Inter-District Disparities in Health Infrastructure in Haryana

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Abstract:

Despite being a state of India with a robust economy, Haryana faces the issue of inter-district discrepancies in health facilities. A handful of the state's twenty-two districts have greater health infrastructure than others, with some lagging behind. In order to comprehend disparities and provide solutions. Four health infrastructure indicators have been chosen for this purpose, and their coefficient of variation, Mean, and Standard Deviation, Development and Deprivation indices and Borda Ranking method have worked upon. It is discovered that whereas "Ambala, Fatehabad, Jhajjar, Kaithal, Kurukshetra, Palwal and Rewari" are experiencing a modest level of growth in health facilities, the districts of "Bhiwani, Hisar, Jind, Karnal, Mahendragarh, Panipat, Rohtak and Sonipat" are developed. The third group of districts includes "Charkhi Dadri, Faridabad, Gurugram, Nuh and Panchkula".

Keywords: Health infrastructure, Discrepancies, Deprivation index, Development index.

Introduction:

By properly allocating existing resources, making the most of them, and using them as well as by monitoring demand for health care, disparities in the health sector can be identified. Access to health care is based on medical needs and equitable health care is made feasible by wise resources allocation. The health of the population in a nation is a crucial factor in determining both it's economic and social progress. A nation's socioeconomic progress, among other things, is significantly influenced by the general calibre of it's people resources. The population's health, the quality of human resources can be seen. In order to improve people's health circumstances, which in turn depend on the creation and provision of health infrastructure facilities in any given region or community, economic and social development must be prioritised. To support the health conditions of people in every location, a better and solid health infrastructure is of utmost importance. Considering this, the current study has attempted to analyse the inter-district differences in Haryana's health infrastructure. Health infrastructure is a part of social infrastructure. A society's social infrastructure is crucial to the development of it's economy. The concept of social infrastructure is very broad and plays a crucial role in economic development as it carries out the task of human resources

development through skill generation, education, awareness creation, training, research and development, and health care to increase the effectiveness of production. The improvement of social infrastructure plays a crucial part in raising human potential. To eradicate economic backwardness and establish human capabilities that are more conducive to economic success, knowledge advancement and the dissemination of new ideas and activities are required. (P. S. Raikhy and Anu)'[1]. It is acknowledged that significant human capital production is directly correlated with increase in physical capital. Poor infrastructure, illiteracy and a lack of health care workers are blamed for the lack of access to high-quality healthcare in rural areas. This prevents the use of preventive health services and seriously jeopardises the implementations of wellness and healthy lifestyle programmes. There are certain consequences to the general lack of regularly published data on social and economic inequality in the health industry. We may be able to comprehend the nature of health disparities and the best approaches to address them by looking at how social patterns relate to them. [2]. (Adler N, Boyce, 1993; Macintyre S. 1994)'. A focus on specific policies to address aspects of deprivation experienced by the most disadvantaged would be supported by differences in health that suggest a socioeconomic threshold at or near the poverty line (for example, a high rate of particular illness among the poor, in contrast to more favourable and similar rates for all other income groups). National policies have long been significantly shaped by social welfare equity. [3]. (Liu et al, 2002)'.

Review of Literature:

Panmei, (2013) [4] evaluated the geographic inequalities of the state of Manipur's medical facilities. The study found that location with higher socioeconomic status, better road connectivity and higher levels of accessibility tend to have better development of health care services. The majority of the hill districts, however, lack such amenities. In terms of service quality and order, the health care facilities in hill and valley districts differ from one another. Despite the fact that there has been a significant increase in health care facilities, there are differences in the physical distribution of these facilities due to the uneven distribution and non operation of health centres in some regions. **'Narayan L. [5].** The study creates a composite health index for each district using principal component analysis to compare the health status across different Haryana districts. The three components of health, namely health outcomes indicators, health infrastructure indicators, and access to and utilisation of health services, were used to measure the health status. Numerous health indices showed significant inter-district differences. The general public uses both public and private health services, as health care is not only the province of the state. The private health care industry expands greatly. By comparing infant mortality rates and Child mortality rates among districts of the state, the article also examined health outcomes.

'Hooda E. et al (2017)' [6] analyzed the differences in development between Haryana districts based on their stage of

development. Data from three times in time – 1991-1992, 2001-2002 and 2011-2012 were used in this study. Using composite indices built from forty indicators, researchers have studied how development in the agricultural, industrial, infrastructural and socio-economic sectors has been assessed. The main conclusion of this study is that Mahendragarh district trailed in practically all of the sectors examined. While the district of Karnal excelled in agriculture throughout all three decades, the districts of Faridabad and Gurgaon fell behind. '**Nandal S.& Monika (2019)' [7] In** this essay, an effort has been made to examine Haryana's social infrastructure as well as inter-district differences for the years 2000-01 and 2017-18. The social infrastructure of the more and less developed regions was also examined in the study. The inter-district discrepancies have been quantified using basic statistical tools like mean and coefficient of variation have been applied. The development of districts has been determined using a composite index. To obtain factor loadings and weights for a few chosen indicators, Principles component analysis was employed. A significant disparity exists between the levels of development in various districts, according to the report. '**Kumar G. & Singh J. (2020)' [8]** The goal of this current study was to look into Punjab's inter-district health infrastructure discrepancies. A district level health infrastructure index for Punjab has been created using Principal component analysis at three different stages in time: 1994,2008 and 2018. The study found that Punjab's health infrastructure amenities differed amongst districts. Amritsar, Firozpur, Hoshiarpur, Jalandhar, Kapurthala, Ludhiana, Moga, Patiala and Tarn Taran were classified as deteriorating districts while Barnala, Faridkot, Mansa and Shri Muktsar Sahib we're identified as improving districts. While Sahibzada Ajit Singh Nagar and SBS Nagar have emerged as stable districts over the study period, Bathinda, Gurdaspur, Rupnagar and Sangrur have been identified as variable districts.

Objectives:

This study is based upon mainly three objectives which are as

- To investigate the differences in health infrastructure accessibility between districts.
- To analyse the differences in each district's overall performance in terms of it's health infrastructure.
- To determine the advanced and backward districts in terms of "Hospitals, Community health Centre, primary health centre, and dispensaries".

Research Methodology:

The current study only uses secondary data that was gathered from the Statistical Abstract of Haryana (2019-20) for it's foundation. Four Health infrastructure indicators are chosen in order to meet the study's goals. The number of hospitals, primary health centres, dispensaries and community health centres inside allopathic medical institutions are four of the indicators.

The objective-wise techniques of analysis used are given as below:

Objective 1. "To examining the difference in health infrastructure

accessibility between districts": The coefficient of variation, Standard deviation and mean Methods are initially used to examine the existence of inter-district differences related to the aforementioned variables.

$$A = \frac{1}{n}\sum_{i=1}^{n} x_i$$

Here,
A = Arithmetic mean,
N = Number of observations of the given data set
Xi = the value of each observation from 1 to n in the data set.

Arithmetic Mean: It is equal to the sum of all the values in the group of data divided by the total number of value.

Standard Deviation: The average degree of variability in dataset is represented by the
standard deviation. It reveals the average deviation of each statistic from the mean. In general, value with a large standard deviation are spread out from the mean, and those with a low standard deviation are grouped together near the mean.

Variance: Variance means square root of standard deviation. Variance compared to the mean value, the variance aids in determining the extent of the data's spread. More fluctuation in data values and sometimes a wider gap between one data value and another occur as the variance increases. The variance will be lower if the data values are evenly distributed.

Objective 2. "To analysis the difference in each district's overall performance in terms of it's health infrastructure"

Their deprivation and development indexes are created in order to know the disparities in overall performance of all districts with regard health infrastructure. The following processes are used to generate the deprivation and development indices of health infrastructure for each individual district:

Step 1. Deprivation and Development indices calculation first, the degree of deprivation in a given area is assessed using a chosen indicator or variable. Deprivation index (d) is calculated mathematically as indicated

$$Dij = \frac{\text{Maximum xi} - \text{Xij}}{\text{Max i} - \text{Min i}}$$

Where Maxi and Mini represent the ith variable's highest and minimum values in the series, respectively, and dij represents the ith variable's deprivation index (an indication of health infrastructure) for the jth region. For the jth region, Xij represents the actual value of the ith variable.

Step 2. Average Development Index and Average Deprivation Index: The following equation uses the simple average of the deprivation index of all indicators (for the jth region) to calculate the average deprivation index (for the jth region):

$$dj = \text{€ } dij / n$$

i=1
Where, € = Summation
dj stands for average development index
Dij is the development index of all indicators (for jth region)

Deprivation and Development indices, however, have values that range from 0 to 1. Additionally, a low deprivation index score or a high number on the development index are preferred because they indicate a high level of development. A higher

deprivation index score or a lower development index number indicates a poor degree of development.

Objective 3. *"To identify the advance and backward districts in context of selected indicator*"

To fulfil this objective, ' **Borda Ranking Method'** has been employed. In this method each individual or region is provided a rank according to ascending or descending order of magnitude for each indicator separately and is known as ' Borda Ranking' method. Here the district in each year have been ranked in ascending order that is, the best district is ranked first while the worst district ranked 22. The rank associated with 4 components for any particular district.

Discussion and Analysis of This Study:

When it comes to the first aim, the coefficient of variation for the four indicators listed in table 1 is used to estimate inter-district differences in the accessibility of health infrastructure

Table 1.

"Examining the differences across districts in the provision of health infrastructure"

Districts	Hospitals	CHCs	PHCs	Dispensaries
Ambala	3	5	22	3
Bhiwani	7	7	29	3
Charkhi Dadri	1	3	15	0
Faridabad	2	4	16	7
Fatehabad	3	6	24	1
Gurugram	5	4	15	3
Hisar	6	9	39	4
Jhajjar	4	6	27	3
Jind	4	8	34	1
Kaithal	3	6	27	0
Karnal	4	7	33	7
Kurukshetra	2	6	22	1
Mahendragarh	2	7	25	0
Nuh	1	4	22	0
Palwal	2	5	20	0
Panchkula	3	2	9	13
Panipat	2	7	20	2
Rewari	2	5	21	0
Rohtak	3	7	23	5
Sirsa	4	8	32	1
Sonipat	2	9	38	3
Yamuna Nagar	3	8	23	1
Total	68	133	536	58
Mean	3.091	6.045	24.36	2.636
SD	1.509	1.889	7.6	3.155
CV (%)	48.82	31.25	31.2	119.7

Source: Statistical Abstract of Haryana, 2019-20, Calculations by Authors

Table 1 makes it evident that the districts of Charkhi Dadri and Nuh only have one hospital. However, Bhiwani district has the most hospitals, seven in all These lowest and highest figures alone demonstrate the variety in the number of hospitals, and the 48.82% coefficient of variation value support this. The district of Panchkula has the fewest CHCs, two. The two districts with the most CHCs, nine, are Hisar and Sonipat. The Panchkula district has the fewest PHCs, two. The most PHCs, 39, are located in district Hisar. Regarding these two variables, the coefficient of variation for CHCs and PHCs are 31.25% and 31.2%, respectively. It demonstrates that there are less differences between CHCs and PHCs. There are no pharmacies in the districts of "Charkhi Dadri, Kaithal, Mahendragarh, Nuh, Palwal, and Rewari" whereas there are 13 pharmacies in the district of Panchkula, with a coefficient of variation of 119.7% illustrating the huge variations in the availability of pharmacies. Additionally, hospitals (CV=48.82%) have greater regional differences than CHCs (31.25%) and PHCs (31.2%). CHCs and PHCs are in insufficient supply in Panchkula. This table makes it quite evident that Bhiwani has access to hospitals while Charkhi Dadri and Nuh are less fortunate. Panchkula district is disadvantaged in terms of the quantity of PHCs, while Hisar and Sonipat districts are affluent in terms of CHCs that is 9. When it comes to the availability of dispensaries, the districts of "Charkhi Dadri, Kaithal, Mahendragarh, Nuh, Palwal, and Rewari" are in the worst situation, while Panchkula is in the best.

Therefore, Haryana is facing inter-district inequalities in the availability of health infrastructure, regardless of the case of low or high disparities. Since it is widely accepted that population serves as one of the foundations for the provision of infrastructure amenities by the government, such imbalances can initially be attributed to differences in population size in the distinct districts.

TABLE 2. Haryana's district-level health infrastructure deficiency index for 2020-21

Districts	Deprivation index of hospitals	Deprivation index of CHCs	Deprivation index of PHCs	Deprivation index of Dispensaries	Average deprivation index
Ambala	0.667	0.571	0.567	0.769	0.641
Bhiwani	0	0.285	0.334	0.769	0.347
Charkhi Dadri	1.00	0.857	0.800	1.00	0.914
Faridabad	0.833	0.714	0.767	0.462	0.694
Fatehabad	0.667	0.428	0.500	0.923	0.629
Gurugram	0.333	0.714	0.800	0.769	0.654
Hisar	0.167	0	0	0.692	0.214
Jhajjar	0.500	0.428	0.400	0.769	0.524
Jind	0.500	0.142	0.167	0.923	0.433
Kaithal	0.667	0.428	0.400	1.00	0.623

Karnal	0.500	0.285	0.200	0.462	0.361
Kurukshetra	0.833	0.428	0.567	0.923	0.687
Mahendragarh	0.833	0.285	0.467	1.00	0.646
Nuh	1.00	0.714	0.567	1.00	0.820
Palwal	0.833	0.571	0.633	1.00	0.759
Panchkula	0.667	1.00	1.00	0	0.667
Panipat	0.833	0.285	0.633	0.846	0.649
Rewari	0.833	0.571	0.600	1.00	0.751
Rohtak	0.667	0.285	0.533	0.615	0.525
Sirsa	0.500	0.142	0.233	0.923	0.449
Sonipat	0.833	0	0.033	0.769	0.408
Yamuna Nagar	0.667	0.142	0.533	0.923	0.566

Calculations by Authors based on Table 1.

Examining the inter-district discrepancies' in infrastructure development. Tables 2 and 3 show the deprivation and development indices for each district in order to show the differences in overall performance of each district in relation to the health infrastructure. The district of Bhiwani is fully developed in terms of hospitals, while Charkhi Dadri and Nuh districts are absolutely deficient in terms of hospitals. In terms of CHCs, and PHCs the district of Hisar is entirely developed, while the district of Panchkula is fully underdeveloped.

TABLE 3. Average Development index by district in Haryana for 2020-21

Districts	Hospitals	CHCs	PHCs	Dispensaries	Average Development index
Ambala	0.333	0.429	0.433	0.231	0.356
Bhiwani	1	0.715	0.666	0.231	0.653
Charkhi Dadri	0	0.143	0.200	0	0.085
Faridabad	0.167	0.286	0.233	0.538	0.306
Fatehabad	0.333	0.572	0.500	0.077	0.370
Gurugram	0.667	0.286	0.200	0.231	0.346
Hisar	0.833	1	1	0.308	0.785
Jhajjar	0.500	0.572	0.600	0.231	0.475
Jind	0.500	0.858	0.833	0.077	0.567
Kaithal	0.333	0.572	0.600	0	0.376
Karnal	0.500	0.715	0.800	0.538	0.638
Kurukshetra	0.167	0.572	0.433	0.077	0.312
Mahendragarh	0.167	0.715	0.533	0	0.353
Nuh	0	0.286	0.433	0	0.179
Palwal	0.167	0.429	0.367	0	0.240
Panchkula	0.333	0	0	1	0.333

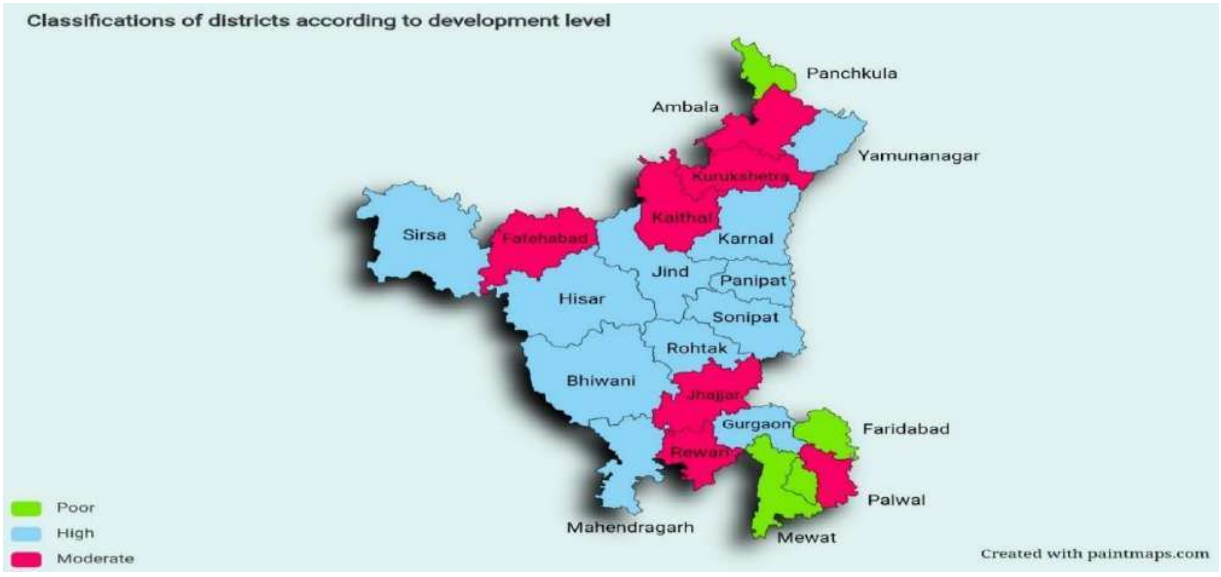
Panipat	0.167	0.715	0.367	0.154	0.350
Rewari	0.167	0.429	0.400	0	0.249
Rohtak	0.333	0.715	0.467	0.385	0.475
Sirsa	0.500	0.858	0.767	0.077	0.550
Sonipat	0.167	1	0.967	0.231	0.591
Yamuna Nagar	0.333	0.858	0.467	0.077	0.433

Calculated by Authors based on table no. 1

TABLE 4. Districts classification based on the growth of the health infrastructure

Districts	Development level	Average Deprivation index	Average Development index
Bhiwani, Hisar, Jind, Karnal, Mahendragarh, Panipat, Rohtak, Sirsa, Sonipat, Yamuna Nagar	High	Less than 0.400	More than 0.600
Ambala, Fatehabad, Jhajjar, Kaithal, Kurukshetra, Palwal, Rewari	Moderate	Between 0.400-0.600	Between 0.400-0.600
Charkhi Dadri, Faridabad, Gurugram, Nuh, Panchkula	Poor	More than 0.600	Less than 0.400

Author's Calculations according to table 2 and 3.



Source: Based on table 1 & Created with the help of Paintmap website.

Districts with the fewest "hospitals, CHCs, PHCs and dispensaries" include "Ambala, Charkhi Dadri, Faridabad, Fatehabad, Kaithal, Kurukshetra, Mahendragarh, Nuh,

Palwal, Panchkula, and Rewari". As a result, they have a deprivation index score more than 0.600 and a lowest development score below 0.400. In light of a few chosen indicators, these areas are bad. Due to the large concentration of hospitals, CHCs, PHCs and dispensaries in the districts of Bhiwani, Hisar, and Karnal, these areas have lower deprivation indices (below 0.400) and higher development indices (over 0.600). These areas have been developed according to certain health infrastructure metrics. The districts classification according to the evolution of health infrastructure is shown in Table 4. Districts like "Bhiwani, Hisar, Jind, Karnal, Mahendragarh, Panipat, Rohtak, Sirsa, Sonipat and Yamunanagar" have lower deprivation indices than 0.400 and higher development indices over 0.600. These areas are included in the first category because they have a well developed infrastructure for healthcare For the districts of "Ambala, Faridabad, Jhajjar, Kaithal, Kurukshetra, Palwal and Rewari", the values of the deprivation and development indices are moderate (between 0.400 and 0.600. In districts with scores above 0.600 on the deprivation index or below 0.400 on the development index, deprivation considered to be extremely high. These districts include "Charkhi Dadri, Faridabad, Gurugram, Nuh, Panchkula". In table 5, these districts are included in the third category of underdeveloped health infrastructure. This highlights the inter-district discrepancy in the development of the health infrastructure in Haryana as the score of deprivation and development indices different among districts.

Table 5. Results of Borda Ranking Method

Districts	Hospitals	CHCs	PHCs	Dispensaries
Ambala	10.5	16	14	8
Bhiwani	1	8	6	8
Charkhi Dadri	21.5	21	20.5	19.5
Faridabad	17	19	19	2.5
Fatehabad	10.5	12.5	10	14
Gurugram	3	19	20.5	8
Hisar	2	1.5	1	5
Jhajjar	5.5	12.5	7.5	8
Jind	5.5	4	3	14
Kaithal	10.5	12.5	7.5	19.5
Karnal	5.5	8	4	2.5
Kurukshetra	17	12.5	14	14
Mahendragarh	17	8	9	19.5
Nuh	21.5	19	14	19.5
Palwal	17	16	17.5	19.5

Panchkula	10.5	22	22	1
Panipat	17	8	17.5	11
Rewari	17	16	16	19.5
Rohtak	10.5	8	11.5	4
Sirsa	5.5	4	5	14
Sonipat	17	1.5	2	8
YamunaNagar	10.5	4	11.5	14

Source: Calculations according to table 1.

*Note: Calculated by self by using Borda Ranking Method**.*

This table shows that what the Borda Ranking Method's findings were. According to this table, Charkhi Dadri and Nuh districts are behind in terms of hospitals, while Bhiwani is an advanced district. In terms of CHCs, Hisar and Sonipat are advanced districts with 1.5 and 1.5 ranks respectively, while Panchkula is a backward district with 22 rank. Hisar district is an advanced district that received the top ranking in terms of PHCs. Moreover, the 22nd ranked Panchkula District is a backward district. Districts "Charkhi Dadri, Kaithal, Mahendragarh, Nuh, Palwal and Rewari" are backward districts, while Panchkula is an advanced district.

Results of the Study

- Inequalities in the accessibility of "Hospitals, CHCs, PHCs and Dispensaries" exist between districts in Haryana.
- The districts "Ambala, Charkhi Dadri, Faridabad, Fatehabad, Kaithal, Kurukshetra, Mahendragarh, Nuh, Palwal, Panchkula and Rewari" had the lowest development score which was below 0.400 and the worst deprivation score which was over 0.600.
- The districts of "Bhiwani, Hisar and Karnal" have higher development indices over 0.600 and lower deprivation indices below 0.400 as a result of the high concentration of "Hospitals, CHCs, PHCs and Dispensaries".
- Based on the results of the Borda Ranking Method, the advance district Bhiwani received the top ranking, while the backward district namely Charkhi Dadri and Nuh received the 21.5 and 21.5th rankings respectively, in terms of the accessibility of hospitals.
- In terms of CHCs, the district of Hisar and Sonipat are advanced, while Panchkula is a backward district.
- Hisar, a forward thinking district, came in first rank for PHCs whereas Panchkula, a backward district came on 22nd rank.
- Panchkula is advanced district and "Charkhi Dadri, Kaithal, Mahendragarh, Nuh, Palwal and Rewari" districts are backward districts in context of availability of dispensaries.

Significance of this Study:

The study's conclusions will enable planners, legislators, scholars and

government representatives formulate appropriate policy measures that will aid in the development of underdeveloped areas. Future academics looking to investigate this area more on the same topic will find the work useful. The government of Haryana may also take the results into account and implement the appropriate measures to help develop less developed areas in order to lessen the differences between districts in terms of various social and economic infrastructure indicators.

Study limitations: Although the differences at the district level have been explored, further research is needed to determine their root causes. It is advised to conduct more research to uncover the reasons behind differences in some indicators, such as "Hospitals, CHCs, PHCs and dispensaries", among others. Additionally, as secondary data were used, there can be some data reporting inaccuracies. Due to this problem, the current study may have inadvertently shown differences in the level of health between districts in the Indian State of Haryana.

Acknowlegment

This work is supported by the "Maharshi Dayanand University, Rohtak" [URS Number, R&S/ R-15/21/URS/6240].

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