of dying is not uniform throughout the first year of life. Several studies (Ghosh, 1988; Singhi et al, 2004; Roy et al, 2008) have revealed that the risk of death is comparatively higher during neonatal infancy than during post-neonatal infancy and remains higher during the infancy as compared to children of all age groups. The neonatal mortality covers the deaths within the first month or first four weeks of birth, whereas post-neonatal mortality covers the deaths after the first four weeks of birth but within the first year of life. The under-five mortality rate, on the other hand, predicts the probability of dying before reaching the age of five. Underweight of the baby is a critical factor causing mortality within the first month of life, which may be due to delivery of the baby before the full term or due to poor health of the mother (Majumdar, 2000), while a significant burden of post-neonatal death is composed of a residue of infectious disease (Yankauer, 1964). Health surveys have reckoned certain infectious and parasitic diseases, diseases of the respiratory system, disease of the circulatory system etc. as the main causes of death among the children aged 0 to 4 years. Most of these can be prevented through full immunization.

Though mortality and morbidity are biological events, yet the human health is influenced by some socio-demographic factors, economic condition, access to healthcare facilities and their utilization. An inverse relationship between socioeconomic level and mortality has been found which cannot be explained

by biological differences (Chase, 1961). Studies (e.g. Caldwell, 1979; Hobcraft, McDonald and Rutstein, 1984) have shown strong correlation between maternal education and child health and survival. Education equips women with specific skills and dispositions which significantly influence use of medical services and changes in household health behaviour (Joshi, 1994). Mother's education is found to be the most consistent and important determinant of the use of child and maternal health services (Becker, Peters, Gray, Gultiano and Blake; 1993). Length of exposure to formal schooling is expected to be conducive to use of obstetric services (Bhatia and Cleland, 1995; Mekonnen and Mekonnen, 2003). Maternal education has been found to have significant impact on immunization status (Desai and Alva, 1988). Places having higher level of literacy and education are likely to have better health status as education can improve the status of health through better maternal and child healthcare practices.

Infant mortality and fertility rates are closely related (Bhattacharya, Singh and Singh, 1995). Fertility has a direct bearing on infant mortality; more the children born, more are likely to die (Verma, Saha and Kumar, 2005). The more is the number of children, the more will be the likelihood of ill health of the mother and less will be the intensive care of the children and hence the more will be the chance of morbidity and mortality among the children.

Breastfeeding is highly recommended for babies, because mother's milk contains antibodies that protect infants from infection, and it is clean and inexpensive (Zablan, 1979). Moreover, it is one of the natural means of delaying pregnancies (Knodel, 1977; Zablan, 1979; Visaria, 1999). Breastfeeding should be initiated immediately after child birth and exclusive breastfeeding should be continued up to a minimum of six months. Therefore, Reproductive and Child Health programme in India envisages creating awareness among mothers on correct breastfeeding practices.

Income affects the health status remarkably as the children of poor families are more exposed to the risk of disease due to poor housing conditions, undernourishment, inadequate water and sanitation. Poverty is the prime cause for ill health, persistent morbidity and early death (Rao, 1998).

In most of the instances, mortality and morbidity problems arise due to unsatisfactory health behaviour. Health behavior is affected by availability, quality and costs of the health services and the health beliefs of the people. Substantial decline in maternal and child mortality will be realized if women visit for at least three antenatal medical check-ups, commencing as early as possible in the first trimester. Antenatal check-up done by doctor or nurse or any other trained personnel examines a pregnancy, detects and treats problems of pregnancy, and provides counseling on pregnancy and delivery related issues.

The foremost important requirement for safe motherhood is the institutional delivery. The likelihood of maternal and infant mortality increases if delivery takes place at home without assistance of trained birth attendant. Infant mortality rate will come down, if

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births take place in hygienic conditions and proper medical care is available (Visaria, 1985). Moreover, vaccination of the child against six preventable diseases like diphtheria, pertussis, tuberculosis, tetanus, polio and measles is very important for the sound health condition of the infant and child. But, very often mothers do not bring their children to the health institutions for check-up until they get sick.

Easy access to health institutions can significantly increase the utilization of the healthcare services which in turn contributes towards uplift of the health status. The inaccessibility, quantitative deficiencies, and qualitative inferiority of health care services contribute to the progression of all disease and inhibit their prevention (Yankauer, 1964).

## **Data and methodology**

The study is based on the data taken from government publications. District-wise data on child health published in the Annual Health Survey (2011-12) Fact Sheet, Assam released by the Vital Statistics Division, Office of the Registrar General of India and Census Commissioner, India have been utilized. Furthermore, data presented in Economic Survey, Assam, 2011-12 have also been used. The study covers 23 districts of Assam (Kokrajhar and Kamrup as a whole) for which data have been released.

The status of child health has been verified by constructing a composite Child Health Index (CHI) for which Principal Component Analysis has been made and the districts have been ranked on the basis of the index value. In order to construct the CHI three mortality indicators frequently used in the demographic health study such as, infant mortality rate, neonatal mortality rate and under-five mortality rate are used. As the status of health is indicated by morbidity as well, the data on the percentage of children suffered from fever and the percentage of children with birth weight less than the recommended level (i.e. 2.5 k.g.) have also been used. As the low mortality and morbidity rates reveal better health status, the districts having lower index value are placed in higher rank.

The performance of the districts in selected health promoting factors has been examined by constructing a composite Index of Health Contributors (IHC) applying Principal Component Analysis and subsequently districts are ranked in terms of the index value. In the construction of the index three socio-demographic (i.e. literacy rate, mean number of children ever born to the women aged 15-49 years and percentage of children aged 6-35 months exclusively breastfed for at least six months), one economic (i.e. per capita district domestic product), one healthcare infrastructure (i.e. number of PHCs per lakh rural population) and three healthcare

utilization (i.e. percentage of mothers who received 3 or more antenatal care, percentage of institutional delivery and percentage of children aged 12-23 months fully immunized) variables are considered. As higher levels of these indicators (except the mean number of children ever born to the women aged 15-49 years for which inverse has been taken) signify better outcome, the districts with higher index value are considered to have better status.

Finally, to examine if there is any correlation between the status of child health represented by ranks of the districts in CHI and that of health contributors represented by ranks of the districts in IHC spearman rank correlation coefficient is worked out.

## **Inter-district variations in child health indicators**

### ***Infant mortality***

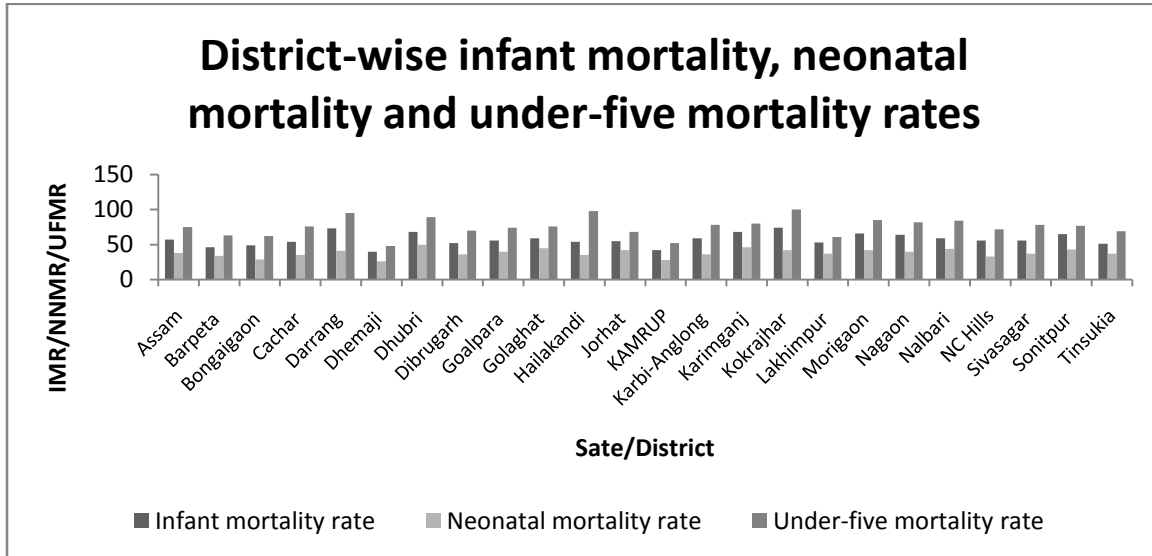
As per the Annual Health Survey (2011-12) the infant mortality rate in Assam is 57 per thousand live births. The infant mortality rate varies considerably across the districts ranging from 40 in Dhemaji district to 74 in Kokrajhar district signifying the range of 34 deaths. Out of the 23 districts 13 districts have infant mortality rate lower than the state average and 10 districts have higher than the state average.

### ***Neonatal mortality***

The Annual Health Survey (2011-12) shows that the neonatal mortality in Assam was 38 per thousand live births. Wide-disparities in the neonatal mortality rate are witnessed across the districts of the state. Data reveal that 12 districts have neonatal mortality rate lower than the state level and 11 districts have higher than the state level. Dhemaji, Kamrup and Bongaigaon are the top three districts with lowest neonatal mortality rate while Dhubri, Nalbari and Golaghat are the bottom three districts with highest neonatal mortality rate. The neonatal mortality rate ranges from 26 in Dhemaji to 50 per thousand live births in Dhubri. The gap between the lowest and highest neonatal mortality rates is 24 points.

### ***Under-five mortality***

As like the infant mortality and neonatal mortality rates, inter-district differential in the under-five mortality rate is also evident. The under-five mortality rate for the state is estimated as 75 per 1000 live births and ranges from 48 to 100 across the districts. While 10 districts have under-five mortality rate below the state level, remaining 13 districts have a rate higher than the state rate. Dhemaji registered the lowest under-five mortality rate succeeded by Kamrup and Lakhimpur, whereas Kokrajhar recorded the highest preceded by Hailakandi and Darrang.



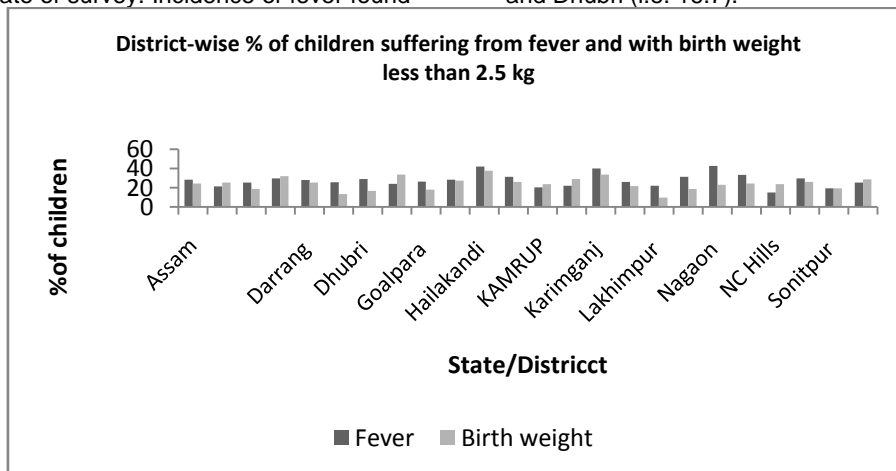
Source: Annual Health Survey 2011-12 Fact Sheet, Office of Registrar General of India

The horizontal lines indicate the state averages

**Morbidity**

As the health status is indicated by morbidity also, the percentage of children suffered from fever and the percentage of children with birth weight less than 2.5 k.g. are taken. The Annual Health Survey (2011-12) reports that 28.4 per cent of the children in Assam suffered from fever during fifteen days preceding the date of survey. Incidence of fever found

to be the highest in Nagaon (42.5 per cent) and lowest in North Cachar Hills (14.9 per cent) and the gap between these two extremes amounting 27.6 percentage points suggests wide differential in the incidence of fever in the districts of Assam. Likewise, the percentage of children with birth weight less than the recommended level, i.e. 2.5 Kg, is the highest in Hailakandi (i.e. 37.5) followed by Karimganj (i.e. 33.7) and Dibrugarh (i.e. 33.6), while it is the lowest in Lakhimpur (i.e. 9.7) preceded by Dhemaji (i.e. 13.5) and Dhubri (i.e. 16.7).



Source: Annual Health Survey 2011-12 Fact Sheet, Office of Registrar General of India

The horizontal lines indicate the state averages

On the basis of the above-mentioned indicators the status of child health in the districts of Assam has been quantified by eliciting composite index for each of the 23 districts considered in this study. The Principal Component Analysis is used for constructing the index. Before undertaking the principal component analysis, the suitability of the data for factor analysis has been tested for which the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy test and Bartlett's test of sphericity have been done. The observed KMO statistic (i.e. 0.612) being greater than 0.5, factor analysis is justified. Furthermore, the chi-square value for Bartlett's test of

sphericity (i.e. 59.901) is found to be significant at 0.01 level, which indicates that the set of data is suitable for principal component analysis.

**Table – 1**  
**Results of Statistical Tests for Principal Component Analysis (Child Health Status Indicators)**

Test	Result
Kaiser-Meyer-Olkin Measure of sampling Adequacy test	0.612
Bartlett's Test of Sphericity	59.901 p < 0.01 d.f. 10

Extraction communalities estimate the variance in each indicator accounted for by the indicators in the factor solution, the larger of which

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suggest that the indicators conform to the factor solution. The estimated values of extraction communalities being reasonably large, it can be ascertained that variables fit well for factor analysis. The varimax rotation method has furnished rotated component matrix after 3 iterations. Applying Kaiser's criterion of Eigen value greater than unity, two components are retained. These two components together explain almost 81 per cent of the inter-district variations in the selected indicators.

**Table – 2**  
**Extraction Communalities and Rotated Component Matrix – Child Health Status Indicators**

Indicators	Extraction	Component 1	Component 2
Infant mortality rate	.927	0.961	0.0516
Neonatal mortality rate	.818	0.903	0.0598
Under five mortality rate	.850	0.834	0.393
% of children suffering from fever	.627	0.369	0.700
% of children having birth weight less than 2.5 kg	.826	-0.0483	0.908
Eigen values		2.872	1.176
% of Variance		57.439	23.525

Extraction Method: Principal Component Analysis  
Rotation Method: Varimax with Kaiser Normalization.

**Table-3**  
**Child Health Index Value and Ranks of the Districts of Assam**

District	Index value	Rank
Dhemaji	93.871	1
Kamrup	99.373	2
Bongaigaon	113.122	3
Barpeta	114.566	4
Lakhimpur	116.844	5
NC Hills	123.931	6
Tinsukia	126.900	7
Dibrugarh	128.212	8
Goalpara	133.875	9
Jorhat	134.560	10
Cachar	135.420	11
Karbi-Anglong	136.774	12
Sivasagar	138.141	13
Sonitpur	141.326	14
Golaghat	143.824	15
Nalbari	150.497	16
Morigaon	152.596	17
Nagaon	153.826	18
Hailakandi	158.027	19
Dhubri	160.432	20
Karimganj	160.466	21
Darrang	163.761	22
Kokrajhar	166.889	23

The rotated component matrix shows that more weights are assigned on infant mortality, neonatal mortality and under-five mortality rates and these indicators will dominate the value of the index. The factor loadings of the principal components are applied to the selected indicators to elicit the composite index. As low value of each of the selected indicators is preferred, the districts with low index value will have better child health status. The value of the composite index of the districts and their rank in terms of the index value is presented in Table-3. Among all the districts, Dhemaji holds the first rank in child health status with lowest index value followed by Kamrup and Bongaigaon. Kokrajhar, Darrang and Karimganj are the bottom three districts with highest index values.

## Inter-district Variations in Health Contributing Factors

This section presents the inter-district variations in some key elements that contribute towards better health. Table – 4 provides district level data on key health contributors as reported by the Annual Health Survey 2011-12. The coefficients of variation presented at the end of the table indicates that there is considerable inter-district variations in each of the factors, except literacy and mean number of children ever born where variations are moderate indicated by relatively smaller coefficients of variation.

It is noticed that 9 districts of Assam have literacy rate higher than the state level (i.e. 81%). North Cachar

Hills registered the highest literacy rate (90.4) whereas Karimganj registered the lowest (72.5). The mean number of children ever born to the women aged 15-49 years is found highest in Hailakandi (3.4) and lowest in Kamrup (2.2), while the level for the state is 2.7. Wide-scale differential in exclusive breast-feeding practice across the districts has been reported. The percentage of children aged 6-35 months who were exclusively breastfed for at least 6 months is the highest in Dibrugarh (72.7) and lowest in Kokrajhar (14.9), which signifies a gap of 57.8 percentage points.

As per the data revealed by the Economic Survey, Assam, 2011-12 the per capita domestic product of the state at constant prices stood at Rs.23.02/- thousand. North Cachar Hills occupied the first rank with highest per capita district domestic product (Rs. 84.68/- thousand) while Dhubri has the lowest (11.49/- thousand).

Varying levels of utilization of healthcare services have also been observed. For instance, the percentage of mothers who received 3 or more antenatal check-up is the lowest in Dhubri (28.1) and highest in Nalbari (78.6). Likewise, the percentage of institutional delivery was the lowest in Dhubri (35.1) and highest in Sivasagar (83.6). Dhubri also registered the lowest complete immunization (i.e. BCG, three injections of DPT, three doses of Polio and measles) of children aged 12-23 months (35.1 per cent) while Dibrugarh registered the highest (85.5 per cent). As far as the availability of primary Health Centres (PHC) is concerned, Economic Survey, Assam, 2011-12 reports that Tinsukia (1.8) and N.C.

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Hills (6.57) are facilitated with the lowest and highest number of PHCs per lakh rural population

respectively.

**Table-4**  
Performance of the of the Districts of Assam in Health contributors

State/ District	Literacy rate	Mean number of children ever born	Children exclusively breastfed (%)	Per capita district domestic product* (in Rs.1000/-)	Mothers who received 3 or more antenatal care (%)	Institutional delivery (%)	Children aged 12-23 months fully immunized (%)	Number of PHC per lakh rural population*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<b>Assam</b>	81	2.7	40.1	23.02	60.2	60.8	61.4	3.15
Barpeta	76.8	2.7	37.5	14.6	44.5	48.9	56.9	2.33
Bongaigaon	76.2	2.6	29.2	27.87	53.4	50.1	49	4.27
Cachar	87.2	3.1	36	20.79	63.2	60.2	61.5	1.90
Darrang	73.1	2.8	34.6	20.06	53.6	58.9	52.1	2.93
Dhemaji	81.2	2.8	39.5	15.89	58.7	71.7	64.2	2.97
Dhubri	77.1	3	21.8	11.49	28.1	35.1	39.2	1.95
Dibrugarh	81.8	2.4	72.7	37.69	78.3	75.4	85.5	2.40
Goalpara	81.3	2.9	36.1	17.71	51.6	49.7	40.6	3.79
Golaghat	82.1	2.5	56	23.29	71	67.6	69.5	3.95
Hailakandi	86.6	3.4	18	20.35	60.2	38.1	62.4	1.96
Jorhat	85.2	2.4	51.5	31.26	77.2	74.8	71.3	4.47
Kamrup#	86.3	2.2	42.8	34.9	75.6	80	58.5	4.71
Karbi-Anglong	84.6	3	44.9	23.97	53.4	53.2	78.7	5.40
Karimganj	72.5	3.1	31.2	21.08	52.4	35.5	64.4	1.99
Kokrajhar#	72.5	2.7	14.9	18.96	56.1	54.2	42.6	4.18
Lakhimpur	83.2	2.6	28.6	18.46	61.5	78.8	60.2	2.74
Morigaon	83.3	2.7	24.4	17.96	62.5	60.6	65.9	2.94
Nagaon	80.7	2.9	52.7	14.1	54.3	53.4	51.6	2.36
Nalbari	83.5	2.4	47.2	21.05	78.6	83.5	61.9	5.82
NC Hills	90.4	2.6	38.8	84.68	45.7	59.8	51.6	6.57
Sivasagar	85.1	2.3	47.8	44.63	78	83.6	80.8	3.17
Sonitpur	74.9	2.6	32.2	16.85	58.1	58.3	62.2	2.68
Tinsukia	75.4	2.7	45.2	36.19	68.1	71.8	78.1	1.80
<i>Mean</i>	80.91	2.71	38.42	25.82	60.18	61.01	61.25	3.36
<b>C.V.</b>	6.36	10.69	34.54	59.56	21.02	24.17	20.53	40.32

Source: Annual Health Survey 2011-12 Fact Sheet, Office of Registrar General of India

\* Economic Survey, Assam, 2011-12

# Column (5) and column (9) are calculated after aggregation

On the basis of the above-discussed health contributing factors the Index of Health Contributors has been developed by applying principal component analysis. Before performing principal component analysis, the suitability of the set of data for factor analysis has been verified in terms of the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy test and Bartlett's Test of Sphericity. The observed KMO statistic (i.e. 0.724) confirms that factor analysis is justified. Furthermore, the chi-square value for Bartlett's Test of Sphericity (i.e. 90.438) being significant at 0.01 level, the set of data is suitable for principal component analysis.

**Table - 5**  
Results of Statistical Tests for Principal Component Analysis (Health Contributors)

Test	Result
Kaiser-Meyer-Olkin Measure of sampling Adequacy test	0.724
Bartlett's Test of Sphericity	90.438 p < 0.01 d.f. 28

The estimated values of extraction communalities being reasonably large except for literacy, it can be ascertained that variables fit well for factor analysis. Considering low extraction communality, the literacy variable is not considered for eliciting the index. Applying varimax rotated method two components are retained based on Kaiser's criterion of Eigen value greater than unity. These two components together explain almost 69 per cent of the inter-district variations in the selected indicators.

**Table - 6**  
Extraction Communalities and Rotated Component Matrix - Health Contributors

Indicators	Extraction	Component 1	Component 2
Literacy	0.467	0.555	0.398
Mean number of children ever born	0.651	0.804	0.066
Percentage of children exclusively breastfed	0.625	0.745	-0.264
Per capita district domestic product	0.645	0.546	0.589
Antenatal check-up	0.828	0.841	-0.347
Institutional delivery	0.803	0.887	-0.127
Percentage of children fully immunized	0.699	0.669	-0.501
PHCs per lakh population	0.770	0.455	0.750
Eigen values		3.957	1.530
% of Variance		47.695	19.174

Extraction Method: Principal Component Analysis

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Rotation Method: Varimax with Kaiser Normalization. Higher factor loading for two healthcare indicators namely antenatal check-up and institutional delivery and two demographic indicators namely, mean number of children ever born and percentage of children exclusively breastfed show that much of the variations in the status of the districts is due to variations in them. In other words, districts having higher of these will also have higher index value. As, such Dibrugarh holds the first rank with highest index value followed by Sivasagar and Jorhat. On the contrary, Dhubri, Kokrajhar and Hailakandi are the bottom three districts with lowest index values. The values of the IHC for each of the districts and the consequent ranks of the districts are presented in Table-7.

**Table – 7**  
**Values of Index of Health Contributors and Ranks of the Districts of Assam**

District	Index value	Rank
Dibrugarh	171.0556	1
Sivasagar	166.9987	2
Jorhat	152.96	3
Kamrup	149.0482	4
Nalbari	148.7433	5
Tinsukia	147.2071	6
NC Hills	146.1157	7
Golaghat	142.182	8
Lakhimpur	124.8611	9
Dhemaji	124.2415	10
Karbi-Anglong	123.6347	11
Cachar	119.1768	12
Morigaon	114.1997	13
Sonitpur	112.1648	14
Nagaon	111.4084	15
Darrang	109.7935	16
Bongaigaon	105.9021	17
Goalpara	99.11206	18
Barpeta	98.74109	19
Karimganj	97.72519	20
Hailakandi	96.02604	21
Kokrajhar	95.90347	22
Dhubri	66.73494	23

A comparison of the ranks of the districts in both indices indicates that Dibrugarh occupies the first rank in the IHC while it holds 8<sup>th</sup> rank in CHI. Likewise, Dhemaji secures first rank in CHI while it achieves 10<sup>th</sup> position in the IHC. Similarly, Kamrup attains the 2<sup>nd</sup> rank in CHI whereas its position in IHC is 4<sup>th</sup>. Whether or not the status of child health of the districts is significantly correlated with the performance in health contributors, is tested through the spearman rank correlation coefficient. The Spearman rho is found to be 0.47 which is significant at 0.05 level. This suggests that both are linearly related.

## Conclusion

The study finds that much of the variations in the child health status may be attributed to infant mortality rate, neonatal mortality rate and under-five mortality rate and reductions in them are essential for improvement in the status of health. The significant correlation between the child health index and index of health contributors suggests that health status can be improved only through improvements in socio-demographic, economic and healthcare factors. Specifically, greater coverage of antenatal care, complete institutional delivery, control of fertility, realization of exclusive breastfeeding and full immunization are highly essential for overall uplift of the status of health.

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