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# Health Care Analysis and Regional Disparities in Different Provinces of Iran

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## Abstract

The main objective of the present study is to find out healthcare disparities in different states of Iran with reference to the relevant public health indicators and also extract those principal factors which are responsible for unequal distribution of healthcare facilities in Iran. Factor analysis is applied as a structure detection method with the goal of discovering that how many different factors are needed to explain the pattern of relationships among the variables including both component analysis and common factor analysis. The analysis presented in the study concludes that four components i.e. Child Mortality rate, number of Rural Public Health Centers, number of Rehabilitation Centers and number of paramedics, could describe nearly about 76 percent of total variance explained for regional disparities and thereby any considerable policy action implemented by the government effectively changes the environment of health and health care facilities distribution among the states specially deprived regions in Iran.

**Keyword:** Health Disparities - Factor Analysis-Taxonomy- Ranking-Iran.

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## 1- Introduction

Generally speaking, health is not only understood as mere absence of disease but also as the indispensable basis for defining a person's sense of well being. Health care, is the prevention, treatment, and management of illness and also preservation of mental and physical well being through the services offered by the medical, nursing, and allied health professions. According to World Health Organization report, it embraces all the goods and services designed to promote health, including preventive, curative and palliative interventions, whether directed to individuals or to populations (W.H.O Report 2006). In this sense health disparity deals with health outcomes and illness burden, while healthcare disparity is related to the conditions of access, treatment, and quality. Though health disparity in terms of health outcomes, health status, and healthcare has been defined in several ways, but "Healthy People 2010", defines health disparity as all differences among populations in measures of health and health care. That is to be mentioned that in most of the circumstances, disparities occur when resources are inequitably distributed across the countries, regions, communities or societies. From this point of view, access to healthcare refers to the degree to which people are able to obtain care from the healthcare system in a timely manner (Millman, 1993).

In a wide range of human socio economic activities run in the society, that is valuable to mention that, health care industry consists of many important segments which care about health care delivery services. These sorts of activities not only impact the quality and quantity of services available to the individuals and communities but also work toward reducing the health disparities among the regions. They are such as: Hospitals, Nursing and residential care facilities, Offices of physicians and surgeons, Offices of dentists, Home health care services, Offices of other health practitioners including chiropractors, optometrists, podiatrists, therapists, psychologists, audiologists, speech-language, pathologists, dietitians and other health practitioners and Diagnostic laboratories (Bureau of Labor Statistics, 2009) .

It is Widely Known that, causes of disparities in quality of care are multiple and are the result of a variety of factors but generally speaking Socio economic inequities such as income, education, occupation, family structure, service availability, directly affect the resources required to

maintain healthy regions and play a pivotal role as health indicators (Collins, 2004).That is believed, the lower quality of healthcare that is often a result of healthcare disparities has a significant impact on the individual, healthcare system, and society.

As it is stated by "Healthy people 2010", healthcare program should be designed to achieve two gold objectives: The first goal is to help individuals of all ages increase life expectancy and improve their quality of life. The second goal is to eliminate health disparities among different segments of the population. It can be used by many different people, States, communities, professional organizations, and others to help them develop programs to improve health (Healthy people, 2000).

Until 1950, Iran was divided into twelve provinces: Ardalan, Azarbaijan, Baluchestan, Fars, Gilan, Araq-e Ajam, Khorasan, Khuzestan, Kerman, Larestan, Lorestan, and Mazandaran. In 1950, Iran was reorganized to form ten numbered provinces with subordinate governorates: Gilan; Mazandaran; East Azarbaijan; West Azarbaijan; Kermanshah; Khuzestan; Fars; Kerman; Khorasan; Isfahan. From 1960 to 1981 the governorates were raised to provincial status one by one. Since then several new provinces have been created, most recently in 2004 when the province of Khorasan was split into three new provinces (Provinces, 2009). At present Iran's territory consists of 30 provinces **(Map 1)** , which are governed by a local center, mostly the largest local city. Provincial authority is headed by a governor (Ostandar), who is appointed by the Minister of Interior subject to approval of the cabinet. Regional planning is directed through the budgeting system which is annually proposed by the central government and approved by the parliament. This study considers three divided parts of Khorasan as one integrated State as before political partition done, therefore 28 provinces are included in data analysis.

During the last three decades, four round of socio economic five year plans have been passed through Iran parliament and implemented by the central government. The country is now at the threshold of sanctioning fifth round of five year plan. Indeed, one of the principal justifications for introduction of five year plans and the establishment of the Planning and management organization were to ensure a process of regionally balanced and socially equitable development in Iran. Through public policies, directed

private investments and various other interventions, balanced development across the regions was pursued during the last four decades of planning. The role of central government in general and local government (Ostandar) in particular, in the economic activities of the nation changed substantially since the initiation of economic reforms in 1990. The private sector, which was controlled and contained in various ways, has since then been encouraged to play a more important role.

An interesting aspect of socio economic five year plans performance in the ’90s is its regional dichotomy. The better performing states are mostly near the center of the country and they are geographically contiguous. On the other hand, the non-performing or poorly performing states are in desert and border regions of the country. Indeed, this geographical dichotomy is not only restricted to economic performance but also similar trends are noticeable in other spheres of development, such as health care indices of the people living in different regions. Such polarized position of the forward and backward states is certainly not a healthy trend in an integrated centrally governed country. It is the responsibility of the Centre to ensure that more or less same level of public health services are provided in all parts of a federal nation (Kurian, 2005) .

In the past three decades, Iran has adopted a policy aimed at more strongly addressing the needs of its population, and substantial progress has been achieved in Primary Health Care (PHC) sector. The Ministry of Health and Medical Education, which is the highest authority for delivering Primary Health Care, could achieve remarkable developments in the health sector, such as establishing health networks and improvement in various health indicators (World health statistics, 2007). In lowest level of programming , each village area contains a Health House which constitutes the basic building blocks for Iran’s health network in rural areas, staffed by trained or community health workers (Behvarz). While Rural and urban Health Centers administrated by physicians, health technicians and public health consolers, deal with more complex health problems in the area . The whole network is managed and administered through District Health Centers, working under the top supervision of Ministry of Health and Medical Education. The Chancellor of the university in each state, as executive director of the provincial health services is also in charge of all district health centers and hospitals.

So much so that the World Bank voiced its concern that "substantial disparities persist within the country" In its Country Overview 2006, it pointed out that the reforms process, initiated in the 1990s, was accompanied by visible increase in income inequality between urban and rural areas, between the forward and backward States, as also between skilled and unskilled workers (Punnathara, 2007).This all happened even while the country was able to reduce the number of people living under the poverty line through better five year plans performance. But poverty continues to be endemic and pervasive in States such as Sistan&Baluchestan, Lorestan and Khuzestan states in south and south west, West Azarbaijan state in west, and Golestan state in north of Iran with respect to socio economic development achievements.

## 2- Materials and Methods

The present study focused on Health care Indices collected from Iran, for the period 2004 - 2006, to find out ranking positions of the states and their comparative developmental status from one hand and extract principal components basically responsible for regional disparities. Health Indicators publication in Iran comes in a series of annual reports containing the most recently available health indicators data from the Ministry of Health And Medical Education. Normally, such reports present indicators measuring factors associated with the health of the nation and the health system provided by the government including data showing number of Hospitals and hospital beds, Nursing and residential care facilities, physicians, surgeons, specialists, dentists, other health practitioners (Paramedics), medical and diagnostic laboratories available per capita population living in rural and urban areas (Health Statistics, 2006). In order to find out health disparities among different states of Iran, researcher used to collect information on 21 variables (healthcare indices), named $X_1$, $X_2$…….. $X_{21.}$ The first 17 variables have their positive effects on the degree of regional development that is why they are directly used in the process of analysis, while those variables of $18^{th}$ and above, have been inversely used in computation process because of their negative effects on regional development level (Table 1). Three major statistical methods have been used to analyze data aiming at selecting homogenous states, ranking them

according to the level of development with respect to their accessibility to health care facilities and finding out the patterns of relationship among dependent and independent variables. Brief notes about the above mentioned statistical methods applied in the study are as follows;

**1- Compound Indexing method (CI):** In this method variables for each region are converted into standard scores (Z scores) and then Compound Indexes are computed for making comparison. Finally provinces are ranked with respect to their prosperity rate of health indicators access (Kalantry, 2001).

**Table A : Compound indexing method (CI)**

| Index $x_j$ / Region $A_i$ | $x_1$ $x_2$ .... $x_j$ | $Z_{xi}$ $Z_{x2}$ $Z_{xi}$ | CI |
|---|---|---|---|
| $A_1$ | $x_{11}$ $x_{12}$....$x_{1j}$ | $Z_{11}$ $Z_{12}$ $Z_{1j}$ | $\sum_{j=1}^{n} Z_{1j}$ |
| $A_2$ | $x_{21}$ $x_{22}$....$x_{2j}$ | $Z_{21}$ $x_{22}$ $Z_{2j}$ | $\sum_{j=1}^{n} Z_{2j}$ |
| $A_i$ | $x_{i1}$ $x_{i2}$.....$x_{ij}$ | $Z_{i1}$ $Z_{i2}$ $Z_{ij}$ | $\sum_{i}^{n} \sum_{j}^{n} Z_{ij}$ |

Source: (Kalantry, 2001)

**2- Deprivation Score method (DV):** This method has been introduced by the Programming Sector of the United Nations to compute Human Development Index (HDI) of the countries (United Nations, 2008). The HDI measures the average progress of a country in human development and Human Poverty Index for developing countries (Human Development Reports, 2008).

$$\text{(coefficient of deprivation } x_{ij}) \; DC_{ij} = \frac{Max(x_j) - \text{Re}\,al(x_{ij})}{Max(x_j) - Min(x_j)}$$

$$(x_{ij} \text{ Development index}) \; DV_{ij} = 1 - DC_{ij}$$

**Table B: Deprivation Score method (DV)**

| Index $x_j$ / Region $A_i$ | $x_1$ $x_2$.....$x_j$ | $(DV_{ij})$ Converted indexes | CI |
|---|---|---|---|
| $A_1$ | $x_{11}$ $x_{12}$....$x_{1j}$ | $DV_{11}$ $DV_{12}$.....$DV_{1j}$ | $\sum V_{1j}$ |
| $A_2$ | $x_{21}$ $x_{22}$....$x_{2j}$ | $DV_{21}$ $DV_{22}$.....$DV_{2j}$ | $\sum V_{2j}$ |
| $A_i$ | $x_{i1}$ $x_{i2}$.....$x_{ij}$ | $DV_{i1}$ $DV_{i2}$.....$DV_{ij}$ | $\sum V_{ij}$ |

Source: (Kalantry, 2001)

**3- Numerical Taxonomy Method:** This method has been introduced for the first time by UNESCO to classify and determine the degree of developmental level of countries on the basis of proposed similar indicators (Sneath & Sokal, 1973). In this method each region is compared to the ideal point of development (CO) and the degree of developmental level of a region is obtained (di).

$$c_{io} = \sqrt{\sum_{j=1}^{n} (Z_{ij} - Z_{oj})^2} \qquad \overline{C_{io}} = \frac{\sum_{n=1}^{n} C_{io}}{n}$$

$$co = C_{i\bar{o}} + 2S_{io}$$

$$S_{io} = \sqrt{\frac{\sum (C_{io} - C_{i\bar{o}})^2}{n}} \qquad d_i = \frac{C_{io}}{c_o}$$

**4- Factor Analysis method:** On the contrary of many statistical methods that use to study the relation between independent and dependent variables, factor analysis is used to study the patterns of relationship among many dependent variables with the goal of discovering something about the nature of the independent variables that affect them, even though those independent variables were not measured directly (Darlington, 1973).To gain the purpose, Principal Component Analysis (PCA) is applied as a data reduction or structure detection method to suggest that how many different factors are needed to explain the pattern of relationships among the variables which

includes both component analysis and common factor analysis. Moreover, varimax test is used over 21 health care variables to authenticate that the outcomes are normally distributed. An alternative method suggested showing that how different indicators (factors) affect regional disparities is called the scree plot in which the successive eigenvalues are first plotted, and then look for a spot in the plot where the plot abruptly levels out.

## 3- Results

Through applying matrices of distances among the states considering public health indicators, computed confidence level resulted in that all of the 28 states were identified as homogenous states and within the range of confidence level (0.66__6.46), therefore it was not necessary to eliminate any state from comparative analysis, but still there was considerable disparity among the provinces showing near about 41 percent coefficient of variance (C.V) and valuable for analytical study.

$D = \bar{d} \pm 2\ sd_i$ Confidence limits of distances

$D = 3.562 \pm 2 \times 1.451$

L1 = 0.66 lower limit of homogenous provinces

L2 = 6.46 upper limit of homogenous provinces

C.V = 0.41 coefficient of variance

As far as the descriptive statistics, factor analysis and extracting principal components are concerned, results in Table 2, Table 3 and Table 4, show that the first four reduced principal components, could describe nearly about 76 percent of Total Variance determining regional disparities. The extracted factors include presence of “Child Mortality rate” (0.882 loading value and 39.77 percent of the variance), “Number of Rural Public Health Centers” (0.796 loading value and total variance explain 23.96 percent), “Number of Rehabilitation Centers” (0.664 loading value and total variance explains 7.11 percent) and “Number of Paramedics” (0.455 loading value and total variance explain 4.86 percent). Scree Plot also indicated the variation between the variables as after the first four variables has highest

eigenvalues and after that the values of each component has been declining at almost sustainable pace. As it is shown by Figure 1, this will happen between the forth and fifth factor.

Table 5 is the final result of statistical analysis applied to find out ranking positions of the states and their comparative developmental status with respect to the degree of accessibility to health and health care facilities in Iran. Semnan,Mazandaran,Tehran,Esfahan,Ilam,Gilan, Qom,Bushehr and kerman provinces with ranking positions starting from $1^{st}$ to $10^{th}$ ,stand in the category of developed regions. Chaharmahal&Bakhtiari, Markazi, Kohkiluyeh&Buyerahmad, Fars, Hormozgan, Hamadan and Zanjan with ranking positions starting from $11^{th}$ to $17^{th}$, stand in the category of relatively developed regions. Kurdistan, Qazvin,East Azarbaijan, Kermanshah, Khorasan and Ardabil provinces with ranking positions starting from $18^{th}$ to $23^{th}$ stand in the category of less developed regions and the provinces Khuzestan, Sistan & Baluchistan, West Azarbaijan, Lorestan and Golestan with ranking positions of $24^{th}$ to $28^{th}$ stand in the category of under developed regions of the country.

## 4- Discussion

The health of population plays a vital role in public policy Program of every mature society which most often determining socio-economic status of a country. For many economists, health care policy is as much about the state's economic health, since hospitality and health care services play a key role in communities for supplying jobs, revenues and healthy environmental opportunities. In this regard, measurement of health indicators on a regional scale level seems to be interesting because it allows us to study regional disparities and its evolution over a period of time.

No doubt, the health care sector affects the economy in much the same way as a manufacturing plant does by bringing money in through third party payments, providing jobs and wages to the residents and providing an opportunity to keep consumer health care expenditures circulating within the county economy. In addition, since health care businesses have an additional impact through the purchases of utility services, cleaning supplies, as well as the payment of property taxes, that’s why Policy makers state that, just like changes in a manufacturing plant or farm operations, changes in the health

sector influence the rest of the Grant County Economy (Bodeen, 1998). So it is important for local decision makers and residents of the society to understand how their health care decisions affect individual and total economic life in order to make better informed decisions plan for the changes in health care service delivery system.

The challenge of health care delivery system arises in developed as well as developing economies which could achieve a top priority status among the national objectives. Number of research studies show that there are large differences both among and within European countries in the supply of health care facilities and personnel. In 1979 ,Smith posed the hypothesis that spatial disparities in health care supply is smaller in countries with socialist (or social-democratic) governments and finally concluded that regional disparities in health care supply within European countries are smaller in countries that have been governed predominantly by socialist governments(Westert,1999).In America for most people, the frightening prospect of being unemployed, losing health insurance coverage, having inadequate insurance benefits, or living in a rural community without a physician raises one vital access-related question: Will I be able to get the care I need if I become seriously ill? (Institute of Medicine, 1993).That means, there is a growing uneasiness that the health care delivery system, especially insurance infrastructure is not meeting the needs of low and middle income Americans. Many besides the poor may have difficulty getting access to health care. That's why in May 2008, the NC Health and Wellness Trust Fund Commissioners approved an additional $9 million for the Eliminating Health Disparities Initiative, the majority of which has been used for a second round of grant-making to public health, faith- and community-based organizations working to eliminate health disparities in low-income African-American, Latino and American Indian communities across the state (N.C.H.commission, 2006).

The experience of economic reforms in Iran during the past four decades clearly indicates that one of its major victims has been balanced regional growth .Private investments have increasingly been directed towards relatively developed regions with better social, economic and governance, rather than the non-performing or poorly performing states. As a result drastic regional disparities make life in rural areas of the country

much harsher than in urban centers and a considerable disparity still remain among the prosperous and deprived regions of the country.

According to the Human Development Report which looks beyond GDP to a broader definition of well-being, the HDI for Iran (Islamic Republic of) is 0.777, which gives the country a rank of 84th out of 179 countries with data. The HPI-1 which measures severe deprivation in health by the proportion of people who are not expected to survive age 40, ranks Iran 51st among 135 developing countries for which the index has been calculated (Human Development Reports, 2008). It is also reported that despite of considerable improvements in the overall health of the country, over 8-10% of the population is not covered by any insurance scheme and has to pay directly, underdeveloped regions experience disparities in health care services and are less likely to receive routine medical procedures and have higher rates of morbidity and mortality than prosperous developed areas (World health statistics, 2007). Restricted access and low service availability in the under developed provinces (Sistan & Baluchistan) result in poor health indices compared to the rest of the provinces. Although infant and maternal mortality rates have decreased, malnutrition deficiencies remain a challenge in the most disadvantaged provinces of Sistan and Baluchistan, Khuzestan and West Azarbaijan. Children in these provinces also suffer from lower rates of birth registration and from wasting, stunting and being underweight.

On the other hand it deserves to be mentioned that under a comprehensive primary health care system, Iranian children today have a much better chance at survival than their parents did. The probability of dying before reaching the age of five (under-five mortality rate) is 3.9%, a rate which puts the country in a relative fair position compared to other developing countries. According to annual reports of World Health Organization, more than 85 per cent of the population in rural and deprived regions has access to primary health care services. Access to safe drinking water has been provided for over 90 per cent of Iran's rural and urban population and also more than 80 per cent of the population has access to sanitary facilities. However, it has not been able to keep pace with the rapidly changing demographic developments. Rural areas in some parts of

the country are not fully covered and health centers are inadequately equipped to meet community needs (WHO, 2006).

## 5- Main Findings

The purpose of the Eliminating Health Disparities Initiative as the fundamental idea of present study is identifying and creating new and innovative strategies to close the gap in the health status of prosperous and deprived regions. It is important for local decision makers and residents of the society to understand how their health care decisions affect the total economy in order to make better informed decisions and to be able to plan for the changes in health care service delivery.

Policy makers emphasize on this opinion that in order to make Public health policies more effective and comprehensive, it is necessary to step on (EHDI) goal programming (Minnesota, 2006). This grant program is intended to promote active community involvement and build non-profit social service organizations, as they promote the health and quality of life of individuals and communities, and work toward reducing the health disparities of racial and ethnic populations. Finally it would be the responsibility of the Central authorities to ensure that more or less same level of public health services in all parts of the country. Kurian (2005) , puts it in this way that, the goal of "Eliminating Disparities" can be better understood and embraced, since introduces a condition in which all people in the nation will be challenged with the same standards for health and safety.

In developing countries such as India, embarking on regional planning and economic growth policies in order to eliminate regional disparities is remarked as a goal programming and achieved some sort of successes during the recent decades too. For instance, research studies indicate that regional disparities in the levels of socio-economic development in Andhra Pradesh, which has been conventionally classified into three broad regions of Coastal Andhra, Rayalaseema and Telangana, have come down in the last 50 years (Reddy, 2004). However, despite the decline, the regional disparities in the levels of development are still significant in the State weaker sections and community institutions. Large differences exist not only between the better performing and other States but also between districts within the same better performing State. Urban areas appear to have better health outcomes than rural areas although the figures may not fully reflect the situation of peri-

urban slums with large in migration with conditions comparable to rural pockets (Srinivasan ,2006).

In case of Iran, Comparison of coefficient of variances during the period of third five year socio economic development program (1999-2004), proves that the degree of inequalities is lowered down and government anti-poverty programming could positively put its effect on regional health welfare and human development index. Further steps must be taken to ensure the quality and quantity of locally provided health services as well as to maintain or improve the health of the Grant County economy. By selecting from among the national objectives, individuals and organizations can build an agenda for community health improvement and can monitor results over time.

To improve the case, four criteria is suggested to make health care system ideal and equally available to all living people in different states of Iran; First, providing minimum national access to an adequate level of health care facilities for population. Second, bringing just and equal distribution of financial burden on people with respect to health care expenditures without external effects on their socio economic status of life. Third, equip providers with permanent touch with knowledge of accountability and cost effective usage of central health care budget. Fourth, special attention is given to vulnerable groups such as children, women, disabled and the aged ones of the society. Indeed, changes in health care service delivery not only impact the quality and quantity of services available to local residents, it has economic implications for almost all other activities in the county. So it would be on the providers, county officials and local residents to re-evaluate their health care decisions in light of the role the health care industry plays in their economic well-being.

## 6- Conclusions

Health status is a dynamic that often manifests in the relationships between health and income, education, cultural influences, environment, and access to quality medical services. Despite the steady improvements in the overall health of states, deprived regions in developing countries experience a lower quality of health services and are less likely to receive routine medical procedures and have higher rates of morbidity and mortality than

wealthy regions. That's why the concept to "eliminate health disparities" is strongly supported by health care providers, county officials and local residents. To eliminate health disparities among different segments of the population, public investment on preventive health care and health promotion programs has to be increased and expenditure on health and education should be stepped up substantially focusing on less developed areas. Moreover it might be more prudent for the government to re-evaluate its health care decisions and focus on inclusive and equitable growth rather than pursuing the dreams of bridging regional inequalities. Eliminating health disparities will require both individual and societal efforts and failure to focus on health disparities and the determinants of health places serious limitations on the effectiveness of preventive health care and health promotion programs. For further researches it is recommended that a comparative study be carried out between private and government health care facilities in order to find out whether private sector activities could have a drastic effect on eliminating health care disparities or not ?

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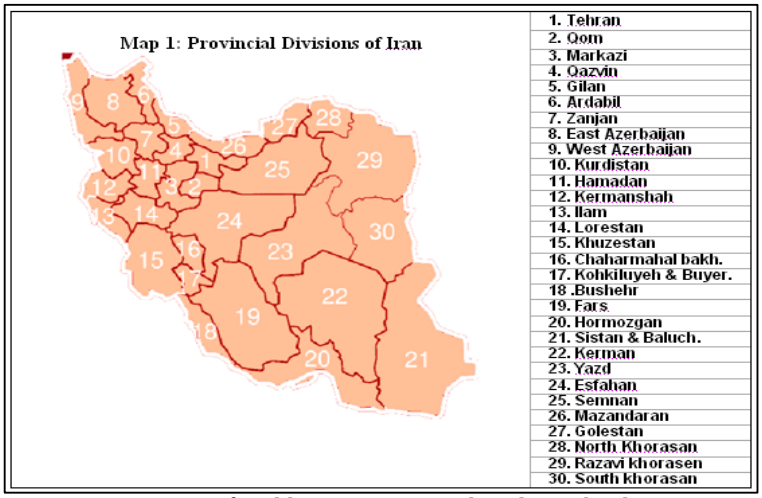


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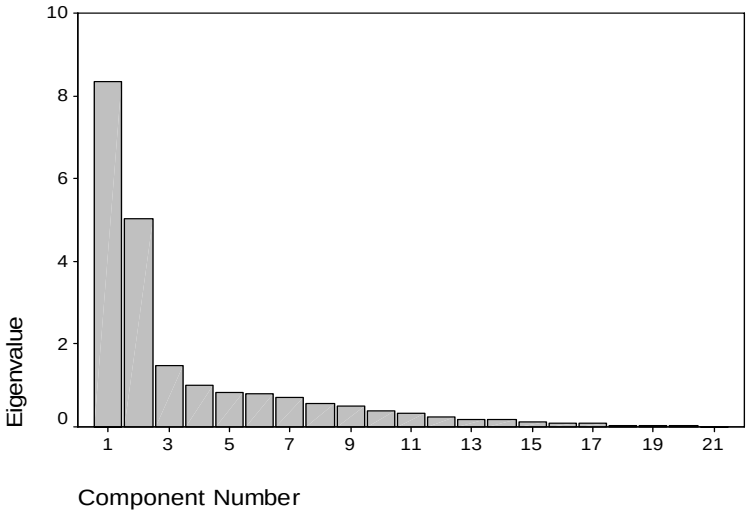


**Figure 1: Scree plot**

**Extraction Method**: Principal Component Analysis

**Table 1: Definition of health and health care indicators in each province**

| Variable | Operational Definition of Variables as per population ratio |
|---|---|
| **X1** | Number of Physicians per 10000 population of state |
| **X2** | Number of Specialists and surgeons per 10000 population of state |
| **X3** | Number of Paramedics per 100000 population of state |
| **X4** | Number of Dentists per 100000 population of state |
| **X5** | Number of Pharmacists per 100000 population of state |
| **X6** | Number of Urban Public Health Centers per 10000 urban population |
| **X7** | Number of Rural Public Health Centers per 10000 rural population |
| **X8** | Number of Health & Medicare Institutes per 100000 population |
| **X9** | Number of Hospital Beds per 10000 population of state |
| **X10** | Number of Active Health House per 10000 Village area population |
| **X11** | Percentage of rural population under protection of Health House centers |
| **X12** | Number of Rural Health Workers per 10000 rural population |
| **X13** | Number of laboratories available per 100000 population |
| **X14** | Number of Rehabilitation Centers available per 100000 population |
| **X15** | Number of Radiology Centers available per 100000 population |
| **X16** | Number of Pharmacies & Drug Stores available per 100000 population |
| **X17** | Inverse rate of Mortality at birth per 100 delivery |
| **X18** | Inverse rate of under one month Neo Natal Mortality per 1000 (NMR) |
| **X19** | Inverse rate of under one year Infant Mortality per 1000 birth(IMR) |
| **X20** | Inverse rate of under five year Child Mortality per 1000 birth |
| **X21** | Inverse rate of Maternal Mortality per 100000 delivery (MMR) |

**Source:** Ministry of health & medical education (2006), Annual Statistics, I.R. Iran

**Table 2: Descriptive Statistics and Communalities**

| Variable | Mean | Std. Deviation | Communalities | |
|---|---|---|---|---|
| | | | Initial | Extraction |
| $X_1$ | 1.90 | 0.77 | 1 | 0.668 |
| $X_2$ | 1.47 | 0.55 | 1 | 0.727 |
| $X_3$ | 2.82 | 0.82 | 1 | 0.850 |
| $X_4$ | 3.40 | 1.73 | 1 | 0.670 |
| $X_5$ | 1.63 | 0.71 | 1 | 0.807 |
| $X_6$ | 1.53 | 0.26 | 1 | 0.559 |
| $X_7$ | 1.14 | 0.31 | 1 | 0.710 |
| $X_8$ | 1.25 | 0.40 | 1 | 0.771 |
| $X_9$ | 16.79 | 5.07 | 1 | 0.821 |
| $X_{10}$ | 7.38 | 1.49 | 1 | 0.609 |
| $X_{11}$ | 90.90 | 12.64 | 1 | 0.692 |
| $X_{12}$ | 5.44 | 1.95 | 1 | 0.832 |
| $X_{13}$ | 6.98 | 2.47 | 1 | 0.698 |
| $X_{14}$ | 2.96 | 1.17 | 1 | 0.726 |
| $X_{15}$ | 3.01 | 0.83 | 1 | 0.814 |
| $X_{16}$ | 8.97 | 1.94 | 1 | 0.702 |
| $X_{17}$ | 0.98 | 0.39 | 1 | 0.802 |
| $X_{18}$ | 0.07 | 0.02 | 1 | 0.880 |
| $X_{19}$ | 0.05 | 0.01 | 1 | 0.914 |
| $X_{20}$ | 0.04 | 0.01 | 1 | 0.891 |
| $X_{21}$ | 0.11 | 0.25 | 1 | 0.754 |

**Extraction Method: Principal Component Analysis**

**Table 3: Total Variance Explained and Sums of Squared Loading**

| Component | Initial Eigenvalues | | |
|---|---|---|---|
| | Total | % of Variance | Cumulative % |
| $X_1$ | 8.35 | 39.77 | 39.77 |
| $X_2$ | 5.03 | 23.96 | 63.73 |
| $X_3$ | 1.49 | 7.11 | 70.84 |
| $X_4$ | 1.02 | 4.86 | 75.70 |
| $X_5$ | 0.84 | 3.99 | 79.69 |
| $X_6$ | 0.79 | 3.77 | 83.46 |
| $X_7$ | 0.70 | 3.34 | 86.80 |
| $X_8$ | 0.56 | 2.67 | 89.47 |
| $X_9$ | 0.50 | 2.39 | 91.86 |
| $X_{10}$ | 0.37 | 1.78 | 93.64 |
| $X_{11}$ | 0.33 | 1.57 | 95.21 |
| $X_{12}$ | 0.24 | 1.17 | 96.37 |
| $X_{13}$ | 0.19 | 0.91 | 97.29 |
| $X_{14}$ | 0.17 | 0.83 | 98.12 |
| $X_{15}$ | 0.12 | 0.57 | 98.68 |
| $X_{16}$ | 0.10 | 0.48 | 99.17 |
| $X_{17}$ | 0.08 | 0.37 | 99.54 |
| $X_{18}$ | 0.04 | 0.21 | 99.74 |
| $X_{19}$ | 0.03 | 0.15 | 99.89 |
| $X_{20}$ | 0.02 | 0.09 | 99.98 |
| $X_{21}$ | 0.00 | 0.02 | 100.00 |

**Extraction Method: Principal Component Analysis**

**Table 4: Rotated Component Matrix**

| | Component | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| $X_1$ | 0.174 | 0.684 | -0.411 | 0.035 |
| $X_2$ | 0.730 | 0.415 | -0.127 | -0.068 |
| $X_3$ | 0.171 | 0.758 | -0.197 | **0.455** |
| $X_4$ | 0.649 | 0.449 | 0.215 | 0.023 |
| $X_5$ | 0.711 | 0.360 | -0.413 | -0.032 |
| $X_6$ | -0.056 | 0.683 | 0.139 | 0.265 |
| $X_7$ | 0.003 | **0.796** | 0.268 | -0.073 |
| $X_8$ | 0.565 | 0.620 | 0.037 | -0.258 |
| $X_9$ | 0.838 | 0.209 | -0.069 | -0.266 |
| $X_{10}$ | -0.375 | 0.603 | 0.320 | 0.046 |
| $X_{11}$ | -0.532 | 0.480 | 0.355 | -0.230 |
| $X_{12}$ | -0.607 | 0.523 | 0.224 | 0.374 |
| $X_{13}$ | 0.495 | 0.665 | 0.002 | -0.106 |
| $X_{14}$ | 0.507 | -0.048 | **0.664** | -0.163 |
| $X_{15}$ | 0.864 | 0.212 | -0.144 | 0.030 |
| $X_{16}$ | 0.756 | -0.100 | 0.124 | -0.325 |
| $X_{17}$ | 0.865 | -0.197 | -0.062 | 0.107 |
| $X_{18}$ | 0.787 | -0.239 | 0.299 | 0.339 |
| $X_{19}$ | 0.815 | -0.316 | 0.310 | 0.233 |
| $X_{20}$ | **0.882** | -0.260 | 0.106 | 0.183 |
| $X_{21}$ | 0.623 | -0.572 | 0.008 | 0.198 |

**Extraction Method: Principal Component Analysis**

**Table 5: Ranking Position of Provinces in Iran With Respect to Health Indicators; Using three Statistical Methods (CI, DV and Taxonomy)**

| Status | Provinces of Iran | Ranking Position |
|---|---|---|
| DEVELOPED REGIONS | Yazd | 1 |
| | Semnan | 2 |
| | Mazandaran | 3 |
| | Tehran | 4 |
| | Esfahan | 5 |
| | Ilam | 6 |
| | Gilan | 7 |
| | Qom | 8 |
| | Bushehr | 9 |
| | Kerman | 10 |
| RELATIVELY DEVELOPED REGIONS | Chahar Mahaal &Bakhtiari | 11 |
| | Markazi | 12 |
| | Kohkiluyeh & Buyer Ahmad | 13 |
| | Fars | 14 |
| | Hormozgan | 15 |
| | Hamadan | 16 |
| | Zanjan | 17 |
| LESS DEVELOPED REGIONS | Kurdistan | 18 |
| | Qazvin | 19 |
| | East Azarbaijan | 20 |
| | Kermanshah | 21 |
| | Khorasan | 22 |
| | Ardabil | 23 |
| UNDER DEVELOPED REGIONS | Khuzestan | 24 |
| | Sistan & Baluchistan | 25 |
| | West Azarbaijan | 26 |
| | Lorestan | 27 |
| | Golestan | 28 |