Nutritional Deprivation of Children in Orissa

SUKANTA CHANDRA SWAIN

This paper seeks to measure deprivation in terms of physical development and calorie-intake of children in two villages of Orissa. While the first aspect focuses on retardation in the physical growth of children as reflected in their weights vis-à-vis age, the second aspect highlights the inadequacy of children's calorie-intake. The analysis is based on a framework that is typically used in measuring income poverty but is rarely used in the measurement of physical underdevelopment of children.

I am indebted to Prasanta K Pattanaik at the University of California, Riverside, USA, my guide during my doctoral degree, for initiating me into the area of development, poverty and deprivation. Words are not adequate to convey the depth of my feelings of gratitude for his uninhibited encouragement, thought-provoking counsel, unreserved guidance and strenuous efforts in uplifting my mental horizon.
I remain indebted to ICFAI Business School for providing a research-conducive atmosphere.
I convey my deep sense of feelings and gratitude to Arun Kumar Mohanty of Niswartha, Nayagarh, Orissa and Biswanath Nayak of Niswartha for their help in collecting primary data for this study.

Sukanta Chandra Swain (*sukanta_swain@yahoo.com*) is with the ICFAI Business School, Bhubaneswar, Orissa.

Human physical stature is a useful supplementary indicator of well-being. Well-being encompasses the physical, mental and emotional aspects of life. The key to a sense of well-being is having the right balance to achieve good health, happiness and prosperity. Sound health, both physical and mental, of children provides a wide array of benefits to children, families and society as a whole. This, in turn, depends, along with other factors, on the nutritional value of food that children take. Nutrition is the key factor linking health, fitness and well-being. The human body is like a complex machine, which will not work properly unless one puts the right fuel in it and keeps it well-maintained. Nutritional supplements are mandatory to improve physical growth and mental development. These are also meant to prevent the occurrence of common day-to-day infections of children, who are the future nation builders. Health is a positive concept emphasising social and personal resources, as well as physical capacities. Although the health and well-being of children depends upon the interaction between their genetic potential and adequacy of nutrition along with other exogenous factors, nutrition plays a dominant role in this context. It has a global role to promote physical growth and enhance neuro-motor development. It is empirically established that neurons are more sensitive to nutrients and dietary chemicals compared to other body cells. And hence, proper nutrition helps in improving the quality of life.

A child performs dismally if he or she is either under-weight or over-weight. Under-nutrition and over-nutrition as well as deficiencies and excess of single nutrients have been shown to have adverse effects on the immune system. Therefore, proper care should be taken for a child's physical growth, which also requires taking care of a child's nutrition as nutritional standard has direct bearing on physical growth. Recent studies on infant brain development show that most of a person's neurons are formed from ages zero to eight. If a young child does not receive sufficient nurturing and nutrition during this crucial period, the child may be left with a developmental deficit that hampers his or her success in the future. Thus, physical growth and nutrition are two distinct but related parameters of well-being.

In the context of their intake of nutrition and physical growth, all children are not equal. While some are better off in these two aspects in spite of very low economic status some others are not, even though they belong to a very well-to-do background. That means, in spite of facilities also performance may not be up to mark. So in order to know the well-being, it is important to know the achievement of the individual child, not the facilities available in these two aspects. That is why the purpose of this paper is to analyse these two distinct, though related, aspects of deprivation of the children, in the age group of one to 12 years, in two

villages of Orissa. While the first aspect highlights the retardation in the physical growth of children as reflected in their weights, the second aspect exhibits the inadequacy of the children's calorie intake.

The analysis is based on a framework, which is typically used in measuring income poverty but rarely used in the measurement of physical underdevelopment of children. Analysing poverty or deprivation when income is the only indicator is convenient as there is a common poverty benchmark assumed for all individuals. In such analysis, individuals whose incomes do not exceed the assumed benchmark are identified as deprived or poor. The researchers who consider income as the parameter to analyse poverty have also ranked the poor individuals on a "1" to "q" scale, where the poorest person has a rank of "q" and the poor person nearest to the poverty line has a rank of "1". This paper tries to apply the technique developed in the literature on the measurement of income poverty to areas it has not been applied to before, i e, deprivation in nutrition and physical growth.

The plan of the paper is as follows. The analytical framework of the study has been properly elaborated in Section 1 of the paper highlighting the technique when there is only one real indicator and when there are more than one real indicators. Section 2 of the paper exhibits the socio-economic profile of the two villages of Orissa considered for this study. Two indices of deprivation among children in these two villages in terms of their physical growth and calorie intake are incorporated in Section 3 of the paper. Section 4 of the paper tries to integrate two real indicators of deprivation in order to find an overall measure of it. Last but not least, the concluding remarks of the study have been placed in Section 5.

1 Analytical Framework

Literature on income poverty considers a collection N of individuals i = 1, 2, ..., n, each receiving a respective quantity y_i of income. The convenience of identifying and assessing poverty when income is the only indicator lies in the poverty line, which is common for all individuals and assumed to be given. The poor are identified as all persons whose incomes do not exceed the poverty line (denoted as π by welfare economists). Accordingly, the set of poor can be expressed as $T(Y; \pi) = \{i \varepsilon N | y_i \leq \pi\}$; where $Y = \{y_1, y_2, ..., y_n\}$ is the income distribution.

After identifying the individuals who are poor, in order to distinguish one from another in the set of poor individuals on the basis of the extent of individual shortfall from the poverty line, welfare economists, particularly Amartya Sen introduced the notion of ranking (r). They define the ranking of the poor to be a one-to-one function, $r: T \rightarrow (1, 2, ..., q)$, which satisfies $r(i) > r(j)$ whenever $g_i(Y; \pi) > g_j(Y; \pi)$. Hence, the poorest person has a rank of q, while the poor person nearest the poverty line has a rank of one. On the basis of this, the income poverty measure is defined as

$$S(Y; \pi) = \frac{2\Sigma giri(Y; \pi)}{(q+1)\, n\, \pi}, \; i \varepsilon T;$$

where $r_i(Y; \pi)$ is a ranking of the poor associated with Y and π. Aggregate poverty is the normalised weighted sum of individual poverty gaps, where the weights are given by ranking among the poor.

The difference between income poverty and deprivation in terms of real attributes is regarding the poverty benchmark. While the convenience of the same poverty benchmark is assumed there, in the former case, the latter is deprived of that assumption as the poverty benchmark in that case varies with age, sex, height, etc, depending upon the attribute. This paper tries to analyse poverty going beyond the conveniences attached with income poverty. However, while we think of considering real attributes for analysing poverty, the option of going for either a single indicator or more than one indicator will be open to us. Although this study picks up two indicators for the purpose, the analytical frameworks for both the options are discused in this section.

1.1 One Real Indicator

Let the population be $N = \{1, 2, ..., n\}$. In the case of real attributes, the poverty benchmark may differ from individual to individual. As there is only one real attribute, poverty benchmarks for different individuals can be expressed as $Q_i = \{Q_1, Q_2, ..., Q_n\}$. The achievement of individuals in that attribute may be expressed as $S_i = \{S_1, S_2, ..., S_n\}$. An individual i will be deprived in terms of that given attribute, if $S_i < Q_i$. If the set of deprived individuals in N be $M = \{1, 2, ..., m\}$, then the absolute shortfall vector (d) will be $d = \{d_1, d_2, ..., d_m\}$, where $d_1 = Q_1 - S_1$, $d_2 = Q_2 - S_2$, ..., $d_m = Q_m - S_m$.

To obtain the normalised shortfall, we have to express the absolute shortfall as a proportion of the poverty benchmark of respective individuals. So the normalised shortfall of individual i in the given attribute here will be $\frac{Qi-Si}{Qi}$. The vector of the normalised shortfall can be expressed as

$$D = \left\{ \frac{Q1-S1}{Q1}, \frac{Q2-S2}{Q2}, \quad ..., \quad \frac{Qm-Sm}{Qm} \right\}.$$

This is all about identification and assessment when there is only one real indicator. If we take more than one indicator, which is what this paper has done, there will be more complicacies.

1.2 More Than One Real Indicator

Let the population be $N = \{1, 2, ..., n\}$ and $M = \{1, 2, ..., m\}$ be the set of attributes or indicators. If S_{ij} is i's achievement in terms of attribute j and Si the achieved attribute bundle of individual i, then $S_i = \{S_{i1}, S_{i2}, ..., S_{im}\}$.

Let $Q = \{Q_1, Q_2, ..., Q_m\}$ be the vector of the poverty benchmark for individual i, one poverty benchmark for each attribute. The vector (S_i, Q) may be represented as $D(S_{i1}, S_{i2}, ..., S_{im}; Q_1, ..., Q_m) \varepsilon [0, 1]$. This means the deprivation of individuals varies

Table 1: Composition of Population of the Two Villages

Age-group (Category)	Maskabari			Gundarsahi			Aggregate		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-12 (children)	27	36	63	12	06	18	39	42	81
13-18 (adolescents)	17	12	29	09	04	13	26	16	42
19 and above (adults)	114	86	200	37	35	72	151	121	272
Total	158	134	292	58	45	103	216	179	395

Source: Primary data.

between zero and one. If it is zero, the individual is not deprived as the achieved value of the individual is just equal to the poverty benchmark. On the other hand, if it is one, the individual is mostly deprived. However, the vector (S_i, Q) constitutes the complete informational basis of our analysis.

An individual i will be deprived in terms of attribute j if $S_{ij} < Q_j$. If we consider the case of the individual 1 in terms of indicator 1, then the absolute shortfall of individual 1 will be expressed as $s_{11} = Q_1 - S_{11}$

Thus, the absolute shortfall of individual i in terms of all attributes can be represented through the set s_i, where $s_i = \{Q_1 - S_{i1}, Q_2 - S_{i2}, \ldots, Q_m - S_{im}\}$.

The normalised shortfall of individual i in terms of attribute j will be $\frac{Qj-Sij}{Qj}$, which can be denoted as $\check{s}_{ij}$ where i = 1, 2, …, n and j = 1, 2, …, m.

So normalised shortfall of individual i in terms of all attributes will be

$$\left[\frac{Q1-Si1}{Q1}, \frac{Q2-Si2}{Q2}, \ldots, \frac{Qm-Sim}{Qm}\right].$$

The set of normalised shortfall of individual i can be denoted as $\check{s}_i = \check{s}_{i1}, \check{s}_{i2}, \ldots, \check{s}_{im}$. The overall deprivation d_i of individual i will be assumed to be a function of $\check{s}_i$. This function will be assumed to be the same for all individuals. Thus, we can write, $d_i = d(\check{s}_i)$, i = 1, 2, …, n. The normalised overall shortfall of all individuals is given by the vector $(d_1, d_2, \ldots, d_n)$.

The level of deprivation D in a society is assumed to be a function of $d_1, d_2, \ldots, d_n$. Therefore, $D = F(d_1, d_2, \ldots, d_n)$.

To find overall individual deprivation and overall social deprivation, we have adopted the following two poverty measures in the latter part of this paper:

(1) quadratic Measure (d_i): $d_i = \frac{1}{m}\sum_{j=1}^{m} \check{s}ij^2$; and (2) modified version of Sen's income-based measure (H): $H = \frac{2}{n(m^*+1)} \sum_{k=1}^{m^*}$ tk ($m^* + 1 - k$), where, n = total number of children, m^* = total number of deprived children and t_k = the proportion or fraction by which k falls short his/her ideal requirements. Here, $t_k = t_1, t_2, \ldots, t_{m^*}$ and $t_1 \geq t_2 \geq \ldots \geq t_{m^*-2} \geq t_{m^*-1} \geq t_{m^*}$

2 Socio-economic Profile and Sources of Data

Let us then get to a socio-economic profile of the two villages and our method of data collection.

2.1 Village Profile

We are going to apply the technique explained in the preceding section to measure the relevant aspects of deprivation of the children in two villages, namely, Maskabari and Gundarsahi of Orissa. It may be helpful for the reader to have some general information about these two villages. The purpose of this section is to provide such general information. Both the villages are from the Nuagaon block of the Nayagarh district. Natural resources are the means of livelihood and sources of physical and spiritual life of these two villages. Maskabari is a small village of the Paradhip gram panchayat. It borders Timirimundia Hill to the east, Pallava Hill to the west, Panchu Pandava Hill to the north and

Table 2: Index of Nutritional Deprivation

Sl No of Children	Actual Calorie Intake	Ideal Calorie Intake	Shortfall in Calorie	Weights	Weighted Shortfall	Weighted Average Shortfall	Simple Average Shortfall
43	918.76	1200	281.24	45	12655.8	495959/1891 = 262.27	11800.74/61 = 93.45
3	845.36	1200	354.64	55	19505.2		
15	802.012	1200	397.98	59	23480.82		
73	887.064	1200	312.93	50	15646.5		
80	834.148	1200	365.85	56	20487.6		
1	1380.77	1500	119.23	21	2503.83		
47	1305.71	1500	194.29	35	6800.15		
65	1403.68	1500	96.32	18	1733.76		
70	1225.454	1500	274.55	44	12080.2		
75	1254.498	1500	245.51	42	10311.42		
76	1214.102	1500	285.89	46	13150.94		
6	1495.42	1800	304.58	47	14315.26		
12	1672.76	1800	127.24	23	2926.52		
35	1636.65	1800	163.35	29	4737.15		
55	1759.12	1800	40.88	6	245.28		
29	1465.21	1800	334.79	52	17409.08		
32	1774.2	1800	25.8	3	77.4		
69	1354.408	1800	445.59	60	25735.6		
78	1704.352	1800	95.64	17	1625.88		
11	1901.5	2100	198.5	38	7543		
19	1913.852	2100	186.14	34	6328.76		
37	1765.56	2100	334.44	53	17725.32		
42	1902.46	2100	197.54	37	7308.98		
16	2002.84	2100	97.16	19	1846.04		
18	2048.774	2100	51.22	9	460.98		
33	2019.22	2100	80.78	12	969.36		
68	1949.91	2100	150.09	26	3902.34		
74	1832.082	2100	267.91	43	11502.13		
77	1956.448	2100	143.55	24	3445.2		
5	1091.2	1200	108.8	20	2876		
14	1157.14	1200	42.86	7	300.02		
21	1025.584	1200	174.41	31	5406.71		
25	976.456	1200	223.54	40	8941.6		
27	1107.39	1200	92.61	15	1389.15		
36	1033.76	1200	166.24	30	4987.2		
39	1003.71	1200	196.29	36	7066.44		
49	1169.26	1200	30.74	4	12296		
48	1250.77	1500	249.23	41	10218.43		
13	1314.7	1500	185.3	33	6114.9		
38	1353.48	1500	146.52	25	3663		
24	1479.116	1500	20.88	2	41.76		
46	1344.226	1500	155.77	27	4205.79		
63	1090.96	1500	409.04	59	24133.36		
67	1338.41	1500	161.59	28	4524.52		
17	1222.526	1800	577.47	61	35225.67		
20	1622.412	1800	177.58	32	5682.56		
23	1450.314	1800	349.68	54	18882.72		
59	1756.016	1800	73.98	10	739.8		
52	1417.112	1800	382.88	57	21824.16		
72	1762.398	1800	37.60	5	188		
34	1793.9	2100	306.1	48	14692.8		
53	2008.98	2100	91.02	14	1274.28		
58	1782.276	2100	317.72	51	16203.72		
28	2025.6	2100	74.4	11	818.4		
30	1892.25	2100	207.75	39	8102.25		
31	2050.8	2100	49.2	8	393.6		
41	1976.77	2100	123.23	22	2711.06		
45	2017.08	2100	82.92	13	1077.96		
57	2092.47	2100	7.53	1	7.53		
62	1791.01	2100	308.99	49	15140.51		
64	2004.76	2100	95.24	16	1523.84		
Total (61)			11800.74	1891	495959		

Source: Primary data.

Ramjenapalli and Gojisulia jungles to the south. Such a vegetative highland not only stands for natural beauty but also provides (to some extent) a good livelihood to those who have no or little land. On the other hand, Gundarsahi is seven km away from Maskabari to the west. It has the Pallava Hill to its west and Singarpalli gram panchayat to its south. Besides, Pallava reserve forest at the south-west adds some extra feather to the natural beauty of the village. Being surrounded by hill and forest, Gundarsahi is full of potential.

Maskabari is a small village with only 102 hectares of area and 56 households. It constitutes only 10.43 per cent of the total population of the Paradhip gram panchayat. Out of the 56 households of the village, only three belong to the scheduled caste (SC) category and the rest belong to the other backward classes (OBC). On the other hand, Gundarsahi is a very small village with an area of only 95 hectares and 25 households. Its population is only 3.8 per cent of the total population of Jakada gram panchayat. Out of 25 households of the village, 24 belong to the scheduled tribe (ST) category and the remaining one household is that of a milkman. Table 1 (p 50) depicts the composition of population of these two villages and their aggregates in different age groups.

On an aggregate, these two villages have 81 children in the age group of zero-12 years among whom four children (three male and one female) are below one year of age and are mostly breastfed. Keeping in mind the suitability of the children for this study, we have considered children in age group of one-12 years, ignoring these four children. Thus, out of 77 children, 36 are male and 41 are female. This paper analyses the problems of those 77 children pertaining to the real indicators, specifically nutrition.

The performance of children on their nutrition and physical growth depends on their parents' income. So it is essential to know the occupation of their parents. Out of 56 households in Maskabari, only four households depend on the service sector and one on business, that too on a small grocery shop. Rest of the households lives on agriculture whose landholdings are very small. Some of them are landless and depend on wage-labour in agricultural fields. One household depends on carpentry for its livelihood. Of course, the head of the household is not a carpenter by birth but by occupation. Among the total households of the village, 10-15 households are living in misery as they depend on daily wage in agricultural field. The only alterative for them is to work or starve. People of Maskabari do not view the hospital any more favourably because it is located at a distance of 10 km from their village. The village is without a metalled road or electricity. Only two to five households have cemented shelter. Others have earthen huts. However, they have easy access to drinking water from both wells and tube-wells. Irrigation facilities are not available there for which the productivity of land is very low.

The economic status of the people of Gundarsahi is much worse than that of Maskabarians. Households of this village are either marginal farmers or daily labourers. Because of the very small size of holdings and lack of irrigation facilities, agricultural productivity of this village is very low. However, some of the farmers produce parbol, sugarcane, moong and groundnut seasonally. Some villagers, basically women and children, are engaged in collecting sal leaves from nearby forests, which afford

Table 3: Index of Deprivation in Terms of Weight

Sl No of Children	Observed Weight (kg)	Median Ideal Weight (kg)	Shortfall (kg)	Weights	Weighted Shortfall	Weighted Average Shortfall	Simple Average Shortfall
43	7.6	11.89	4.29	35	150.15	8468.59/1653 = 5.12	198.73/57 = 3.49
73	10.6	11.89	1.29	21	27.09		
80	9.8	11.89	2.09	28	58.52		
3	12.8	13.78	0.98	17.5	17.15		
15	7.5	13.78	6.28	46	288.88		
70	11.8	15.39	3.59	34	122.06		
76	12.2	15.39	3.19	33	105.27		
1	16.5	17.1	0.6	10	6		
65	12	17.1	5.1	40.5	206.55		
2	14.7	19.0	4.3	36	154.8		
9	18.5	19.0	0.5	8.5	4.25		
26	18.7	19.0	0.3	4	1.2		
61	20.6	21.0	0.4	6	2.4		
6	21.7	22.6	0.9	16	14.4		
12	21.2	22.6	1.4	22	30.8		
35	15.1	22.6	7.5	51	382.5		
69	21.9	22.6	0.7	12	8.4		
29	14.6	24.4	9.8	56	548.8		
78	23.6	24.4	0.8	14	11.2		
11	24.9	27.0	2.1	29	60.9		
19	26.2	27.0	0.8	14	11.2		
37	18.2	27.0	8.8	55	484		
42	19.9	27.0	7.1	48.5	344.35		
68	19.2	27.0	7.8	52	405.6		
16	30.3	30.6	0.3	4	1.2		
18	34.6	34.8	0.2	1.5	0.3		
74	30.3	34.8	4.5	37	166.5		
77	31.7	34.8	3.1	32	99.2		
5	6.4	8.96	2.56	30	76.8		
66	7.8	8.96	1.16	19	22.04		
14	8.6	11.55	2.95	31	91.45		
21	9.5	11.55	2.05	27	55.35		
25	12.5	13.48	0.98	17.5	17.15		
27	13.0	13.48	0.48	7	3.36		
36	7.8	13.48	5.68	42	238.56		
39	7.3	13.48	6.18	44	271.92		
49	12.8	13.48	0.68	11	7.48		
79	11.6	13.48	1.88	26	48.88		
48	13.5	15.12	1.62	24	38.88		
4	11.9	16.8	4.9	38.5	188.65		
13	15.1	16.8	1.7	25	42.5		
38	8.4	16.8	8.4	54	453.6		
24	17.0	17.8	0.8	14	11.2		
46	11.2	17.8	6.6	47	310.2		
63	9.7	17.8	8.1	53	429.3		
17	13.5	20.8	7.3	50	365		
20	13.7	20.8	7.1	48.5	344.35		
23	14.6	20.8	6.2	45	279		
72	19.6	20.8	1.2	20	24		
22	23.3	23.5	0.2	1.5	0.3		
52	18.4	23.5	5.1	40.5	206.55		
34	21.2	26.9	5.7	43	245.1		
64	26.0	30.9	4.9	38.5	188.65		
28	34.5	35.0	0.5	8.5	4.25		
30	28.4	35.0	1.6	23	36.8		
45	21.8	35.0	13.2	57	752.4		
51	34.7	35.0	0.3	4	1.2		
Total (57)			198.73	1653	8468.59		

Source: Primary data.

them a significant part of their livelihood. But they do not get a reasonable price for the collected sal leaves. It is because of the presence of middlemen in the marketing of sal leaves. As regards to medical facilities, the people of Gundarsahi are more or less in the same position as the people of Maskabari. Transport and communication facility in Gundarsahi is at its wildest form. Roads are seasonal and muddy. The villages are far away from electrification. There is no question of cemented shelter. All the houses of the village have thatched roofs and mud walls. But they get drinking water easily as there are two tube-wells in that village.

2.2 Method of Data Collection

The measures taken for this study are standard health and nutritional data. For these, the study is entirely based on primary data collected through direct personal interviews. With the help of the members of the non-governmental organisation – Niswartha, Nayagarh, we could have face-to-face contact with the informants. We put the desired questions together in the form of a questionnaire for this survey. Thus, the data we obtained were first-hand and original in character. Collection of data relating to the measurement of nutrition deficiencies in children was a very difficult task. One has to know the daily calorie requirement of children in different age groups, nutritional value of different food items consumed by children and the calorie value of different food items. There is no problem regarding the daily calorie allowance and nutritional value of food items as such information is available from secondary and published sources. The real problem, however, is to obtain correct information regarding the exact quantities of different food items consumed by the children. As this study is confined to the case of rural children in the age group of 1-12 years only, difficulties encountered in making correct estimates are innumerable. Since it was difficult to obtain correct information regarding the pattern and composition of food consumption as available to children over a particular time, we had to resort to the direct method of collecting information regarding their food consumption from their parents.

We also collected information about the quantities of different types of food available for the family and the respective share of the adults (for this study, who are above the age of 12) in such family consumption. This enabled us to find and measure the quantum of food that the families made available to their children. But to obtain the quantum of food made available to each child of the family, we distributed their aggregate share among them in proportion to their age. The reliability of information given to us by the parents regarding their children's consumption had to be verified again and again and substantiated by their response to the second query relating to family consumption and the share of adults in family consumption. However, in most cases, the information obtained by those two processes was found to be the same. When there was any discrepancy between the two results, we followed the second process. Then by following the chart reflecting the nutritional value of different types of food, we calculated the calorie intake of children in the age group of 1-12 years. Information regarding the quantum of different types of food a child consumes differs from season to season and

Table 4: Overall Deprivation of Individuals and Society

Serial No of Children	Normalised Shortfall in Terms of Nutrition($\check{s}_{ic}$)	$(\check{s}_{ic})^2$	Normalised Shortfall in Terms of Health($\check{s}_{ih}$)	$(\check{s}_{ih})^2$	$d_i = [(\check{s}_{ic})^2 + (\check{s}_{ih})^2]/2$	$d_i{}^2$	Weights of d_i (i e, k)	$t_k(m^*+1-k)$
1	2	3	4	5	6	7	8	9
10	–	–	–	–	–	–	–	–
43	0.234	0.054	0.36	0.129	0.0915	0.00837	60	0.0065
73	0.26	0.067	0.108	0.011	0.039	0.0015	45.5	0.9945
80	0.304	0.092	0.175	0.031	0.0615	0.00378	55	0.984
3	0.295	0.087	0.071	0.005	0.046	0.002	52.5	0.851
15	0.331	0.109	0.455	0.207	0.158	0.0249	68	0.474
70	0.183	0.033	0.233	0.054	0.0435	0.00189	45.5	0.9787
76	0.19	0.036	0.207	0.042	0.039	0.0015	45.5	0.9945
5	0.09	0.008	0.285	0.081	0.0445	0.00198	50	0.9345
56	–	–	–	–	–	–	–	–
66	–	–	0.129	0.016	0.008	0.00006	27.5	0.348
14	0.035	0.001	0.255	0.065	0.033	0.00108	42	0.957
21	0.145	0.021	0.177	0.031	0.026	0.00067	39	0.832
25	0.186	0.034	0.072	0.005	0.195	0.00038	69	0.39
27	0.077	0.005	0.035	0.001	0.003	0.000009	20	0.153
36	0.139	0.019	0.421	0.177	0.098	0.0096	62	0.882
39	0.163	0.026	0.458	0.209	0.1178	0.0138	64	0.8225
49	0.025	0.0006	0.072	0.005	0.0028	0.000007	19	0.1456
79	–	–	0.139	0.019	0.0095	0.00009	29.5	0.3942
48	0.166	0.027	0.107	0.011	0.019	0.00036	37	0.646
1	0.079	0.006	0.035	0.001	0.0035	0.00001	21.5	0.1732
47	0.129	0.016	–	–	0.008	0.00006	27.5	0.348
65	0.064	0.004	0.298	0.088	0.046	0.0021	53.5	0.851
4	–	–	0.291	0.084	0.042	0.0017	47	1.008
13	0.123	0.015	0.101	0.010	0.0125	0.000156	33	0.475
38	0.097	0.009	0.50	0.250	0.1295	0.0167	65	0.777
67	0.107	0.011	–	–	0.0055	0.00003	24.5	0.2557
2	–	–	0.266	0.070	0.035	0.0012	43	0.98
9	–	–	0.026	0.0006	0.0003	0.0000001	10	0.0183
26	–	–	0.015	0.0002	0.0001	0.00000001	5	0.0066
75	0.163	0.026	–	–	0.013	0.00017	34.5	0.4745
24	0.013	0.0001	0.049	0.002	0.0011	0.000001	15	0.0616
46	0.103	0.010	0.37	0.136	0.073	0.0053	59	0.876
63	0.272	0.073	0.455	0.207	0.14	0.0196	66	0.7
61	–	–	0.019	0.0003	0.00015	0.00000002	6	0.0097
6	0.169	0.028	0.039	0.001	0.145	0.0002	67	0.58
12	0.07	0.004	0.061	0.003	0.0035	0.000012	21.5	0.1732
35	0.09	0.008	0.331	0.109	0.0585	0.0034	54	0.9945
55	0.022	0.0004	–	–	0.0002	0.00000004	7	0.0128
69	0.247	0.061	0.03	0.0009	0.0309	0.00095	40	0.9579
8	–	–	–	–	–	–	–	–
17	0.32	0.102	0.35	0.122	0.112	0.0125	63	0.896
20	0.098	0.009	0.341	0.116	0.0625	0.0039	56.5	0.9062
23	0.194	0.037	0.298	0.088	0.0625	0.0039	56.5	0.9062
59	0.141	0.019	–	–	0.0095	0.00009	29.5	0.3942
72	0.02	0.0004	0.057	0.003	0.0017	0.0000028	18	0.0901
29	0.186	0.034	0.401	0.160	0.097	0.0094	61	0.97
32	0.014	0.0001	–	–	0.00005	0.000000003	4	0.0034
54	–	–	–	–	–	–	–	–
60	–	–	–	–	–	–	–	–
78	0.053	0.002	0.032	0.001	0.0015	0.000002	16.5	0.0817
22	–	–	0.008	0.00006	0.00003	0.000000001	2.5	0.0021
52	0.212	0.044	0.217	0.047	0.0455	0.0021	51	0.91
11	0.094	0.008	0.077	0.005	0.0065	0.00004	26	0.2925
19	0.088	0.007	0.029	0.0008	0.0039	0.000015	23	0.1872
37	0.159	0.025	0.325	0.105	0.065	0.0042	58	0.845
42	0.094	0.008	0.262	0.068	0.038	0.0014	44	0.026
68	0.071	0.005	0.288	0.082	0.0435	0.00189	48.5	0.9787
34	0.145	0.021	0.211	0.044	0.0325	0.00105	41	0.875
53	0.043	0.001	–	–	0.0005	0.0000002	11.5	0.0297
58	0.051	0.022	–	–	0.011	0.00012	32	0.429
16	0.046	0.002	0.009	0.00008	0.00104	0.000001	14	0.0592
64	0.045	0.002	0.158	0.024	0.013	0.000169	34.5	0.4745
18	0.024	0.0005	0.005	0.00002	0.00026	0.00000007	9	0.0161
33	0.038	0.001	–	–	0.0005	0.0000002	11.5	0.0297
74	0.127	0.016	0.129	0.016	0.016	0.00025	36	0.56
77	0.068	0.004	0.089	0.007	0.0055	0.00003	24.5	0.2557
81	–	–	–	–	–	–	–	–
7	–	–	–	–	–	–	–	–
28	0.035	0.001	0.014	0.001	0.001	0.0000001	13	0.058
30	0.098	0.009	0.188	0.035	0.022	0.00048	38	0.726
31	0.023	0.0005	–	–	0.00025	0.00000006	8	0.0157
41	0.058	0.003	–	–	0.0015	0.000002	16.5	0.0817
45	0.039	0.001	0.377	0.142	0.715	0.0051	70	0.715
51	–	–	0.008	0.00006	0.00003	0.000000001	2.5	0.0021
57	0.003	0.000009	–	–	0.000005	0.00000000002	1	0.00035
62	0.147	0.021	–	–	0.0105	0.00011	31	0.42
Total (77)		1.296609		3.12812		0.17031850502		35.85805

Source: Primary data.

person to person. During the post-harvesting period, parents provide more food items to their children in comparison to the pre-harvesting period. Similarly, the quantities of different types of food may also vary over time. As such there is genuine difficulty in relying on information for any particular period that will genuinely reflect on children's daily consumption of different food items. We have however measured the deprivation among children on the basis of the last week's consumption of different types of food and that was almost the middle of the pre-harvesting and post-harvesting period.

Data on health can be used to examine the growth of children in the village in comparison with statistical tables of "reference data", which provides a value for a genetic potential of healthy individuals. In order to make such a comparison, indices are derived from the measurement of weight-for-age. The main problem of using the weight-for-height index is that it disguises stunting, ie, the failure of an individual to achieve his/her potential growth, for which weight-for-age or height-for-age is the best indicator. The next task is the choice of reference data. There are two sets of data available for weight and height indices. The international reference data are those advocated by the World Health Organisation (WHO). The second reference data is the Indian classification of weight-for-age, which is used for child welfare work in India. For our reference data, we have followed the second one. During the survey we used a weighing machine and a tape measure. The villagers cooperated with me in collecting data, thanks to the efforts of Niswartha.

3 Indices of Calorie Intake and Physical Growth

This section highlights the performance of the children of these two villages in calorie-intake and weight. After finding the calorie value of the food items served to the children, we compared it with the ideal calorie-intake of the children. The shortfall of individual performance has been assessed by deducting the actual value from the ideal value. By ranking the set of individuals falling short of their ideal calorie-intake in line with the notion of ranking introduced by Amartya Sen, as mentioned in Section 1, the index of calorie intake has been constructed and presented in Table 2 (p 51). The children with equal or more than the ideal calorie requirement are not considered in this index as they are not deprived. On an aggregate, 77 children are considered for this dimension out of which 16 children are shortfall free. The remaining 61 children constitute the shortfall group.

In order to construct the index of physical growth, we have followed the dataset for the Indian classification of weight-for-age. From this dataset we have considered the median ideal weights for different ages. These are then compared with the actual weights of the children in order to find the shortfall. Those who are falling short of their ideal weights are ranked on the basis of the extent of their shortfall as mentioned in Section 1 so as to construct the weight index as presented in Table 3 (p 52). The children weighing equal to or more than the ideal weights are not considered in this index as they are not deprived. On an aggregate, 77 children are considered for this attribute, out of which 20 children are not under the shortfall category as they weigh either equal to or more than the ideal weight. The rest constitute the set of deprived in weight-for-age attribute.

4 Overall Deprivation and Integration of Real Attributes

After calculating the individual shortfall in different attributes the next task is – "what procedure should one adopt to measure the overall deprivation of a society?" The conceptual framework of welfare economics would suggest that we should proceed by first measuring the overall deprivation of each individual on the basis of that individual's achievements in terms of different attributes and then measuring the deprivation of the society by aggregating the overall deprivation levels of all individuals in the society. In doing so, we have used two methods.

First, the quadratic measure for overall individual deprivation, ie, $d_i = \frac{(\check{s}ic)2+(\check{s}ih)2}{2}$, where (šic)2 stands for the square of the nor-normalised shortfall of i in terms of attribute, calorie intake (c) and (ših)2 stands for the square of the normalised shortfall of i in terms of attribute, health (h) and also quadratic measure for overall social deprivation, ie, $D = \sum di2/n$. Second, quadratic measure for overall individual deprivation and modified measure of Sen (H) for overall social deprivation, ie, $H = \frac{2}{n(m* + 1)} \sum_{k=1}^{m*} tk\ (m* + 1 - k)$, where, n = total number of children, m* = total number of children in the deprived group and k = rank of the children in the deprived group.

Table 4 (p 53), depicts the overall deprivation of individuals and society. Overall individual deprivation in terms of both the attributes is calculated using the quadratic measure and is presented in column 6 of Table 4. It is observed that the child bearing the serial number 45 is the most deprived, whose overall deprivation in both the attributes is 0.715 and the child with serial number 57 is the least deprived as the overall deprivation of this child in both the attributes is 0.000005. Overall social deprivation by the quadratic measure, $D = \sum d_i^2/n$. As here $\sum d_i^2 = 0.1703185$ and n = 77, D = 0.1703185/77 = 0.002. As per the second method, overall individual deprivation in terms of both the attributes is calculated by the quadratic measure as is done in the first method. But for overall social deprivation, Sen's modified measure (H) has been adopted.

$H = \frac{2}{n(m* + 1)} \sum_{k=1}^{m*} tk\ (m* + 1 - k)$. Here, n = 77, m* = 70 and $\sum_{k=1}^{m*} tk\ (m* + 1 - k) = 35.858$. So, $H = \frac{2\ (35.858)}{(77)(71)} = 0.013$

To know the link between nutritional deprivation, of children and their physical growth in terms of weight, one has to ascertain the correlation coefficient between nutritional deprivation and weight deprivation. By converting the shortfalls of individuals in percentage for both the parameters, nutrition and weight, we can get two variables. By making use of the values of these variables so obtained, we can find Karl Pearson's simple correlation coefficient as 0.402. The positive value of Karl Pearson's coefficient of correlation suggests that high values of one variable are associated with high values of the other. Thus, we can conclude that as nutritional deficiencies among children increase, their weight deficiencies also increase. But we can never conclude that

nutritional deficiency is the cause of weight deficiency or weight deficiency is the cause nutritional deficiency. It is because, there are nine children (with serial numbers 66, 79, 4, 2, 9, 26, 61, 22 and 51) free from deprivation in terms of nourishment but they are deprived in terms of weight. Similarly, 13 children (with the serial numbers 47, 67, 75, 55, 59, 32, 53, 58, 33, 31, 41, 57 and 62) are not deprived in terms of weight but are deprived in terms of nourishment.

5 Conclusions

It is clear from the analysis that the children of these two villages of India are quite typical of a deprived community, being stunted and wasted to some degree from early childhood. Most of the children work in fields or forests to collect sal leaves. Poverty here is the chief cause of child labour. Children of these two villages work long hours for little pay, sacrificing their health and childhood. From the nutrition point of view, most of the children are deprived. Malnourishment has been felt most frequently and severely among the children. There are conflicting claims on food. Out of 77 children, only 16 are capable of obtaining the ideal calorie-intake. Maximum percentage of their calorie-intake comes from rice and rice products, which provide plenty of energy but little protein. Poor nourishment reflects on morbidity and illness. The children in those two villages are deprived not because of lack of natural blessings and material efforts from their parents but because of lack of material and non-material assets. To rehabilitate children who are deprived of nutrition and are in poor health, an experiment in environmental adaptation is required. Governmental intervention in the form of assistance to those households, the children of which are going to work at the cost of their childhood, is inevitable so that those households can spare the children to concentrate on their development. In fact, ending poverty and increasing access to education are therefore crucial tools in the fight against deprivation of children in nutrition and health.

The discussions on the concept of deprivation and extent of deprivation derived, as outlined in this paper show who counts as poor and what features characterise the poor population. This has wide-ranging implications for the selection of target groups and measures for poverty reduction. Thus, in each case the causes of poverty as well as measuring methods are to be considered in conjunction with their respective political implications for a consistent policy on poverty. The quantitative ascertainment, as done in this paper, assists in the assessment of the dimension of the problem of poverty and in the observation of the extent to which the problem of poverty has deepened or whether there has been an improvement in the situation.