INDEX COMPUTATION AND RANKING

INTRODUCTION:

A composite index helps to group a number of indicators falling under different dimensions in a standardized way. It is a useful statistical measure to assess overall performance of a region over a period of time. A total of 48 indicators that fall under three broad dimensions were used to calculate the overall composite index. The three broad dimensions are:

  I.   Results for Children
  II.   Human Resource
  III.   ICPS Structure and Functionality

All the districts' relative positions are identified under four indices that will be computed from the indicators. The four indices are:

  a. Index - Results for Children
  b. Index - Human Resource
  c. Index - ICPS Structure and Functionality
  d. Index – Overall

In this system, we are ranking all the districts and also major 5 institutions in the districts (numerically, without colour coding) – District Child Protection Unit (DCPU), Child Welfare Committee (CWC), Juvenile Justice Board (JJB), Special Juvenile Police Unit (SJPU) and Probationary Officer (PO).

INDEX CALCULATION:

Indicators may be of two types in this system – positive and negative. As a first step towards index re-computation, the following steps will be carried out –

Step 1: Identify the positive and negative indicators in the identified indicators.
Step 2: Calculation of index for both positive and negative indicators.
Step 3: Normalisation of the index of each indicator.
Step 4: Ranking of districts and institutions.

Index Calculation for Positive Indicators –

Let X_{id} represent the index value of the ith indicator in the dth district of a state (i = 1,2,3,…..48 ; d = 1,2,3,…..32). Index has been calculated for 32 districts in Tamil Nadu. If an indicator Xi is positively associated with child protection, like Percentage of children (children in need of care and protection or children in conflict with law) for whom Individual Care Plan exists, index is computed using the following formula: -

$$\text{Index Value } X_{id} = \frac{X_{id} - \text{Min}(X_{id})}{\text{Max}(X_{id}) - \text{Min}(X_{id})}$$

For example, if the maximum value of ICP for CNCP 350 in a month, the minimum value is 0 and the value of that particular indicator for Chennai district is 90, then it will be calculated as -

$$\text{Index Value } X_{id} = 90 - 0/350\text{-}90 = 90/260 = 0.34$$

Assumptions:
- If all data points of an indicator for a particular time period are less than 100 and are same, then the normalized value of all data points is 0.
- If all data points of an indicator for a particular time period are 100 and same, then the normalized value of all data points is 1.
- If all data points of an indicator for a particular time period are less than 100 and are not same, then the normalized value of each data point is calculated.

Index Calculation for Negative Indicators –

If an indicator X_{id} is negatively associated with child protection, like children (children in conflict with law) whose cases are pending for more than 120 days, index is computed using the following formula:

$$\text{Index Value } X_{id} = \frac{\text{Max}(X_{id}) - X_{id}}{\text{Max}(X_{id}) - \text{Min}(X_{id})}$$

For example, if the maximum value of Pending cases of CCL is 50 in a month, the minimum value is 0 and the value of that particular indicator for Chennai district is 30, then it will be calculated as -

$$\text{Index Value } X_{id} = 50 - 30/50\text{-}0 = 20/50 = 0.4$$

Assumptions:
- If all data points of an indicator for a particular time period are greater than 0 (> 0) and are same, then the normalized value of all data points is 0.
- If all data points of an indicator for a particular time period are 0 and same, then the normalized value of all data points is 1.
- If all data points of an indicator for a particular time period are * less than 100 and are not same, then the normalized value of each data point is calculated.

Normalising Index –
The normalized index values of each of the n indicators for a district are then combined by using simple average to arrive at dimension specific composite index for each district as follows:

$$\text{Dimension specific Composite Index for } d^{th} \text{ district} = \frac{\sum\limits_{i}^{n} X_{id}}{n}$$

$${}^{*}d = 1, 2, 3...32;\ 27 \text{ districts}$$
$$i = 1, 2, 3...n;\ n \text{ indicators}$$

In this normalisation process, the total number of indicators will have the count of every indicator that are categorised as performance.

To calculate the overall composite index across three dimensions, the following formula is referred:

$$\text{Overall Index} = \frac{\text{Index - Results for Children + Index - Human Resource +}}{3}$$
$$\frac{\text{Index - ICPS Structure and Functionality}}{3}$$

Composite index ranges from 0 to 1. Values nearing to 0 implies poor performance while values nearing to 1 implies better performance.

RANKING CALCULATION:

The ranking will be represented numerically, for districts and specific institutions. All districts will be ranked from 1 to 32. In the list of districts sorted in ascending order of their score, if two districts score 10 each and have a rank of 5, then the subsequent district would have a rank of 7 (no district would have a rank of 6). An illustration of the above ranking method (for 8 districts only) is given below:

Human Resource		
Area	**Score**	**Rank**
Erode	0.8	1
Cuddalore	0.63	2
Dharmapuri	0.63	2
Ariyalur	0.55	4
Chennai	0.51	5
Coimbatore	0.43	6
Kancheepuram	0.43	6
Dindigul	0.31	8