Health Performance of the Districts in India: An Empirical Analysis of NFHS-5 Data

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Abstract

Development and health, specifically child health, can be multi-dimensional and need to be investigated more deeply specially in a developing nation like India. This paper tries to find out the best and the worst performing districts using NFHS-5 district level percentage figures. First, some groups of variables named 'development', 'health' and 'health behavior' were created by taking similar types of variables relevant for the group and then the variables within each group were combined through principal component analysis. The districts were ranked according to the performance of each group and then these ranks were combined to get the overall rank to choose the best and the worst performing districts. We see that among top ten best performing districts, five are from Tamil Nadu, four are from Kerala and one is from Punjab, whereas most of the ten worst performing districts are from Jharkhand and Bihar and the rest are from UP, Assam and Meghalaya. Since another objective of the paper is to find the variables related to the child health scores, this variable was regressed on scores of other groups along with state dummies. Surprisingly all the variables relating to mothers like mother's health and health facilities, health behaviour, mother being not underweight and mother being not anemic turned out to have significant positive effect on child health. Thus, mothers are the key factor towards the good health of children, and it is the mothers who should be given maximum attention to.

Keywords and Phrases: NFHS-5, District Level Data, Principal Component Analysis, Child Health, India.

AMS Classification: 62D20, 62F07, 62J05.

1.   Introduction

District is the most suitable administrative unit for decentralized planning below the state level as it is supposed to possess the least heterogeneity and is small enough to undertake action plans to improve the quality of life of people in the district. National and State level planning often ignores the specific needs of the districts. Requirement of district level planning, thus, arises from the need to supplement the national and state plans with a more detailed examination of the potentials and resources at the district level. Such planning would help in making investment decisions geared to the needs of each district.

Though for planning purpose one has to know only the backward districts where more attention needs to be given, but sometime the lessons from the more developed districts would help one to choose the right path of action.

Thus, in this paper we wish to have a closer look at districts through the lens of development and health and for that we employ the unsupervised method of principal component analysis in order to compare the districts and linear regression to see which factors that influence the health of children in a district given the district parameters.

2.   Literature Review

Level of development is closely related with health parameters of any region. We find much evidence throughout the literature for the same.

Well (2007) states that health gaps among countries are closely related with income inequality, more specifically it reduced the variance of log GDP per worker by 9.9 percent. Sabia (2007) using data on adolescents ages 14–17 finds that a higher BMI is positively associated with academic performance for white females. But she also finds that this result does not generalize to non-white females or to males.

Bose and Saikia (2015-16) divided the districts of India into three groups - the districts which have already achieved, will achieve and might not be able to achieve the SDG for U5MR (Under 5 years mortality rate) and NMR (Neonatal Mortality Rate) by 2030.[1] Among the districts which have already achieved U5MR SDG, there are 15 districts from Tamil Nadu, 10 from Maharashtra, 8 from Karnataka and 7 from Kerala. On the other hand, it was seen that none of Uttar Pradesh's districts were expected to achieve U5MR SDG by 2030. Many districts of Jharkhand and Bihar were expected to achieve U5MR SDG by 2030.For NMR SDG Tamil Nadu has 9, Maharashtra 5, Karnataka 8, Kerala has 2 districts which have already achieved NMR SDG and remaining are expected to achieve by 2030, whereas none of Uttar Pradesh and Bihar districts are expected to achieve NMR SDG by 2030, and for Jharkhand only 1 has already achieved NMR SDG and 23 are expected to achieve by 2030 and 13 are not expected to achieve by 2030.

Ashish Awasthi et al (2016) defined what was termed as coverage gap index (CGI) of maternal and children health services and found its relationship with the socioeconomic development indicator (SEDI) in the districts of high focus states of India.

They defined CGI as

$$CGI = 100 - \frac{\frac{(ORT+ARI)}{2} + FP + \frac{(SBA+ANC)}{2} + \frac{(MSL+2DPT3+BCG)}{4}}{4}$$

where

ORT is the percentage of children getting oral rehydration therapy among the children who need ORT;

ARI is the percentage of children with suspected pneumonia/ARI who sought care from a health provider;

FP is the percentage of mothers using any of the family planning methods;

SBA is the Percentage of live births getting skilled birth attendance;

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[1]By the year 2030, SDG 3.1 aims to reduce maternal mortality ratio less than 70 per 100 000 live births, SDG 3.2 seeks to reduce neonatal mortality rate below 12 per 1000 live births, and under-5 mortality below 25 per 1000 live births.

ANC is the percentage of mothers receiving antenatal care;

MSL is the percentage of children getting measles vaccination;

DPT3 is the percentage of children getting all the three doses of DPT (diphtheria, pertussis and tetanus) vaccine; and

BCG is the percentage of children getting BCG vaccination.

Similarly, SEDI is the average of female literacy rate, urban population, main workforce, safe drinking water and electricity in the household, all expressed as a percentage. It was found that Uttarakhand was the best performing state whereas Bihar was the worst performing state in terms of SEDI.

NFHS-5 is rich with a vast amount of data especially of health of mothers and their children and it allows disaggregation up to rural-urban, states and even up to district level, which can help the policy makers identify locations for urgent intervention (Seth and Jain, 2021).

Government of India has recently launched in 2018, the Aspirational Districts Programme (2022). They aimed at transforming under-developed districts in India and thus chose more than hundred districts for this purpose which were most underdeveloped according to their criteria. It is a center-state collaboration project in which State level Nodal Officers & District Collectors have important roles to play. The districts were spread over 28 states. In order to monitor the progress of the districts,49 indicators were taken in the five identified thematic areas as Health & Nutrition, Education, Agriculture & Water Resources, Basic Infrastructure and Financial Inclusion & Skill Development with weights 30%, 30%, 20%, 10% and 10% respectively.

The aim of our analysis is also to identify the worst and best performing districts in the country taking almost all the districts in the country. In fact, we aim at ranking each district so that the performance of each district can be visualized.

3. The Methodology

In this study a total of 680 districts were selected for which readymade district fact sheet for key indicators were available from the National Family Health Survey-5. We have altogether taken 107 variables of which major ones used in the analysis will be described below.

All the analysis was done using IBM SPSS software.

We have first put the variables in one of the three groups relating to Development, Children health and Behaviour, leaving out other variables which do not match any of these three. Their respective subgroups were also made as follows.

A: Development:
    (i)   Female population aged 6 years and above who ever attended school (%),
    (ii)   Women with 10 or more years of schooling (%)
    (iii) Population living in households with electricity (%)
    (iv) Children aged 5 years who attended pre-primary school during the school year 2019-20(%)
    (v)   Women who are literate (%)
    (vi) Institutional births (%)
    (vii) Households with any member covered under a health insurance scheme (%)

B: Children's Good Health:
    (i) Children aged 6-59 months who are not anemic (>11.0 g/dl) (%)
    (ii) Non-Prevalence of diarrhea for two weeks preceding the survey (%)

(iii) Children under 5 years who are not stunted (weight-for-height) (%)
(iv) Children under 5 years who are not wasted (weight-for-height) (%)
(v) Children under 5 years who are neither underweight nor overweight (weight-for-age) (%)

C: Behaviour:
C1: Bad Health Behaviour-Individual:
(i) Women aged 15 years and above who use any kind of tobacco (%)
(ii) Women aged 15 years and above who consume alcohol (%)
(iii) Men aged 15 years and above who use any kind of tobacco (%)
(iv) Men aged 15 years and above who consume alcohol (%)

C2: Good Health Behaviour
C2.1 Household:
(i)Population living in households with an improved drinking-water source (%)
(ii) Population living in households that use an improved sanitation facility (%)
(iii) Households using clean fuel for cooking (%)
(iv) Households using iodized salt (%)

C.2.2 Women:
(i) Women aged 15-24 years who use hygienic methods of protection during their menstrual period (%)
(ii) Women who have ever undergone a screening test for cervical cancer (%)
(iii) Women who have ever undergone a breast examination for breast cancer (%)
(iv) Women who have ever undergone an oral cavity examination for oral (%)

C.2.3 Maternal and Child Health (Facilities):
(i) Mothers who had at least 4 antenatal care visits (%)
(ii) Mothers during pregnancy was protected against neonatal tetanus (%)
(iii) Mothers who consumed iron folic acid for 180 days or more when they were pregnant (%)
(iv) Mothers who received postnatal care from a doctor/nurse/LHV/ANM/ midwife/other health personnel within 2 days of delivery (%)
(v) Children who received postnatal care from a doctor/nurse/LHV/ANM/ midwife/other health personnel within 2 days of delivery (%)

C.2.4 Child Vaccination:
(i) Children aged 12-23 months fully vaccinated based on information from either vaccination card or mother's recall (%)
(ii) Children aged 12-23 months who have received BCG (%)
(iii) Children aged 12-23 months who have received 3 doses of polio vaccine (%)
(iv) Children aged 12-23 months who have received 3 doses of penta or DPT vaccine (%)
(v) Children aged 12-23 months who have received the first dose of measles-containing vaccine (%)
(v) Children aged 9-35 months who have received vitamin A dose in the last 6 months (%)

For each of the groups/subgroups, principal component analysis[2] was employed to calculate the first principal component loadings for each variable in the respective group and subgroup as required (See Appendix 1), also Bartlett's test was done to see the efficacy of PCA.

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[2]Principal components analysis (PCA) is an approach for reducing dimension of a set of variables. Suppose $X_1, X_2, \ldots, X_p$, are the p variables. The first principal component is a linear combination of $X_1, X_2, \ldots, X_p$ such that the sum of the square of the coefficients in the linear

The first principal component scores were calculated for all the districts for each such group/subgroup and then ranked. Thus, the district with the highest score was given rank one, the district with the next highest score was given rank 2 and so on. The subgroup C1 (Bad Health Behaviour-Individual) was ranked in the opposite manner to what we have described above. If a group had more than one subgroup, then the ranks of the subgroups in that group were added for each district to get a combined rank of the group. Finally, ranks of the three groups were added for each district to get the overall rank of the district.

Finally, we use PCA scores to run linear regression by taking Good Health Parameter-Children as dependent variable and all other PCA scores along with Percentage of Women who are not underweight, Percentage of women aged 15-49 who are not anemic as independent variables. In the regression analysis, we have put state dummies. For state dummies, all the large states were taken, along with a single dummy for all eight north east states (Assam, Mizoram, Meghalaya, Manipur, Mizoram, Arunachal Pradesh, Tripura, and Sikkim).

4. Results of our Analysis
4.1 Results for District Comparison

As already stated, we have first got the ranks of the districts for each of the groups. Under the third group "Behaviour", we have two subgroups and among these two subgroups, one of the groups have 4 further subgroups. The ranks of the four subgroups are added and then ranked this sum again to be added with the ranks of the other subgroup to get the rankings of the group "Behaviour". Also, note that the ranks of the subgroup "Bad Health Behaviour –Individual" was found in the reverse order to conform with the other groups/subgroups.

Here are top 10 best and worst performing districts for each of the groups.

Table 1: The Top 10 Best Performing Districts for Each of the Three Groups

A. Development			
State	**District**	**Rank**	**Principal Component Scores**
Kerala	Alappuzha	1	2.935
Kerala	Kozhikode	2	2.873
Kerala	Ernakulam	3	2.855
Kerala	Kottayam	4	2.854
Kerala	Pathanamthitta	5	2.790
Kerala	Thrissur	6	2.695
Kerala	Thiruvananthapuram	7	2.616
Kerala	Kannur	8	2.563
Tamil Nadu	Kannyakumari	9	2.455
Kerala	Kollam	10	2.381

relation is one and having maximum variance. The coefficients are the factor loadings. The second principal component is also a similar linear combination of $X_1, X_2, ..., X_p$ with additional property that it has zero correlation with the first principal component and so on. In our case we take only the first principal component. The value of the principal component for each observation is called principal component score. Thus, we have the same number of scores as the number of observations.

B. Good Health Parameter– Children			
State	**District**	**Rank**	**Principal Component Scores**
Manipur	Imphal West	1	2.516
Arunachal Pradesh	Lower dibang valley	2	2.343
Tamil Nadu	Kannyakumari	3	2.306
Arunachal Pradesh	Siang	4	2.163
Manipur	Bishnupur	5	2.153
Uttrakhand	Bageshwar	6	2.096
Kerala	Kannur	7	2.027
Tamil Nadu	Coimbatore	8	2.025
Manipur	Ukhrul	9	1.972
Arunachal Pradesh	Longding	10	1.963

C. Behaviour							
State	**District**	**Rank**	**Principal Component Scores**				
			C1	**C2.1**	**C2.2**	**C2.3**	**C2.4**
Tamil Nadu	Chennai	1	-1.327	1.736	2.922	1.772	1.275
Tamil Nadu	Kannyakumari	2	-1.302	1.399	2.892	1.313	1.518
Kerala	Kasaragod	3	-1.165	1.271	0.780	1.893	1.256
Tamil Nadu	Tirunelveli	4	-1.143	1.157	4.036	1.443	1.080
Tamil Nadu	Thoothukkudi	5	-0.939	1.161	0.889	1.571	1.547
Tamil Nadu	Coimbatore	6	-0.710	1.371	4.162	1.818	1.330
Punjab	SBS Nagar	7	-1.222	1.347	0.377	0.969	1.639
Kerala	Kozhikode	8	-1.349	1.305	0.710	1.576	0.867
Kerala	Ernakulam	9	-0.902	1.810	0.796	1.573	0.606
Tamil Nadu	Theni	10	-0.757	1.076	2.517	1.732	1.254

Table 2: The Top Ten Worst Performing Districts for Each of the Three Groups

A. Development			
State	**District**	**Rank**	**Principal Component Scores**
Uttar Pradesh	Shravasti	1	-3.196
Uttar Pradesh	Bahraich	2	-3.092
Uttar Pradesh	Balrampur	3	-2.729
Jharkhand	Pakur	4	-2.441
Uttar Pradesh	Budaun	5	-2.358
Uttar Pradesh	Sitapur	6	-2.203
Bihar	Kishanganj	7	-2.149
Madhya Pradesh	Alirajpur	8	-2.141
Haryana	Mewat	9	-2.139
Jharkhand	West Singhbhum	10	-2.112

(Good) Health Parameter – Children			
State	**District**	**Rank**	**Principal Component Scores**
Jharkhand	West Singhbhum	1	-3.007
Gujarat	Dahod	2	-2.893
Gujarat	Panchmahal	3	-2.880
Uttar Pradesh	Hardoi	4	-2.780
Bihar	Supaul	5	-2.552
Gujarat	Aravali	6	-2.501
Maharastra	Nandurbar	7	-2.431
Bihar	Arwal	8	-2.381
Gujarat	Chhota Udaipur	9	-2.344
Gujarat	Tapi	10	-2.213

C. Behaviour							
State	**District**	**Rank**	**Principal Component Scores**				
			C1	**C2.1**	**C2.2**	**C2.3**	**C2.4**
Meghalaya	West Jaintia Hills	1	1.786	-1.550	-1.087	-2.279	-1.510
Tripura	Unakoti	2	1.740	-1.465	-0.821	-1.951	-1.397
Meghalaya	West Khasi Hills	3	2.078	-1021	-0.848	-1.501	-1.811
Assam	West KarbiAnglong	4	2.848	-2.588	-0.505	-1.223	-2.384
Meghalaya	North Garo Hills	5	0.524	-1.938	-0.557	-2.284	-3.904
Assam	Cachar	6	0.632	-2.674	-0.797	-1.339	-0.868
Uttar Pradesh	Bahraich	7	0.421	-1.006	-0.740	-1.526	-2.030
Arunachal Pradesh	Longding	8	0.549	-2.093	-0.729	-1.481	-0.573
Jharkhand	Pakur	9	2.629	-1.562	-0.325	-1.452	-3.296
Jharkhand	Chatra	10	0.710	-1.912	-0.683	-1.271	-0.786

The combined final ranks were found by adding the ranks of the three groups and the results are as follows.

Table 3: The Top 10 Best and the Worst Performing Districts by Overall Ranking

The Top Ten Best Performing Districts		
State	**District**	**Rank**
Tamil Nadu	Kannyakumari	1
Kerala	Kasaragod	2
Tamil Nadu	Coimbatore	3
Kerala	Kozhikode	4
Punjab	SBS Nagar	5
Kerala	Ernkulam	6
Tamil Nadu	Thoothukkudi	7
Kerala	Kollam	8
Tamil Nadu	Thoothkukkudi	9
Tamil Nadu	Theni	10

The Top Ten Worst Performing Districts		
State	**District**	**Rank**
Jharkhand	Pakur	1
Uttar Pradesh	Bahraich	2
Bihar	Araria	3
Meghalaya	West Jayantia hills	4
Jharkhand	Sahibganj	5
Assam	West Karbi Anglong	6
Jharkhand	Dumka	7
Bihar	Sitamarhi	8
Jharkhand	Khunti	9
Bihar	Saharsa	10

The results clearly show that the top ten best performing districts were mainly from Kerala, Tamil Nadu and from high altitude regions. Kerala itself has nine districts out of ten in the "Development" group. It clearly shows that Kerala is the most developed state in India according to the criteria taken for our analysis. The group "Good Health Parameter – Children" contains the states mostly from high altitude regions. The top performing districts in the third group "Behaviour" are mainly from Tamil Nadu and Kerala. On the other hand, the worst performing districts are mainly from Uttar Pradesh and Jharkhand in the first group, Gujarat and Bihar in the second group and North-Eastern States in the third group. Though, one should not confer about the states' performance on the basis of top ten the best and the worst performing districts, but it gives a hint that Uttar Pradesh and Bihar is known to be economically backward states in India. Health situation of children in some of the districts may be very worse in Gujarat and Jharkhand. Though, performance of the North-Eastern States is good on health parameters but not so good on "Behaviour".

If we see the overall performance, we have four districts in Kerala, five districts in Tamil Nadu and one district from Punjab occupying the top ten position. Among the top ten worst performing districts, we have four districts from Jharkhand, three districts from Bihar and one district each from Meghalaya, Assam, and Uttar Pradesh.

All the factor loadings are seen to be positive (See Appendix1). The Pearson correlation coefficients between the factor scores of the first principal components can also be seen from the Table 4. One can see that most of the pairs are significantly positively correlated except for Group3 which signifies "Bad Health Behaviour-Individual" and this is expected. Note that the factor scores are the variables, which represent the groups.

Table 4: Correlation between the first principal component scores of the seven Groups/Subgroups

	Group1	Group2	Group3	Group4	Group5	Group6	Group7
Group1	1	.581[**]	-.214[**]	.634[**]	.444[**]	.529[**]	.265[**]
Group2	.581[**]	1	.007	.442[**]	.366[**]	.201[**]	.038
Group3	-.214[**]	.007	1	-.335[**]	-.154[**]	-.375[**]	-.169[**]
Group4	.634[**]	.442[**]	-.335[**]	1	.431[**]	.450[**]	.178[**]
Group5	.444[**]	.366[**]	-.154[**]	.431[**]	1	.388[**]	.148[**]
Group6	.529[**]	.201[**]	-.375[**]	.450[**]	.388[**]	1	.616[**]
Group7	.265[**]	.038	-.169[**]	.178[**]	.148[**]	.616[**]	1

**. Correlation is significant at the 0.01 level (2-tailed).

Group1: Development, Group2: Good health parameter- children, Group3: Bad health behaviour-individual, Group4: Good health behaviour – household, Group5: Good health behaviour – women, Group6: Maternal and child health facilities, Group7: Child vaccination.

4.2 The Results of Linear Regression Analysis

Let us now focus on the status of child health, with the goal of increasing the health status of children, we wish to find out the factors which affect the child's health using the district wise figures. For this, we run the multivariable linear regression taking dependent variable as the factor score of the first principal component of "good health parameter – children" and the independent variables as the factor scores of the first principal component of the other groups and the following two variables.

i. Percentage of Women who are not underweight (i.e., whose BMI is more than 18.5)
ii. Percentage of women aged 15-49 years who are not anemic.

Along with these we also took state dummies assuming that there is a common effect of the state to all the districts of the states. Thus, dummies for all the large states except Uttar Pradesh and a single dummy for all the eight north-eastern states together (Assam, Mizoram, Meghalaya, Manipur, Mizoram, Arunachal Pradesh, Tripura, and Sikkim) were taken. So, in total, we have 19 dummy variables. Uttar Pradesh has been taken as the base state for comparison.

The results are given in Table 5. Although, we have a lot of variables as regressors, the model is clearly free from high multicollinearity, maximum VIF being less than 6. The residuals are tested to be normally distributed. The goodness of fit of the model is quite high as the R squared and the adjusted R squared being 0.733 and 0.721 respectively with F value of 61.247 and p value less than 0.001.

Though the dummy variables carry no special importance of their own, we need to include these variables in order to eliminate the state effect. The value of the coefficient of dummy variable is interpreted as the overall fixed effect compared to the base category. The overall fixed effect has been found to be higher for the states Haryana, Odisha, Punjab, Rajasthan, Uttarakhand, and North-East states and lower for the states Gujarat, Karnataka, Maharashtra, Telangana, and Delhi compared to the state Uttar Pradesh.

Table 5: Result of Regression of the Status of Child Health on the Socio-Demographic Variables Along with State Dummies

Independent Variables	Coefficient	Sig.	VIF
(Constant)	-3.552	.000	
Development	.277	.000	4.054
Bad health behaviour- individual	.005	.890	3.219
Good health behaviour – household	.058	.160	3.773
Good health behaviour – women	.074	.046	3.107
Maternal and child health facilities	.121	.016	5.732
Child vaccination	-.051	.102	2.164
Women_not_underweight	.030	.000	3.991
Women_not_anemic	.023	.000	2.174
State=Andhra Pradesh	.065	.731	1.622

State=Bihar	-.297	.013	1.783
State=Gujarat	-.826	.000	2.039
State=Haryana	.697	.000	1.554
State= Himachal Pradesh	-.051	.780	1.373
State=Jharkhand	.158	.264	1.632
State=Karnataka	-.352	.006	1.664
State=Kerala	-.141	.501	1.667
State=Madhya Pradesh	.129	.256	2.020
State=Maharashtra	-1.053	.000	1.910
State=Odisha	.448	.002	2.165
State=Punjab	.728	.000	1.580
State=Rajasthan	.340	.004	1.558
State=Tamil Nadu	.101	.592	3.447
State=Telangana	-.362	.009	1.980
State=Uttarakhand	.468	.007	1.342
State=West Bengal	.071	.650	1.656
State=Delhi	-.448	.018	1.369
Dummy = North-East	.301	.020	5.044

The variables representing 'development', 'good health behaviour – women' and 'maternal and child health facilities' along with 'women who are not underweight' and 'women who are not anemic' have significant positive coefficients at five percent level implying the positive impact of these variables on child health. One can see from the result how profound the effect of mother on the child health of children is. All the variables for the mother such as 'good health behaviour', 'being not underweight', 'being not anemic' and 'good health facility', have significant positive coefficients. Thus, apart from development, mothers should be given good facilities so that their status of health improve and by turn children status of health is upgraded.

5. Discussions

As already mentioned in the literature review, the Government of India has launched the 'Transformation of Aspirational Districts' initiative in 2018. The aim of this initiative is to find out more than 100 districts which are at the bottom of the list in terms of development, health and other parameters some of which are common to the parameters taken by us and then give special efforts to uplift the districts (https://www.niti.gov.in/aspirational-districts-programme). The choice of districts taken by the Government will not be same as of our choice, because one of the criteria of choosing the districts is to see that no states are left from the list. Still, there are seven out of ten districts in our list which are found to be common to their list of 101 districts. These are Pakur, Sahibganj, Dumka and Khunti districts from Jharkhand; Araria and Sitamari districts from Bihar and Bahraich district from Uttar Pradesh.

India Today State of the State survey is done every year by Delhi-based premier research agency Marketing and Development Research Associates (MDRA). They take more than 100 parameters to get the best performing state in India. The best performing five states this year (India Today State of the State Survey, 2022) found by them are Tamil Nadu, Maharashtra, Gujarat and Delhi,

Kerala. Nine of the top ten districts that we have got from our data are all from the two districts Tamil Nadu and Kerala. The only one remaining district is from Punjab.

6. Conclusion

This study recognizes the districts which need more attention in terms of health and development but at the same time it offers to break down health into various other parameters that can be focused upon separately for the purpose of overall improvement. Given a worst performing district, one can easily identify some of the top performing districts with similar geographical patterns and learn how these districts went to the top positions and replicate the work done there for the worst performing district.

We saw that development and health are interrelated and aiming for higher development for a district might also bring better health for the people of that district as a bonus and vice versa. Since many districts from Tamil Nadu and Kerala are doing better than rest of the other districts in India, Tamil Nadu and Kerala can be flag bearers for bringing about district wise development in the country.

Finally, child's health is a very important area where works need to be done and this study shows how by focusing on factors like development, good health behaviour – women and maternal and child health facilities along with percentage of women who are not underweight and percentage of women aged 15-49 who are not anemic, it may be possible to improve the status of health of children. And from the list of the factors that are related to child health, mother's welfare comes in the forefront apart from development.

We have also seen that the altitude is somehow related with good health of children, because most of the top raking districts in health are from high altitude states. This is an area which needs further research.

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APPENDIX

Table A1: Factor Loadings for the First Principal Component for each group:

A. Development	Loadings
Women who are literate	.923
Women with 10 or more years of schooling	.866
Female population aged 6 years and above who ever attended school	.846
Population living in households with electricity	.529
Institutional births	.471
Children aged 5 years who attended pre-primary school during the school year 2019-20	.458
Households with any member covered under a health insurance scheme	.096
B. Children's Good Health	**Loadings**
Children under 5 neither underweight nor overweight (weight-for-height) (%)	.933
Children under 5 years who are not stunted (height-for-age) (%)	.739
Children under 5 years who are not wasted (weight-for-height) (%)	.733
Children aged 6-59 months who are not anemic (>11.0 g/dl) (%)	.613
Non-Prevalence of diarrhea of children for 2 weeks preceding the survey (%)	.473
C.1 Bad health behavior- Individual	**Loadings**
Women aged 15 yrs and above who consume alcohol	.790
Men aged 15 yrs and above who consume alcohol	.736
Women aged 15 yrs and above who use any kind of tobacco	.717
Men aged 15 yrs and above who use any kind of tobacco	.624
C.2.1 Good health behavior- Household	**Loadings**
Household using clean fuel for cooking	.866
pop living in hh with improved sanitation facilities	.746
pop living hh with an improved drinking water sources	.579
Household using iodized salt	.106
C.2.2 Good health behavior- Women	**Loadings**
Women who have ever undergone a screening test for cervical cancer	.924
Women who have ever undergone a breast examination for breast cancer	.881
Women who have ever undergone an oral cavity examination for oral cancer	.560
Women aged 15-24 years who use hygienic methods of protection during their menstrual period	.526
C.2.3 Maternal and Child health (Facilities)	**Loadings**
Children who received postnatal care from a doctor/nurse/LHV/ANM/ midwife/other health personnel within 2 days of delivery	.927
Mothers who received postnatal care from a doctor/nurse/LHV/ANM/ midwife/other health personnel within 2 days of delivery	.925
Mothers who had at least 4 antenatal care visits	.872
Mothers who consumed iron folic acid for 180 days or more when they were pregnant	.799
Mothers during pregnancy was protected against neonatal tetanus	.159
C.2.4 Child Vaccination	**Loadings**
Children aged 12-23 months fully vaccinated based on information from either vaccination card or mother's recall	.949
Children aged 12-23 months who have received 3 doses of Penta or DPT vaccine	.939
Children aged 12-23 months who have received the first dose of measles vaccine	.939
Children aged 12-23 months who have received 3 doses of polio vaccine	.929
Children aged 12-23 months who have received BCG	.789
Children aged 9-35 months who have received vitamin A dose in the last 6 months	.469