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A study of regional health disparities in Haryana state

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Abstract
Good health is a key to human happiness. This social well-being encourages human beings to act efficiently and have a sense of accomplishment. Therefore, investment in healthcare facilities is a valuable investment and has implications in the economic development of any country. So, every nation has given due importance to the health care infrastructure and has started to invest heavily to improve the public health system. India is showing its commitments to provide accessible, affordable and equitable quality of health care facilities to the marginalized and underprivileged section of the society. But India has smudged picture in health care facilities at the international stage characterized by poor quality of services, high cost of medical services, high infant mortality rate, and no check on communicable diseases, poor sanitation, malnutrition, female health issues and no access to safe drinking water. So, the present study is a miniature effort to study the health development in India with special reference to Haryana. For in depth analysis, inter-district variations are analyzed with the help of health development composite index (HDI). The research resulted that Jhajjar district has better health care infrastructure in terms of a greater number of hospitals per lakh of population, birth rate, number of doctors per lakh population & number of PHCs and CHCs per lakh of population followed by Panchkula and Rohtak. While Kaithal, Fatehabad and Nuh districts are lagged far behind in health care facilities and categorized as highly backward districts.

Keywords: Health, economic development, health development composite index

Introduction
It is well established fact that health is more important than wealth. Good health means a state of well-being which is free from diseases and any kind of stress. There is a close nexus between the economic development of the country and social infrastructure. A good investment in the social infrastructure (primarily in health care facilities together with education) impacts inclusive growth and is helpful in erasing poverty. Educated and healthy civilians are more efficient and significantly contribute to economic growth. Better health care facilities make people more productive which in turn increase their income. This results in improving the quality of life and standard of living of the masses. In Indian constitution, it is fixed as primary responsibility of states to improve the public health but not defined as fundamental right of the citizens. Indian government has introduced The National Rural Health Mission (NRHM) in 2005, Janani Shishu Suraksha Karyakaram in 2011 and recently introduced National Health Policy in 2015 with the aim to improve the performance of Indian health system.

According to the economy survey of India (2016-17), Government's total expenditure on social services as percentage to GDP is 28.4 percent while expenditure on health services is just 1.4 percent in 2015-16 which is significantly low in comparison to the world average (5.99 percent). India has been ranked at number 154 among the survey of 195 countries on Health Care Access and Quality Index in 2015 and posed as biggest underachievers in Asia. India lagged even Sri Lanka, Bangladesh, Bhutan and Nepal in index.

Review of Literature
Sharma and Chahal (1999) [14] resulted that most patients were highly satisfied with health care services, namely doctor, medical assistant, quality of administration, facilities and sanitation. Doctors and medical assistants were the most important among them. Ramani and Dileep (2005) suggested that Govt. and NGO's need to stress more on prevention and

promotional health services activities. Iyengar and Dholakia (2011) [4] found that basic health care services, namely Antenatal care, Immunization health services and ratio of institutional deliveries were beyond the reach of poor people. Kavita (2012) [6] found that lack of education, poverty, insufficient health facilities, poor sanitation and adequate safe drinking water were major problems in health services. Kumar and Gupta (2012) [7] reported that National Rural Health Plan (NRHM) of Govt. fail to provide reasonable, fair and quality health care services in the rural area specifically in those states which are lacking in infrastructure facilities. Moga *et.al* (2012) [8] studied that the overall performance of private hospital was declining due to inadequate use of resources. Ramez (2012) [13] found that reliability was the most important factor whereas assurance was the least important factor among the five factors of service quality which include responsiveness, empathy and satisfaction. Gogoi and Bhaben (2015) [1] suggested that the administration must reconstruct the admission and registration process, training nurses and proper supervision over the fourth-class employees for the improvement in patients' satisfaction level. Studies on health development in Haryana have highlighted considerable differences among districts in terms of infrastructure, services, and outcomes. Much of the available evidence comes from large-scale surveys such as the National Family Health Survey (NFHS) and the District Level Household and Facility Survey (DLHS), which provide district-level data on maternal health, childcare, nutrition, and sanitation. These sources have been widely used by researchers to map health inequalities within the state (IIPS & ICF, 2017). One of the earliest attempts to study health disparities in Haryana was by Gupta (2015) [2], who examined the distribution of hospitals, beds, and doctors across districts. His findings revealed that urbanized districts like Gurugram and Faridabad enjoyed better health infrastructure, while rural and less-developed districts had fewer facilities. This uneven distribution of resources has been linked to gaps in service availability and differences in health outcomes between regions. Maternal and child health indicators also show wide variations across districts. For example, analysis of immunization coverage in Haryana found that although the state's average was relatively good, some districts lagged significantly. Prinja (2018) [11] noted that such gaps often occurred due to local service delivery problems and difficulties in accessing health facilities. Broader studies of reproductive and child health confirm that districts with lower female literacy and weaker primary care systems tend to perform worse on antenatal care, institutional deliveries, and child nutrition. Social and economic conditions further deepen these differences. Researchers have pointed out that issues such as caste divisions, gender norms, and persistent son preference strongly influence health indicators in Haryana. Districts with higher gender bias often show poorer outcomes for women and children, even when the level of health infrastructure is comparable to better-performing areas by Jain *et al*., (2020) [5]. Thus, health disparities in the state cannot be explained by infrastructure alone; social determinants play a major role. Governance and management of health services also shape inter-district differences. Districts with stronger administrative systems, better monitoring, and regular staff availability show higher levels of institutional deliveries and immunization coverage compared to others with similar resources by Gupta, 2015; Prinja *et al*., (2018) [2, 11]. This indicates that effective governance is as important as physical infrastructure in ensuring equitable health outcomes. Recent research has developed composite indices to capture multiple aspects of health performance across districts. Panda, Kumar, and Awasthi (2020) [10] used such an approach and found that while some districts in Haryana performed well across reproductive, maternal, neonatal, and child health indicators, others continued to lag far behind. These findings suggest that even within a relatively developed state, inequalities at the district level remain significant.

Objective of the study

- To study the inter-district variation in the health development in Haryana.
- To understand the Level of Health Development in Haryana.

Research Methodology

Secondary data has been used for the period of 2015-16. The data has been collected from economic survey of Haryana, statistical abstract of Haryana and Government publication. Haryana's 21 districts are taken viz. Ambala, Panchkula, Yamunanagar, Kurukshetra, Kaithal, Karnal, Panipat, Sonipat, Rohtak, Jhajjar, Faridabad, Palwal, Gurugram, Nuh, Rewari, Mahendergarh, Bhiwani, Jind, Hisar, Sirsa and Fatehabad. Following formula of composite indices of development of various districts of Haryana has been made by using Ranking and Principal Component Analysis (PCA).

$$C_i = \sum_{j=1}^{n} F_{ij} . R_{ij}$$

Where:

C_i = 1, 2,3,4, 5……21 (Districts)

j = 1, 2,3,4, 5……12 (Indicators)

C_i= Composite index of health development of district 'i'.

F_{ij}= the factor loading of district 'i' on indicator 'j'.

R_{ij}= the rank of district 'i' on indicator 'j'.

Following indicators are used to make health development index:

1. Number of hospitals per 1000Sq.Km. of area- X_1
2. Number of hospitals per lakh of Population- X_2
3. Number of hospitals beds per lakh of Population - X_3
4. Number of PHCs and CHCs per 1000Sq. Km. of area- X_4
5. Number of PHCs and CHCs per lakh of Population - X_5
6. Number of Dispensary per 1000 Sq. Kms of area- X_6
7. Number of Dispensary per lakh of Population- X_7
8. Number of sub centres per 10 villages- X_8
9. Number of Doctors per lakh of Population- X_9
10. Birth rate-X_{10}
11. Death rate -X_{11}
12. Infant Mortality Rate- X_{12}

Analysis and Discussion

Ranking of Health Development Indicators

To understand the bright side of the variation in health development, ranking methods have been used. Indicators $X_1$to $X_9$are ranked highest to lowest and Indicators X_{10} to $X_{12}$are ranked from lowest to highest.

Table 1: Health Development Indicator's Ranking (2015-16)

Districts	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12
Ambala	10	16	4	9	17	8	11	20	5	3	19	15
Panchkula	1	1	3	12	14	2	1	19	1	14	11	6
Yamunanagar	12	17	5	15	18	3	3	21	16	7	15	18
Kurukshetra	14	14	12	5	7	19	17	17	9	13	13	12
Kaithal	18	11	15	14	6	20	20	4	13	10	14	8
Karnal	15	13	10	13	15	6	7	12	18	8	17	16
Panipat	7	20	17	10	19	7	13	9	17	16	9	3
Sonipat	13	18	18	1	3	4	4	7	10	11	18	9
Rohtak	4	5	11	2	4	10	9	1	3	19	21	21
Jhajjar	6	2	1	4	2	15	15	8	2	1	5	7
Faridabad	3	21	19	8	21	1	2	11	21	20	2	4
Palwal	8	15	21	3	13	17	18	14	15	18	3	1
Gurugram	2	19	16	17	20	5	14	16	8	17	16	2
Nuh	5	8	20	7	16	18	19	15	20	21	1	13
Rewari	11	9	9	11	10	12	12	18	6	9	8	5
Mahendragarh	9	3	7	6	1	20	20	13	4	4	7	17
Bhiwani	19	4	2	19	5	11	6	6	12	2	6	19
Jind	17	10	13	16	9	14	10	5	14	5	12	14
Hisar	16	7	6	18	8	9	8	2	11	15	20	20
Fatehabad	21	12	8	20	12	16	16	3	19	12	4	11
Sirsa	20	6	14	21	11	13	5	10	7	6	10	10

Note: Lower rank digit represents higher levels of health development.

The analysis of the above ranking may not present the true picture of the overall health development among the various districts of Haryana. All the indicators have been given equal weight age while assigning the ranking. While some indicators hold more importance over the others in health development. So, the various indicators have been given relative importance with the help of factor loading as follows:

Factor loading of Health Indicators

Table 2 exhibits the factor loading of different indicators of health development as follows:

Table 2: Factor loading of Health Indicators

Indicators	Factor loading
X_1	.765
X_2	.762
X_3	.712
X_4	.686
X_5	.798
X_6	.857
X_7	.858
X_8	.362
X_9	.727
X_{10}	.715
X_{11}	.565
X_{12}	.296

The table demonstrates that the indicator X_7(Number of Dispensary per lakh of Population) shows highest factor loading (0.858) and is most significant factor followed by X_6 (Number of Dispensary per 1000Sq.Kms of area) with factor loading (0.857) and X_5(Number of PHCs and CHCs per lakh of Population) with factor loading (0.798). X_{12}(Infant Mortality rate) found to be statistically significant with very small factor loading value (0.296).

Health Development Composite Index (HDI) and Ranking of Districts

Table 3 indicates the health development composite index and HDI rank. Highest rank is assigned to the district with lowest index value and vice versa.

Table 3: Health Development Composite Index (HDI) and Ranks

Districts	HDI	RANK
Ambala	86.91	8
Panchkula	51.24	2
Yamunanagar	93.52	12
Kurukshetra	102.69	15
Kaithal	109.85	19
Karnal	98.02	14
Panipat	104.89	17
Sonipat	76.93	6
Rohtak	69.77	3
Jhajjar	46.85	1
Faridabad	92.49	11
Palwal	105.77	18
Gurugram	104.70	16
Nuh	112.84	21
Rewari	81.09	7
Mahendragarh	72.82	5
Bhiwani	71.94	4
Jind	95.10	13
Hisar	91.82	10
Fatehabad	110.62	20
Sirsa	90.06	9
Mean	89.05	
Standard Deviation	18.62	

HDI reveals that Jhajjar district with lowest index value of 46.85 stands on first position followed by Panchkula district (51.24) and Rohtak district (69.77). The health development index also shows the better position of Bhiwani district (71.94), Mahendargarh district (72.82), Sonipat district (76.93), Rewari district (81.09) and Ambala district (86.91). On the other side Nuh district with highest health development index (112.84), occupied the last position.

Categorization of Districts

Table 4 shows range of the health development index for the different categories on the basis of Standard deviation and mean.

Table 4: Categorization of Districts

S. N.	Categorization of Districts	Range	Group
1.	$\bar{X}$-2(S.D) < First Group> $\bar{X}$-1(S.D)	51.797 - 70.421	Highly Developed
2.	$\bar{X}$-1(S.D) < Second Group > $\bar{X}$-0(S.D)	70.421 - 89.045	Developed
3.	$\bar{X}$-0(S.D) < Third Group > $\bar{X}$ +1(S.D)	89.045 - 107.669	Backward
4.	$\bar{X}$+1(S.D) < Fourth Group> $\bar{X}$+ 2(S.D)	107.669 - 126.293	Highly Backward

Districts are categorized into four groups with the help of health development index value. With index value in the range of 51.797 to 70.421 listed as highly developed districts, index values 70.421 to 89.045 listed as developed districts, index values 89.045 to 107.669 listed as backward districts and index value 107.669 to 126.293 listed as highly backward.

Classification of Districts

Table 5 demonstrates classification of districts based on highly developed, developed, backward and highly backward district on basis of range shown above in table 4.

Table: 5 Classification of Districts

S.N.	Level of Development	Districts
1.	Highly Developed	Jhajjar, Panchkula, Rohtak
2.	Developed	Bhiwani, Mahendragarh, Sonipat, Rewari, Ambala
3.	Backward	Sirsa, Hisar, Faridabad, Yamunanagar, Jind, Karnal, Kurukshetra, Gurugram, Panipat, Palwal
4.	Highly Backward	Kaithal, Fatehbad, Nuh

It is observed from table 5 that Jhajjar stands at the top position in group I among the highly developed districts with noticeable performance in number of hospitals bed per lakh of population, birth rate, number of doctors per lakh population & number of PHCs and CHCs per lakh of population followed by Panchkula and Rohtak. Five districts namely Bhiwani, Mahendergarh, Sonipat, Rewari and Ambala ranked at position number four, five, six, seven and eight in the category of developed districts. The third group of development index includes backward districts namely Sirsa, Hisar, Faridabad, Yamuna Nagar, Jind, Karnal, Kurukshetra, Gurugram, Panipat and Palwal. Due to lack of health facilities, Kaithal, Fatehabad and Nuh districts are listed as highly backward.

Conclusion

Human capital is an important input which contributes to the economic growth of the country. There is a constant need to improve the quality of human life by investing in the health care system. There have been significant improvements in the public health care system over the last few decades. But still a meager amount of funds is invested by the central government and state governments in their health system. Regional disparities are visible among the states and within the states in health care facilities. So, the present study is an effort to explore the inter-district disparities within the state of Haryana in health care facilities. For this purpose, health development composite index (HDI) has been constructed based on twelve indicators. The research has categorized the districts into four categories: highly developed, developed, backward and highly backward. Jhajjar district bagged top position in the category of highly developed followed by Panchkula and Rohtak districts. Five districts fall in the category of developed districts namely: Bhiwani, Mahendragarh, Sonipat, Rewari and Ambala. While Sirsa, Hisar, Faridabad, Yamuna Nagar, Jind, Karnal, Kurukshetra, Gurugram, Panipat and Palwal districts are backward in health care facilities. Kaithal, Fatehabad and Nuh districts are highly backward districts on account of inadequate health care facilities. The Haryana government should increase their health care expenditure, especially in highly backward districts.

Limitations and implications of the study

This study provides valuable insights into the uneven health development across districts in Haryana; it is not without limitations. One major constraint is the reliance on secondary data sources such as government surveys and health reports, which may not fully capture the most recent or ground-level realities, especially in rapidly changing districts. Additionally, some health indicators were either unavailable or inconsistently reported across districts, limiting the depth and comparability of the analysis. The study also focuses mainly on measurable aspects like infrastructure and selected health outcomes, leaving out important social and cultural determinants that may influence health behavior. Moreover, due to the absence of primary data, such as field interviews or community-level insights, the study lacks a qualitative understanding of local health challenges. Despite these limitations, the findings carry important implications. They highlight the urgent need for district-specific health planning and better resource distribution, especially in underdeveloped regions like Kaithal, Fatehabad and Nuh. Policymakers can use this analysis to direct investments where they are needed most. Furthermore, the study underscores the importance of improving health data systems and integrating social development measures such as education and sanitation into health policy. It also opens avenues for further research that could include longitudinal data or qualitative fieldwork to better understand the root causes of health disparities.

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