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HEALTH STATUS AND HEALTH INFRASTRUCTURE INEQUALITIES IN EAG STATES: A MULTIVARIATE ANALYSIS

RUCHI BHALLA[#]

Abstract

Growth and human development are both important for achieving the objective of development. There exists a strong two-facet relationship between economic growth and human development. Without adequate human development and growth paths, India cannot emerge as an economic superpower. The aim of inclusive growth seems to be daunting with the falling of education and health indicators in the Empowered Action Group states (EAG). There exists a great deal of inequality among the EAG states in terms of growth and human development indicators. The COVID-19 pandemic has worsened the situation of health indicators in the EAG states. Developed nations are spending a very large proportion of their income on health indicators of human development as a means to provide a decent and healthy life to their citizens. Health is an important indicator of human development; without an adequate health status, human development cannot be achieved. The objectives of the paper are, firstly, to address the inequalities existing among the EAG states in the pre and post-pandemic eras and, secondly, to examine the level of health status and infrastructure among EAG states through the construction of a composite index using the PCA technique. In addition, a coefficient of variation has been calculated for assessing the level of inequalities among these states. The study is prepared for two periods, i.e., 2015-16 and 2021-22, and various secondary data sources such as the National Family Health Survey (2015-16), Census (2011), the National Health Profile (2021-22, 2015-16), etc. have been used to fulfil the objectives of the paper. The findings of the paper conclude that indicators related to health status are performing well as there is a diminution of inequalities among EAG states, but indicators related to health infrastructure are neglected as no significant effect can be observed in terms of disparities. Recovery in the EAG states, especially in terms

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of health infrastructure indicators, is very depressing, and the result shows that the indicators have worsened after the pandemic.

Keywords: Composite Indices, EAG States, Health Inequality, Health Outcome, Health Status.

I. Introduction

Improvement in the health of a country's population, financial risk protection and satisfaction amongst the citizens are the three goals of health systems (Roberts et al., 2003). Since 2005, the health sector in India has been on a reform path. The government has made a substantial infusion of Central Government funds under the National Health Mission (NHM). This mission has made significant reforms in terms of fiscal federalism by defining the relationship between the Center and the States. The mission also manages the ways in which government funds for health will be utilized. So far, many noteworthy initiatives have been taken under this mission in the health care sector.

The 14th and 15th Finance Commission recommendations, aimed to reduce direct central support to social sectors but increase the States' share in the central tax revenue, have given greater autonomy in budgeting to the States. Moreover, these recommendations have put the responsibility on the States to set priorities for social sectors like health. The National Democratic Alliance (NDA) Government launched a new National Health Policy (NHP) in 2017 with the goal of ensuring universal health coverage (UHC).

The literature on health has recognized that public spending on health is essential for fighting major diseases and meeting Millennium Development Goal (MDG) targets. Investment in the social sector helps in reducing the poverty-deepening effect of high health (out-of-pocket) payments and the overall economic development of a country (UN, 2008). Most developed countries, as welfare states, invest a sizable amount of public funds in the health sector as compared to developing countries. The per capita government expenditure on health in high-income countries was around USD 3026 (8% of Gross Domestic Product i.e. GDP), while in low-income countries it was only USD 10 (2% of GDP) in 2010 (WHS, 2013), reflecting

high variation in health expenditure across countries. Newhouse (1977) also examined the degree to which this discrepancy in health expenditure can lead to the emergence of many social issues.

It has been stated by several economists that in India public expenditure on the health sector has a direct relationship with health infrastructure. Farahani et al. (2009), in their study, used cross-sectional data for the period 1998–99 in Indian states and suggested that increased public expenditure on health reduced the probability of death across all age groups. Bhalotra (2000), in his study, found that an inverse relationship exists between state-level health expenditure and infant mortality in rural areas using a time series data of infant mortality rates and health expenditure from 1970 to 1998. Another study on Indian states by Bhalotra (2012) examined the relationship between public expenditure on health and infant mortality and concluded that there is a negative association between the two.

“Globally, investment in health is regarded as an integral component of human development. Literature suggests that the interrelationship between better health and the creation of wealth, between the environment and population health, and the growing interdependence among countries have contributed to attributing people's health status to good governance" (CMH, 2000). India is among the countries which continue to give low priority to the health and well-being of its citizens. Even as it has transited from being a low-income country to a lower middle-income country, whether at times of low growth or high growth, for over six decades, public spending on health has remained stagnated within the narrow band of 0.8 to 1.2% of GDP.

As per the last census (2011), India, with a total population of 1,210 million is divided into 29 States and seven Union Territories, among which 17 are major States with a population size of 20 million and above. Eight States, barring Uttarakhand, are included under the special category of Empowered Action Group (EAG) States. These States are characterized by high population growth, low literacy rates (especially low female literacy rates, a prominent gap in literacy rates among both genders) and poor maternal and child health status. The EAG States were formerly known as the BIMARU States, exclusive of the States of Odisha and Assam.

During the mid-1980s, famous economic analyst Ashish Bose coined the term BIMARU in a study submitted to the then Prime Minister (Som et al. 2014). The word BIMARU strongly resembles the Hindi word 'Bimar, which means sick. This term was used to denote the state of backwardness of some of the major Indian States, including undivided Bihar, undivided Madhya Pradesh, Rajasthan, and Uttar Pradesh. These states have much higher population growth than the Indian average. The income disparity between BIMARU and other Indian states is extremely sharp. These states have low human development, including Odisha and Assam, which were together identified as EAG States by the Registrar General of India in 2017.

Public programs focusing on child health issues and child survival remain an area of concern in India although, as per the statistics, the under-five mortality rate has declined from 192 to 63 deaths per 1000 live births from 1970 - 2009. However, nearly a quarter of the 7.2 million under-five deaths globally occur in India every year. An action plan by NDA government in 2017 for universal health care in India has been prepared, which still remains unimplemented and does not commensurate with economic growth and increased political commitment to the social sector. Poor child health infrastructure in India is attributable to a mix of social determinants of health, including maternal education, socio-economic status and access to health care. As per the data provided by the World Health Organisation (WHO 2019), approximately 900 women die every day due to complications related to pregnancy in low- and middle-income countries. These complications are actually preventable. The reason behind such a high incidence of deaths is the lack of investment in health indicators viz. lack of government hospitals, lack of beds, lack of female workers, low number of Primary Health Centers (PHCs) and Community Health Centers (CHCs), low number of institutional deliveries, etc.

Several studies also indicate the role of community health services at the village level, such as school facilities, distance to the health facility, and a low number of centers, which leads to a low level in **maternity care services** (Mistry et al., 2009; Singh et al., 2014; Vidler et al., 2016). India's efforts to provide safe motherhood started with the *Janani Suraksha Yojana* (JSY) under the umbrella of NRHM, which aims to reduce maternal and neonatal mortality

by providing adequate services to village women through institutional deliveries (Gopalan & Varatharajan, 2012).

Despite several measures taken by the government of India to improve the health infrastructure and health condition of people living in EAG States of the country much needs to be done even now. The present study is conducted to determine the inequalities existing among EAG States with respect to health indicators.

II. Objectives

The paper tries to study two objectives in accordance with the health status and health infrastructure of EAG States. The first objective is to study the level of inequalities in health indicators such as infant mortality rates, crude birth rate, crude death rate, under-five mortality rate, institutional deliveries, number of doctors, number of primary and community health centers, and number of beds among EAG States. The second objective is to compare the ranking of EAG States for two years, i.e., 2015–16 and 2020–21, on various indicators related to health and development. Health indicators are the quantitative indicators that describe the health of the population of a country.

III. Methods and Methodology

Data Sources

For the purpose of analyzing the objectives of the paper, data is extracted from secondary data sources viz. the National Family Health Survey Fourth Round (2015–16) and Census 2011. The NFHS survey is performed on a large scale and collects data from a nationally representative population. It is part of the Democratic Health Survey program. The Ministry of Health and Family Welfare (MoHFW), Government of India, and the International Institute for Population Sciences (IIPS) are the nodal agencies under which the survey is conducted. It covers around 699,686 women aged 15–49 years with a response rate of 97%

and 112,122 men aged 15–54 years with a response rate of 92%. A two-stage stratified sampling design is used to collect the data (GOI, 2015).

Methods

The main objective of the study is to assess the level of inequalities present among the EAG States. These States are characterized by a high level of population, a low level of education, a high level of malnourished children, and an alarming rate of maternal and neonatal mortality. For assessing the inequalities among the EAG States, the study uses several health indicators that determine the health status and health infrastructure of the States.

Health status indicators used in the paper are:

- **Infant Mortality Rate (IMR):** The Infant Mortality Rate (IMR), defined as the number of deaths in children under 1 year of age per 1,000 live births in the same year, has in the past been regarded as a highly sensitive (proxy) measure of population health.

- **Crude Birth Rate (CBR):** Fertility is measured through an indicator such as the Crude Birth Rate per 1,000 living individuals.

- **Crude Death Rate (CDR):** The Crude Death Rate defines the number of deaths per 1,00,000 people.

- **Under-Five Mortality Rate (U5MR):** The Under-five Mortality Rate (U5MR) is the probability (expressed as a rate per 1,000 live births) of a child born in a specified year dying before reaching the age of five if subject to current age-specific mortality rates.

- **Institutional Deliveries (Ins. Del.):** It This refers to the facilities like hospitals, trained health care professionals, etc. for women giving birth to children.

Health infrastructure indicators used in the paper are:

- **Number of doctors:** Number of government doctors working in the States

- **The number of PHCs and CHCs**: The number of primary and community health centers that provide primary care to the people: It is one of the most important infrastructure indicators in analyzing the infrastructure backwardness in these States.

- **Number of government hospitals:** Hospitals that are totally funded by the government and help the citizens enjoy cheap and better health care facilities.

- **Number of female workers:** Female workers include nurses, helping staff, etc. who are working in the health sector.

- **Number of beds**: Number of beds available in the government hospitals for patients and for their better assistance.

IV. Methodology

To assess the inequalities, the paper uses simple descriptive statistics and the coefficient of variation. Descriptive statistics helps in understanding and describing the data set, which is essential for understanding any methodology. The coefficient of variation helps in understanding the degree of variability and stability of the data. Another objective of the paper is to compare the human development ranking across the States and also to check if any improvement has been made in the health status of States during 2015–16 and 2020–21. For this purpose, multivariate analysis is used, and a composite index is generated with the help

of principal component analysis. A detailed description of the methodology is given in Section 2.

Section I

This section gives a brief description of the variables that are used in the study for the purpose of analyzing status and infrastructure variables.

Health status

To assess the health status of the EAG States, the following variables have been taken into consideration: Infant Mortality Rate, Crude Birth Rate, Crude Death Rate, Under-five Mortality Rate, and Institutional Deliveries.

Table 1: HEALTH STATUS 2015-16

STATES	**IMR**	**CBR**	**CDR**	**U5MR**	**INS.DEL**
Bihar	44	22.5	6.6	57	78.5
Chhattisgarh	48	27.7	7.9	55	57.6
Jharkhand	39	17.6	6.8	50	63.6
MP	59	14.9	8.1	73	86.1
Odisha	57	16.6	8.5	68	84.8

Rajasthan	52	15.9	6.6	59	90.6
Uttar Pradesh	57	27.8	7.7	68	61.7
Uttarakhand	34	27.4	6.1	36	62.4
MEAN	48.75	21.3	7.2875	58.25	73.1625
SDEV	9.161254	5.704134	0.86757	11.85327	13.18125699
CV	5.321324	3.734134	8.399894	4.914256	5.550494925

Source: Census of India 2011, National Health Profile 2016 (MOHFW)

The above table explains the status of health indicators among EAG States for the year 2015–16. From the figures shown above, we can easily conclude that Madhya Pradesh has the highest IMR among the States. IMR has a negative relationship with the health variable of development. The study by Allotey (2003) reflects the deceptive association between infant mortality and other factors that are likely to have a greater influence on the health status of whole populations. The lower the expenditure on the health sector, the lower the economic development, with lower living conditions, lower social well-being, higher rates of illness, and a degraded quality of the environment. The higher the infant mortality rate, the lower the health status. Uttarakhand is the only State among EAG states with an IMR of less than 35, while all other States show a very high rate.

Another birth indicator is commonly known as the Crude Birth Rate (CBR). Fertility is measured through indicators such as the CBR per 1000 living individuals. Previous research (2017) explained that during the demographic transition, a decline in the CBR reflected an increase in life expectancy at birth. From the above statement, it is quite clear that the CBR has a negative relationship with health indicators of development. Among the EAG states,

Madhya Pradesh (14.9) is the state with the lowest crude birth rate, while Uttar Pradesh (29) has the highest birth rate. A higher birth rate lowers the development of the state.

The third indicator is another mortality indicator that describes the health status and development among the states in the demographic transition theory. The crude death rate reflects the number of deaths per 1,000 people. The decline in the death rate indicates improvement in health status. Among the EAG states, MP has the lowest death ratio while UP has the highest death ratio. The crude death rate has a negative relationship with life expectancy.

The fourth indicator that describes the status of health among the EAG states is under five mortality rate (U5MR). The under-five mortality rate (U5MR) is the probability (expressed as a rate per 1,000 live births) of a child born in a specified year dying before reaching the age of five if subject to current age-specific mortality rates. Uttarakhand has the lowest Under Five Mortality Rate, while MP has the highest U5MR among the EAG states.

The last and final indicator that is used for computing the index is institutional delivery. Institutional deliveries are considered one of the most important indicators for measuring health status. It refers to the facilities like hospitals, trained health care professionals, etc. for women giving birth to children. Facility-based births are often promoted as reducing maternal and neonatal mortality. The higher the number of institutional deliveries, the higher the development of the health indicator of development.

Table 1 also gives a detailed description of descriptive statistics, which measure coefficients of variation. The coefficient of variation for EAG states explains that the higher the variation among the states, the higher the dispersion around the mean. The crude death rate shows the highest variation, while the crude birth rate shows the lowest variation among the EAG states.

Table 2: Health status 2020-21

STATES	**IMR**	**CBR**	**CDR**	**U5MR**	**INST. DEL**
Bihar	38	21.7	6	48	63.8
Chhattisgarh	39	26.8	7.4	48	70.2
Jharkhand	29	15.7	5.5	39	61.9
MP	47	14.3	7.1	62	80.8
Odisha	44	15.9	7.8	56	85.4
Rajasthan	41	14.9	6.1	50	84
Uttar Pradesh	43	17.5	6.9	51	67.8
Uttarakhand	38	26.2	6.7	38	68.6
MEAN	39.875	19.125	6.6875	49	72.8125
SD	5.409978	5.09194	0.773559	7.982123	9.238187438
CV	0.135673	0.266245	0.115672	0.1629	0.126876394

SOURCE: NHP (2020-21), MOHFW

Table 2 explains the status of health among the EAG states for the years 2020–21. It can be easily assessed that some improvement has been made in comparison with the past year (2015–16). Even the variance among the States is seen to be lower for the years 2020–21.

The coefficient of variation shows that inequality in IMR has been reduced from 5.32 in 2015-16 to 0.14 in 2020–21. The huge reduction during 2015-16 to 2021-21 shows that variables that are necessary for the upliftment of society are given importance.

Table 3: HEALTH INFRASTRUCTURE 2015-16

STATES	**NUMBER OF DOCTORS**	**NUMBER OF PHC'S & CHC'S**	**NUMBER OF GOVT. HOSPITALS**	**NUMBER OF FEMALE WORKERS**	**NUMBER OF BEDS**
Bihar	4.32	1.86	0.22	16.28	59.33
Chhattisgarh	5.11	3.48	0.85	21.41	9.06
Jharkhand	5.72	1.57	1.52	19.93	16.41
MP	5.61	2.05	0.63	14.05	39.29
Odisha	9.35	3.82	4.17	19.56	37.68
Rajasthan	11.47	2.76	1.20	25.73	37.92
Uttar Pradesh	5.15	2.11	0.43	11.24	28.44
Uttarakhand	11.44	2.91	6.89	19.99	78.97
MEAN	7.27	2.57	1.99	18.52	38.39

SDEV	2.79	0.75	2.19	4.24	21.00
CV	0.38	0.29	1.10	0.23	0.55

SOURCE: NHP 2015-16, MOHFW

Table 3 represents the status of health infrastructure indicators. Indicators that have been considered for the purpose of evaluating the infrastructure of health indicators in the EAG states are the number of doctors, the number of PHCs and CHCs, the number of government hospitals, the number of female workers, and the number of beds. All the indicators have been calculated in terms of per lakh population. A positive linkage between child immunization and the availability of health infrastructure was studied by Ghei et al. (2010). Better-equipped facilities with better health facilities have bigger effects on immunization coverage in the health sector. Health infrastructure, in terms of hospitals, hospital beds, doctors, nurses, and many more has a significant direct and positive contribution to the health infrastructure of any country.

In terms of various indicators, Uttarakhand seems to be in a favorable position for the year 2015-16. In terms of number of doctors and government hospitals, Bihar lags behind other states while for indicators like PHCs and CHCs, Jharkhand, the most populated state, represents a very meager picture for the female attendants and Chhattisgarh has a very low number of beds for patients.

A simple descriptive analysis such as Mean and Standard Deviation has been done and for the purpose of measuring inequality, the coefficient of variation has been calculated.

Table 4: Health Infrastructure 2020-21

STATES	**NUMBER OF DOCTORS**	**NUMBER OF PHC'S & CHC'S**	**NUMBER OF GOVT. HOSPITALS**	**NUMBER OF FEMALE WORKERS**	**NUMBER OF BEDS**
Bihar	3.52	1.87	1.38	21	11.08
Chhattisgarh	3.99	3.64	2.45	24.5	46.22
Jharkhand	4.91	1.52	1.64	23.14	31.9
MP	5.32	1.92	0.58	17.17	36.85
Odisha	12.38	3.95	4.11	19.4	39.17
Rajasthan	8.51	3.62	4.29	23.65	63.69
Uttar Pradesh	5.01	1.98	0.44	13.59	27.34
Uttarakhand	12.03	2.96	4.31	20.44	79.72
MEAN	6.96	2.68	2.4	20.36	42
SDEV	3.56	0.97	1.64	3.64	21.44
CV	0.51	0.36	0.69	0.18	0.51

SOURCE: NHP 2020-21, (MOHFW)

The above table represents the availability of health infrastructure among the EAG states for the year 2020–21. In terms of number of doctors, it is Bihar, which lags behind other states, while for indicators like PHCs and CHCs, it is Jharkhand, and the most populated state (Uttar Pradesh) represents a very meager picture for female attendants, number of beds, and number of government hospitals.

For health infrastructure variables, it can be easily analyzed, but not such a huge difference is witnessed. There is no change in terms of reducing disparity. The coefficient of variation is somewhat similar for both years.

Section 2

This section presents a detailed analysis of the disparities among the States with the help of multivariate analysis. The methodology is explained in detail in the following paragraphs.

V. Multivariate Analysis

In addition to univariate analysis using coefficients of variation, multivariate analysis of dispersion is also conducted to get a better picture of interstate disparity in infrastructure development. The tools used for the ranking of States on the basis of infrastructure indices have been constructed using principal component analysis. A health index is constructed for the variables explained above. Two indexes have been calculated - one index for health status indicators, which include variables CBR, CDR, IMR, institutional deliveries, and U5MR, and the second index is the health infrastructure index, which includes variables like the number of government hospitals (PHCs and CHCs), the number of female attendants, the number of beds, and the number of doctors. The indexes have been calculated for the years 2015–16 and 2020–21. Health indexes are calculated as a weighted average of various components. It should be noted that health status and infrastructure components are not mutually uncorrelated. Pair-wise correlations between them are given below in the appendix. Since there is a correlation between these components, it is not appropriate to pick one of them (say, the number of hospitals or the number of doctors) to analyze the effect of changes in

them on health indicators. There is a need to compute a "composite index" by combining various components of health variables in a suitable way (assigning appropriate weights to different components) and relating it to the health indicators. While constructing the health infrastructure index as a weighted average of various components, it is crucial to determine the weights to be assigned to each of these components. The papers exploit the total variation in five components to arrive at the health status and infrastructure index. For this purpose, we construct principal components (defined as normalized linear combinations) of various components, which have the property that the first principal component (P1) accounts for the largest proportion of total variation in all components, the second principal component (P2) accounts for the second largest proportion of total variation in all components as the number of components increases, and so on. If we compute as many principal components as the number of components, the total variation in all components is accounted for by all principal components together. It is also true that the corr (Pi, Pj) =0, i.e., the principal components are mutually uncorrelated. A weighted average of the principal components HII = 1P1+.....+kPk/ 1+.....+ k defines the HII. In the present case, k = 3 and 1>2>3 are the successive eigenvalues of the 33-correlation matrix of observations on various components. We assign the largest weight, 1/1, to P1 because it accounts for the largest proportion of total variation in all components. Similarly, P2 has been assigned the second largest weight, 2/2, because it accounts for the second largest proportion of the total variation in all the components, and so on. The HII index can be expressed as a weighted sum of various components, which provides the weights (shares) of individual components. Eigen values have been assigned, after which the weights are given.

VI. Health Status Index

A health status index has been constructed for the EAG states for the years 2015–16 and 2020–21. Weights have been generated with the help of principal component analysis. The indicators used are specified in the above section for the health status index. The original variables were redefined into a set of newly constructed orthogonal variables in order to find a few components that account for most of the variations in the original data. The relationship between the original variables and newly constructed variables is expressed by component

loadings, which are derived from the correlation matrix of the variables. These component loadings are used as weights in calculating component scores. The loadings of the indicators of infrastructural development are given in the appendix.

Table 5: HEALTH STATUS INDEX SCORES 2015-16

STATES	**HEALTH STATUS 2016**	**HEALTH STTAUS 2021**
Bihar	0.582331484	0.548126472
Chhattisgarh	0.292118436	0.380455046
Jharkhand	0.645448165	0.77550528
Madhya Pradesh	0.285297457	0.478117448
Odisha	0.279599611	0.472706382
Rajasthan	0.603783272	0.728588461
Uttar Pradesh	0.147950461	0.436402907
Uttarakhand	0.757877528	0.49216067
GINI COEFF	0.25541084	0.12947931

SOURCE: AUTHOR'S CALCULATION

The above table shows the scores of health status variables for 2015–16 and 2020–21. From the figures above, it can be easily analyzed that there is a vast improvement in the scores, which simply explains that the States are doing fairly well in terms of health indicators. Even the inequality measure, i.e., the GINI coefficient, shows that inequalities have decreased in the States over the past year. For the year 2015-16, States had around 25% persistence of inequalities among them, while it got reduced to 13% for the year 2021-22. The improvement can be relied upon because more and more policies are considering health as a necessary and important indicator for development.

Table 6: STATES RANKING

STATES	**HEALTH STATUS RANKING 2016**	**HEALTH STATUS RANKING 2021**
Bihar	4	3
Chhattisgarh	5	8
Jharkhand	2	1
Madhya Pradesh	6	5
Odisha	7	6
Rajasthan	3	2
Uttar Pradesh	8	7

Uttarakhand	1	4

SOURCE: AUTHOR'S CALCULATION

Ranks for EAG States have been calculated from the scores computed from PCA. A researcher can easily analyze the fact that a major variation among the ranks from 2016 to 2021? can be witnessed. Uttarakhand State, which was on the 1st rank for the year 2015-16, has slipped to the 4th position for the year 2020–21. All other states have seen an upward trend in their ranking positions except Chhattisgarh, which was in the 5th position and then slipped to 8th position. Uttar Pradesh has also shown improvement by jumping one rank upward from the year 2016.

Table 7: HEALTH INFRASTRUCTURE INDEX

STATES	**HEALTH INFRASTRUCTURE 16**	**HEALTH INFRASTRUCTURE 21**
Bihar	0.204627974	0.171223307
Chhattisgarh	0.37074141	0.543879831
Jharkhand	0.226560129	0.27890108
Madhya Pradesh	0.203572863	0.205594031
Odisha	0.673677037	0.810351857

Rajasthan	0.648750273	0.813923185
Uttar Pradesh	0.124014405	0.125305302
Uttarakhand	0.831012443	0.860520044
GINI COEFF	0.34252233	0.33415213

SOURCE: AUTHOR'S CALCULATION

The above table demonstrates the scores for health infrastructure indicators for the years 2015–16 and 2020–21. From the figures above, it can be easily analyzed that there is no or meager improvement in the scores of the States in terms of the infrastructure index. Even the inequality measure, i.e., the GINI coefficient, shows that inequalities have not increased nor decreased among the States over the years. For the year 2015-16, states had around 34% persistence of inequalities among them, while it got reduced to a meager 33% for the year 2020-21. The figures explain that investment in the infrastructure variables of health has not been on the priority list of the so-called poor states. Infrastructure represents the facilities being provided to patients to keep their conditions healthy. Lack of initiatives towards investment in key indicators of health show that policies amended should focus on the infrastructure variables for improving the conditions of these poor States.

Table 8: RANKING OF STATES

STATES	**HEALTH INFRASTRUCTURE RANKING 2016**	**HEALTH INFRASTRUCTURE RANKING 2021**
Bihar	6	7

Chhattisgarh	4	4
Jharkhand	5	5
Madhya Pradesh	7	6
Odisha	2	3
Rajasthan	3	2
Uttar Pradesh	8	8
Uttarakhand	1	1

SOURCE: AUTHOR'S CALCULATION

The above table displays the ranking of the States for the past two years. No major changes have been witnessed in the rankings of the States. Uttarakhand remains in the top position for both years, while Uttar Pradesh is at the bottom. Bihar has slipped to 7th position from 6th place, while Madhya Pradesh jumps one rank upward for the year 2020–21. Odisha also slipped from 2nd position to 3rd position, while Rajasthan jumps one place upward.

VII. Concluding Remarks

The backwardness of these States has been a cause for concern for the planners since a long time. These States have always reflected a state of backwardness in the field of socio-economic development. The population growth rate has been high, coupled with the strong existence of illiteracy and poverty. The condition of the female population has been even more shocking. The health sector is considered the backbone of a good ranking in the human development index. Ignorance of this sector leaves an economy in a state of poverty. "The

index of backwardness calculated in the year 2013 by the then Chief Economic Advisor of the Ministry of Finance under the Government of India has placed Odisha in the last position and Madhya Pradesh and Bihar jointly in the second-last position. On the economic and financial front, the EAG states of the country have exhibited slow but promising economic growth in recent years with the improvement of the Gross State Domestic Product (GSDP). From the above data, improvement can be witnessed in terms of the health status indicators for the EAG States, but if we consider the infrastructure indicators, no improvement has been witnessed.

The reason for the improvement of the health status indicators relates to the programs, which are the Integrated Child Development Services Scheme, Janani Suraksha Yojana, and Ayushmati Scheme. These welfare schemes have tried to improve the status of antenatal and postnatal care while popularizing the institutionalizing childbirth in these States. In Odisha, the provision of Nischay Yan, or referral transport, has been ensured by the State government, especially for pregnant and ailing mothers. Thus, the above-mentioned improvements in the socio-economic front and endowments granted by the government at both the Central and State levels have provided the planners of the country with a sigh of relief since these once extremely underdeveloped States have now exhibited signs of development in the recent years. The grouping of these States under the special category has further ensured proper and adequate attention by the Government of India.

The backwardness of these States in the health sector is due to the negligence attached to the investment in infrastructure indicators of health. Government policies should focus on expenditure on health infrastructure and increasing manpower in the health sector.

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Appendix

Table 1.1 Health Status 2015-16

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
IMR	.4100	.36645	8
INST DEL	.4716	.39943	8
CBR	.5039	.44218	8
CDR	.5052	.36149	8
U5MR	.3986	.32036	8

Correlation Matrix

		IMR	INST DEL	CBR	CDR	U5MR
Correlation	IMR	1.000	-.508	-.363	.801	.962

	INSTDEL	-.508	1.000	.816	-.152	-.519
	CBR	-.363	.816	1.000	-.198	-.440
	CDR	.801	-.152	-.198	1.000	.787
	U5MR	.962	-.519	-.440	.787	1.000
	IMR		.100	.189	.008	.000
	INSTDEL	.100		.007	.360	.094
Sig. (1-tailed)	CBR	.189	.007		.319	.137
	CDR	.008	.360	.319		.010
	U5MR	.000	.094	.137	.010	

a. Determinant = .003

Communalities

	Initial	Extraction
IMR	1.000	.948
INST DEL	1.000	.923
CBR	1.000	.886
CDR	1.000	.884
U5MR	1.000	.949

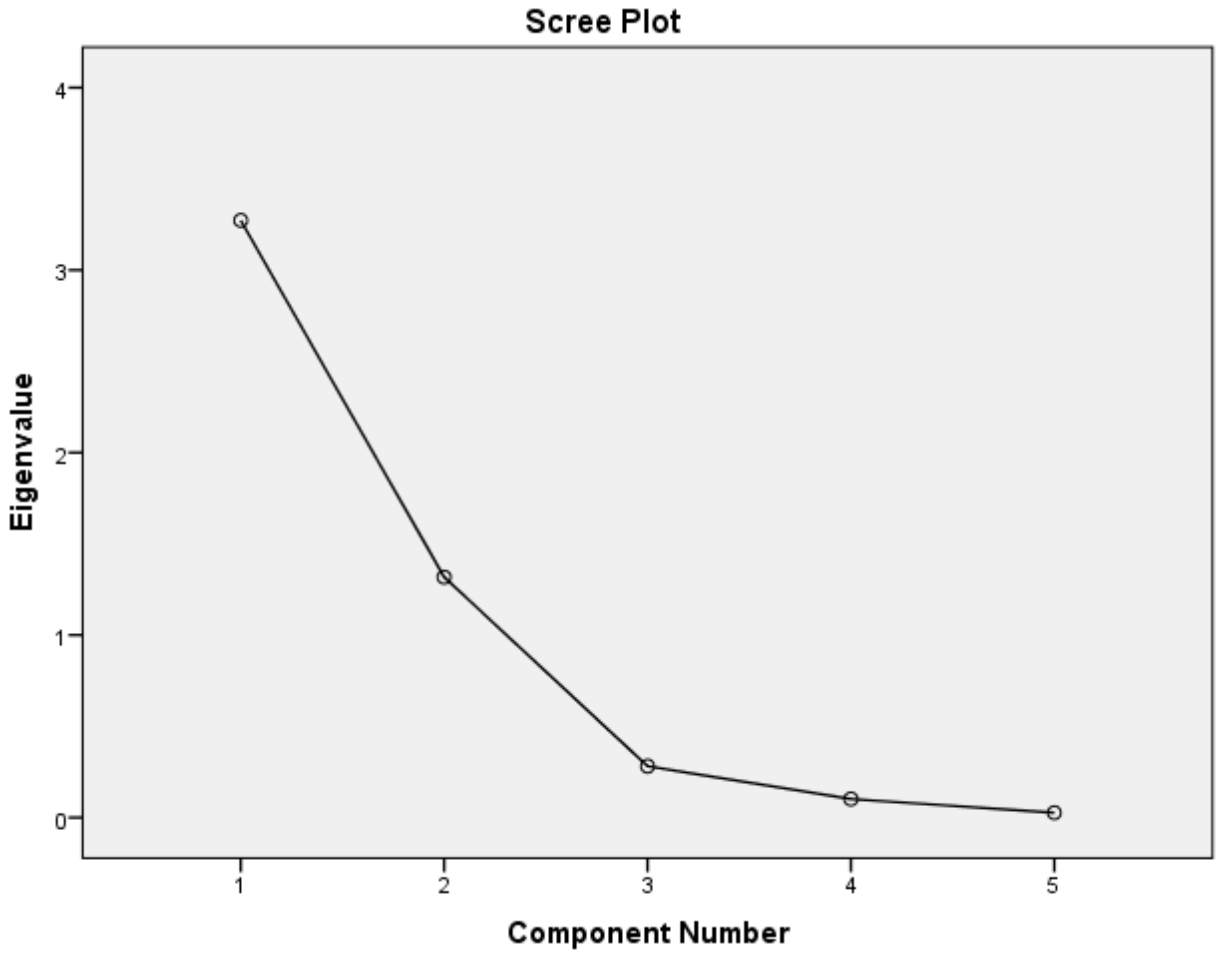
Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Varian	Cumulative %	Total	% of Varian	Cumulative %	Total	% of Varian	Cumulative %

		ce			ce			ce	
1	3.272	65.449	65.449	3.272	65.449	65.449	2.627	52.540	52.540
2	1.318	26.355	91.805	1.318	26.355	91.805	1.963	39.265	91.805
3	.281	5.629	97.434						
4	.102	2.034	99.468						
5	.027	.532	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix[a]

	Component	
	1	2
IMR	.925	-.303
INST	-.209	.938
DEL		

CBR	-.145	.930
CDR	.940	.016
U5MR	.907	-.356

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Table 1.2 Health Status 2020-21

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
IMR	.3958	.30055	8
INST DEL	.4644	.39311	8
CBR	.6140	.40736	8
CDR	.3750	.40714	8
U5MR	.8900	.07982	8

Correlation Matrix

	IMR	INST DEL	CBR	CDR	U5MR

Correlation	IMR	1.000	-.719	-.234	.720	.863
	INSTDEL	-.719	1.000	.468	-.538	-.698
	CBR	-.234	.468	1.000	.160	-.515
	CDR	.720	-.538	.160	1.000	.571
	U5MR	.863	-.698	-.515	.571	1.000
Sig. (1-tailed)	IMR		.022	.289	.022	.003
	INSTDEL	.022		.121	.085	.027
	CBR	.289	.121		.353	.096
	CDR	.022	.085	.353		.069
	U5MR	.003	.027	.096	.069	

a. Determinant = .016

Communalities

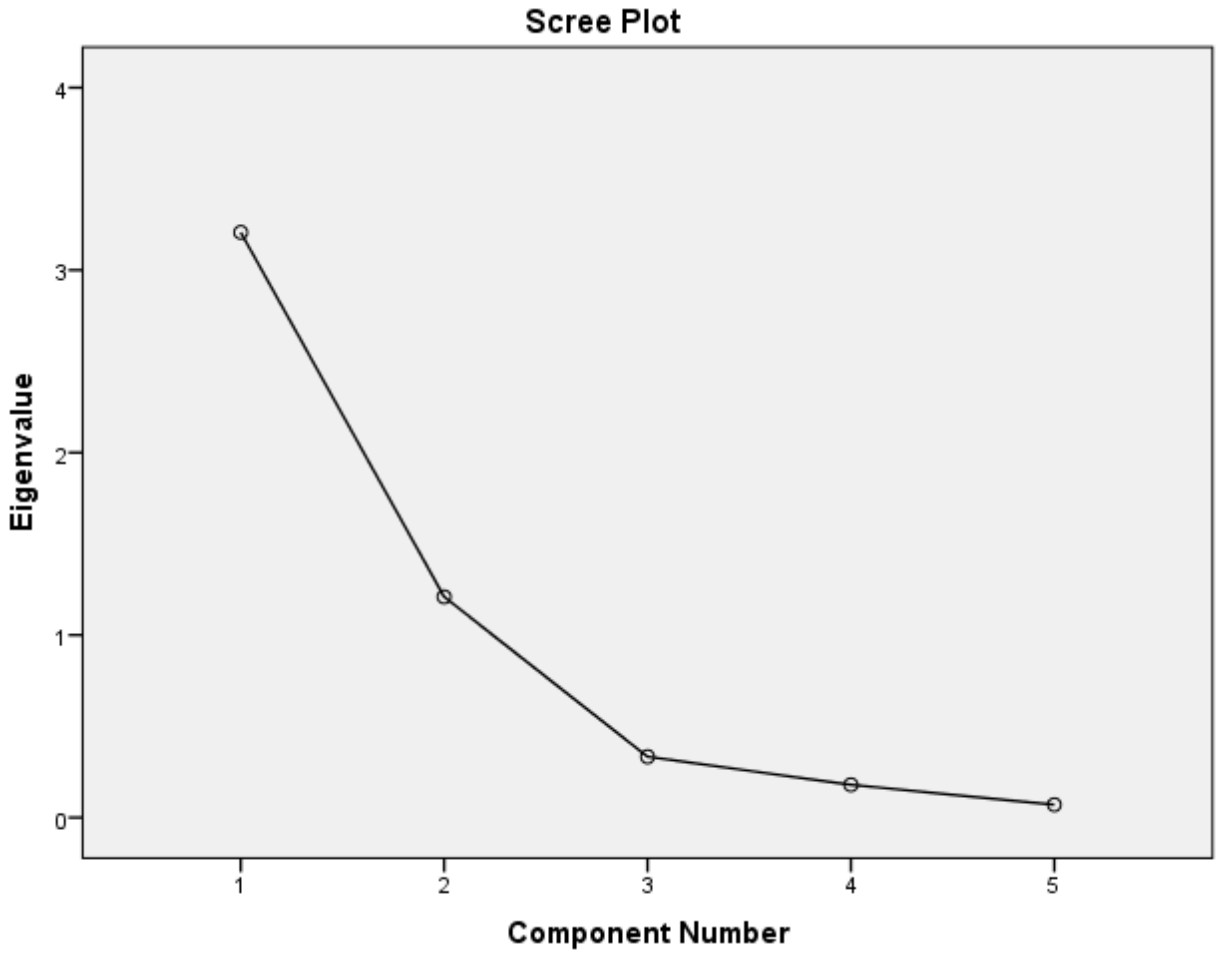
	Initial	Extraction
IMR	1.000	.899
INST DEL	1.000	.771
CBR	1.000	.958
CDR	1.000	.907
U5MR	1.000	.881

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.207	64.136	64.136	3.207	64.136	64.136	2.893	57.858	57.858
2	1.210	24.193	88.329	1.210	24.193	88.329	1.524	30.471	88.329
3	.333	6.668	94.997						
4	.180	3.593	98.590						
5	.071	1.410	100.000						

Extraction Method: Principal Component Analysis.


Scree Plot
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4
3
2
1
0
1
2
3
4
5
Component Number

Rotated Component Matrix

	Component	
	1	2
IMR	.927	-.198
INST DEL	-.744	.466
CBR	-.065	.976
CDR	.910	.282
U5MR	.804	-.484

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Table 2.1 Health infrastructure 2015-16

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
phc&chc	.4444	.35797	8
doctors	.4128	.41745	8
hospitals	.2652	.35073	8
beds	.4195	.32118	8
female workers	.5026	.31252	8

Correlation Matrix

		phc&chc	Doctors	hospitals	beds	female workers
Correlation	phc&chc	1.000	.498	.485	-.020	.459
	doctors	.498	1.000	.729	.471	.630

	hospitals	.485	.729	1.000	.595	.287
	beds	-.020	.471	.595	1.000	-.055
	female workers	.459	.630	.287	-.055	1.000
	phc&chc		.105	.112	.482	.126
	doctors	.105		.020	.119	.047
Sig. (1-tailed)	hospitals	.112	.020		.060	.246
	beds	.482	.119	.060		.449
	female workers	.126	.047	.246	.449	

a. Determinant = .073

Communalities

	Initial	Extraction

phc&chc	1.000	.665
doctors	1.000	.862
hospitals	1.000	.836
beds	1.000	.906
female workers	1.000	.749

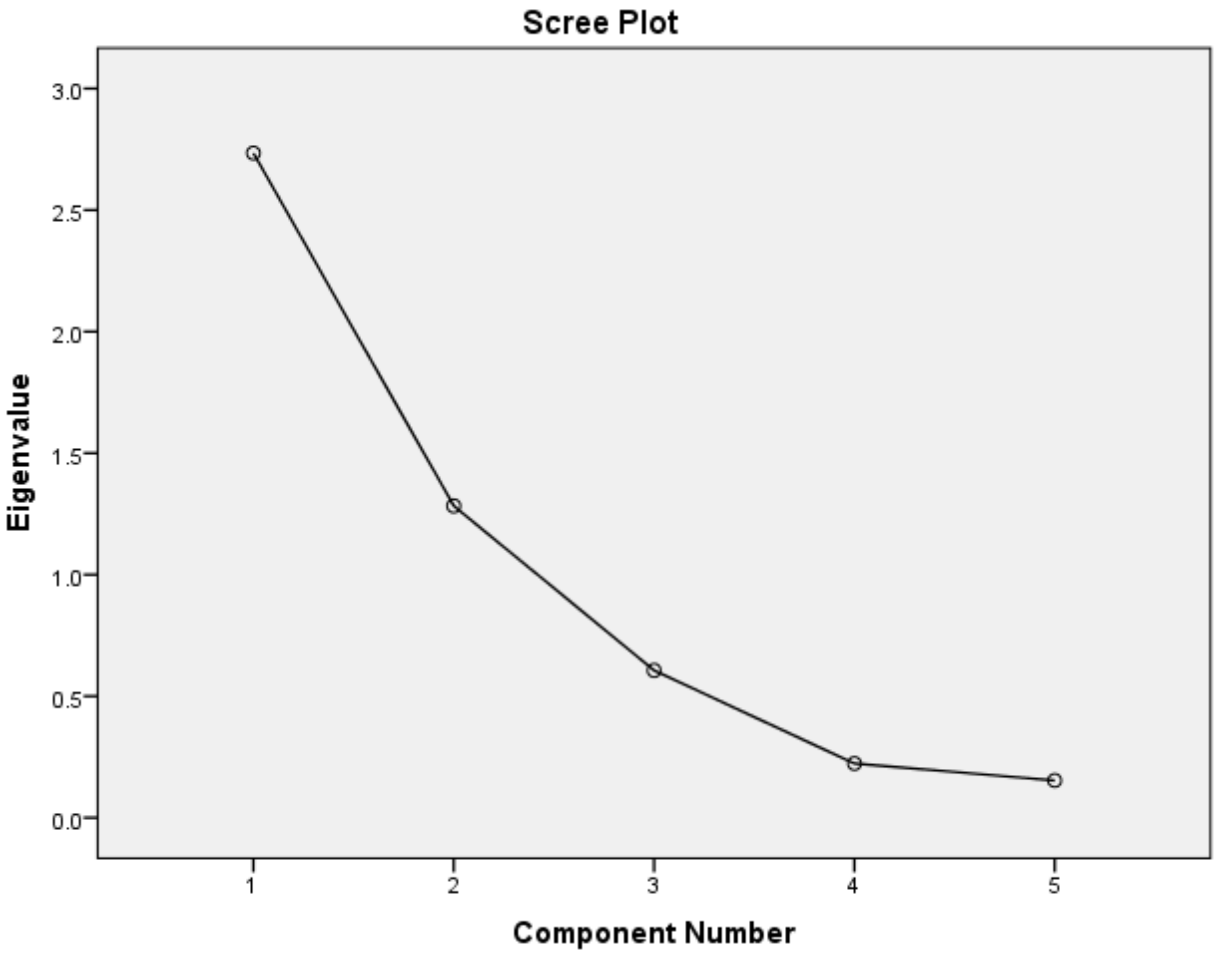
Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.735	54.692	54.692	2.735	54.692	54.692	2.070	41.400	41.400

2	1.283	25.660	80.352	1.283	25.660	80.352	1.948	38.952	80.352
3	.606	12.123	92.475						
4	.223	4.461	96.936						
5	.153	3.064	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix

	Component	
	1	2
phc&chc	.808	.112
Doctors	.679	.632
Hospitals	.427	.808
Beds	-.157	.939
female workers	.865	.005

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Table 2.2 Health infrastructure 2020-21

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
PHC&CHC	.4780	.39828	8
DOCTORS	.3881	.40206	8
HOSP	.5064	.42503	8
BEDS	.4504	.31239	8
FEMALE	.6206	.33411	8

Correlation Matrix

		PHC&CHC	DOCTORS	HOSP	BEDS	FEMALE
Correlation	PHC&CHC	1.000	.609	.807	.567	.376

	DOCTORS	.609	1.000	.820	.675	-.016
	HOSP	.807	.820	1.000	.753	.507
	BEDS	.567	.675	.753	1.000	.297
	FEMALE	.376	-.016	.507	.297	1.000
	PHC&CHC		.054	.008	.072	.179
Sig. (1-tailed)	DOCTORS	.054		.006	.033	.485
	HOSP	.008	.006		.016	.100
	BEDS	.072	.033	.016		.238
	FEMALE	.179	.485	.100	.238	

a. Determinant = .007

Communalities

	Initial
PHC&CHC	1.000
DOCTORS	1.000
HOSP	1.000
BEDS	1.000
FEMALE	1.000

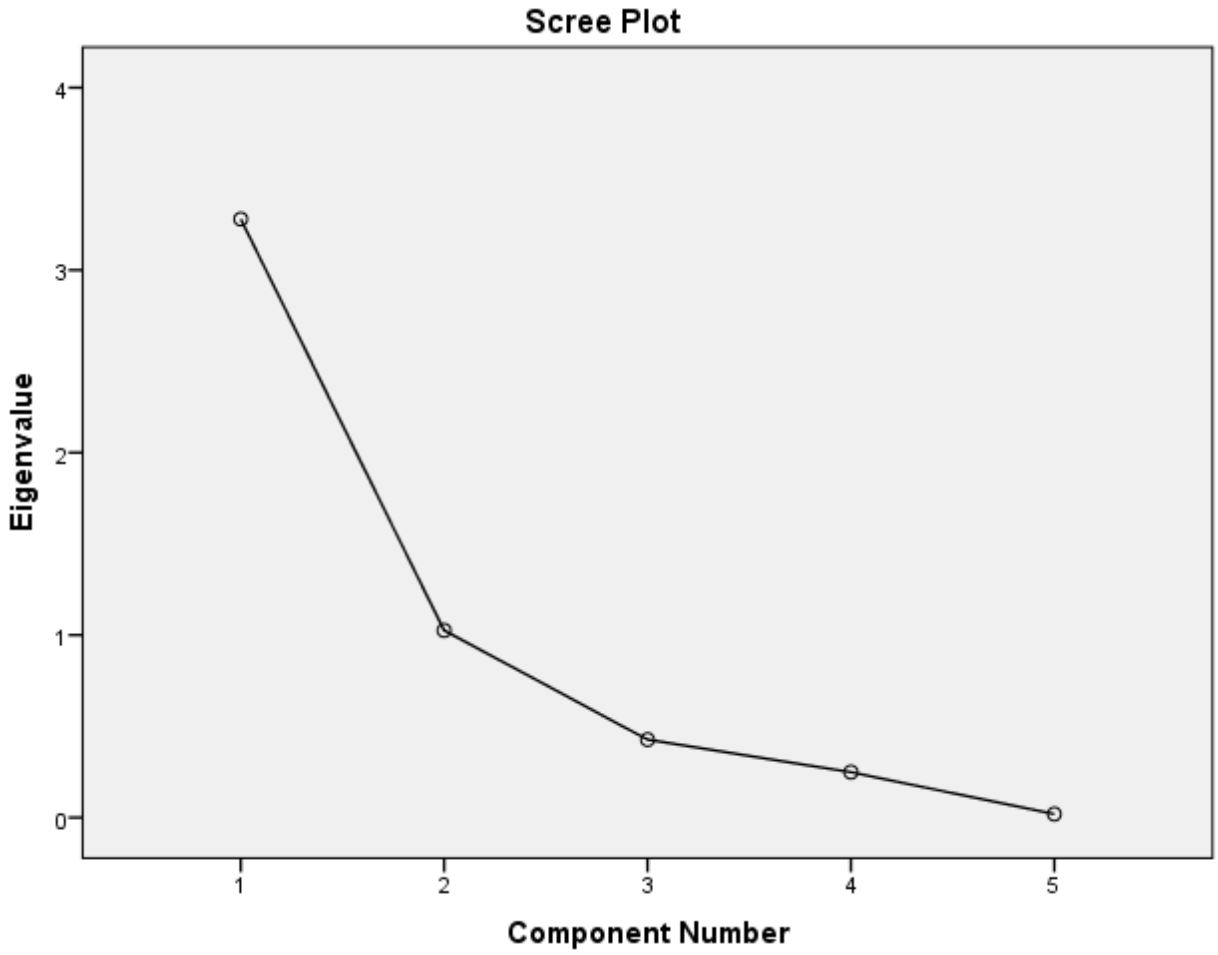
Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %

1	3.280	65.593	65.593	3.004	60.075	60.075
2	1.025	20.509	86.101	1.301	26.026	86.101
3	.427	8.543	94.644			
4	.249	4.977	99.621			
5	.019	.379	100.000			

Extraction Method: Principal Component Analysis.


Scree Plot
Eigenvalue
4
3
2
1
0
1
2
3
4
5
Component Number

Rotated Component Matrix

	Component	
	1	2
PHC&CHC	.776	.356
DOCTORS	.946	-.175
HOSP	.899	.388
BEDS	.826	.187
FEMALE	.127	.979

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.