AN ANALYTICAL STUDY OF SOCIO – ECONOMIC FACTORS INFLUENCING THE LEVEL OF MALNUTRITION IN SELECTED STATES OF INDIA

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Abstract

Human Development is closely related to health. Malnourished children are more vulnerable to infection and if not treated on time and may fall into the vicious cycle of Malnutritional-infection-Malnutrition. The primary objective of this research is to determine whether economic growth affects nutritional status or not and to understand the effect of other socio-economic factors on Malnutrition. The study has been conducted for three states namely Gujarat, Sikkim, and Bihar. Sikkim had the highest per capita Net State Domestic Product (NSDP) while Bihar had the Lowest per capita NSDP. Researchers have compared Gujarat's nutritional situation with Sikkim and Bihar using data from NFHS-4 & 5 reports. Malnutrition Index, Household Condition Index, and Women's Condition Index have been prepared and efforts have been made to measure the socio-economic factors that influence the level of Malnutrition. The results show that despite having the lowest per capita NSDP, Bihar's nutritional status is far better than Gujarat's Nutritional status. Gujarat's nutritional status is worsened in NFHS -5 as compared to NFHS-4 despite a stable Household Condition Index. This may be because of deprivation in Women Condition Index. While, a different situation in Sikkim's case is observed because despite decreasing the Household Condition and Women Condition Index, it has improved its nutritional status in NFHS- 5 compared to NFHS-4.

Keywords: Malnutrition Index, Household Condition Index, Women Condition Index, Socio-Economic Impact, NFHS

JEL Code: I12, J13, J15

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Introduction:

Malnutrition refers to a condition in which the body does not receive the required nutrients, or where those nutrients are in excess. Formally, Malnutrition can be classified into two categories -Undernutrition and Overweight. Undernutrition is further divided into three parts-stunting, wasting, and underweight. Stunting refers to low height for age. Wasting refers to low weight for height and underweight refers to low weight for age. Malnutrition is one of the major global health burdens. It mainly affects the young population especially, those who are under 5 years of age. The invisible nature of Malnutrition makes it the biggest threat to children's health (Adebisi et al., 2019). Children who are Malnourished are more vulnerable to infections, and if not treated on time, fall into the vicious cycle of Malnutrition-infections-Malnutrition. Human development is closely linked to health. Optimal productivity and well-being are the product of good health. In 2017, Indian Council of Medical Research (ICMR) estimated that Malnutrition was the strongest risk factor for death in children under the age of five in every State of India (UNDP (United Nations Development Programme), 2022).

As per the Global Hunger Index (GHI) India was ranked 94th out of 107 countries in 2020 which has dropped to 101st place among 116 countries in 2021. Based on the GHI score of 27.5 out of 50 in 2021, India falls under the serious category (Grebmer et al., 2021). According to Human Development Report (HDR) 2021-22, India's rank on the Human Development Index (HDI) has slipped from 130 in 2020 to 132 in 2022. According to National Family Health Survey (NFHS-5), the proportion of severely wasted and overweight children in India are increased by 0.3% and 1.3% compared to NFHS-4 while, the proportion of stunted, wasted, and underweight children decreased by 2.9%, 1.7% and1.3% respectively as compared to NFHS-4. If we talk about Gujarat, according to NFHS-5, the percentage of stunting, severely wasted, underweight, and overweight have increased to 0.5%, 1.1%, 0.4%, and 2% respectively, as compared to NFHS-4. Considering the nutritional status of Gujarat in comparison with states like Sikkim and Bihar for NFHS-4 and NFHS-5, the values for wasted children are found with 26.1% and 25.1 % respectively, which is highest among all the three States. Chronically stunted children are 48.3% and 42.9% for NFHS-4 and NFHS-5 respectively, found highest for Bihar state. 8.6% and 9.6% of children found overweight in Sikkim for NFHS-4 and NFHS-5 respectively which is higher among all these three States.

Financial well-being of a Country or State is traditionally determined by economic indicators such as Gross State Domestic Product (GSDP) and Net State Domestic Product (NSDP). In general, more income leads to economic development (Haddad & Alderman, 2000). The increase in income boosts the purchasing power of the household and purchasing power of the household leads to increase in consumption of the household. In this way, health and nutrition can be considered to be a function of economic development (Ruia et al., 2018). The phenomenon of Malnutrition cannot be explained only from an economic perspective. Reviews claim that children's health status is not related to the stage of economic development (Pal & Bharati, 2007)(Ruia et al., 2018). There is a bi-directional causation between malnutrition and poverty, which fuels each other in a vicious cycle. Through the reduction of the economic potential of the population, Malnutrition creates conditions of poverty, and poverty reinforces Malnutrition by increasing the risk of food insecurity (Siddiqui et al., 2020). A child's nutritional status is influenced by a number of determinants including food security, the educational level of their parents, necessities such as water, sanitation, and other diseases (Shashidhar et al., 2011).

This study is intended to compare state of Gujarat with Sikkim and Bihar using data from National Family Health Survey-4 (NFHS) and NFHS-5. Sikkim is the State with the highest per capita NSDP in 2015-16 and 2019-20. While, Bihar has the lowest per capita NSDP in 2015-16 and 2019-20 at constant price according to the National Statistics Office (NSO), Ministry of Statistics and Programme Implementation (MOSPI) (www.rbi.org.in, 2021), Government of India and therefore these states are chosen for comparison with Gujarat. Reason for considering per capita Net State Domestic Product for the years 2015-16 and 2019-

20 has been that both these NFHS-4 and NFHS-5 are conducted for the these same years and would be appropriate to compare. The major objective of this research exercise is to find out the link between economic growth and nutritional status and to measure the effects of household condition and other women-related social factors on nutritional status of children. For that, socio-economic situation of Gujarat is compared with Sikkim and Bihar using per capita NSDP and various health related indicators from NFHS 4 and 5.

The first part is on introduction of the study which covers some basics of Malnutrition, scenario of Malnutrition in India and Gujarat and India's ranking in various Nutrition related indices. Second section is related to literature reviews. Next section is related to methodology and analysis part of the research, and the last section deals with results, conclusion, and suggestion.

Literature Reviews:

(Pal & Bharati, 2017) Aim of this study is to investigate the degree of chronic Malnutrition in the context of socio-economic and demographic characteristics of the children and their households in three States: Bihar, West Bengal, and Kerala. These three States represent the three stages of development. Kerala is one of the most developed State in India, while Bihar is one of the least developed. Results indicate that major factors that influenced the health status of the children in all three States were women's education and household condition index irrespective of the stage of economic development. (Ruia et. al.,2018) It focuses on a comparative analysis of Malnutrition with the main emphasis on Integrated Child Development Scheme (ICDS) in the two economically resurgent States namely Gujarat and Bihar. Results pointed out that Gujarat which is criticized for focusing excessively on economic growth has shown sharp improvement in combating Malnutrition. On the other hand, Bihar also exhibited impressive economic growth but still languishes at the bottom with a Malnutrition rate of 82%. They have concluded that high economic growth does not have an automatic and immediate positive impact on alleviation of Malnutrition.

(Christian & Dake, 2021) This study examines the coexistence and correlates of household burden of Malnutrition in twenty-three countries across Sub-Saharan Africa (SSA). The results indicated that various conditions of household Malnutrition burden are associated with the age of household head, the location of household, access to improved toilet facilities, and wealth status. (Adebisi et al., 2019) This study suggested that communal education especially of women and young people is essential to improve the nutritional level. It has also recommended to improv roads, infrastructure, and information systems to enable good food availability in the Country.

(Webb et al., 2015) Using six nutrition goals endorsed by the 2012 World Health Assembly (WHA), researchers proposed a composite index that measures the state of nutrition across 89 countries. Countries have been ranked and researchers have tracked their changes over time. India placed in the second group with the highest average anemia rate. Results also pointed out that despite having a low prevalence of children overweight in India, it rates badly on all five other measures including stunting, anemia, low birth weight, exclusive breastfeeding, and wasting. (Rosenbloom et al., 2008) Researchers have used three indicators of nutritional status to calculate the Global Nutrition Index (GNI), including deficit, excess, and food security, based on the HDI (Human Development Index). A total of 119 Countries were analyzed based on the percentage of undernourished, underweight, and dying children under five years of age. Countries have been divided in 4 parts, 1. Developed countries, 2. Countries in transition, 3. Low mortality in developing Countries, and 4. High mortality in developing Countries. Calculations have been made within four groups of Countries as well as between them. Based on HDI, GNI has been calculated and weighed equally. Scores range from 0 to 1, with higher scores indicating better nutrition. The results show that many developed countries, have poor nutritional status, like United States ranks 8th in the HDI while, 99th in the GNIg. Japan ranked 1st rank and Sierra Leone ranks 192 in the GNIg while, India ranks 96th in the GNIg rank. Researchers used a diagonal 45-degree line to compare HDI and GNI for each of the four groups of Countries. All points fall on the line if, the GNI and HDI ranks are perfectly correlated. And if a country is above the line, its nutritional status lags its growth. While, a country falls below the line, its nutritional status is worse than its development level. India is in high mortality developing country and India's rank is placed above the diagonal lines which

means India's nutritional status is outranked its development stage. It is a good sign for our country, but there is concerned which needs to pay attention that India is placed in the high mortality developing countries group.

Based on the literature reviews, several economic factors and socio- individual factors have been identified as determinants of Malnutrition. A Malnutrition Index is prepared which consists of stunted, wasted, severely wasted, underweight, and overweight. This index is quite similar to the Net State of Nutrition Index (NeSNI) which was developed based on the six indicators formally approved by the World Health Assembly (WHA) to set global targets for improving nutrition (Webb et al., 2015). NeSNI considers 6 indicators: stunting, anemia, low birth weight, overweight, exclusive breastfeeding, and wasting. While in this research, five indicators discussed above are considered. For the formation of Malnutrition Index, both undernutrition as well as overweight are included because traditionally undernutrition associated with poor resources while overweight is associated with wealth but recent observations reveals that undernutrition and overweight are increasingly co-occurring (Christian & Dake, 2021).

Child health is influenced by various individual and household characteristics. Variations in the long-term nutritional status of children can be explained by socio-economic factors, household economic situation, and women's educational attainment (Yimer, 2000). Most studies addressing this topic report that socio-economic factors are the major cause of childhood Malnutrition World-wide (Ghosh, 2020). The present study experiments with both socio- economic approaches. A Household Condition Index is prepared which consists of electricity, drinking water source, sanitation facility, and clean fuel for cooking. Researchers have also used the Household Condition Index because household conditions are important factors on children's health status (Pal & Bharati, 2007). (Kane et al., 2000)They have pointed that Malnutrition was more likely to occur in female children, mothers who have little education, multiple siblings, and siblings born within 24 Months. Mother's age, birth interval, number of under five children are associated with stunting and number of antenatal care visits are associated with chronic Malnutrition (Yimer, 2000). It is also important to consider social factors when determining Malnutrition, as Malnutrition has been linked to young mothers and low income in Ghana during the year 1990 (Rikimaru et al., 1998). Therefore, we consider all the characteristics of mother that affect children's health. Women Condition Index consists of women with 10 or more years of schooling, women age 20 – 24 years married before age of 18 years, mothers who had at least 4 antenatal care visits and, institutional birth. All these data are in percentage. Data used for this study are taken from the NFHS-4 and NFHS-5 reports published by the International Institute for Population Sciences (IIPS). The report provides information on India's population, health, and nutrition of each State and Union Territory (NFHS-5). In this paper for assigning minimum and maximum values for construction of Indices, only 28 states of India are taken into consideration.

Research Methodology

This research exercise consists of three indices namely-Malnutrition Index, Household Condition Index and Women Condition Index. Like most other nutrition indices, the statistical approach is adopted to construct the Malnutrition Index, Household Condition Index, and Women Condition Index. These indices are constructed based on methodology used in Human Development Index (HDI) developed by United Nations Development Programme (UNDP). Firstly, the maximum and minimum values are assigned to each indicators, and all the variables are equally weighted. (Rosenbloom et al., 2008) Moreover, all the variables included in this research exercise are basic needs for human development. Hence, equal weightage is given to them for making them comparable in a meaningful way. Some of the variables are positive indicators and some of the variables are negative indicators of child health. Therefore, standard process is adopted according to the following formula.

1) For positive indicator = $(X_i - Min_i) / (Max_i - Min_i)$

2) For negative indicator = $(Max_i - X_i) / (Max_i - Min_i)$

where, X_i = actual value of the indicator

Stunted, wasted, severely wasted, underweight, overweight, and women aged 20 -24 years married before age 18 years are negative indicators of the individual social situation of a children's health. While electricity, drinking water, sanitation facility, clean fuel, women's education, antenatal check-up, and

institutional birth are positive indicators of the socio-economic situation of a children's health. The maximum and minimum values of each indicator for NFHS – 4 and NFHS – 5 are given in the below Table No: 1. While actual values of these indicators are given in Table 2.

Table No: 2 shows the actual value of each indicator of three Indian States- Gujrat, Sikkim, and Bihar. All these data are taken from NFHS-4 and NFHS-5. The Fourth and Fifth series are comparable over a period of time. For the construction of all Three indices (Malnutrition Index, Household Condition Index, Women Condition Index) firstly, normalized value of each indicator is counted. Then after, the weighted mean of each indicator is calculated. The methodology and construction of these indices are incorporated in the Appendix-1. Table No: 3 shows the normalized values of each indicator obtained during NFHS-4 and NFHS-5 in Gujarat, Sikkim and Bihar. The value lies between 0 to 1. Getting closer to 1 or equal to 1 indicates better conditions while getting closer to 0 or equal to 0 indicate worse situation. It refers that State should take some initiatives for improvement. Now, the values of Malnutrition Index, Household Condition Index and Women Condition Index are shown in table- 4 by taking weighted mean of the values of different indicators of these three indices. Table No: 4 shows the analysed value of Malnutrition Index, Household Condition Index and Women Condition Index.

Major outcomes:

In terms of Malnutrition, the condition of Gujarat is seen worst in NFHS -5. According to NFHS-4, Gujarat had a Malnutrition Index value of 0.35, which decreased to 0.24 in NFHS-5. It indicates that the rate of Malnutrition in Gujarat is rising (NFHS-5). Apart from this, although the value of Household Condition Index has remained stable in NFHS-4 and NFHS-5 for Gujarat, the rate of Malnutrition has increased in NFHS-5. Moreover, the women condition is deteriorated from NFHS-4 to NFHS-5 for Gujarat. Which shows that the economic situation of the state does not play an important role in affecting the rate of malnutrition. (Rosenbloom et al., 2008). We can say that poverty and Malnutrition are linked but are not identical (Haddad & Alderman, 2000). Sikkim is having the highest per capita Net State Domestic Product (NSDP) in 2015-16 & 2019-20. In Sikkim, the Household condition and Women condition are worsened although its Nutritional status has increased. This indicate that this situation is different from Gujarat. It may be because of we have not consider all the factors that affect Malnutrition. Same situation we can see in Bihar also. That means factors affecting the prevalence of Malnutrition vary by region, zone, and community (Yimer, 2000). The results show that despite having the lowest per capita NSDP, Bihar's nutritional status is far better than Gujarat's nutritional status. Gujarat's nutritional status is worsened in NFHS -5 as compared to NFHS-4 despite a stable Household Condition Index. This may be because of deprivation in Women Condition Index. While, a different situation in Sikkim's case is observed because despite decreasing the Household Condition and Women Condition Index, it has improved its nutritional status in NFHS-5 compared to NFHS-4.

Conclusion:

Malnutrition varies by region, zone, and community. Both socio-economic and individual factors influence Malnutrition. Only if the economic situation improves but there is no change in the social thinking and lifestyle of the people, then the improvement in the economic situation does not result in reduction of Malnutrition. Along with this, improvement in economic conditions is a prerequisite for improvement in social conditions. The index illustrates that good nutrition and development are not necessarily synonymous. Thus, if measures are taken keeping in mind both the socio-economic situation, success can be achieved in reducing the Malnutrition rate.

References:

Adebisi, Y. A., Ibrahim, K., Lucero-Prisno, D. E., Ekpenyong, A., Micheal, A. I., Chinemelum, I. G., & Sina-

Odunsi, A. B. (2019). Prevalence and Socio-economic Impacts of Malnutrition Among Children in Uganda. *Nutrition and Metabolic Insights*, *12*, 1–5. https://doi.org/10.1177/1178638819887398

Christian, A. K., & Dake, F. A. A. (2021). Profiling household double and triple burden of malnutrition in sub-Saharan Africa: prevalence and influencing household factors. *Public Health Nutrition*, *25*(6), 1563–1576. https://doi.org/10.1017/S1368980021001750

Ghosh, S. (2020). Factors Responsible for Childhood Malnutrition : A Review of The Literature. *Current Research in Nutrition and Food Science*, *08*(2), 360–370. https://doi.org/http://dx.doi.org/10.12944/CRNFSJ.8.2.01

Grebmer, K. von, Bernst, J., Wiemers, M., Schiffer, T., Hanano, A., Towey, O., Chéilleachair, Ní, R., Foley, C., Gitter, S., Ekstrom, K., & Fritschel, H. (2021). *GLOBAL HUNGER INDEX HUNGER AND FOOD SYSTEMS IN CONFLICT SETTINGS* (Issue October). https://www.globalhungerindex.org/download/all.html

Haddad, L., & Alderman, H. (2000). Eradicating Malnutrition: Income Growth or Nutrition Programs? In *World Development* (Issue November).

Kane, T. T., Levin, A. N. N., & Ahmed, S. (2000). THE EFFECT OF BIRTH INTERVAL ON MALNUTRITION IN BANGLADESHI INFANTS. *J. Biosoc. Sci*, 289–300.

Ministry of Health &Family Welfare, G. of I. (2021). International Institute for Population Sciences (IIPS) and ICF . National Family Health Survey (NFHS-5) : India. Mumbai. In *International Institute for Population Sciences.* http://rchiips.org/nfhs/factsheet_NFHS-5.

Ministry of Health and Family Welfare. (2020). National Family Health Survey-5 (NFHS-5). In *International Institute for Population Sciences.*

Pal, M., & Bharati, P. (2007). Role of individual and household level factors on stunting : A comparative study in three Indian States. *Annals of Human Biology*, 632–646. https://doi.org/10.1080/03014460701671772

Rikimaru, T., Yartey, J. E., Taniguchi, K., Kennedy, D. O., & Nkrumah, F. K. (1998). Risk factors for the prevalence of malnutrition among urban children in Ghana. *Journal of Nutritional Science and Vitaminology*, *44*(3), 391–407. https://doi.org/10.3177/jnsv.44.391

Rosenbloom, J. I., Kaluski, D. N., & Berry, E. M. (2008). A Global Nutritional Index. *Food and Nutrition Bulletin*, *29*(4), 266–277.

Ruia, A., Gupta, R. K., Bandyopadhyay, G., & Gupta, R. R. (2018). An Analysis of Integrated Child Development Scheme Performance in Contributing to Alleviation of Malnutrition in Two Economically Resurgent States. *Indian J Community Medicine*, *43*(1), 44–48. https://doi.org/10.4103/ijcm.IJCM

Shashidhar, R., Maiya, P. S., & Ramakrishna, V. (2011). INDIA'S INTEGRATED CHILD DEVELOPMENT SCHEME AND ITS IMPLEMENTATION: PERFORMANCE OF ANGANWADIS AND ANALYSIS. *OIDA International Journal of Sustainable Development*, *5*, 29–38.

Siddiqui, F., Salam, R. A., Lassi, Z. S., & Das, J. K. (2020). The Intertwined Relationship Between Malnutrition and Poverty. In *Frontiers in Public Health* (Vol. 8). Frontiers Media S.A. https://doi.org/10.3389/fpubh.2020.00453

UNDP (United Nations Development Programme). (2022). *Human Development Report 2021-22: Uncertain Times, Unsettled Lives: Shaping our Future in a Transforming World.* https://hdr.undp.org/content/human-development-report-2021-22

Webb, P., Luo, H., Gentilini, U., & Webb, P. (2015). Measuring multiple facets of malnutrition simultaneously : the missing link in setting nutrition targets and policymaking. *Food Sec.*, 479–492. https://doi.org/10.1007/s12571-015-0450-0

Yimer, G. (2000). The Ethiopian Journal of Health Development. *The Ethiopian Journal of Health Development*, *4*, 283–292.

Table No: 1 Maximum and Minimum Value of parameters.

Sr. no.	Indicator	NFHS – 4		NFHS – 5	
		Maximum	Minimum	Maximum	Minimum
1	Children under 5 years who are stunted	48.3	19.7	46.5	22.3
2	Children under 5 years who are wasted	29	6.1	25.6	9.8
3	Children under 5 years who are severely wasted	11.4	2.2	10.9	3.4
4	Children under 5 years who are underweight	47.8	12	41	12.7
5	Children under 5 years who are overweight	8.6	0.7	10	2
6	Population living in household with electricity	99.8	60	100	59.4
7	Population living in household with an improved drinking water source	99.6	63.9	99.2	77.1
8	Population living in household that use sanitation facility	98.2	25	98.7	49.4
9	Household using clean fuel for cooking	84.1	17.8	96.5	31.9
10	Women with 10 year or more year of schooling	59.4	22.8	96.5	23.2
11	Women age 20 – 24 years married before age of 18 years	42.5	7.6	41.6	5.4
12	Mothers who had at least 4 antenatal care visits	90.1	14.4	93	20.7
13	Institutional birth	99.8	32.8	99.8	45.7

Source :(Ministry of Health &Family Welfare, 2021)(Ministry of Health and Family Welfare, 2020)

Table No: 2 Actual value of each parameters for Gujarat, Sikkim and Bihar

Sr. No.	Indicator	Gujarat		Sikkim		Bihar	
		NFHS-4	NFHS-5	NFHS-4	NFHS-5	NFHS-4	NFHS-5
1	Children under 5 years who are stunted	38.5	39	29.6	22.3	48.3	42.9
2	Children under 5 years who are wasted	26.4	25.1	14.2	13.7	20.8	22.9
3	Children under 5 years who are severely wasted	9.5	10.6	5.9	6.6	7	8.8
4	Children under 5 years who are underweight	39.3	39.7	14.2	13.1	43.9	41
5	Children under 5 years who are overweight	1.9	3.9	8.6	9.6	1.2	2.4
6	Population living in households with electricity	96.2	97.6	99.4	99.3	60	96.3
7	Population living in households with an improved drinking water source	95.9	97.2	97.8	92.8	98.4	99.2
8	Population living in households that use sanitation facility	63.6	74	89.7	87.3	26.5	49.4
9	Households using clean fuel for cooking	52.6	66.9	59.1	78.4	17.8	37.8
10	Women with 10 years or more years of schooling	33	33.8	40.7	49	22.8	28.8
11	Women age 20 – 24 years married before age of 18 years	24.9	21.8	15	10.8	42.5	40.8

| 12 | Mothers who had at least 4 antenatal care visits | 70.5 | 76.9 | 74.7 | 58.4 | 14.4 | 25.2 |
| 13 | Institutional birth | 88.5 | 94.3 | 94.7 | 94.7 | 63.8 | 76.2 |

Source: - (Ministry of Health &Family Welfare, 2021)(Ministry of Health and Family Welfare, 2020)

Table No: 3 Normalized values of each indicator for Gujarat, Sikkim, and Bihar

Sr. no.	Indicator	Gujarat		Sikkim		Bihar	
		NFHS-4	NFHS-5	NFHS-4	NFHS-5	NFHS-4	NFHS-5
1	Stunted	0.34	0.31	0.65	1	0	0.15
2	Wasted	0.11	0.03	0.65	0.75	0.36	0.17
3	Severely wasted	0.21	0.04	0.60	0.57	0.48	0.28
4	Underweight	0.24	0.04	0.94	0.98	0.11	0
5	Overweight	0.85	0.76	0	0.05	0.94	0.95
6	Electricity	0.91	0.94	0.99	0.98	0	0.91
7	Improved drinking water source	0.89	0.90	0.95	0.71	0.97	1
8	Sanitation facility	0.53	0.49	0.88	0.77	0.02	0
9	Clean fuel	0.52	0.54	0.62	0.72	0	0.09
10	Women with 10 years or more years of schooling	0.52	0.14	0.49	0.35	0	0.07
11	Women age 20 – 24 years married before age of 18 years	0.50	0.55	0.79	0.85	0	0.02
12	Mothers who had at least 4 antenatal care visits	0.74	0.78	0.80	0.52	0	0.06
13	Institutional birth	0.83	0.89	0.92	0.9	0.46	0.56

Source: Authors' own calculation

Table No: 4 Value of Malnutrition, Household Condition and Women Condition Index for Gujarat, Sikkim, and Bihar

Sr. No	Indices	Gujarat		Sikkim		Bihar	
		NFHS-4	NFHS-5	NFHS-4	NFHS-5	NFHS-4	NFHS-5
1	Malnutrition Index	0.35	0.24	0.57	0.67	0.38	0.31
2	Household Condition Index	0.71	0.71	0.86	0.79	0.25	0.50
3	Women Condition Index	0.65	0.59	0.75	0.65	0.11	0.17

Source: Authors' own calculation

Appendix -1

The various indices are prepared as per the following procedure.

Step – 1

For positive indicator = $(X_i - Min_i) / (Max_i - Min_i)$

For negative indicator = $(Max_i - X_i) / (Max_i - Min_i)$

1) Malnutrition Index

For the construction of the Malnutrition index, the Stunting Index, Wasted Index, Severely Wasted Index, Underweight Index, and Overweight Index are constructed using the following formula.

$$(Max_i - X_i) / (Max_i - Min_i) \ldots\ldots\ldots\ldots (1)$$

where,

X_i = Actual value of (i) variable

Max_i = Maximum value of (i) variable

Min_i = Minimum value of (i) variable

2) Household Condition Index:

Electricity, drinking water, sanitation facility and clean fuel are considered in the construction of Household Condition Index. To calculate the Household Condition Index, electricity index, drinking water index, sanitation facility index and clean fuel index have been calculated using the following formula.

$$(X_i - Min_i) / (Max_i - Min_i) \ldots\ldots\ldots\ldots (2)$$

where,

X_i = Actual value of (i) variable

Max_i = Maximum value of (i) variable

Min_i = Minimum value of (i) variable

3) Women Condition Index:

Women Condition Index Consists of four parameters: (1) Women with ten or more years of schooling (2) Women age 20 – 24 years married before 18 years of age (3) Mothers who had at least 4 antenatal care visits (4) Institutional birth. For the construction of the Women Condition Index, equation-2 is used for 1, 3

and 4 parameters while equation-1 is used for the second parameter. The values of each indices obtained using formula no. 1 and formula no. 2 and are given in table no. 3.