



## Demography India

A Journal of Indian Association of Study of Population  
Journal Homepage: <https://demographyindia.iasp.ac.in/>

### Health Services Utilization in Districts of Haryana: An Approach based on Composite Performance Measures

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#### Abstract

Adequate health service utilization is crucial for achieving Sustainable Development Goal Target 3. Despite targeted interventions, India grapples with inadequate utilization, exacerbated by significant reductions and disruptions due to COVID-19 pandemic. This study examines the variation and overall performance of health service utilization in Haryana for the years 2019-20 and 2021-22, employing composite performance measures approach. Lastly, this paper investigates the association between maternal health services utilization and related health outcomes.

Top-performing districts were majorly from Ambala Division, while the lowest-ranking districts were notably in Faridabad division. Gurugram stands out as the sole division where all its districts have manifested improved service utilization. The Health Service Utilization Index (HSUI) score unveiled significant disparities, with the top-performing districts scoring over 2.5 times higher than the lowest, underscoring the necessity for targeted measures to narrow the gap between top and bottom-ranking districts. Half of the districts demonstrated improvement in HSUI score, in the backdrop of baseline performance. Palwal district ranked at the top, with a notable 15-percentage point increase in its score.

Matrix results revealed that Hisar, Bhiwani, and Charkhi Dadri districts had 'Low MHSU' and 'High MMR', emphasizing of need of maternal health services utilization in reducing MMR. Sonipat and Nuh exhibited low MHSU with a low MMR, indicating potential barriers to accessing maternal health service utilization despite favourable outcomes. Rohtak district displayed a paradox of 'High MHSU' and 'High MMR', reveals that merely increasing maternal health service utilization is insufficient to attain the health goals. The findings advocate for delivering high-quality services and targeted intervention to reduce MMR.

#### Keywords

Composite Index,  
HSUI, Health  
Services Utilization,  
Maternal Mortality  
Ratio, Maternal  
Health

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## Introduction

Ensuring adequate utilization of health services is imperative to the attainment of Sustainable Development Goal (SDG) Target 3 and improving overall health outcomes. Despite targeted intervention in healthcare, suboptimal utilization of health services remains a daunting errand in India, particularly among vulnerable and underprivileged populations, that needs improvement. The COVID-19 pandemic has further exacerbated these challenges, resulting in tremendous variations in the use of healthcare services, including a major reduction or disruption (Moynihan et al., 2021; Singh et al., 2021; Tadesse et al., 2020).

Understanding the aspect of healthcare service utilization is crucial for improving healthcare access and outcomes. Analyzing the variation and comprehensive performance of healthcare service utilization across districts in the state is essential for identifying any existing healthcare disparities and designing effective policies and interventions. It is therefore essential to comprehend the current performance of districts compared to the pre-covid period, in order to enhance the service utilization.

While the importance of healthcare service utilization is widely acknowledged, various factors shape its utilization pattern. Existing research has highlighted factors influencing healthcare service utilization, such as geographical distance as a limiting factor (B Nair, Sajini et al., 2021), inadequate utilization contributing to high child and maternal mortality rates in India (Yadav et al., 2016). Several studies have highlighted the importance of healthcare services, particularly maternal healthcare services (antenatal care, delivery care, and postnatal care), in reducing the maternal mortality (Zhao, et al., 2020; Berhan et al., 2014). Improving maternal healthcare service utilization is therefore an important goal for governments globally, as it can lead to improved health outcomes. Hooda, S. K. (2014) found that decentralization plays an important role to influence the access of health care utilization in equitable way and improving the infant mortality rate of rural areas. Decentralization has

been identified as a key factor positively related with increased service access and utilization and improved service delivery (Regmi et al., 2010).

Furthermore, there is lack of existing studies in the specified area that provide the overall current performance as well as comparative rank-based progressive analysis. This study seeks to fill this gap by assessing the incremental improvement/progress from base year (2019-20) to the reference year (2021-22).

This study aims to examine the variation and overall performance in the utilization of healthcare services in the districts of Haryana, employing a composite performance measure approach based on 12 key health indicators. The comparative analysis of health services utilization, specifically for MCH & patient services, will be conducted for the years 2019-20 (Base year) and 2021-22 (Reference year). This research desk study also seeks to explore the relationship between maternal healthcare services utilization and related health outcomes i.e., Maternal Mortality Ratio, by using Matrix analysis. Understanding this insight is crucial for identifying gaps in maternal healthcare service utilization and determining effective strategies to improve maternal health and reduce the MMR in Haryana.

## Materials and Methods

The present study undertakes a composite performance analysis of Haryana, encompassing all its 22 districts, to uncover and understand the patterns of health service utilization. The study is based on secondary data sources extracted from Health Management Information System (HMIS) for the years 2019-20 and 2021-22. Descriptive as well as statistical analysis i.e., Composite Index, and spatial analysis have been attempted. Composite Index was used to rank the districts. Matrix analysis has been carried out to examine the relationship between maternal healthcare service utilization and related health outcomes.

Composite Index is generated using a total 12 key relevant indicators of health, broadly divided into two domains: Maternal & Child Health (MCH) and patient services. The MCH domain covering indicators such as 1st trimester ANC

registration, 4 ANC check-up, Institutional delivery, C-section delivery, the length of postpartum stays after institutional delivery, SBA attended home deliveries, Oral Polio Vaccine at birth. Similarly, some indicators were selected from patient service domain. Appendix Table 1 tabulated the in-depth details of all indicators.

#### **Computation of Index Scores & Ranks**

After calculating all above indicators mentioned above, maximum and the minimum value for each indicator across district were ascertained for both years. After identification of the maximum and minimum value for each indicator, index value for each individual indicator for each district is calculated. The index value is calculated on the basis of all selected positive indicators. For the calculation of the index value of positive indicators, the following formula is used:

$$X_{is} = \frac{X_{is} - \text{Min}(X_{is})}{\text{Max}(X_{is}) - \text{Min}(X_{is})}$$

where,  $X_{is}$  represent the value of the  $i^{\text{th}}$  indicator in the  $s^{\text{th}}$  district ( $i=1,2,3,\dots,12$ ;  $s=1,2,3,\dots,22$ )

$\text{Min}(X_{is})$  and  $\text{Max}(X_{is})$  are respectively, the minimum and maximum of ( $X_{is1}, X_{is2}, \dots, X_{isn}$ ) for that particular indicator in  $s^{\text{th}}$  district of state.

Based on each indicator scaled value, a composite index score for each district was calculated for the Base Year and Reference Year using the following formula:

$$\text{Composite Index} = \frac{\sum_{i=1}^{12} \text{Index Value } X_i}{12}$$

The composite index score provides the overall health service utilization of each district of states and has been used for generating overall performance rank. A comparison of change in the ranks between the base and reference year has also undertaken. Furthermore, incremental change ranking from base year composite scores to reference year were also measured.

#### **Key Features & Limitations of the Index**

Measures the "overall performance" in the Districts of Haryana in the Base Year and Reference Year. The composite index shows the "incremental improvement" in Haryana's districts over two-years from the Base to the

Reference Year. To ensure consistency and comparability, the same indicators were used for the Health Service Utilization Index for both Base and Reference Year.

The HSUI consists of a limited set of relevant indicators broadly categorized in the domains of MCH and Patient services. The HSUI is based mainly on data from public healthcare services reported on the HMIS portal. The limitation of the index is that index calculated for 22 districts of the states may not be comparable with the others state's districts, because it is relative and is suitable for the comparison of the area included in the analysis. However, this index can be used if the same indicators are derived by the same method for the other state.

#### **Results**

##### **Healthcare Service Utilization in Haryana: A Composite Index Framework**

Analysis used categorization of districts based on colour coding, calculating individual indicator index, Composite Index and Rank. The districts have been categorized on the basis of their healthcare indicator specific performance for the year 2021-22. Colour coded system indicates the level of performance of each district regarding each indicator. Criterion for used in indicators for Table 1 categorization for health service utilization; Indicators like ANC 1, ANC 4, TT2+B, OPV0 are Color coded as red for less than 60%, yellow for 60-80% and green for over 80% coverage. Similarly, Indicator ID, SBAHD, 48hr Stay, BOR are categorized based on less than 50% in Red, 50-70% in Yellow and over 70% in green colour. C- Sec rates are classified as red for over 25% and less than 15%- Red, and a moderate range of 15-25% is in green colour. With regards to PPIUCD, no color scheme applied, as there is no threshold limit for service utilization. Sex Ratio is highlighted in red for < 900, yellow for 900-950, and green for > 950. IPD/ OPD ratios are marked red for under 5, yellow for 5-10, and green for over >10.

Table 1 clearly depicts that across the districts in Haryana, ANC 1 coverage appears satisfactory with notable exceptions Faridabad (63.3%), Nuh (67.8%) and Gurugram (69.5), which showed

lower antenatal care uptake. Several districts like Fatehabad, Kaithal, Karnal, Hisar, Kurukshetra, and Sirsa demonstrate relatively commendable ANC coverage (above 85%) indicating good antenatal care uptake in the first trimester. Karnal, Sonapat and Rohtak district having high ANC 4 or more coverage, signifying good continuity of antenatal care. While Panchkula, Panipat, Nuh, Gurugram, and Faridabad have lower ANC 4 coverage, indicating potential gaps in antenatal care continuity. Thus, these districts need to improve their indicator performance to improve their overall composite score. With regards to TT2+B (Tetanus Toxoid 2+ Booster), all districts (except Nuh) exhibit a high coverage (>80%) and falls in the "Category A", indicating good immunization services for pregnant women.

Regarding institutional delivery care service, Panchkula district stands out as a top performer and falls in the "A category", while Ambala, Jhajjar, Karnal, Mahendragarh, Nuh, Palwal, Panipat, Rohtak, Sirsa, and Sonapat falls in the "B Category". Remaining districts i.e., Bhiwani, Charkhi Dadri, Faridabad, Bhiwani, Gurugram, Hisar, Jind, Kaithal, Kurukshetra, Rewari and Yamunanagar districts need to improve their Institutional delivery care indicator performance. With regards to the percentage share of C-section deliveries in total institutional delivery, one third districts of state are performing poorly with the same, which needs to be addressed. C- Section rates vary across districts, with some having higher rates (e.g. Yamunanagar, Panchkula) compared to others, which might require monitoring and needs to be addressed. Charkhi Dadri, Nuh, and Panipat district (having extremely low C-section) needs to increase its percentage of C-section deliveries in total institutional deliveries, which is currently less than the ideal range. SBA attended home delivery indicators were found to be poor across all districts except Jhajjar, which is performing moderate in the same. High rates of skilled birth attendance during home delivery are essential for ensuring safe deliveries.

Postnatal stays, essential for maternal and neonatal health, are notably high in Kaithal and

Kurukshetra. Panchkula falls in the "B Category". Remaining all districts highly need to address the length of stay for at least 48hr stay of mothers in health facility after delivery. With regards to PPIUCD (Postpartum Intrauterine Contraceptive Device), there is no color scheme applied, as there is no threshold limit for service utilization. Yamunanagar district showing highest PPIUCD insertion in the state, while Nuh having low.

The coverage of OPV0 (Oral Polio Vaccine 0 Dose) is generally high across districts, indicating effective vaccination program. Just Nuh district 75% of OPV0 coverage, which needs to be improved. The outlier and validation error may be existed in the immunization indicators. IPD to OPD ratio and Bed occupancy rate was found to be poor across all districts of Haryana State except a few districts. The state needs to be work towards the efficient utilization of hospital/ facilities beds, as low bed occupancy can be a sign of underutilization and leave scope for improving efficiency.

To improve the overall composite score, Bhiwani, Charkhi Dadri, Faridabad, Gurugram, Jind, and Rewari need to improve their Institutional deliveries, percentage share of C-section delivery in total institutional delivery, SBA attended home delivery, and 48 hours stay of mothers at the facility after delivery, IPD/ OPD and Bed Occupancy ratio. NUH district needs to improve their all-indicators specific performance, to improve the overall composite performance score. Overall, delivery care, post-delivery care, IPD/OPD and bed occupancy rate indicators were noted to be poor in almost districts of study state, except few districts. Overall, figures vary across districts, suggesting differences in healthcare-seeking behaviour and infrastructure utilization. Understanding the district-wise situation across these indicators helps identify areas of strength and areas needing improvement in maternal healthcare delivery and healthcare utilization.

Table 1 also summarizes the descriptive statistics for the indicators of the composite index included in the study.

**Table 1:** Performance of Districts on Each Targeted Indicators and Descriptive statistics of Composite Index in Haryana: 2021-22

| Districts    | ANC 1 | ANC 4 | TT2+ B | ID    | SBA HD | C-sec | 48hr Stay | PPIU CD | SR    | OPV 0 | IPD/OPD | BOR   |
|--------------|-------|-------|--------|-------|--------|-------|-----------|---------|-------|-------|---------|-------|
| Ambala       | 81.6  | 86.8  | 97.8   | 64.2  | 0.0    | 24.2  | 39.1      | 50.5    | 931   | 113.1 | 2.5     | 52.9  |
| Bhiwani      | 82.5  | 77.9  | 90.1   | 36.6  | 7.8    | 7.1   | 43        | 58.7    | 933   | 116.6 | 4.1     | 33.4  |
| Charki Dadri | 78.8  | 75.8  | 93.0   | 43.5  | 25.0   | 0.1   | 10.5      | 59      | 952   | 138.4 | 3.1     | 24.7  |
| Faridabad    | 63.3  | 61.7  | 82.9   | 42.8  | 8.9    | 9.0   | 25.5      | 20.2    | 912   | 106.2 | 2.8     | 40.4  |
| Fatehabad    | 89.6  | 82.6  | 89.2   | 44.9  | 25.0   | 20.2  | 48.6      | 19.4    | 942   | 105.3 | 3.5     | 28.9  |
| Gurugram     | 69.5  | 64.6  | 74.8   | 42.0  | 19.7   | 13.0  | 21.1      | 50.5    | 920   | 120.2 | 3.3     | 31.6  |
| Hisar        | 85.0  | 78.3  | 89.4   | 46.1  | 8.3    | 18.5  | 33.2      | 20.6    | 940   | 144.5 | 4.3     | 15.6  |
| Jhajjar      | 84.1  | 77.9  | 85.1   | 52.2  | 50.0   | 11.2  | 29.6      | 68.7    | 937   | 126.8 | 2.3     | 16.2  |
| Jind         | 82.5  | 78.4  | 92.2   | 45.4  | 17.1   | 9.0   | 20.3      | 40.4    | 935   | 143.7 | 2.1     | 31.8  |
| Kaithal      | 89.1  | 79.7  | 95.1   | 46.0  | 2.4    | 11.5  | 72.3      | 45.8    | 943   | 132.4 | 3.4     | 21.8  |
| Karnal       | 85.0  | 100.9 | 92.3   | 59.7  | 0.0    | 18.7  | 44.7      | 22.6    | 925   | 118   | 3.8     | 42.2  |
| Kurukshetra  | 88.6  | 84.6  | 87.3   | 38.1  | 28.6   | 10.4  | 71.5      | 23.6    | 975   | 161.4 | 3.2     | 57.4  |
| MG           | 81.8  | 89.3  | 92.3   | 65.5  | 0.0    | 23.6  | 28.6      | 27      | 900   | 109.2 | 5.9     | 23.7  |
| Nuh          | 67.8  | 64.9  | 63.9   | 59.8  | 4.8    | 4.1   | 10.4      | 2.5     | 943   | 75    | 6.8     | 1.6   |
| Palwal       | 76.1  | 87.7  | 89.8   | 58.1  | 35.1   | 7.7   | 28.4      | 19.6    | 934   | 113.6 | 7.5     | 35.6  |
| Panchkula    | 72.7  | 64.4  | 94.2   | 73.6  | 2.1    | 25.6  | 68.2      | 68.7    | 975   | 101.1 | 4.0     | 71.1  |
| Panipat      | 73.1  | 66.4  | 81.8   | 60.1  | 5.9    | 5.1   | 12.7      | 45.6    | 906   | 118.4 | 4.2     | 7.7   |
| Rewari       | 82.5  | 80.8  | 90.8   | 34.4  | 4.8    | 13.1  | 46.7      | 26.4    | 928   | 125.5 | 3.5     | 32.7  |
| Rohtak       | 75.3  | 92.1  | 97.0   | 66.1  | 4.9    | 22.4  | 44        | 27.9    | 920   | 112.2 | 2.7     | 9.6   |
| Sirsa        | 90.6  | 87.1  | 97.9   | 55.2  | 7.5    | 17.2  | 33.1      | 67.6    | 955   | 155.1 | 2.0     | 30.9  |
| Sonipat      | 84.6  | 90.2  | 100.7  | 58.8  | 0.0    | 10.7  | 41.5      | 28.5    | 900   | 136.1 | 3.0     | 15.1  |
| Yamunanagar  | 82.1  | 76.2  | 84.7   | 49.9  | 0.0    | 30.5  | 43.7      | 79.8    | 928   | 112.1 | 3.2     | 51.4  |
| MEAN         | 80.28 | 79.46 | 89.18  | 51.95 | 11.7   | 14.2  | 37.12     | 39.72   | 933   | 122.0 | 3.69    | 30.74 |
| SD           | 7.41  | 10.31 | 8.25   | 10.78 | 13.5   | 7.91  | 17.93     | 20.93   | 20.21 | 19.50 | 1.42    | 17.18 |
| Min          | 63.34 | 61.74 | 63.9   | 34.43 | 0.0    | 0.08  | 10.36     | 2.54    | 900   | 75    | 2.01    | 1.61  |
| Max          | 90.64 | 100.9 | 100.7  | 73.63 | 50     | 30.5  | 72.33     | 79.82   | 975   | 161.4 | 7.49    | 71.06 |

Source: Health Management Information System, 2021-22

Note: Category A- Better performing districts shown by green colour, Category B- Average performing districts by a yellow colour, Category C-Poor performing districts by red colour

Maximum, Minimum, Mean & Standard Deviation score against each indicator have been calculated. ANC registration in the first trimester in districts ranges from 63% in Faridabad, to 91% in Sirsa. The percentage of pregnant women who received full Antenatal checkups ranges for 62% in Faridabad to 100.92% in Karnal. On an average districts included in the study sample recorded 80% (SD 10.31) pregnant women received full ANC care services. The percentage of institutional delivery in districts range from 34% in Rewari, to 74% in Panchkula. With regards to C-section delivery, lowest caesarian conducted in (0.08%) Charkhi Dardi, while the maximum noted in Yamuna Nagar with 31%. The mean & SD for the C-section indicators were noted at 14

and 7.9. The percentage of SBA attended home deliveries to total reported home deliveries noted minimum in Jhajjar, while the maximum noted in Ambala. The percentage of women 48 hours stay at the facility after institutional deliveries noted maximum in Kaithal, and had minimum in Nuh in the same. On average, districts of the Haryana state recorded 37% (SD- 17.93) postpartum length stay at the facility in the year 2021-22. Post-Partum Sterilization after delivery ranges from 2.5% in Nuh to 79.8% PPIUCD insertion in Yamunagar. With regards to immunization, percentage of new-borns given OPV0 at birth to reported live birth ranges from 75% in Nuh to 161% in Kurukshetra. Bed Occupancy rate range from 1.6% in Nuh to 71% in Panchkula. Further,

average Bed occupancy rate in the year 2021-22 was 31% and the SD for the same was 17%. The maximum and minimum IPD to OPD ratios were observed in State; the minimum ratio of 2.01% was found in the Sirsa district, while the maximum was found in Palwal (7.49%). Bed Occupancy rate ranges from 0.36% to 69%. The maximum Bed Occupancy rate recorded in Panchkula, while the minimum was in Nuh. The average mean for the said indicator was observed to be 31% of all districts of Haryana state.

Table 2 depicts the HSUI index score with rank for the 22 districts. The overall HSUI score of the best performing district is more than two and a half times the overall score of the least performing district. Panchkula district records the highest score with an overall score of 62.99, while Nuh district is the worst performing in health service utilization with an overall score of 21.4. Analysis implies that there is a dire need to accelerate efforts to narrow the gap between top and bottom ranking districts. There is no indication that the gap between the top and bottom performing districts is narrowing as compared to the base year, HSUI score have further declined in the bottom performing districts, leading to a wider performance gap. It is very interesting and crucial to identify over the years improvement made by districts. This measure is particularly important for identifying the districts with the highest and lowest incremental change/progress. The Palwal (14.81) district of Haryana ranked at top followed by Karnal (9.81), Kurukshetra (7.63), and Sirsa (5.18). Thus, results of this study clearly showed that the change more than 5 percentage points increase in their index score from base to reference year in above mentioned districts. Compared to the Base Year, index scores have increased in 11 (50%) districts in state in the Reference Year, while it decreased in the remaining 11 (50%) districts. This finding implies that these 50% districts in Haryana, have broad scope to improve their usage of healthcare services.

In Table 3, districts are categorized into 4 groups based on the index value change in the reference year (2021-22) from the base year (2019-20): 'Significantly Deteriorated' (>-5 or more),

'Slightly Declined' (-0.01 to -5.0 score decrease), 'Slightly Improved' (0 to 5.0 score increase), and 'Most Improved' (>5.0). From the above breakdown categories, we can see the performance trends across various divisions in Haryana from 2019-20 to 2021-22.

Notably, index scores/value have declined across divisions except one division i.e., Gurugram. Notably, Gurugram stands out as the only division where all its districts have recorded an improvement in health service utilization over the year.

Across divisions, Faridabad (Palwal), Karnal (Karnal), Ambala (Kurukshetra), and Hisar (Sirsa) divisions exhibit towards "most improvement" category in healthcare service utilization, while most deteriorated trends observed in divisions of Ambala, Rohtak, Karnal, and Faridabad division. In the Ambala Division: Out of its 4 districts, 3 districts- Yamunanagar, Ambala and Panchkula- have not showed improvement in health services utilization. Therefore, around 75% of districts fall into the category of 'no improvement' in service utilization. Health service utilization is already high in Panchkula, however, Yamunanagar have the scope for improvement. Only Kurukshetra district demonstrate a significant increase in the utilization of healthcare services with more than 5 point surge in the index score.

Karnal Division: Total of three districts come under this division, which depicts a mixed performance. Panipat experiencing significantly deteriorated, Kaithal district witnessed a "slightly declined" and Karnal district emerges as a "Most Improved". Panipat and Kaithal districts need to be addressed concerning health service utilization.

In Hisar Division: Fatehabad district witnessed a slight decline in their index score. The majority of districts fall into the category of 'improvement' in health service utilization. Hisar and Jind districts shown a slight increase in said service utilization from base to reference year, while Sirsa district was categorized as "Most Improved" with more than 5-point increase.

**Table 2** Composite Index and Rank of districts of Haryana, 2019-20 vs 2021-22

| Districts    | Reference Year Index Score | Incremental change | IC Rank | Base Year | Reference Year |
|--------------|----------------------------|--------------------|---------|-----------|----------------|
| Panchkula    | 62.99                      | -0.62              | 13      | 1         | 1              |
| Kurukshetra  | 61.83                      | 7.63               | 3       | 5         | 2              |
| Sirsa        | 59.16                      | 5.18               | 4       | 6         | 3              |
| Ambala       | 54.57                      | -4.73              | 17      | 3         | 4              |
| Karnal       | 53.20                      | 9.81               | 2       | 13        | 5              |
| Kaithal      | 52.60                      | -0.32              | 12      | 7         | 6              |
| Yamunanagar  | 52.54                      | -7.79              | 19      | 2         | 7              |
| Palwal       | 52.48                      | 4.81               | 1       | 19        | 8              |
| Jhajjar      | 50.76                      | -7.85              | 20      | 4         | 9              |
| Fatehabad    | 50.22                      | -2.63              | 15      | 8         | 10             |
| Mahendragarh | 48.00                      | 0.28               | 11      | 10        | 11             |
| Rohtak       | 46.36                      | -1.80              | 14      | 9         | 12             |
| Hisar        | 46.23                      | 0.35               | 10      | 12        | 13             |
| Sonipat      | 45.03                      | 3.57               | 5       | 16        | 14             |
| Bhiwani      | 44.09                      | -3.31              | 16      | 11        | 15             |
| Jind         | 43.00                      | 0.57               | 9       | 14        | 16             |
| Charki Dadri | 42.86                      | 1.15               | 8       | 15        | 17             |
| Rewari       | 41.72                      | 3.30               | 6       | 18        | 18             |
| Gurugram     | 32.05                      | 2.07               | 7       | 21        | 19             |
| Panipat      | 29.73                      | -8.99              | 21      | 17        | 20             |
| Faridabad    | 24.20                      | -4.94              | 18      | 22        | 21             |
| Nuh          | 21.40                      | -9.61              | 22      | 20        | 22             |

Note: IC Rank stands for Incremental change rank

**Table 3** Categorization of District on Overall Performance: Base to Reference Year

| Incremental Performance/ Divisions | Categorization                               |                                   |   |
|------------------------------------|--|-----------------------------------|---|
|                                    | Significantly Deteriorated<br>>-5.0 to -10.0 | Slightly Declined<br>-0.1 to -5.0 | Slightly Improved<br>0-5.0  |
| Ambala                             | Yamunanagar                                  | Ambala<br>Panchkula               | Kurukshetra   |
| Karnal<br>Hisar                    | Panipat                                      | Kaithal<br>Fatehabad              | Karnal<br>Sirsa   |
| Rohtak                             | Jhajjar                                      | Rohtak<br>Bhiwani                 | Hisar<br>Jind<br>Sonipat<br>Charkhi Dadri<br>Mahendragarh<br>Rewari<br>Gurugram |
| Faridabad                          | Nuh  | Faridabad                         | Palwal  |

In Rohtak division: Among the 5 districts, 3 districts- Jhajjar, Rohtak, and Bhiwani have not improved the usage of healthcare services. Thus,

a significant proportion of districts (60%) fall into the category of ‘no improvement’ in health service utilization, necessitating focused intervention. The remaining 40% of districts

(Sonipat and Charkhi Dadri) showed a marginal improvement in health service utilization from base to the reference year.

Gurugram division: This division emerges as a paragon of progress, where all districts have improved the health service utilization. Mahendragarh, Rewari, and Gurugram have shown a slight increase in service utilization within 0- 5.0 points surge in score.

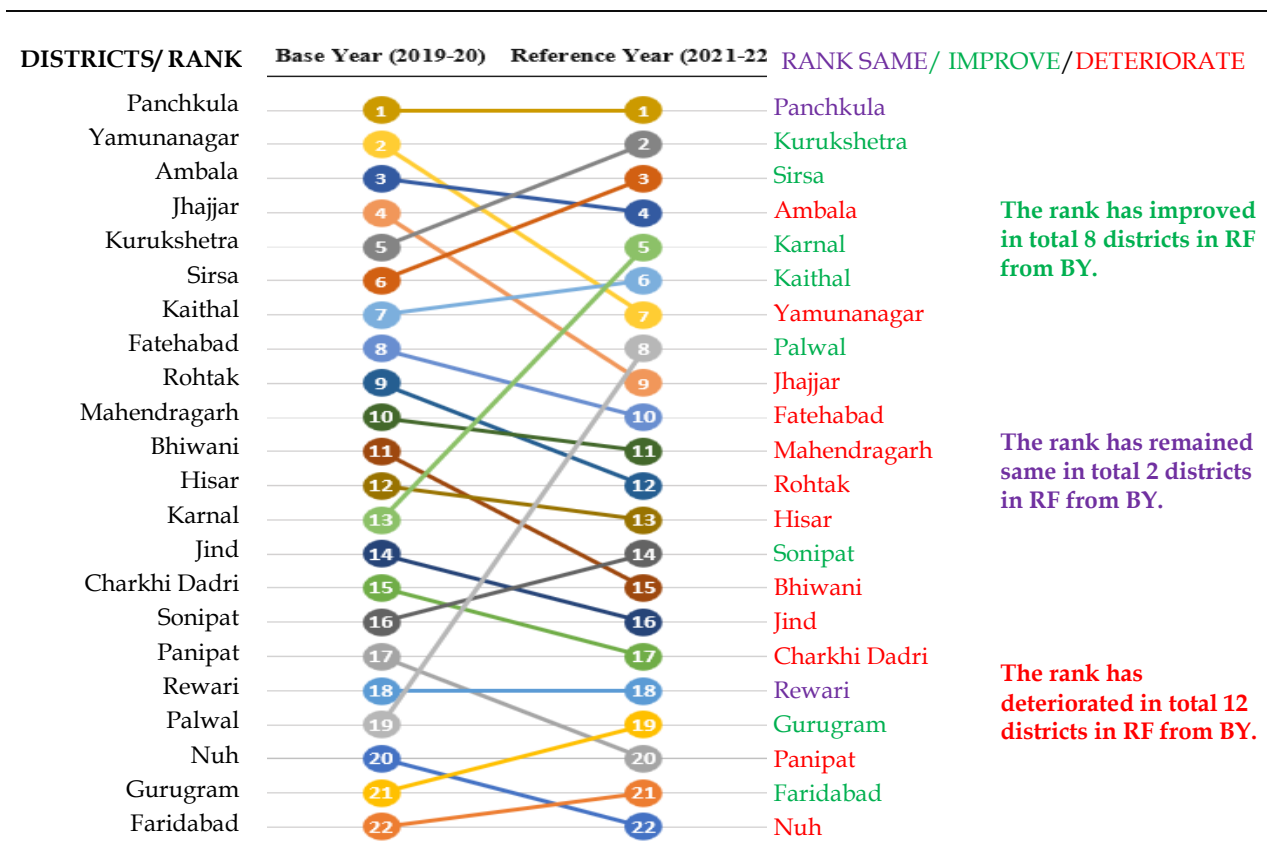
Lastly, Faridabad Division: Out of the total districts of this division, 33% of the district (Nuh) fall in the category of “Significantly Deteriorated” 33% district (Faridabad) fall in the category of “Slightly Declined” and the remaining 33% district (Palwal) fall in the category of “Most Improved”. This division underscore a tripartite/ multilateral distribution of districts, highlighting the multifaceted nature of health service utilization. Nuh district is the high priority district which needs to be addressed by specific intervention.

Overall, the analysis underscores the imperative

of targeted interventions to address disparities and bolster health service utilization across districts in Haryana, while conceding Gurugram division's commendable steps towards improvement.

Table 4 compares the ranking of districts in Haryana in Base as well as Reference Year is depicted by categorization, namely, Rank Improved, Deteriorate and No Change/ Same and is visually identified by colour coding. The purple colour denotes that the healthcare service utilization rank is stagnant and there has been no change in rank from the Base to the Reference Year. The red colour indicates the deteriorate rank of the district, while the rank improved shown by the green colour. Panchkula district tops the rankings for health service utilization, while Nuh is at Bottom. Kurukshetra and Sirsa have emerged as the second and third best performers in the reference year. In Base year, Yamunanagar district of Haryana ranked second, while Kurukshetra district of Haryana was ranked 5<sup>th</sup>.

**Table 4** Base & Reference Year Rank of the Districts of Haryana with Performance





In Reference Year, Kurukshetra district has moved up to the 2<sup>nd</sup> top rank, while Yamunanagar district has moved down to the 7<sup>th</sup> rank. Kurukshetra district exhibited significant progress in the same as the rank moved from 5<sup>th</sup> to the 2<sup>nd</sup> position.

Karnal, and Palwal district demonstrate drastic improvement as the rank moved from 13<sup>th</sup> to the 5<sup>th</sup>, and 19<sup>th</sup> to 8<sup>th</sup> position respectively, indicates the increasing utilization of healthcare services. Similarly, there have been changes in the rankings of other districts as well. Districts like Sirsa, Sonipat, Kaithal, Gurugram and Faridabad have improved their rankings.

The top 5 best performing districts based on the overall performance in the reference period are Panchkula, Kurukshetra, Sirsa, Ambala, and Karnal, while the top ten best performing districts in the baseline period were Panchkula, Yamunanagar, Ambala, Jhajjar, and Kurukshetra respectively. The majority of top performing districts in both years were recorded from Ambala Division. On the other hand, the least health service utilization in the reference year is noted in Nuh, Faridabad, Panipat, Gurugram and Rewari, while Faridabad, Gurugram, Nuh, Palwal, and Rewari were the 5 least performing districts in the base year. The majority of least performing districts in both years were recorded in Faridabad, and Gurugram divisions.

Overall, the rank has improved in more than 35% districts (8) in RF from BY. The most significant progress was observed in Palwal district moved up by 11<sup>th</sup> position in the ranking. However, the ranking position has deteriorated/ declined in total 12 (more than 50%) districts, indicating that there is large scope for improvement in health service utilization in these districts. Yamunanagar (2<sup>nd</sup> place to 7<sup>th</sup> place), and Jhajjar (4<sup>th</sup> -9<sup>th</sup>) registered the most significant decline in ranking from 2019-20 to 2021-22, followed by Bhiwani (Rank 11 to 15). In the reference year, two (9%) districts, namely, Panchkula, Rewari maintained their base-year rankings. The results crystal clear that top ranking districts in both year, most of the districts were recorded from Ambala Division. On the other hand, the least performing districts in both years were recorded

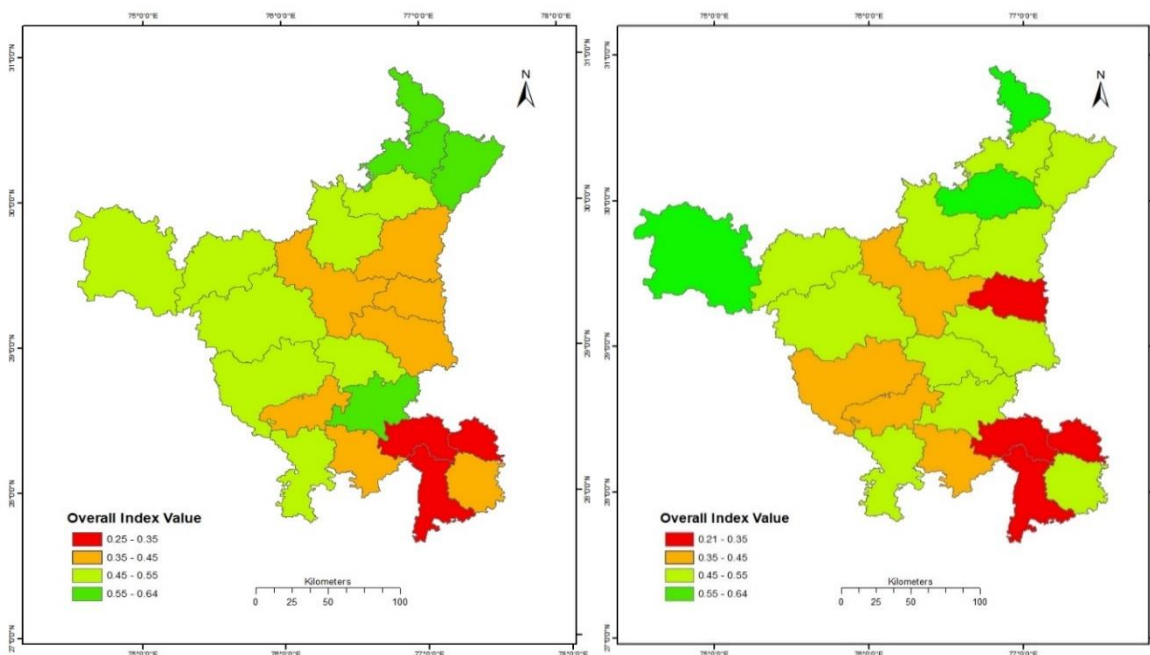
mainly in Faridabad division.

### *Spatial Analysis of Healthcare Service Utilization in District of Haryana State*

Understanding health service utilization is critical to achieving the health goal of providing adequate and high-quality care. The Health Service Utilization Composite Index demonstrate the degree of utilization, and color represents the HSUI value of districts. The color moves from red, through orange, to green as the HSUI value increases. The color coding of green indicating better utilization of healthcare services, while red reflecting underutilization of services in the district. Map 1 (A) represents the spatial distribution of health service utilization in Base Year, while Map 1 (B) depicts same in Reference Year as represented below.

In the base Year, districts with low healthcare service utilization, mostly from Faridabad, Gurgaon and Karnal divisions, encompassing around 40% of districts. The utilization of healthcare services has slightly improved in Palwal (Faridabad division), and Karnal districts (Karnal Division) in the Reference Year from the Base as shown by the Map B. Sonipat district have reportedly improvement in the use of healthcare from Orange to Green, while Sirsa and Kurukshetra districts experienced a shift from green to dark green. Panchkula, Kurukshetra, and Sirsa districts depicted high health service utilization as shown by the dark green coloration, while in Base Year 4 districts fall in this category namely, Panchkula, Yamunanagar, Ambala, and Jhajjar.

Contrary, several districts experienced declines in health service utilization, notably in Ambala division. Yamunanagar and Ambala districts (Ambala division), moved from dark green to light green. Further, Sirsa from Hisar division moves from Dark green to light green colour. In Rohtak division, Jhajjar district's color shifted from dark green to light green, Bhiwani district moves from light green to orange. Similarly, decline in health-care utilization can be seen in another district as well. Moreover, Panipat (Karnal division) experienced a decline, shifted from orange to red color, indicates of decrease in same.



Spatial Distribution of Health Service Utilization in 2019-20: Base Year (A)

Spatial Distribution of Health Service Utilization in 2021-22: Reference Year (B)

**Map 1:** Health Service Utilization Composite Index for the Districts of Haryana, India

***Defining a Relationship between Maternal Healthcare Service Utilization and Related Health Outcomes***

The matrix table 5 depicts the relationship between the utilization of maternal health care services and the Maternal Mortality Ratio (MMR) across districts of Haryana. The following formula have been used to calculate the MMR.

$$\text{Maternal mortality Ratio} = \frac{\text{Maternal deaths}}{\text{Total live births}} * 100000$$

Classifying districts based on their Maternal Health Utilization Index Value (Low (<0.54032), Medium (0.54032-0.57557), High (>=0.57557)). The categorization of MMR in low, medium, and high was similarly done by calculating the quartile (Q2, Q3, and Q4). The districts have been separated into low, medium and high HSUI and MMR. On the behalf of categorization of districts, we have developed this matrix, which can be useful to see the pattern of maternal service utilization and maternal mortality ratio.

Each row represents a utilization level of maternal health services, classified as low, medium, or high. Each column represents the MMR (Maternal Mortality Ratio) level, classified as low, medium, or high.

The intersections of the rows and columns list the districts that correspond to the respective utilization and MMR levels. Sonipat and Nuh districts have noted low utilization of maternal health care services and a low MMR, indicating a mixed situation. Low MMR depicts that maternal health outcomes are favorable/ positive. On the other hand, low maternal health service utilization raises questions about the accessibility, quality of services, and lack of awareness about the same and could indicate that women are not utilizing available health services. In such a situation, it is crucial to understand why the utilization of maternal health services is low. Panipat, Jind, Gurugram, Rewari, Faridabad, and Palwal district have low maternal health service utilization and a medium MMR. Hisar, Bhiwani, and Charkhi Dadri districts have low MHSU and a high MMR which is a cause for concern. Proper utilization of maternal health services in certain districts can play an important role in reducing Maternal Mortality. Further, there is an urgent need to raise awareness about the importance of Institutional delivery, the length of post-partum stays at the facility, and SBA-attended home delivery as depicted in Table 1.

**Table 5** Matrix of maternal healthcare service Utilization Index and Maternal Mortality Ratio, 2021-22

|   |        | Maternal Mortality Ratio (MMR) |                   |                        |
|---|--------|--------------------------------|-------------------|------------------------|
|   |        | Low (L)                        | Medium (M)        | High (H)               |
| Maternal Healthcare service Utilization Index (MHSUI) | Ambala | Low                            |                   |                        |
|   |        | Medium                         | Yamunanagar       | Kurukshetra            |
|   |        | High                           | Ambala, Panchkula |                        |
| Karnal  | Low    |                                | Panipat           |                        |
|   | Medium | Kaithal                        |                   |                        |
|   | High   |                                | Karnal            |                        |
| Hisar   | Low    |                                | Jind              | Hisar                  |
|   | Medium |                                |                   | Fatehabad              |
|   | High   | Sirsa                          |                   |                        |
| Rohtak  | Low    | Sonipat                        |                   | Bhiwani, Charkhi Dadri |
|   | Medium |                                |                   |                        |
|   | High   | Jhajjar                        |                   | Rohtak                 |
| Gurugram  | Low    |                                | Gurugram, Rewari  |                        |
|   | Medium | Mahendragarh                   |                   |                        |
|   | High   |                                |                   |                        |
| Faridabad   | Low    | Nuh                            | Faridabad, Palwal |                        |
|   | Medium |                                |                   |                        |
|   | High   |                                |                   |                        |

The majority of the mothers in Charkhi Dadri still not getting postnatal care, i.e., 48-hour stay at the facility after delivery, which constitutes a critical period to avert maternal mortality.

Fatehabad district has medium MHSU and a high MMR, which implies that proper utilization of maternal healthcare services in this district can play an important role in reducing the Maternal Mortality ratio.

It must be noted that Rohtak district have the paradox of high maternal health service utilization and a high MMR, underscore the importance of focusing not only on increasing service utilization but also on delivering high-quality maternal health care services. Additionally, targeted interventions are essential to effectively reducing the MMR. Ambala and Panchkula have a high MHSU and a low MMR, which is generally considered an ideal situation as the women utilizing the healthcare services, resulting in favorable maternal health outcomes. Yamunanagar, Kaithal and Mahendragarh districts perform optimally with a lower MMR and medium utilization of services. Karnal district exhibits a high MHSU and a medium MMR.

Overall, analysis reveals varying maternal health service utilization (MHSU) and Maternal Mortality Ratio (MMR) levels across Haryana districts. Sonipat and Nuh district show low MHSU with a low MMR, indicating mixed outcomes. Hisar, Bhiwani, and Charkhi Dadri face low MHSU and high MMR, necessitating urgent interventions. Rohtak demonstrates high MHSU but high MMR, emphasizing the need for quality-focused approaches. Ambala, Panchkula, Yamunanagar, Kaithal, and Mahendragarh perform optimally. Study findings highlight notable maternal health challenges in Ambala (Kurukshetra District), Hisar (Fatehabad and Hisar district), and Rohtak (Bhiwani, Rohtak, and Charkhi Dadri district) divisions, where high maternal mortality ratio is concerning issue. Additionally, Rohtak (Sonipat district), and Faridabad (Nuh District) divisions display low maternal health service utilization, indicating potential barriers to accessing and utilizing maternal health care service.

### Discussion

The findings from our study revealed significant disparities in healthcare services utilization in the reference year. The observed disparities in MCH

care coverage were echo to the results reported by previous studies from as well as different areas of India (Singh, N. at al., 2022). The magnitude of these disparities is alarming; the overall HSUI score of the best performing district is more than two and a half times higher than that of the least performing district. Therefore, there is a dire need to accelerate efforts to narrow the gap between top and bottom ranking districts. Notably, top-performing districts were predominantly noted from the Ambala Division, while the least-performing districts were primarily from the Faridabad division. These findings underscore the need for targeted interventions to address the specific challenges faced by underperforming districts.

The COVID-19 pandemic has resulted in tremendous variations in the use of healthcare services, including a major reduction or disruption in the same (Moynihan et al., 2021; Singh et al., 2021; Tadesse et al., 2020). In line with the global trends, our study finding highlight that Compared to the Base Year, index scores have decreased in around 50% of the districts in Haryana. This implies that half of the districts in Haryana have substantial scope to improve their utilization of healthcare services. The observed reduction in health service utilization in Haryana is consistent with other studies in Haryana which have reported a significant decline in utilization of maternal healthcare services, particularly ANC and delivery care at public Institutions (Singh, T. et al, 2023).

Inadequate utilization of healthcare services is one of the reasons why child mortality and maternal mortality is still considerably high in India (Yadav et al., 2016). The matrix analysis reveals that Hisar, Bhiwani, and Charkhi Dadri districts are listed under "Low MHSU" and a "High MMR" which is a cause for concern. Proper utilization of maternal health services, particularly Institutional delivery, the length of post-partum stays, and SBA-attended home delivery, in these districts can play an important role in improving related health outcomes.

Improving maternal healthcare service utilization is therefore an important goal for governments globally, given its correlation with

improved health outcomes. Contrary, the existing research has shown that the problem of maternal mortality in the country may not necessarily lie with utilization but with the quality of services (Ibeh, C. C., 2008). Our findings in Haryana, particularly in Rohtak district, supports this perspective. Despite "High MHSU" in Rohtak, there was also a "High MMR", highlighting a concerning paradox. This emphasizes that merely increasing utilization of maternal health services is insufficient to meet health goals. The research advocates for prioritizing the high-quality services and targeted intervention to reduce the MMR. It is imperative to recognize that the quality of care provided plays a pivotal role in reducing maternal mortality rate.

### **Conclusion and Policy Implications**

The findings revealed significant disparities in healthcare services utilization across districts in Haryana, with the HSUI score highlighting a wider performance gap between top and bottom ranking districts. Panchkula district tops the rankings for health service utilization, while Nuh is at Bottom. The cluster of top-ranking districts within the Ambala Division and consistent underperformance of districts in the Faridabad division underscore the need for targeted interventions tailored to regional disparities in healthcare access and utilization. Overall performance at the division level reveals that index scores and values have decreased in almost all divisions of Haryana from base to the reference year, except one. Gurugram stands out as the only division where all its districts have recorded an improvement in health service utilization over the year.

This study explored the over-two-year improvement made by districts. Palwal district from Faridabad division ranked at the top with a notable percentage point increase in its score, followed by Karnal, and Kurukshetra. The significant progress seen in Palwal district serves as a compelling example of successful interventions, indicating replicable strategies for improving healthcare delivery in similarly challenged/ underperforming areas. Overall, half of the districts demonstrated improvement

in HSUI score, in the backdrop of baseline performance. Remaining districts experienced declines in health service utilization, notably from Ambala, Karnal, Rohtak, and Faridabad Division. This underscores that half of the districts in Haryana have substantial scope to improve their health service utilization. Ranking position improved in about one-third of the districts, while it declined in more than half of them. The analysis showed only Panchkula, and Rewari districts maintained their base-year rankings.

The study finding highlights significant maternal health challenges in specific divisions of Haryana, namely Ambala (Kurukshetra district), Hisar (Fatehabad and Hisar district), and Rohtak (Bhiwani, Rohtak, and Charkhi Dadri district), where high maternal mortality ratio is concerning issue. Matrix analysis reveals Ambala and Panchkula have a high MHSU and a low MMR, which is generally considered an ideal scenario as the women effectively utilizing the healthcare services, resulting in favorable maternal health outcomes. Sonipat and Nuh exhibited low MHSU with a low MMR, indicating potential barriers to accessing maternal health service utilization despite favorable outcomes. On the other hand, Rohtak district call for a dire need to monitor as district displayed a paradox of 'High MHSU' and 'High MMR', reveals that merely increasing maternal health service utilization is insufficient to attain the health goals. The findings strongly advocate for delivering high-quality services and targeted intervention to reduce MMR.

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## Appendix

Table 1 List of Indicators included in the Healthcare Service Utilization Index

| Domain               | Indicators' Name                         | Calculation Methodology   |
|----------------------|--|---|
| I. Pre-Natal         | ANC1                                     | $\frac{\text{Total no. of 1st trimester ANC Registration}}{\text{Total ANC Registration}} * 100$                                    |
|                      | ANC 4                                    | $\frac{\text{Total no. of PW received 4ANC checkup}}{\text{Total ANC Registration}} * 100$  |
|                      | TT2+Booster                              | $\frac{\text{Total no. of PW received TT2 + Booster}}{\text{Total ANC Registration}} * 100$   |
| II. Delivery care    | Institutional Delivery                   | $\frac{\text{Total no. of Institutional Delivery}}{\text{Total no. of Reported Delivery}} * 100$                                    |
|                      | C-section Delivery                       | $\frac{\text{Total no. of C – section Delivery}}{\text{Total no. of Institutional Delivery}} * 100$                                 |
|                      | SBA attended HD                          | $\frac{\text{Total no. of home delivery attended by SBA}}{\text{Total Reported Home}} * 100$  |
| III. Post Natal      | 48 Hours stay at facility                | $\frac{\text{Total no. of women stayed 48 hr after delivery}}{\text{Total Institutional Delivery}} * 100$                           |
| IV. Reproductive     | Post-Partum Sterilization                | $\frac{\text{Total no. women accepted PPIUCD after delivery}}{\text{Total Institutional Delivery}} * 100$                           |
| V. Neo Natal         | Sex Ratio                                | $\frac{\text{Total no. of female live births}}{\text{Total no. of male live births}} * 1000$  |
|                      | OPV0 (Birth Dose)                        | $\frac{\text{Total no. of newborn received OPV0 dose}}{\text{Total Reported Live birth}} * 100$                                     |
| VI. Patient services | IPD to OPD                               | $\frac{\text{Total number of IPD}}{\text{Total number of OPD}} * 100$   |
|                      | Bed Occupancy Rate                       | $\frac{\text{Total no. of Impatient head count} * 100}{\text{Total no. of functional beds} * \text{no. of days in financial year}}$ |
| HSU Index            | Comprises of all 12 indicators           |   |
| MHSU Index           | Comprises of 8 indicators (Domain I -IV) |   |

Table 2 Composite Index of Health Service Utilization in the Districts of Haryana, India

| Districts    | ANC<br>1 | ANC<br>4 | TT2+B<br>P | ID at<br>P | SBAHD  | C-sec   | 48 hr<br>stay | PPIUCD  | SR      | OPV0    | IPD<br>/OPD | BOR     | HSUI    |
|--------------|----------|----------|------------|------------|--------|---------|---------------|---------|---------|---------|-------------|---------|---------|
| Panchkula    | 0.34249  | 0.06687  | 0.82300    | 1.00000    | 0.0426 | 0.84018 | 0.93384       | 0.85598 | 0.99617 | 0.30137 | 0.35584     | 1.00000 | 0.62986 |
| Kurukshetra  | 0.92527  | 0.58244  | 0.63567    | 0.09464    | 0.5714 | 0.33903 | 0.98628       | 0.27303 | 1.00000 | 1.00000 | 0.20803     | 0.80346 | 0.61827 |
| Sirsa        | 1.00000  | 0.64829  | 0.92360    | 0.52857    | 0.15   | 0.56264 | 0.36695       | 0.84149 | 0.72893 | 0.92689 | 0.00000     | 0.42217 | 0.59163 |
| Ambala       | 0.66703  | 0.63936  | 0.92088    | 0.75969    | 0      | 0.79448 | 0.46345       | 0.62086 | 0.41295 | 0.44088 | 0.09124     | 0.73808 | 0.54574 |
| Karnal       | 0.79158  | 1.00000  | 0.77216    | 0.64337    | 0      | 0.61296 | 0.55414       | 0.25932 | 0.33448 | 0.49757 | 0.33394     | 0.58503 | 0.53204 |
| Kaithal      | 0.94286  | 0.45712  | 0.84666    | 0.29413    | 0.0476 | 0.37521 | 1.00000       | 0.55914 | 0.57530 | 0.66393 | 0.25912     | 0.29114 | 0.52602 |
| YN*          | 0.68645  | 0.36958  | 0.56580    | 0.39464    | 0      | 1.00000 | 0.53849       | 1.00000 | 0.37886 | 0.42943 | 0.22445     | 0.71735 | 0.52542 |
| Palwal       | 0.46740  | 0.66309  | 0.70310    | 0.60281    | 0.7012 | 0.25058 | 0.29175       | 0.22114 | 0.45997 | 0.44655 | 1.00000     | 0.48942 | 0.52475 |
| Jhajjar      | 0.76154  | 0.41169  | 0.57640    | 0.45255    | 1      | 0.36501 | 0.30967       | 0.85624 | 0.50132 | 0.59949 | 0.04745     | 0.20950 | 0.50757 |
| Fatehabad    | 0.96081  | 0.53139  | 0.68706    | 0.26582    | 0.5    | 0.66261 | 0.61756       | 0.21843 | 0.56579 | 0.35030 | 0.27372     | 0.39237 | 0.50215 |
| MG*          | 0.67656  | 0.70444  | 0.77243    | 0.79260    | 0      | 0.77244 | 0.29369       | 0.31677 | 0.00502 | 0.39577 | 0.71168     | 0.31850 | 0.47999 |
| Rohtak       | 0.43736  | 0.77463  | 0.89913    | 0.80867    | 0.097  | 0.73298 | 0.54300       | 0.32829 | 0.26697 | 0.43024 | 0.12956     | 0.11505 | 0.46357 |
| Hisar        | 0.79231  | 0.42266  | 0.69222    | 0.29745    | 0.1666 | 0.60671 | 0.36792       | 0.23370 | 0.53910 | 0.80403 | 0.42336     | 0.20115 | 0.46227 |
| Sonapat      | 0.77692  | 0.72716  | 1.00000    | 0.62245    | 0      | 0.35054 | 0.50266       | 0.33644 | 0.00000 | 0.70662 | 0.18613     | 0.19438 | 0.45028 |
| Bhiwani      | 0.70330  | 0.41118  | 0.71071    | 0.05536    | 0.1562 | 0.23150 | 0.52590       | 0.72619 | 0.44848 | 0.48091 | 0.38321     | 0.45745 | 0.44087 |
| Jind         | 0.70000  | 0.42394  | 0.76781    | 0.28010    | 0.3418 | 0.29201 | 0.16024       | 0.49042 | 0.46235 | 0.79442 | 0.01277     | 0.43456 | 0.43004 |
| Charki Dadri | 0.56777  | 0.35758  | 0.79092    | 0.23214    | 0.5    | 0.00000 | 0.00226       | 0.73085 | 0.69683 | 0.73299 | 0.19891     | 0.33305 | 0.42861 |
| Rewari       | 0.70220  | 0.48647  | 0.72974    | 0.00000    | 0.0952 | 0.42946 | 0.58641       | 0.30823 | 0.37292 | 0.58399 | 0.26460     | 0.44708 | 0.41719 |
| Gurugram     | 0.22491  | 0.07223  | 0.29636    | 0.19337    | 0.3944 | 0.42354 | 0.17363       | 0.62060 | 0.26711 | 0.52267 | 0.22628     | 0.43110 | 0.32052 |
| Panipat      | 0.35788  | 0.11843  | 0.48641    | 0.65408    | 0.118  | 0.16343 | 0.03695       | 0.55771 | 0.08719 | 0.50208 | 0.39781     | 0.08711 | 0.29726 |
| Faridabad    | 0.00000  | 0.00000  | 0.51740    | 0.21403    | 0.177  | 0.29431 | 0.24480       | 0.22878 | 0.17041 | 0.36129 | 0.13686     | 0.55868 | 0.24196 |
| Nuh          | 0.16337  | 0.07938  | 0.00000    | 0.64719    | 0.0954 | 0.13219 | 0.00000       | 0.00000 | 0.57094 | 0.00000 | 0.87956     | 0.00000 | 0.21400 |

\*MG- Mahendragarh; YN- Yamunanagar

**Table 3** Rank of Districts on Each Targeted Indicators based on Composite Index value: 2021-22

| Districts    | ANC<br>1 | ANC<br>4 | TT2+B | ID at<br>P | SBA<br>HD | C-<br>sec | 48 hr<br>stay | PPIU<br>CD | SR | OP<br>V0 | IPD<br>/OPD | BOR |
|--------------|----------|----------|-------|------------|-----------|-----------|---------------|------------|----|----------|-------------|-----|
| Panchkula    | 19       | 21       | 6     | 1          | 17        | 2         | 3             | 3          | 2  | 21       | 7           | 1   |
| Kurukshetra  | 4        | 8        | 16    | 20         | 3         | 15        | 2             | 16         | 1  | 1        | 14          | 2   |
| Sirsa        | 1        | 6        | 2     | 10         | 11        | 9         | 13            | 4          | 3  | 2        | 22          | 12  |
| Ambala       | 14       | 7        | 3     | 4          | 18        | 3         | 11            | 7          | 13 | 15       | 19          | 3   |
| Karnal       | 6        | 1        | 9     | 7          | 18        | 7         | 6             | 17         | 16 | 12       | 8           | 5   |
| Kaithal      | 3        | 11       | 5     | 14         | 16        | 12        | 1             | 9          | 5  | 7        | 11          | 16  |
| Yamunanagar  | 12       | 16       | 18    | 12         | 18        | 1         | 8             | 1          | 14 | 17       | 13          | 4   |
| Palwal       | 16       | 5        | 13    | 9          | 2         | 18        | 16            | 20         | 11 | 14       | 1           | 7   |
| Jhajjar      | 8        | 14       | 17    | 11         | 1         | 13        | 14            | 2          | 9  | 8        | 20          | 17  |
| Fatehabad    | 2        | 9        | 15    | 16         | 4         | 6         | 4             | 21         | 7  | 20       | 9           | 13  |
| Mahendragarh | 13       | 4        | 8     | 3          | 18        | 4         | 15            | 14         | 21 | 18       | 3           | 15  |
| Rohtak       | 17       | 2        | 4     | 2          | 13        | 5         | 7             | 13         | 18 | 16       | 18          | 20  |
| Hisar        | 5        | 13       | 14    | 13         | 9         | 8         | 12            | 18         | 8  | 3        | 4           | 18  |
| Sonipat      | 7        | 3        | 1     | 8          | 18        | 14        | 10            | 12         | 22 | 6        | 16          | 19  |
| Bhiwani      | 9        | 15       | 12    | 21         | 10        | 19        | 9             | 6          | 12 | 13       | 6           | 8   |
| Jind         | 11       | 12       | 10    | 15         | 7         | 17        | 19            | 11         | 10 | 4        | 21          | 10  |
| Charki Dadri | 15       | 17       | 7     | 17         | 4         | 22        | 21            | 5          | 4  | 5        | 15          | 14  |
| Rewari       | 10       | 10       | 11    | 22         | 15        | 10        | 5             | 15         | 15 | 9        | 10          | 9   |
| Gurugram     | 20       | 20       | 21    | 19         | 6         | 11        | 18            | 8          | 17 | 10       | 12          | 11  |
| Panipat      | 18       | 18       | 20    | 5          | 12        | 20        | 20            | 10         | 20 | 11       | 5           | 21  |
| Faridabad    | 22       | 22       | 19    | 18         | 8         | 16        | 17            | 19         | 19 | 19       | 17          | 6   |
| Nuh          | 21       | 19       | 22    | 6          | 14        | 21        | 22            | 22         | 6  | 22       | 2           | 22  |

**Table 4** Maternal Health Service Utilization (MHSUI) and Maternal Mortality Ratio in Haryana's District: 2021-22

| Districts          | MHSUI          | MMR        |
|--------------------|----------------|------------|
| Ambala             | 0.60822        | 96         |
| Bhiwani            | 0.44004        | 287        |
| Charki Dadri       | 0.39769        | 295        |
| Faridabad          | 0.20954        | 225        |
| Fatehabad          | 0.55546        | 264        |
| Gurugram           | 0.29988        | 204        |
| Hisar              | 0.44745        | 249        |
| Jhajjar            | 0.59164        | 174        |
| Jind               | 0.43204        | 245        |
| Kaithal            | 0.56534        | 174        |
| Karnal             | 0.57919        | 233        |
| Kurukshetra        | 0.55097        | 262        |
| Mahendragarh       | 0.54112        | 118        |
| Nuh                | 0.13969        | 123        |
| Palwal             | 0.48763        | 233        |
| Panchkula          | 0.61312        | 62         |
| Panipat            | 0.31161        | 214        |
| Rewari             | 0.41722        | 201        |
| Rohtak             | 0.57763        | 342        |
| Sirsa              | 0.62769        | 148        |
| Sonipat            | 0.53952        | 188        |
| Yamunanagar        | 0.56937        | 172        |
| <b>Q2 (Low)</b>    | <b>0.54032</b> | <b>209</b> |
| <b>Q3 (Median)</b> | <b>0.57557</b> | <b>248</b> |
| <b>Q4 (High)</b>   | <b>0.57557</b> | <b>342</b> |

Source: Health Management Information System, 2021-22

MHSUI consists ANC 1, ANC 4, TT2+B, ID at P, SBA- HD, C-sec, 48Hr stay, PPIUCD