

## **Errors in Measuring Poverty and Food Insecurity for Perception-based Food Consumption Data: An Alternative Approach for Accurate Data Collection**

**Md. Zakir Hossain**

Department of Statistics, Shahjalal University of Science & Technology,  
Sylhet-3114, Bangladesh

\*Correspondence should be addressed to Md. Zakir Hossain  
(E-mail: mzhossain.bds@gmail.com)

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### **Abstract**

An accurate measurement of poverty and food insecurity is important for informed policy formulation. The conventional methods used the perception-based food intake data for measuring poverty and food insecurity, which suffers from many kinds of bias. The present study has introduced an innovative measurement method to gather accurate food consumption data at household level and estimated the errors in measuring the incidence of poverty and food insecurity through direct calorie intake method in the context of Bangladesh. The data collection activities through innovative approach have been performed in three stages - the amount of raw food items (considered for cooking), ready-to-cook food items, and leftover of cooked food. The findings indicated that a substantial amount of errors occurred in measuring poverty and food insecurity for the food consumption data collected through conventional methods. It is found that about 55% of the households over-reported the consumed amount of food, while about 31% of the households under-reported the food intake. The findings reveal that the under-estimation of incidence of poverty and food-insecurity is higher than over-estimation for the conventional method of data collection. The study suggests adopting the innovative data collection method to reduce the errors in measuring poverty and food insecurity.

**Keywords:** Poverty, food insecurity, food consumption data, direct calorie intake method.

**AMS Classification:** 62P20.

### **1. Introduction**

Poverty is viewed as deprivation of basic abilities rather than lowness of income (Sen, 2000) and food insecurity is the state of insufficient access of food, for which food intake falls below the energy requirements (Cunningham, 2005). The poverty and food insecurity are interlinked in several aspects (Hossain, 2020). Literature suggests that poverty measurement is directly related to minimum food diet and indirectly with income/expenditure of the concerned people (Kakwani, 2003; Ahmed, 2004), and hence required numerically measured data (Hossain, 2020). On the other hand, food insecurity may be measured through perception-based information on hunger (Hossain, 2020). The 1996 World Food Summit has pointed out that poverty is a major cause of food insecurity and poverty eradication is necessary to improve access to food. The Food Summit has

emphasized four crucial components for ensuring food security, which are availability of required amount of food, stability in food supplies, access to necessary food, and nutrition security (FAO, 1996). Thus, the measurement methods of poverty can easily be used as the measurement of food insecurity. The incidence of poverty and food insecurity in Bangladesh has reduced substantially during the last 2 decades. Using data from the several rounds of Household Income and Expenditure Surveys, the Bangladesh bureau of Statistics has documented the head count rate of poverty was 48.9% in the year 2000, which has reduced to 24.3% in 2016 (BBS, 2017). The incidence of poverty has further decreased to 20.5% in the financial year 2018-2019 as estimated by the Bangladesh Bureau of Statistics. The government of Bangladesh has prioritized on poverty alleviation at the forefront of the country's development strategy. The ending of poverty and hunger is one of the prime objectives of the Sustainable Development Goals (SDGs) to be implemented by 2030. In consonance with the SDGs and considering the adverse impact of covid-19 pandemic, the government of Bangladesh has adopted the 8<sup>th</sup> Five Year Plan, in which one of the targets has been fixed to bring down poverty to 15.6% by the financial year 2024-2025 (GoB, 2020).

The Bangladesh Bureau of Statistics is considered a person to lie in the category of absolute poverty whose daily calorie intake is lower than 2,122 kilocalorie (k.cal) (BBS, 2001). However, the Food and Agriculture Organization has suggested 2430 k.cal as average per capita per day dietary energy requirement for Bangladesh in the Country Nutrition Paper (FAO, 2014). The Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM) has also estimated the same amount of energy requirements for Bangladesh people (DDP, 2013; Nahar et al., 2013). Several measurement techniques were used in measuring food insecurity and poverty by several studies at home and abroad (Ravallion, 1992; Ravallion and Bidani, 1994; Ravallion and Sen, 1996; Bickel et al., 2000; Kakwani, 2003; Ahmed, 2004; Fengying *et al.*, 2011; Foster et al., 1984; Maxwell and Caldwell, 2008; Nguyen and Winters, 2011; Hossain et al., 2014; Deyshappriya, 2018; Hossain, 2020). The popular methods of poverty measurement in Bangladesh have appeared as direct calorie intake, food energy intake, and cost of basic needs (Ahmed, 2004; Hossain, 2020). On the other hand, coping strategy index score, perception analysis, food consumption score and direct calorie intake are found as widely used methods to measure the food insecurity (Hossain et al., 2014; Kazal et al., 2017; Hossain, 2020).

The Bangladesh Bureau of Statistics has been used the direct calorie intake method for estimation of the poverty since 1973-74 using the data collected through several rounds of Household Income and Expenditure Surveys and incorporated the cost of basic needs method in the mid-1990s (BBS, 2011). The report of Household Income and Expenditure Survey 2000 used both direct calorie intake and cost of basic needs methods for estimating poverty. In the middle, Bangladesh Bureau of Statistics has tried with the food-energy intake method to estimate poverty for the data of Poverty Monitoring Survey 1995.

In direct calorie intake method, poor households are defined as whose per capita energy intake is less than the average per capita requirement of energy (2,122 k.cal for Bangladesh). Under the direct calorie intake method, the food consumption data at household level are converted to calorie value by multiplying the amount of foods with corresponding calorie content for each of the consumed food items. The cost of basic needs method has the advantage that it considers both the "calorie intake" and "basic needs" of the concerned individuals/households (BBS, 2001; Hossain, 2020). The costs of both of the components are added to find the poverty line. Under this method, it is required to estimate the cost of a basic consumption food basket to compute the food poverty line. In the context of Bangladesh, Ravallion and Sen (1996) has recommended the food basket that included eleven items (coarse rice, wheat, pulses, milk, oil, meat, fish, potatoes, other vegetables,

sugar, and fruits) containing nutritional requirements corresponding to 2,122 k.cal per day per person. The Bangladesh Bureau of Statistics is used to collect the information on food consumption of the households for 14 days by paying seven visits through Household Income and Expenditure Surveys since 2010; that is, perception-based food consumption data of the previous two days usually collected during each visit (BBS, 2011; 2017). In India, Uniform Resource Period method was used until 1993-94, in which the poverty line was based on consumption expenditure of 30-days, that is, the information was based on the recall of consumption expenditure in the previous 30 days. India has switched to Mixed Reference Period method in 1999-2000, which quantifies the consumption of five low-frequency items (clothing, footwear, durables, education and institutional health expenditure) over the previous year, and all other items over the previous 30 days. Pakistan has shifted to the costs of basic needs approach in 2013-14 which takes into account the non-food expenditures on clothing, shelter and education for households along with food expenditures. The consumption data has been collected through Household Integrated Economic Survey in Pakistan to update the incidence of poverty. In addition, Pakistan also used the multidimensional poverty index based on education, health and living standard dimensions.

A limitation of the direct calorie intake method appeared as it measures the undernourishment rather than poverty since the latter involves deprivation of calorie intake together with other aspects (Ahmed, 2004). Considering this limitation of the direct calorie intake method, most of the countries shifted to costs of basic needs technique for measuring poverty. However, the importance of the direct calorie intake method is not lessened as a measure of poverty because of its simplicity and transparency in measurement. In addition, the direct calorie intake method is a very useful tool for measuring the food and nutrition insecurity. Therefore, accurate consumption data of food items and other daily necessities will certainly be helpful for an authentic estimate of incidence of poverty and food insecurity in addition to assess the status of nutrition security. The main limitation of the perception-based food consumption data is that it may over-estimate or under-estimate the actual food intake due to memory lapse and digit preference, which leads to error in measuring poverty. Thus, an attempt is essential to gather the actual amount of food intake in order to reduce the errors in measuring the poverty and food insecurity by the existing methods. Therefore, this study aims to estimate the errors in measuring poverty and food insecurity for conventional methods of data collection using experimental data collected through an innovative measurement approach.

## **2. Methodology**

### **2.1 Proposed Innovative Approach for Collecting Accurate Food Consumption Data**

The basic principle of the proposed innovative approach is recording the accurate food consumption data at household level through measurement of ready-to-cook and leftover foods using a digital kitchen weight scale rather than perception of the respondents. The kitchen weight scales needed to be calibrated before weighing, if the scale reading shows other than zero. It is expected that the data obtained through innovative measurement approach is free from memory bias as well as guess-based food intake, and hence calorie intake data found by this method would be faultless. Following steps have been followed for collecting the 3-days food consumption data by measurement through digital weight scale:

- 1) Adequate number of female field investigators have been employed from the same community of the respective clusters to monitor and record the food intake of the households. They have given short-term training on measurement and recording system along with all other technical aspects of data collection activities. It is observed that the

- engagement of female enumerators from the same community was very helpful to make their easy access to the surveyed households for the collection of food consumption data.
- 2) Each of the field investigator has been provided a digital weight scale and required number of record sheets to record the consumed foods for each of the selected households. The field investigators recorded the amount of food items in three stages through weighting. At the first stage, they have recorded the amount of raw food items (considered for cooking); at the second stage, they have recorded the amount of ready-to-cook food items after cleaning; at the third stage, they have recorded the waste of cooked/prepared food items. The Principal Investigator have closely supervised the data collection activities.
  - 3) The data record sheets obtained through measurement of food items is kept confidential before collecting the perception-based data from the respondents of the selected households.

#### Perception-based data collection (Conventional Method)

The study has also collected 3-days food consumption data of the selected households following the format of Household Income and Expenditure Survey - 2016. The perception-based food intake data has been collected from the respondents (mainly household women-head who took the decision about cooking) in two rounds: food consumption data of the first two days were collected at the third day; the third day's food consumption data were collected at the fourth day. The respondents were asked about the amount of food for each of the items that they consumed during the previous days.

## **2.2 Sample Design for Data Collection**

In order to gather primary data from a representative number of households for estimating the level of poverty through direct calorie intake method using the data collected by conventional and innovative techniques, a household-level survey was conducted. The household survey was designed in such a way that it has covered all the data to measure poverty through direct calorie intake method along with the background information. Particular emphasis has been given on recording the 3-days' food intake data for both conventional (perception-based) and innovative (measuring through weight scale) approach (described in section 1.1). For the household-level survey, the study has adopted a cluster-sampling method in which the primary sampling units of Bangladesh Bureau of Statistics have been considered as clusters. The study used the following sample-size determination formula for cluster sampling design with a relatively small indicator percentage:

$$n = \frac{p(1-p)Z^2}{(rp)^2} \times Deff$$

where,  $p$  is the indicator percentage,  $Z$  is the value of normal variate with 95% confidence interval,  $rp$  is the relative error margin and  $Deff$  is the design effect. Based on 24% indicator percentage (proportion of households lie below the poverty line),  $0.18 \times p$  as the relative error margin, 95% confidence interval and highest response distribution with an assumed design effect 2.0, the formula for sample-size determination yields that at least 526 households are required to cover. The study planned to cover 30 rural clusters of Sylhet division of Bangladesh. To distribute the equal number of households in each cluster, the study increased the sample size from 526 to 540. However, the analysis has been performed based on the data of 538 households, because the

complete data on 3-days food intake were not available for the rest two households. The data for this study has been collected through a research project '*Reducing the Errors in the Measurement of Food Security in Bangladesh through Development and Implementation of an Innovative Method*', sponsored by the Ministry of Education, Government of Bangladesh under the canopy of *Grants for Advanced Research in Education* (GARE) in 2018 (Hossain and Ahmed, 2019).

## 2.1 Data Analysis

In order to estimate the errors in measuring poverty using conventional approach, an effort is undertaken here to make a comparison of the incidence of poverty based on food intake data collected through conventional as well as innovative approaches (described in section 2.1). The study has resorted a modified direct calorie intake method (Hossain and Ahmed, 2019). The modification is that it has used per capita required calorie for each households considering the age and sex of the household population who took food at the survey days instead of threshold level of required calorie, which is fixed as 2,122 k.cal for Bangladesh (BBS, 2017). In order to achieve the objectives of the study, following analytical steps has been performed:

Step#1: Estimation of per capita calorie requirements for each of the households considering the age and sex of the household population. It is documented that the energy requirements vary according to age, sex, and activity level of the people (Hossain and Ahmed, 2019), but an up-to-date list of required calories by age and sex is not available for Bangladesh. The list of required calories by age and sex prepared by Ahmed et al. (1980) is used as a ready reference by different studies. However, the energy requirements by age and sex is needed to update considering the international evidence as well as the current socio-demographic profile of Bangladesh. Hence, the study prepared a chart for per day calorie requirements for Bangladeshi people considering age-sex composition by reviewing and adjusting the available literature (Appendix Table 1).

Step#2: Estimation of per capita calorie consumption using the data collected through conventional and innovative approaches. The study has converted the consumed amount of food into the food-energy value as kilo-calorie using different food composition tables (Ahmed *et al.*, 1980; Nahar *et al.*, 2013; Shaheen *et al.*, 2013) prepared for Bangladesh.

Step#3: Computation of incidence of poverty and food insecurity using modified direct calorie intake method by counting the percentage people consumed less calorie than required amount (instead of a threshold level of energy requirements, e.g., 2,122 k.cal). The incidence of poverty has been estimated by comparing the required calorie following Appendix Table-1 and consumed calorie for both conventional and innovative measurement methods. The head count ratio is implemented for the individual/households whose consumed calorie is less calorie than required amount.

Step#4: Estimation of errors in measuring poverty and food insecurity for conventional approach of data collection. The reporting error at the household level has been estimated by estimating the deviation of calorie intake between measurement and conventional methods. Specifically, the reporting error has been estimated as:

*Reporting error at household-level = Estimated calorie intake by measurement method - Estimated calorie intake by perception method.*

## 3. Results and Discussions

The estimated average calorie consumption and incidence of poverty using the data collected through both the conventional and innovative approaches along with the errors in poverty

estimation using the conventional approach of data collection have been discussed in the following sections. The differentials of incidence of poverty and estimated reporting error have also been studied according to the location of residence, type of family, education, and occupation of household heads to explore the household characteristics where the variation of poverty incidence and reporting errors are high.

### **3.1 Comparison of Poverty Estimation between Conventional and Innovative Data Collection Methods**

It is to be noted that the study has estimated the calorie requirements for each of the households by considering the age-sex composition of household members who took food at the survey date (Table 1). In addition, the per capita consumed energy has been estimated using the food intake data collected through both perception of the respondents and measurement. The required calorie, consumed calorie, and incidence of poverty for both conventional and measurement methods is shown in Table 1. Considering the age-sex composition of household members who took food at the survey days, the per capita average calorie requirements have been estimated at 2234.56 k.cal, which is slightly higher than the average calorie consumption (2210.40 k.cal) reported by BBS through HIES-2016 survey. Based on the data collected through the conventional method (perception-based), the study estimated that a person took on average 2515.23 k.cal in a day. On the other hand, it is estimated that, on average, a person took 2426.42 k.cal in a day based on measurement data collected through an innovative approach. Based on paired sample t-test for equality of population mean, the amount of consumed calorie was found significantly ( $p < 0.01$ ) lower for the data collected by measurement method than that collected by perception method.

The incidence of absolute poverty (% of people consumed less calorie than required amount) has been estimated at 21.7% and 25.3% for the data collected by perception and measurement methods, respectively. Thus, the findings revealed that the conventional method (perception-based data) underestimates the poverty situation with a considerable margin, though the difference is not found statistically significant.

**Table 1:** Poverty Estimation using Direct Calorie Intake Method for the Data Collected through Perception and Measurement Approaches

Methods	Required kilocalorie (per capita)	Per Capita Consumed kilocalorie (Mean $\pm$ SD)	Incidence of Poverty
Perception-based data	2234.56*	2515.23 $\pm$ 702.35	21.70
Measurement data		2426.42 $\pm$ 622.42	25.30

\* based on calorie requirements for age group & sex composition of the household members who took food at the survey days (Appendix Table 1)

### **3.2 Differentials of Average Calorie Intake and Incidence of Poverty**

The study intends to explore the differentials of average calorie intake as well as the incidence of poverty according to selected background characteristics. The per capita per day average calorie intake and poverty incidence according to selected background characteristics for both perception and measurement methods are shown in Table 2. The findings on the study of the differentials are

categorically discussed in terms of geographical location, occupation of the household heads, education of the household head, and type of family. The variation of the average calorie intake and incidence of poverty is categorically discussed below according to these background characteristics.

#### Location-District

Literature suggests that the geographical location of residence has influence on the livelihood of human beings both countrywide and worldwide (Hossain, 2014; Hossain and Riad, 2020). The findings of the study on average calorie intake and incidence of poverty supported this proposition. The per capita average calorie intake is found highest for Sunamgonj district by both perception and measurement methods. On the other hand, the average calorie intake is found lowest for the sampled households of the Sylhet district by both perception and measurement methods. The incidence of poverty was found highest in the Moulvibazar district by both perception (27.5%) and measurement (29.6%) methods. Conversely, the poverty incidence was found lowest in the Sylhet district by both the methods of data collection (17% by conventional and 21.4% by measurement methods). The comparison of the incidence of poverty between the two methods indicates a remarkable difference for Sunamgonj and Sylhet districts.

#### Occupation of the Household Head

The engagement of economic activities of the household head plays a vital role in socio-economic conditions of the households and it might impacts on food intake and poverty situation. The comparison of average calorie intake and incidence of poverty between the two methods indicates a wide difference according to the occupation of the household heads. Both the average calorie intake and poverty incidence were found highest for the agricultural labourer headed households. These findings are counterintuitive, might occur due to heterogeneity of food intake. That is, some households of this occupational category consumed a huge amount of food, and the majority of the households consumed a small amount of food than required. The incidence of poverty was estimated lowest (18.5%) for the households whose heads occupation was some sort of job/service.

#### Education of the Household Head

The education of the household head influences the food security situation of the household in several ways. Sometimes education of the household head influences the production and income, sometimes education of the household head provides knowledge regarding household food preparation and consumption. The findings indicate that the average calorie intake is not varied significantly according to the educational status of the household heads. However, the average calorie intake was found higher for perception data than those of measurement data for all the categories of education of the household heads. The incidence of poverty was found to decrease with the increase in the education of the household heads. Using the data collected through measurement, the incidence of poverty was found 31.4% for the households whose heads have no education, while it is estimated at 18.9% for the households whose heads have at least secondary level education. The difference in incidence of poverty is, even higher in the case of perception-based data.

#### Type of family

The household composition is playing an essential role concerning the food consumption of the households. The differentials' study on the type of family indicates that the incidence of poverty has increased remarkably for the increase of the household members in terms of type of the family. For measurement-based data, the incidence of poverty is estimated at 22.2% for the nuclear family,

while it was found 40.6% for extended family. Almost similar variation has been observed in case of the perception-based data.

The discussion on differential study indicates that the calorie intake, as well as incidence of poverty, vary remarkably according to the different characteristics of the households.

**Table 2:** Per capita per day average calorie intake and poverty incidence for both Perception and Measurement methods according to selected background Characteristics

Characteristics	Number of Households	Poverty by perception (%)	Average Calorie Intake (Perception)	Poverty by measurement (%)	Average Calorie Intake (Measurement)
<b>District</b>					
Habigonj	65	23.10	2568.24	23.10	2531.73
Moulvibazar	142	27.50	2560.59	29.60	2449.02
Sunamgonj	107	23.40	2604.36	29.00	2517.20
Sylhet	224	17.00	2428.52	21.40	2338.17
<b>Occupation of the Household Head</b>					
Farming	81	28.40	2510.93	30.90	2401.48
Non-agriculture work (Trading/Labour)	192	20.30	2472.08	22.40	2400.06
Agricultural Labour	43	30.20	2589.38	37.20	2424.13
Job/Service	81	18.50	2533.87	18.50	2470.82
Others (Unemployed/Housewife/Student)	141	19.10	2543.14	26.20	2451.83
<b>Education of the Household Head</b>					
No education	207	29.50	2446.17	31.40	2368.46
Pre-Primary (1-3 years schooling)	31	25.80	2485.95	29.00	2385.52
Primary (4-5 years schooling)	88	26.10	2581.54	25.00	2504.01
Secondary & above (6+ years schooling)	212	11.80	2559.43	18.90	2456.79
<b>Type of family</b>					
Nuclear family	397	19.40	2538.03	22.20	2450.50
Joint family	109	26.60	2425.75	32.10	2359.00
Extended family	32	34.40	2537.25	40.60	2357.34
<b>Total</b>	<b>538</b>	<b>21.70</b>	<b>2515.23</b>	<b>25.30</b>	<b>2426.42</b>

### 3.3 Estimated Errors in Poverty Estimation for the Data Collected through Conventional Method

This section deals with the estimation of errors in measuring poverty by the conventional method of data collection with the help of the food intake data collected through both perception and measurement methods. With the assumption that the measurement method provided authentic data, the reporting error for conventional method at the household level has been estimated by deducting the estimated calorie intake obtained through perception method from estimated calorie intake found through measurement method (as stated in the step#4 of methodology).



Table 3 shows the distribution of reporting errors of poverty estimation for perception-based data of the direct calorie intake method at the household level. The estimated errors at household level are categorized as over-estimation, negligible bias, and under-estimation. The under-estimation of poverty was considered if the error was obtained -500 or less; over-estimation of poverty was considered if the deviation was 500 or more, and negligible bias in poverty estimation was considered if the deviation were between -499 and +499 (Table 3). It is found that about 55% of households over-estimated the consumed amount, while about 31% of households under-estimated the situation. It is found that about one-third of households over-estimated the calorie intake by 2000 k.cal or more, that is, the measurement error of these households is more than ' -2000' k.cal (Table 3). Besides, 16% of households are found with reporting error in-between ' -1999 and -1000' k.cal. The findings indicate that about 15% of households have negligible errors in the estimation of poverty considering the estimated reporting errors of calorie intake. It is found that 14.3% of households underestimated the consumed amount by a great margin (2000 k.cal or more). On the other hand, about 9% of households underestimated the consumed amount by a considerable margin (1000-2000 k.cal).

The findings indicate that the reporting error is higher in terms of over-estimation than under-estimation. That is, the under-estimation dominates the over-estimation situation for poverty estimation by the perception-based conventional method of data collection.

**Table 3:** Errors in Poverty Estimation for Data Collected through Conventional Approach

Reporting Errors at Household Level (in k.cal)	Number of households	% of Households	Comments on Consumed Amount	Comments on Poverty Estimation
Lowest to -5000	61	11.3	Over-estimation	Under-estimation
-4999 to -2000	115	21.4	Over-estimation	Under-estimation
-1999 to -1000	86	16.0	Over-estimation	Under-estimation
-999 to -500	33	6.1	Over-estimation	Under-estimation
-499 to 499	78	14.5	Negligible Bias	Negligible Bias
500 to 999	38	7.1	Under-estimation	Over-estimation
1000 to 1999	50	9.3	Under-estimation	Over-estimation
2000 to 4999	54	10.0	Under-estimation	Over-estimation
5000 to highest	23	4.3	Under-estimation	Over-estimation

### 3.4 Differentials of Reporting Errors by Background Characteristics

The analysis of reporting errors, both over-estimation and under-estimation, by background characteristics is shown in Table 4. Since 78 households have negligible reporting errors, therefore these households were excluded from studying the differentials. The findings indicate that about 67% of households over-reported the food intake, and the rest (33%) of the sampled households under-reported the food intake. The variation of the errors in poverty estimation by the conventional method of DCI is studied by the selected characteristics, namely, location of the households (district), household head's occupation, household head's education, and type of family. The results are categorically described for each of the characteristics.

Location (District):

The percentage of households with a considerable margin of reporting errors was found to vary significantly according to the districts. The reporting errors was found highest (90.84%) among the sampled households of Moulvibazar district. On the contrary, the reporting errors were found lowest (73.85%) among the sampled households of Habigonj district. Among these households, 64.6% have over-reported the food intake, and 35.4% have under-reported the food intake according to the conventional method. It is found that nine-in-ten households of Moulvibazar district have reporting errors, of which two-thirds have over-reported and one-third have under-reported the food intake. Over four-fifths of the sampled households of Sylhet district are found to have reporting errors. The over-estimation, and the under-estimation ratio was obtained at 66:34 in the Sylhet district.

Occupation of the Household Head

The reporting error was found to vary in relation to the occupation of the household heads. The reporting error was found highest for households with labourer as household heads (93.02% for agricultural labour, and 94.79% for non-agricultural labour). On the other hand, the reporting error was found lowest for households with job/service as an occupation of the household heads. Among the households with job/service as an occupation of the household heads, a little more than four-fifths were found to have reporting error, and about two-thirds of these households have over-reported the food intake.

Education of the Household Head

The percentage of households with estimated reporting error in poverty measurement is not found to vary much more according to the level of education of the household heads. A decreasing trend of reporting error has been observed concerning to the educational level of household heads. About three-fifths of the households were found to over-estimate the poverty condition irrespective of the educational level of the household heads.

Type of Family

The food distribution may vary according to the family size. The estimated reporting error is found to increase with the increase of the family size. Also, the over-reporting was found higher in extended families in comparison to nuclear families.

**Table 4:** Error in the Estimation of Poverty according to Selected Characteristics

Characteristics	No. of Households	% of Households with reporting error	Errors in Poverty Estimation	
			% of HHs Over-reported the Food Intake	% of HHs Under-reported the Food Intake
District				
Habigonj	65	73.85	64.60	35.40
Moulvibazar	142	90.84	65.90	34.10
Sunamgonj	107	88.79	56.80	43.20
Sylhet	224	84.37	66.10	33.90
Occupation of the HH				
Farming	81	88.89	63.90	36.10
Non-agriculture	192	94.79	61.50	38.50

work (Trading/ Labour)				
Agricultural Labour	43	93.02	67.50	32.50
Job/Service	81	82.72	67.20	32.80
Others (Unemployed/ Housewife/ Student)	141	88.65	63.20	36.80
<b>Education of the HH</b>				
No education	207	85.51	62.70	37.30
Pre-Primary (1-3 years schooling)	31	96.77	64.50	35.50
Primary (4-5 years schooling)	88	85.23	62.70	37.30
Secondary & above (6+ years schooling)	212	83.96	65.70	34.30
<b>Type of family</b>				
Nuclear family	397	83.38	63.40	36.60
Joint family	109	91.74	64.00	36.00
Extended family	32	93.75	73.30	26.70
<b>Total</b>	<b>538</b>	<b>89.62</b>	<b>66.90</b>	<b>33.10</b>

#### 4. Conclusions

This study is designed to estimate the errors of measuring poverty and food insecurity by the conventional method of data collection. The study has estimated the errors of calorie intake at household level considering the deviation of calorie intake from measurement (innovative) to perception (conventional) method. The per capita per day calorie intake has been estimated at 2515.23 k.cal and 2426.42 k.cal for perception-based and measurement data, respectively. The consumed amount of calorie differs significantly ( $p < 0.01$ ) between these two approaches. Considering the age-sex of the present household members, the incidence of absolute poverty has been estimated at 21.7% and 25.3% for the data collected by perception and measurement methods, respectively. Both the average calorie intake and the incidence of poverty were found to vary according to selected background characteristics of the households. The analysis of estimated errors indicates that about 55% of households over-estimated the consumed amount, while about 31% of households under-estimated the situation. That is, the under-estimation dominates the over-estimation in estimation of poverty and food insecurity through direct calorie intake method using the data collected by perception-based conventional approach.

The study recommends to using modified direct calorie intake method (deviation between required amount of food/energy considering age-sex of the household members who took food and actual

intake by these members) with innovative data collection method (using a kitchen scale to record the consumed amount) for estimation of poverty and food insecurity. The exiting number of visits (for example, 7 visits for 14 days data collection for Bangladesh) can be reduced remarkably for collection of food consumption data under innovative data collection method. The policymakers and concerned authorities can adopt the innovative data collection method in order to reduce the errors in measuring poverty and food insecurity through conventional perception-based data collection approaches with the aim to achieve the development goals set for the eradication of poverty and hunger by 2030 through SDGs.

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## Appendix

**Table 1:** Estimated per Day Calorie Needs for Bangladeshi People by Age and Sex<sup>1</sup>

Age	Male	Female
0-2	820	820
2-4	1300	1250
4-6	1700	1700
6-8	1750	1800
8-10	1800	1900
10-12	2100	2000
12-16	2600	2200
16-20	2700	2100
20-40	2700	2000
40-50	2400	2000
50-60	2300	1800
60-70	2000	1600
70+	1600	1400

<sup>1</sup> This chart is prepared for Bangladesh by adjusting the requirements stated in the following reports:

Ahmed, K., Malek, M.A, Ullah, K.S., Nahar, B. Edib, K. and Begum, M. (1980). *Nutrients of Domestic Foods (Deshiyo Khaddodrobber Pustiman)*. Institute of Nutrition and Food Science, Eden Press, Dhaka, p. 33.

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Available at <http://health.gov/dietaryguidelines/2015/guidelines>.

Free-dieting online server for “Calorie Calculator- Daily Calorie Needs”. This site is retrieved on 25 November 2018 from <https://www.freedieting.com/calorie-calculator>.