White Paper on Review of Health Challenges faced by Karnataka

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Abstract

Background - Karnataka is in midst of epidemiological transition and faces dual burden of diseases, in such situation it becomes more evident to have a Macro and Micro level understanding of the burden of diseases and develop multidimensional, multisectoral strategy to address the barriers in healthcare access, redefines the priorities and distribution of resources.

Objective - To look at the burden of diseases at state level, district level, and taluk level, compare within the levels and identify priority geography for each level

Methods – We undertook a three staged approach;

State level Analysis - The 2019 study by "The Indian State level Diseases Burden initiative" data visualisation tool was use to abstract data on Morbidity and Mortality across the Low ETL state of Madhya Pradesh, Lower Middle ETL state of Gujrat, Higher Middle ETL state of Karnataka, and High ETL state of Kerala and a comparative analysis of Mortality and Morbidity Patterns was undertaken

District Level Analysis - The data from National Family Health Survey (NFHS- 4) conducted in 2015-16 and NFHS- 5 conducted in 2018-19 was extracted from district level fact sheet and classified into three categories of Maternal and Child Health, Nutrition and Non-Communicable Disease. We conducted descriptive analysis at district analysis, to compare the change in burden of diseases patterns between NFHS 4 and 5, to help us understand the epidemiological trend.

Taluk Level Analysis - Data was abstracted from HMIS of Department of Health and Family Welfare, Government Karnataka. The methodology used by "The Indian State level Diseases Burden initiative" was adopted. Data on taluka level health indicators was downloaded from state HMIS for month on month for one year (January to December 2019).

The Epidemiological Transition Ratio for each Taluk was obtained by dividing CMNNDs rate per 10,000 to NCDs and Injuries rate per 10,000. The Epidemiological Transition Level (ETL) was divided as per "State level Diseases Burden Initiative" into

- ETL ratio less than 0.30 - High ETL
- ETL ratio between 0.31- 0.40 – Higher Middle ETL
- ETL ratio between 0.41- 0.55 – Lower Middle ETL
- ETL ration above 0.55 – Low ETL

High ETL ratio indicate high burden of NCDs with decreasing burden of CMNNDs, whereas low ETL taluks indicate High burden of CMNNDs high burden of NCDs. Higher Middle ETL taluks indicate higher burden of NCDs and relatively declining

CMNNDs burden, Lower Middle ETL taluks indicate dual burden of NCDs and CMNNDs

Findings –

State level Analysis

- Karnataka is in midst of transformation on epidemiological level with burden of morbidity and mortality already shifted towards Non-Communicable Diseases and the Communicable Maternal Neonatal and Nutrition Diseases burden just following the NCDs
- This indicates more investments (human, infrastructure, medicine) to tackle the increasing burden on NCDs. The analysis of e-janma data undertaken by PAC also indicated that **between January to December 2020, the deaths reported due to COVID-19 were 22000, 4 times lesser than the deaths reported due to Heart Attacks and heart related conditions (108810) indicating Cardiovascular diseases being the largest factor causing deaths even during COVID-19 pandemic**
- Maternal and Child diseases and disorders are still a concern for majority of people, indicating the investments made through various schemes in Maternal and Child care should be sustained for the upcoming decade to have substantial decrease in disease burden due to CMNNDs

District Level Analysis

- District of Mysore, Shivamogga, Hassan, Udupi, Bangalore Urban, Chikmagalur, Dharwad, Bengaluru Rural, Gadag, Chitradurga are classified as High Epidemiological Transition level districts with declining burden of Maternal and Child Diseases, Increasing Burden of Non-Communicable Diseases
- Districts of Tumkur, Mandya, Chamarajanagar, Kodagu, Belgaum, Chikkaballapur, Dakshin Kannada, Kolar, Bijapur, Ramanagar, Uttar Kannada are classified as Moderate Epidemiological Transition level districts with dual burden of Maternal and Child disease and Non-Communicable Diseases
- Districts of Bidar, Yadgir, Haveri, Koppal, Raichur, Gulbarga, Bagalkot, Bellary, Davanagere are classified as Low Epidemiological Transition level districts with high burden of Maternal and Child disease and increase burden of Non-Communicable Diseases

Taluk Level Analysis

- The patterns of Diseases vary to a greater extend across Karnataka
- 28 taluks were classified as High ETL taluks wherein Non-Communicable Disease have substantially high burden
- 16 taluks were classified as Higher Middle ETL taluks wherein Non-Communicable Disease burden is increasing rapidly

- 23 taluks were classified as Lower Middle ETL taluks wherein Non-Communicable Disease burden is increasing whilst Communicable Disease and Maternal diseases burden is still substantial
- 105 taluks were classified as Low ETL taluks which face dual burden of Non-Communicable Disease and Communicable Disease and Maternal Diseases
- This estimates about 128 taluks in Karnataka wherein investment on control and prevention of Communicable, Maternal, Neonatal and Nutritional diseases has to be improved in terms of manpower, budget, drugs and equipment
- Also, 44 taluks need priority investment to tackle the increasing burden of NCDs wherein trained Manpower, Infrastructure and processes need to be suited for NCD Management

Karnataka is on the cross roads of transition of disease burden and this study re-iterates the need of sustained focus and investments to continue seeking improvement in Communicable, Maternal, Neonatal and Nutritional Diseases whilst becoming early mover to simultaneously invest in Prevention, Management and Control of Non-Communicable Disease

Introduction –

Access to Healthcare services is a basic human right, and the same has been never more highlighted as is during the COVID-19 pandemic. The First and Second wave of COVID-19 in India has opened the wormhole to the plethora of chronic issues faced by the health systems of the country(1–3). The effect is also seen globally with health systems across developed and developing world scrambling to find resources, medicines, equipment's to tackle the global pandemic(4). However with all the attention to tackle the increasing COVID-19 burden, the global agenda of tackling other high burden diseases like HIV, Diabetes, Alzheimer's have been on back seat form perspective of healthcare delivery, also the attention sought by COVID-19 from news and media has over shadowed the high burden diseases(5).

Karnataka a southern Indian State, has been experiencing similar effects of COVID-19 and has left State Government and leadership scrambling for healthcare resources. The Indian State level Diseases Burden initiative classifies Karnataka as *Higher Middle Epidemiological Transition Level State,* indicating the burden of Non Communicable Diseases (NCDs) is higher than the burden of Communicable, Maternal, Neonatal, and Nutritional Diseases (CMNNDs)(6). However, the NITI Aayog's Sustainable Development Goals Index 2019-20 also tags Karnataka as performer in the Maternal and Neonatal Diseases when compared to its Southern Peer State of Kerala and Tamil Nadu. The National Family Health Survey 5, has reported increase in burden of Nutritional Diseases, i.e. Mild to Severe Malnutrition among children below 5 years of age.

This indicates Karnataka is in midst of epidemiological transition and faces dual burden of diseases, in such situation it becomes more evident to have a Macro and Micro level understanding of the burden of diseases and develop multidimensional, multisectoral strategy to address the barriers in healthcare access, redefines the priorities and distribution of resources. This paper is thus designed with an objective to look at the burden of diseases at state level, district level, and taluk level, compare within the levels and identify priorities for each level.

State Level Analysis

The 2019 study by "The Indian State level Diseases Burden initiative" data visualisation tool(7) was use to abstract data on Morbidity and Mortality across the Low ETL state of Madhya Pradesh, Lower Middle ETL state of Gujrat, Higher Middle ETL state of Karnataka, and High ETL state of Kerala. The states were selected at convenience.

For Mortality estimates two indicators were used as follows;

- Percentage of Total Deaths attribute to a disease in 2019
- Percentage of Annual Death Change of a diseases from 1990 to 2019

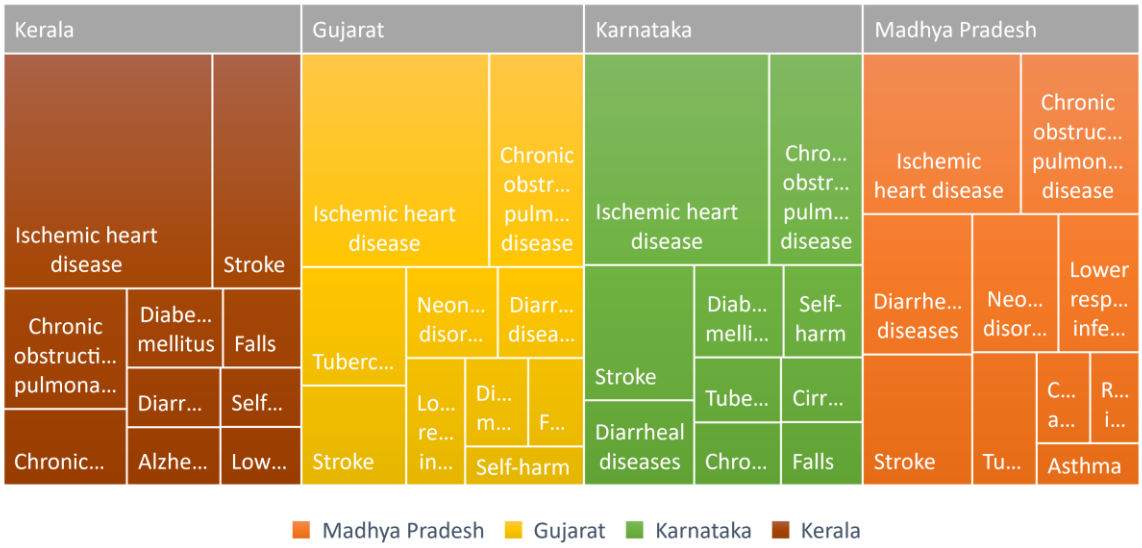
For Morbidity estimate single indicator was used a follow;

- Percentage of DALY's attributed to a disease in 2019 with confidence interval

1. Percentage of Total Deaths attribute to a disease in 2019

   Ischemic Heart Diseases were leading cause of Mortality across all the ETL categories. However, the percentage attributed to cause of deaths across NCDs, CMNNDs varies across ETL states (Annexure A). For Kerala, Karnataka (High and Higher Middle ETL) top three causes of death were NCDs (Ischemic Heart Disease, COPD and Stroke), while for Madhya Pradesh (Low ETL) and Gujrat (Lower Middle ETL) top two causes of deaths were NCDs (Ischemic Heart Disease, and COPD) and CMNNDs (Diarrheal Diseases and Tuberculosis)

Figure 1- Percentage of Total Deaths attribute to a disease in 2019



2. Percentage of Annual Death Change of a diseases from 1990 to 2019

The two decadal rate of disease mortality has shown increase in burden due to deaths related HIV infection, Alzheimer, Peripheral Artery Disease, Pancreatic Cancer (Figure 2), whereas burden of deaths due to Tetanus infection, Malaria, Leishmaniasis, have been on decline over past two decades.

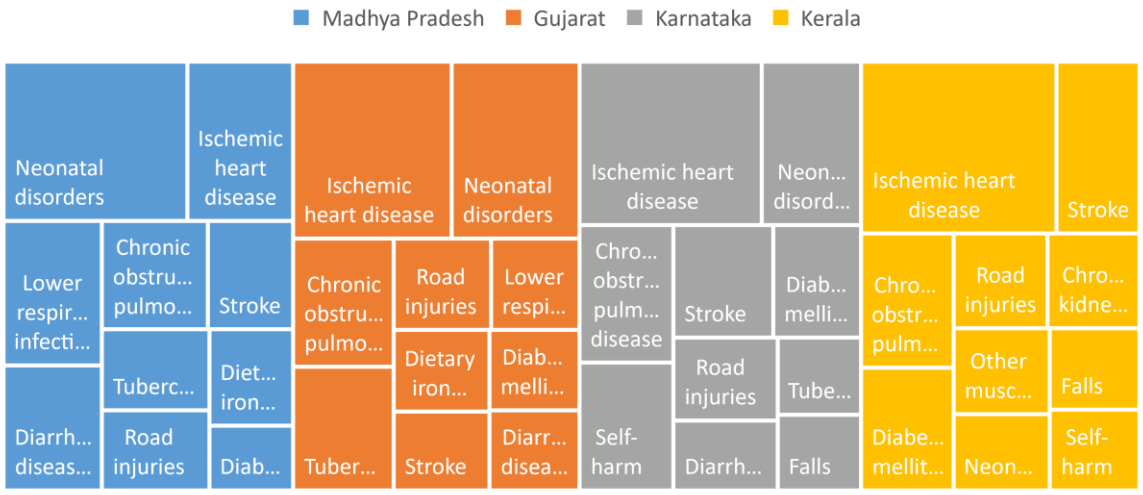
Figure 2- Top 5 diseases across ETL with increase in mortality

Figure 3- Top 5 diseases across ETL with decrase in Mortaity 1990-2019

3. Percentage of DALY's attributed to a disease in 2019

Across the four states with various ETL's the morbidity attributed to Ischemic Heart Diseases (IHD) is common, however for Madhya Pradesh which falls in Low ETL the burden of Neonatal disorders is higher than Ischemic Heart Diseases. The lower middle and higher middle ETL states of Gujrat and Karnataka show a shift of increased burden of DALYs due to IHD is much higher than burden due to Neonatal Disorders. For High ETL state of Kerala the burden of neo-natal disorders falls to number seven amongst top 10 causes.

Figure 4 - Percentage of DALY's attributed to a disease in 2019



Takeaway's from State Level Analysis

- Karnataka is in midst of transformation on epidemiological level with burden of morbidity and mortality already shifted towards Non-Communicable Diseases and the Communicable Maternal Neonatal and Nutrition Diseases burden just following the NCDs
- This indicates more investments (human, infrastructure, medicine) to tackle the increasing burden on NCDs. The analysis of e-janma data undertaken by PAC also indicated that **between January to December 2020, the deaths reported due to COVID-19 were 22000, 4 times lesser than the deaths reported due to Heart Attacks and heart related conditions (108810) indicating Cardiovascular diseases being the largest factor causing deaths even during COVID-19 pandemic**
- Maternal and Chid diseases and disorders are still a concern for majority of people, indicating the investments made through various schemes in Maternal and Child care should be sustained for the upcoming decade to have substantial decrease in disease burden due to CMNNDs

District Level Analysis

The data from National Family Health Survey (NFHS- 4) conducted in 2015-16 and NFHS- 5 conducted in 2018-19 was extracted from district level fact sheet and classified into three categories of Maternal and Child Health, Nutrition and Non-Communicable Disease. We included into outcome indicators for NFHS surveys, example - % institutional deliveries, % Men and Women currently taking medicine for Diabetes Type 2. Process Indicators like "% Women Screened for breast cancer" and Institutional Indicators like "Number of Pregnant Women Registered for ANC check-up". The outcome indicators were only included to avoid complexity in analysis. The list of indicators is presented in Table 1.

Table 1 - List of indicators selected from NFHS

Categories	**Indicators**
Maternal and child	Expenditure per delivery Public Facility
Maternal and child	Institutional Births (%)
Maternal and child	Fully Immunised Children (%)
Maternal and child	Burden of Diarrhoea Children
Maternal and child	Burden of Respiratory Infection Children
Nutrition	Mild to Moderate Stunting (0-5 years)
Nutrition	Mild to Moderate Wasting (0-5 years)
Nutrition	Severe Stunting (0-5 years)
Nutrition	Mild to Moderate Underweight (0-5 years)
Nutrition	Overweight Women (BMI >=25.0 kg/m2)
Nutrition	Anemia Women (<12.0 g/dl)
Non-Communicable Diseases	Blood sugar level - high (>140 mg/dl)
Non-Communicable Diseases	BP Slightly above normal (Systolic 140-159 mm of Hg and/or Diastolic 90-99 mm of Hg)

We conducted descriptive analysis at district analysis, to compare the change in burden of diseases patterns between NFHS 4 and 5, to help us understand the epidemiological trend.

A) Understanding the epidemiological Trend between NFHS 4 and 5

Maternal and Child Care

Under Institutional Delivery 29 out of thirty were showing improvement in number of pregnant women delivering in public or private healthcare institutions. Districts of Bellary (9.5%) , Raichur (9.2%), Chikkaballapur (7.4%) showed maximum improvement, whereas Gulbarga showed decrease in number institutional delivery by 2.6% in NFHS5 when compared to NFHS4.

Under Universal Immunisation all the 30 districts showed improvement in immunisation percentage. While Ramanagar reported 100% immunisation coverage, maximum improvement of 45-50% was seen in coverage for Shivamogga (96.1%), Mysore (97.2%), Chikmagalur (91%) when compare between NFHS4 and 5. Districts of Davanagere (79.4%) Bagalkot (78.6%)Bellary (71.5%) showed less than 5% improvement

Under Diarrhoeal and Respiratory Tract infections amongst infants and children below 5 years 9 districts out of 30 showed decrease in number of children with diarrhoeal and respiratory tract infection when asked to recount of any episode within las two weeks of survey date. Gublurga showed maximum increase in cases with 4.6% increase.

For Out of Pocket expenditure (OPE) per delivery in public health care institutes 10 districts showed decrease in OPE, with Bengaluru Urban showing highest drop of ₹4362 between NFHS4 and 5. 20 districts showed increase in OPE with Bellary showing highest increase of ₹9343 between NFHS4 and 5. Overall the state reported increase of ₹1453 in OPE per delivery from NFHS4 to 5.

District of Mysore, Shivamogga, Hassan, Udupi, Bangalore Urban, Chikmagalur, Dharwad, Bengaluru Rural, Gadag, Chitradurga are showing trend of decrease in burden of maternal and child diseases with decrease in Out of Pocket expenditure, improvement in Immunisation coverage, Institutional delivery and decrease in burden of diarrhoeal and respiratory disease

Districts of Tumkur, Mandya, Chamarajanagar, Kodagu, Belgaum, Chikkaballapur, Dakshin Kannada, Kolar, Bijapur Ramanagar, Uttar Kannada are showing plateau phase in burden of maternal and child diseases with indicators in NFHS4 and 5 not showing significant change

Districts of Bidar, Yadgir, Haveri, Koppal, Raichur, Gulbarga, Bagalkot, Bellary, Davanagere are showing increasing trend of maternal and child diseases, however when compared against the NFHS 4 and 5, these districts have also been showing maximum improvement in the indicators

Nutrition

For children aged 0 to 5 years, overall rate of Stunting, Wasting and Underweight decreased between NFHS4 and NFHS5. 22 districts showed improvement in Nutritional status of the children aged 0 to 5 years, with Gulbarga showing maximum improvement. 8 districts showed increase in burden of malnutrition among children aged 0 to 5 years, with Dakshin Kannada showing maximum increase in 7.5%. **The state documented plateau phase in child malnutrition between NFHS4 and 5.**

The districts of Gadag, Davanagere, Mandya, Hassan, Bengaluru Rural, Bijapur, Shivamogga, Chitradurga, Ramanagar, Bangalore Urban have shown increase in burden of obesity amongst women

The districts of Haveri, Koppal, Yadgir, Uttara Kannada, Gulbarga have shown decrease in burden of obesity amongst women

The burden of Malnutrition and Obesity was showing mixed patterns with Dakshin Kannada Showing increase in burden of malnutrition and obesity, Bengaluru Urban showing decrease in burden of malnutrition and obesity.

The burden of anaemia amongst women 14 to 49, showed a slight increase in burden across the state with 10 district showing decrease in anaemia prevalence, with Hassan showing maximum reduction of 10% across NFHS4 and 5. While Raichur showed maximum increase of 15.43% across NFHS4 and 5.

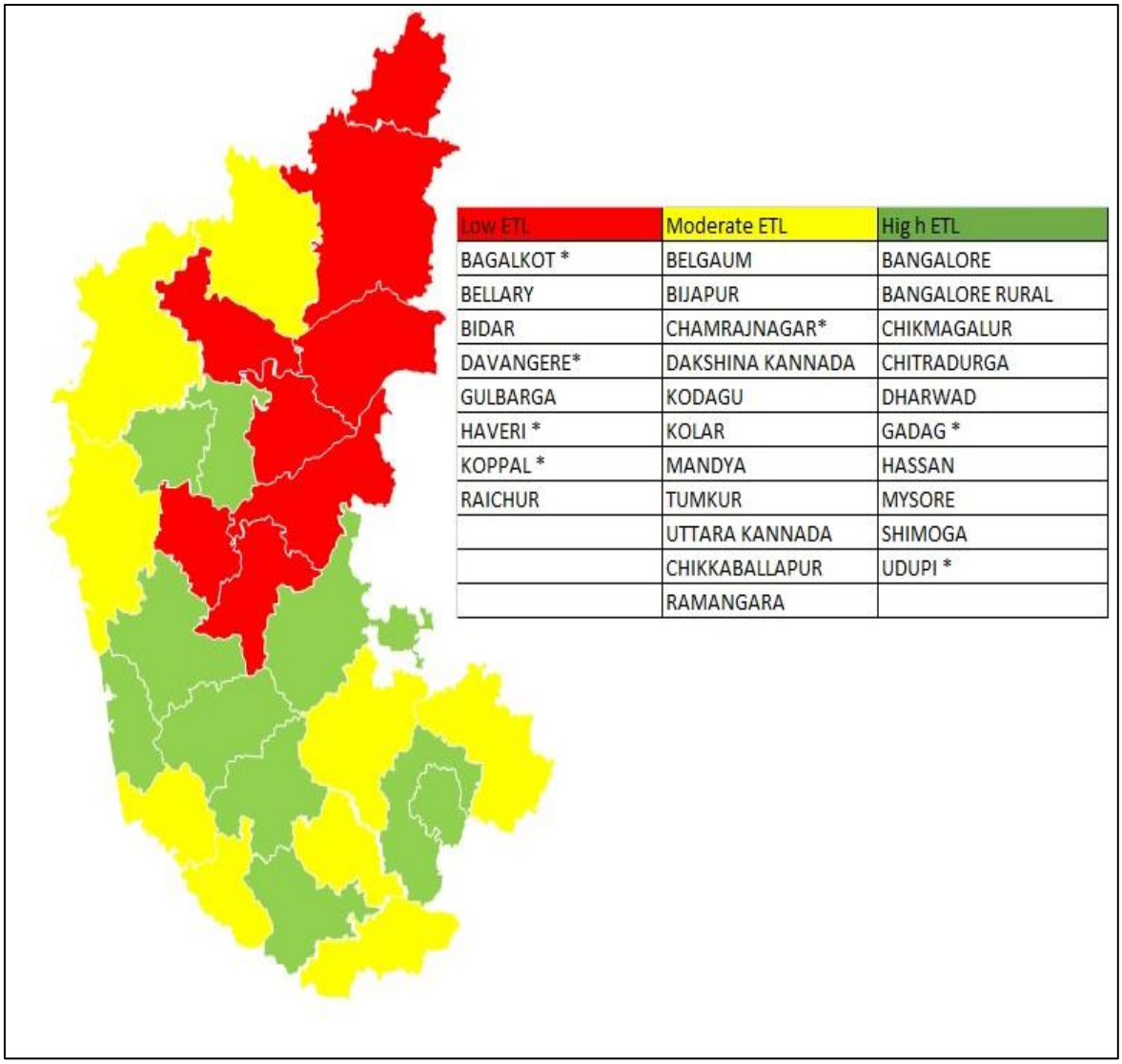
Non-Communicable Diseases

Diabetes and Hypertension were the two indicators examined for NCDs. The Karnataka state recorded average 10% increase in prevalence of NCDs. Bengaluru Urban showed maximum increase in prevalence with 17% increase in Diabetes, and 18% increase in Hypertension. While Raichur showed 0.9% increase in Diabetes and Hypertension prevalence, least amongst all districts of Karnataka.

Takeaway from District Analysis

- District of Mysore, Shivamogga, Hassan, Udupi, Bangalore Urban, Chikmagalur, Dharwad, Bengaluru Rural, Gadag, Chitradurga are classified as High Epidemiological Transition level districts with declining burden of Maternal and Child Diseases, Increasing Burden of Non-Communicable Diseases
- Districts of Tumkur, Mandya, Chamarajanagar, Kodagu, Belgaum, Chikkaballapur, Dakshin Kannada, Kolar, Bijapur, Ramanagar, Uttar Kannada are classified as Moderate Epidemiological Transition level districts with dual burden of Maternal and Child disease and Non-Communicable Diseases
- Districts of Bidar, Yadgir, Haveri, Koppal, Raichur, Gulbarga, Bagalkot, Bellary, Davanagere are classified as Low Epidemiological Transition level districts with high burden of Maternal and Child disease and increase burden of Non-Communicable Diseases

Note – Supplementary Material link includes the District wise analysis tables



Low ETL	Moderate ETL	Hig h ETL
BAGALKOT *	BELGAUM	BANGALORE
BELLARY	BIJAPUR	BANGALORE RURAL
BIDAR	CHAMRAJNAGAR*	CHIKMAGALUR
DAVANGERE*	DAKSHINA KANNADA	CHITRADURGA
GULBARGA	KODAGU	DHARWAD
HAVERI *	KOLAR	GADAG *
KOPPAL *	MANDYA	HASSAN
RAICHUR	TUMKUR	MYSORE
	UTTARA KANNADA	SHIMOGA
	CHIKKABALLAPUR	UDUPI *
	RAMANGARA	

Figure 1 - Epidemiological Transition Level District Wise for Karnataka

Taluk Level Analysis

For Taluk Level analysis we abstracted indicators from HMIS of Department of Health and Family Welfare, Government Karnataka. The methodology used by "The Indian State level Diseases Burden initiative" was adopted. Data on taluka level health indicators was downloaded from state HMIS for month on month for one year (January to December 2019). Indicators were sorted into Non-Communicable Diseases (NCDs), Injuries, Communicable, Maternal, Neonatal, and Nutritional Diseases (CMNNDs). The indicators for in-patient admission to hospital were only used as out patient will have large number of repeating cases for NCDs. The list of indicators is presented in Table 2. Taluka wise census population was obtained, for Maternal disease number of pregnant women registered for ANC care was taken as baseline. Rate of diseases and condition per 10,000 population was derived. Average rate per 10,000 population was derived combing all the stratified indicators in NCDs and Injuries as one group and CMNNDs are another group. The Epidemiological Transition Ratio for each Taluk was obtained by dividing CMNNDs rate per 10,000 to NCDs and Injuries rate per 10,000. The Epidemiological Transition Level (ETL) was divided as per "State level Diseases Burden Initiative" into

- ETL ratio less than 0.30 - High ETL
- ETL ratio between 0.31- 0.40 – Higher Middle ETL
- ETL ratio between 0.41- 0.55 – Lower Middle ETL
- ETL ration above 0.55 – Low ETL

The taluks with *High ETL ratio indicate high burden of NCDs with decreasing burden of CMNNDs, whereas low ETL taluks indicate High burden of CMNNDs high burden of NCDs. Higher Middle ETL taluks indicate higher burden of NCDs and relatively declining CMNNDs burden, Lower Middle ETL taluks indicate dual burden of NCDs and CMNNDs.*

The findings of the Taluk level analysis are divided for Districts classified into High, Moderate and Low ETL.

Table 2 - List of Indicators used for Taluk Level Analysis

NCD and Injuries	CMNNDs
Number of PW tested positive for GDM	New RTI/STI cases identified
Inpatient - Asthma, Chronic Obstructive Pulmonary Disease (COPD)	Number of DOTS cases completed successfully
Emergency - Trauma (accident, injury)	Inpatient - Malaria
Emergency - Burn	Inpatient - Dengue
Emergency - Acute Cardiac Emergencies	Inpatient - Typhoid
Emergency - CVA (Cerebrovascular Disease)	Inpatient - Tuberculosis
Emergency - Snake Bite	Inpatient - Pyrexia of unknown origin (PUO)
	Inpatient - Diarrhoea with dehydration
	Inpatient - Hepatitis
	Emergency - Obstetrics complications
	HIV - Number Positive

High ETL District

District of Mysore, Shivamogga, Hassan, Udupi, Bangalore Urban, Chikmagalur, Dharwad, Bengaluru Rural, Gadag, Chitradurga are classified as High Epidemiological Transition level districts with declining burden of Maternal and Child Diseases, Increasing Burden of Non-Communicable Diseases

High ETL 10 districts consisted of 58 taluks, the findings are as follows

- 6 (10%) Taluks of Bangalore South, Anekal, Navalgund, Sakaleshpura, Sagar, Bhadravathi were High ETL taluks
- 5 (8.62%) Taluks of Tharikere, Molakalumur, Shirahatti, Mundargi, Ron were Higher Middle ETL taluks
- 8 (13.7%) Taluks of Doddaballapur, Bangalore East, Bangalore North, Koppa, Chikmagalur, Gadag, Shikaripura Shimoga were Lower Middle ETL
- 38 (65%) Taluks of Nelamanagala, Devanahalli, Hosakote, BBMP, Shringeri, Mudigere, Narasimharajapura, Kadur, Hosadurga, Chitradurga, Hollelkere, Hiriyur, Challakere, Kundgol, Kalaghatgi, Dharwad, Hubli, Naragund, Holenarasipura, Alur, Arasikere, Channarayapatna, Arakalgud, Hassan, Belur, Periyapatna, Hunsur, Nanjangudu, Mysore, Krishnarajanagara, Heggadadevankote, Tirumakudal Narsipur, Hosanagar, Soraba, Thirthahalli, Kundapura, Karkal, Udupi were Low ETL
- Table 3 Presents the taluk with District name and ETL ratio and class for High ETL districts

Moderate ETL

Districts of Tumkur, Mandya, Chamarajanagar, Kodagu, Belgaum, Chikkaballapur, Dakshin Kannada, Kolar, Bijapur, Ramanagar, Uttar Kannada are classified as Moderate Epidemiological Transition level districts with dual burden of Maternal and Child disease and Non-Communicable Diseases

Moderate ETL 11 dsitricts consisted of 71 taluks, the findings are as follows;

- 8 (11%) Taluks of Pandavapura, Pavagada, Athani, Somwarpet, Sriranagapatna, Belgaum, Hukkeri, Srinivasapura were High ETL taluks
- 6 (8.4%) Taluks of Turuvekere, Soundatti, Bijapur, Yelandur, Ramadurga, Siddapura were Higher Middle ETL taluks
- 9 (12.6%) Taluks of Ramanagar, Kolar, Kollegala, Chikkaballapur, Yellapur, Kanapur, Malur, Gudibanda, Chikkodi were Lower Middle ETL taluks
- 47 (67%) Taluks of Gundlupet, Karvar, Sira, Indi, Tumkur, Chintamani, Chamaraja Nagar, Shidalaghatta, Muddebihal, Bailahongala, Gokak, Kunigal, Virajpet, Ankola, Koratagere, Bagepalli, Tipatur, Mandya, Gubbi, Mundgod, Chikkanayakanhalli, Magadi, Haliyal, Bangarpet, Maddur, B Bagewadi, Krishnarajpet, Bantwal, Sirsi, Madugiri, Supa, Malavalli, Madikeri, Kanakapur, Raibag, Bhatkal, Honnavara, Chennapattna, Nagamangala, Mangalore, Puttur, Sindagi, Gowribidanur, Mulbagal, Sullia, Belthangadi, Kumta were Low ETL taluks

- Table 4 Presents the taluk with District name and ETL ratio and class for Moderate ETL districts

Low ETL Districts

Districts of Bidar, Yadgir, Haveri, Koppal, Raichur, Gulbarga, Bagalkot, Bellary, Davanagere are classified as Low Epidemiological Transition level districts with high burden of Maternal and Child disease and increase burden of Non-Communicable Diseases

Low ETL 9 districts consisted of 45 taluks, the findings are as follows

- 14 (31%) Taluks of Hunagund, Mudhole, Bagalkot, Hagaribommanahalli, Siruguppa, Hospet, Sandur, Afzalpur, Aland, Ranibennur, Shiggaon, Koppal, Gangavati, Kushtagi were High ETL Taluks
- 5 (11%) Taluks of Jamakhandi, Badami, Jagalur, Yelburga, Shahpur were Higher Middle ETL Taluks
- 6 (13%) Taluks of Kudligi, Chincholi, Gulbarga, Bydagi, Yadgir, Surapur were Lower Middle ETL Taluks
- 20 (44%) Taluks of Bilagi, Bellary, Hadagali, Harrapanahalli, Honnali, Davangere, Harihara, Chennagiri, Jewargi, Sedam, Chittapur, Hirekerur, Hanagal, Haveri, Savanoor, Raichur, Lingsagur, Manvi, Sindhanoor, Devadurga were Low ETL Taluks
- Table 5 Presents the taluk with District name and ETL ratio and class for Low ETL districts

Takeaways from Taluk Wise Analysis

- The patterns of Diseases vary to a greater extend across Karnataka
- 28 taluks were classified as High ETL taluks wherein Non-Communicable Disease have substantially high burden
- 16 taluks were classified as Higher Middle ETL taluks wherein Non-Communicable Disease burden is increasing rapidly
- 23 taluks were classified as Lower Middle ETL taluks wherein Non-Communicable Disease burden is increasing whilst Communicable Disease and Maternal diseases burden is still substantial
- 105 taluks were classified as Low ETL taluks which face dual burden of Non-Communicable Disease and Communicable Disease and Maternal Diseases
- This estimates about 128 taluks in Karnataka wherein investment on control and prevention of Communicable, Maternal, Neonatal and Nutritional diseases has to be improved in terms of manpower, budget, drugs and equipment
- Also, 44 taluks need priority investment to tackle the increasing burden of NCDs wherein trained Manpower, Infrastructure and processes need to be suited for NCD Management

Discussion and Conclusion

The Karnataka State review of health challenges was attempted to understand what are diseases and conditions that sate needs to prioritise. We have use a similar and abridged version of methodology to "The Indian State level Diseases Burden initiative", however we have not include similar indicators across all the three tiers of analysis.

For the overview and comparison with other Indian state, most inferences were drawn from the Dandona et.al 2017 study titled "Nations within a nation: variations in epidemiological transition across the states of India, 1990–2016 in the Global Burden of Disease Study"

We used NFHS 4 and 5 data to show the transition between the two surveys across districts of Karnataka, however outcome indicators were only used to categorically enable us compare on objective indicators.

We used HMIS data month on month available from State HMIS for year 2019 (January to December) as the taluk wise completed data was available in the HMIS. We excluded the outpatient data like DM and HT OPD, Mental Health OPD, Haemoglobin Screening as the data would add to bias from repeated visits and diagnostics test would include negatives which would act as outlier indicator.

The analysis is at a systems level and has looked only at disease burden and not compared disease burden with health infrastructure, manpower of any other factors that influence health seeking behaviour. The impact of COVID-19 was not assessed as the data was 2019 and earlier.

To conclude, this paper is first of its kind to our knowledge to explore the Epidemiological transition in diseases for Karnataka State and understand the regional patterns of diseases.

Karnataka is on the cross roads of transition of disease burden and this study re-iterates the need of sustained focus and investments to continue seeking improvement in Communicable, Maternal, Neonatal and Nutritional Diseases whilst becoming early mover to simultaneously invest in Prevention, Management and Control of Non-Communicable Disease.

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Annexure

Table 3 - Classification of Taluks on ETL for High ETL District

Taluk	High ETL District	CNNMDs NCD Ratio	ETL Taluk Class
Doddaballapur	Bengaluru Rural	0.51	Lower Middle ETL
Nelamanagala	Bengaluru Rural	1.39	Low ETL
Devanahalli	Bengaluru Rural	1.40	Low ETL
Hosakote	Bengaluru Rural	1.48	Low ETL
Bangalore South	Bengaluru Urban	0.02	High ETL
Anekal	Bengaluru Urban	0.22	High ETL
Bangalore East	Bengaluru Urban	0.47	Lower Middle ETL
Bangalore North	Bengaluru Urban	0.52	Lower Middle ETL
BBMP	Bengaluru Urban	2.78	Low ETL
Tharikere	Chickmagalur	0.31	Higher Middle ETL
Koppa	Chickmagalur	0.41	Lower Middle ETL
Chickmagalur	Chickmagalur	0.55	Lower Middle ETL
Shringeri	Chickmagalur	0.57	Low ETL
Mudigere	Chickmagalur	2.26	Low ETL
Narasimharajapura	Chickmagalur	3.47	Low ETL
Kadur	Chickmagalur	5.51	Low ETL
Molakalumur	Chitradurga	0.34	Higher Middle ETL
Hosadurga	Chitradurga	0.67	Low ETL
Chitradurga	Chitradurga	0.82	Low ETL
Hollelkere	Chitradurga	0.88	Low ETL
Hiriyur	Chitradurga	1.52	Low ETL
Challakere	Chitradurga	1.79	Low ETL
Navalgund	Dharwad	0.08	High ETL
Kundgol	Dharwad	0.75	Low ETL
Kalaghatgi	Dharwad	1.64	Low ETL
Dharwad	Dharwad	1.74	Low ETL
Hubli	Dharwad	3.38	Low ETL
Shirahatti	Gadag	0.34	Higher Middle ETL
Mundargi	Gadag	0.35	Higher Middle ETL
Ron	Gadag	0.36	Higher Middle ETL
Gadag	Gadag	0.41	Lower Middle ETL
Naragund	Gadag	0.56	Low ETL
Sakaleshpura	Hassan	0.05	High ETL
Holenarasipura	Hassan	0.67	Low ETL
Alur	Hassan	1.04	Low ETL
Arasikere	Hassan	1.40	Low ETL
Channarayapatna	Hassan	1.42	Low ETL
Arakalgud	Hassan	1.87	Low ETL
Hassan	Hassan	2.20	Low ETL

Belur	Hassan	2.33	Low ETL
Periyapatna	Mysuru	0.63	Low ETL
Hunsur	Mysuru	0.63	Low ETL
Nanjangudu	Mysuru	0.79	Low ETL
Mysore	Mysuru	1.37	Low ETL
Krishnarajanagara	Mysuru	1.56	Low ETL
Heggadadevankote	Mysuru	1.69	Low ETL
Tirumakudal Narsipur	Mysuru	2.24	Low ETL
Sagar	Shivmogga	0.24	High ETL
Bhadravathi	Shivmogga	0.29	High ETL
Shikaripura	Shivmogga	0.47	Lower Middle ETL
Shimoga	Shivmogga	0.55	Lower Middle ETL
Hosanagar	Shivmogga	1.00	Low ETL
Soraba	Shivmogga	1.51	Low ETL
Thirthahalli	Shivmogga	1.93	Low ETL
Kundapura	Udupi	3.79	Low ETL
Karkal	Udupi	4.04	Low ETL
Udupi	Udupi	5.44	Low ETL

Table 4 - Classification of Taluks on ETL for Moderate ETL District

Taluk	Moderate ETL District	CNNMDs NCD Ratio	ETL Taluk Class
Pandavapura	Mandya	0.12	High ETL
Pavagada	Tumkuru	0.19	High ETL
Athani	Belgaum	0.25	High ETL
Somwarpet	Kodagu	0.27	High ETL
Sriranagapatna	Mandya	0.28	High ETL
Belgaum	Belgaum	0.30	High ETL
Hukkeri	Belgaum	0.30	High ETL
Srinivasapura	Kolar	0.30	High ETL
Turuvekere	Tumkuru	0.32	Higher Middle ETL
Soundatti	Belgaum	0.35	Higher Middle ETL
Bijapur	Bijapur	0.37	Higher Middle ETL
Yelandur	Chamaraja Nagar	0.37	Higher Middle ETL
Ramadurga	Belgaum	0.40	Higher Middle ETL
Siddapura	Uttara Kannada	0.40	Higher Middle ETL
Ramanagar	Ramnagara	0.41	Lower Middle ETL
Kolar	Kolar	0.41	Lower Middle ETL
Kollegala	Chamaraja Nagar	0.43	Lower Middle ETL
Chikkaballapur	Chikkaballapur	0.47	Lower Middle ETL
Yellapur	Uttara Kannada	0.47	Lower Middle ETL

Kanapur	Belgaum	0.47	Lower Middle ETL
Malur	Kolar	0.48	Lower Middle ETL
Gudibanda	Chikkaballapur	0.50	Lower Middle ETL
Chikkodi	Belgaum	0.52	Lower Middle ETL
Gundlupet	Chamaraja Nagar	0.57	Low ETL
Karvar	Uttara Kannada	0.59	Low ETL
Sira	Tumkuru	0.60	Low ETL
Indi	Bijapur	0.62	Low ETL
Tumkur	Tumkuru	0.62	Low ETL
Chintamani	Chikkaballapur	0.63	Low ETL
Chamaraja Nagar	Chamaraja Nagar	0.72	Low ETL
Shidalaghatta	Chikkaballapur	0.75	Low ETL
Muddebihal	Bijapur	0.77	Low ETL
Bailahongala	Belgaum	0.78	Low ETL
Gokak	Belgaum	0.78	Low ETL
Kunigal	Tumkuru	0.85	Low ETL
Virajpet	Kodagu	0.87	Low ETL
Ankola	Uttara Kannada	0.88	Low ETL
Koratagere	Tumkuru	0.89	Low ETL
Bagepalli	Chikkaballapur	0.91	Low ETL
Tipatur	Tumkuru	1.06	Low ETL
Mandya	Mandya	1.14	Low ETL
Gubbi	Tumkuru	1.15	Low ETL
Mundgod	Uttara Kannada	1.15	Low ETL
Chikkanayakanhalli	Tumkuru	1.29	Low ETL
Magadi	Ramnagara	1.38	Low ETL
Haliyal	Uttara Kannada	1.42	Low ETL
Bangarpet	Kolar	1.48	Low ETL
Maddur	Mandya	1.56	Low ETL
B Bagewadi	Bijapur	1.63	Low ETL
Krishnarajpet	Mandya	1.71	Low ETL
Bantwal	Dakshina Kannada	2.07	Low ETL
Sirsi	Uttara Kannada	2.31	Low ETL
Madugiri	Tumkuru	2.55	Low ETL
Supa	Uttara Kannada	2.58	Low ETL
Malavalli	Mandya	2.63	Low ETL
Madikeri	Kodagu	2.72	Low ETL
Kanakapur	Ramnagara	2.86	Low ETL
Raibag	Belgaum	3.03	Low ETL
Bhatkal	Uttara Kannada	3.13	Low ETL
Honnavara	Uttara Kannada	3.25	Low ETL
Chennapattna	Ramnagara	3.44	Low ETL
Nagamangala	Mandya	3.85	Low ETL
Mangalore	Dakshina Kannada	4.24	Low ETL

Puttur	Dakshina Kannada	4.46	Low ETL
Sindagi	Bijapur	6.27	Low ETL
Gowribidanur	Chikkaballapur	6.66	Low ETL
Mulbagal	Kolar	7.52	Low ETL
Sullia	Dakshina Kannada	7.98	Low ETL
Belthangadi	Dakshina Kannada	8.31	Low ETL
Kumta	Uttara Kannada	15.02	Low ETL

Table 5 - Classification of Taluks on ETL for Low ETL District

Taluk	Low ETL District	CNNMDs NCD Ratio	ETL Taluk Class
Hunagund	Bagalkot	0.03	High ETL
Mudhole	Bagalkot	0.05	High ETL
Bagalkot	Bagalkot	0.11	High ETL
Jamakhandi	Bagalkot	0.31	Higher Middle ETL
Badami	Bagalkot	0.38	Higher Middle ETL
Bilagi	Bagalkot	0.62	Low ETL
Hagaribommanahalli	Bellary	0.10	High ETL
Siruguppa	Bellary	0.11	High ETL
Hospet	Bellary	0.14	High ETL
Sandur	Bellary	0.18	High ETL
Kudligi	Bellary	0.51	Lower Middle ETL
Bellary	Bellary	0.86	Low ETL
Hadagali	Bellary	2.46	Low ETL
Jagalur	Davangere	0.40	Higher Middle ETL
Harrapanahalli	Davangere	0.56	Low ETL
Honnali	Davangere	0.61	Low ETL
Davangere	Davangere	1.02	Low ETL
Harihara	Davangere	1.52	Low ETL
Chennagiri	Davangere	2.88	Low ETL
Afzalpur	Gulbarga	0.01	High ETL
Aland	Gulbarga	0.19	High ETL
Chincholi	Gulbarga	0.44	Lower Middle ETL
Gulbarga	Gulbarga	0.50	Lower Middle ETL
Jewargi	Gulbarga	0.58	Low ETL
Sedam	Gulbarga	1.32	Low ETL
Chittapur	Gulbarga	4.33	Low ETL
Ranibennur	Haveri	0.26	High ETL
Shiggaon	Haveri	0.27	High ETL
Bydagi	Haveri	0.41	Lower Middle ETL

Hirekerur	Haveri	0.58	Low ETL
Hanagal	Haveri	0.69	Low ETL
Haveri	Haveri	0.83	Low ETL
Savanoor	Haveri	1.05	Low ETL
Koppal	Koppal	0.07	High ETL
Gangavati	Koppal	0.17	High ETL
Kushtagi	Koppal	0.27	High ETL
Yelburga	Koppal	0.40	Higher Middle ETL
Raichur	Raichur	0.67	Low ETL
Lingsagur	Raichur	0.91	Low ETL
Manvi	Raichur	0.95	Low ETL
Sindhanoor	Raichur	1.04	Low ETL
Devadurga	Raichur	1.34	Low ETL