National Micronutrients Status Survey 2011-12

Final Report

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PREFACE

This report summarizes the findings of the National Micronutrients Survey 2011-12 conducted in collaboration of icddr,b, UNICEF, Bangladesh, Global Alliance for Improved Nutrition (GAIN) and the Institute of Public Health and Nutrition (IPHN). The UNICEF funding was provided under contract numbers-SSA/BANA/2011/2296-1, 43115503. The National Micronutrients Survey 2011-12 collected updated data on the key micronutrients status-such as subclinical vitamin A, anemia, iron, zinc, folate, B_{12}, iodine and iodization of salts in Bangladesh population.

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ACROMYMS

AGP	Alpha Acetylated Glycoprotein
BBS	Bangladesh Bureau of Statistics
BDHS	Bangladesh Demographic Health Survey
BDT	Bangladesh Taka
CI	Confidence Interval
CRP	C- Reactive Protein
CUS	Center for Urban Studies
CV	Co-efficient of Variation
EPI	Expanded Program for Immunization
ERC	Ethical Review Committee
EQUIP	Ensuring the Quality of Iodine Procedures
FFQ	Food Frequency Questionnaire
FANTA	Food and Nutrition Technical Assistance
GOB	Government of Bangladesh
GDP	Gross Domestic Product
HKI	Hellen Keller International
HH	Households
icddr,b	International Centre for Diarrheal Diseases Research; Bangladesh
ID	Iron Deficiency
IDA	Iron Deficiency Anemia
IDD	Iodine Deficiency Disorder
IOM	Institute of Medicine
IPHN	Institute of Public Health and Nutrition
IRB	Institutional Review Board
IVACG	International Vitamin A Consultative Group
IZINCG	International Zinc Nutrition Consultative Group
LPG	Liquid Petroleum Gas
MDG	Millennium Development Goals
MICS	Multiple Indicator Cluster Sampling
MMQAP	Micronutrients Measurement Quality Assurance Program
Mmol/l	Micromole per liter
MUAC	Mid Upper Arm Circumference
NGO	Non Government Organization
NIST	National Institute of Standards and Technology
Ng/ml	Nanogram per mililiter
Nmol/l	Nano mole per liter
NPNL	Non pregnant non lactating
PCA	Principal Component Analysis
Pg/ml	Pico gram per milliliter
PHM	Photometeric Hemoglobinometer
Pre SAC	Preschool age children
PPM	Parts Per Million
PSU	Primary Sampling Unit
QC	Quality Control
RDA	Recommended Daily Allowance
RE	Retinol Equivalents
RRC	Research Review Committee
SAC	School age children
SES	Socio Economic Status

SOP	Standard Operating Procedure
THFPO	Thana Health and Family Planning Officer
UIC	Urinary Iodine Concentration
UNICEF	United Nation’s Children’s Fund
USI	Universal Salt Iodization
VITAL EQA	Vitamin A Laboratory - External Quality Assurance
WHO	World Health Organization

SUMMARY OF FINDINGS

Household characteristics: Possession of household assets, such as electricity, television, and refrigerator was 68.0%, 41.0% and 12.0% respectively. Mobile phone possession was remarkable as 78.0% of the households possessed mobile phones.

Household food insecurity: Over half of the households (51.0%) were "food secure". Households with "food security" were 53.3% in the urban and 36.3% in the slums area. Households experiencing severe grade of "food insecurity" were 12.3%.

Household's monthly spending: The average monthly expenditure was BDT. 8944.0. It appeared slightly higher in the urban (BDT. 11006.0) than in the rural (BDT. 8393.0) area. Households with "food security" had significantly higher spending ability than the householed which were "severely food insecure" (BDT. 10357.0 vs. BDT. 6505.0).

Consumption of edible oil: Per capita daily consumption of oil was 24.4 grams. It was 29.7, 25.9, and 22.9 grams respectively in the urban, slums and rural areas. According to household food insecurity, the consumption was 27.8 grams in the "food secure" households while it was just 16.4 grams in the "severely food insecure" households.

Type of oil consumption in households: Soybean oil was used in 89.5% of the households. Mustard oil was consumed in 17.2% of the households. "brand" oil was used in 25.7% of the households. In the rural, urban and slums area the usage of "brand" oil was 22.8%, 38.6% and 12.7% respectively. However in the vast majority of the households (75.0%) at the national level, "open" oil was used for consumption.

Subclinical status of vitamin A: The prevalence of subclinical vitamin A deficiency, as measured by serum level of retinol (serum retinol< 0.7 mmol/l) was 20.5% in the preschool age children; the prevalence in the slums was significantly higher at 38.1%. The prevalence was 20.9% and 5.4% respectively in the school age children and the NPNL women. The prevalence in the school age children in the slums was 27.1%.

Vitamin A supplementation in the preschool age children: The national estimate of the coverage was 77.0%. It was 77.9%, 73.1% and 72.4% respectively in the rural, urban and the slums area. According to asset index, the coverage was 76.4% in the "poorest" section and 87.5% in the "richest" section of population.

Anemia: The prevalence of anemia in the preschool age children was 33.1%. It was 37.0% and 22.8% respectively in the rural and the urban strata. The prevalence appreared to be lower than the earlier nationally representative estimates of the country (47.0%, NSP 2001); however this may be accountable to the difference in the assessment methods. The venous hemocue was used in the national micronutrients survey. The prevalence of anemia in the school age children was 19.1% and 17.1 % respectively in the 6-11 year and 12-14 year groups. The prevalence of anemia in the NPNL women was 26.0%. According to the earlier nationally representative survey it was 33.0% (NSP 2001).

Iron deficiency: Iron deficiency was measured by estimation of the serum level of ferritin. In the national micronutrients survey first time a nationally representative data on serum ferritin was available. The ferritin value in serum was adjusted for presence of infection by addressing the elevated values of CRP (>10mg/l) and AGP (>1 gm/l), the bio-markers for infection. The national prevalence of iron deficiency, as measured by low ferritin (preschool

age children<12 ng/ml; school age children and NPNL women<15 ng/ml) was 10.7% in the preschool age children and in the NPNL women it was 7.1%. It was 3.9% and 9.5 % in the school age children aged 6-11 year and 12-14 year respectively. The prevalence of iron deficiency in Bangladesh population appreared to be substantially lower than the widely held assumption. The amount of consumption of iron from food is short of the daily recommended requirement (RDA) in all the population groups studied. The total consumption of iron from food was 41.0-82.0% of the recommended daily requirement across age and sex of the studied population groups. The mean ferritin level in the blood in the studied population groups were significantly higher ($p<0.001$) in the areas where ground water iron concentration was higher than in the areas where groundwater iron was lower. In spite of lower consumption of iron from food, iron deficiency in the population was lesser than expected, and it was presumably linked with high level of iron in the groundwater, which is the largest source for drinking water in Bangladesh population (80.0%).

Zinc status: The National micronutrients survey 2011-12 provided for the first time in Bangladesh a nationally representative data on zinc status in the selected populations. The national prevalence of zinc deficiency was 44.6% in the preschool age children. It appeared to be higher in the slums children (51.7%) than in the urban (29.5%). In the NPNL women the national prevalence was 57.3%, while the prevalence in the slums was 66.4%. The amount of consumption of zinc was well below the recommended daily amount. In the NPNL women total consumption was 54.7% and 47.0% of the recommended daily amount in the urban and slums area respectively. Of the total consumption majority comes from plant origin, which is poorly bio-available.

B_{12} and folate status: The B_{12} and folate status was estimated in the NPNL women. It was the first time the national micronutrients survey has provided a nationally representative data on these deficiencies. The national prevalence of folate deficiency was 9.1%. The prevalence of B_{12} deficiency (frank deficiency and marginal deficiency) was 23.0% at the national level.

Status of iodine and salt iodization: The prevalence of iodine deficiency as measured by the proportion of the school age children whose mean urinary iodine concentration was below the cut-off mark of 100 µg/l was 40.0%. It appeared to have a rising trend from the 2004/5 data when it was 33.8%. In the NPNL women, the prevalence of iodine deficiency was 42.1%, which also has shown a rising trend from the earlier data when it was 38.0%. However according to median urinary iodine concentration, which was above the cut-off for defining the deficiency (100 µg/l), indicated that Bangladesh as a whole on the total polulaion basis was iodine sufficient, despite the fact that the trend in iodine deficiency prevalence was on rise. The median urinay iodine concentration in the school age children and the NPNL women were 145.7 µg/l and 122.6 µg/l respectively. According to asset index, the bottom two quintiles –"poorest" and "poorer" of the NPNL women had median uriniary iodine concentration below the 100 µg/l, indicating the impoverished section of the women were iodine deficient.

About 80% of the households used iodized salt (iodine level >=5 PPM), while 57.6% of the households used adequately iodized salt (iodine level >=15 PPM). In the rural stratum, usage of adequately iodized salt was just 51.8%. The national rate of usage of "brand" salt was 75.8%, however a substantial share (30%) of the households in the rural area still used "open" salt. The usage of "open" salt was 37.0% and 17.0% in the "poorest" and the "richest" households respectively. The proportion of retailer salt sample with adequately iodized salt (>=20 ppm) was 66.4%.

Nutritional status in the preschool age children: The prevalence of stunting (height-for-age z-score<2) in the preschool age children was 32.1%. It was worse in the slums (51.1%) than in the urban (31.3%) and rural (31.4%) strata. The prevalence of underweight (weight-for-age z score<2) at the national level was 30.0%. It was more prevalent in the slums (47.4%) than in the other two strata-29.6% in the rural and 28.1 % in the urban area. The prevalence of wasting (weight-for-height z score<2) was 19.3 %, with proportionately more children in the slums (20.3%) and rural (21.1%) area were living with the condition than in the urban strata (12.9%).

Micronutrients consumption from food: In regard to consumption of nutrients from food, it appeared although the consumption level of animal source foods have been increasing in the country (Household Income & Expenditure Survey of Bangladesh, 2010), the data of the national micronutrients survey suggested, the population of Bangladesh are still well short of the Recommended Daily Allowance (RDA) of food intake for the key micronutrients. In case of vitamin A, the median daily consumption of vitamin A, as expressed by Retinol Equivalents (RE) were 270.0, 318.0, and 372.0 REs respectively in the preschool age, school age children and the NPNL women, which were short of the RDA amount for respective age and population groups. Daily median consumption of iron from food was 4.17, 5.21 and 6.64 mg in the preschool age children, school age children and the NPNL women, which were comprehensibly lesser than the RDAs for the age and population. The consumption of animal source iron, the form of dietary iron that is readily absorbed in the body was a scant proportion of the total iron consumption. The share of animal source iron to total iron consumption was 23.0%, 24.0% and 18.0% respectively in the school age children, preschool age children and the NPNL women. In regard to consumption of zinc from food, the median daily consumption was 3.2 mg and 2.6 mg in the urban and slums area, against the RDA of 3-5 mg for zinc in the preschool age children, again falling short of the requirement.

Micronutirients and nutritional status in the slums: The national micronutrients survey was the first attempt to see the micronutrients status in the slums population- an issue of long time felt need which lacked data on key micronutrients. However the findings were startling as the slums population had been suffering from the key micronutroients deficiencies and the under nutrition status was higher than the other two starta-urban and rural, in spite of the fact that SES indicators were not inferior to the rural area.

The Table below is highlighting the issue

	Rural (%)	Urban (%)	Slums (%)
Subclinical vitamin A deficiency			
Preschool age	19.4	21.2	**38.1**
School age	20.2	22.1	**27.1**
NPNL women	5.4	4.9	**6.9**
Zinc deficiency			
Preschool age	48.6	29.5	**51.7**
NPNL women	57.5	54.5	**66.4**
Nutritional status			
Stunting	31.4	31.3	**51.1**
Wasting	21.1	12.9	**20.3**
Underweight	29.6	28.1	**47.4**

1. INTRODUCTION

Bangladesh has been making impressive progress in reducing under nutrition, and is one of the countries which are on course to likely meet the nutrition Millennium Development Goal (MDG). However prevalence of micronutrient deficiency still exists at a level of high magnitude. It was estimated that micronutrients deficiency is accounted for loss of $7.9 billion losses in national GDP. The major micronutrients deficiency problems affecting Bangladesh are vitamin A, iron and anemia, zinc and iodine. According to the last nationally representative survey, the prevalence of sub-clinical vitamin A deficiency, as measured by low serum level of retinol (<0.7 mmol/l) in the pre school aged children (6-59 month) was 22.0% (IPHN/HKI 1997-98). In a more recent study conducted in the areas where homestead gardening was operational, reported that about one-fifth (19.6%) of the young children had a serum retinol level of <0.7 µmol/l (Faruque et al 2006). Vitamin A capsule distribution program for preschool aged children has been successfully contributed to decrease the magnitude of the problem over last one decade, especially in reducing the prevalence of night blindness. However there are pockets of areas, where vitamin A deficiency might be present at high magnitude. Post partum vitamin A supplementation coverage was just 17.0% (BDHS 2007). To increase the coverage of vitamin A intervention, the GOB under the auspices of Ministry of Industry has initiated the national oil fortification program. The program fortifies locally processed edible oil (soybean, palm oil) with vitamin A. The present national micronutrients survey constitutes the baseline assessment of the current subclinical vitamin A status. The impact of the oil fortification program could be assessed with regard to present survey.

Anemia probably is the biggest public health problem of the country. Still over half of young children, over one -fourth of the school age children and over one-third of the women are living with this condition. Prevalence among, under two children is pervasive as over 60% of them are suffering from anemia (Nutrition Surveillance Project 2001). There is no national policy for the children to control anemia. The last nationally representative anemia survey was conducted about a decade ago, and it is unanimously recommended by the policy actors of the country for conducting a national survey on anemia and iron deficiency. Until now in Bangladesh there is no nationwide data on iron deficiency, assessed through serum ferritin or other specific indicators of iron such as sTfr. There are only sporadic small scale studies using such iron indicators. Therefore the present survey was an attempt to obtain a nationally representative data on iron deficiency for the very first time in Bangladesh.

Although the control of Iodine Deficiency Disorder (IDD) has been impressive over a decade, still the problem exists at a magnitude of public health significance. The prevalence of IDD, as indicated by urinary iodine concentration below a defined cut-off (100 microgram/l) is 33% and 38% in the school age children and women respectively. The national IDD control program is mandated to monitor the situation over the time, and the last IDD survey was conducted in 2004. Hence the present survey posed with an opportunity to inform the updated status of iodine nutrition and status of iodine in salt.

Zinc is essential for normal growth and immune function. In children residing in countries with an elevated risk of zinc deficiency, zinc supplementation enhances growth, decreases morbidity from diarrhea and pneumonia, and decreases mortality. Zinc is available in animal source foods, meat, fish, eggs etc. Unfortunately the diet of Bangladesh lacks in optimum amount of animal source food and it is predominatly staple based, which are poor source of zinc. However, an estimated 50% of the population is at risk of inadequate zinc intake based on national food supply data. In a recent study conducted in two of the subdistricts in Bangladesh looking at efficacy of bio fortified rice shows that prevalence of inadequate

serum zinc in under five children and women is respectively 22% and 73% (Joanne E. Arsenault,2010). However nationally representative data on zinc deficiency was not available. Therefore the present survey provided for the very first time, a nationally representative data on zinc nutrition in the selected population groups. Thr survey also provided a nationwide data on folate and B_{12} deficiencies in the non pregnant and non lactating women.

Conglomeration of multiple micronutrients for the survey was efficient in terms of resources and perhaps more importantly was an essential public nutrition response to inform the policymakers about the nation-wide population status of the micronutrients (iron, zinc, folate, B_{12}) which was unknown and the updated status of other key micronutrients (vitamin A, iodine), requiring ongoing monitoring for better nutrition of the people.

1.1 OBJECTIVES

To estimate the status of key micronutrients (vitamin A, iron, iodine) for the selected population groups, e.g. pre-school age children (pre-SAC;6–59 months old), non-pregnant non-lactating women of reproductive age (NPNL, 15–49 years of age), and school-age children (SAC; 6–14 years old) for rural, urban, and urban slums strata, to:

a) estimate the current prevalence of sub-clinical vitamin A deficiency in the pre-SAC (6-59 months), SAC, and the NPNL as baseline for the government's national oil fortification program as measured using serum retinol concentrations
b) assess the current status of Iodine deficiency disorder (IDD) among SAC and NPNL as measured by urinary iodine concentration (UIC);
c) estimate the current prevalence of anemia in the pre-SAC (6-59 months), SAC, and NPNL as measured by hemoglobin;
d) estimate current prevalence of iron deficiency in the pre-SAC (6-59 months), SAC and NPNL as measured by ferritin (and CRP and AGP for adjusting for infection);
e) estimate current prevalence of zinc deficiency in the pre-SAC (6-59 months), and NPNL as measured by serum zinc;
f) assess the proportion of households using adequately iodized salt by analyzing salt samples collected from households;
g) obtain information on the knowledge of the study populations on iodine deficiency disorders , vitamin A and iron-rich food consumption, oil consumption and purchasing patterns of the study population;
h) assess the proportion of households using oil that will, in the future, be fortified by asking for use of refined oil and collecting the brand names (where possible)
i) Compare the progress in coverage of adequately iodized salt, and the iodine status with the previous findings in national IDD/USI survey
j) Assess prevalence of folate and B_{12} deficiency in NPNL.

TABLE 1: PARAMETERS FOR ANALYSIS

Issues of Interest	Key Indicators
Biochemical assessment	Prevalence of sub clinical Vitamin A deficiency Prevalence of iron deficiency Prevalence of iodine deficiency Prevalence of zinc deficiency Prevalence of folate deficiency Prevalence of B_{12} deficiency Prevalence of anemia (hemoglobin) Assessment of inflammatory biomarkers (CRP, AGP) Assessment of salt for presence and adequacy of iodization
Dietary Assessment	Dietary consumption pattern, specially vitamin A, iron, zinc rich food consumption Consumption of edible oil
Anthropometry	Prevalence of underweight (weight-for-age <-2 Z-score) for children aged 6-59 months Prevalence of wasting (weight-for-height <-2 Z-score) for children aged 6-59 months Prevalence of stunting (height-for-age <-2 Z-score) for children aged 6-59 months
Other indicators	Household food insecurity Socio demographic conditions influencing vitamin A deficiency, anemia, iodine deficiency and child nutritional status.

2. METHODOLOGY

2.1 STUDY POPULATION

The pre-school aged children (pre-SAC; 6–59 months old), the non-pregnant non-lactating women of reproductive age (NPNL, 15–49 years of age), and the school-aged children (SAC; 6–14 years old)

2.1.1 INCLUSION CRITERIA FOR THE HOUSEHOLD

1. Any member belongs to any one of the groups of the study population. In case of the presence of more than one eligible individual in a household from a particular population group, all will be considered for enrolment
2. The head of household (or another adult in his absence) gave verbal consent for household participation, including that for children
3. Household members currently lived in a selected cluster

2.1.2 INCLUSION CRITERIA FOR THE INDIVIDUAL

1. The individual was a member of the survey target group
2. The participating woman gave written informed consent for her and her pre school age (6-59 month) child's participation in the study. For school age (more than 10 years old) children able to communicate, written assent was taken.

2.2 SAMPLE SIZE DETERMINATION

Sample size was calculated in two different ways depending on the indicators. For the assessment of serum retinol, the sample size for each target group was calculated to detect with statistical significance a minimum assumed decline in the prevalence of low serum

retinol between the two surveys as shown in the table 102 (Annex 7.2). The following formula was used to calculate the sample size.

$$n = \frac{\left[Z_\alpha \sqrt{2PQ} - Z_{1-\beta}\sqrt{P_1Q_1 + P_2Q_2}\right]^2}{(P_2 - P_1)^2}$$ x design effect x factor to adjust non-response rate

Where *n*= required sample size for each survey, expressed as number of units of analysis,

$P_1 =$ Proportion in the pre-intervention (or baseline) survey,

$P_2 =$ Proportion in post-intervention survey,

$(P_2 - P_1) =$ Expected difference between baseline and follow-up surveys,

$P = (P_1 + P_2)/2$ and $Q = (1-P)$,

Z_α = 1.96 at α =0.05 and $Z_{1-\beta}$ = (-0.842) for power of the test set at 0.80,

and the design effect = 2 and factor to adjust non-response rate of 20%

The sample size calculated as such could detect the statistical significance for the stated change between baseline and end line retinol status in each of the stratum separately, however it would necessitate more than 13,000 households to visit making the survey infeasible to conduct with regard to logistics, resources and time required to accomplish. Hence, 3000 households was considered to visit, which would detect the stated change in low retinol prevalence between baseline and end line in all the three strata together, and would be logistically feasible to conduct. The table 103 (annex 7.2), showing actual p values obtained for each target group for differences in the prevalence of vitamin A between the baseline and follow-up surveys given the inclusion of 3000 households in the sample for each survey.

On the other hand, to estimate the prevalence of anemia, iron deficiency, iodine deficiency, zinc deficiency, folate deficiency, and vitamin B_{12} deficiency, the minimum sample size was calculated in order to obtain a specified precision, that is, a confidence interval of a specified width around a single point estimate in the survey for each target group and outcome. The required precision depended on the target group and outcome, as shown in Table 104, (annex 7.2). The formula used for these calculations is:

$$n = \frac{Z_\alpha{}^2\, P(1-P)}{d^2}$$ x design effect

P = the current prevalence, Z_α = 1.96 at α =0.05, d = the half confidence interval

and the design effect = 2

The Table 105, 107 (Annex 2) shows the actual confidence intervals obtained for each target group, for anemia, iron deficiency, folate, B_{12}, urinary iodine, salt for iodization at households and retailers, given the inclusion of 3000 households in the sample. Based on the feasible sample size calculated in the tables 103, 105,106 and 107 (annex 7.2), the table 2 following gives the adjusted (to the whole numbers for field work) and definitive sample size for each of the parameters in the different population groups

TABLE 2: ADJUSTED SAMPLE SIZE FOR LABORATORY PARAMETERS

Parameter	Population	Actual sample (3 strata)	Adjusted to whole numbers for field work
S. Retinol	Pre-school	1176	1200
	NPNL	954	1050
	School aged children	1455	1500
		Total	***3750***
Hemoglobin	Pre-school	588	600
	NPNL	954	1050
	School aged children	1455	1500
		Total	***3150***
S. Ferritin	Pre school	588	600
	NPNL	954	1050
	School aged children	1455	1500
		Total	***3150***
S. zinc	Pre-school children	969	1050
	NPNL	1514	1500
	Total		***2550***
S. Folate	NPNL	954	***1050***
B_{12}	NPNL	954	***1050***
Urinary Iodine excretion	NPNL	1401	1500
	School aged children	1320	1350
		Total	***2850***
Salt for iodide (Household)-"adequacy of iodized" salt*			***1800***
Retailer's salt- "sale of iodized salt"**			***1650***

The Sample size also covered the sample for "purchase of iodized salt"*

The sample size also covered the sample for "Adequacy of iodization in salt"**

2.3 SAMPLING DESIGN

The outcomes were estimated for three strata (rural, urban, and urban slums). The list of the 15,000 primary sampling units (PSUs) selected for the Bangladesh Multiple Indicator Cluster Survey (MICS 2009) was used as the sampling frame to select the required number of PSUs per stratum for this survey. Sampling was carried out at three stages.

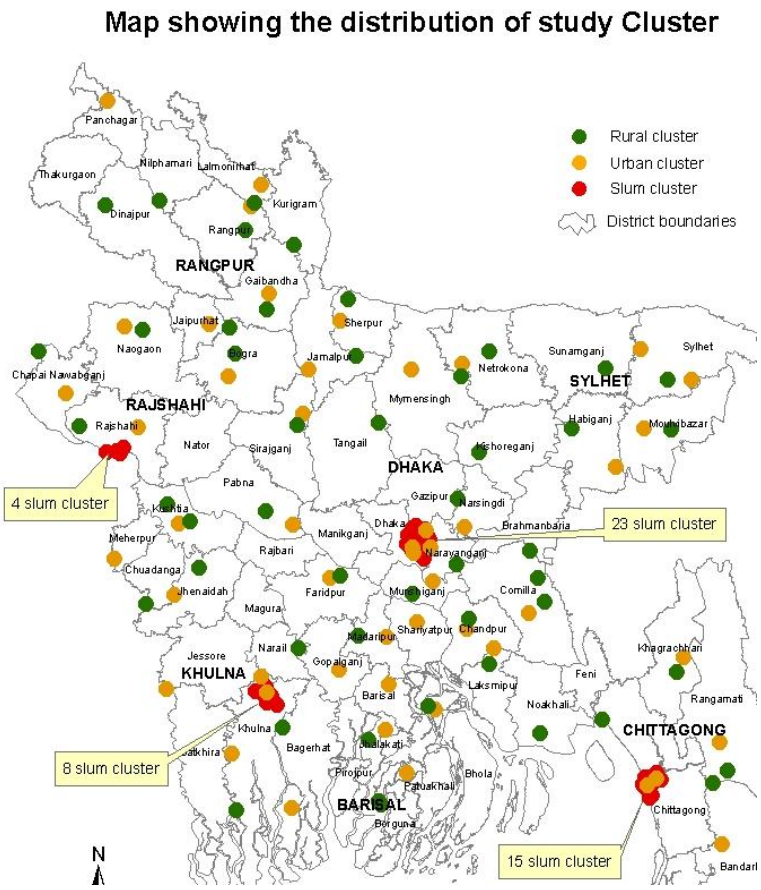
2.3.1 FIRST STAGE SAMPLING: In the first stage selection of the PSUs was done by systematic random sampling with equal probability in each stratum. Equal probability of selection was used to preserve equal selection probability for every household in the stratum. This is because the 15,000 PSUs used in the MICS 2009 survey have already been selected by the PPS (Population proportion to Size). In this way a total of 150 PSUs were selected, 50 in each strata.

2.3.2 SECOND STAGE SAMPLING: In the second stage a segment of 50 households was selected randomly within each selected PSU. The selected PSU (Enumeration Area) was subdivided into segments. The size of each segment was as close to 50 households as possible. The field supervisor on arrival in the sampled PSU, asked the local people about its size, boundary. S/he requested a local inhabitant to help and accompany him in a walk through the mouza. In the walk, the number of 'Bari's (holdings) and number of households in each 'Bari' were counted. In this way the number of holdings containing 50-55 households were identified with the drawing of a "segment" on a piece of a paper. This was continued until a second segment (containig the holdings housing next 50-55 households) was drawn on the paper. When the process was completed for that PSU, randomly one "segment" was chosen.

2.3.3 THIRD STAGE SAMPLING: In the third stage, listing of the households was carried out for eligible study participants in the selected 50-household segment. From this list, 20 households were selected using simple random sampling by random numbers. The computer generated random numbers (for picking 20 households from the list of the 50) were produced beforehand. Five sets of random numbers generated were handed over to the field teams. The field teams used all those different sets by turn. These 20 households were the definitive list for data and biological sample collection.

The figure 1 below shows the spread of the sample PSUs in the divisions and districts

FIGURE 1: SELECTED 150 PSUS



2.4 SUB-SAMPLING FOR BIOLOGICAL SAMPLES (WITHIN 20 HOUSEHOLDS)

Because the sample sizes calculated for laboratory testing in different target groups are different, households differed in which target group members are recruited from that household.

The table below shows, number of study participants from different groups, required for collection of different biological parameters.

TABLE 3: CLUSTER WISE SAMPLE REQUIREMENT

Parameters	Population group	# required per cluster (20 HH)
Serum retinol	Pre-school (6-59 month)	8
	NPNL	7
	School aged children	10
Hemoglobin	Pre-school (6-59 month)	4
	NPNL	7
	School aged children	10
Serum ferritin	Pre school(6-59 month)	4
	NPNL	7
	School aged children	10
Serum zinc	Preschool	7
	NPNL	10
Serum folate	NPNL	7
Serum B_{12}	NPNL	7
Urinary iodine	NPNL	10
	School aged children	9

From these 20 households, maximum 8 samples for retinol in the preschool age children and 10 samples for retinol in the school age children were required. Also, 10 samples for urine (UIC) in the NPNL women were required. At first, every odd numbered household in the list was approached until the target for each of the parameters in each of the population groups was achieved. (i.e. Households 1, 3, 5….11, 13…19, in the 20HH form). In case of short fall in a particular population group, the even numbered households were approached to get the required number of samples (i.e. Households 2, 4, 6, 8….12, 14….20, in the 20 HH form). In case of more than one participant of a population group residing in a household, all were considered for data and biological sample collection.

4 preschool age children from the 8 selected for retinol were picked randomly for hemoglobin, ferritin, CRP and AGP. Computer generated four (4) random numbers were provided with the field teams. The field data collectors selected the 4 participants according to the given random numbers for estimation of hemoglobin, ferritin, CRP and AGP. From the 8 pre school age children selected for retinol, one was randomly excluded and the rest 7 were considered for assessing zinc.

All 10 school age children selected for retinol were considered for hemoglobin, ferritin, CRP and AGP. One of them was randomly excluded and the rest 9 (nine) were considered for collecting urine sample.

Seven of the 10 NPNL women selected for urinary iodine were randomly picked by the field staffs for hemoglobin, ferritin, CRP, AGP, folate and B_{12}. Computer generated, three (3) random numbers were provided with the field team. They selected the 3 participants according to the given random numbers and excluded them from estimating for hemoglobin, ferritin, CRP, AGP, folate and B_{12}. All 10 women selected for urinary iodine were considered for serum zinc assessment.

2.5 RETAILER SALT SAMPLING

Selection of salt retailers were done by asking the respondents in the households in each cluster where they usually buy their salt from. This questioning continued until six different retailers were identified. A survey team member then visited these six retailers to conduct interviews of the shopkeepers and collected specimens of the salt sold over there. At each shop, two salt samples were collected. The first specimen was a “brand” salt. The second

specimen was from an “open” salt container. If there was no “open” salt in the shop, a second “brand” specimen was collected.

2.6 HOUSEHOLD SALT SAMPLING

12 salt samples from the 20 selected households were collected. The household salt samples were collected from the households where at least a NPNL woman or school aged children or both resided and selected for urinary iodine/data collection. One salt sample per household was taken.

2.7 SAMPLE WEIGHT

Sample fractions (or selection probabilities) was different for different domains because population size of the strata and enumeration area varied widely. Sample weights $W_h = 1/P_h$ where P_h equals the overall selection probability in the h^{th} stratum was used in the analysis of the survey data. The program used for data analysis of the national micronutrients survey (STATA 10.0) permitted the estimates, calculated as the total weighted number of units of analysis included in analyses being the same as the unadjusted total.

2.7.1 ESTIMATION OF SAMPLING WEIGHT

The national micronutrients status survey (NMS) 2011-12 randomly sampled 50 clusters from each of the three strata/domains. The domains are:

1. Rural + other urban areas (“rural”)
2. Municipalities (including cities) without slum (“urban”)
3. Slum in Dhaka, Chittagong, Rajshahi and Khulna (“slums”)

Data of the Population Census 2001 of the Bangladesh Bureau of Statistics (BBS) and the Slum Census 2005 of the Centre of Urban studies (CUS) were used to estimate populations in each domain in 2011. The 2001 census data were disaggregated for rural, municipalities and other urban areas and used to project the size of the rural and urban populations for 2001-2050. CUS provided estimates of the populations in non-slum and slum in six cities (Chittagong, Dhaka, Khulna, Rajshahi, Sylhet and Barisal) in 2005.

Data of these two sources were used to estimate the size of the populations in each domain in 2011 under the assumptions that (a) the inter-census growth rates of the rural and urban populations during 2001-2011 were similar to the growth rates during 1991-2001; and (b) the share of the slum and non-slum population in 2011 was the same as the share in 2005.

Estimates of the populations in the three strata; rural and other urban areas, municipalities and urban slums in 2011 were 122.6, 23.3 and 5.5 million respectively. Despite the large difference in size, we selected 50 PSUs from each stratum, which resulted in differential selection probabilities and representations across the strata. Sampling weights are applied to the households in each stratum to compensate for the differential representations and to derive weighted estimates combining the estimates of the three strata. The sampled households are weighted by the inverse of the differential probabilities at household, cluster and stratum levels. The procedure used for calculating the selection probability (SP) is given below.

$$SP = \frac{No.of\ households\ interviewed\ in\ a\ segment}{50\ \ households\ in\ a\ segment} \times \frac{1\ segment\ per\ PSU}{No.of\ segments\ in\ a\ PSU} \times \frac{50\ PSUs\ in\ a\ stratum}{No.of\ PSUs\ in\ stratum} \times \frac{200\ \ households\ per\ PSU}{Estimated\ numberof\ households\ in\ a\ statum}$$

The sampling weight is the inverse of SP $Weight = \frac{1}{SP}$

2.8 Questionnaire and Data Collection

2.8.1 Questionnaires

The National Micronutrients Status Survey used five types of questionnaires: **a) Household questionnaire, b) Preschool age children's questionnaire, c) School age children's questionnaire, d) NPNL women's questionnaire and e) Questionnaire for Retailer's shopkeepers.** The contents of the questionnaires were finalized upon consultation with the experts from GAIN, UNICEF, icddr,b and the Technical Committee, organized for the survey. Field testing of the questionnaires was conducted and necessary modification was made. The Institutional Review Board (IRB) of icddr,b approved all the tools, including the research and ethical protocols. The questionnaires were developed in English and then translated and printed in Bangla.

The household questionnaire was used to list all the usual members and visitors in the selected households. Information was collected about the dwelling unit, such as the source of water, type of toilet facilities, materials used to construct the floor and walls, and ownership of various consumer goods. The questionnaire covered knowledge about source and health benefits of consumption of vitamin A and iron rich food, iodized salt and its benefits and household practice with the use of iodized salt. The household questionnaire was used to keep record of the collected salt samples from the household.

The NPNL women's questionnaire was used to collect information from non pregnant and non lactating women of reproductive age, 15-49 year old. Women were asked questions on the following topics:

- Background characteristics (e.g., age, education, occupation)
- Reproductive history
- Food consumption,
- Record of biological parameters collected, e.g. retinol, hemoglobin, ferritin, CRP, AGP, folate, B_{12}, zinc and urinary iodine.

The school age children's questionnaire was used to collect information from children aged 6-14 years old. Children were asked questions on the following topics:

- Background characteristics (e.g., age, education, occupation of household head),
- Morbidity history,
- Record of biological parameters collected, e.g. retinol, hemoglobin, ferritin, CRP, AGP, and urinary iodine.

The preschool age children's questionnaire was used to collect information from children aged 6-59 months old. The primary caregiver was asked questions on the following topics:

- Background characteristics (age of the child, vitamin A supplementation, mother's education),
- Food consumption
- Morbidity history(Fever, respiratory infection, diarrhea, malaria etc)

Retailer questionnaire was used to collect information from the retailer shopkeepers and questions were asked on the following topics.

- Type of salt sold, knowledge related with iodized salt and salt iodization, laws on salt iodization
- Knowledge about fortification of oil with vitamin A, type of oil sold etc

2.9 Field Operational Guidelines

2.9.1 Standard Operating Procedure (SOP)

A Standard Operating Procedure (SOP) was developed prior to start of the survey. The SOP, which was developed through pretesting, includes guidance on asking survey questions, sampling technique, anthropometry measurements and biological sample collection and management.

2.9.2 Survey monitoring tools

A survey monitoring tool was prepared to monitor the performance of the interviewers and enumerators and laboratory technicians in the field. The tools objectively assessed various field performances in light of the SOP and quantitatively evaluated the cluster performance. A bi-weekly monitoring reporting form was developed to capture average performance of several clusters, measured in quantitative assessments. These tools were helpful to inform the field team about their strength and weaknesses and thereby improving the performance subsequently.

2.10 Survey Training, Planning, and Organization

2.10.1 Training and Fieldwork

The training was organized in two stages. In the first stage (5-8 September 2011) held at icddr,b, a cadre of master trainers from the Mitra and Associates (data collection agency) and monitoring officers from icddr,b were given theoretical and practical orientation on different aspects of the survey e.g. cluster identification at the field, study participant selection, study parameter selection, interviewing, anthropometry, management of biological samples, e.g. blood collection, serum separation, aliquot preparation, labeling, maintenance of cold chain etc. Specialist trainers from icddr,b convened the sessions. It was followed by the second stage, held on 18-30 September 2011 when the field staffs were given the necessary orientation, being supervised by icddr,b representatives, Mitra trainers from the first stage and the core trainers of the Mitra. In the process, a total of 87 field data collectors, laboratory technicians and data management assistants were given training for the survey.

Nine field teams from Mitra and Associates, each consisting of 5 persons were engaged in data collection. Each team consisted of one supervisor, two interviewers, one quality control officer and one laboratory technician. The interviewers conducted the interviews. The laboratory technician was responsible for management of biological samples-collection, serum separation, aliquot preparation, labeling, and dispatching to the laboratory. The team supervisor was responsible for coordination of the activities, management of logistics, contacting the local authorities and rapport building with the community. The quality control officer was responsible for spot checking of filled up questionnaire, observation of interviews, and feedback on the activities. icddr,b engaged 6 (six) field based monitoring

officers, who worked very closely with the Mitra teams to supervise the work. Field supervisors from the Institute of Public Health and Nutrition (IPHN) visited the fields to monitor the activities.

2.10.2 DAY-WISE PLAN FOR THE DATA COLLECTION TEAMS

Day 1: Upon arrival in a selected mouza, the team visited the sub-district health and family planning officers (THFPO) / Thana Nirbahi Officer (Sub-district administrative officer)/ ward commissioner/ and local law enforcing agencies to brief about the survey and to garner support for assistance to facilitate the survey. The teams then did the segmentation of the mouza and random selection of a 50- household segment, listing of the 50 households of the selected segment, random selection of required number of study partcipants and arrangement of blood drawing at a local health center, NGO offices, primary schools or the residence offered by the local people.

Day 2-3: The teams collected data on socio-demographic, food consumption, morbidity, knowledge and practice related issues on vitamin A, iodine and iron, conducting anthropometry and collected the biological samples (blood, urine) and salt samples from the selected respondents and households/retailer shops in the PSU.

Day 4: The teams did any unfinished work, and moved for the next PSU according to trip plan.

The survey started on 4 October 2011. It was conducted in two phases. In the first phase data was collected from 72 clusters in the divisions of Rajshahi, Khulna, and part of Dhaka. The work of the first phase was continued till 3 November 2011. The second phase followed the Eid holidays (Eid-ul-azha) commencing from 14 November to complete the remaining 78 clusters in the division of Sylhet, Barishal, Chittagong, Dhaka and part of Rajshahi. The field work was completed on 20 December 2011.

2.11 SOCIO ECONOMIC STATUS INDICATORS

Information on ethnicity, religion, level of education of household head, occupation of household head, number of family members, ownership of the house, number of dwelling rooms, household construction materials, toilet facilities, sources of drinking water, household assets, land ownership, and household's monthly expenditure were collected as key indicators of socioeconomic status.

We used asset index as a measure of SES which was created by using information on household assets. Variables included were land (homestead, land under cultivation), construction materials of the walls, roof and floor of the house, ownership of household assets (electricity, radio, television, mobile phone, land phone, chair, watch, table, cupboard, rickshaw, van, animal drawn cart, refrigerator, motor boat), and type of toilet facility. The categories for construction materials of the roof and wall was considered as - tin, brick-cement(pacca) and others, while those of floor were considered as brick-cement(pacca), mud and others. For household assets, each item was belonged to categories ''owned'' or ''not owned'' by the household. Principal Component Analysis (PCA) was used to create the asset index. A weight was attached to each item from the first principal component. The households were classified into SES quintiles based on the asset index: quintile 1 (poorest), 2 (lower middle/poorer), 3 (middle), 4 (upper middle/richer), and 5 (richest).

2.12 HOUSEHOLD FOOD INSECURITY

The questionnaire consisted of nine occurrence questions that represent a generally increasing level ofseverity of food insecurity (access), and nine "frequency-of-occurrence" questions that are asked as a follow-up to each occurrence question to determine how often the condition occurred. Some of the nine occurrence questions inquire about the respondents' *perceptions* of food vulnerability or stress and others ask about the respondents' *behavioral responses* to insecurity. The questions address the situation of all household members and do not distinguish adults from children or adolescents. All of the occurrence questions ask whether the respondent or other household members either felt a certain way or performed a particular behavior over the previous four weeks. The generic occurrence questions are grouped by three domains-i.e. 1) Anxiety and uncertainty about the household food supply, 2) Insufficient food quality; and 3) Insufficient food intake and its physical consequences. The questions are added in the annexure (Annex 7.5).

2.13 CHILD'S AGE

Child's age was estimated using the immunization card, birth registration certificates. In the absence of the immunization card/birth registration certificates, age was verified by well tested questions, e.g historical events, natural disasters, religious festivals etc. The Bengali calendar was used as required.

2.14 CHILD ANTHROPOMETRY

The child's weight was taken using the electronic scale (Tanita Inc. Japan) with 100 gram precision. Calibration of the weighing scales was checked before the start of every day, using the same known weights (5 kg standard weight). Length/height was measured on a locally made standardized wooden length/height board. Mid upper arm circumference was measured of the pre-school aged children to the nearest 1 mm using the colour coded MUAC tape.

2.15 FOOD CONSUMPTION DATA

To assess food consumption, a 7-day semi quantitative Food Frequency Questionnaire (FFQ) was used taking into consideration commonly consumed foods, with special attention to vitamin A, iron and zinc-rich foods. Food photographs indicating the serving and amount (grams) were used to assess the quantity of consumption. Raw food weight was calculated by using appropriate conversion factors (Keramat Ali, 1991). Nutrients values (protein, carbohydrate, lipid, vitamin A, iron, zinc, folate, B_{12}, phytate, energy) were calculated per 100 gram of raw food consumed using the most updated Food Composition Table on the Bangladesh food (Nazrul Islam Khan, 2010).

2.16 HOUSEHOLD MONTHLY EXPENSE

The data on household's monthly expense was derived by collective expenses incurred on various items e.g. food, housing, utilities, transport cost, education, recreation, treatment etc. For example for food, approximate monthly requirement of food (rice, oil, salt, sugar, fish, meat etc) amount and unit cost for that was gathered, and expense was calculated by simple arithmatics.

2.17 ADJUSTING FERRITIN, RETINOL AND ZINC FOR INFECTION

The ferritin, retinol and zinc were analyzed keeping in mind the indicators of infection (CRP, AGP). The adjustment for elevated CRP (>10.0 mg/l) and AGP (>1.0 g/l) was done by a mathematical correction, a procedure being increasingly used now a days and published in the renowned journals (David Thurnham 2010; Reina Engle-Stone 2011). With regard to the

procedure, respondents were divided into four groups- “incubation” (CRP >10 mg/l & AGP<1 g/l), “early convalescence” (CRP>10 mg/l & AGP>1 g/l), “late convalescence” (CRP<10 mg/l & AGP>1 g/l, and the “healthy/reference” (CRP<10 mg/l & AGP<1 g/l) group. Geometric mean of serum ferritin was calculated for each of these groups (Typically, ferritin value at the population level was skewed. Therefore, ferritin value was log transformed and then back-transformed to give the geometric means for each of the groups). Correction factor for ferritin was calculated as ratios of geometric means of the “healthy/reference” group to that of the infection groups (incubation, early convalescence, late convalescence). Ferritin values in the infection groups were adjusted by multiplication by the group specific correction factors. As for example, the correction factors to adjust ferritin in the preschool age children data were: 0.79, 0.37, and 0.72 respectively in “incubation”, “early convalescence” and “late convalescence” groups. By the same technique, correction factor for retinol and zinc were calculated and used to adjust the retinol and zinc level in serum.

2.18 Biological Sample Collection, Preparation, Transport and Storage

2.18.1 Blood Sample Collection and Processing

Collection of blood specimens was carried out in a nearby health facility e.g. sub district health complex, Union sub centre, primary school, EPI clinic, NGO clinic, NGO office, residencial place offered by the local people etc. The selected respondents were given a token indicating their name and identification and requested to appear at the temporary blood collection setup.

In order to obtain 1200 µl serum, at least 3.5 ml of venous blood was collected in a Venoject tube. After collection of blood, the blood tube was placed in a cool box and allowed to clot. At the end of each day, the whole blood was centrifuged and the serum was aliqoted into at least four cryovials by pipetting using a disposable pipette. One aliquot of approximately 250µl was for the analysis of retinol; one aliquot of 450 µl was for ferritin, CRP, and AGP; one for zinc and, for specimens from the NPNL women, a third aliquot of 450 µl was for the analysis of folate and vitamin B_{12}. Sample ID tag was applied on each of the cryovials. The serum was stored in a freezer (-20ºC or colder) as soon as possible. Otherwise the serum was kept in a cool box and put into a freezer (-20ºC or colder) within 3-4 hours. Aliquoted samples of the same cluster were kept in cryo-boxes with a label of the same cluster on the box. In this way, the laboratory could easily identify, which particular clusters are to be tested in a batch and thus minimizing the possibilities of increasing freeze/thaw cycles. A sample record/handover form was filled up indicating name of the participants, ID number, sample ID number, and type of analysis to be done. The samples were carried to the nutritional biochemistry laboratory in Dhaka in dry ice. Samples were received at the laboratory and stored in a -70^{o}C freezer and analyzed to estimate the blood parameters.

2.18.2 Collection of Urine Samples

The children and women selected for collection of urine samples were asked to provide a urine sample in a single use plastic cup. The samples were transferred to wide-mouthed screw capped plastic bottles that had been previously washed with de-ionized water and dried. All the samples from one cluster were packed in one carton, transported to the nutritional biochemistry laboratory in icddr,b and stored in -20 degree celsius, where the analysis was done.

2.18.3 Collection of Salt Samples

1. Salt samples were collected from salt retailer’s shop
2. Salt samples from households

Households selected for salt collection were asked to provide a sample of salt used for cooking. Salt samples were collected from the retailers (sold in "sealed"/ "named"/ "polyethylene" packets). "Open" salt (not sold in "sealed"/ "polyethylene" packets and "unnamed") were also be collected. All salt samples were transferred to air-tight containers and stored at room temperature in the nutritional biochemistry laboratory of icddr,b prior to analysis.

Table 4 below provides an overview of the indicators that were assessed for each of the populations

TABLE 4: PARAMETERS BY POPULATION GROUPS

Indicator	Pre-SAC	SAC	NPNLW	Retailers	Household
Serum Retinol	√	√	√		
Serum markers of inflammation	√	√	√		
Hemoglobin	√	√	√		
Serum ferritin	√	√	√		
Serum Zinc	√		√		
Urinary iodine		√	√		
Serum folate			√		
Serum B_{12}			√		
Salt iodine				√	√
Height	√				
Weight	√				

2.19 DATA PROCESSING AND ANALYSIS

Questionnaires for the National Micronutrients Status Survey were periodically returned to Dhaka for data processing at the Mitra and Associates. Data processing consisted of office editing, coding of open-ended questions, data entry, and editing of inconsistencies found by the computer programs. The data was processed by 2 data entry operators and one data entry supervisor. Data processing was carried out using CSPro, a joint software product of the U.S. Census Bureau, Macro International, and Serpro S.A.

Data analysis was done using the statistical software- STATA 10.0 SE (Statacorp, College station, Texas) and SPSS 11.5. Proportions were calculated with a 95% Confidence Interval. Estimates are weighted to represent at the population level. Means were calculated with a 95% confidence interval.

2.20 QUALITY CONTROL

The quality control of the survey data was conducted through training and refresher of the field staffs and extensive monitoring and supervision of the field activities. icddr,b led the training and refresher by orienting the Mitra Associates field staffs on the questionnaire administration, interviewing technique, biological sample collection and processing, and anthropometry. A three-pronged monitoring and supervision was conducted. Firstly, six full time monitoring officers from icddr,b were deployed to observe the interviews, sample collection, anthropometry, conducting repeat interviews and doing on-spot check of the data forms. They provided necessary guidance and supportive supervision to the field teams. In another level, investigators of the study from icddr,b and UNICEF provided frequent visits to the field to oversee the activities. Still at a different level, independent monitoring team from the Institute of Public Health Nutrition (IPHN) visited the field sites frequently. The

quality of the biological sample analysis was confirmed by satisfactory performance in the external quality assurance programs of the Center for Diseases Control (CDC), USA.

As far as general consistency in data is concerned, the Cronbach's alpha was ~80.0% (reference limit: 70.0-90.0%), which indicates a good deal of inter-relatedness among the related variables (e.g. socio-economic and micronutrients status variables in the data. This statistical assessment reiterated the quality of data collection.

2.20.1 Quality Control of the Laboratory Analysis

2.20.1.1 External Quality Control (EQC)

For external quality control, the Nutritional Biochemistry Laboratory of icddrb had participated to the Micronutrients Measurement Quality Assurance Program (MMQAP) for retinol. This program is organised by National Institute of Standards and Technology (NIST).
The Laboratory had also participated to The Vitamin A Laboratory - External Quality Assurance (VITAL-EQA) program for Retinol, Ferritin, CRP, Folate and Vitamin B_{12}. This program is organized by the Global Micronutrient Laboratory at the Centers for Disease Control and Prevention (CDC). The VITAL EQA program is a standardization program designed to provide laboratories measuring nutritional markers in serum with an independent assessment of their analytical performance. Performance of each laboratory is shared.

The Laboratory had participated to the Ensuring the Quality of Iodine Procedures (EQUIP) for urinary iodine. This program is organized by the Center for Disease Control (CDC). Three times a year, CDC sends participating laboratories three to five urine samples that have been spiked with iodine (in a range of 10 to 300 µg/L) for UI analysis. At the end of each year, laboratories receive a certificate with tabulated scores for that year.

2.20.1.2 Internal Quality Control (IQC)

For internal quality control the Nutritional Biochemistry Laboratory of icddr,b used the following quality control materials:

1. PreciControl Anemia 1, 2 and 3, (Roche Diagnostics GmbH, D-68298 Mannheim, Germany) for ferritin, folate and vitamin B_{12}
2. Precinorm Protein and , Precipath Protein (Roche Diagnostics GmbH, D-68298 Mannheim, Germany) for CRP and AGP

3. Bi - level serum toxicology control (UTAK LABORATORIES, INC, 25020 AVENUE TIBBITTS, VALENCIA, CA 91355) for zinc

4. Pooled serum whose values were assigned in the Nutritional Biochemistry Laboratory against standard reference material (SRM) for retinol and zinc. The pooled serum was stored in freezer and analyzed with every batch of samples. The pooled serum was analyzed with standard reference material (fat-soluble vitamins, carotenoids and cholesterol in human serum, 968c; National Institute of Standards and Technology, Gaithersburg, MD, USA) in ten replicates within same day. The mean (X), standard deviation (SD) and 95% confidence interval of this pooled serum was calculated.

The stated values of an assayed control material corresponding to the methodology and instrumentation employed by the manufacturer were used as the target values. These QC

materials were used along with study samples, to monitor systemic and random errors. After a significant number of control determinations have been completed, the standard deviation and the coefficient variation were calculated.
In retinol measurement internal standards were added to the sample at the beginning of the extraction procedure to compensate for losses of retinol at each step of the sample preparation. It was also used as a control. If the extraction of the internal standard was below 84%, the analysis was repeated.

Urinary Iodine
For the internal verification analysis was done on the leftover EQUIP reference sample which has a certified concentration value for iodine, in triplicate in each micro plate run. The coefficients of variation for the intra-assays and the inter-assays were calculated for each EQUIP reference material. For recovery equal volume of standard and sample were mixed, then run as a sample. The recovery of urinary iodine was 92–108%.

The results of the QC analyses carried out together with the analysis of the monitoring samples are shown in table following. In general the QC results were in good agreement with the reference values, and it can be assumed that the systemic errors of the monitoring data do not exceed the limit of assigned values.

TABLE 5: PERFORMANCE OF THE INTERNAL QUALITY CONTROL FOR LABORATORY ANALYSIS

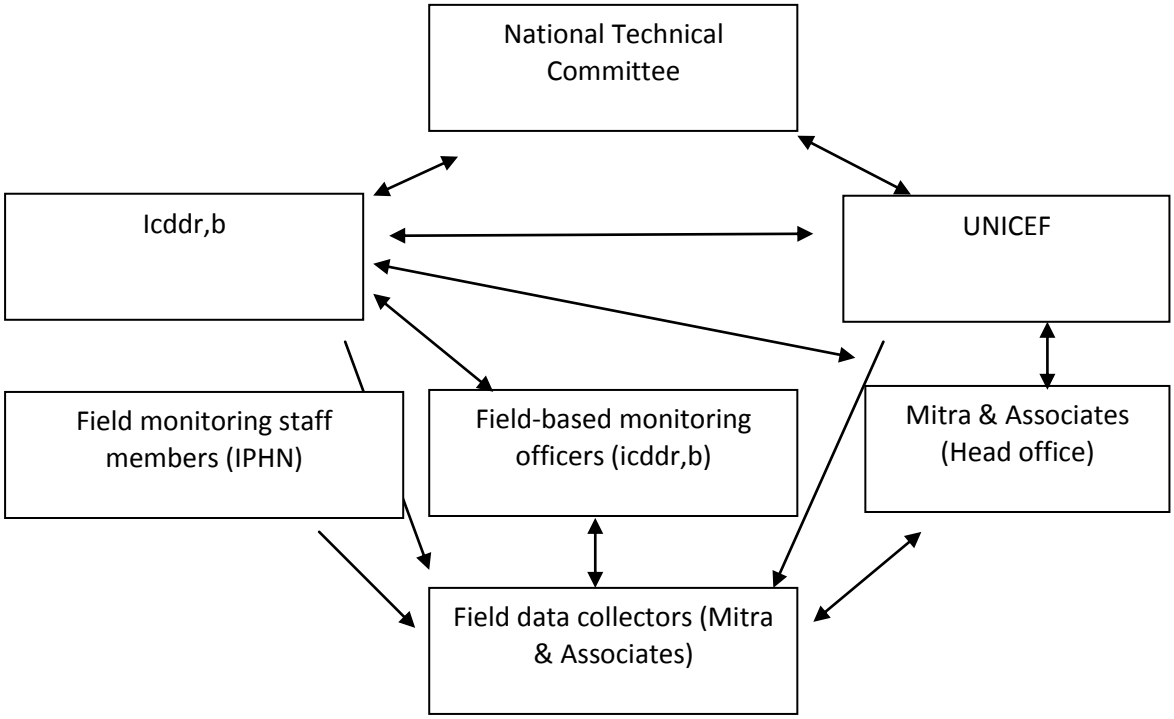
Name of QC	Name of paramater	Assigned value	CV%
Precicontrol Anemia Lot 163921	Ferritin	(21.6-33.2)ng/ml	4.2
		(285-437)ng/ml	3.9
		(605-927)ng/ml	3.7
	Folate	(2.57-6.77)ng/ml	8.6
		(6.71-10.3)ng/ml	5.8
		(12.1-17.5)ng/ml	5.6
	Vitamin B_{12}	(173-321)pg/ml	4.6
		(426-612)pg/ml	4.6
		(952-1288)pg/ml	3.5
Precinorm protein Lot161643-02 Precipath protein Lot 157580-02	CRP	(7.83-11.73)mg/l (37.9-57.1)mg/l	8.6 3.9
Precinorm protein Lot161643-02 Precipath protein Lot 157580-02	AGP	(58.4-95.6)mg/dl (100-166)mg/dl	5.5 5.2
Pool Serum	Retinol	52.9-58.0	1.5
Pool Serum QC-Normal QC-High	Zinc	(0.73-0.96)mg/l (0.51-0.85)mg/l (2.0-3.0)mg/l	4.5 4.1 4
UI 100604 UI 100609 UI 100629 UI 100601	Urinary Iodine	(414-560.1) µg/l (48.3-80.5) µg/l (109.6-164.4) µg/l (76.7-127.9) µg/l	6.7 10.4 8.3 7.5

2.21 PROJECT MANAGEMENT STRUCTURE

A national technical committee, spearheaded by the Institute of Public health Nutrition (IPHN) was formed consisting of the experts in the field. The members of the committee hailed from the academia, research organizations, the Ministry of Industry and related government organizations, program managers from government sectors and NGOs and the representatives from the Development Partners. The technical committee had reviewed the survey protocol and provided guidance in different stages of the survey, e.g. technical protocol, field data collection, report preparation, communication and national dissemination. The committee convened meetings at different stages of the project. There

were independent monitoring teams from icddr,b, UNICEF and the Institute of Public Health Nutrition (IPHN) for monitoring the field activities. Six field based staff members of icddr,b had been in charge to oversee the full time supervision and monitoring of the field activities. The prepared the biweekly monitoring reports on the field performance. The biweekly reports were collated and summarized in icddrb, and shared with the technical committee to monitor the progress.

FIGURE 2: PROJECT MANAGEMENT STRUCTURE



2.22 ETHICAL APPROVAL

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of icddr,b. Under the Board, the Research Review Committee (RRC) provided approval on the technical aspects of the protocol, which was followed by the Ethical Review Committee (ERC) giving approval considering ethical obligation to be adhered in the study. The participants and/or the guardian of the participants in the study provided the written informed consent.

3. RESULTS

3.1. HOUSEHOLD CHARACTERISTICS

Bangalees constituted overwhelming share for the ethnicity (98.1%).With regard to religion, 89.0% of the households practice Islam. The proportion appeared slightly higher in the slum and rural areas than in the urban. In regard to education of the household head, one in four has not attended to any formal education. This is in agreement with the BDHS 2011, which reports 26.0% and 28.0% of adult men and women respectively did not obtain formal education. This proportion appeared higher in the slums (35.6%). The national estimate of the household heads completing the secondary education was 16.4%, which was consistent with the findings of the BDHS 2011, reporting 18.0% and 12.0% of adult male and female respectively were having secondary or higher grade education. Proportionately more household heads from the urban area have attained secondary or higher grades of education (29.7%-urban; 13.1%-rural).

TABLE 6: HOUSEHOLD CHARATERISTICS[1]

	Rural		Urban		Slums		National	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Ethnicity		**n=661**		**n=693**		**n=649**		**n=2003**
Bangalee	97.7	95.1-100	99.6	98.9-100	98.9	96.7-100	98.1	96.2-100
Chakma	0.53	0.0-1.5	0.02	0.0-0.08			0.41	0.0-1.1
Marma	0.96	0.0-2.8	0.34	0.0-1.0			0.80	0.0-2.2
Garo					1.1	0.0-3.2	0.04	0.0-0.12
Sautaal	0.26	0.0-0.8					0.19	0.0-0.59
Other	0.47	0.0-1.3					0.36	0.0-1.0
Religion		**n=661**		**n=693**		**n=649**		**n=2003**
Islam	90.6	83.4-97.7	86.2	77.5-94.9	95.6	92.2-98.9	89.9	84.2-95.5
Hinduism	7.4	0.9-13.1	13.0	4.3-21.7	3.3	0.6-5.9	8.4	3.1-13.6
Buddism	1.5	0.0-3.8	0.4	0.0-1.0			1.2	0.0-2.9
Christianity	0.4	0.0-1.3	0.3	0.0-0.9	1.0	0.0-3.2	0.44	0.0-1.1
Others								
Education		**n=659**		**n=692**		**n=645**		**n=1996**
No education	27.4	22.8-31.9	20.5	15.3-25.6	35.6	28.1-43.2	26.3	22.7-29.8
Primary incomplete	26.7	21.7-31.7	18.3	13.2-23.4	25.8	20.5-31.1	25.0	21.1-28.9
Primary complete	14.4	11.2-17.5	9.3	6.2-12.4	11.4	8.1-14.6	13.2	10.7-15.8
Secondary incomplete	18.2	15.1-21.4	22.0	16.9-27.1	17.5	11.9-23.0	19.0	16.4-21.5
Secondary complete and higher	13.1	9.5-16.6	29.7	22.1-37.3	9.6	6.4-12.7	16.4	12.9-19.8
Assets		**n=661**		**n=693**		**n=649**		**n=2003**
Electricity	63.4	50.6-76.1	83.3	74.3-92.3	95.3	92.2-98.5	68.7	59.4-78.0
Radio	8.5	4.8-12.2	11.1	1.3-20.9	4.0	2.2-5.8	8.9	5.4-12.3
Television	35.2	27.1-43.3	62.2	51.6-72.8	58.2	52.0-64.3	41.6	35.1-48.2
Mobile phone	76.0	70.7-81.3	87.0	81.6-92.3	77.9	72.9-82.9	78.4	74.2-82.4
Land phone	1.3	0.0-2.8	1.8	0.8-2.9	0.33	0.0-0.77	1.4	0.0-2.5
Refrigerator	7.6	4.0-11.2	28.9	18.1-39.7	8.7	5.4-12.0	12.0	7.9-16.2
Almirah	45.8	34.7-57.0	55.9	49.3-62.4	41.3	32.7-49.8	47.7	39.5-56.0
Asset Index								
Poorest	30.3		14.6		15.4			
Second	25.1		15.9		19.2			
Middle	23.9		15.2		21.2			
Fourth	13.0		20.5		26.6			
Richest	7.7		33.9		17.7			

[1]estimates weighted to represent at the population level

In regard to possession of assets - mobile phone, television and refrigerator registered a remarkable increase over recent years. The possession of mobile phone was 78.4% at the national level, which is a phenomenal increase from the BDHS 2007 estimate (35.0%). About 42.0% of the population possessed a television at the national level, which appeared as an increment from BDHS 2007 estimate (32.9%). The possession of refrigerator has shown an upward trend, from 8.0% in 2007 (BDHS 2007) to 12.0%. Nearly 7 households out of 10 have got the electricity connected, which appeared as increase from the BDHS 2007 estimate (48.9%). According to the Wealth Index, it appeared that more "Richest" households were located in the urban stratum than in the rural or slums (34.0%-urban vs. 17.7%-slum vs. 7.7%-rural).

3.1.1 HOUSEHOLD CONSTRUCTION MATERIALS

The Table 7 below depicts an account of materials used in construction of households. With regard to construction material of floor, 74.0% of households had the floor made with earth/sand. This proportion appeared greater in the rural (84.6%) than in the urban (41.7%) and in the slums (32.2%). Cement constituted the second largest (22.2%) material used for building the floor of the households. This proportion was more prevalent in the urban (56.5%) than in the rural area (10.9%).

In regard to roof of the households, tin was most common material as 88.0% of the households had its roof made of tin. The proportion was above 80.0% in all the strata. Cement was the next most common roof material, as 5.8% of households had roofs made of cement. This proportion was higher in the urban (15.2%) than in the rural strata (3.2%).

In regard to external wall of the households, tin was the most commonly used material (45.0%). The proportion for this appeared less in the urban area (29.3%) than in the rural (49.3%) and slums (46.6%). Cement was another important material for external wall in 15.6% of the households, with the urban proportion (38.0%) appeared significantly more than in the rural (9.3%) and slums (19.3%). In nearly one-fifth (18.0%) of the households, bamboo with mud was used to construct the external wall.

TABLE 7: HOUSEHOLD CONSTRUCTION MATERIAL

Housing characteristic	Rural (n=661)		Urban (n=693)		Slums (n=649)		National (n=2003)	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI
Flooring material								
Earth/sand	84.6	77.5-91.7	41.7	29.5-54.0	32.2	23.3-41.1	73.8	67.2-80.3
Wood/planks	0.6	-0.3-1.4	1.3	-0.6-3.1	3.5	0.1-6.9	0.8	0.0-1.6
Palm/bamboo	0.5	-0.3-1.3	0.0	0.0-0.1	3.6	0.1-7.1	0.4	-0.2-1.0
Wood	3.1	-2.8-9.0	0.1	-0.1-0.3	0.2	-0.1-0.5	2.5	-1.9-6.9
Ceramic tiles/mosaic	0.0	0.0	0.2	0.0-0.4	59.6	51.4-67.8	0.0	0.0-0.1
Cement	10.9	5.7-16.2	56.5	45.0-68.0	0.1	-0.1-0.2	22.2	17.0-27.4
Carpet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0-0.0
Other	0.2	-0.1-0.5	0.1	-0.1-0.4	0.8	-0.4-2.0	0.2	0.0-0.5
Main roof material								
No roof	1.0	-0.5-2.4	0.3	-0.2-0.7	0.0	0.0	0.8	-0.3-1.9
Thatch/palm leaf	3.9	1.1-6.7	0.6	-0.4-1.6	0.8	0.1-1.5	3.1	1.0-5.2
Bamboo	0.5	-0.1-1.2	0.3	-0.1-0.7	0.5	-0.0-1.0	0.5	0.0-1.0
Tin	90.8	85.9-95.6	81.3	75.0-87.5	90.2	85.2-95.2	88.8	85.0-92.6
Wood	0.1	-0.1-0.4	0.3	-0.0-0.7	1.0	-0.4-2.5	0.2	0.0-0.4
Ceramic tiles	0.0	-0.0-0.1	1.7	-0.0-4.9	0.0	0.0	0.4	-0.3-1.0
Cement	3.2	0.8-5.7	15.4	10.1-20.8	5.0	1.5-8.6	5.8	3.5-8.1
Other	0.4	-0.1-0.8	0.2	-0.3-0.7	2.5	-0.7-5.6	0.4	0.1-0.8
External wall material								
No wall	0.0	0.0	0.1	-0.1-0.4	0.0	0.0	0.0	0.0-0.1
Cane/palm/trunks	1.8	0.2-3.4	0.3	-0.2-0.7	0.5	0.0-1.1	1.4	0.3-2.6
Bamboo with mud	19.9	7.4-32.5	12.2	3.1-21.3	11.1	3.9-18.4	18.0	8.3-27.6

Stone with mud	0.1	-0.1-0.2	0.1	-0.1-0.4			0.1	0.0-0.2
Tin	49.3	32.5-66.2	29.3	19.0-39.7	46.6	33.2-60.0	45.1	32.4-57.8
Cement	9.3	2.8-15.8	37.9	25.0-50.7	19.3	11.0-27.7	15.6	10.0-21.1
Stone with lime/cement	0.3	-0.1-0.6	1.0	0.1-1.8	0.6	-0.3-1.6	0.4	0.1-0.8
Bricks	5.9	2.2-9.5	12.7	7.8-17.6	13.2	7.3-19.1	7.5	4.5-10.6
Wood planks/shingles	2.1	-0.5-4.7	2.1	-0.1-4.2	1.3	0.0-2.6	2.1	0.1-4.1
Other	11.3	3.9-18.7	4.4	1.4-7.4	7.2	2.2-12.3	9.8	4.3-15.2

3.1.2 NUMBER OF ROOMS FOR SLEEPING

The Table 8 below depicts number of rooms used for living. At the national level, 40.6% of the households had one room for living. Most of the slums households (77.7%) used one room for living. More than one third of the households in the rural (36.0%) and urban (34.6%) strata had two rooms for living; however in the slums only 17.0% of the households had two living rooms. At the national level the proportion of households having three living rooms was 17.6%. The proportion was 19.1%, 14.9% and 2.6% respectively in the rural, urban and slums area. Less than 2.0% of households at the national level possessed 5 rooms for living.

TABLE 8: NUMBER OF ROOMS FOR SLEEPING

Number of room for sleeping	Rural (n=661)		Urban (n=693)		Slums (n=649)		National (n=2003)	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI
1	38.1	30.1-46.0	42.8	35.8-49.8	77.7	70.6-84.7	40.6	34.3-46.9
2	36.0	31.3-40.7	34.6	27.8-41.4	17.3	11.6-23.0	35.0	31.3-38.7
3	19.1	10.2-27.9	14.9	9.7-20.2	2.6	0.8-4.4	17.6	10.8-24.4
4	4.7	1.8-7.5	4.9	2.3-7.6	1.8	0.4-3.1	4.6	2.4-6.8
5	1.5	0.2-2.8	2.0	0.2-3.8	0.6	-0.2-1.3	1.6	0.6-2.6

3.1.3 POSSESSION OF OWN LAND

TABLE 9: POSSESSION OF OWN LAND

	Rural (n=661)		Urban (n=693)		Slums (n=649)		National (n=2003)	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI
Homestead ownership	93.2	89.8-96.5	78.5	71.4-85.6	33.6	25.6-41.5	87.8	84.4-91.2
Homestead ownership in other place	4.9	-1.0-10.8	32.6	15.3-49.9	30.9	20.9-40.8	20.5	13.3-27.7
Any land other than homestead land	45.0	38.7-51.4	24.1	18.1-30.1	15.9	9.8-22.0	39.6	34.5-44.7

The Table 9 above presents the profile of land possession. It states, 87.8% of households owned a homestead. The proportion appeared higher in rural (93.2%) and urban (78.5%) than in the slums (33.6%). One in five households possessed a homestead in other places, the proportion was more in case of the urban (32.6%) and slums (30.9%) stratum than in the rural, where just under 5.0% of households had owned homestead in other places. Four in ten households (39.6%) had possessed lands other than homestead land. The proportion appeared higher in the rural area (45.0%) than in the urban (24.0%) or slums (15.9%).

3.1.4 TOILETS FOR THE HOUSEHOLDS

The Table 10 below states an account of toilet used in Bangladesh. Majority of households in Bangladesh used pit latrines. The proportion of pit latrine with slab was 47.6%, with proportions in the rural, urban and slums were 44.2%, 60.2% and 47.2% respectively. One in five households (21.0%) used pit latrine without slab, i.e."open pit", the proportion appeared somewhat higher in the rural (24.5%) than in the urban (14.3%) and slums (7.9%). The usage of toilet that flushes to piped sewer system was 9.1%. The proportion for rural,

urban and slums were 7.9%, 11.8% and 17.6% respectively. Just 6.6% of the households had toilet that flush into septic tank. A very small proportion of households used bucket toilet (1.2%) and hanging toilets (1.6%). At the national level, 4.1% of the households did not have toilet facility or they used open-air toilets in the bush, fields etc. The proportion was concentrated mainly in the rural strata (5.4%).

TABLE 10: TOILET USED BY HOUSEHOLDS

Toilet facilities	Rural (n=661)		Urban (n=693)		Slums (n=649)		National (n=2003	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI
Flushed to piped sewer system	7.9	2.2-13.7	11.8	4.9-18.6	17.6	8.1-27.1	9.1	4.6-13.6
Flush to septic tank	6.5	2.9-10.1	7.0	1.5-12.5	5.9	2.3-9.5	6.6	3.7-9.5
Flush to pit latrine	6.5	1.1-11.8	4.3	1.5-7.1	3.8	1.1-6.4	5.9	1.9-9.9
Flush to somewhere else	1.4	-0.6-3.4	0.4	-0.1-0.8	4.3	0.0-8.6	1.3	-0.2-2.8
Pit latrine with slab	44.2	32.7-55.7	60.2	49.9-70.5	47.2	35.8-58.6	47.6	38.5-56.7
Pit latrine without slab/open pit	24.5	15.6-33.3	14.3	7.8-20.8	7.9	4.2-11.6	21.7	14.8-28.6
Bucket toilet	1.4	0.3-2.5	0.8	-0.1-1.7	-	-	1.2	0.4-2.1
Hanging toilet	1.8	0.6-3.1	0.8	-0.1-1.7	0.9	-0.3-2.2	1.6	0.7-2.5
No facility/bush/field	5.4	2.0-8.9	0.2	-0.1-0.5	-	-	4.1	1.6-6.7
Others	0.2	0.0-0.4	0.3	-0.2-0.8	12.4	-0.2-24.9	0.7	0.1-1.3

3.1.5 COOKING FUEL USED IN THE HOUSEHOLDS

The Table 11 below depicts an account of cooking fuel used in the households. Wood was most commonly used cooking fuel as it was used in 56.7% of households. The proportion for rural, urban and slums were 59.8%, 45.8% and 54.5% respectively. Straw/shrubs/grass was next most common cooking fuel (22.8%). Its usage in the rural, urban and slums were respectively 28.4%, 6.5% and 1.9%. At the national level 8.7% of the households used natural gas. It was used in 33.5% and 34.8% of households in the urban and slums respectively with very negligible usage in the rural area (0.5%). The other sources of cooking fuel were agricultural crop (6.8%), animal dung (2.2%), coal (0.8%), LPG (0.8%), electric heater (0.4%) and biogas (0.1%).

TABLE 11: COOKING FUEL USED IN THE HOUSEHOLDS

Cooking fuel	Rural (n=661)		Urban (n=693)		Slums (n=649)		National (n=2003)	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI
Electricity	0.0	0.0	1.7	-0.6-4.1	2.2	-1.1-5.6	0.4	-0.1-0.9
LPG	0.0	0.0	3.5	0.5-6.4	1.0	0.2-1.8	0.8	0.1-1.4
Natural gas	0.5	-0.4-1.4	33.5	-0.6-4.1	34.8	20.1-49.4	8.7	3.4-13.8
Biogas	0.0	0.0	0.3	0.5-6.4	1.0	-0.2-49.4	0.1	0.0-0.2
Kerosene	0.0	0.0	0.0	0.0	0.8	-0.2-1.7	0.0	0.0-0.1
Coal	0.9	-0.4-2.3	0.5	-0.2-1.4	0.0	0.0	0.8	-0.2-1.8
Wood	59.8	47.6-72.0	45.8	32.2-59.4	54.5	41.0-67.9	56.7	47.1-66.4
Straw/shrubs/grass	28.4	16.4-40.3	6.5	-0.0-12.9	1.9	0.3-3.6	22.8	13.5-32.2
Agricultural crop	7.5	3.0-11.9	5.6	1.1-10.2	0.5	-0.0-1.1	6.8	3.4-10.2
Animal dung	2.4	0.7-4.2	1.6	0.0-3.1	0.5	-0.0-1.3	2.2	0.9-3.5
Other	0.5	-0.2-1.2	1.1	-0.1-2.3	2.8	0.1-5.5	0.7	0.1-1.3

3.1.6 HOUSEHOLDS MONTHLY EXPENDITURE

The Table 12 below depicts household's monthly expenses. The national average of household expenditure was BDT. 8944.0. It was BDT. 8393.0, 11006.0 and 8779.0 respectively in the rural, urban and slums households. According to status of household food

insecurity, the household's spending ability decreased as households belonged to increasing degree of food insecurity. Household's average monthly expenditure was BDT. 10357.0 in the food secure households. It was BDT. 8206.0, 7324.0, and 6505.0 respectively in cases of mild, moderate and severe degrees of household food insecurity.

TABLE 12: HOUSEHOLD MONTHLY EXPENSES

Strata	n	Mean (BDT)	95% CI
National	1931	8944.0	8212.0-9674.0
Rural	638	8393.0	7664.0-9121.0
Urban	669	11006.0	8956.0-13055
Slums	624	8779.0	8109.0-9449.0
According to household food insecurity			
Food secure	888	10357.0	9266.0-11447.0
Mild insecure	298	8206.0	7304.0-9109.0
Moderate insecure	487	7324.0	6711.0-7937.0
Severe insecure	258	6505.0	5513.0-7496.0

3.1.7 HOUSEHOLD FOOD INSECURITY

The table 13 below states the household food insecurity by strata. It appeared that 52.0% of households at the national level were food secure. The proportion of food secure households appeared to be less in the slums (36.3%), compared with rural (52.4%) and urban (53.5%) strata. Just over 10.0% of households experienced severe food insecurity at national level as well as in the rural and urban area. This proportion appeared slightly higher in the slum stratum (17.2%).

TABLE 13: HOUSEHOLD FOOD INSECURITY

Strata	%	95% CI
National		
Food secure	52.0	45.5-58.4
Mild insecure	14.1	10.8-17.4
Moderate insecure	21.6	16.1-27.0
Severe insecure	12.3	8.2-16.3
Rural		
Food secure	52.4	44.0-60.3
Mild insecure	14.0	9.8-18.2
Moderate insecure	21.6	14.5-28.6
Severe insecure	12.0	6.8-17.1
Urban		
Food secure	53.5	46.1-60.8
Mild insecure	14.4	9.4-19.4
Moderate insecure	19.6	13.8-25.4
Severe insecure	12.4	7.7-17.1
Slums		
Food secure	36.3	25.7-46.9
Mild insecure	14.8	10.2-19.5
Moderate insecure	31.5	25.4-37.7
Severe insecure	17.2	9.7-24.7

3.2 MORBIDITY: PRESCHOOL AGE CHILDREN

3.2.1 MORBIDITY BY STRATA

TABLE 14: MORBIDITY IN PRESCHOOL AGE CHILDREN BY STRATA

	Rural (n=368)		Urban(n=391)		Slums(n=349)		National (n=1108)	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI
Diarrhea in last 2 wks	9.4	5.3-13.1	7.7	2.3-12.4	15.9	9.6-22.3	9.3	6.4-12.2
Fever in last 2 wks	49.0	38.6-59.4	34.4	28.4-40.3	35.5	29.2-41.8	45.4	37.1-53.7
Cough , fast breathing in last 2 wks	32.7	26.1-39.4	27.4	19.4-35.2	31.5	24.7-38.3	31.6	26.3-36.8
Measles in last 6 mo	5.1	2.5-7.8	8.1	5.1-11.2	7.1	3.7-10.5	5.8	3.7-7.9

The Table 14 above shows status of morbidty in the preschool age children. It appeared that 9.3% of the preschool age children suffered from diarrhea within 2 weeks of the survey. The proportion appeared slightly higher in the slums (15.9%) than in the rural (9.4%) and urban area (7.7%). Among the preschool age children 45.4% had suffered from fever within last two weeks. The proportion in the rural area appeared to be slightly higher (49.0%). Three in ten (31.6%) of the preschool children had suffered from cough and cold in last 2 weeks, and the proportion was similar in all the strata. About 6.0% of the children had suffered from measles over last 6 months.

3.2.2 MORBIDITY BY SOCIO-ECONOMIC STATUS

The Table 15 below states the morbidity in the preschool age children by the socio economic status. In regard to suffering from diarrhea in the preceding two weeks of the survey, it appeared that the "poorest" section in the community suffered more (11.6%) than in the "richer" (5.7%) and the "richest" (2.9%). However with regard to occurrence of fever over the preceding two weeks, by and large, similar proportion of the children had suffered from fever in the "poorest" (45.9%) and the "richest" quintiles (38.2%). It appeared that more children from the "poorest" section (37.8%) had suffered from cough and cold than the "richest" households (15.3%). In regard to suffering from measles over preceding 6 months, about the similar proportion of the children had suffered the medical condition in the "poorest" (5.1%) and the "richest" (5.4%).

TABLE 15: MORBIDITY IN THE PRESCHOOL AGE CHILDREN BY SOCIO ECONOMIC STATUS

	Poorest (221)		Poorer(221)		Middle(224)		Richer221)		Richest(221)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Diarrhea in last 2 wks	11.6	6.7-16.4	11.9	5.4-18.5	11.7	1.7-21.6	5.7	2.2-9.2	2.9	-0.9-6.8
Fever in last 2 weeks	45.9	33.5-58.4	40.8	26.4-55.2	59.9	44.0-75.9	44.3	27.6-61.1	38.2	20.1-56.3
Cough and cold	37.8	25.4-50.1	35.1	21.9-48.2	38.6	22.8-54.5	26.4	17.2-35.4	15.3	8.1-22.5
Measles (6 mo)	5.1	1.7-8.4	8.8	2.8-14.8	1.6	0.4-2.9	6.9	1.7-12.1	5.4	-0.4-11.4

3.3 MORBIDITY: SCHOOL AGE CHILDREN

TABLE 16: MORBIDITY BY STRATA

	Rural (475)		Urban(484)		Slums(468)		National (1427)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Diarrhea in last 2 wks	4.6	0.9-8.4	4.9	1.7-8.2	3.2	1.3-5.2	4.6	1.8-7.5
Fever in last 2 wks	19.5	13.3-25.7	19.6	12.4-26.8	16.1	11.9-20.1	19.4	14.6-24.2
Measles in last 6 mo	1.0	0.06-2.0	1.7	-0.07-4.1	0.3	-0.008-0.6	1.1	0.2-2.2

The Table 16 above shows pattern of morbidity in the school age children. The prevalence of diarrhea suffered in last two weeks were similar across the strata-4.6%, 4.9% and 3.2% respectively in the rural, urban and slums area. About one in five of the children (19.4%) had suffered from fever within two weeks of the survey, with the proportion by and large similar over all the strata. Just over 1.0% of the children had suffered from measles within preceding 6 months.

3.4 PREVALENCE OF VITAMIN A DEFICIENCY

Table 17 presents the prevalence of sub clinical vitamin A deficiency. The national prevalence of subclinical vitamin A deficiency in the preschool age children, as measured by estimation of the prevalence of low retinol (serum retinol <0.7mmol/l), was 20.5%. The prevalence in the slum children was 38.1%.

The prevalence in the school age children was 20.9%. Apparently higher proportion of the school age children in the slums was found to be vitamin A deficient (27.1%).

The prevalence in the NPNL women was 5.4%, with the proportion appeared a shed higher in the slums (6.9%).

TABLE 17: PREVALENCE OF VITAMIN A DEFICIENCY[1,2,6]

	n	Vitamin A deficiency (%)	95% CI
Preschool age children[3]			
National	873	20.5	15.9-25.0
Rural	306	19.4	13.6-25.2
Urban	305	21.2	15.5-26.8
Slums	262	38.1	28.4-47.7
School age children[4]			
National	1267	20.9	17.4-24.4
Rural	432	20.2	16.3-24.1
Urban	431	22.1	12.8-31.5
Slums	404	27.1	21.5-32.7
NPNL women[5]			
National	918	5.4	2.8-8.1
Rural	328	5.4	2.1-8.7
Urban	304	4.9	1.7-8.2
Slums	286	6.9	2.9-10.8

[1]Retinol deficiency is defined as Serumretinol level of <0.7mmol/l (WHO/IVACG), [2]Adjusted for elevated CRP (>10mg/l) or elevated AGP (>1 g/l)by mathematical correction (Thurnham et al, Am J ClinNutr., 2010; Reina Engle-Stone et al; J Nutr. 2011), [3]Age 6-59 mo, [4]Age 6-14 y, [5]Age 15-49 y
[6]Estimates weighted to represent at the population level

3.4.1 GRADES OF VITAMIN A DEFICIENCY

The Table 18 below shows grades of sub-clinical vitamin A deficiency in the preschool age, school age children and the NPNL women. At the national level over half of the preschool age (56.3%) and school age children (53.3%) are having the mild grade of vitamin A deficiency, while the mild deficiency affects one-third (34.3%) of the NPNL women. Although the prevalence of severe grade of the deficiency was low in all the population groups studied (less than 1.0% in most of the strata), it appeared to be somewhat higher in the slums in the preschool age children (2.4%) and school age children (2.2%). Normal status of retinol in the preschool age children was 21.7%, 30.4% and 8.5% in the rural, urban and slums area.

TABLE 18: GRADES OF VITAMIN A DEFICIENCY

	Preschool age children		School age children		NPNL women	
	%	95% CI	%	95% CI	%	95% CI
National	(n=873)		(n=1267)		(n=933)	
Normal status[1]	23.1	16.3-29.9	25.5	20.8-30.2	60.3	54.8-65.8
Mild deficiency[2]	56.3	47.6-65.1	53.5	48.8-58.2	34.3	39.0-39.7
Moderate deficiency[3]	20.0	15.5-24.5	19.8	16.7-22.9	5.1	2.6-7.7
Severe deficiency[4]	0.5	0.08-0.8	1.1	0.0009-2.1	0.1	-0.04-0.3
Rural	(n=306)		(n=432)		(n=331)	
Normal status[1]	21.7	13.8-29.6	25.9	19.7-32.1	59.6	52.8-66.3
Mild deficiency[2]	58.7	47.8-69.7	53.8	47.8-59.9	35.1	28.3-41.7
Moderate deficiency[3]	19.1	13.2-24.8	19.4	15.8-23.0	5.3	2.0-8.6
Severe deficiency[4]	0.4	0.0-0.8	0.8	-0.3-1.9	0.06	-0.06-0.2
Urban	(n=305)		(n=431)		(n=312)	
Normal status[1]	30.4	16.1-44.7	25.8	19.5-32.1	63.7	54.1-73.3
Mild deficiency[2]	48.4	35.9-60.8	52.0	45.9-58.1	31.6	22.9-40.2
Moderate deficiency[3]	20.9	15.3-26.5	20.4	12.8-28.1	4.3	1.2-7.4
Severe deficiency[4]	0.2	0.0-0.7	1.7	-1.0-4.5	0.4	-0.4-1.1
Slums	(n=262)		(n=404)		(n=290)	
Normal status[1]	8.5	4.7-12.3	17.0	12.6-21.4	58.7	50.8-66.6
Mild deficiency[2]	53.4	45.2-61.5	55.8	50.1-61.5	34.5	27.1-41.7
Moderate deficiency[3]	35.6	26.5-44.7	24.9	19.4-30.5	6.6	2.7-10.4
Severe deficiency[4]	2.4	0.2-4.6	2.2	0.01-4.4	0.2	-0.2-0.7

[1]Normal status: S. retinol>-1.05 mmol/l, [2]Mild deficiency: S. retinol >=0.7-<1.05 mmol/l, [3]Moderate deficiency: S. retinol>=0.35-<0.7 mmol/l, [4]Severe deficiency: S. retinol<0.35 mmol/l

3.4.2 VITAMIN A SUPPLEMENTATION IN THE PRESCHOOL AGE CHILDREN

The Table 19 below shows coverage of vitamin A supplementation in the preschool age children. The proportion of the children who received vitamin A supplementation before the six months of the survey date was 77.0% at the national level. The rate was 78.0%, 73.0% and 72.0% respectively in the rural, urban and the slums area. According to asset index, the coverage appeared higher in the "richest" (87.0%) section of the population compared to the "poorest" (76.0%).

TABLE 19: VITAMIN A SUPPLEMENTATION IN THE PRESCHOOL AGE CHILDREN

Strata	n	%	95% CI
National			
<=6m[1]	932	77.0	69.4-84.2
6-12m[2]		16.5	10.3-22.8
>12m[3]		6.6	2.7-10.4
Rural			
<=6m	319	77.9	68.4-87.4
6-12m		15.6	7.4-23.8
>12m		6.4	1.5-11.4
Urban			
<=6m	320	73.1	66.1-80.2
6-12m		19.6	13.6-25.6
>12m		7.2	2.7-11.6
Slums			
<=6m	293	72.4	63.1-81.7
6-12m		21.3	13.3-29.7
>12m		6.2	1.9-10.5
Asset index			
Poorest			
<=6m	175	76.4	62.3-90.4
6-12m		17.1	4.7-29.1
>12m		6.4	1.3-11.4
Poorer			
<=6m	190	69.6	58.0-81.2
6-12m		19.6	8.8-30.5
>12m		10.6	2.1-19.2
Middle			
<=6m	200	80.0	67.4-92.8
6-12m		12.3	0.9-23.8
>12m		7.6	0.3-14.8
Richer			
<=6m	176	74.5	61.6-87.5
6-12m		22.9	9.8-36.0
>12m		2.5	-0.3-5.3
Richest			
<=6m	191	87.5	81.8-93.1
6-12m		9.5	4.9-14.2
>12m		2.9	0.4-5.5

[1]<=6m: Supplemented within 6 mo; [2]6-12m: Supplemented within 6-12 mo; [3]>12m: Supplemented before last 12 mo

3.5 VITAMIN A CONSUMPTION FROM FOOD

3.5.1 VITAMIN A CONSUMPTION IN THE PRESCHOOL AGE CHILDREN BY STRATA

The table 20 below depicts daily vitamin A consumption in the preschool age children (aged 2-<5 years). The median intake was 270.4 RE (Retinol Equivalents). The median daily consumption of animal source vitamin A was 52.6 RE. The median for rural, urban and slums strata were 52.4 RE, 61.1 RE and 40.2 RE respectively. The median intake of plant source vitamin A were 186.3 RE, 105.3 RE and 111.8 RE in the rural, urban and slums strata respectively.

TABLE 20: VITAMIN A CONSUMPTION IN PRESCHOOL AGE CHILDREN BY STRATA

	National (n=845)	Rural(n=284)	Urban(n=296)	Slums(n=265)
	Median (Retinol Equivalents)			
Total vitamin A	270.4	291.5	230.3	209.1
Animal source vitamin A	52.6	52.4	61.1	40.2
Plant source vitamin A	162.8	186.3	105.3	111.8

3.5.2 VITAMIN A CONSUMPTION IN THE PRESCHOOL AGE CHILDREN BY ASSET INDEX

The Table 21 below shows vitamin A consumption in preschool age children by socio-economic status. The animal source vitamin A consumption appeared to be rising from the "poorest" (median, 11.8 RE) to the "richest" (median, 99.9 RE) quintiles. The plant source vitamin A consumption was similar over the two extremes of the SES (94.8 RE in the "poorest" and 96.1 RE in the "richest").

TABLE 21: VITAMIN A CONSUMPTION IN PRESCHOOL CHILDREN BY ASSET INDEX

	Poorest	Poorer	Middle	Richer	Richest
	Median (Retinol Equivalents)				
Total vitamin A	115.8	314.4	367.3	576.4	230.6
Animal source vitamin A	11.8	39.0	76.8	90.0	99.9
Plant source vitamin A	94.8	207.6	286.2	196.9	96.1

3.5.3 VITAMIN A CONSUMPTION IN THE PRESCHOOL AGE CHILDREN BY HOUSEHOLD FOOD INSECURITY

The Table 22 below depicts vitamin A consumption in the preschool age children by the status of household food insecurity. The consumption appeared to be less as households were having progressively increasing level of food insecurity, especially in regard to total vitamin A consumption and animal source vitamin A consumption.

TABLE 22: VITAMIN A CONSUMPTION IN THE PRESCHOOL CHILDREN BY HOUSEHOLD FOOD INSECURITY

	Food secure	Mild insecure	Moderate insecure	Severe insecure
	Median (Retinol Equivalents)			
Total vitamin A	333.0	314.4	189.6	140.7
Animal source vitamin A	75.4	42.1	32.7	7.0
Plant source vitamin A	193.5	193.3	110.1	136.3

3.5.4 VITAMIN A CONSUMPTION IN THE SCHOOL AGE CHILDREN BY STRATA

The Table 23 below shows consumption of vitamin A in the school age children. The median consumption was 321.3 RE, 300.1 RE and 260.3 RE respectively in the rural, urban and slums strata. The median consumption from animal source appeared to be less in the slums (median 29.8 RE) than in the other strata (40.1 RE in rural and 44.7 RE in the urban).

TABLE 23: VITAMIN A CONSUMPTION IN THE SCHOOL AGE CHILDREN BY STRATA

	National	Rural	Urban	Slums
	Median (Retinol Equivalents)			
Total vitamin A	318.4	321.3	300.1	260.3
Animal source vitamin A	40.5	40.1	44.7	29.8
Plant source vitamin A	226.1	237.0	194.1	201.9

3.5.5 VITAMIN A CONSUMPTION IN THE SCHOOL AGE CHILDREN BY SOCIO-ECONOMIC STATUS

The table 24 below depicts vitamin A consumption in the school age children by socioeconomic status. The"richest" population appeared to have higher consumption (median, 141.9 RE) of animal origin vitamin A than the "poorest" group (median, 13.1 RE). Howerver the consumption from the plant source appeared more homogenous across the SES groups.

TABLE 24: VITAMIN A CONSUMPTION IN THE SCHOOL CHILDREN BY ASSET INDEX

	Poorest	Poorer	Middle	Richer	Richest
	Median (Retinol Equivalents)				
Total vitamin A	236.8	374.1	364.1	348.1	281.9
Animal source vitamin A	13.1	45.7	44.9	46.1	141.9
Plant source vitamin A	208.6	297.7	283.6	212.5	138.0

3.5.6 VITAMIN A CONSUMPTION IN THE SCHOOL AGE CHILDREN BY HOUSEHOLD FOOD INSECURITY

The Table 25 below shows the consumption of vitamin A in the school age children by the status of household food insecurity. The median consumption in regard to total and animal source vitamin A consumption appeared progressively lower as the households were more food insecure. The median for animal source vitamin A consumption was 74.8 RE in the food secure households and 10.1 RE in the severely food insecure households.

TABLE 25: VITAMIN A CONSUMPTION IN SCHOOL AGE CHILDREN BY HOUSEHOLD FOOD INSECURITY

	Food secure	Mild insecure	Moderate insecure	Severe insecure
	Median(Retinol Equivalents)			
Total vitamin A	374.1	368.7	265.5	194.2
Animal source vitamin A	74.8	40.1	24.8	10.1
Plant source vitamin A	275.5	286.6	201.3	190.5

3.5.7 VITAMIN A CONSUMPTION IN THE NPNL WOMEN BY STRATA

The Table 26 below depicts consumption of vitamin A in the NPNL women by strata. The median consumption of animal source vitamin A were 28.9 RE, 40.2 RE and 30.3 RE respectively in the rural, urban and slums strata.

TABLE 26: VITAMIN A CONSUMPTION IN THE NPNL WOMEN BY STRATA

	National	Rural	Urban	Slums
	Median (Retinol Equivalents)			
Total vitamin A	372.1	315.9	467.2	412.5
Animal source vitamin A	31.8	28.9	40.2	30.3
Plant source vitamin A	285.8	258.7	392.3	373.2

3.5.8 VITAMIN A CONSUMPTION IN THE NPNL WOMEN BY SOCIO-ECONOMIC STATUS

The Table 27 below shows vitamin A consumption in the NPNL women according to socio economic class. The median consumption appeared to have increased as the SES gets higher. The median for total consumption was 245.9 RE and 485.3 RE in the "poorest" and the "richest" quintiles respectively. The median consumption of animal source vitamin A was 13.1 RE and 90.4 RE respectively in the "poorest" and the "richest" groups.

TABLE 27: VITAMIN A CONSUMPTION IN THE NPNL BY ASSET INDEX

	Poorest	Poorer	Middle	Richer	Richest
	Median (Retinol Equivalents)				
Total vitamin A	245.9	317.6	418.7	389.2	485.3
Animal source vitamin A	13.1	23.5	45.1	40.9	90.4
Plant source vitamin A	218.9	283.7	383.4	370.9	383.1

3.5.9 VITAMIN A CONSUMPTION IN THE NPNL WOMEN BY HOUSEHOLD FOOD INSECURITY

The Table 28 below depicts consumption of vitamin A in the NPNL women according to status of household food insecurity. The total consumption and consumption from the animal source appeared to be less as household insecurity of food increased. The median for animal source consumption was 46.2 RE and 11.3 RE respectively in the "food secured" and "severely food insecured" households. However the consumption from the plant source was by and large homogenous across the food security status.

TABLE 28: VITAMIN A CONSUMPTION IN THE NPNL BY HOUSEHOLD FOOD INSECURITY

	Food secure	Mild insecure	Moderate insecure	Severe insecure
	Median (Retinol Equivalents)			
Total vitamin A	385.6	306.8	299.5	272.0
Animal source vitamin A	46.2	31.1	22.5	11.3
Plant source vitamin A	305.5	260.2	234.6	241.1

3.5.10 CONSUMPTION OF VITAMIN A VS. THE RECOMMENDED DAILY ALLOWANCE (RDA)

The Table 29 below depicts consumption of total vitamin A (RE) from food in comparison to the Recommended Daily Allowances (RDA). It appeared that the median consumption was fairly short of the RDA in all the population groups studied.

TABLE 29: CONSUMPTION OF VITAMIN A VS. THE RECOMMENDED DAILY ALLOWANCE (RDA)

	National consumption (RE)(Median)	RDA[1]
Preschool age	270	300-400[2]
School age	318	400-600[3]
NPNL women	372	700[4]

Institute of Medicine (IOM)[1], Age 1-3 years: 300 RE; age 4-5 years: 400 RE[2], Age 6-8 years: 400 RE; age 9-13 years: 600 RE[3], Age 15-49 years (NPNL): 700 RE[4]

3.6 KNOWLEDGE ON VITAMIN A RELATED ISSUES

3.6.1 KNOWLEDGE ON VITAMIN A-RICH FOOD SOURCE

TABLE 30: KNOWLEDGE ON VITAMIN A-RICH FOOD SOURCE

Know about vitamin A rich foods?	Rural (n=661)		Urban (n=693)		Slum (n=649)		National (n=2003)	
Yes	74.4	70.8-78.0	71.9	65.2-78.5	71.3	63.0-79.5	73.7	70.7-76.7
No	25.6	22.0-29.2	28.1	21.5-34.8	28.7	20.5-37.0	26.3	23.3-29.3
Green leafy vegetables		n=485		n=492		n=477		n=1454
Mentioned	95.9		96.0		98.4		96.0	
Didn't mention	4.1		4.0		1.6		4.0	
Yellow/orange vegetables and fruits		n=485		n=492		n=477		n=1454
Mentioned	35.9	27.2-44.6	49.2	43.6-54.7	39.5	32.5-46.4	38.7	31.9-45.5
Didn't mention	64.1	55.4-72.8	50.8	45.3-56.4	60.5	53.6-67.5	61.3	54.5-68.1
Small fish		n=485		n=492		n=477		n=1454
Mentioned	45.1	34.1-56.1	48.1	38.7-57.6	37.8	31.0-44.7	45.4	37.0-53.8
Didn't mention	54.9	43.9-65.9	51.9	42.4-61.3	62.2	55.3-69.0	54.6	46.2-63.0
Liver		n=485		n=492		n=477		n=1454
Mentioned	4.0	1.9-6.0	4.2	1.8-6.6	1.8	-0.1-3.7	3.9	2.3-5.6
Didn't mention	96.0	94.0-98.1	95.8	93.4-98.2	98.2	96.3-100.1	96.1	94.4-97.7

The Table 30 above shows knowledge of the respondent on the issues relating vitamin A. At the national level 73.7% of the respondents said that they know the foods which are rich in vitamin A. The proportions were similar in all the strata. Over 95.0% of the respondents mentioned that green leafy vegetables are rich source of vitamin A and the response rate was even across the strata. 49.2% of the urban respondents mentioned that yellow and

orange vegetables and fruits are rich source of vitamin A; the proportion appeared somewhat less in the rural area (35.9%). Small fish is rich source of vitamin A was mentioned by 48.1% of urban respondents, the proportion in slums was somewhat less (37.8%). Liver is good source of vitamin A was mentioned by 3.9% of the respondents.

3.6.2 KNOWLEDGE ABOUT HEALTH BENEFITS OF EATING VITAMIN A RICH FOODS

TABLE 31: KNOWLEDGE ABOUT HEALTH BENEFITS OF EATING VITAMIN A RICH FOODS

Knowledge about benefits of eating vitamin A rich foods?	Rural (n=661)		Urban (n=693)		Slum (n=649)		National (n=2003)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Yes	68.0	62.9-73.1	76.1	67.3-85.0	70.1	62.7-77.5	69.7	65.3-74.2
No	32.0	26.9-37.1	23.9	15.0-32.7	29.9	22.5-37.3	30.3	25.8-34.7
Good for eyesight		n=459		n=503		n=469		n= 1431
Mentioned	55.2	45.5-65.0	60.1	50.3-69.8	51.7	44.0-59.4	56.2	48.9-63.5
Didn't mention	44.8	35.0-54.5	39.9	30.2-49.7	48.3	40.6-56.0	43.8	36.5-51.1
Good for health		n=459		n=503		n=469		n= 1431
Mentioned	84.0	79.2-88.7	77.8	70.6-84.9	77.5	71.8-83.2	82.3	78.5-86.2
Didn't mention	16.0	11.3-20.8	22.2	15.1-29.4	22.5	16.8-28.2	17.7	13.8-21.5
Good for skin		n=459		n=503		n=469		n= 1431
Mentioned	3.7	1.3-6.0	9.5	4.7-14.3	4.3	2.0-6.5	5.0	3.0-7.0
Didn't mention	96.3	94.0-98.7	90.5	85.7-95.3	95.7	93.5-98.0	95.0	93.0-97.0
Prevent night blindness		n=459		n=503		n=469		n= 1431
Mentioned	17.0	12.3-21.7	28.1	23.033.2	14.4	10.1-18.6	19.4	15.6-23.2
Didn't mention	83.0	78.3-87.7	71.9	66.8-77.0	85.6	81.4-89.9	80.6	76.8-84.4
Others		n=459		n=503		n=469		n= 1431
Mentioned	0.2	-0.1-0.4	5.2	1.1-9.2	0.9	-0.1-1.9	1.3	0.2-2.4
Didn't mention	99.8	99.6-100.1	94.8	90.8-98.9	99.1	98.1-100.1	98.7	97.6-99.8

About 70.0% of the respondents mentioned that they know the benefits of eating vitamin A rich foods (Table 31), the proportions being by and large similar in all the strata. Over 50.0% of the respondents mentioned that eating vitamin A rich foods is good for eyesight. Over 80.0% of the respondents mentioned that eating vitamin A rich food is good for health. Eating vitamin A rich food prevents night blindness, was mentioned by 28.1% respondents in the urban stratum, the proportion was 17.0% and 14.4% respectively in the rural area and slums. Vitamin A is good for skin was mentioned by 9.5% of the respondents in the urban strata, however in the rural and in the slums the proportion was about 4.0%.

3.7. PER CAPITA OIL CONSUPMTION

3.7.1 DAILY PER CAPITA OIL CONSUMPTION

TABLE 32: PER CAPITA OIL CONSUMPTION

Stratum	n	Mean (gm)	95% CI
National	2000	24.4	22.1-26.7
Rural	659	22.9	20.0-25.8
Urban	692	29.7	25.8-33.7
Slums	649	25.9	24.1-27.6
According to household food insecurity[2]			
Food secure	918	27.8	23.9-31.8
Mild insecure	305	24.7	19.5-29.8
Moderate insecure	509	20.5	17.8-23.1
Severe insecure	268	16.4	14.5-18.4

[1]Estimates weighted to represent at the population level, [2]Household Food Insecurity Access Scale; FANTA 2007

The Table 32 above depicts per capita consumption of oil every day. At the national level per capita daily consumption was 24.4 grams. The consumption in the rural, urban and slums

strata were 22.9, 29.7 and 25.9 grams respectively. According to status of household food insecurity, per capita oil consumption appeared to have decreased as households were progressively more food insecure. It was 27.8 gram in the "food secure" households, while it was 16.4 grams in "severely food insecure" households.

3.7.2 TYPE OF COOKING OIL USED IN HOUSEHOLDS

TABLE 33: TYPE OF COOKING OIL

	Rural (n=661)		Urban (n=693)		Slums (n=649)		National (n=2003)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Soybean	87.6	81.6-93.5	95.9	92.9-98.9	94.1	88.0-100.1	89.5	85.2-93.9
mustard	20.7	11.7-29.7	6.3	2.2-10.5	7.4	0.7-14.0	17.2	10.2-24.3
Supper/palm	0.1	-0.1-0.3	1.9	-0.3-4.1	0.1	-0.1-0.3	0.5	0.0-0.9
Coconut	0.0	0.0	0.1	-0.1-0.2	0.0	0.0	0.0	0.0
Others	0.2	-0.1-0.6	0.0	0.0	0.0	0.0	0.2	-0.1-0.5
Brand oil	22.8	17.0-28.6	38.6	32.0-45.1	12.7	7.9-17.6	25.7	20.8-30.5
Open oil	76.1	70.2-82.0	60.1	53.6-66.7	86.2	81.0-91.3	73.2	68.3-78.1
Both	0.5	0.0-1.0	1.1	-0.3-2.5	1.1	-0.3-2.4	0.6	0.1-1.1
Others	0.6	0.1-1.2	0.2	-0.1-0.5	0.0	0.0	0.5	0.1-0.9

The above Table 33 depicts the use of cooking oil in the households. Soybean was used in 89.5% of the households. The proportions according to the strata were- 87.6%, 95.9% and 94.1% respectively in rural, urban and slum households. In about one in five households (17.2%) mustard oil was used for cooking, the proportion being higher in the rural (20.7%) than in the urban (6.3%) and slum (7.4%). The usage of palm oil and coconut oil was negligible.

One in four (25.7%) households used "Brand" oil for cooking. The rate of usage was 38.6%, 22.8% and 12.7% respectively in urban, rural and slums strata. Concomitantly the rate of use of "open" oil was 73.2% at the national level. In slums, it was highly prevalent at 86.2% followed by the rural area where it was 76.1%. In the urban area the use of "open" oil was 60.0%. A negligible proportion of households used both the types of cooking oil.

3.7.3 SPENDING ON COOKING OIL

TABLE 34: SPENDING ON COOKING OIL

Strata	n	mean	95% CI
National	2003	380.0	347.4-412.6
Rural	661	356.8	319.6-394.1
Urban	693	463.5	399.1-527.1
Slums	649	388.3	361.2-415.4
Household food insecurity			
Food secure	919	436.6	385.6-487.6
Mild insecure	305	358.5	322.4-394.7
Moderate insecure	510	324.0	273.6-374.3
Severe insecure	269	263.4	225.5-301.4

The Table 34 above depicts spending for cooking oil in the households. National average of monthly spending on cooking oil was BDT. 380.0 (US$ 4.6). It appeared less in the rural (BDT. 356.8) and slums (BDT. 388.3) than in the urban households where it was BDT. 463.5. In the food secure households the monthly spending on cooking oil was BDT. 436.6 while in the severely food insecure households it was BDT. 263.4.

3.8 ANEMIA AND IRON STATUS

3.8.1 STATUS OF HEMOGLOBIN

3.8.1.1 Status of haemoglobin concentration by strata

The Table 35 below depicts mean hemoglobin concentration in blood. The means for the preschool age children were 11.4, 11.7 and 11.4 gm/dl respectively in the rural, urban and slums strata. It was 12.4, 12.6 and 12.6 gm/dl in the rural, urban and slums strata respectively in the NPNL women, while for the school age children the mean estimates were respectively 12.3, 12.5 and 12.4 gm/dl.

TABLE 35: MEAN HEMOGLOBIN BY STRATA (GM/DL)

	National (n= 607)		Rural (n=207)		Urban (n=220)		Slums (n=180)	
	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
Preschool	11.5	11.3-11.7 (n=1031)	11.4	11.2-11.7 (n=362)	11.7	11.4-12.1 (n=351)	11.4	11.3-11.6 (n=318)
NPNL	12.4	12.3-12.6 (n=1320)	12.4	12.2-12.6 (n=441)	12.6	12.3-12.8 (n=452)	12.6	12.4-12.8 (n=427)
School age	12.3	12.2-12.5	12.3	12.1-12.5	12.5	12.4-12.7	12.4	12.2-12.5

3.8.1.2 Status of hemoglobin concentration by socio- economic status

The Table 36 below shows the mean estimates of hemoglobin in the studied population groups by the socio economic status. In the preschool age children the means were 11.2 g/dl and 11.7 g/dl respectively in the "poorest" and the "richest" quintiles. In case of school age children, it was 12.3 and 12.5 g/dl in the "poorest" and the "richest" quintiles respectively. In the NPNL women, similar trend was observed, with 12.4 g/dl and 12.8 g/dl respectively in the "poorest" and the "richest" quintiles.

TABLE 36: MEAN HEMOGLOBIN BY SOCIO-ECONOMIC STATUS

	Poorest		Poorer		Middle		Richer		Richest	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
		(n=114)		(n=128)		(n=118)		(n=116)		(n=131)
PreSAC	11.2	10.9-11.5	11.5	11.2-11.8	11.7	10.9-12.4	11.4	11.2-11.5	11.7	11.2-12.3
NPNL	12.4	12.1-12.7 (n=256)	12.5	12.3-12.8 (n=262)	12.3	12.1-12.5 (n=268)	12.4	12.1-12.7 (n=269)	12.8	12.6-13.1 (n=265)
School age	12.3	11.9-12.6	12.3	12.1-12.5	12.3	12.2-12.5	12.4	12.1-12.7	12.5	12.2-12.8

3.8.1.3 Status of hemoglobin concentration by household food insecurity

The Table 37 below depicts the mean hemoglobin level according to status of household food insecurity. In all the studied population groups, the mean level of hemoglobin in blood (g/dl) was by and large similar.

TABLE 37: MEAN HEMOGLOBIN BY HOUSEHOLD FOOD INSECURITY

	Food secure		Mild insecure		Moderate insecure		Severe insecure	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
		(n=272)		(n=94)		(n=153)		(n=88)
Preschool age	11.6	11.3-11.9	11.3	10.8-11.8	11.3	11.-11.5	11.6	11.3-12.0
		(n=490)		(n=138)		(n=272)		(n=131)
NPNL women	12.5	12.3-12.7	12.3	11.8-12.7	12.4	12.1-12.6	12.7	12.4-13.0
		(n=559)		(n=204)		(n=361)		(n=196)
School age	12.4	12.2-12.6	12.4	12.0-12.7	12.3	12.1-12.5	12.4	12.1-12.6

3.8.2 PREVALENCE OF IRON DEFICIENCY AND ANEMIA

The national prevalence of anemia was 33.1% in the preschool age children (Table 38). The prevalence in rural, urban and slum areas were 37.0%, 23.0% and 22.0% respectively. The national prevalence of anemia was 26.0% in the NPNL women. It was 21.4% in the urban area.

3.8.2.1 Anemia and iron status in the preschool age children and the NPNL women

TABLE 38: ANEMIA AND IRON STATUS IN THE PRESCHOOL AGE CHILDREN AND THE NPNL WOMEN

	Preschool children[5]			NPNL women[6]		
	n	%	95% CI	n	%	95% CI
Anemia[1,7]						
National	607	33.1	25.7-40.4	1031	26.0	20.2-31.6
Rural	207	36.6	27.5-45.6	362	27.4	20.3-34.6
Urban	220	22.8	12.9-32.8	351	21.4	13.7-29.1
Slum	180	22.0	14.1-29.9	318	20.1	12.9-27.3
Iron Deficiency[2,3,7]						
National	468	10.7	5.8-15.6	882	7.1	4.2-9.9
Rural	155	9.4	3.2-15.7	314	6.7	3.1-10.2
Urban	164	12.3	4.3-20.2	298	8.7	4.1-13.3
Slum	149	27.2	19.5-34.9	270	7.4	3.8-11.1
Iron Deficiency Anemia[4,7]						
National	449	7.2	2.4-11.9	868	4.8	2.1-7.8
Rural	149	6.1	-0.02-12.1	312	5.0	1.6-8.4
Urban	158	10.1	2.2-18.0	294	4.1	1.4-6.7
Slum	142	13.9	5.5-22.2	262	4.1	1.3-6.8

[1]Anemia is defined as hemoglobin level <12.0gm/dl in NPNL women, and <11.0 gm/dl in preschool age children, [2]Iron deficiency is defined as serum ferritin level<15.0ng/ml in NPNL women and <12.0ng/ml in preschool age children (WHO, 2001), [3]Adjusted for elevated CRP (>10.0 mg/l) or levated AGP (>1.0 g/l) by mathematical correction (Thurnham et al, Am J Clin Nutr., 2010; Reina Engle-Stone et al; J Nutr. 2011), [4]Iron deficiency anemia is defined as hemoglobin<12.0 g/dl plus ferritin level<15.0 ng/ml in NPNL women and hemoglobin<11.0 g/dl plus ferritin level<12.0 ng/ml in preschool age children, [5]Age 6-59 mo, [6]Age 15-49 years, [7]Estimates weighted to represent at the population level

3.8.2.2 Anemia and iron status in the school age children

TABLE 39: ANEMIA AND IRON STATUS IN THE SCHOOL AGE CHILDREN[5]

	6-11 y			12-14 y		
	n	%	95% CI	n	%	95% CI
Anemia[1]						
National	995	19.1	13.1-25.1	326	17.1	7.4-26.6
Rural	340	21.7	13.7-29.5	102	18.1	5.4-30.7
Urban	342	11.8	8.3-15.2	110	13.2	2.3-24.1
Slum	313	13.2	7.0-19.4	114	18.1	10.6-25.6
Iron deficiency[2,3]						
National	960	3.9	1.7-6.1	319	9.5	-0.6-19.7
Rural	331	4.1	1.1-6.9	98	10.0	-0.4-23.8
Urban	329	3.6	1.2-5.9	112	8.1	2.1-14.2
Slum	300	3.4	1.2-5.5	109	8.3	1.8-14.8
Iron deficiency anemia[4,3]						
National	944	1.3	0.2-2.4	312	1.8	-0.2-3.9
Rural	324	1.1	-0.3-2.5	97	1.8	-0.8-4.6
Urban	325	2.1	1.1-4.0	108	1.7	-0.6-4.1
Slum	295	1.3	-0.1-2.7	107	1.8	-0.3-3.9

[1]Anemia is defined as hemoglobin level <11.5 gm/dl in children 6-11 year old and <12.0 gm/dl in children 12-14 year, [2]Iron deficiency is defined as serum ferritin level<15.0 ng/ml (WHO 2001), [3]Adjusted for elevated CRP (>10.0 mg/l) or elevated AGP(>1.0 g/l) by mathematical correction (Thurnham et al, Am J Clin Nutr.,2010; Reina Engle-Stone et al; J Nutr. 2011), [4]Iron deficiency anemia is defined as hemoglobin<11.5 g/dl plus ferritin

level<15.0 ng/ml in children 6-11 year and hemoglobin<12.0 g/dl plus ferritin level<15.0 ng/ml in children 12-14 year, [5]Estimates weighted to represent at the population level

The Tables 38 and 39 above depicts the iron status in the population. The national prevalence of iron deficiency (ID), i.e. low ferritin in preschool age children was 10.7%. The deficiency appeared greater in proportion in the slum than in the rural or urban strata (27.2%-slum vs. 9.4%-rural vs. 12.3%-urban). In the NPNL women the national prevalence was 7.1%; it was 8.7% and 6.7% in the urban and rural strata respectively. In the school age children, the national prevalence were around 3.9% in children 6-11 year old and 9.5% in children 12-14 year old (Table 39).

The national prevalence of iron deficiency anemia (IDA) was 7.2% and 4.8% respectively in the preschool age children, and the NPNL women (Table 38). For the school age children, the prevalence were 1.3% and 1.8% respectively for children 6-11 year and 12-14 year old (Table 39).

3.9 CONSUMPTION OF IRON FROM FOOD

3.9.1 CONSUMPTION OF IRON FROM FOOD BY STRATA

The Table 40 below shows daily consumption of iron from food in the studied population groups. In the preschool age children the average daily consumption of total iron was 4.61 mg, 4.65 mg and 4.10 mg respectively in the rural, urban and the slums children. The consumption of animal source (heme iron) was 0.94 mg, 1.12 mg and 0.96 mg respectively in the rural, urban and the slums strata. In the school age children mean consumption in the rural, urban and slums strata were 5.95 mg, 6.8 mg and 6.15 mg respectively. The consumption of animal source heme iron was 1.14 mg, 1.28 mg, and 1.09 mg respectively in the rural, urban and slums area. In the NPNL women, the mean consumption in the rural, urban and slums strata was 7.18 mg, 8.24 mg and 7.83 mg respectively. Consumption of animal source iron was 1.16 mg, 1.18 mg and 1.09 mg respectively in the rural, urban and slums area.

TABLE 40: IRON CONSUMPTION (MG/DAY) FROM FOOD BY STRATA

	National (n=845)	Rural (n=284)	Urban (n=296)	Slums (n=265)
Preschool age children				
Daily total iron				
mean	4.59	4.61	4.65	4.10
median	4.17	4.19	3.81	3.69
Daily animal source iron				
mean	0.98	0.94	1.12	0.96
median	0.74	0.71	0.79	0.72
Daily non animal source iron				
mean	3.61	3.66	3.52	3.13
median	3.06	3.12	2.77	2.84
School age children				
Daily iron consumption				
mean	6.13	5.95	6.8	6.15
median	5.21	5.17	5.49	5.19
Daily animal source iron consumption				
mean	1.16	1.14	1.28	1.09
median	0.90	0.94	0.88	0.70
Daily non animal source iron consumption				
mean	4.96	4.81	5.52	5.05
median	4.14	4.10	4.24	4.36
NPNL women				
Daily iron consumption				
mean	7.42	7.18	8.24	7.83

median	6.64	6.42	7.27	6.68
Daily animal source iron consumption				
mean	1.16	1.16	1.18	1.09
median	0.99	0.99	1.03	0.87
Daily non animal source iron consumption				
mean	6.25	6.01	7.06	6.74
median	5.48	5.34	6.13	5.74

3.9.2 CONSUMPTION OF IRON FROM FOOD BY SOCIO-ECONOMIC STATUS

The Table 41 below depicts consumption of iron from food by socio-economic status. The consumption tends to get higher as the socioeconomic status gets better. In case of the preschool age children, the mean consumption of total iron was 3.89 mg in the "poorest" and 4.72 mg in the "richest". Consumption of animal source iron was just 0.54 mg in the "poorest", which increased gradually as the SES gets higher and it was 1.48 mg in the "richest" segment of the population. In the NPNL women, the mean consumption of total iron was 6.67 mg in the "poorest", while in the "richest" it was 8.85 mg. The iron consumption from animal source food was 0.82 mg in the "poorest" and 1.88 mg in the "richest". In regard to school age children, the daily consumption of total iron was 5.79 mg in the "poorest" and 6.89 mg in the "richest" group. Regarding consumption of animal source iron, it was 0.69 mg and 1.88 mg respectively.

TABLE 41: IRON CONSUMPTION (MG/DAY) FROM FOOD BY SOCIO-ECONOMIC STATUS

	Poorest	Poorer	Middle	Richer	Richest
Preschool age children					
Daily total iron					
mean	3.89	4.40	5.03	5.44	4.72
median	3.09	4.19	5.24	5.54	4.55
Daily animal source iron					
mean	0.54	0.77	0.97	1.53	1.48
median	0.32	0.65	1.01	1.44	1.40
Daily non animal source iron					
mean	3.34	3.62	4.05	3.91	3.23
median	2.69	3.06	4.06	3.20	2.82
School age children					
Daily total iron					
mean	5.79	5.93	6.13	6.24	6.89
median	4.50	5.51	5.17	5.48	6.04
Daily animal source iron					
mean	0.69	1.05	1.15	1.43	1.88
median	0.52	0.95	1.05	0.99	1.81
Daily non animal source iron					
mean	5.10	4.87	4.98	4.81	5.01
median	3.85	4.44	4.08	4.41	4.09
NPNL women					
Daily total iron					
mean	6.67	6.99	7.78	7.48	8.85
median	6.12	6.27	7.04	6.83	7.97
Daily animal source iron					
mean	0.82	0.98	1.24	1.25	1.88
median	0.55	0.81	1.0	1.06	1.58
Daily non animal source iron					
mean	5.84	6.0	6.53	6.22	6.97
median	5.01	5.40	6.11	5.33	6.28

3.9.3 CONSUMPTION OF DAILY (MG/DAY) IRON FROM FOOD BY HOUSEHOLD FOOD INSECURITY

The Table 42 below shows iron consumption according to household food insecurity status. In the preschool age children, mean consumption of total iron was 4.97 mg in the food secure households, while in the severe food insecure households the consumption was 3.59

mg. Mean consumption of animal source iron (heme iron) was 1.23 mg and 0.43 mg in the food secure and severe food insecure households respectively. For the school age children the mean consumption of total iron in the food secure households was 6.69 mg, it was 5.44 mg in the severe food insecure households. Consumption of animal source iron was 1.6 mg in the food secure households and just 0.61 mg in the severely food insecure households. In case of the NPNL women, the women from the food secure households consumed on average 7.85 mg of total iron, while their peers from the severe food insecure households could consume 6.89 mg every day. The consumption of animal source heme iron was 1.44 mg in the food secure households and 0.66 mg in the food insecure households. However consumption of non-animal source iron was similar by and large irrespective of household food insecurity status. It was 6.41 mg and 6.23 mg respectively in the food secure and severely food insecure households.

TABLE 42: IRON CONSUMPTION (MG/DAY) BY HOUSEHOLD FOOD INSECURITY

	Food secure	Mild insecure	Moderate insecure	Severe insecure
Preschool age children				
Daily total iron consumption				
mean	4.97	3.97	4.63	3.59
median	4.55	3.89	4.19	2.81
Daily animal source iron consumption				
mean	1.23	0.81	0.77	0.43
median	1.20	0.61	0.59	0.32
Daily plant source iron consumption				
mean	3.73	3.15	3.86	3.16
median	3.32	2.84	3.11	2.41
School age children				
Daily total iron consumption				
mean	6.69	5.29	6.0	5.44
median	5.96	4.44	5.33	4.19
Daily animal source iron consumption				
mean	1.6	0.94	0.84	0.61
median	1.33	0.73	0.58	0.46
Daily plant source iron consumption				
mean	5.08	4.35	5.17	4.82
median	4.41	3.74	4.44	3.72
NPNL women				
Daily total iron consumption				
mean	7.85	7.14	6.84	6.89
median	7.24	6.07	6.23	6.05
Daily animal source iron consumption				
mean	1.44	1.10	0.84	0.66
median	1.23	1.09	0.68	0.50
Daily plant source iron consumption				
mean	6.41	6.04	6.0	6.23
median	5.74	4.79	5.25	5.31

3.9.4 CONSUMPTION OF IRON FROM FOOD VS. RECOMMENDED DAILY ALLOWANCE (RDA)

The Table 43 below states daily consumption of iron from food and how it compares with the Recommended Daily Allowance (RDA). The median consumption of iron was short of the RDAs in all the population groups studied.

TABLE 43: CONSUMPTION OF IRON FROM FOOD VS. RECOMMENDED DAILY ALLOWANCE (RDA)

	Daily total iron consumption (mg);median	RDA[1]
Preschool children	4.17	7-10[2]
School age children	5.21	8-10[3]
NPNL women	6.64	15-18[4]

Institute of Medicine (IOM)[1], Age 1-3 year: 7 mg; age 4-5: 10 mg[2], Age 6-8 year: 10 mg; age 9-13: 8 mg[3], Age 15-18 year: 15 mg; age 19-49: 18 mg[4]

3.10. KNOWLEDGE ABOUT IRON RICH FOOD

TABLE 44: KNOWLEDGE ABOUT IRON RICH FOOD

	Rural		Urban		Slums		National	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Knowledge about food containing Iron		n=661		n=693		n=649		n=2003
Yes	30.1	24.9-35.2	48.6	38.7-58.5	35.0	27.9-42.1	34.1	29.3-38.8
No	69.9	64.8-75.1	51.4	41.5-61.5	65.0	57.9-72.1	65.9	61.2-70.7
Fish		n=213		n=298		n=245		n=756
Mentioned	53.8	39.9-67.8	60.7	51.9-69.4	56.2	45.4-67.0	55.9	46.6-65.3
Didn't mention	46.2	32.2-60.1	39.3	30.6-48.1	43.8	33.0-54.6	44.1	34.7-53.4
Meat		n=213		n=298		n=245		n=756
Mentioned	32.2	21.9-42.6	47.5	38.5-56.5	32.1	21.5-42.7	36.7	29.2-44.2
Didn't mention	67.8	57.4-78.1	52.5	43.5-61.5	67.9	57.3-78.5	63.3	55.8-70.8
Eggs		n=213		n=298		n=245		n=756
Mentioned	38.9	26.7-51.1	39.6	30.8-48.5	28.8	17.7-39.8	38.7	30.3-47.1
Didn't mention	61.1	48.9-73.3	60.4	51.5-69.2	71.2	60.2-82.3	61.3	52.9-69.7
Milk		n=213		n=298		n=245		n=756
Mentioned	28.2	17.2-39.3	28.7	19.7-37.6	19.8	10.6-29.0	28.0	20.3-35.7
Didn't mention	71.8	60.7-82.8	71.3	62.4-80.3	80.2	71.0-89.4	72.0	64.3-79.7
Others								
Mentioned	2.0	0.1-3.9	3.4	-0.3-7.0	3.2	0.6-5.7	2.4	0.8-4.1
Didn't mention	98.0	96.1-99.9	96.6	93.0-100.3	96.8	94.3-99.4	97.6	95.9-99.2
Knows benefit of eating Iron rich food		n=238		n=297		n=263		n=798
Yes	34.2	26.7-41.6	47.6	37.5-57.7	41.5	34.3-48.6	37.2	31.1-43.4
No	65.8	58.4-73.3	52.4	42.3-62.5	58.5	51.4-65.7	62.8	56.6-68.9
Gives energy		n=238		n=297		n=263		n=798
Mentioned	56.9	49.5-64.4	53.9	47.5-60.4	57.3	45.2-69.5	56.2	50.7-61.6
Didn't mention	43.1	35.6-50.5	46.1	39.6-52.5	42.7	30.5-54.8	43.8	38.4-49.3
Gives Iron		n=238		n=297		n=263		n=798
Mentioned	14.6	5.3-23.8	9.6	4.1-15.2	8.1	4.0-12.3	13.0	6.3-19.7
Didn't mention	85.4	76.2-94.7	90.4	84.8-95.9	91.9	87.7-96.0	87.0	80.3-93.7
Good for health		n=238		n=297		n=263		n=798
Mentioned	77.4	68.2-86.7	76.4	69.3-83.4	65.5	54.6-76.3	76.6	70.0-83.2
Didn't mention	22.6	13.3-31.8	23.6	16.6-30.7	34.5	23.7-45.4	23.4	16.8-30.0
Others		n=238		n=297		n=263		n=798
Mentioned	2.6	0.1-5.2	1.2	-0.1-2.4	4.2	1.2-7.1	2.3	0.5-4.1
Didn't mention	97.4	94.8-99.9	98.8	97.6-100.1	95.8	92.9-98.8	97.7	95.9-99.5

The Table 44 above states the knowledge of the respondents about foods rich in iron. One in three (34.0%) of the respondents said that they know the foods that are rich in iron, the proportion was 30.1% in the rural strata and appeared to be higher in the urban area (48.0%). Fish is a good source of iron was mentioned by over 50.0% of the respondents in all the strata. Meat is a good source of iron was mentioned by 37.0% of the respondents, the proportion was somewhat less in the rural and slums area (32.0%), compared with urban area (47.5%)

47. 5% of the urban respondents said that they know about the health benefits of eating iron rich foods. Over 70.0% of the respondents said that iron rich foods are good for health. That the iron rich food gives iron was mentioned by only 13.0% of the respondents at the national level.

3.11 ZINC NUTRITION

3.11.1. PREVALENCE OF ZINC DEFICIENCY

The national prevalence of zinc deficiency in the preschool age children was 44.6 % (Table 45). Urban children were less likely to suffer from zinc deficiency than their rural and slum peers (29.5%-urban vs. 48.6%-rural vs. slum-51.7%). However over half of the NPNL women suffered from zinc deficiency at the national level and in all the strata, with the prevalence being highest in women living in slums (66.4%).

TABLE 45: PREVALENCE OF ZINC DEFICIENCY[1,2,3]

	n	%	95% CI
Preschool age children[4]			
National	662	44.6	34.3-54.9
Rural	228	48.6	35.8-61.4
Urban	236	29.5	17.7-41.3
Slum	198	51.7	40.8-62.7
NPNL women[5]			
National	1073	57.3	51.1-63.4
Rural	391	57.5	49.9-65.1
Urban	359	54.5	45.5-63.6
Slum	323	66.4	55.1-77.6

[1]Zinc deficiency is defined as S. zinc level of <9.9 mmol/l in preschool children and <10.1 mmol/l in NPNL women (IZINCG), [2] Adjusted for elevated CRP (>10mg/l) or elevated AGP (>1 g/l) by mathematical correction (Thurnham et al, Am J Clin Nutr.,2010; Reina Engle-Stone et al; J Nutr. 2011), [3]Estimates weighted to represent at the population level, [4]Age 6-59 mo, [5]Age 15-49 years

3.11.2 MEAN SERUM ZINC

TABLE 46: MEAN ZINC CONCENTRATION IN SERUM (MMOL/L)[1,2]

	Preschool age children[3]		NPNL women[4]	
	mean(mmol/l)	95% CI	mean(mmol/l)	95% CI
National	10.25	9.9-10.6	10.04	9.81-10.27
Rural	10.04	9.63-10.46	10.06	9.77-10.34
Urban	11.02	10.37-11.67	10.05	9.73-10.37
Slums	9.89	9.56-10.23	9.67	9.29-10.05

[1] Adjusted for elevated CRP (>10mg/l) or elevated AGP (>1 g/l) by mathematical correction (Thurnham et al, Am J Clin Nutr.,2010; Reina Engle-Stone et al; J Nutr. 2011, [2]Estimates weighted to represent at the population level, [3]Age 6-59 mo, [4]Age 15-49 years

The Table 46 above depicts mean zinc level in serum. The national average levels were 10.2 mmol/l and 10.04 mmol/l in the preschool age children and the NPNL women respectively. The mean serum zinc appeared to be higher in the urban stratum than in the slums in both the population groups studied.

3.12.1 CONSUMPTION OF ZINC FROM FOOD

The Table 47 below depicts seven-day consumption of zinc from food in the preschool age children. The mean animal source zinc consumption in the rural, urban and slums were respectively 8.1 mg, 9.4 mg, and 7.5 mg. Total zinc consumption tends to have decreased as households were pregressively more food insecure. The same trend was observed in regard to consumption of animal source zinc, with the consumption being 10.2 mg and 3.6 mg respectively in the food secure and severely food insecure households.

TABLE 47: SEVEN DAY CONSUMPTION OF ZINC FROM FOOD: PRESCHOOL AGE CHILDREN

Strata	N	mean (mg)	95% CI
Total zinc consumption			
National	845	22.3	19.8-24.8
Rural	284	22.4	19.1-25.7
Urban	296	22.7	19.7-25.6
Slums	265	18.7	16.5-20.8
Animal source zinc consumption			
National	845	8.3	7.2-9.5
Rural	284	8.1	6.6-9.6
Urban	296	9.4	7.9-10.8
Slums	265	7.5	6.1-8.8
Non animal source zinc consumption			
National	845	13.9	12.2-15.7
Rural	284	14.3	12.1-16.5
Urban	296	13.3	11.4-15.1
Slums	265	11.2	9.8-12.5
According to household food insecurity			
Total zinc consumption			
Food secure	382	25.4	22.4-28.3
Mild insecure	125	20.6	16.8-24.3
Moderate insecure	210	20.4	13.8-27.1
Severe insecure	128	13.7	10.2-17.2
Animal source zinc consumption			
Food secure	382	10.2	9.0-11.4
Mild insecure	125	7.8	5.4-10.3
Moderate insecure	210	6.6	4.3-8.9
Severe insecure	128	3.6	2.7-4.5
Non animal source zinc consumption			
Food secure	382	15.2	12.9-17.4
Mild insecure	125	12.7	9.3-16.0
Moderate insecure	210	13.8	9.3-18.3
Severe insecure	128	10.1	7.2-13.1

Table 48 below depicts seven- day consumption of zinc in the NPNL women. Consumption of total zinc was 29.0 mg, 32.3 mg and 28.4 mg respectively in the rural, urban and slums strata. Zinc consumption from animal source was 8.9 mg, 9.4 mg and 8.1 mg respectively in the above strata. In regard to household food insecurity, consumption of total zinc pregressively decreased as households became increasingly food insecure. The similar observation was noted for consumption of animal-origin zinc.

TABLE 48: SEVEN DAY CONSUMPTION OF ZINC FROM FOOD: NPNL WOMEN

Strata	n	mean (mg)	95% CI
Total Zinc consumption			
National	1412	29.6	27.0-32.3
Rural	486	29.0	25.4-32.6
Urban	482	32.3	29.8-34.8
Slums	444	28.4	25.6-31.3
Animal source zinc consumption			
National	1412	9.1	7.8-10.2
Rural	486	8.9	7.3-10.6
Urban	482	9.4	8.4-10.5
Slums	444	8.1	6.6-9.1
Non animal source zinc consumption			
National	1412	20.6	18.8-22.4
Rural	486	20.0	17.6-22.4
Urban	482	22.9	21.0-24.7
Slums	444	20.3	18.2-22.3
According to household food insecurity			
Total zinc consumption			
Food secure	674	33.3	30.6-35.9

Mild insecure	193	28.5	18.7-38.2
Moderate insecure	365	25.8	22.7-28.9
Severe insecure	180	22.5	18.8-26.2
Animal source zinc consumption			
Food secure	674	11.3	9.7-12.8
Mild insecure	193	8.3	6.3-10.3
Moderate insecure	365	6.4	5.2-7.6
Severe insecure	180	5.1	3.3-6.9
Non animal source zinc consumption			
Food secure	674	22.1	20.2-23.1
Mild insecure	193	20.1	12.1-28.2
Moderate insecure	365	19.4	16.8-21.9
Severe insecure	180	17.4	14.6-20.2

3.12.1.1 Consumption of zinc from food vs. The Recommended Daily Allowance (RDA)

The Table 49a below states daily consumption of zinc from food and how this compares with the Recommended Daily Allowance (RDA). It appeared that, by and large the Bangladesh preschool age children (6-59 month) are just short of the RDA amount of consumption for zinc. The status of consumption in the NPNL women appeared even worse. By and large in the urban women the median consumtion was half of the RDA amount, and in the slums it was just one-third of the RDA.

TABLE 49A: CONSUMPTION OF ZINC FROM FOOD VS. THE RECOMMENDED DAILY ALLOWANCE (RDA)

	Daily total zinc consumption from food (mg); median	RDA[1]
Preschool age		
Rural	3.20	3-5[2]
Urban	3.23	
Slums	2.67	
NPNL women		
Rural	3.93	
Urban	4.47	8-9[3]
Slums	3.61	

Instititute of Medicine (IOM)[1], Age 1-3 years: 3 mg; age 4-5 years: 5 mg[2], Age 15-18 years: 9 mg; age 19+: 8 mg[3]

TABLE 49B: CONSUMPTION OF ZINC FROM FOOD VS. THE RECOMMENDED DAILY ALLOWANCE (RDA)

RDA for zinc in the NPNL women(mg)	Strata	Total daily mean intake from animal source(mg)	Total daily mean intake(mg)	% of RDA	Prevalence of zinc deficiency (%)
9.0[1]	National	1.92	4.87	54.1	57.3
	Rural	2.02	4.88	54.2	57.5
	Urban	1.67	4.93	54.7	54.5
	Slums	1.33	4.23	47.0	66.4

Institute of Medicine[1]

The Table 49b above shows average daily zinc consumption from food in the NPNL women. It was 4.88 mg, 4.93 mg and 4.23 mg respectively in the rural, urban and slum strata and there are corresponding proportions of the daily requirement (RDA). Proportions of RDA are reflected in the proportions of the populations with zinc deficiencies.

3.12.2 GRADES OF PHYTATE-ZINC MOLAR RATIO

The Table 50 below depicts the phytate-zinc molar ratio in the food of the studied population groups. Phytate present in the food is an inhibitor for zinc absorption. The phytate-zinc molar ratio which is an indicator of relative proportions of phytate to zinc in the

food is an indicator of zinc absorption. The higher is the ratio, the more is the abundance of phytate in relation to zinc and less is the zinc absorption. The International zinc nutrition consultative group (IZING) has devised three categories of phytate-zinc molar ratios to account for dietary quality facilitating zinc absorption. The table below shows by and large, Bangladeshi food for the preschool age children falls in the moderate category (phytate zinc ratio: 5-15), with about two third of the children are having this category of diet. The urban children appeared to have diet that are more conducive for zinc absorption (phytate zinc molar ratio :< 5), with 26.3% of urban children had this category of food, while in the rural and slums children the proportion were 23.6% and 17.2% respectively. Diet of one fourth of the school age children in the slums had the ratio>15.0, indicationg a high content of phytate. Diet of one third of the NPNL women in the slums had the ratio >15.0. This could be linked with very high rate of zinc deficiency in the slums populations.

TABLE 50: GRADES OF PHYTATE-ZINC MOLAR RATIO IN PRESCHOOL AGE CHILDREN

Preschool	Phytate-zinc molar ratio[1]					
	<5.0		5.0-15.0		>15.0	
	(%)	95% CI	(%)	95% CI	(%)	95% CI
National	23.9	17.8-30.1	63.1	57.9-68.1	13.0	7.7-18.2
Rural	23.6	15.7-31.5	62.1	55.3-68.9	14.1	7.1-21.2
Urban	26.3	18.4-34.2	64.9	59.3-70.6	8.6	3.6-13.7
Slums	17.2	8.6-25.7	69.6	58.2-81.1	13.1	4.3-21.8
School age						
National	14.1	7.2-21.0	65.3	59.2-71.4	20.5	13.5-27.5
Rural	15.8	6.8-24.8	62.9	55.1-70.6	21.2	12.1-30.4
Urban	10.1	4.8-15.5	72.7	64.2-81.2	17.1	8.4-25.6
Slums	2.4	0.8-4.1	73.2	66.1-80.3	24.2	16.9-31.6
NPNL						
National	7.5	3.2-11.9	65.1	57.5-72.6	27.3	18.6-35.9
Rural	8.9	3.3-14.6	62.4	52.3-72.5	28.5	17.1-40.0
Urban	3.2	0.9-5.6	75.2	69.6-80.9	21.4	15.1-27.8
Slums	2.1	0.4-3.7	64.1	57.6-70.6	33.7	27.2-40.2

WHO[1]

3.12.3 MEAN PHYTATE-ZINC MOLAR RATIO

The Table 51 below shows mean phytate- zinc molar ratio in the foods consumed by the studied populations. The ratio in the preschool age children was 9.0. In the rural, urban and slums strata the ratio was respectively 9.13, 8.42, and 9.77 respectively. In the NPNL women the ratio at the national level was 12.0. The ratios were respectively 12.0, 11.67 and 13.45 respectively in the rural, urban and slums. In the School age children the ratio at the national level was 10.67. It was 10.6, 10.6 and 12.5 respectively in the rural, urban and slums.

TABLE 51: MEAN PHYTATE-ZINC MOLAR RATIO

Preschool	n	mean	95% CI
National	843	9.01	8.02-10.0
Rural	284	9.13	7.82-10.44
Urban	296	8.42	7.42-9.42
Slums	263	9.77	8.78-10.75
NPNL women			
National	1412	12.0	10.6-13.5
Rural	486	12.0	10.2-13.7
Urban	482	11.67	10.6-12.7
Slums	444	13.45	12.7-14.1
School age children			
National	1428	10.67	9.3-12.0
Rural	476	10.60	8.8-12.4
Urban	484	10.60	8.95-12.2
Slums	468	12.50	11.5-13.4

3.13 PREVALENCE OF FOLATE AND B_{12} DEFICIENCY

The prevalence of folate deficiency was 9.1% at the national level (Table 52), with rural and urban proportions were 8.6% and 11.4% respectively.

3.13.1 FOLATE STATUS IN NPNL WOMEN

TABLE 52: FOLATE STATUS IN NPNL WOMEN

Prevalence of folate deficiency[1,2]	n	%	95% CI
National	849	9.1	5.3-12.9
Rural	294	8.6	3.6-13.5
Urban	288	11.4	6.6-16.3
Slum	267	7.9	3.3-12.4

[1]S. Folate level <6.8 nmol/l (Lindstorm et al 2011), [2]Estimates weighted to represent at the population level

3.13.2 CONSUMPTION OF FOLATE FROM FOOD

The Table 53 below depicts seven day folate consumption from food. As households were progressively more food insecure, contribution of animal source folate decreased.

TABLE 53: CONSUMPTION OF FOLATE FROM FOOD

Household food insecurity	7-day plant source folate (microgram)	7-day animal source folate (microgram)
Food secure	1057.5	109.3
Mild insecure	946.9	90.5
Moderate insecure	935.5	62.6
Severe insecure	1153.1	39.6

3.13.3 B_{12} STATUS IN NPNL WOMEN

TABLE 54: B_{12} STATUS IN NPNL WOMEN

Prevalence[4] of B_{12} Deficiency		n	%	95% CI
National	Deficiency[1]	872	6.1	2.1-10.1
	Marginal Deficiency[2]		15.9	12.0-19.9
	Normal Status[3]		77.9	70.8-85.0
Rural	Deficiency[1]	303	5.7	0.5-11.0
	Marginal Deficiency[2]		15.8	10.8-20.8
	Normal Status[3]		78.4	69.3-87.6
Urban	Deficiency[1]	295	7.5	3.0-11.9
	Marginal Deficiency[2]		16.0	10.3-21.7
	Normal Status[3]		76.5	67.6-85.3
Slums	Deficiency[1]	274	6.5	1.9-11.0
	Marginal Deficiency[2]		18.1	11.5-24.6
	Normal Status[3]		75.5	67.4-83.5

[1]S. B_{12} level <200 pg/ml, [2]S, B_{12} level 200.0-300.0 pg/ml, [3]S. B_{12} level >300.0 pg/ml, [4]Estimates weighted to represent at the population level

At the national level, 22.0% (Table 54) of the NPNL women suffered from vitamin B_{12} deficiency. The proportion was similar in all the strata, albeit it appeared to be slightly higher in proportion in the slums, where it was about 25.0%.

3.13.4 CONSUMPTION OF B_{12} FROM FOOD: NPNL WOMEN

The Table 55 below states daily consumption of B_{12} from food. The mean consumption was 1.98 mg, 2.43 mg and 2.10 mg respectively in the rural, urban and slums areas. The consumption followed a decreasing trend as the households become progressively more

food insecure. The mean consumption was 2.58 mg in the food secure households and 1.07 mg in the severe food insecure households.

TABLE 55: CONSUMPTION OF B12 FROM FOOD

Strata	n	Mean(mg)	95% CI
National	1412	2.07	1.76-2.39
Rural	486	1.98	1.59-2.37
Urban	482	2.43	1.79-3.06
Slums	444	2.10	1.6-2.6
Household food insecurity			
Food secure	674	2.58	2.11-3.06
Mild insecure	193	1.69	1.12-2.27
Moderate insecure	365	1.69	1.30-2.08
Severe insecure	180	1.07	0.83-1.30

3.14 SALT IODIZATION

3.1

4.1 CONSUMPTION OF IODIZED SALT

Table 56a below shows the profile of salt consumed at the household level. The national estimate of usage of iodized salt (≥5 ppm) at household level was 80.3%. The proportions were 76.7%, 91.7% and 91.1% respectively in rural, urban and the slums area. At the national level, 57.6% of the households used adequately iodized salt (≥15 ppm). Three out of four households in the urban area and slums used adequately iodized salt, while the proportion was just over 50.0% in the rural area.

TABLE 56A: STATUS OF HOUSEHOLD SALT[1]

Presence of iodine(≥5ppm)	n	%	95% CI
National	1692	80.3	75.1-85.5
Rural	564	76.7	69.8-83.5
Urban	574	91.7	88.1-95.4
Slums	554	91.1	84.6-97.5
Presence of adequate iodine (≥15ppm)			
National	1692	57.6	50.4-64.8
Rural	564	51.8	42.8-60.9
Urban	574	75.4	68.0-82.9
Slums	554	76.9	64.7-89.0
Brand salt			
National	1709	75.8	66.1-85.5
Rural	566	70.8	58.1-83.4
Urban	576	92.3	87.8-96.6
Slums	567	88.2	79.5-96.9
Open salt			
National	1709	24.2	24.4-33.8
Rural	566	29.2	16.5-41.9
Urban	576	7.7	3.3-12.1
Slums	567	11.8	3.0-20.5

[1]estimates weighted to represent at the population level, [2]Sold in sealed plastic packets, e.g. ½, 1 kg packets
[3]Kept in "open" condition and sold in small amount e,g, in few hundred grams wrapped up with paper

The estimate of household consumption of "Brand" salt was 75.8% at the national level. It appeared proportionately more urban households consume "Brand" salt than in the rural area (92.0% vs. 71.0%). The proportion of "Open" salt consumption in the households was 24.2% at the national level. More rural households consumed "Open" salt than in the urban area (29.2% vs. 7.7%).

TABLE 56B: USE OF IODIZED SALT BY SOCIO-ECONOMIC STATUS

Use of iodized salt[1]				Use of adequately iodized salt[2]			
According to asset index							
	n	**%**	**95% CI**		**n**	**%**	**95% CI**
Poorest	347	73.1	60.0-86.3	Poorest	347	51.9	40.2-63.6
Poorer	327	82.1	73.2-90.1	Poorer	327	56.3	46.6-66.0
Middle	342	80.4	72.2-88.5	Middle	342	57.8	48.8-66.8
Richer	337	88.2	82.0-94.4	Richer	337	64.8	51.8-77.9
Richest	338	86.0	78.4-93.4	Richest	338	65.1	51.8-78.1
According to household food insecurity							
Food secure	777	84.2	77.6-90.7	Food secure	777	63.3	55.0-71.6
Mild insecure	260	86.2	77.4-94.9	Mild insecure	260	54.9	37.3-72.6
Moderate insecure	432	75.0	67.2-82.8	Moderate insecure	432	51.4	42.0-60.8
Severe insecure	223	66.9	55.7-78.1	Severe insecure	223	48.9	37.1-60.7

[1]Salt iodization level >=5 ppm, [2]Salt iodization level>=15 ppm

The Table 56b above states, the use of iodized salt across different socio-economic status in the population. It appeared, the rate of usage of iodized salt rising as socio-economic status rises. Similar trend was observed in regard to usage of adequately iodized salt. The usage of iodized salt appeared to be decreased as the households became progressively more food insecure. Similar trend was observed in case of usage of adequately iodized salt.

3.14.2 REASON BEHIND NOT TAKING PACKET SALT

TABLE 57: REASON BEHIND NOT TAKING PACKET SALT

If not eating packet salt, why?	n	(%)	95% CI
Do not like the taste	362	14.9	4.8-24.9
Too expensive		83.9	77.3-90.5
Not available		18.7	3.1-34.3
Do not believe it is iodized		11.5	2.0-21.8
Cannot buy in a small amount		23.9	16.8-30.9
Do not know		0.5	-0.4-1.4
Others		2.3	0.03-4.7

The most common reason behind not taking packet salt was that it was “too expensive”, as mentioned by 83.9% of the household respondents. Another important cause was, “cannot buy in a small amount” which was mentioned by roughly one fourth of the household respondents (23.9%). Among other notable reasons were-“not available” (18.7%),”do not like the taste” (14.9%), “do not believe it is iodized” (11.5%) (Table 57).

3.15 IODINE NUTRITION

Iodine status can be reported as mean and/or median urinary iodine concentration (µg/l) (Maria Andersson, J. Nutr. 2012). Prevalence of inadequate iodine intake or iodine deficiency is reported as proportion of the population with mean urinary iodine concentration<100 µg/l. Historically in Bangladesh and in other countries iodine nutrition is reported in this way, hence this was used in the present survey to find a trend relative to earlier rounds of national surveys (e.g. National IDD and USI Survey of Bangladesh 2004/05). On the other hand, the median urinary iodine concentration is used as well to define as a whole of the iodine status of the entire population, based on the cut-off point 100 µg/l. If the median is >= 100 µg/l, the population as a whole is said to be iodine sufficient, nevertheless a proportion of that population might have mean urinary iodine concentration below the 100 µg/l , hence deficient in iodine. In the national micronutrients survey the iodine nutrition is reported using both the definitions.

3.15.1 PREVALENCE OF IODINE DEFICIENCY IN SCHOOL AGE CHILDREN

Table 58 below, reports prevalence of iodine deficiency in the population groups as measured by urinary iodine concentration (UIC). The proportion of population with inadequate iodine (UIC<100.0 µg/l) at the national level in the school age children was 40.0%. The proportion of population with severe, moderate and mild iodine deficiency were 5.6%, 13.0% and 21.4% respectively.

TABLE 58: PREVALENCE OF IODINE DEFICIENCY IN SCHOOL AGE CHILDREN[9]

	National n=1154		Rural n=390		Urban n=388		Slums n=376	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Iodine deficiency[1]	40.0	29.3-50.6	40.8	26.8-54.8	39.3	25.2-53.3	27.4	14.7-40.2
Severe Iodine deficiency[2]	5.6	2.1-9.1	6.7	2.0-11.5	2.1	0.6-3.7	1.2	0.3-2.1
Moderate Iodine deficiency[3]	13.0	8.8-17.1	12.9	7.7-18.0	13.1	5.6-20.7	14.3	3.3-25.4
Mild Iodine deficiency[4]	21.4	15.6-27.1	21.1	13.7-28.6	23.9	16.2-31.6	11.9	6.7-17.0
Optimum[5]	23.4	18.4-28.4	23.1	16.5-29.6	22.8	17.0-28.6	33.2	23.2-43.1
More than adequate[6]	14.6	6.0-23.1	16.2	5.1-27.4	7.8	3.9-11.7	18.5	11.9-25.2
Excessive[7]	13.9	8.2-19.5	12.6	5.3-19.8	18.3	8.5-28.2	15.5	10.1-21.0
Particularly high[8]	8.0	2.5-13.5	7.2	0.09-14.2	11.6	3.5-19.7	5.1	0.3-10.0

[1]UIC< 100.0 µg/l, [2]UIC< 20.0 µg/l, [3]UIC 20.0-<50.0 µg/l , [4]UIC 50.0-<100.0 µg/l, [5]UIC 100.0-<200.0, [6]UIC 200.0-<300.0 µg/l, [7]UIC ≥300.0 µg/l, [8]UIC ≥500.0 µg/l (WHO 2001), [9]Weighted to represent population level

TABLE 59: IODINE STATUS IN SCHOOL AGE CHILDREN BY STRATA

Urinary iodine concentration(µg/l)	Rural (n=390)	Urban(n=388)	Slums(n=376)	National (n=1154)
				All
Median	146.2	136.3	173.5	145.7
25th percentile	58.9	66.1	91.6	61.3
75th percentile	270.3	334.1	270.9	283.9
Boys	(n=188)	(n=199)	(n=188)	(n=566)
Median	163.3	167.6	173.5	166.7
25th percentile	68.2	90.7	92.8	73.3
75th percentile	270.3	384.0	259.6	283.9
Girls	(n=202)	(n=198)	(n=188)	(n=588)
Median	122.9	106.7	172.3	122.7
25th percentile	51.5	57.5	91.6	51.5
75th percentile	273.2	324.7	280.1	273.2

TABLE 60: IODINE STATUS IN SCHOOL AGE CHILDREN BY ASSET INDEX

Urinary iodine concentration(µg/l)	Poorest (n=234)	Poorer(n=232)	Middle(n=226)	Richer (n=227)	Richest(n=235)
Median	93.6	146.8	147.4	152.5	151.3
25th percentile	44.2	54.6	66.4	59.5	127.1
75th percentile	204.1	285.2	287.8	299.9	312.9

The Table 59 above shows the median urinary iodine concentration in the school age children was 145.7 µg/l at the national level. The estimate was above 100.0 µg/l in all the strata-rural, urban and slums. The median urinary iodine concentration was higher than 100.0 µg/l in the boys and girls. It was 93.3 µg/l in the "poorest "quintile of the population (Table 60).

3.15.2 PREVALENCE OF IODINE DEFICIENCY IN THE NPNL WOMEN

Table 61 below shows iodine status in the NPNL women. The national prevalence of iodine deficiency (UIC<100.0 µg/l) in the NPNL women was 42.0%. The prevalence of severe and moderate iodine deficiencies were 7.1% and 17.5% respectively. The prevalence of optimum iodine level was 24.9%.

TABLE 61: PREVALENCE OF IODINE DEFICIENCY IN NPNL WOMEN[9]

	National		Rural		Urban		Slum	
	n=1273		n=452		n=433		n=388	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Iodine deficiency[1]	42.1	31.7-52.5	44.7	31.3-58.1	33.3	19.3-47.2	33.5	23.5-43.4
Severe Iodine deficiency[2]	7.1	3.7-10.5	8.3	3.8-12.8	3.3	1.0-5.6	1.6	0.08-3.2
Moderate Iodine deficiency[3]	17.5	12.1-22.9	19.0	12.0-26.1	12.4	5.4-19.4	12.2	5.7-18.6
Mild Iodine deficiency[4]	17.4	12.4-22.1	17.3	11.4-23.3	17.5	10.4-24.6	19.6	14.2-24.9
Optimum[5]	24.9	18.9-30.8	24.3	16.7-31.8	27.1	19.3-34.8	26.2	18.8-33.5
More than adequate[6]	11.9	8.9-14.9	11.3	7.3-15.1),	13.5	9.6-17.5	17.5	12.2-22.5
Excessive[7]	11.6	6.5-16.7	9.7	3.9-15.4	19.0	5.3-32.7	13.6	9.2-18.1
Particularly high[8]	9.3	3.9-14.7	9.9	2.9-16.9	7.0	3.5-10.5	9.1	2.4-15.7

[1]UIC< 100.0 µg/l, [2]UIC< 20.0 µg/l , [3]UIC 20.0-<50.0 µg/l , [4]UIC 50.0-<100.0 µg/l , [5]UIC 100.0-<200.0, [6]UIC 200.0-<300.0 µg/l, [7]UIC ≥300.0 µg/l, [8]UIC ≥500.0 µg/l (WHO 2001), [9]Weighted to represent population level

TABLE 62: IODINE STATUS IN NPNL WOMEN BY STRATA

Urinary iodine concentration(µg/l)	Rural (n=452)	Urban(n=433)	Slums(n=388)	National (n=1276)
Median	112.8	151.1	154.9	122.6
25th percentile	41.6	76.9	75.1	50.4
75th percentile	225.1	306.6	280.5	257.7
Iodine deficiency (%)	44.7	33.2	33.4	42.1

TABLE 63: IODINE STATUS IN NPNL WOMEN BY ASSET INDEX

Urinary iodine concentration(µg/l)	Poorest (n=262)	Poorer (n=259)	Middle (n=254)	Richer (n=248)	Richest (n=253)
Median	99.3	92.7	145.1	137.8	201.0
25th percentile	33.1	39.7	68.3	57.2	100.1
75th percentile	197.7	250.5	383.8	211.7	354.6

The Table 62 above shows the median urinary iodine concentration in the NPNL women was 122.6 µg/l, at the national level. The estimate was above 100.0 µg/l across all the strata-rural, urban and slums. The median urinary iodine concentrations were below 100.0 µg/l in the "poorest" and "poorer" quintiles of the population (Table 63).

3.16 IODINE STATUS IN RETAILER'S SALT

3.16.1 IODINE CONTENT IN RETAILER'S SALT

The Table 64 depicts status of iodine in retailer's salt. The proportion of retailer salt samples with iodine levels ≥5ppm was 91.9%. The proportion appeared less in the rural area than in the urban (85.0% vs. 95.0%).

The proportion of retailer salt samples with adequately iodized salt (≥20ppm)[2] was 66.4%. It appeared fewer shops in the rural than in the urban stratum sold adequately iodized salt (57.3% vs. 68.5%).

TABLE 64: IODINE STATUS OF RETAILER'S SALT[1]

Presence of iodine(≥5ppm)	n	%	95% CI
National	1566	91.9	90.5-93.2
Rural	514	85.0	81.9-88.1
Urban	544	94.8	93.0-96.7
Slum	508	95.6	93.8-97.6
Presence of adequate iodine(≥20ppm)[2]			
National	1566	66.4	64.1-68.7
Rural	514	57.3	53.1-61.6
Urban	544	68.5	64.6-72.5
Slum	508	73.2	69.3-77.1

[1]Based on samples collected from the retailer's shops, [2]National IDD/USI Survey, Bangladesh; 2004-05

With regard to iodine content of retailer salt, 8.1% of the salt samples contained negligible iodine (<5.0 ppm) (Table 65). The proportion of retailer salt samples with inadequately iodized salt (<20 ppm) was 33.5%. There were almost no salt samples (~0.0%) with excess iodine (>100 ppm).

TABLE 65: IODINE CONTENT: RETAILER SALT[2] BY STRATA

	National n=1566		Rural n=514		Urban n=544		Slum n=508	
ppm[1]	%	95% CI	%	95%CI	%	95%CI	%	95%CI
Nil	8.1	6.7-9.4	14.9	11.8-18.1	5.1	3.2-7.0	4.3	2.5-6.1
5.0-<20.0	25.4	23.3-27.6	27.6	23.7-31.5	26.2	22.5-29.9	22.4	18.8-26.1
20-<40.0	42.9	40.4-45.3	35.7	31.6-39.9	42.4	38.3-46.6	50.6	46.2-54.9
40.0-<60.0	20.8	18.8-22.8	18.4	15.1-21.8	22.4	18.9-25.9	21.4	17.8-25.1
60.0-<80.0	2.1	0.9-3.3	2.1	0.88-3.3	2.7	1.3-4.1	1.1	0.23-2.1
80.0-<100.0	0.44	0.11-0.77	0.97	0.12-1.8	0.36	-0.14-0.87	0.0	0.0
100.0-<200.0	0.19	-0.002-0.4	0.0	0.0	0.55	-0.7-1.1	0.0	0.0
200.0-<300.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
>300.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1]Parts per million, [2]Iodine level, based on collected samples from retailer's shops

3.17.1 RELATIONSHIP OF RETAILER SHOPKEEPER

TABLE 66: RELATIONSHIP OF RETAILER SHOPKEEPER

	Combined (n=1567)	Rural (n=515)	Urban (n=544)	Slums (n=508)
Owner	89.9	94.8	92.5	82.1
Staff	4.7	2.1	5.3	6.5
Brother in law	0.1	0.4		
Nephew	1.0	0.8	0.4	2.0
Sister	0.1	0.4		
Wife	1.8	1.2	1.1	3.1
Daughter	0.4	0.4	0.4	0.4
Brother	2.0	-	0.4	5.9

The Table 66 above depicts the relationship of the respondent with the owner of the retailer shop. In most of the cases, the respondent is the owner of the shop (89.9%). In about 5.0% of cases the respondents were hired staff of the shop owner. This proportion appeared to be slightly higher in the urban (5.3%) and slums (6.5%) than in the rural area (2.1%). Family members-brother, wife, daughter, sister, nephew etc constituted a minor proportion of the respondents.

3.17.2 EDUCATION OF RETAILER SHOPKEEPER

The Table 67 below shows education level of the respondents. About one in ten of the respondents (9.1%) did not have any form of institutional education. One in four of the respondents (24.6%) had completed secondary or higher level of education in all the strata.

TABLE 67: EDUCATION OF RETAILER SHOPKEEPER

	Combined (1567)		Rural (515)		Urban (544)		Slums (508)	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI
No education	9.1	7.7-10.5	8.1	5.7-10.5	9.3	6.9-11.8	9.8	7.2-12.4
Primary incomplete	17.6	15.7-19.5	16.3	13.1-19.5	15.2	12.2-18.2	21.4	17.8-25.0
Primary complete	19.5	17.5-21.5	18.8	15.4-22.2	22.2	18.7-25.7	17.3	14.0-20.6
Secondary incomplete	29.2	26.9-31.4	33.6	29.5-37.6	29.2	25.3-33.1	24.6	20.8-28.3
Secondary complete and higher	24.6	22.4-26.7	23.1	19.4-26.7	23.9	20.3-27.4	26.8	22.9-30.6

3.17.3 SELLING AND BUYING BY TYPE OF SALT (RETAILERS)

The Table 68 below states an account of selling and buying of crude and open salts by the retailer shopkeepers. Nearly one in five respondents (18.3%) stated to sell open salt. The proportion appears higher in the rural strata (38.3%), than in the urban (14.3%) and slums (2.3%). Just 1.0% of the respondents stated they sell crude salt. In regard to source of buying open salt, two-thirds of the respondents (66.9%) stated, they bought it from wholesalers, while one fourth of them (27.1%) stated to buy from the Market.

TABLE 68: SELLING AND BUYING OF CRUDE AND OPEN SALT (RETAILERS)

	Combined (n=1567)		Rural (n=515)		Urban (n=544)		Slums (n=508)	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI
Selling of crude salt	1.0	0.5-1.4	2.1	0.9-3.3	0.4	0.0-0.8	0.4	0.0-0.9
Selling of open salt	18.3	16.4-20.2	38.3	34.0-42.4	14.3	11.4-17.3	2.3	1.0-3.6
Buying crude salt from?		n=15		n=11		n=2		n=2
	%	95%CI	%	95%CI	%	95%CI	%	95%CI
wholesaler	20.0	0.0-42.9	9.1	0.0-29.9	100.0	-	-	-
market	53.3	24.7-81.9	72.7	41.3-100.0	-	-	-	-
Other	26.7	1.3-52.0	18.2	-8.0-45.0	-	-	100.0	-
Buying open salt from?		n=287		n=197		n=78		n=12
Factory	0.7	0.0-1.6			2.6	0.0-6.1		
Retailer	1.4	0.03-2.7	2.0	0.04-4.0				
Wholesaler	66.9	61.4-72.3	66.0	59.3-72.6	74.3	64.4-84.2	33.3	2.0-64.6
Market	27.1	22.0-32.3	29.4	23.0-35.8	20.5	11.3-29.6	33.3	2.0-64.6
Other	3.8	1.6-6.1	2.5	0.3-4.7	2.6	0.0-6.1	33.3	2.0-64.6

3.17.4 SOURCE OF BUYING PACKET SALT (RETAILERS)

The Table 69 below states the selling and buying of packet salt by the retailers. Almost all the respondents (99.2%) have stated to sell the packet salt. In regard to source of buying the packet salt, 67.6% have stated to buy packet salt from the wholesalers. While one in five (22.0%) of the shopkeepers had bought it from the market.

TABLE 69: SELLING AND BUYING OF PACKET SALT (RETAILERS)

	Combined (n=1567)		Rural (n=515)		Urban (n=544)		Slums (n=508)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Selling packet salt?	99.2	98.8-99.6	98.3	97.1-99.3	99.4	98.8-100	100.0	-
Buying packet salt from?		n=1555		n=506		n=541		n=508
Factory	2.2	1.4-2.9	1.4	0.4-2.4	1.3	0.3-2.2	3.9	2.2-5.6
Retailer	1.5	0.9-2.1	1.7	0.6-2.9	1.8	0.7-2.9	1.0	0.1-1.8
Wholesaler	67.6	65.2-69.9	69.0	64.9-73.0	70.1	66.1-73.9	63.5	59.3-67.7
Market	22.6	20.5-24.7	24.9	21.1-28.6	22.4	18.8-25.8	20.6	17.1-24.2
Other	6.0	4.8-7.2	3.0	1.5-4.4	4.4	2.7-6.1	10.8	8.1-13.5

3.17.5 MAINTENACE OF OPEN SALT BY THE RETAILERS' SHOPKEEPERS

The Table 70 below states maintenance of open salt by the retailers. In regard to maintenance of open salt, 90.0% of the respondents stated they seal the small packets made from the big sacks. Nearly half of all respondents (45.9%) stated they keep the open salt in the places where air passes, this proportion appeared to be lower in the urban area (30.7%). Another 42.0% stated they keep the open salt in cool, dry, and dark place. Respondents stating they keep the open salt in open sunlight were 7.3%.

TABLE 70: MAINTENANCE OF OPEN SALT (RETAILERS)

	Combined (n=287)		Rural (n=197)		Urban (n=78)		Slums (n=12)	
Seal the small packets made from the big sack?	90.6	87.2-94.0	93.4	89.9-96.9	94.8	89.8-99.8	16.7	0.0-41.4
Mode of storing of open salt?		n=285		n=195		n=78		n=12
Open sunlight	7.3	4.3-10.4	8.2	4.3-12.1	5.1	0.1-10.1	8.3	0.0-26.6
Damp place	1.4	0.03-2.7	-	-	5.1	0.1-10.1	-	-
Places where air passes	45.9	40.1-51.7	52.3	45.2-59.3	30.7	20.2-41.2	41.6	8.9-74.3
Cool, dry, dark place	42.4	36.6-48.2	38.4	31.5-45.3	53.8	42.5-65.1	33.3	20.5-64.6
Other	2.8	0.9-4.7	1.0	0.0-2.4	5.1	0.1-10.1	16.7	0.0-41.3

3.17.6 PRACTICE BY THE RETAILERS REGARDING OPEN SALT MADE OUT OF PACKET SALT

The Table 71 below presents practice related to salt by the respondents. Less than 1.0% of the respondents reported they make small packets from ½ to 1-kg packets and sell. Among them 71.4% reported they close mouth of the ½-1 kg packets and 57.1% stated they seal the small packets made from ½ to 1-kg packets. Among them, 42.0% store the ½ to 1-kg packets in cool, dry and dark places, while 28.0% of them store those packets in places where air passes.

TABLE 71: SMALL PACKETS MADE OUT OF PACKET SALT AND ITS MAINTENANCE (RETAILERS)

	Combined (n=1555)		Rural (n=506)		Urban (n=541)		Slums (n=508)	
	%	**95%CI**	**%**	**95%CI**	**%**	**95%CI**	**%**	**95%CI**
Make small packets from ½ to 1- kg packets and sell?	0.9	0.4-1.3	1.6	0.5-2.6	0.4	0.0-0.9	0.8	0.01-1.5
		(n=14)		(n=8)		(n=2)		(n=4)
	%	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**
Mouth of the ½ to 1-kg packets kept closed?	71.4	44.3-98.4	100.0	-	100.0	-	50.0	-
Seal the small packets made from ½ to 1-kg packets?	57.1	27.4-86.1	100.0	-	100.0	-	100.0	-
Mode of storing of ½ to 1-kg packets used to make small packets		n=14		n=8		n=2		n=4
	%	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**
Places where air passes	28.6	1.5-55.6	25.0	0.0-63.7	-	-	50.0	-
Cool, dry, dark places	42.9	13.2-72.5	75.0	36.2-100.0			-	-
Other	28.6	1.5-55.6	-	-	100.0	-	50.0	-

3.17.7 KNOWLEDGE OF THE RETAILERS ABOUT IODIZED SALT-SOURCE OF INFORMATION

The Table 72 below states about knowledge of the retailers about iodized salt. Among the respondents 81.3% stated that they heard about iodized salt. In regard to source of knowledge about iodized salt, 4 of the five respondents (79.4%) stated that have heard about it from television. This proportion is 70.7%, 81.7% and 85.6% respectively in the rural, urban and slum areas. One in four of the respondents (26.3%) stated they heard about it from radio. About one in five of the respondents (18.6%) stated they got to know about it from newspapers. This proportion is 14.7% in the rural and 21.1% in the urban strata. One in five of the respondents (21.3%) stated they heard about this from the health workers. This proportion appeared to be higher in the urban (25.3%) than in the slums (16.1%). A fair proportion (31.1%) of the respondent s stated they came to know about iodized salt from friends and relatives. This proportion appeared to be more in the rural (38.6%) than in the urban area (26.9%). Interestingly, just 9.0% of the respondents stated they came to know about this from the label of the packet. Other very minor source of the information were seminar, internet, NGO, Government official etc.

TABLE 72: KNOWLEDGE ABOUT IODIZED SALT AND ITS SOURCE (RETAILERS)

	Combined (n=1567)		Rural (n=515)		Urban (n=544)		Slums (n=508)	
Heard about iodized salt?	81.1	79.2-83.1	80.4	76.9-83.8	83.5	80.3-86.5	79.5	76.0-83.1
How do you know about iodized salt?		(n=1272)		(n=414)		(n=454)		(n=404)
Television	79.4	77.1-81.6	70.7	66.3-75.1	81.7	78.1-85.2	85.6	82.2-89.1
Radio	26.3	23.9-28.7	23.7	19.5-27.7	30.4	26.1-34.6	24.5	20.3-28.5
Newspaper	18.6	16.5-20.7	14.7	11.3-18.1	21.1	17.3-24.9	19.8	15.9-23.7
Poster/leaflet	8.6	7.1-10.2	5.3	3.1-7.4	6.4	4.1-8.6	14.6	11.1-18.1
Health worker	21.3	19.1-23.5	22.0	17.9-25.9	25.3	21.3-29.3	16.1	12.5-19.6
Friend/relative	31.1	28.5-33.5	38.6	33.9-43.3	26.9	22.7-30.9	27.9	23.5-32.3
School child	8.4	6.8-9.9	7.5	4.9-10.0	7.9	5.4-10.4	9.9	6.9-12.8
School teacher	7.5	6.1-9.0	10.1	7.2-13.1	5.7	3.5-7.8	6.9	4.4-9.4
From label of packets		9.0		11.5		6.8		8.9
Other[1]		1.7		2.2		1.8		1.0

[1] Seminar, Internet, Retailer, NGO, Govt. official

3.17.8 KNOWLEDGE OF RETAILERS ON IODIZED SALT-TYPE OF SALT AND IODINE CONTENT

The Table 73 below states about knowledge of the retailers about salt iodization. Less than 1.0% of the respondents stated crude salt contains iodine. About 16.0% did not know if crude salt contains iodine. Among the respondents, 3.0% stated open salt contains iodine. Over one half of the respondents (52.9%) stated all packet salts contain iodine while another 43.7% think some of the packet salts contain iodine.

TABLE 73: KNOWLEDGE ABOUT IODIZED SALT (RETAILERS)

	Combined (n=1272)		Rural (n=414)		Urban (n=454)		Slums (n=404)	
Crude salt contain iodine?								
	%	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**
Yes, all	0.9	0.4-1.4	1.0	0.02-1.9	1.3	0.3-2.3	0.5	0.0-1.1
Yes, some	2.8	1.9-3.7	3.4	1.6-5.1	2.6	1.1-4.1	2.4	0.9-3.9
No	80.4	78.2-82.6	79.2	75.3-83.1	78.6	74.8-82.4	83.6	80.0-87.2
Do not know	15.8	13.8-17.8	16.4	12.8-20.0	17.4	13.9-20.9	13.4	10.0-16.7
Open salt contain iodine?		(n=1272)		(n=414)		(n=454)		(n=404)
Yes, all	2.9	2.0-3.8	3.6	1.8-5.4	3.9	2.1-5.7	1.0	0.02-1.9
Yes, some	8.6	7.1-10.2	9.1	6.3-11.9	10.6	7.7-13.4	5.9	3.6-8.2
No	75.8	73.5-78.2	71.7	67.4-76.1	74.2	70.2-78.2	81.9	78.1-85.7
Do not know	12.6	10.7-14.4	15.4	11.9-18.9	11.2	8.3-14.1	11.1	8.1-14.2
Packet salts contain iodine?		(n=1272)		(n=414)		(n=454)		(n=404)
Yes, all	52.9	50.1-55.6	50.2	45.4-55.1	61.9	57.4-66.3	45.5	40.6-50.4
Yes, some	43.7	40.9-46.4	45.9	41.1-50.7	36.3	31.9-40.7	49.8	44.8-54.6
No	1.5	0.9-2.2	3.1	1.4-4.8	-	-	1.7	0.4-3.0
Do not know	1.8	1.0-2.5	0.7	0.0-1.5	1.7	0.5-2.9	2.9	1.3-4.6

3.17.9 RETAILER'S KNOWLEDGE ABOUT BENEFITS OF IODIZED SALT

The Table 74 below depicts the retailer shopkeepers's knowledge on benefits of iodized salt. Seven of the ten respondents (71.3%) stated, they knew benefits of iodized salt. Among them, 72.3% reported that iodized salt "prevent goiter". About a quarter of them (27.2%) know that the iodized salt "prevent cretinism". Approxmately one in five respondents stated that iodized salt "promote mental development/intelligence" (21.1%) and "promote growth" (20.1%). Less than 10.0% of the respondents stated that iodized salt "prevent abortion and stillbirth". Nearly 70.0% of the respondents stated that iodized salt is "good for health".

TABLE 74: KNOWLEDGE ABOUT BENEFITS OF IODIZED SALT (RETAILERS)

	Combined (n=1272)		Rural (n=414)		Urban (n=454)		Slums(n=404)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Do you know benefits of iodized salt?	71.3	68.8-73.7	72.0	67.6-76.3	70.9	66.7-75.1	71.0	66.6-75.4
		(n=907)		(n=298)		(n=322)		(n=287)
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Prevent goiter?	72.3	69.4-75.2	64.8	59.3-70.2	75.8	71.1-80.4	76.3	71.3-81.2
Prevent cretinism?	27.2	24.3-30.1	20.5	15.9-25.0	29.8	24.7-34.8	31.4	25.9-36.8
Promote mental development/intelligence?	21.1	18.4-23.7	20.5	15.9-25.1	18.3	14.1-22.5	24.7	19.7-29.7
Promote growth?	20.1	17.4-22.6	16.1	11.9-20.3	24.5	19.8-29.2	19.2	14.6-23.7
Prevent abortion and stillbirth?	9.0	7.2-10.9	8.4	5.2-11.5	9.0	5.9-12.1	9.8	6.3-13.2
Good for health?	68.8	65.7-71.8	71.1	65.9-76.3	67.4	62.2-72.5	67.9	62.5-73.3
Others?	5.3	3.8-6.7	5.4	2.8-7.9	3.7	1.6-5.8	7.0	4.0-9.9

3.17.10 RETAILER'S KNOWLEDGE ON TESTING OF SALT FOR IODINE

The Table 75 below states knowledge of the respondents on testing of salt for iodine and their practice of testing the salt. About one third of the respondents (31.5%) stated they know how to test salt for iodine; the proportion is similar across all the strata. Over 80.0% of the respondents stated, the "home based" technique is the method for testing salt for iodine, while just over 10.0% of them mentioned the "test kit" method for testing the salt. Knowledge about the "test kit" method appeared to be less common among the slums respondents (4.1%), compared with the urban respondents (17.1%). In regard to practice of testing the salt they sell, one half of the respondents (51.1%) mentioned, they test the salt either by the home based or test kit methods. The proportion appeared to be higher in the urban (60.5%) than in the slums (45.5%). Of those who test salt they sell for iodine, 87.0% reported to have tested it by the home based method. Among those who mentioned that they know how to test salt for iodine, 81.8% reported they know "salt" as an ingredient to test the salt for iodine. About 90.0% of them correctly stated that "pinch amount" of salt is required. About 16.0% of the respondent stated, they know "cooked rice" as an ingredient to test salt for iodine. Among them over 80.0% correctly said that "small amount" of cooked rice is required. Over 85.0% of the respondent stated, they know "lemon juice" as an ingredient to test salt for iodine. Among them, 95.0% correctly said that "few drops" of lemon juice is required.

TABLE 75: TESTING OF SALT FOR IODINE (RETAILERS)

	Combined (n=1272)		Rural (n=414)		Urban (n=454)		Slums (n=404)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Do you know how to test salt for iodine?	31.5	28.9-34.1	30.9	26.4-35.3	33.5	29.1-37.8	30.0	25.4-34.4
Please tell the way to test salt for iodine?		(n=401)		(n=128)		(n=152)		(n=121)
Test kit	11.7	8.5-14.8	12.5	6.7-18.3	17.1	11.1-23.1	4.1	0.5-7.7
Home based	83.5	79.9-87.1	82.0	75.2-88.7	79.6	73.1-86.1	90.1	84.7-95.4
Both	4.7	2.6-6.8	5.5	1.5-9.4	3.3	0.4-6.1	5.8	1.5-10.0
Do you test your salt for iodine using home based or testing kit method?	51.1	46.2-56.0	45.3	36.5-54.1	60.5	52.6-68.3	45.5	36.4-54.4
How do you test your salt for iodine?		(n=205)		(n=58)		(n=92)		(n=55)
Test kit	13.7	8.9-18.4	15.5	5.9-25.1	20.7	12.2-29.1	0.0	-
Home based	86.3	81.6-91.1	84.5	74.8-94.1	79.3	70.9-87.7	100.	-
		(n=401)		(n=128)		(n=152)		(n=121)
Do you know the	81.8	78.0-85.5	79.7	72.6-86.7	83.6	77.5-89.5	81.8	74.8-88.7

ingredients to test salt for iodine (salt)?								
How much salt?		(n=326)		(n=102)		(n=127)		(n=97)
Pinch amount	88.0	84.4-91.5	90.2	84.3-96.1	86.6	80.6-92.6	87.6	80.9-94.2
Level teaspoon	9.5	6.3-12.7	7.8	2.5-13.1	8.7	3.7-13.6	12.4	5.7-19.0
Other	0.6	-0.2-1.4	2.0	-0.7-4.6	0.0	-	0.0	-
Do not know	1.8	0.3-3.3	0.0	-	4.7	1.0-8.4	0.0	-
Do you know the ingredients to test salt for iodine (cooked rice)?	16.7	(n=401) 13.1-20.3	18.8	(n=128) 11.9-25.6	19.7	(n=152) 13.3-26.1	10.7	(n=121) 5.1-16.3
		(n=59)		(n=21)		(n=28)		(n=10)
Small amount	81.4	71.1-91.5	66.7	44.6-88.6	85.7	71.9-99.5	100.	-
5 grains	18.6	8.4-28.8	33.3	11.3-55.3	14.3	0.5-28.1	0.0	-
Do you know the ingredients to test salt for iodine (lemon juice)?	87.3	(n=401) 84.0-90.5	85.2	(n=128) 78.9-91.3	86.2	(n=152) 80.6-91.7	90.9	(n=121) 85.7-96.1
		(n=342)		(n=107)		(n=127)		(n=108)
Few drops	95.3	93.1-97.5	94.4	89.9-98.8	93.7	89.4-97.9	98.1	95.5-100.
Other	2.6	0.9-4.3	4.7	0.6-8.7	3.1	0.07-6.2	0.0	-
Do not know	2.0	0.5-3.5	0.9	-0.9-2.7	3.1	0.07-6.2	1.9	-0.7-4.4

3.17.11 RETAILER SHOPKEEPER'S KNOWLEDGE ABOUT SALT LAW

The Table 76 below states the appraisal of the retailer shopkeepers about the salt law. One fourth of the respondents (27.5%) stated, they knew about the salt law. The proportion appeared to be higher in the urban (32.0%) and rural (29.5%) strata than in the slums (20.9%). With regard to punitive measures in case of violation of the law, one in five of the respondents (20.4%) stated, they "do not know" about any punitive measure in place. This proportion appeared to be higher in the slums (30.2%) and urban (23.1%) than in the rural (10.5%) area.

TABLE 76: KNOWLEDGE ON SALT LAW (RETAILERS)

	Combined (n=1567)		**Rural (n=515)**		**Urban (n=544)**		**Slums (n=508)**	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Do you know that there is a salt law?	27.5	25.3-29.7	29.5	25.6-33.4	31.8	27.9-35.7	20.9	17.3-24.4
Is there any punishment for violating salt law?		(n=431)		(n=152)		(n=173)		(n=106)
Yes	71.2	66.9-75.5	83.6	77.6-89.5	68.8	61.8-75.7	57.5	48.0-67.1
No	8.4	5.7-10.9	5.9	2.1-9.7	8.1	4.0-12.1	12.3	5.9-18.6
Do not know	20.4	16.6-24.2	10.5	5.6-15.4	23.1	16.8-29.4	30.2	21.3-39.1
If yes, what is the punishment?		(n=307)		(n=127)		(n=119)		(n=61)
Imprisonment	9.4	6.1-12.7	4.7	1.0-8.4	9.2	3.9-14.5	19.7	9.4-29.9
Fine	34.5	29.2-39.8	37.0	28.5-45.5	27.7	19.5-35.8	42.6	29.8-55.3
Both	56.0	50.4-61.6	58.3	49.6-66.9	63.0	54.2-71.8	37.7	25.1-50.2

3.17.12 RETAILER'S KNOWLEDGE ABOUT RESULT OF TESTING THE SALT FOR IODINE

The Table 77 below states about retailer shopkeeper's knowledge about the result of testing salt for iodine. More than 85.0% of the respondents correctly mentioned that salt color turns violet/bluish on testing if it contains iodine.

TABLE 77: RETAILER'S KNOWLEDGE ON RESULT OF TESTING THE SALT FOR IODINE

What color is turned if salt contains iodine?	Combined (n=401)		Rural (n=128)		Urban (n=152)		Slums (n=121)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
White	4.7	2.6-6.8	2.3	-0.3-5.0	7.9	3.5-12.2	3.3	0.07-6.5
Violet/blusih	86.8	83.4-90.1	89.8	84.5-95.1	83.5	77.6-89.5	87.6	81.6-93.5
other	3.2	1.5-4.9	4.7	1.0-8.3	2.6	0.06-5.2	2.5	-0.3-5.2
Do not know	5.2	3.1-7.4	3.1	0.07-6.1	5.9	2.1-9.7	6.6	2.1-11.8

3.17.13 RETAILER'S PRACTICE REGARDING TESTING THE SALT FOR IODINE

The Table 78 below states retailer shopkeeper's practice in regard to testing salt for iodine. Every four of the ten respondents stated that they never do the testing, with majority of the respondents (59.0%) reported; they test the salt for iodine "sometimes".

TABLE 78: RETAILER'S PRACTICE REGARDING TESTING THE SALT FOR IODINE

How often test salt for selling for iodine?	Combined (n=401)		Rural (n=128)		Urban (n=152)		Slums (n=121)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Never	40.6	35.8-45.4	41.4	32.7-50.0	36.8	29.1-44.5	44.6	35.6-53.6
Sometimes	58.8	54.0-63.7	57.0	48.3-65.7	63.1	55.4-70.9	55.3	46.4-64.3
always	0.5	-0.2-1.2	1.5	-0.6-3.7	-	-	-	-

3.17.14.1 Iodization of household salt and the iodine status in the NPNL

TABLE 79: IODINE IN SALT AND IODINE STATUS IN THE NPNL

Salt iodization level of the household salt (ppm)	Median urinary iodine (µg/l) in the NPNL women
<15.0	69.7
15.0-29.0	130.8
>=30.0	175.2

The above table depicts a relation between salt iodization levels of household salt with corresponding iodine status in the NPNL women. In Bangladesh, iodine adequacy of household salt is defined by the presence of iodine in salt at concentration>=15 .0 ppm. It is apparent from the table that at inadequate iodine concentration in the salt (<15.0 ppm), the women were iodine deficient (median urinary iodine concentrations were below 100.0 µg/l, the cutoff defining iodine deficiency). However with adequate iodine in the household salt (>=15.0 ppm), the iodine status in the women were sufficient.

3.17.14.2 Iodization of household salt and the iodine status in the school age children

TABLE 80: SALT IODIZATION VS. IODINE STATUS IN SCHOOL AGE CHILDREN

Salt iodization level of the household salt (ppm)	Median urinary iodine (µg/l) in the school age children
<15.0	91.5
15.0-29.0	157.6
>=30.0	187.9

The above table depicts a relation between salt iodization levels of household salt with corresponding iodine status in the school age children. In Bangladesh, iodine adequacy of household salt is defined by the presence of iodine in salt at concentration>=15 .0 ppm. It is

apparent from the table that at inadequate iodine concentration in the salt (<15.0 ppm), the children were iodine deficient (median urinary iodine concentrations were below 100.0 µg/l, the cutoff defining iodine deficiency). However with adequate iodine in the household salt (>=15.0 ppm), the iodine status in the children were sufficient.

3.18.1 KNOWLEDGE IN THE HOUSEHOLD RESPONDENTS WITH REGARD TO IODIZED SALT SOURCE, TYPE OF SALT WITH IODINE

TABLE 81: KNOWLEDGE IN THE HOUSEHOLD RESPONDENTS WITH REGARD TO IODIZED SALT-SOURCE, TYPE OF SALT WITH IODINE

	Rural		Urban		Slums		National	
	(%)	95% CI	(%)	95% CI	(%)	95% CI	(%)	95% CI
Knowledge about iodized salt								
		n=661		n=693		n=649		n=2003
	68.8	60.9-76.8	78.7	72.7-84.8	77.3	70.3-84.3	71.2	65.2-77.2
Knowledge source about iodine								
		n=443		n=536		n=473		n=1452
TV	62.4	56.1-68.7	84.2	77.6-90.7	81.0	74.8-87.1	68.1	63.5-72.8
Radio	15.5	8.8-22.2	12.8	6.7-18.9	3.3	1.5-5.2	14.4	9.4-19.3
Newspaper	4.2	0.0-8.3	9.4	4.9-14.0	1.4	0.4-2.5	5.3	2.1-8.4
Poster/leaflet	4.0	0.5-7.5	5.5	2.3-8.6	0.3	-0.1-0.7	4.2	1.5-6.8
Health worker	24.8	17.5-32.1	21.9	15.2-28.5	23.7	17.6-29.8	24.1	18.6-29.6
Friend/relative	28.7	18.5-39.0	22.9	14.8-30.9	22.0	14.8-29.2	27.1	19.6-34.7
School child	4.9	1.7-8.1	3.7	1.5-5.9	2.1	0.6-3.7	4.5	2.2-6.9
Teacher	7.8	3.5-12.0	11.3	6.7-15.8	5.9	2.7-9.1	8.5	5.2-11.8
Others	0.1	-0.1-0.3	0.3	-0.1-0.7	0.7	0.0-1.4	0.2	0.0-0.3
Knowledge on containing iodine in crude salt								
		n=443		n=536		n=473		n=1452
Yes	1.4	-0.2-3.0	1.2	0.2-2.2	0.4	-0.1-0.9	1.3	0.1-2.5
Yes, some	2.3	0.6-4.0	2.1	0.6-3.5	1.3	0.0-2.6	2.2	1.0-3.5
No	75.8	69.7-81.9	85.5	78.6-92.4	75.7	64.3-87.0	78.0	73.1-82.9
Don't know	20.5	13.5-27.5	11.2	5.1-17.4	22.6	11.1-34.1	18.5	13.1-23.9
Knowledge on containing iodine in open salt								
		n=443		n=536		n=473		n=1452
Yes	4.1	1.8-6.4	2.8	1.0-4.6	6.6	2.4-10.8	3.9	2.2-5.6
Yes, some	8.7	3.3-14.2	4.5	1.7-7.3	6.0	2.3-9.7	7.7	3.6-11.7
No	73.5	65.6-81.4	85.7	78.8-92.5	75.4	69.8-80.9	76.3	70.0-82.7
Don't know	13.7	8.8-18.5	7.1	2.6-11.5	12.1	7.5-16.6	12.1	8.4-15.8
Knowledge on containing iodine in packet salt								
		n=443		n=536		n=473		n=1452
Yes	75.6	63.6-87.5	75.6	69.1-82.0	79.7	73.1-86.3	75.7	67.0-84.5
Yes, some	18.9	8.0-29.7	20.9	13.7-28.1	14.7	8.8-20.6	19.2	11.2-27.1
No	3.1	0.8-5.3	1.2	0.2-2.3	1.8	-0.2-3.9	2.6	0.9-4.3
Don't know	2.5	0.6-4.3	2.3	0.7-4.0	3.8	1.2-6.4	2.5	1.1-3.9

The Table 81 states, at the national level, the respondents of 68.0% of the households knew about iodized salt from Television. The proportions were 62.0%, 84.0% and 81.0% respectively in the rural, urban and slums strata. Radio was a source of knowing about iodized salt in 14.4% of households. The proportions were 15.5%, 12.8% and 3.3% in the rural, urban and slums respectively. The other two major sources were health workers and friends, from whom one in four of the respondents got the information, and the proportions were by and large similar in all the strata. Every three of the four respondents stated that packet salt contains iodine. Around 4.0% of the respondents mentioned that open salt contained iodine. Only 1.3% of the respondents reported crude salt contained iodine.

3.18.2 KNOWLEDGE ABOUT BENEFITS OF IODIZED SALT IN THE HOUSEHOLD RESPONDENTS

TABLE 82: KNOWLEDGE ABOUT BENEFITS OF IODIZED SALT IN THE HOUSEHOLD RESPONDENTS

	Rural		Urban		Slums		National	
	(%)	95% CI	(%)	95% CI	(%)	95% CI	(%)	95% CI
Know benefit of iodized salt								
63.8	56.7-70.8		78.0	68.8-87.2	58.6	48.9-68.3	66.8	60.9-72.7
Benefits of iodized salt?								
	n=443		n=536		n=473		n=1452	
Prevent goiter	78.1	68.2-87.9	80.9	72.9-88.8	74.0	62.6-85.3	78.7	71.7-85.7
Cretinism	22.4	14.5-30.3	21.1	12.7-29.5	14.8	9.4-20.1	21.8	15.9-27.6
Mental development/intelligence	6.1	2.2-10.1	5.8	3.5-8.1	7.0	2.5-11.6	6.1	3.3-8.9
Normal growth	12.9	7.3-18.5	9.2	6.1-12.2	6.2	2.1-10.3	11.6	7.6-15.7
Prevent abortion & still birth	0.5	-0.2-1.2	3.5	0.2-6.9	0.6	-0.6-1.9	1.3	0.3-2.4
Good for health/beneficial	67.3	53.1-81.4	61.6	51.5-71.7	51.3	39.3-63.4	65.1	55.0-75.3
Tests iodine?	n=443		n=536		n=473		n=1452	
	12.7	7.0-18.4	21.8	8.9-34.6	9.4	5.8-12.9	14.6	9.4-19.8

At the national level 67.0% of the respondents said they know the benefits of taking iodized salt. The proportion was 78.0% in the urban and 58% in the slums stratum (Table 82). Over 75.0% of the respondents in any stratum mentioned that iodized salt prevents goiter. One in five respondents mentioned that iodized salt prevents cretinism. The proportion was 21.0% in the urban and 14.0% in the slums stratum. Just 1.3% of the respondent could mention that iodized salt prevents abortion and still birth.

3.18.3 KNOWLEDGE OF THE HOUSEHOLD RESPONDENTS REGARDING TESTING OF SALT FOR IODINE

The Table 83 below states the household respondent's knowledge about testing the salt for iodine.

14.0% of the respondents said that they test salt for iodine; the proportion was 22.0% in the urban and 12.0% in the rural stratum. Among those who test iodine, the majority (82.0%) used the home based method to test iodine in salt.

One in five of the respondents could correctly mention that the testing of salt for iodine require salt and lemon juice. Apparently more urban respondents (30.0%) than in the rural (19.4%) and slums (22.9%) could mention this correctly. However only 7.0% of the respondents could correctly mentioned that cooked rice is required in testing salt for iodine.

80.0% of the respondents correctly mentioned that pinch amount of salt is required to test the salt. The proportion appears slightly higher in the rural and urban (80.0%) than in the slums (69.0%). Just over a quarter of the respondents correctly said that "5 grains" of rice is required for the test. Over 90.0% of the respondents said that "few drops" of lemon juice is required.

TABLE 83: KNOWLEDGE OF THE HOUSEHOLD RESPONDENTS REGARDING TESTING OF SALT FOR IODINE

Tests iodine?	Rural(n=443)		Urban(n=536)		Slums(n=473)		Nationaln=1452	
	12.2	7.0-18.4	21.8	8.9-34.6	9.4	5.8-12.9	14.6	9.4-19.8
		n=54		n=82		n=48		n=184
Test kit	20.9	1.2-40.6	10.1	-3.1-23.4	10.1	-6.6-26.8	17.0	3.5-30.4
Home based method	78.6	58.8-98.4	89.9	76.6-103.1	89.9	73.2-106.6	82.7	69.2-96.2
Both	0.5	-0.6-1.5						-0.3-0.9
Knowledge on ingredients to test iodine - salt								
		n=443		n=536		n=472		n=1451
Mentioned	19.1	13.3-24.9	31.2	19.6-42.8	20.3	11.6-28.9	21.9	16.7-27.1
Didn't mentioned	80.9	75.1-86.7	68.8	57.2-80.4	79.7	71.1-88.4	78.1	72.9-83.3
Knowledge on ingredients to test iodine - cooked rice								
		n=443		n=536		n=472		n=1451
Mentioned	5.2	3.0-7.5	12.5	4.9-20.1	5.8	1.7-10.0	6.9	4.3-9.5
Didn't mentioned	94.8	92.5-97.0	87.5	79.9-95.1	94.2	90.0-98.3	93.1	90.5-95.7
Knowledge on ingredients to test iodine in lemon juice								
		n=443		n=536		n=472		n=1451
Mentioned	19.4	13.7-25.1	30.8	19.2-42.3	22.9	14.3-31.6	22.1	17.0-27.3
Didn't mentioned	80.6	74.9-86.3	69.2	57.7-80.8	77.1	68.4-85.7	77.9	72.7-83.0
Amount of salt?								
		n=101		n=144		n=98		n=343
Pinch amount	80.6	69.7-91.5	81.3	64.6-98.0	69.7	52.9-86.4	80.4	71.7-89.1
Level teaspoon	12.9	5.6-20.3	9.3	2.1-16.6	17.2	5.8-28.6	11.9	6.7-17.1
Do not know	6.4	-2.2-15.0	9.4	-5.5-24.4	13.1	-1.1-27.3	7.6	0.5-14.9
Amount of rice?								
		n=22		n=32		n=26		n=80
small amount	1.7	-2.2-5.6	0.7	-1.1-2.4	19.5	-12.6-51.6	2.5	-0.8-5.8
5 grains	32.4	-0.6-65.3	16.4	-7.3-40.1	20.9	-8.8-50.6	26.9	6.1-47.7
Others	0.0	0.0	7.5	-9.3-24.3	0.6	-0.9-2.1	2.3	-2.3-6.8
Do not know	66.0	32.4-99.6	75.4	36.7-114.2	59.0	21.1-96.8	68.4	45.1-91.6
Amount of lemon juice?								
		n=103		n=146		n=108		n=357
Few drops	94.2	86.0-102.4	90.8	75.9-105.6	86.7	74.5-98.9	92.7	85.8-99.7
Others	0.2	-0.2-0.7	0.0	0.0	1.1	-1.0-3.1	0.2	-0.1-0.5
Do not know	5.6	-2.6-13.8	9.2	-5.6-24.1	12.3	-0.1-24.6	7.1	0.1-14.0
Color change of salt on iodine testing?								
		n=443		n=536		n=472		n=1451
White	29.6	17.3-41.9	35.2	23.8-46.5	25.9	17.5-34.3	30.7	21.5-39.9
violet/bluish	0.3	-0.2-0.7	2.1	0.3-3.8	0.7	-0.1-1.4	0.7	0.2-1.2
Other	1.3	-0.2-2.9	2.1	-1.1-5.3	2.1	0.3-3.8	1.5	0.2-2.8
Don’t know	68.9	56.9-80.8	60.7	50.5-70.9	71.4	62.7-80.0	67.1	58.2-76.0

3.18.4 HOUSEHOLD PRACTICE OF GIVING SALT TO LIVESTOCK

The Table 84 below states household practice of feeding livestock with salt. At the national level 46.0% of the respondents feed their livestock with salt. Among them, 26.0% gives iodized salt to their livestocks.

TABLE 84: HOUSEHOLD PRACTICE OF GIVING SALT TO LIVESTOCK

Gives salt to livestock?								
		Rural		Urban		Slums		National
		n=485		n=266		n=80		n=831
	%	95%CI	%	95%CI	%	95%CI	%	95%CI
	46.9	39.7-54.1	42.9	30.0-55.8	14.5	0.8-28.1	46.2	39.9-52.6
Type of salt given to livestock								
		Rural		Urban		Slums		National
		n=251		n=118		n=15		n=384
	%	95%CI	%	95%CI	%	95%CI	%	95%CI
Iodized	26.9	17.3-36.6	23.4	8.9-37.8	48.7	22.3-75.2	26.6	18.0-35.3
Not iodized	45.8	35.0-56.6	55.3	38.5-72.0	10.9	-3.4-25.2	46.6	37.0-56.3
Do not know	27.3	17.3-37.3	21.4	7.0-35.7	40.3	14.0-66.7	26.7	17.8-35.7

3.18.5 SOURCE OF SALT PURCHASE IN HOUSEHOLDS

TABLE 85: SOURCE OF SALT PURCHASE

	National (n=366)		Rural(n=201)		Urban(n=74)		Slums(n=91)	
	(%)	95% CI	(%)	95% CI	(%)	95% CI	(%)	95% CI
Open salt								
City shop	3.2	0.7-5.8	1.2	-0.7-3.2	26.4	7.6-45.3	24.6	3.9-45.2
Village/local shop/haat	93.6	89.3-97.8	96.4	92.9-99.9	64.2	45.2-83.1	54.4	34.4-74.4
Others	3.0	0.3-5.5	2.1	-0.4-4.7	9.3	-0.2-18.8	20.9	7.4-34.4
Packet salt	n=1628		n=464		n=614		n=553	
City shop	25.4	17.2-33.6	12.6	3.2-21.9	54.9	38.6-71.1	61.3	46.5-76.1
Village/local shop/haat	73.9	65.6-82.1	86.9	77.6-96.2	43.9	27.9-59.8	38.1	23.3-52.8
Others	0.6	-0.01-1.3	0.5	-0.5-1.4	1.1	-0.2-2.5	0.5	-0.07-1.0
Crude salt[1]	-	-	-	-	-	-	-	-

[1]Data on crude salt is not given, as the number of observations is too small to have a meaningful statistical inference

With regard to source of open salt purchase, "village/local shop" is the most common source of purchase. This proportion was 96.0%, 64.0% and 54.0 % respectively in the rural, urban and slums area. The packet salt is mostly purchased from city shop in the urban (55.0%) and slums (61.0%), however it is commonly purchased from village shop/local shops in the rural area (86.0%)

3.18.6 HOUSEHOLD PRACTICE RELATED TO USE OF SALT

TABLE 86: HOUSEHOLD PRACTICE RELATED TO USE OF SALT

	National (2003)		Rural(661)		Urban(691		Slums(649)	
	(%)	95% CI	(%)	95% CI	(%)	95% CI	(%)	95% CI
Storing of salt								
Closed packet/container	97.3	95.9-98.7	97.4	95.6-99.2	97.1	95.2-98.9	98.5	97.3-99.7
Open packet/container	2.4	1.1-3.8	2.4	0.7-4.1	2.6	0.8-4.4	1.5	0.3-2.6
Both	0.1	-0.02-0.3	0.1	-0.06-0.3	0.2	-0.2-0.6	-	-
Timing for adding salt								
During cooking	98.5	97.6-99.5	98.6	97.3-99.8	98.6	97.7-99.6	97.6	95.5-99.6
After cooking	0.4	-0.009-0.9	0.4	-0.2-1.0	0.5	-0.1-1.1	0.6	-0.3-1.3
Both	0.97	0.35-1.6	1.0	0.2-1.8	0.8	0.03-1.5	1.8	-0.1-3.8
Salt is added to meal at the time of eating								
Always	60.7	52.2-69.1	60.4	49.3-71.5	62.4	54.7-70.0	56.7	48.7-64.8
Sometimes	19.9	12.4-27.3	20.4	10.5-30.3	17.3	12.3-22.2	22.3	16.1-28.5
Never	19.4	15.6-23.1	19.1	14.3-23.8	20.3	14.2-26.3	20.9	13.4-28.3

The Table 86 states, at the national level, salt are stored in closed packet/container in 97.0% of the households. The proportions were similar in all the strata. In 98.5% of households salt was added with food at the time of cooking. The proportion was similar over all the strata. In 60.0% of the households, salt was taken on plate always. The proportions were 60.4%, 62.4% and 56.7% respectively in the rural, urban and slums areas. The 19.4% of the household respondents never took added salt on plate and the proportions remains similar in all the strata.

3.19 ANTHROPOMETRY

3.19.1 STUNTING IN PRESCHOOL AGE CHILDREN

The Table 87 below states prevalence of stunting (height-for-age z score<2z) in the preschool age children. The national estimate was 32.1%. The prevalence in the slums (51.1%) appeared higher than in the rural (31.4%) and urban (31.3%) strata. According to asset index, higher SES class tended to have lower prevalence of stunting. The stunting was 44.3% and 20.6% respectively in the "Poorest" and the "Richest" quintiles. The prevalence of stunting was 49.1% in the severe food insecure households, while it was 28.1% in the food secure households.

TABLE 87: PREVALENCE OF STUNTING IN PRESCHOOL AGE CHILDREN

Strata	n	(%)	95% CI
National	1016	32.1	26.2-38.0
Rural	344	31.4	23.7-39.1
Urban	361	31.3	24.7-37.9
Slums	311	51.1	44.9-57.2
According to asset index			
Poorest	198	44.3	32.9-55.7
Poorer	205	36.5	24.6-48.3
Middle	205	24.1	13.1-35.1
Richer	202	28.9	17.1-40.7
Richest	206	20.6	9.5-31.7
According to household food insecurity			
Food secure	461	28.1	17.8-38.3
Mild insecure	145	39.8	22.9-56.7
Moderate insecure	255	29.4	16.7-42.1
Severe insecure	155	49.1	37.5-60.7

3.19.2 UNDERWEIGHT IN PRESCHOOL AGE CHILDREN

The Table 88 below states prevalence of underweight (weight-for-age z score<2z) in the preschool age children. The prevalence at the national level was 30.0%. It was higher in the slums (47.4%) than in the rural area (29.6%). The prevalence was 36.9% in the "Poorest" and 17.8% in the "Richest" quintiles.

TABLE 88: PREVALENCE OF UNDERWEIGHT IN PRESCHOOL AGE CHILDREN

Strata	n	(%)	95% CI
National	1033	30.0	24.7-35.3
Rural	352	29.6	22.8-36.5
Urban	364	28.1	21.0-35.1
Slums	317	47.4	39.3-55.5
According to asset index			
Poorest	205	36.9	28.0-45.7
Poorer	209	36.5	25.8-47.1
Middle	209	27.8	17.6-37.9
Richer	203	24.3	12.9-35.8

Richest	207	17.8	9.8-25.8
According to household food insecurity			
Food secure	466	24.2	15.7-32.8
Mild insecure	150	41.3	21.5-61.1
Moderate insecure	258	30.0	17.8-42.3
Severe insecure	159	45.3	35.1-55.6

3.19.3 WASTING IN PRESCHOOL AGE CHILDREN

The Table 89 below states the prevalence of wasting (weight-for-height z score<2z) in the preschool age children. The national prevalence of wasting was 19.3%. The prevalence appeared somewhat lower in the urban (12.9%) than in the rural (21.1%) and slums (20.3%). The prevalence was by and large similar in all SES groups. In regard to status of household food insecurity, the prevalence of wasting was 19.6% and 25.2% respectively in the food secure and mild food insecure households.

TABLE 89: PREVALENCE OF WASTING IN PRESCHOOL AGE CHILDREN

Strata	n	(%)	95% CI
National	997	19.3	14.4-24.2
Rural	336	21.1	14.8-27.3
Urban	355	12.9	7.6-18.2
Slums	306	20.3	13.0-27.6
According to asset index			
Poorest	195	16.3	8.6-23.9
Poorer	201	20.6	13.4-27.9
Middle	201	24.3	2.9-45.7
Richer	197	19.0	7.6-30.4
Richest	203	16.1	8.1-24.1
According to household food insecurity			
Food secure	455	19.6	14.7-24.5
Mild insecure	140	25.2	5.4-44.9
Moderate insecure	249	14.9	6.9-22.8
Severe insecure	153	19.7	10.7-28.7

3.19.4 HEIGHT-FOR-AGE Z-SCORE IN PRESCHOOL AGE CHILDREN

The Table 90 below states, the mean z-score for height-for-age in the preschool age children. It appeared that the slum children had lesser scores (-1.97) than their rural (-1.29) and urban (-1.30) peers. By and large the z-score for height-for-age appeared higher as the children belonged to progressively higher socio-economic class.

TABLE 90: HEIGHT-FOR-AGE Z-SCORE IN PRESCHOOL AGE CHILDREN

Strata	n	mean	95% CI
National	1017	-1.32	-1.51-(-1.13)
Rural	344	-1.29	-1.54-(-1.04)
Urban	361	-1.30	-1.57-(-1.04)
Slums	312	-1.97	-2.19-(-1.75)
According to asset index			
Poorest	199	-1.66	-1.99-(-1.33)
Poorer	205	-1.52	-1.87-(-1.17)
Middle	205	-1.20	-1.55-(-0.85)
Richer	202	-0.86	-1.56-(-0.17)
Richest	206	-1.10	-1.44-(-0.77)

3.19.5 WEIGHT-FOR-AGE Z-SCORE IN PRESCHOOL AGE CHILDREN

The Table 91 below states the weight-for-age z scores in the preschool age children. It appeared that the z score in the slum (-1.85) was lower than in the urban (-1.19) and rural (-1.48) strata.

TABLE 91: WEIGHT-FOR-AGE Z-SCORE IN PRESCHOOL AGE CHILDREN

Strata	n	mean	95% CI
National	1033	-1.43	-1.57-(-1.29)
Rural	352	-1.48	-1.65-(-1.31)
Urban	364	-1.19	-1.39-(-0.98)
Slums	317	-1.85	-2.03-(-1.67)
According to asset index			
Poorest	205	-1.67	-1.91-(-1.42)
Poorer	209	-1.56	-1.83-(-1.28)
Middle	209	-1.57	-1.76-(-1.38)
Richer	203	-1.10	-1.44-(-0.75)
Richest	207	-1.08	-1.36-(-0.80)

3.19.6 WEIGHT-FOR-HEIGHT Z-SCORE IN PRESCHOOL AGE CHILDREN

The Table 92 below depicts weight-for-height z score in the preschool age children. It appeared the score was better in the urban children (-0.61) than their peers in the slums (-0.94) and rural (-0.95) strata. The z-score had appeared progressively higher as the children were from higher SES classes.

TABLE 92: WEIGHT-FOR-HEIGHT Z-SCORE IN PRESCHOOL AGE CHILDREN

Strata	n	mean	95% CI
National	997	-0.88	-1.08-(-0.67)
Rural	336	-0.95	-1.20-(-0.70)
Urban	355	-0.61	-0.84-(-0.37)
Slums	306	-0.94	-1.12-(-0.77)
According to asset index			
Poorest	195	-0.86	-1.20-(-0.51)
Poorer	201	-0.99	-1.21-(-0.77)
Middle	201	-0.99	-1.57-(-0.41)
Richer	197	-0.77	-1.29-(-0.24)
Richest	203	-0.70	-1.07-(-0.33)

4. DISCUSSION

4.1 ANEMIA

The survey revealed the prevalence of anemia in preschool age children at the national level was 33.0%.The prevalence of anemia in the preschool age children (under- 5) in Bangladesh was 47.0%, based on the national survey data in rural areas conducted in 2001 (Nutrition Surveillance Project, HKI, 2001). The prevalence of anemia in 6 month old infants was found to be 44.0% in a study in a rural site in Bangladesh (Eneroth, J Nutr, 2010). A nationally representative survey estimated the anemia prevalence in children under two year old as 49.0% (H Rashid; Nagoya J Med Sci, 2009).

The prevalence of anemia in the NPNL women was 26.0% in the national micronutrients survey. According to the Nutrition Surveillance Project, HKI, 2001, the prevalence in non pregnant women of reproductive age (15-49 y) was 33.2%. The anemia prevalence survey of

urban Bangladesh, a nationally representative survey, estimated the prevalence among the NPNL women as 32.9% in 2001-03.

The prevalence of anemia was 19.1% and 17.1% respectively in children aged 6-11 year and 12-14 year. The nationally representative data for children aged 13-14 year revealed that the prevalence was 24.6% in the urban area in 2001-03 (Anemia Prevalence Survey of Urban Bangladesh and Rural Chittagong Hill Tracts 2003).

4.1.1 ASSESSMENT METHODS

The lower prevalence of anemia found in this survey compared to earlier estimates might be the following: The National Micronutrients Survey used venous blood samples with hemocue whereas commonly, capillary blood is used with hemocue to assess anemia in Bangladesh and other regions for public health studies. Published literature reported wide variations in measure of hemoglobin with the PHM (Photometric Hemoglobinometer) method, i.e. hemocue with capillary blood. The reliability of the hemocue with capillary blood method is low. It varies widely site-to-site (between samples taken at the same time from two different parts of the body of an individual) and over the time (samples taken from the same site of the body of the same individual at a few days interval). This unreliability may lead to misclassification of anemia status in individuals and biases in anemia prevalence estimates (Saul S Morris, Am J Clin Nutr.1999). The other studies also reported wide variability in hemoglobin measurement with the capillary hemocue (Xiaoyan; BMC Public Health 2009; Rippmann; J ClinMonit. 1997; Chen PP, Anaesth Intensive Care 1992). The present survey reports, prevalence of anemia in children aged 6-23 month to be 40.0% at the national level. In the “poorest” population group it was 56.3% and in the slums area it was 45.0%. Very few population based studies have been conducted in Bangladesh that employed the similar method (venous hemocue) or the venous cyanomethemoglobin method, the gold standard. A very recent study using the venous cyanomethemoglobin method, conducted by icddr,b (personal communication, manuscript under preparation) among the poor rural community estimated the prevalence of anemia in children under two was 55.0%. Another ongoing icddr,b study conducted in a slum in Dhaka and employing the venous hemocue method reported the prevalence of anemia in children 7 month old to be 48.3% (personal communication). Therefore when compared with similar method or the gold standard method after adjusting age group and socio-economic status, the estimates of the present survey appear consistent.

4.2 IRON DEFICIENCY

The prevalence of iron deficiency (low serum ferritin) in Bangladesh is much lesser than what is assumed. It is 10.7% in the preschool age children and 7.1% in the NPNL women. It may be noted that, for the very first time in Bangladesh a nationwide estimate of ferritin was obtained in the national micronutrients survey. There were only some smaller scale studies reporting the estimates of iron deficiency. In a study in 2007 in a rural subdistrict among married nulliparous women iron deficiency was found in 11.0% of the women (Khambalia, J. Nutr. 2009). In another study in a rural subdistrict, the prevalence among pregnant women was found to be 8.0% (Lindstorm, Acta Obstetricia et Gynecologica Scandinavica 2010). One recent study, reported the prevalence of iron deficiency in nulliparous women in a northern district in Bangladesh was 0.0% (Rebecca Merrill, J Nutr. 2011). In that study, daily iron intake from water [42 mg (18, 71)] was positively correlated with plasma ferritin (r = 0.36) and total body iron (r = 0.35). It also revealed a strong, positive, dose-response association between natural iron content in groundwater, intake of iron from such sources, and iron status of women. They study linked the finding with very high iron in ground water

consumed through drinking water. The study further pointed out that the ground water iron and therefore the status of iron deficiency in population may not be the unique feature of that particular district. A British geological survey on the mineral content in groundwater across Bangladesh showed that iron concentration is high in most parts of the groundwater in Bangladesh (Kinniburgh, British Geological Survey; 2001). According to this report, the range of ground water iron in Bangladesh is <0.004 mg/l to 61.0 mg/l and the median are 1.4 mg/l and 0.2 mg/l respectively in shallow and deep ground water. This survey and other reports have shown that the aquifer environment is reducing (Merrill RD, J Water Health. 2010, Roberts LC Environ Sci Technol. 2007) indicating that dissolved iron is predominantly ferrous (Fe2+), a form that is readily absorbed through the gut (Hallberg Annu Rev Nutr.1991). This is supported by an experimental study, which showed natural water with electrolytically reduced iron (ferrous) is readily absorbed (Halksworth Clin Lab Haematol. 2003).

We referred from the British Geological Survey report and accordingly identified the areas, with arbitrarily termed "high" level of ground water iron (areas with ground water iron concentration >=2.8 mg/l), and the areas with "low" level of ground water iron (areas with ground water iron concentration <2.8 mg/l). We compared the mean serum ferritin in our data between these two categories of areas, (Table 93).

TABLE 93: COMPARISON OF MEAN FERRITIN BY GROUNDWATER IRON STATUS

	ferritin(ng/ml)[1] (geometric mean)					
	Preschool age children		NPNL women		School age children	
Areas with ground water iron concentration: 'high" (>=2.8 mg/l)	38.9	P=0.0002	67.9	P=0.0001	57.1	P=0.0001
Areas with ground water iron concentration: 'low" (<2.8mg/l)	23.1		44.7		42.1	

[1]Ferritin is adjusted for infection

It appeared that mean ferritin level in serum was statistically significantly higher in all the studied population groups in the areas with "high" ground water iron. The following descriptive and multivariate analyses will further explore about it.

TABLE 94: SERUM FERRITIN IN THE NPNL WOMEN AND FEW RELATED VARIABLES

Household food insecurity(FANTA HFIAP* tools)	Serum ferritin (ng/ml) (geometric mean)	Household monthly expense (BDT.) (geometric mean)	7-day iron consumption from food (mg)
Food secure	45.1	9509.0	55.0
Mild insecure	55.7	7631.0	50.0
Moderate insecure	61.5	7186.0	47.9
Severe insecure	52.4	6634.0	48.2
Asset index			
Richest	49.4	15017.0	62.0
Richer	49.9	10117.0	52.3
Middle	41.6	8910.0	54.5
Poorer	56.8	7435.0	49.0
Poorest	54.6	5558.0	46.7
Ground water iron(GWI)			
GWI>=2.8 mg/l	67.9	7707.0	49.8
GWI<2.8 mg/l	44.7	8604.0	54.8

*Household Food Insecurity Access Prevalence, FANTA

The Table 94 shows, "food insecure" households had lower household spending ability (ranging from BDT. 7631 in "mild food insecure" to BDT. 6634 in the "severe food insecure")

than the "food secure" households (BDT.9509.0). Seven-day iron consumption from food appeared to be lower in the "food insecure" households (48.0-50.0 mg) compared to the "food secure" households where the consumption was 55.0 mg. According to wealth index, households of the upper quintiles had progressively higher spending ability. Seven-day consumption of iron from food was also similarly complementing, with gradually higher consumption from the bottom to the top quintiles.

However, defying the trend, it appeared that serum level of ferritin was rather less in the "food" secure" households (45.1 ng/ml) than the households experiencing different grades of food insecurity (52.0-61.0 ng/ml). This was complemented by observation through wealth index as well. The mean serum ferritin was 49.0 ng/ml in the top two quintiles, while it was around 55.0 ng/ml in the bottom two quintiles. This unlikely to happen issue could be explained perhaps by the ground water iron. In the areas with "high" (>=2.8 mg/l) ground water iron, the NPNL women had higher level of serum ferritin (67.9 ng/ml) than the areas with "low" (<2.8 mg/l) ground water iron, where mean serum ferritin in the NPNL women was 44.7 ng/ml. This was despite the fact that area with "high" groundwater iron had household's spending ability significantly less (BDT. 7707 vs. 8604) and consumption of iron appeared to be less (49.8 mg vs. 54.8 mg) as well than the area with "low" ground water iron. Therefore serum ferritin in NPNL women did not depend on higher economic status or higher level iron consumption from food. However ground water iron appeared to exert a positive influence on serum ferritin.

TABLE 95: DETERMINANTS OF SERUM FERRITIN IN NPNL WOMEN

Variables	Coefficient	t	p	Standardized effect size (Beta)
Household monthly expense	-0.000014	-2.26	0.02	-0.12
7 day iron consumption from food	0.0006	0.47	0.63	0.02
Mother's institutional education (Ref: No education)	0.011	0.15	0.88	0.0068
Retinol status(s.retinol)	0.18	2.08	0.038	0.09
Para (parity)	-0.009	-0.56	0.57	-0.024
Area of residence(Ref: rural)				
urban	-0.002	-0.03	0.97	-0.001
slums	-0.02	-0.13	0.89	-0.006
Asset index(Ref: poorest)				
poorer	0.21	2.42	0.016	0.13
middle	0.07	0.69	0.48	0.04
richer	0.178	1.34	0.18	0.079
richest	0.458	2.62	0.009	0.19
Zinc status(s. zinc)	0.013	0.72	0.46	0.034
Groundwater iron(Ref: GWI<2.8 mg/l)				
GWI>=2.8 mg/l	0.46	4.32	0.000	0.22
HH food insecurity(Ref:food secure)				
Mild insecure	0.07	0.69	0.48	0.03
Moderate insecure	0.22	2.67	0.008	0.13
Severe insecure	0.17	1.7	0.09	0.08
Serum B_{12}	0.12	1.97	0.05	0.09
Serum folate	0.23	3.08	0.002	0.13
Possession of refrigerator	0.32	2.37	0.018	0.14

To determine association with serum ferritin (dependent variable) in the NPNL women, related independent variables were put into the multivariate regression analysis (Table 95). Monthly household expense was negatively associated with serum ferritin (p=0.02). This indicates that the women of poor households might have higher level of ferritin. This is also

evident from the descriptive statistics (see Table 94). The issue is further complemented by the observation that moderately food insecure households are associated with higher level of serum ferritin in NPNL women, compared to food secure households (p=0.008). The NPNL women's households of the rural stratum have the lowest household monthly expense - BDT. 7707.0 (rural), BDT. 8350.0 (slums), and BDT. 10721.0 (urban). However, usage of tube well as source of drinking water (tube well water is exclusively groundwater, rich in absorbable iron) is greater in the rural (~80.0%) than in the urban (62.0%) or slum area (30.0%). This possibly explains the reason behind negative association between household spending ability and ferritin status in the NPNL women.

Among the nutrients, serum retinol, and folate were positively associated with serum ferritin in NPNL women.

The environmental factor-the ground water iron was in highly significant positive association with serum ferritin. The areas with "high" ground water iron (>=2.8 mg/l) were associated with higher serum level of ferritin in the NPNL women than the areas with "low" level of ground water iron (<2.8 mg/l) (p<0.001). From the standardized effect size (Beta), it appeared that ground water iron has the highest absolute effect size (0.22), among the independent variables.

The similar effect of groundwater iron on iron status was noted in the preschool age and the school age children by the descriptive and multivariate regression analysis.

We explored the effect of food consumption on iron status. The Table 96 shows consumption of iron from food in different age groups and sex from the national micronutrients survey data, and the RDA (Recommended Daily Allowance) for iron.

TABLE 96: IRON CONSUMPTION VS. IRON RDI

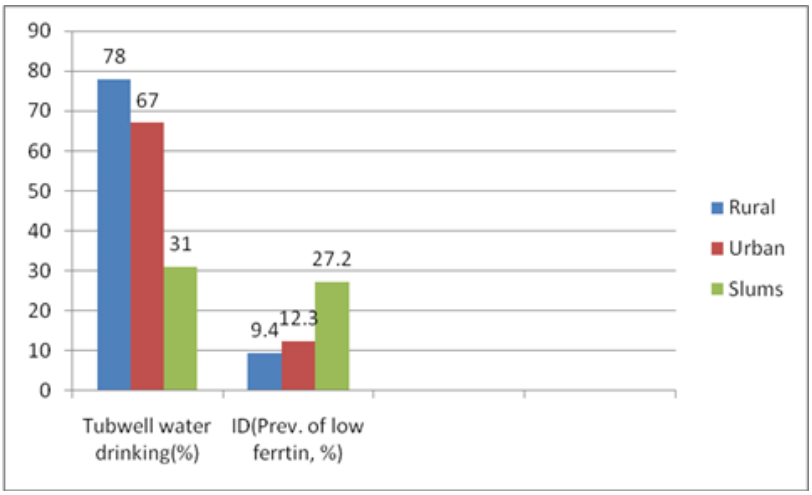
	RDA[1] (mg)	Daily iron consumption(mg)	Daily consumption of animal source iron(mg)
Age 2-3 y	7.0	4.76	0.98
Age 4-5 y	10.0	4.77	0.98
Boys 9-14y	8.0	6.60	1.20
Girl 9-14 y	8.0	5.90	0.97
Women 15-50 y	18.0	7.40	1.12

Institute of Medicine (IOM)[1]

Although consumption of animal source foods, e.g. meat, fish, eggs has increased in Bangladesh (HIES 2010), still the consumption of iron from food is well below the requirement. The Table 96 shows daily consumption of iron and animal source iron from foods, as estimated in the national micronutrients survey. The estimates reveal, daily consumption was fairly short of the RDA in each of the age and sex groups. Animal source iron consumption, which is rich in heme iron constitutes a small share of the total iron. The finding suggests, iron consumption through food is unlikely to make positive impact on ferritin status, much like the findings of other contemporary studies in the country (Rebecca Merrill, 2011). The finding is also consistent with the findings of the multivariate regression analyses presented in this report, which did not show any impact of iron consumption from food on serum level of ferritin (Table 95).

There was a question in the national micronutrients survey on source of drinking water. The following graph illustrated how drinking of tube well water (ground water) influenced the iron status in the preschool age children.

FIGURE 3: DRINKING OF TUBE WELL WATER (GROUNDWATER) VS. PREVALENCE OF IRON DEFICIENCY IN PRESCHOOL AGE CHILDREN



The more was the tube well water (ground water) drunk; less was the prevalence of iron deficiency (Figure 3). The same trend was observed in case of the NPNL women and school age children.

The widespread presence of high ground water iron may contribute to high ferritin status among populations in Bangladesh, irrespective of socio economic class, location of residence or status of food consumption. In absence of adequacy of iron from food, food fortification programs and with a very limited coverage of MNP (Multiple Micronutrient Powder) supplementation in young children, ~1.0% in the national micronutrients survey data (Table 97), high ground water iron appeared to have an understandable association for low prevalence of iron deficiency in Bangladesh population. This was observed in the National Micronutrients Survey.

TABLE 97: COVERAGE OF MULTIPLE MICRONUTRIENTS POWDER (MNP) IN THE UNDER TWO CHILDREN IN BANGLADESH

Strata	n	%	95% CI
National	247	1.3	-0.3-2.9
Rural	78	0.7	-0.8-2.3
Urban	89	3.3	-1.5-8.1
Slums	80	0.0	-

Evidence-based research suggests that groundwater can offer a cheap, sustainable, source of bioavailable iron commonly not taken into account in traditional dietary assessments or intervention planning phases to define target audiences. (Rebecca Merrill 2012).

The finding of a modest prevalence of iron deficiency supports the finding of anemia in this study. Iron deficiency is widely believed to be the major cause of anemia. However, from the data of the National Micronutrients Survey, it appeared that iron deficiency (prevalence of low ferritin) was not a problem of large magnitude in Bangladesh. Consequently, the role of iron deficiency in causation of anemia appeared less than what is assumed, resulting in relatively low prevalence of anemia, as observed in this survey.

4.3 VITAMIN A

The prevalence of vitamin A deficiency were 20.5%, 20.9% and 5.4% respectively in preschool age children, school age children and the NPNL women. The status of vitamin A nutrition by and large remained similar to the last nationally representative survey (IPHN/HKI 1997). The IPHN/HKI survey reported the estimates as 21.7%, 19.6% and 5.0%

respectively in the above population groups. In another study in a rural community, the prevalence in 6 month old infants was found to be 19.0% (Eneroth, J. Nutr. 2010). The current estimates indicated, vitamin A deficiency still exists at a magnitude of public health significance in preschool age children and the school age children. The problem was pervasively present in the slum stratum, where the prevalence was 38.0% and 27.0% respectively in the preschool age children and the school age children.

The national prevalence of subclinical vitamin A deficiency appears to have remained at the same level in all the population groups studied, e.g. preschool age children, school age children and the NPNL women, compared to the earlier nationally representative survey conducted in 1997 (HKI/IPHN,1999). One of the reasons for this could be the intake of vitamin A from diet. According to the data of the national micronutrients survey, the median daily consumption of vitamin A in the preschool age children was 270 REs, against the RDA (Recommended Daily Allowance) of 300-400 REs. In case of the school age children, it was 318 REs, compared to the RDA of 400-600 REs. In the NPNL women, it was 372 REs against the 700 RE, the RDA amount. Therefore it appeared that in all the population groups studied, the consumption did not meet the requirement. Again, the Bangladesh diet is dominated by the plant origin vitamin A (Carotenoids). This data revealed, the share for the plant origin vitamin A (Carotenoids) to the total vitamin A consumption is 77%, 71% and 60% respectively in the NPNL women, school age children and preschool age children. The plant origin vitamin A is less bio-available form of vitamin A. Although in the present report the conversion factor for Beta carotene to retinol, chosen was 12:1 (Institute of Medicine ,2002), progressvely more literature reported that bio-conversion for beta carotene to retinol in the body is even weaker and conversion factor, like 29: 1 for beta-carotene to retinol is suggested in some literature (Hickenbottom 2002; Tang G 2002; Solomons 1999; Brubacher 1985). A recent study states that, higher level of consumption of provitamin A (carotenoids), which is the typical case scenario in Bangladesh, is associated with inefficient bio-conversion to retinol in the body (Janet A 2010). These perhaps explain the reason behind the stagnation and still a higher prevalence of sub clinical vitamin A deficiency, measured by serum level of retinol in the Bangladesh population.

The data of the national micronutrients survey states that slums strata appear to have consistently higher level of retinol deficiency than the other two strata, notably in comparison to the urban area. This trend was consistent in all the studied population groups. The one of the reasons behind this could be dietary intake. In the preschool age children, the daily median consumption of vitamin A was 209 REs (Retinol Equivalents) in the slums, against 291 RE and 231 REs of the rural and urban strata respectively. The median consumption of animal source vitamin A giving higher bio-available retinols was 40.2 REs in the slums, compared to 52.4 RE and 61.1 REs of the rural and urban strata, respectively. In the school age children, the children from the slums had median daily consumption of 260.3 REs, while it was 321.3 and 300.1 REs in the rural and urban area respectively. The daily median consumption of animal source vitamin A was 29.8 REs in the slums, against 40.1 and 44.7 REs of the rural and urban strata. Hence, it appeared that the slums children might have lesser consumption of total and animal source vitamin A from food than their peers from the rural and urban strata. This could be linked with apparent higher prevalence of subclinical vitamin A deficiency in the preschool age and the school age children of the slums.

The national coverage of vitamin A supplementation is 77%; it is more than 72% in any stratum, yet there appears difference do exists in coverage across socio-economic classes. For example, the coverage was 76.0% in the “poorest” quintile, while it was about 87.0% in the “richest” quintile. Therefore it appears; scopes are left where the coverage can be improved, e.g. bottom quintile of the population according to wealth index.

The Bangladesh Demographic and Health Survey (BDHS) 2007 reported the coverage of vitamin A supplementation as 84%. However in the BDHS 2011, the coverage of vitamin A supplementation was 60% and reason for this was exclusion of the national immunization days by the "six-month margin" prior to the survey (BDHS 2011), which failed to account for considerably in the estimate. In the national micronutrients survey the coverage was 77%. This can be explained by the fact that the latest national immunization day prior to the present survey was held on 29 May, 2011. The survey started on 4 October 2011 and continued until 20 December 2011. Therefore the last three weeks time of the survey was outside the "six-month margin" from the last immunization day (29 May, 2011), hence although the survey suffered less than the BDHS 2011, in regard to missing out coverage data, a subtle amount of additional coverage estimate was not accounted into it. Therefore by and large the coverage of vitamin A supplementation in the preschool age children remains similar to the BDHS 2007 estimate. Nevertheless it needs to gear up to further increase the coverage.

Since the estimates of prevalence of subclinical vitamin A deficiency by and large remains same over the last one and a half decade, and still there are pocket of areas or underprivileged groups where coverage of supplementation of vitamin A appeared somewhat lower than the rest of the population, the findings of the national micronutrients survey is a perfect setter to initiate the wide scale edible oil vitamin A fortification program in the country.

4.4 ZINC

National prevalence of zinc deficiency was 44.0% in the preschool age children and 57.0% in the NPNL women. In a study in Bangladesh, the prevalence of zinc deficiency was reported to be 49.7% in children aged 3-7 years (Kongsbak, J Nutr, 2006). Another study in a rural community reported the CRP adjusted prevalence of zinc deficiency in infant as 56.0% (Eneroth, J. Nutr. 2010). A study in a rural sub-district reported zinc deficiency at 49.0-66.0% in pregnant women (Lindstrom, Acta Obstetricia et Gynecologica Scandinavica, 2011).Therefore by and large the findings for zinc were comparable to other studies.

The relatively high burden of zinc deficiency among Bangladesh population was likely to be attributed to dietary intake, which depicts that consumption was well short of the Recommended Daily Allowance (RDA) amount. For the preschool age children, the median daily consumption of zinc was 2.67 mg in the slums and 3.23 mg in the urban area, against the daily requirement of 3-5 mg (RDA). In regard to the NPNL women the consumption appeared even worse. It was 4.47 mg in the urban, 3.61 mg in the slums and 3.93 mg in the rural stratum against the RDA of 8-9 mg, indicating that Bangladesh NPNL women consumed just 33-50% of the daily requirement for zinc.

In addition to this issue of low dietary intake, the content of phytate in the food, an inhibitor of zinc absorption is high in Bangladesh diet. Phytate-zinc molar ratio is an indicator of relative abundance of phytate to zinc in the food. The higher is the ratio; less is the absorption of zinc. 26.3% of the urban preschool age children had in their diet, the phytate-zinc molar ratio <5 (the favorable ratio for zinc absorption), while this proportion was just 17.2% in the slums children, perhaps explaining for the higher prevalence of zinc deficiency in the slums children than their urban peers. Diet of one-third of the NPNL women had very high phytate-zinc molar ratio (>15), indicating high inhibition of zinc absorption from diet.

Therefore, compounded with low intake from diet, the issue of phytate in food possibly explains for very high prevalence of zinc deficieny in the women as well as in the preschool age children in Bangladesh.

4.5 IODINE

The national estimate of usage of iodized salt (≥5 ppm) at household level was 80.3%, which was by and large similar to the estimate in the preceding National IDD/USI Survey 2004-5 (81.4%). The usage of iodized salt appeared lower in the rural households compared to the urban areas or slums (76.7%-rural vs. 91.7%-urban vs. 91.1%-slum). At the national level, 57.6% of the households used adequately iodized salt (≥15 ppm), which appeared as a slight improvement from the 2004-5 estimate (51.2%). The improvement may not be the real, as the confidence intervals of the estimates overlapped. Three out of four households in the urban area and slums used adequately iodized salt, while the proportion was just over 50.0% in the rural area.

The estimate of household consumption of "Brand" salt was 75.8% at the national level, which appeared by and large similar to the 2004-5 estimates (71.4%). Proportionately more urban households consumed "Brand" salt than in the rural area (92.0% vs. 71.0%). The proportion of "Open" salt consumption in the households was 24.2% at the national level, which appeared to have a declining trend from the 2004-5 estimates (30.1%). More rural households consumed "Open" salt than in the urban area (29.2% vs. 7.7%).

With regard to iodine content of retailer salt, 8.1% of the samples had negligible iodine (<5.0 ppm) (Table 65). This estimate appeared to be improving than the earlier round (10.0%, 2004-5). The proportion of retailer salt sample with adequately iodized salt (>=20 ppm) was 66.4%, which appeared to have improved from 2004-5 estimate (53.0%). Almost no shops (~0.0%) had samples with excess iodine (>100 ppm). This proportion was ~2.0% in 2004-5.

According to the present survey, although selling of adequately iodized salt has appeared to be improved at the retailer level, at the household level usage of adequately iodized salt remained by and large similar, when compared with the previous survey.

With regard to iodine deficiency, at the population level, the survey revealed, Bangladesh was iodine sufficient. This was indicated by the median urinary iodine concentrations, which was estimated above the 100.0 µg/l (The cut-off <100 µg/l defines iodine deficiency at the population level) in all the strata-rural, urban and slums as well as the combined national estimate, in the school age children and the NPNL women. However if the trend of iodine deficiency in the school age children from 1999 to 2012 is observed, it appeared that iodine deficiency was on a declining trend from 42.5% (1999) to a level of 33.8% in 2004-05, followed by an upward trend towards 40.0% in 2012 (Figure 4) . This is complemented by an inverse trend in median urinary iodine concentration, which was 125 µg/l in 1999. It registered a high to 162.5 µg/l in 2004/05 and tends to drop again to 145.0 µg/l in 2012. Similar trends were observed with regard to iodine deficiency and median urinary iodine concentration in the NPNL women (Figure 4). Does the status of iodine nutrition regressing towards earlier times of high iodine problem?

The survey reported, the practice of adding salt at the time of cooking was highly prevalent (~99.0%), which was apparently on a rising trend from the 2004/5 data, when it was 95.0%. This indicates loss of iodine from salt while cooking could be substantial. Adding salt at the time of cooking incurs substantial loss of iodine through vaporization, which could be as high as 25.0% of the total iodine. This might be one of the fators behind the falling concentration of iodine in urine of the studied population groups. Educating the mothers to cover cooking pots during cooking or to add salt near the end of cooking, may help reduce this loss.

Another issue was use of "open" salt, especially in the rural strata, where 30.0% of the households used "open" salt. When questioned as to why the respondents do not use

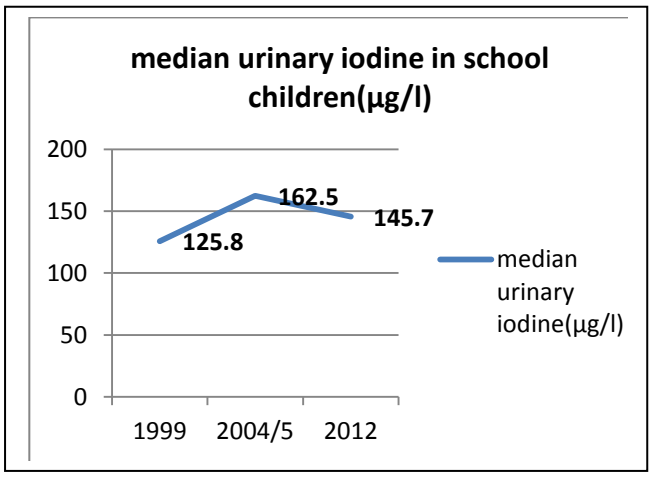
"packet" salt, the huge majority (84.0%) of them responded that the "packet" salt was "too expensive" (table 57). About one fourth of them responded that the "packet" salt was not available in "small amounts". Price of "packet" salt was increased by 66% over a year, as quoated from the Trading Corporation of Bangladesh (The Financial Express, 19 June, 2012). A survey carried out by the Bangladesh Small and Cottage Industries Corporation (BSCIC) found the hike in price of salt by 43.75% over a year (The Financial Express, 11 September 2012). The recent rising trend of price over last 1-2 years might have influenced the respondents to use the "open" salt. The data in the Table 98 following supports it. The use of "open" salt seemed higher in the "poorest" and "severely food insecure" households. The use of iodized salt (>= 5 ppm) and adequately iodized salt (>=15 ppm) appeared increasingly low as the households socio-economic status got lower and status of household food security worsened (Table 56b).

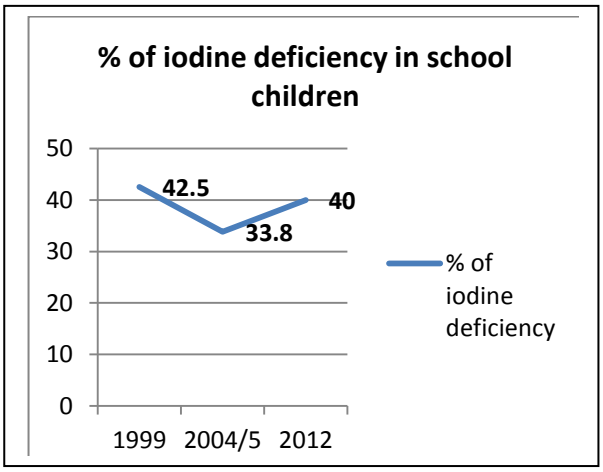
TABLE 98: USE OF "OPEN" SALT (%) VS. SOCIO-ECONOMIC CLASS AND HOUSEHOLD FOOD SECURITY

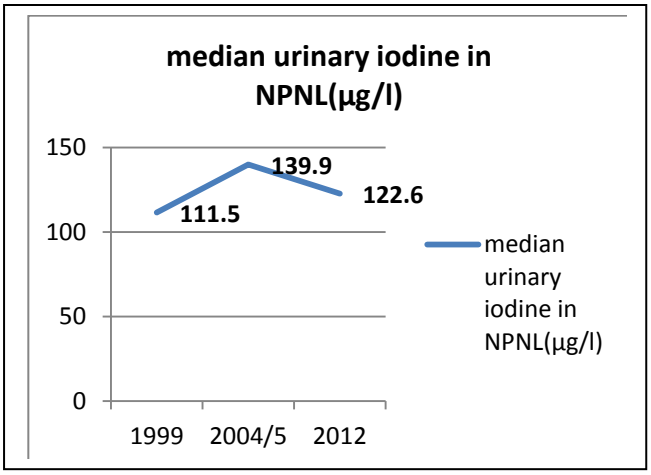
	Use of "open" salt (%)
"Poorest" households	37.1
"Richest" households	17.6
"Severely food insecure" households	31.2
"Food secure" households	26.7

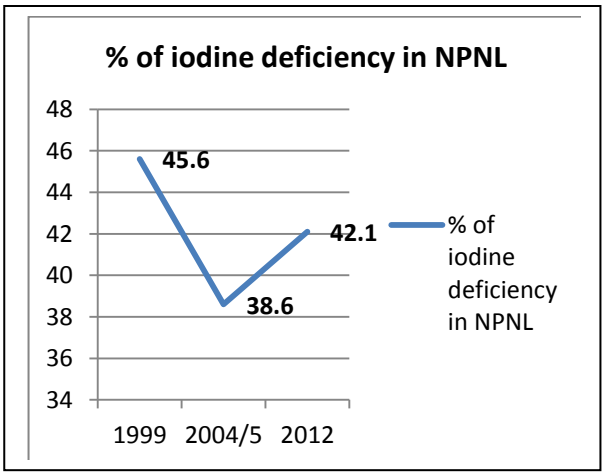
Further to complement with the above observations, according to wealth index, bottom two quintiles of the NPNL women and the bottom quintile of the school age children population, who are socio-economically underprivileged were iodine deficient (Table 60,63).

FIGURE 4: TREND OF IODINE STATUS IN SCHOOL AGE CHILDREN









4.6 FOLATE

With regard to folate deficiency, the national prevalence among the NPNL women was 9.1%. In Bangladesh, 18.0% of rural pregnant women were reported to be folate deficient in a study conducted in 2002 (Lindstorm, Acta Obstetriciae Gynecologica Scandinavica 2010). Another Bangladesh study conducted in 2007 reported folate deficiency of 13.3 % in married non pregnant women (Khambalia et al, J Nutr. 2009). Therefore the finding appears to be consistent with the findings of other studies.

4.7 NUTRITIONAL STATUS IN PRESCHOOL

Prevalence of stunting, underweight and wasting was 32.1%, 30.0% and 19.0% respectively. According to the BDHS 2011, the respective estimates are 41.0%, 36.0% and 16.0%. The apparent difference in the estimates, especially in the stunting and underweight might be due to the fact that sample size in the national micronutrients survey was estimated taking into consideration the micronutrients deficiencies. The given sample size was less than the optimum to assess the nutritional status of the preschool age children.

4.8 STATE OF NUTRITION IN THE SLUMS

Concomitant to industrialization, e.g. the Readymade Garments Industry and rapid urbanization, the informal service sector has been growing exponentitally over the last decade. This calls for inevitable expansion of slums population, especially in the Metropolitan cities of the country. According to the Slum Census 2005 of the Centre of Urban studies (CUS), the projected current slum population could be 5.5 million. Too many people live in congested small places, devoid of adequate utilities and services. The national micronutrients survey 2011-12 is probably the first effort to look at the nutrition situation at a comprehensive scale in the ever growing slum population of the country. The household's average monthly spending in the slums appeared to be higher than in the rural households (BDT. 8944.0 vs. 8393.0, 6.5% higher). However the slums population appeared to have higher burden of malnutrition. The Table 99 below is highlighting the issue.

TABLE 99: COMPARATIVE STATUS OF VITAMIN A AND ZINC NUTRITION IN SLUMS

	Rural (%)	Urban (%)	Slums (%)
Subclinical vitamin A deficiency			
Preschool age	19.4	21.2	38.1
School age	20.2	22.1	27.1
NPNL women	5.4	4.9	6.9
Zinc deficiency			
Preschool age	48.6	29.5	51.7
NPNL women	57.5	54.5	66.4
Nutritional status in preschool age children			
Stunting	31.4	31	51
Wasting	21.1	12	20
Underweight	29.6	28.1	47.4

The Table 99 above shows prevalence of subclinical vitamin A deficiency and zinc deficiency appeared proportionately higher in the slums than in urban and rural strata. Vitamin A supplementation coverage in the preschool age children was 72% in the slums and was not different from the urban (73%) and rural estimates (78%) (Table 19). However dietary consumption of vitamin A appeared lower in the slums. According to data shown elsewhere in this report daily median consumption of total vitamin A and animal-origin vitamin A appeared to be lesser in the slums than in the other two strata in all the studied populations. Same observation is holding true with regard to consumption of zinc from food - the seven

day consumption of total and animal source zinc appeared to be less in the slums in the preschool age children and the NPNL women (Table 47, 48).

Therefore higher burden of malnutrition in the slums could be ascribed to the fact that most of the slum dwellers have to pay for rent of their places, which constitutes a significant portion of their spending. Their peers from the rural stratum mostly own their homesteads (homestead ownership: 93.0%-rural, 78.0%-urban and 33.0%-slums) and do not need to pay for houses. The matter of further stress to the slum dwellers is the fact that they live in the expensive metropolitan cities (Dhaka, Khulna, Chiitagong, Rajshahi), where cost of living is higher than in the rural strata. Complementing to this, slums households might have experienced more food insecurity. Just 36.0% of the households in the slums were "food secure" against 53.0% in the urban and 52.0% in the rural. Proportions of households having "severe food insecurity" were 17.0% in the slums, whereas in the rural and urban strata this was 12.0 % (Table 13). Therefore in spite of having slightly better spending abiltlity than the rural households, the actual consumable financial ability is limited in the slum dwellers, resulting in inferior micronutrients and nutritional status in the slums population.

5. SALIENT FINDINGS

VITAMIN A

The sub clinical deficiency of vitamin A, as measured by low serum retinol (<0.7 mmol/l) was 20.5%, 20.9% and 5.4% respectively in the preschool age children, school age children and the NPNL women. The prevalence appeared to be higher among the slums children; 38.1% in the preschool age children and 27.1% in the school age children. The amount of consumption of vitamin A from food appeared fairly short of the recommended daily requirement in all the population groups surveyed. Major share (60.0-77.0%, across the population groups studied) of vitamin A comes from the plant source (Beta-carotene), which is poorly bio-available in the body. Higher bio-available animal origin vitamin A (Retinol) constitutes only a meager proportion of total consumption. The coverage of vitamin A supplementation in the preschool age children was 77.0%. The coverage among the "richest" and "poorest" section of the population was 87.0% and 76.0% respectively.

ANEMIA AND IRON

The prevalence of anemia in the preschool age children was 33.0%. The prevalence in the school age children was 19.1% and 17.1% in the 6-11 year and 12-14 year old children, while in the NPNL women it was 26.0%. The prevalence of iron deficiency measured by low ferritin (<12 ng/ml in the preschool age children and <15 ng/ml in the school age children and the NPNL women) in serum was lesser than the widely held assumption. It was 10.7% in the preschool age children and 7.1 % in the NPNL women. The prevalence was 3.9% in the school age children 6-11 year old and 9.5% in the children 12-14 year old.

The amount of consumption of iron from food is short of the daily recommended requirement (RDA) in all the population groups studied. The total consumption of iron from food was 41.0-82.0% of the recommended daily requirement across age and sex of the studied population groups. The amount of consumption of animal origin heme iron, which has higher bio-availabilty, was a meager 6.0-15.0% of the daily requirement. In spite of lower consumption of iron from food, and that a general food fortication program with iron is not in place, iron deficiency in the population was way lesser than expected. It was presumably linked with high level of iron in the drinking water (groundwater).

ZINC

The prevalence of zinc deficiency was very high- it was 44.0% and 57.0% respectively in the preschool age children and the NPNL women. The deficiency was apparently higher in the slums-52.0% in the preschool age children and 66.0% in the NPNL women. The amount of consumption of zinc was well below the recommended daily amount. In the NPNL women total consumption was 54.7% and 47.0% of the recommended daily amount in the urban and slums area respectively. Of the total consumption majority comes from plant origin, which is poorly bio-available. Phytate, an inhibitor of zinc absorption in the body and comes from plant origin food, was high in amount in the foods consumed by Bangladesh population, contributing to high zinc deficiency.

IODINE

At the household level, usage of iodized salt (iodine level>=5 PPM) was 80.3%. The usage of adequately iodized salt (iodine level>=15 PPM) 57.6%. The estimate of household consumption of "Brand" salt was 75.8% at the national level. About 30.0% of the rural households consumed "open" salt. The usage of "open" salt was 37.0% and 17.0% in the "poorest" and the "richest" households respectively. The proportion of retailer salt sample with adequately iodized salt (>=20 ppm) was 66.4%. In the school age children, 40.0% had iodine deficiency (urinary iodine concentration below 100.0 µg/l), indicating inadequate iodine in the body. Among the NPNL women, 42.1% had iodine deficiency. However the median of the urinary iodine concentration was 145.7 µg/l and 122.6 µg/l respectively in the school age children and the NPNL women, indicating, as a whole on the population basis iodine nutrition is sufficient. Nevertheless the poorest quintiles of the NPNL women and school age children were iodine deficient.

The trend of iodine deficiency appeared to be rising; 33.8% (2004/05) vs. 40.0% in the school age children and 38.6% (2004/05) vs. 42.1% in the NPNL women. The poorest quintiles of the populations were iodine deficient.

FOLATE AND B_{12}

The prevalence of folate deficiency was found to be 9.1% in the NPNL women. The prevalence of B_{12} deficiency (frank deficiency and marginal deficiency) was 23.0% in the NPNL women.

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7. ANNEXURE

7. 1: BIOCHEMICAL ASSESSMENT

7.1.1 DETERMINATION OF SERUM RETINOL

A single aliquot of serum was assigned to retinol determination and kept at -70 degree celsius until analysis. Serum retinol concentration was determined using HPLC (High-Performance Liquid Chromatography; (Driskell WJ, 1982). An aliquot of serum was de-proteinized with methanol containing 50% retinyl acetate as the internal standard, and retinol was then extracted into hexane. The hexane layer was transferred to a clean vial, evaporated under nitrogen, re-dissolved in a mobile phase (95% methanol), and injected into an HPLC column. Two plasma pool samples with assigned value set against standard serum from National Institute of Science and Technology (NIST) were run with each set of samples, and the concentration of retinol was calculated based on known concentration of retinol in the pool samples.

Quality control (QC): For quality control, SRM 968c (Source: NIST) and a pooled serum sample was used. The Nutritional Biochemistry laboratory participated in the latest Vital EQA program of the U.S. Centers for Disease Control and Prevention (CDC) for serum retinol.

Threshold for vitamin A deficiency: serum retinol concentrations <0.7 µmol/L defining the subclinical deficiency and serum retinol concentrations <0.35 µmol/L defining the severe deficiency.

7.1.2 ANEMIA (HEMOGLOBIN)

Hemoglobin was assessed by the HemoCue technique. HemoCue equipments were supplied by UNICEF. Hemoglobin was measured by the HemoCue machine (HemoCue, Angelholm, Sweden) directly from the gently mixed venous blood sample collected in the blood collection tube. A drop of the collected blood was placed onto a coverslip and the microcuvette was hold onto it, to allow for the capillary action to fill in the microcuvette. The HemoCue technique is based on an optical measuring cuvette of small volume and a short light path. The cuvette cavity contains reagents deposited on its inner walls; the blood sample is drawn into the cavity by capillary force and is spontaneously mixed with the reagents. The cuvette is then placed in a HemoCue photometer in which the absorbance is measured and the hemoglobin level is calculated. Thus, the technique makes it possible to sample the blood, mix and chemically react it with the reagents in the same cuvette. The reaction in the cuvette is a modified azide methemoglobin reaction. The erythrocyte membranes are disintegrated by sodium desoxycholate releasing the hemoglobin. Sodium nitrite converts the hemoglobin iron from the ferrous to the ferric state to form methemoglobin, which then combines with azide to form azide-methemoglobin. The survey team was trained in this technique adequately for appropriate application in the field. Hemoglobin readings were recorded directly in the field and shared with the survey participants.

Threshold for defining anemia was done according to the following table:

TABLE 100: CUT-OFF VALUES FOR ANEMIA ACCORDING TO WHO RECOMMENDATIONS (WHO 2001)

Age group	Anemia
Pre-SAC(6-59 month)	<110 g/L
SAC (5-11 years)	<115 g/L
SAC (12-14 years)	<120 g/L
NPNLW	<120 g/L

7.1.3 FERRITIN (IRON DEFICIENCY), AND C-REACTIVE PROTEIN (CRP), ALPHA-1-ACID GLYCOPROTEIN (AGP) (INFLAMMATORY MARKERS)

Serum for ferritin, CRP and AGP were analyzed from one aliquot. The aliquots were preserved in a freezer (-20^{o}C or colder), and were transported to the Nutritional Biochemistry Laboratory on dry ice, and stored at -70° C until analysis. Ferritin and CRP was analyzed by sandwich ELISA technique. The principle of this method was to coat a 96-well plate with antibodies that captured the antigens in diluted serum samples or standards and then after 2 hours, a detection antibody was added that was coupled to a peroxidase. The plates were washed before each application. The color intensity that developed after the addition of the color reagent was directly proportional to the amount of antigen in the sample.

Quality Control: For quality control Precinorm Protein and Precipath Protein was used (Source: Roche Diagnostics GmbH D-68298 Mannheim, Germany). The Nutritional Biochemistry laboratory participated in the Vital EQA program of the U.S. Centers for Disease Control and Prevention (CDC) for serum ferritin.
Mean and SD were measured by analyzing each QC material in 10 replicates within same day and established a quality control chart by using mean±2SD. In case the results of QC material during regular analysis falling outside±2SD, corrective measures were taken. A pooled sample was also analysed with every run as part of quality control. The pooled serum sample was prepared from pooled volunteer blood, aliquoted and kept at -70^{o}C in the laboratory for that purpose. A target value was established for the pooled sample by analyzing 10 replicates within same lot. Mean and SD was calculated and a quality control chart was established by using mean±2SD.

Thresholds for iron deficiency: Iron deficiency was defined as a ferritin level of <12 ng/ml in children less than 5 years of age and <15 ng/ml in older children and adults (WHO 2001). Biochemical evidence of inflammation was defined as a CRP level of >10 mg/L and/or AGP >1 g/L (Looker 1997).

7.1.4 ZINC

Principle: Serum zinc was estimated by Atomic Absorption Spectrophotometry (AAS). Atomic absorption is a physical process involving the absorption of light by the free atoms at a wavelength specific to that element. Flame Atomc Absorption Spectrophotometry (Shimadzu-7000) was used.
Sample Preparation: Samples were diluted with deionized water without deproteinization or adding any other reagents.
Precautions: Haemolyzed serum samples or any blood cells present in the serum was avoided.
Quality control: Bi-level Serum trace element control was provided from The UTAK Laboratories Inc. USA. Normal and high was used as check for both accuracy and precision. Pooled serum was also used in every day as internal quality control. One or more working standard solutions were run at intervals to check drifting. Duplication assays were also carried out to watch for precision.

7.1.5 FOLATE

The serum sample was analyzed for folate using an electrochemiluminescence immunoassay (Roche kit). The analyzer was Cobas 6000. The serum was incubated with the folate pretreatment reagents to release bound folate from endogenous folate binding proteins. Then, the pretreated sample was incubated with the ruthenium labeled folate binding

protein and a folate complex was formed, the amount of which was dependent upon the analyte concentration in the sample. Next, streptavidin-coated microparticles and folate labeled with biotin was added and the unbound sites of the ruthenium labeled folate binding protein was occupied, with formation of a ruthenium labeled folate binding protein-folate biotin complex. The entire complex was bound to the solid phase via interaction of biotin and streptavidin. The reaction mixture was then aspirated into the measuring cell where the microparticles were magnetically captured onto the surface of the electrode. Unbound substances were washed away and application of a voltage to the electrode induces chemiluminescent emission which was measured by a photomultiplier. Results were determined via a calibration curve.
Quality control: A pooled serum sample was used which was prepared in the nutritional biochemistry lab. Elecsys PreciControl anemia 1, 2 and 3 (Roche Diagnostics).We established mean and SD by analyzing each QC material in 10 replicates within same day and a establish quality control chart by using mean ± 2SD (Roche kits). The Nutritional Biochemistry laboratory participated in the Vital EQA program of the U.S. Centers for Disease Control and Prevention (CDC) for serum folate.
Threshold for folate deficiency: <6.8 nmol/l (Lindstorm, 2011)

7.1.6. VITAMIN B_{12}

The serum sample was analysed for vitamin B_{12} using the (Electrochemiluminescence immunoassay) method (Roche kit). The analyzer was Cobas 6000. Serum was incubated with vitamin B_{12} pretreatment reagent to release bound vitamin B_{12}. By incubating the pretreated sample with the ruthenium labeled intrinsic factor, a vitamin B_{12}-binding protein complex was formed, the amount of which was dependent upon the analyte concentration in the sample. After addition of streptavidin-coated microparticles and vitamin B_{12} labeled with biotin, the still-vacant sites of the ruthenium labeled intrinsic factor became occupied, with formation of a ruthenium labeled intrinsic factor-vitamin B_{12} biotin complex. The entire complex became bound to the solid phase via interaction of biotin and streptavidin. The reaction mixture was aspirated into the measuring cell where the microparticles were magnetically captured onto the surface of the electrode. Unbound substances were then removed with ProCell. Application of a voltage to the electrode then inducesd chemiluminescent emission which was measured by a photomultiplier. Results were determined via a calibration curve which was instrument-specifically generated by 2-point calibration and a master curve provided via the reagent barcode.
Quality control: Elecsys PreciControl anemia 1, 2 and 3 were used for QC. Additionally, pooled serum samples were used as internal quality control. The Nutritional Biochemistry laboratory participated in the CDC vital EQA program for serum vitamin B_{12}.
Threshold for B_{12} deficiency: <200 pmol/l (Lindstorm, 2011)

7.1.7 URINARY IODINE

3-5 ml urine was collected and stored at -20 ˚C. The samples were transported to the nutritional biochemistry lab at icddr,b. Urine was digested with chloric acid under mild conditions for an hour and iodine was determined manually by its catalytic role in the reduction of ceric ammonium sulphate in the presence of arsenious acid (Dunn JT, 1993)
Quality control: The Nutritional Biochemistry laboratory participated in the “Ensuring the Quality of Iodine Procedures” (EQUIP), a standardization program that addresses laboratory quality-assurance issues related to testing for iodine deficiency.
Threshold for iodine deficiency: Deficiency at a population level will be defined as a median urinary iodine excretion level < 100 µgram/L.

7.1.8 ESTIMATION OF IODINE CONTENT IN SALT

The iodine content in iodated salt was estimated by titrimetric procedure known as iodometric titration (Ranganathan S, 2006). In this reaction, free iodine reacts with sodium thio-sulphate solution to give a light yellow color complex. This color complex combines with soluble chemical starch which indicates the presence of sodium iodide.

TABLE 101: DEFINITION OF IODIZATION OF SALT AND ADEQUACY OF IODIZATION

Type of salt	Iodized salt (ppm)	Adequately iodized salt (ppm)
Household	≥5*	≥15
Retailer	≥5	≥20
*Presence of iodine at < 5 PPM in salt (Binod 2008)		

ANNEX 7.2: SAMPLE SIZE

TABLE 102: MINIMUM SAMPLE SIZE TO ACHIEVE STATISTICAL SIGNIFICANCE IN EACH STRATUM FOR STATED DIFFERENCE BETWEEN BASELINE AND FOLLOW-UP SURVEYS IN THE PREVALENCE OF VITAMIN A DEFICIENCY PER TARGET GROUP (ADJUSTING FOR THE DESIGN EFFECT OF 2.0, A HOUSEHOLD RESPONS

Target group	Indicator	Survey 1 (%)	Survey 2 (%)	Minimum number of individuals in 1 stratum	Minimum number of individuals in all strata	% of target population	households in 1 stratum	households in 3 strata
Preschool children	Low serum retinol	25	20	2,155	6,465	10.5	4,409	13,227
NPNL women	Low serum retinol	5	2	1,158	3,474	25.8	965	2,895
School age children	Low serum retinol	25	20	2,155	6,465	26	1,781	5,343

TABLE 103: ACTUAL SAMPLE SIZE, TAKING INTO CONSIDERATION OF LIMITING THE NUMBER OF HOUSEHOLDS TO VISIT UNDER 3000. ACTUAL P VALUES OBTAINED FOR EACH TARGET GROUP FOR DIFFERENCE IN THE PREVALENCE OF VITAMIN A BETWEEN THE BASELINE AND FOLLOW-UP SURVEYS

			Number of individuals with complete data		P value	
Target group	Indicator	% households target group recruited	1 stratum	All strata	1 stratum	All strata
Preschool children	Low serum retinol	100%	392	1,176	0.236	0.040
Non-pregnant, non-lactating women	Low serum retinol	33%	318	954	0.146	0.012
School age children	Low serum retinol	50%	485	1,455	0.187	0.022

TABLE 104: ACTUAL SAMPLE SIZE, TAKING INTO CONSIDERATION OF LIMITING THE NUMBER OF HOUSEHOLDS TO VISIT UNDER 3000. ACTUAL CONFIDENCE INTERVALS OBTAINED FOR EACH TARGET GROUP, GIVEN THAT THE ASSUMPTIONS IN TABLE 3

Target group	Indicator	Estimated prevalence	Precision in 1 stratum (± x %)	Minimum sample in 1 stratum	Minimum sample in all strata	% of target population	Number of households in 1 stratum	Number of households in 3 strata
Preschool age children	Anemia	50	±10	241	723	10.5	494	1482
	Iron deficiency	50	±10	241	723		494	1482
Non lactating pregnant women	Anemia	50	±10	241	723	25.8	201	603
	Iron deficiency	50	±10	241	723		201	603
	Folate deficiency	25	±5	721	2163		601	1803
	B12 deficiency	50	±7	490	1470		408	1224
School age children	Anemia	41	±7	475	1425	26	393	1092
	Iron deficiency	22	±7	337	1011		279	837

TABLE 105: ACTUAL SAMPLE SIZE, TAKING INTO CONSIDERATION OF LIMITING THE NUMBER OF HOUSEHOLDS TO VISIT UNDER 3000. ACTUAL CONFIDENCE INTERVALS OBTAINED FOR EACH TARGET GROUP

			Number of target group with data		Confidence intervals	
Target group	**Indicator**	**% households target group recruited**	**1 stratum**	**All strata**	**1 stratum**	**All strata**
Preschool children	Anemia	50%	196	588	±9.9	±5.7
	Iron deficiency				±9.9	±5.7
Non-pregnant, non-lactating women	Anemia	33%	318	954	±7.8	±4.5
	Iron deficency				±7.8	±4.5
	Folate deficiency				±6.7	±3.9
	B_{12} deficiency				±7.8	±4.5
School age children	Anemia	50%	485	1,455	±6.2	±3.6
	Iron deficiency				±5.2	±3.0

TABLE 106: SAMPLE SIZE IS CALCULATED FOR ZINC CONSIDERING DESIGN EFFECT OF 2 & NON-RESPONSE IS 20%

Population	P	z	d	PQZ^2	Design effect	Adjustment for non response	Population %	N=1 strata	N=3 strata	Adjusted sample in 3 strata
Preschool children	0.22	1.96	0.07	0.659	2	1.2	0.10	323	969	1050
NPNL women	0.73	1.96	0.06	0.757	2	1.2	0.25	505	1514	1500
Total							2550			

TABLE 107: SAMPLE SIZE REQUIRED FOR ASSESSING IODINE DEFICIENCY AND COVERAGE OF USI (ADJUSTING FOR THE DESIGN EFFECT OF 2.0, A HOUSEHOLD RESPONSE RATE OF 95%, AND AN INDIVIDUAL RESPONSE RATE OF 80%)

Target group	Indicator	Estimated prevalence	Precision in 1 stratum (±x%)	Minimum sample in 1 stratum	Minimum sample in all strata	% of target population	No. of households in 1 strata	No. of households in 3 strata
NPNL	UIE<100	39	±7	467	1,401	25.8	389	1,167
SAC	UIE<100	34	±7	440	1,320	26	364	1,092
Household	KAP on iodine "good health"	29.3	±6	NA	NA	NA	466	1,398
	KAP on iodine "prevents goiter"	24.6	±6	NA	NA	NA	417	1,251
	Purchase of iodized salt	69	±6	NA	NA	NA	481	1,443
	Adequacy of iodization in salt (≥15 ppm)	51	±6	NA	NA	NA	562	1,686
Retailer (assume 95% response)	KAP on iodine ("good health")	38.8	±8	301	903	NA	NA	NA
	KAP on iodine ("prevents goitre")	38.5	±8	300	900	NA	NA	NA
	Sale of iodized salt	41	±6	544	1,632	NA	NA	NA
	Adequacy of iodization in salt (≥20 ppm)	53.3	±10	202	606	NA	NA	NA

ANNEX 7.3: STANDARD ERRORS FOR SOME SELECTED VARIABLES CALCULATED FROM THE DATA ANALYSIS

TABLE 108: STANDARD ERRORS FOR SOME SELECTED ESTIMATES

	Estimate	Value	Standard Error (SE)
Number of household members			
national	mean	4.67	0.07
rural	mean	4.70	0.08
urban	mean	4.58	0.11
slums	mean	4.47	0.10
Religion			
Islam	proportion	0.89	0.028
Hinduism	proportion	0.08	0.026
Buddism	proportion	0.004	0.003
Christianity	proportion	0.012	0.008
Ethnicity			
Bangalee	proportion	0.98	0.009
Chakma	proportion	0.004	0.003
Marma	proportion	0.007	0.007
Garo	proportion	0.0004	0.0004
Saotal	proportion	0.002	0.002
Other	proportion	0.003	0.003
Possession of ecectricity	proportion	0.687	0.046
Possession of mobile phone	proportion	0.783	0.02
Monthly household expense (taka)			
national	mean	8943	369
rural	mean	8392	362
urban	mean	11005	1019
slums	mean	8778	333
Per capita oil consumption per day(gm)	mean	24.4	1.16
Prevalence of anemia in the preschool children			
national	proportion	0.33	0.03
rural	proportion	0.37	0.04
urban	proportion	0.23	0.049
slums	proportion	0.22	0.039
Prevalence of iron deficiency in the preschool children			
national	proportion	0.107	0.024
rural	proportion	0.094	0.031
urban	proportion	0.123	0.039
slums	proportion	0.272	0.038
Prevalence of vitamin A deficiency in the preschool children			
national	proportion	0.204	0.022
rural	proportion	0.194	0.029
urban	proportion	0.212	0.028
slums	proportion	0.38	0.047
Prevalence of zinc deficiency in the preschool children			
national	proportion	0.446	0.052
rural	proportion	0.486	0.063
urban	proportion	0.295	0.058
slums	proportion	0.517	0.054
Prevalence of anemia in the npnl women			
national	proportion	0.26	0.028
rural	proportion	0.27	0.034
urban	proportion	0.21	0.038
slums	proportion	0.20	0.035
Prevalence of iron deficiency in the NPNL women			
national	proportion	0.071	0.014
rural	proportion	0.066	0.017
urban	proportion	0.087	0.023
slums	proportion	0.074	0.018
Prevalence of zinc deficiency in the npnl women			
national	proportion	0.572	0.031

rural	proportion	0.575	0.037
urban	proportion	0.545	0.044
slums	proportion	0.664	0.055
Prevalence of vitamin A deficiency in the NPNL women			
national	proportion	0.054	0.013
rural	proportion	0.054	0.016
urban	proportion	0.049	0.016
slums	proportion	0.068	0.019
Iodine deficiency in NPNL women			
national	proportion	0.421	0.052
rural	proportion	0.447	0.066
urban	proportion	0.332	0.069
slums	proportion	0.334	0.049

Annex 7.4. Elevated inflammatory bio-markers (CRP>10 mg/l & AGP>1 g/l)

TABLE 109: ELEVATED INFLAMMATORY BIO-MARKERS

	Elevated CRP				Elevated AGP		
Preschool children	**n**	**%**	**95% CI**		**n**	**%**	**95% CI**
National	471	4.6	1.8-7.5	National	473	28.5	22.6-34.5
Rural	157	3.6	0.4-6.7	Rural	158	28.2	20.5-35.9
Urban	165	7.8	1.0-14.7	Urban	165	27.8	21.5-34.2
Slums	149	8.8	1.7-16.0	Slums	150	37.7	25.5-49.9
NPNL women							
National	896	1.9	0.7-3.2	National	896	12.8	9.0-16.6
Rural	317	1.0	-0.2-2.1	Rural	318	11.5	6.5-16.5
Urban	300	5.8	1.4-10.2	Urban	299	17.8	12.5-23.1
Slums	279	2.9	0.6-5.2	Slums	279	13.7	8.2-19.1
School age children							
National	1277	2.2	0.7-3.7	National	1277	15.3	12.1-18.5
Rural	432	1.9	0.02-3.9	Rural	432	14.6	11.0-18.3
Urban	439	3.3	0.6-6.0	Urban	439	18.0	9.8-26.2
Slums	406	1.3	-0.2-2.9	Slums	406	14.1	8.1-19.9

ANNEX 7.5. HOUSEHOLD FOOD INSECURITY QUESTIONS

The generic occurrence questions, grouped by domain, are:

1) Anxiety and uncertainty about the household food supply:
-Did you worry that your household would not have enough food?

2) Insufficient Quality (includes variety and preferences of the type of food):
- Were you or any household member not able to eat the kinds of foods you preferred, because of a lack of resources?

- Did you or any household member have to eat a limited variety of foods due to a lack of resources?

- Did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?

3) Insufficient food intake and its physical consequences:
-Did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?

-Did you or any household member have to eat fewer meals in a day because there was not enough food?

-Was there ever no food to eat of any kind in your household because of a lack of resources to get food?

-Did you or any household member go to sleep at night hungry because there was not enough food?

-Did you or any household member go a whole day and night without eating anything because there was not enough food?
(*Household Food Insecurity Access Scale Indicator Guide, v.3)*
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ANNEX 7.6: LIST OF PRIMARY SAMPLING UNITS (PSU) FOR THE NATIONAL MICRONUTRIENTS SURVEY

TABLE 110: PRIMARY SAMPLING UNITS (PSUS) FOR THE SURVEY

	Cluster #	District	Upazilla	Union/ward	Mauza	Area	Mauza name
1	280	BARISAL	GAURNADI	WARD NO-08	352	2	DIASUR
2	405	BARISAL	MHENDIGANJ	WARD NO-06	563	2	KHARKI
3	712	JHALOKATI	JHALOKATI SADAR	WARD NO-05	659	2	MUDI PATTY
4	1019	PATUAKHALI	PATUAKHALI SADAR	WARD NO-07	510	2	POWER HOUSE
5	1300	BANDARBAN	BANDARBAN SADAR	WARD NO-06	496	2	KEOCHIN PARA
6	1711	CHANDPUR	CHANDPUR SADAR	WARD NO-01	426	2	PURAN BAZAR UTTAR
7	2018	CHITTAGONG	BAKALIA	WARD NO-35 (PART)	295	3	CHAKTAI
8	2169	CHITTAGONG	KOTWALI	WARD NO-21	396	3	JAMAL KHAN
9	2424	COMILLA	BARURA	WARD NO-04	516	2	KAMEDDA
10	2913	COX'S BAZAR	COX'S BAZAR SADAR	WARD NO-09	381	2	GHONAR PARA (PART)
11	3324	KHAGRACHHARI	KHAGRACHHARI SADAR	WARD NO-05	395	2	GOVT. HIGH SCHOOL AREA
12	3631	LAKSHMIPUR	RAMGANJ	WARD NO-07	926	2	SREEPUR
13	4198	RANGAMATI	RANGAMATI SADAR	WARD NO-02	884	2	RESERVE BAZAR (PAR
14	4297	DHAKA	DHANMONDI	WARD NO-48(PART)	820	3	TINMAZAR (JHIGATALA)
15	4370	DHAKA	KHILKHET	DHAKA C.C./WARD NO-17 (PART)	513	3	KHILKHET KHA PARA
16	4443	DHAKA	MOTIJHEEL	WARD NO-34	192	3	DAKSHIN SHAHJAHANPUR
17	4542	DHAKA	SHYAMPUR	SHYAMPUR	912	2	SHYAMPUR
18	4693	FARIDPUR	FARIDPUR SADAR	WARD NO-08	725	2	UTTAR ALIPUR
19	5000	GOPALGANJ	GOPALGANJ SADAR	WARD NO-07	640	2	PACSHIM TEGHARIA
20	5333	JAMALPUR	SARISHABARI	WARD NO-06	549	2	KATIAR BARI
21	5770	MADARIPUR	MADARIPUR SADAR	WARD NO-03	673	2	MAHISHER CHAR(PART)
22	6129	MUNSHIGANJ	MUNSHIGANJ SADAR	WARD NO-02	300	2	GOPALNAGAR
23	6462	MYMENSINGH	MYMENSINGH SADAR	WARD NO-16	450	2	GANGINAPAR (PART)
24	6821	NARSINGDI	NARSINGDI SADAR	WARD NO-01	088	2	BHELANAGAR
25	7180	NETRAKONA	NETROKONA SADAR	WARD NO-07	533	2	MUKTER PARA
26	7461	SHARIATPUR	NARIA	WARD NO-05	160	2	BITIK KURI
27	7690	SHERPUR	SREEBARDI	WARD NO-04	927	2	UTTAR SREEBARDI
28	8205	BAGERHAT	MONGLA	WARD NO-02	862	2	SELABUNIA
29	8460	JESSORE	ABHAYNAGAR	WARD NO-02	718	2	PASCHIM NOAPARA
30	8793	JHENAIDAH	KOTCHANDPUR	WARD NO-02	468	2	KAZI PARA
31	9022	KHULNA	KHALISHPUR	WARD NO-14	043	3	BARA BOYRA (PART 1-3)
32	9095	KHULNA	PAIKGACHHA	WARD NO-08	107	2	BATIKHALI (PART)
33	9376	KUSHTIA	MIRPUR	WARD NO-09	576	2	KHANDAKBARIA
34	9605	MEHERPUR	MEHERPUR SADAR	WARD NO-04	527	2	KASED PARA
35	9808	SATKHIRA	KALAROA	WARD NO-04	280	2	JIKRA UTTAR
36	10115	BOGRA	KAHALOO	WARD NO-01	479	2	SARAI
37	10708	GAIBANDHA	GAIBANDHA SADAR	WARD NO-05	675	2	MADHA GOBINDAPUR
38	10963	JOYPURHAT	KALAI	WARD NO-09	588	2	KALAI TALUKDER PARA
39	11400	LALMONIRHAT	LALMONIRHAT SADAR	WARD NO-06	175	2	BANIAR DIGHI
40	11681	NAOGAON	PATNITALA	WARD NO-07	458	2	NORTH HARIRAMPUR
41	12066	CHAPAI NABABGAN	CHAPAI NABABGANJ SAD	WARD NO-06	937	2	SANKARBATI
42	12347	PABNA	BERA	WARD NO-03	620	2	MOYTAR BAIDYA

43	12680	PANCHAGARH	PANCHAGARH SADAR	WARD NO-04	660	2	JALASHI COLONY
44	12857	RAJSHAHI	DURGAPUR	WARD NO-06	096	2	BAHARAMPUR
45	13112	RANGPUR	KAUNIA	WARD NO-01	360	2	JUMMA PARA
46	13471	SIRAJGANJ	SIRAJGANJ SADAR	WARD NO-06	814	2	NUTAN BHANGABARI
47	13804	HABIGANJ	CHUNARUGHAT	WARD NO-08	079	2	AZIMABAD
48	14085	MAULVIBAZAR	MAULVIBAZAR SADAR	WARD NO-08	875	2	SABUJBAGH T&T COLONY
49	14652	SYLHET	GOLAPGANJ	WARD NO-04	915	2	NIJ SARASHWATI
50	14803	SYLHET	SYLHET SADAR	WARD NO-21	800	3	SHAPLABAGH
51	97	BARGUNA	BARGUNA SADAR	NALTONA	394	1	GAZI MAMUD
52	422	BARISAL	MHENDIGANJ	CHAR EKKARIA	978	1	UTTAR DADPUR
53	725	JHALOKATI	JHALOKATI SADAR	BINOYKATI	382	1	GARANGA
54	1003	PATUAKHALI	MIRZAGANJ	MAJIDBARI	687	1	MAZIDBARIA
55	1319	BANDARBAN	BANDARBAN SADAR	KUHALONG	559	1	KUHALANG
56	1602	BRAHMANBARIA	KASBA	BADAIR	066	1	BADAIR
57	1881	CHANDPUR	MATLAB DAKSHIN	UTTAR UPADI	731	1	NAOGAON
58	2221	CHITTAGONG	MIRSHARAI	ICHHAKHALI	660	1	PASCHIM ICHHAKHALI
59	2500	COMILLA	BURICHANG	SHOLANAL	111	1	BERAJAL KADAMTALI
60	2776	COMILLA	MEGHNA	GOBINDAPUR	164	1	BURIAR CHAR
61	3057	COX'S BAZAR	TEKNAF	BAHARCHHARA	746	1	SHILKHALI
62	3350	KHAGRACHHARI	KHAGRACHHARI SADAR	KHAGRACHHARI	459	1	GAMARIDHALA
63	3641	LAKSHMIPUR	RAMGANJ	CHANDIPUR	192	1	CHANDIPUR
64	3921	NOAKHALI	SUBARNACHAR	PURBA CHAR BATA	393	1	HAJIPUR
65	4183	RANGAMATI	RAJASTHALI	GHILA CHHARI UNIO	795	1	KUKYA CHHARI
66	4657	FARIDPUR	CHAR BHADRASAN	CHAR HARIRAMPUR	212	1	CHAR HARIRAMPUR
67	4954	GAZIPUR	KAPASIA	SINGASREE	898	1	SINGASREE
68	5256	JAMALPUR	JAMALPUR SADAR	MESHTA	156	1	BIR FULAR PARA
69	5535	KISHOREGONJ	KATIADI	ACHMITA	041	1	ASTAGHARIA
70	5822	MADARIPUR	RAJOIR	KADAMBARI	267	1	GAZARIA
71	6107	MUNSHIGANJ	LOHAJANG	GAODIA	719	1	PAKHIDIA
72	6395	MYMENSINGH	GAURIPUR	SAHANATI	432	1	JOGIR DANGURI
73	6674	NARAYANGANJ	BANDAR	KALAGACHHIA	379	1	GOKUL GOBINDABARI
74	6977	NETRAKONA	BARHATTA	ASMA	476	1	HARIATALA
75	7257	RAJBARI	BALIAKANDI	JANGAL	894	1	SASAPUR
76	7567	SHERPUR	JHENAIGATI	HATIBANDHA	703	1	LAYKHAN
77	7854	TANGAIL	GHATAIL	SANDHANPUR	341	1	GAURI JAINABARI
78	8138	BAGERHAT	FAKIRHAT	MULGHAR	282	1	FALTITA BANIAKHALI
79	8437	CHUADANGA	JIBAN NAGAR	BANKA	071	1	BANKA
80	8720	JHENAIDAH	HARINAKUNDA	RAGHUNATHPUR	478	1	KALAPARIA
81	9071	KHULNA	KOYRA	BAGALI	422	1	GHUGRAKATI
82	9377	KUSHTIA	MIRPUR	AMBARIA	024	1	AMBARIA MIRZAPUR
83	9705	NARAIL	LOHAGARA	LOHAGARA	210	1	CHAR BAGHJURI
84	10013	BOGRA	BOGRA SADAR	GOKUL	416	1	GOKUL
85	10276	BOGRA	SHIBGANJ	SAIDPUR	430	1	GOPIBALLABH
86	10542	DINAJPUR	KAHAROLE	RASULPUR	019	1	BAHARPUR
87	10831	GAIBANDHA	SHAGHATA	BONAR PARA	119	1	BATI
88	11117	KURIGRAM	CHILMARI	RANIGANJ	994	1	UTTAR UARI
89	11417	LALMONIRHAT	LALMONIRHAT SADAR	HARATI	962	1	TALUK HARATI
90	11707	NAOGAON	PATNITALA	SHIHARA	020	1	ASANTA
91	11987	CHAPAI NABABGAN	BHOLAHAT	GOHALBARI	420	1	GOHALBARI

92	12297	NILPHAMARI	SAIDPUR	BOTHLAGARI	211	1	BOTHLAGARI (PART)
93	12577	PABNA	SUJANAGAR	SATBARIA	537	1	KANDARPAPUR
94	12899	RAJSHAHI	GODAGARI	GOGRAM	082	1	BAGHDHARA
95	13217	RANGPUR	PIRGACHHA	ANNADANAGAR	040	1	ANNADANAGAR
96	13494	SIRAJGANJ	SIRAJGANJ SADAR	RATANKANDI	377	1	EKDALA
97	13782	HABIGANJ	BANIACHONG	BARAIURI	110	1	BARA UJIRPUR
98	14073	MAULVIBAZAR	KULAURA	SHARIFPUR	212	1	DAUDPUR (SONAPUR) PART
99	14358	SUNAMGANJ	JAGANNATHPUR	MIRPUR	675	1	NABINAGAR
100	14626	SYLHET	FENCHUGANJ	FENCHUGANJ	331	1	GAYASI
101	14868	Chittagong	Baezid Bostami	Ward-02	346	4	Kulgaon
102	14870	Chittagong	Bakolia	Ward-17	721	4	Paschim Bakalia (Part 1)
103	14871	Chittagong	Bakolia	Ward-18	111	4	Purba Bakalia(Part 2)should
104	14875	Chittagong	Chandgaon	Ward-06	721	4	Paschim Bakalia (Part)
105	14880	Chittagong	Doubul Moring	Ward-29	479	4	Paschim Madrbari (Part)
106	14881	Chittagong	Halishahar	Ward-24	640	4	Pangi Para
107	14884	Chittagong	Kotowali	Ward-21	396	4	Jamal Khan
108	14885	Chittagong	Kotowali	Ward-31	80	4	AL- Karan
109	14886	Chittagong	Kotowali	Ward-34	895	4	Patharghata
110	14891	Chittagong	Kulshi	Ward-14	810	4	Shah Garib Ullah
111	14894	Chittagong	Kulshi	Ward-14	700	4	Railway Colony (Tiger Pass)
112	14896	Chittagong	Pahartoli	Ward-11	236	4	Dakshin Kattali Part
113	14897	Chittagong	Pahartoli	Ward-12	735	4	Sarai Para
114	14898	Chittagong	Panchlaisn	Ward-03	999	4	Shohid Nagar
115	14900	Chittagong	Panchlaisn	Ward-07	822	4	Paschim Shola Shahar (Part 2
116	14911	Dhaka	Newmarket	Ward-52	370	4	Nilkhet Babupura
117	14912	Dhaka	Gulshan	Ward-18	500	4	Kalachandpur (Madhya)
118	14918	Dhaka	Hajaribag	Ward-58	574	4	Hazaribag Road, Nabipur Basti
119	14919	Dhaka	Kufrul	Ward-04	145	4	Purba Baishtek
120	14921	Dhaka	Kufrul	Ward-15	78	4	Bashan Tek 1 no. Basti
121	14924	Dhaka	Kufrul	Ward-16	630	4	Paschim Kafrul, Nahar Bakery Basti
122	14925	Dhaka	Khilgaon	Ward-22	257	4	257 Purba Rampura
123	14928	Dhaka	Khilgaon	Ward-26	500	4	500 Meradia (Part-1)
124	14929	Dhaka	Khilgaon	Ward-26	501	4	501 Meradia (Part-2)
125	14936	Dhaka	Mirpur	Ward-10	225	4	Darussalam Society Basti
126	14939	Dhaka	Muhammadpur	Ward-43	515	4	Baitul Aman Housing
127	14941	Dhaka	Muhammadpur	Ward-46	500	4	Paschim Katashur Bottala Basti
128	14942	Dhaka	Muhammadpur	Ward-47	208	4	Paschim Jafrabad Vandarir Basti
129	14943	Dhaka	Matijhil	Ward-31	226	4	Gopibag
130	14946	Dhaka	Pallabi	Ward-02	148	4	Begun Tila Basti
131	14947	Dhaka	Pallabi	Ward-03	410	4	Mirpur, Section-11, Block-C, Paris Road Basti
132	14949	Dhaka	Pallabi	Ward-05	570	4	Mirpur, Section-11, Block-A, Bihari Camp Basti
133	14950	Dhaka	Pallabi	Ward-06	212	4	Doari Para

134	14954	Dhaka	Shampur	Ward-83	187	4	D.I.T Area, Gandaria Rail Line Basti
135	14956	Dhaka	Shampur	Ward-87	654	4	Uttar Mirhazirbagh, Khetpar Basti
136	14958	Dhaka	Shampur	Ward-90	705	4	Tula Bagicha
137	14963	Dhaka	Tejgaon	Ward-38	960	4	Uttar Paschim Nakhalpara, Kebla bari Basti
138	14964	Dhaka	Tejgaon	Ward-38	177	4	Purba Nakhal Para, Rashid chairman Basti
139	14969	Khulna	Khalishpur	Ward-07	995	4	Crisent Bazar
140	14971	Khulna	Khalishpur	Ward-08	605	4	People Jute Mill Area
141	14973	Khulna	Khalishpur	Ward-14	138	4	Goalkhali Bastuhara Colony
142	14975	Khulna	Khalishpur	Ward-16	114	4	Dakshin Boyra Junction
143	14978	Khulna	Khulna Sadar	Ward-22	628	4	Natun Bazar
144	14980	Khulna	Khulna Sadar	Ward-24	669	4	Roy Para
145	14983	Khulna	Khulna Sadar	Ward-31	430	4	Laban Chora (Madinabad)
146	14985	Khulna	Sona Danga	Ward-17	713	4	Sonadanga Purba
147	14991	Rajshahi	Boalia	Ward-25	919	4	Shekher Char
148	14993	Rajshahi	Boalia	Ward-28	252	4	Jamalpur
149	14997	Rajshahi	Raj Para	Ward-02	721	4	Harogram Ranidighi
150	14998	Rajshahi	Raj Para	Ward-04	431	4	Keshabpur

ANNEX 7.7-QUESTIONNAIRES

ANNEX 7.7.1 HOUSEHOLD QUESTIONNAIRE

Household # (50-HH listing): ☐☐ Household# (Sl. In 20-HH list): ☐☐

Household Identification	
Stratum: 1=Rural; 2=Cities+Municipalities; 3= Urban (Slums).	☐
Division: 1=Dhaka, 2=Chittagong, 3= Rajshahi, 4=Khulna 5=Sylhet, 6=Barishal	Division: ☐ District: _____ ☐☐
Upazilla/Municipality _____	Union: ☐☐ Ward: _____ ☐☐ (.....)
Mauza _____	Cluster No: ☐☐☐
Household Identification:	
Name of the Household Head _____	Date of data collection: DD/MM/YY ☐☐ / ☐☐ / ☐☐
Household Land Telephone/Cell Phone No.:	
Name of the Interviewer _____	Signature: _____
Name of the Supervisor _____	Signature: _____
Name of the Quality control Officer _____	Signature: _____

Written informed consent: 1=Yes, 2=No ☐
Result Code: ☐ Completed=1 Incomplete=2
Reason, the data collection was not completed..... .....

Household General Information Now I would like to ask you some questions about this household and its members.			
1	What is your name?	Respondent's Name	

LINE NO.	**USUAL RESIDENTS**	**RELATIONSHIP with HHH**	**Male/ Female**	**RESIDENCE**		**AGE**
	Please give me the names of the persons who usually live in your household starting with the head of the household	What is the relationship of (NAME) to the head of the household?*	Is (NAME) male or female?	Does (NAME) usually sleep here?	Does (NAME) usually eat here?	How old is (NAME)? IF AGE IS LESS THAN 1 YEAR, WRITE '00'
(1)	(2)	(3)	(4)	(5a)	(5b)	(6)
01		☐☐	M..... 1 F 2	YES..... 1 NO 2	YES ..... 1 NO..... 2	IN YEARS ☐☐
02		☐☐	M..... 1 F 2	YES..... 1 NO 2	YES ..... 1 NO..... 2	IN YEARS ☐☐
03		☐☐	M..... 1 F 2	YES..... 1 NO 2	YES ..... 1 NO..... 2	IN YEARS ☐☐
04		☐☐	M..... 1 F 2	YES..... 1 NO 2	YES ..... 1 NO..... 2	IN YEARS ☐☐
05		☐☐	M..... 1 F 2	YES..... 1 NO 2	YES ..... 1 NO..... 2	IN YEARS ☐☐
06		☐☐	M..... 1 F 2	YES..... 1 NO 2	YES ..... 1 NO..... 2	IN YEARS ☐☐
07		☐☐	M..... 1 F 2	YES..... 1 NO 2	YES ..... 1 NO..... 2	IN YEARS ☐☐
08		☐☐	M..... 1 F 2	YES..... 1 NO 2	YES ..... 1 NO..... 2	IN YEARS ☐☐
09		☐☐	M..... 1 F 2	YES..... 1 NO 2	YES ..... 1 NO..... 2	IN YEARS ☐☐
10		☐☐	M..... 1 F 2	YES..... 1 NO 2	YES ..... 1 NO..... 2	IN YEARS ☐☐
11		☐☐	M..... 1 F 2	YES..... 1 NO 2	YES ..... 1 NO..... 2	IN YEARS ☐☐
12		☐☐	M..... 1 F 2	YES..... 1 NO 2	YES ..... 1 NO..... 2	IN YEARS ☐☐
If more than 12 household members, use continuation sheet						

	*CODES FOR Col. 3 RELATIONSHIP TO HEAD OF HOUSEHOLD: Self.....01 Husband/wife.....02 Son.....03 Daughter.....04 Daughter-in-law.....05	Grand son/grand daughter.....06 Brother/sister.....07 Sister-in-law.....08 Nephew/niece.....09 Father/mother.....10 Father-in-law/Mother-in-law.....11 OTHER (specify).....77

	QUESTIONS	CODING CATEGORIES	SKIP
4	What is the religion practiced by most of the people who live in this household? *(Mark only one answer)*	Islam.....1 Hinduism.....2 Christianity.....3 Buddhism.....4 Other _____77 (Specify) Don't know.....99	
5	Which ethnic group do you belong to?	Bangali.....1 Chakma.....2 Marma.....3 Garo.....4 Saotal.....5 Other _____77 (Specify)	
6	What is the main occupation of the head of the household?	Professional/technical.....01 Small Business.....02 Large Business.....03 Factory worker.....04 Service.....05 Skilled labour/service.....06 Unskilled labour.....07 Farmer/agricultural worker.....08 Poultry/cattle raising.....09 Home based manufacturing.....10 Domestic help.....11 House wife.....12 Other _____77 (Specify)	
7	How much formal education did the (Household Head) attain?	No education.....1 Primary incomplete.....2 Primary complete.....3 Secondary incomplete.....4 Secondary complete or higher.....5 Don't know.....99	
8	What is the main source of drinking water for members of your household?	Piped into dwelling.....01 Piped to yard/plot.....02 Public tap.....03 Tube well.....04 Protected well.....05 Unprotected .well.....06 Unprotected spring well.....07 Protected spring well.....08 Rain water.....09 Tanker truck.....10 Surface water (River/dam/lake/pond/ stream/canal/irrigation channel).....11 Other _____77 (Specify)	
9	Do you do anything to the water to make it safer to drink?	Yes.....1 No.....2 Don't know.....9	→ 11
10	What do you usually do to make water safer to drink?	Boil.....1 Add bleach/chlorine/purifying tablet.....2 Strain through a cloth.....3	

		Use water filter (ceramic/sand/composite)….4 Let it sand and settle .....5 Do nothing.....6 Other _____77 (Specify)	

	QUESTIONS	CODING CATEGORIES	SKIP
11	What kind of toilet facilities do members of your household usually use? (Observe yourself)	Flushed to piped sewer system .....01 Flush to septic tank .....02 Flush to pit latrine .....03 Flush to somewhere else.....04 Pit latrine with slab.....05 Pit latrine without slab/open pit .....06 Bucket toilet .....07 Hanging toilet .....08 No facility/bush/field .....09 Others _____77 (Specify)	
12	**Does your household or anyone of your household have:**		
	a. Electricity?	Yes .....1 No.....2	
	b. Radio?	Yes .....1 No.....2	
	c. Television?	Yes .....1 No.....2	
	d. Mobile phone?	Yes .....1 No.....2	
	e. Land phone?	Yes .....1 No.....2	
	f. Refrigerator?	Yes .....1 No.....2	
	g. Almirah/wardrobe?	Yes .....1 No.....2	
	h. Table?	Yes .....1 No.....2	
	i. Chair?	Yes .....1 No.....2	
	j. Watch?	Yes .....1 No.....2	
	k. Bicycle?	Yes .....1 No.....2	
	l. Motor cycle/scooter/tempo?	Yes .....1 No.....2	
	m. Animal drawn cart?	Yes .....1 No.....2	
	n. Car or truck?	Yes .....1 No.....2	
	o. A boat?	Yes .....1 No.....2	
	p. Rickshaw/van?	Yes .....1 No.....2	
13	What type of fuel does your household usually use for cooking?	Electricity.....01 LPG .....02 Natural gas .....03 Biogas .....04 Kerosene .....05 Coal .....06 Wood.....07 Straw/Shrubs/Grass .....08 Agricultural crop.....09	

		Animal dung .....10 Other _____77 (Specify)	
	QUESTIONS	CODING CATEGORIES	**SKIP**
14	What is the main material of the floor? (Observe yourself)	Natural floor Earth/sand.....01 Rudimentary floor Wood/planks.....02 Palm/Bamboo.....03 Finished floor (Parquet or polished) Wood .....04 Ceramic tiles/mosaic .....05 Cement .....06 Carpet.....07 Other .....77 (Specify)	
15	What is the main material of the roof? (Observe yourself)	Natural roofing No roof .....01 Thatch/Palm leaf .....02 Rudimentary roofing Bamboo .....03 Wood planks.....04 Cardboard.....05 Finished roofing Tin.....06 Wood.....07 Ceramic tiles .....08 Cement .....09 Other .....77 (Specify)	
16	What is the main material of the external wall? (observe yourself)	Natural walls No walls.....01 Cane/palm/trunks .....02 Rudimentary walls Bamboo with mud.....03 Stone with mud .....04 Plywood.....05 Cardboard.....06 Finished walls Tin.....07 Cement .....08 Stone with lime/cement.....09 Bricks .....10 Wood planks/shingles .....11 Other .....77 (Specify)	
17	How many rooms in the household are used for sleeping?	Number of sleeping rooms..... ☐☐	
18	Does the Household own any homestead?	Yes .....1 No.....2	→**19**
18a	Does the Household own homestead in other place?	Yes .....1 No.....2	
19	Does the Household own any land other than homestead land (cultivable/fallen land)?	Yes .....1 No.....2	→**21**
20	How much land does the Household own other than the homestead land (cultivable/fallen)?	Acres:..... ☐☐ Decimals: ..... ☐☐	
21	Do you know the monthly expenditure of your family?	Yes .....1 No/don't know 2	→**22**
	QUESTIONS	CODING CATEGORIES	**SKIP**
21a	Please tell the approximate monthly expenditure of your family (approximate collective expenditure of all the family	Taka .....☐☐☐☐☐☐	

	members)		
22	What type of cooking oil do you use in your household? (Multiple answers possible)	Soybean.....01 Mustard.....02 Supper/Palm.....03 Coconut.....04 Others.....77 (Specify)	
22a	What kinds of cooking oil does your household buy?	"Brand" oil 01 Open oil 02 → **23** Both.....03 Others.....77 → **23** (Specify)	
22b	(In case of you using "brand" oil), what is the name of the "brand" oil you buy/use?	Brand name_____ _____	
22c	Was the brand consumed by the Household "fortified with vitamin A"? (Please check the oil container in the household for labeling, or check it in shops whether the "brand" was fortified)	Yes.....1 No.....2	
23	How many times do you buy cooking oil in a month?	Number of times ..... ☐	
23a	How much cooking oil do you buy at a time?	Liters.....	
23b	How much does your household spend on cooking oil in a month?	Taka ..... ☐☐☐☐	
24	Do you know the foods, which is rich in vitamin A?	Yes.....1 No.....2 → **24b**	
24a	Please tell the name of the foods, which are rich in vitamin A?		
	a. Green leafy vegetables?	Mentioned.....1 Did not mention.....2	
	b. Yellow/orange vegetables and fruits?	Mentioned.....1 Did not mention.....2	
	c. Small fish?	Mentioned.....1 Did not mention.....2	
	d. Liver?	Mentioned.....1 Did not mention.....2	
	e. Others (specify)? _____ _____	Mentioned.....1 Did not mention.....2	
24b	Do you know benefits of eating vitamin A rich foods, e.g. Green leafy vegetables, yellow/orange vegetables and fruits and small fishes?	Yes.....1 No.....2 → 25	
	QUESTIONS	CODING CATEGORIES	SKIP
24c	If yes, What are they? (*Do not prompt)*		
	a. Good for eye sight?	Mentioned.....1 Did not mention.....2	
	b. Good for health?	Mentioned.....1 Did not mention.....2	
	c. Good for skin?	Mentioned.....1 Did not mention.....2	
	e. Prevents night blindness?	Mentioned.....1 Did not mention.....2	
	f. Other (specify)? _____ _____	Mentioned.....1 Did not mention.....2	
25	Do you know the foods, which are rich in iron?	Yes.....1 No.....2 → 25b	

25a	Please tell the name of the foods, which are rich in iron? *(Do not prompt)*		
	a. Fish?	Mentioned……1 Did not mention……2	
	b. Meat?	Mentioned……1 Did not mention……2	
	c. Eggs?	Mentioned……1 Did not mention……2	
	d. Milk?	Mentioned……1 Did not mention……2	
	e. Others (specify)? _____ _____	Mentioned……1 Did not mention……2	
25b	Do you know benefits of eating iron rich foods, e.g. fish, meat, eggs, milk?	Yes……1 No……2 → 26	
25c	If yes, what are they? *(Do not prompt)*		
	a. Gives energy to the body?	Mentioned……1 Did not mention……2	
	b. Gives iron to the body?	Mentioned……1 Did not mention……2	
	c. Good for health?	Mentioned……1 Did not mention……2	
	d. Other (specify)? _____ _____	Mentioned……1 Did not mention……2	
26	Have you heard that oil fortified with vitamin A is available in market?	Yes……1 No……2	
	Household food insecurity (I would now like to ask you some questions about the amount of food available for members of your household.)		
27	In the past four weeks, did you worry that your household would not have enough food?	Yes……1 No……2 → 28	
27a	How often did this happen?	Once or twice in the past four weeks (Rarely)……1 Three to ten times in the past four weeks (Sometimes)2 More than ten times in the past four weeks (Often) ….3	
28	In the past four weeks, were you or any household member not able to eat the kinds of foods you usually have because of a lack of resources?	Yes……1 No……2 → 29	
28a	How often did this happen?	Once or twice in the past four Weeks(Rarely)……1 Three to ten times in the past four weeks (Sometimes)2 More than ten times in the past four weeks (Often) ….3	
29	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	Yes……1 No……2 → 30	
29a	How often did this happen?	Once or twice in the past four weeks (Rarely)……1 Three to ten times in the past four weeks (Sometimes)2 More than ten times in the past four weeks (Often) ….3	
30	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	Yes……1 No……2 → 31	
30a	How often did this happen?	Once or twice in the past four weeks (Rarely)……1 Three to ten times in the past four weeks (Sometimes)2 More than ten times in the past four weeks (Often) ….3	
31	In the past four weeks, did you or any	Yes……1	

	household member have to eat a smaller quantity of food in a meal than you felt you needed because there was not enough food?	No.....2 →	32
31a	How often did this happen?	Once or twice in the past four weeks (Rarely).....1 Three to ten times in the past four weeks (Sometimes)2 More than ten times in the past four weeks (Often) 3	
32	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	Yes.....1 No.....2 →	33
32a	How often did this happen?	Once or twice in the past four weeks (Rarely).....1 Three to ten times in the past four weeks (Sometimes)2 More than ten times in the past four weeks (Often) 3	
33	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	Yes.....1 No.....2 →	34
33a	How often did this happen?	Once or twice in the past four weeks (Rarely).....1 Three to ten times in the past four weeks (Sometimes)2 More than ten times in the past four weeks (Often) 3	
34	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	Yes.....1 No.....2 →	35
No.	**QUESTIONS**	**CODING CATEGORIES**	**SKIP**
34a	35a. How often did this happen?	Once or twice in the past four weeks (Rarely).....1 Three to ten times in the past four weeks (Sometimes)2 More than ten times in the past four weeks (Often) 3	
35	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	Yes.....1 No.....2 →	36
35a	How often did this happen?	Once or twice in the past four weeks (Rarely).....1 Three to ten times in the past four weeks (Sometimes)2 More than ten times in the past four weeks (Often) 3	
	Universal Salt Iodization (Now I would like to ask you some questions about the salt used in this household and about salt in general)		
36	Does your household usually use any of these types of salt? ***(****Read types and record yes or no for each type.****]***		
	1. Crude salt?	Yes.....1 No.....2	
	2. Open?	Yes.....1 No.....2	
	3. Packet?	Yes.....1 No.....2 →	38
37	If you do not consume packet salt at the household, why do you not? *(Please ask each possibility and indicate yes or no)*		
	1. Don't like taste?	Yes.....1 No.....2	
	2. Too expensive?	Yes.....1 No.....2	
	3. Not available?	Yes.....1	

		No.....2	
	4. Don't believe it is iodized?	Yes.....1 No.....2	
	5. Can't buy in small amounts?	Yes.....1 No.....2	
	7. Other (specify)? _____ _____	Yes.....1 No.....2	
	6. Don't know?	Yes.....1 No.....2	
	Interviewers: In **Q.36** if the respondent mentions crude salt then ask **Q.38.1**, if mentions open salt then ask **Q.38.2** and if the respondent mentions packet then **askQ.38.3.**		
38	Where do you usually buy/obtain each of the following types of salt? ***[Please ask each type and indicate code for source]*****?** 1. Crude salt?	City shop.....1 Village/ local shop/hat.....2 Others _____77 (Specify) N/A.....88	
	2. Open salt?	City shop.....1 Village/ local shop/hat.....2 Others _____77 (Specify) N/A.....88	
	3. Packet salt?	City shop.....1 Village/ local shop/hat.....2 Others _____77 (Specify) N/A.....88	
39	How do you store salt in your house?	Closed packet or container.....1 Open packet or container (Bamboo shell, pumpkin shell, earthen pot etc) .....2 Both.....3	
40	While cooking, when do you usually add salt?	During cooking .....1 After cooking .....2 Both.....3	
41	Do you add salt with meals?	Always .....1 Sometimes.....2 No (Never).....3	
42	Have you heard about iodized salt?	Yes .....1 No.....2 → 51	
43	How do you know about iodized salt? *(Do not prompt)*		
	TV	Mentioned.....1 Did not mention.....2	
	Radio	Mentioned.....1 Did not mention.....2	
	Newspaper Poster/Leaflet	Mentioned.....1 Did not mention.....2	
	Health worker	Mentioned.....1 Did not mention.....2	
	Friend/relative	Mentioned.....1 Did not mention.....2	
	School child	Mentioned.....1 Did not mention.....2	
	Teacher/school	Mentioned.....1 Did not mention.....2	

	Other _____ (Specify)	Mentioned.....1 Did not mention.....2	
44	Does crude salt contain iodine?	Yes.....1 Yes, some .....2 No.....3 Don't know.....9	
45	Does open salt contain iodine?	Yes.....1 Yes, some .....2 No.....3 Don't know.....9	
46	Does packet salt contain iodine?	Yes.....1 Yes, some .....2 No.....3 Don't know.....9	
47	Do you know benefits of iodized salt?	Yes.....1 No.....2 → 49	
48	If yes, what are the benefits? *(Do not prompt)*		
	a. Prevent goiter?	Mentioned.....1 Did not mention.....2	
	b. Prevent cretinism?	Mentioned.....1 Did not mention.....2	
	c. Mental development/intelligence?	Mentioned.....1 Did not mention.....2	
	d. Normal growth?	Mentioned.....1 Did not mention.....2	
	e. Prevent abortion and still births?	Mentioned.....1 Did not mention.....2	
	f. Good for health/beneficial?	Mentioned.....1 Did not mention.....2	
	g. Other _____ (Specify)	Mentioned.....1 Did not mention.....2	
49	Do you test your salt for iodine using testing kit or home based method?	Yes.....1 No.....2 → No	
49a	Which method do you use to test salt for iodine?	Test kit.....1 Home based method.....2 Both.....3	
50	Do you know the ingredients to test salt for iodine? **(*Do not prompt)***		
	1. Salt?	Mentioned.....1 Did not mention.....2	
	2. Cooked rice?	Mentioned.....1 Did not mention.....2	
	3. Lemon juice?	Mentioned.....1 Did not mention.....2	
	Interviewers: In **Q.50** if the respondent mentions salt then ask **Q.50a**, if mentions cooked rice then ask **Q.50b** and if the respondent mentions lemon juice then **askQ.50c.**		
50a	How much salt? **(*Do not prompt)***	Pinch amount .....1 Level teaspoon .....2 Other _____77 (Specify) Don't know.....99 N/A.....88	
50b	How much rice? **(*Do not prompt)***	Small amount .....1 5 grains.....2 Other _____77 (Specify) Don't know 99	

		N/A.....88	
50c	How much lemon juice? **(*Do not prompt)***	Few drops.....1 Other _____77 (Specify) Don't know .....99 N/A.....88	
50d	What colour do you see if the salt tested contains iodine? **(*Do not prompt)***	White.....1 Violet/bluish.....2 Other _____77 (Specify) Don't know 99	
50e	What colour do you see if the salt tested has no iodine? **(*Do not prompt)***	White.....1 Violet/bluish.....2 Other _____77 (Specify) Don't know 99	
51	Does your household have any livestock e.g. cow/goat/chicken?	Yes.....1 No.....2 → 54	
52	Do you give salt to your livestock	Yes.....1 No.....2 → 54	
52a	What type of salt do you give to your livestock?	Iodized.....1 Not iodized.....2 Don't know 99	
53	Do you test your livestock salt for iodine? *(Read out all the options and code entry accordingly)*		
	a. Crude?	Yes.....1 No.....2	
	b. Open?	Yes.....1 No.....2	
	c. Packet?	Yes.....1 No.....2	
54	**(Was the household selected for salt collection?)**	Yes.....1 No.....2	
55	**(Was the salt sample collected?)**	Yes.....1 No.....2 → **END**	
	QUESTIONS	CODING CATEGORIES	**SKIP**
56	**(Type of salt collected?)**	Crude 1 Open 2 Packet 3 → **58**	
57	**Brand name of salt (packet)**	Brand	
58	**Sample coding**		
	a. Salt sample	a. Sample ID..... ☐☐☐☐☐☐☐☐	
Interviewer's Comment:			
Supervisor's Comment:			

ANNEX 7.7.2: QUESTIONNAIRE: PRESCHOOL CHILDREN (6-59 MONTH)

Instruction: Started with the youngest children. In case of more than one mother with children in the household, ask about each under 5 year child of one mother, then about those of another. Use separate form for each child.

Household # (50-HH listing): ☐☐ Household# (Sl. In 20-HH list): ☐☐

Household Identification	
Stratum: 1=Rural; 2=Cities+Municipalities; 3= Urban (Slums).	☐
Division: 1=Dhaka, 2=Chittagong, 3= Rajshahi, 4=Khulna 5=Sylhet, 6=Barishal	Division: ☐ District: _____ ☐☐
Upazilla/Municipality _____	Union: _____ ☐☐ Ward: ☐☐ (.....)
Mauza _____	Cluster No: ☐☐☐
Household identification	
Name of the Household Head _____	Date: DD/MM/YY ☐☐/☐☐/☐☐
Household Land Telephone/Cell Phone No.:	
Name of the Interviewer _____	Signature: _____
Name of the Supervisor _____	Signature: _____
Name of the Quality control Officer _____	Signature: _____
Written informed consent: 1=Yes, 2=No ☐	
Result Code: ☐ Completed=1 Incomplete=2	
Reason, the data collection was not completed.....	

Sl. No. of Child:

Sl. No. of Mother/Primary Caretaker: ☐☐☐☐

General Information about the Child		
1.	What is the name of the child?	Name of the child
1a.	Child ID	☐☐☐☐☐☐☐☐ (P/Strata/Division/Cluster/HH no/Sl. No. of the child)
2.	What is your name? (mother/primary caretaker)	Name
2a.	How much education did you receive?	No education……1 Primary incomplete……2 Primary complete……3 Secondary incomplete……4 Secondary complete or above……5

2b.	What is the date of Birth of the child?	☐☐/☐☐/☐☐ (DD/MM/YY)
3.	What is the age of the child (completed months)?	……..Months
4.	What is the sex of the child?	Male 1 Female 2

Child Morbidity (Children aged 6-59 month; Pre SAC children)

Sl. No.	QUESTION	CODING CATEGORIES	SKIP
5.	Did the child (Name) have diarrhoea in last 2 weeks? *(diarrhoea: 3 or more watery or loose/liquid stool in last 24 hrs)*	Yes……..1 No……..2 Don't know……99	
5ª.	In case of having diarrhoea in last 2 weeks, what treatment the child (Name) did receive?	ORS……..1 ORS and Zinc……..2 Did not receive treatment……..3 Other treatment (specify……,.4	
6.	"Has (Name) been ill with a fever at any time in the last 2 weeks?"	Yes……..1 No……..2 Don't know……99	
7.	In the past two weeks has (Name) had an illness with a cough, and fast breathing or difficult breathing?	Yes……..1 No……..2 Don't know……99	
8.	Was the fast or difficult breathing due to a problem in the chest or to blocked or runny nose?	Yes……..1 No……..2 Don't know……99	
9.	Did (Name) have measles in last 6 months?	Yes……..1 No……..2 Don't know……99	
10.	Does (Name) have an EPI card?	Yes……..1 No……..2 Don't know……99	→ 11
10a.	*Interviewer: If response is YES in the Question no. 10, ask the respondent to show the card.*		

Sl. No.	QUESTION	CODING CATEGORIES	SKIP
11.	Did the child (Name) at any time receive (…..)?		
11a.	Measles immunisation?	Yes……..1 No……..2 Don't know……99	
11b.	Vitamin A supplementation? *(Show the sample)*	Yes……..1 No……..2 Don't know……99	→ 11d
11c.	When did the child (Name) receive the last dose of vitamin A?	Month……☐☐ Year……☐☐ Don't know……99	
11d.	In case of "No", what was the reason (Name) has not received vitamin A supplementation?	…… ……	
11e.	(Ask this question if the child is 2 years or more) Did the child (Name) receive antihelminthic tablet/syrup in last 6 months?	Yes……..1 No……..2 Don't know……99 N/A……3	
Infant and Young child Feeding [Check *Q3 and ask the following questions (12 -24), if the child (Name) is aged 6-23 months old]*			
12.	Has (Name) ever been breastfed?	Yes……..1 No……..2 Don't know……99	→ 14
13.	Was (Name) breastfed yesterday during the day or at night?	Yes……..1 No……..2	

		Don't know……..99	
Now I would like to ask you about some medicines and vitamins that are sometimes given to infants.			
14.	Was (Name) given any vitamin drops or other medicines as drops yesterday during the day or at night?	Yes……..1 No……..2 Don't know……99	
14a.	Was (Name) given [*LOCAL NAME FOR ORS*] yesterday during the day or at night?	Yes……..1 No……..2 Don't know……..99	

Read the questions below. Read the list of liquids one by one and mark 'Yes, or 'No' ACCORDINGLY. After you have completed the list, continue by asking question 16 (see far right hand column) for each of those ITEMS (15B, 15C, and 15F) where the respondent replied 'Yes'.

15.	I would like to ask you about some liquids that ***(NAME)*** may have had yesterday during the day or at night. Did ***(NAME)*** have any (***ITEM FROM the LIST***)? *Read the list of liquids starting with 'plain water'.*		**Yes**	***No***	***Don't Know***	**16.** How many times yesterday during the day or at night did ***(NAME)*** consume any (***ITEM FROM LIST***)? ***Read Question 16 for items B, C, and F*** *if child consumed the item. Record '99' for Don't Know.*
	A. Plain water	A	1	2	99	
	B. Infant formula, such as lactogen, nido, my boy, complan	B	1	2	99	Times…….. Don't know.....99
	C. Milk such as packet, tinned, powdered or fresh animal milk	C	1	2	99	Times…….. Don't know.....99
	D. Juice or juice drinks	D	1	2	99	
	E. Clear broth	E	1	2	99	
	F. Yogurt	F	1	2	99	Times…….. Don't know.....99
	G. Thin porridge	G	1	2	99	
	H. Any other liquids Specify……. [Explore drinking of any other liquids available in the locality, e.g. rice water, glucose water etc)	H	1	2	99	

17. Please describe everything that ***(NAME)*** ate yesterday during the day or night, whether at home or outside the home.

a) Think about when ***(NAME)*** first woke up yesterday. Did ***(NAME)*** eat anything at that time? *If yes*: Please tell me everything ***(NAME)*** ate at that time. *Probe:* Anything else? U*ntil respondent says nothing else. If no, continue to Question b).*

b) What did ***(NAME)*** do after that? Did ***(NAME)*** eat anything at that time?

If yes: Please tell me everything ***(NAME)*** ate at that time. *Probe:* Anything else? U*ntil respondent says nothing else*.

R*epeat question b) above until respondent says the child went to sleep until the next day.*

I*f respondent mentions mixed dishes like a* PORRIDGE*, sauce or stew, probe:*

c) What ingredients were in that ***(MIXED DISH)***? *Probe:* Anything else? U*ntil respondent says nothing else*.

A*s the respondent recalls foods, underline the corresponding food and circle '1' in the column next to the food group. If the food is not listed in any of the food groups below, write the food in the box labeled 'other foods'. If foods are used in small amounts for seasoning or as a condiment, include them under the condiments food group*.

O*nce the respondent finishes recalling foods eaten, read each food group where '1' was not circled, ask the following question and Circle '1' if respondent says yes, '2' if no and '8' if don't know:*

Yesterday during the day or night, did ***(NAME)*** drink/eat any ***(FOOD GROUP ITEMS)***?

A. Rice, bread, rice pudding, semolina, or other foods made from grains	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
B. Pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
C. White potatoes, white yams, manioc,	Yes……..1	*Put in the box the maximum number of times any item*

	cassava, or any other foods made from roots	No……..2 Don't know….99	*of the group was eaten* ☐☐
	D. Any dark green leafy vegetables-e.g.pui shak, kolmishak, mula shak, kochu shak, data shak, palong shak, paat shak, shorisha shak etc	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	E. Ripe mangoes, ripe papayas, or (Inquire about other locally available vitamin A rich Ffruits e.g.jack fruit)	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	F. Any other fruits or vegetables	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	G. Liver, kidney, heart, or other organ meats	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	H. Any meat, such as beef, pork, lamb, goat, chicken, or duck	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	I. Eggs	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times the item of the group was eaten* ☐☐
	J. Fresh or dried fish, shellfish, or seafood	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	K. Any foods made from beans, peas, lentils, nuts	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	L. Seeds	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	M. Cheese, yogurt, or other milk products	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	N. Any oil, fats, or butter, or foods made with any of these	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	O. Any sugary foods such as chocolates, sweets, candies, pastries, cakes, or biscuits	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	P. Condiments for flavor, such as chilies, spices, herbs, or fish powder	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	Q. Foods made with red palm oil	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	R. Other Foods Specify……	Yes……..1 No……..2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐

Read the questions below. Read the list of liquids one by one and mark 'Yes, or 'No' ACCORDINGLY. After you have completed the list, continue by asking question 16 (see far right hand column) for each of those ITEMS (15B, 15C, and 15F) where the respondent replied 'Yes'.

15.	I would like to ask you about some liquids that (***NAME***) may have had yesterday during the day or at night. Did (***NAME***) have any (***ITEM FROM the LIST***)? Read the list of liquids starting with 'plain water'.	Yes	No	Don't Know	16. How many times yesterday during the day or at night did (***NAME)*** consume any (I***TEM FROM LIST***)? Read Question 16 for

						items B, C, and F if child consumed the item. Record '99' for Don't Know.
	A. Plain water	A	1	2	99	
	B. Infant formula, such as lactogen, nido, my boy, complan	B	1	2	99	Times……. Don't know.....99
	C. Milk such as packet, tinned, powdered or fresh animal milk	C	1	2	99	Times……. Don't know.....99
	D. Juice or juice drinks	D	1	2	99	
	E. Clear broth	E	1	2	99	
	F. Yogurt	F	1	2	99	Times……. Don't know.....99
	G. Thin porridge	G	1	2	99	
	H. Any other liquids Specify……. [Explore drinking of any other liquids available in the locality, e.g. rice water, glucose water etc)	H	1	2	99	

17. Please describe everything that ***(NAME)*** ate yesterday during the day or night, whether at home or outside the home.

a) Think about when ***(NAME)*** first woke up yesterday. Did ***(NAME)*** eat anything at that time? *If yes*: Please tell me everything ***(NAME)*** ate at that time. *Probe:* Anything else? U*ntil respondent says nothing else. If no, continue to Question b).*

b) What did ***(NAME)*** do after that? Did ***(NAME)*** eat anything at that time?

If yes: Please tell me everything ***(NAME)*** ate at that time. *Probe:* Anything else? U*ntil respondent says nothing else*.

R*epeat question b) above until respondent says the child went to sleep until the next day.*

I*f respondent mentions mixed dishes like a* PORRIDGE*, sauce or stew, probe:*

c) What ingredients were in that ***(MIXED DISH)***? *Probe:* Anything else? U*ntil respondent says nothing else*.

A*s the respondent recalls foods, underline the corresponding food and circle '1' in the column next to the food group. If the food is not listed in any of the food groups below, write the food in the box labeled 'other foods'. If foods are used in small amounts for seasoning or as a condiment, include them under the condiments food group*.

O*nce the respondent finishes recalling foods eaten, read each food group where '1' was not circled, ask the following question and Circle '1' if respondent says yes, '2' if no and '8' if don't know:*

Yesterday during the day or night, did ***(NAME)*** drink/eat any ***(FOOD GROUP ITEMS)***?

A. Rice, bread, rice pudding, semolina, or other foods made from grains	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
B. Pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
C. White potatoes, white yams, manioc, cassava, or any other foods made from roots	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
D. Any dark green leafy vegetables- e.g.pui shak, kolmishak, mula shak, kochu shak, data shak, palong shak, paat shak, shorisha shak etc	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
E. Ripe mangoes, ripe papayas, or (Inquire about other locally available vitamin A rich Ffruits e.g.jack fruit)	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
F. Any other fruits or vegetables	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
G. Liver, kidney, heart, or other organ meats	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
H. Any meat, such as beef, pork, lamb, goat, chicken, or duck	Yes……1 No……2	*Put in the box the maximum number of times any item of the group was eaten*

		Don't know….99	☐☐
	I. Eggs	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times the item of the group was eaten* ☐☐
	J. Fresh or dried fish, shellfish, or seafood	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	K. Any foods made from beans, peas, lentils, nuts	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	L. Seeds	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	M. Cheese, yogurt, or other milk products	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	N. Any oil, fats, or butter, or foods made with any of these	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	O. Any sugary foods such as chocolates, sweets, candies, pastries, cakes, or biscuits	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	P. Condiments for flavor, such as chilies, spices, herbs, or fish powder	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	Q. Foods made with red palm oil	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	R. Other Foods Specify……	Yes……1 No……2 Don't know….99	*Put in the box the maximum number of times any item of the group was eaten* ☐☐
	Questions	**Coding Categories**	Skip
	Did (NAME) eat any solid, semi-solid, or soft foods yesterday during the day or at night? IF'YES' PROB E: What kind of solid, semi-solid, or soft foods did (NAME) eat?	**Yes……1** **No……2** **Don't know……99**	Q20 →
	Interviewer's Note: If the response is YES in the Q. 18, go back to Q. 17 and observe the record for verification. Then continue with Q. 19		
	How many times did (NAME) eat solid, semi-solid, or soft foods other than liquids yesterday during the day or at night?	**Number of times……..** **Don't know……99**	☐☐
	Did (NAME) drink anything from a bottle with a nipple yesterday during the day or night?	**Yes……1** **No……2** **Don't know……99**	

Now I would like to ask you about some particular foods ***(NAME)*** may eat. I am interested in whether your child had the item even if it was combined with other foods.			
21.	Yesterday, during the day or night did (Name) consume any (Explore about, iron fortified solid, semi-solid or soft foods designed specifically for infants and young children available in the local setting)	Yes……..……1 No……2 Don't know……99	
22.	Yesterday, during the day or night, did (Name) consume any food to which you added Monimix or some thing like this?	Yes……..……1 No……2 Don't know……99	
23.	Yesterday, during the day or night, did (Name) consume any plumpy nuts? (Ask to s*how common sample of plumpy nut, if it is available with her)*	Yes……..……1 No……2 Don't know……99	
24.	Yesterday, during the day or night, did (Name) consume any [iron fortified infant/toddler formulas available in the local setting]? *[Explore about, iron fortified infant formula e.g. -'Nido', 'Mother's smile', 'Bio-milk', 'Lactogen' etc available in the local setting)*	Yes……..……1 No……2 Don't know……99	

Food consumption data

Interviewer: Check Q3 and ask Q 25 if the child is 24-59 months old?

Now I would like to ask you some questions about the food eaten by your child (24-59 months old). I know this is sometimes hard to remember, but please give me the best answer you can.

25. During the past 7 days, on how many days did your child (Name) eat the following foods?

Foods	**Serving size**	**# of days in last 7 days**	**# of servings in last 7 days**	**gm/ml**
1. Rice?	1 cup	☐	☐☐☐☐	☐☐☐☐☐
Breads				
2.Chapatti?	2 pieces	☐	☐☐☐☐	☐☐☐☐
3.Bread?	2 slices	☐	☐☐☐☐	☐☐☐☐
4.Parata?	1 piece	☐	☐☐☐☐	☐☐☐☐
Fish				
5. small fish(with bones)?	60 gram	☐	☐☐☐☐	☐☐☐☐
6. big fish (boneless)?	30 gram	☐	☐☐☐☐	☐☐☐☐
7. Egg?	One	☐	☐☐☐☐	☐☐☐☐
8. Dal?	½ cup	☐	☐☐☐☐	☐☐☐☐
Green Leafy Vegetables (Shak)				
9. pui shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
10. Palong shak?	½ cup	☐	☐☐☐☐	☐☐☐☐

	11.Lal shak	½ cup	☐	☐☐☐☐	☐☐☐☐
	12. Kalmi shak	½ cup	☐	☐☐☐☐	☐☐☐☐
	13.Paat shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
	14.Kochu shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
	15.Shorisha shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
	16.Moola shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
	17.Others (specify.....)	½ cup	☐	☐☐☐☐	☐☐☐☐
	Yellow/orange vegetables/fruit				
	18.Carrots	½ cup	☐	☐☐	☐☐☐☐
	Record, the amount.....				
	19.Ripe mango	½ cup	☐	☐☐	☐☐☐☐
	Record, the amount.....				
	20.Sweet Pumpkin	½ cup	☐	☐☐	☐☐☐☐
	Record, the amount.....				
	.21.Ripe jackfruit	½ cup	☐	☐☐	☐☐☐☐
	Record, the amount.....				
	22.Ripe papaya	½ cup	☐	☐☐	☐☐☐☐
	Record, the amount.....				
	23.Tomato	½ cup	☐	☐☐	☐☐☐☐
	Record, the amount.....				
	24.Sweet potato	½ cup	☐	☐☐	☐☐☐☐
	Record, the amount.....				
	25.Orange	½ cup	☐	☐☐	☐☐☐☐
	Record, the amount.....				
	26.Water melon	½ cup	☐	☐☐	☐☐☐☐
	Record, the amount.....				
	27.Banana	½ cup	☐	☐☐	☐☐☐☐
	Record, the amount				
	28.Others(Specify.....)		☐	☐☐	☐☐☐☐
	Meats				

	29.Chicken	60 gram	☐	☐☐	☐☐☐☐
	30.Beef	60 gram	☐	☐☐	☐☐☐☐
	31.Mutton	60 gram	☐	☐☐	☐☐☐☐
	32.Liver	60 gram	☐	☐☐	☐☐☐☐
	Milk and milk products				
	33.Milk	1 cup	☐	☐☐	☐☐☐☐
	34.Yogurt	½ cup	☐	☐☐	☐☐☐☐
	35.Cheese	Measure of a thumb	☐	☐☐	☐☐☐☐
	36.Sugar, honey, molasses	1 tbsf	☐	☐☐	☐☐☐☐
	37. Beans, nuts	½ cup	☐	☐☐	☐☐☐☐

Hand washing practice		
Activities	26A. Do you wash your hands ……..? Yes=1 No= 2	B. How do you wash your hands …….? Soap and water=01, Ash and water=02,=Mud and water=03, only water=04, Others=77,NA=8,
26. Before cooking?	☐	☐☐ If Others (77), specify)……..
27. Before feeding the child?	☐	☐☐ If Others (77), specify)……..
28. Before taking food?	☐	☐☐ If Others (77), specify)……..
29. After cleaning baby's bottom?	☐	☐☐ If Others (77), specify)……..
30. After defecation?	☐	☐☐ If Others (77), specify)……..

34.	Biological sample (Give tick mark in the middle and right columns against each of the parameters)		
	Name	Stipulated for collection	Actual collection
	S. Retinol	☐	☐
		Sample ID ☐☐☐☐☐☐☐☐☐	
	Hemoglobin	☐	☐
		Sample ID ☐☐☐☐☐☐☐☐☐	
	Hemoglobin%: ☐☐.☐		
	S. Ferritin	☐	☐
		Sample ID ☐☐☐☐☐☐☐☐☐	
	S. Zinc	☐	☐
		Sample ID ☐☐☐☐☐☐☐☐☐	

ANNEX 7.7.3: SCHOOL AGED CHILDREN'S FORM

(This form is for the School aged children, aged 6-14 years, who will provide the biological samples. Use separate form for each of the children)

Household # (50-HH listing): ☐☐ Household# (Sl. In 20-HH list): ☐☐

Household Identification	
Stratum: 1=Rural; 2=Cities+Municipalities; 3= Urban (Slums).	☐
Division: 1=Dhaka, 2=Chittagong, 3= Rajshahi, 4=Khulna 5=Sylhet, 6=Barishal	Division: ☐ District: ☐☐
Upazilla/Municipality	Union: ☐☐ Ward: ☐☐ (.....)
Mauza	Cluster No: ☐☐☐
Household identification	
Name of the Household Head	Date: DD/MM/YY ☐☐/☐☐/☐☐
Household Land Telephone/Cell Phone No.:	
Name of the Interviewer	Signature:
Name of the Supervisor	Signature:
Name of the Quality control Officer	Signature:
Written informed consent: 1=Yes, 2=No ☐	
Result Code: ☐ Completed=1 Incomplete=2	
Reason, in case the data collection was not completed:.....	

Identification of the Child:		
1.	Sl. No of the child:	Sl. No..... ☐☐
2.	ID:	☐☐☐☐☐☐☐☐ (P/Strata/Division/Cluster/HH no/Sl. No. of the child)
3.	What is the name of the child?	Name.....
4.	What is (Name)'s age (Complete Years)?	Years.....☐☐
5.	What is (Name)'s Sex?	Male.....1 Female.....2

Q. No.	QUESTION	CODING CATEGORIES	SKIP
6.	Did (Name) have diarrhoea in last 2 weeks? *(diarrhoea: 3 or more watery or loose/liquid stool in last 24 hrs)*	Yes.....1 No.....2 Dont know.....99	
7.	Did (Name) have diarhoea with blood in the last 2 weeks?	Yes.....1 No.....2 Dont know.....99	
8.	Has (Name) been ill with a fever at any time in the last 2 weeks?	Yes.....1 No.....2 Don't know.....99	
9.	Did (Name) have malaria in the last 3 months?	Yes.....1 No.....2 Don't know.....99	

Food consumption data

Now I would like to ask you some questions about the food eaten by you/your child. I know this is sometimes hard to remember, but please give me the best answer you can.

10.	During the past 7 days, on how many days did you/ your child (Name) eat the following foods?				
	Foods	Serving size	# of days in last 7 days	# of servings in last 7 days	gm/ml
	1. Rice?	1 cup	☐	☐☐☐☐	☐☐☐☐☐

	Breads				
	2.Chapatti?	2 pieces	☐	☐☐☐☐	☐☐☐☐
	3.Bread?	2 slices	☐	☐☐☐☐	☐☐☐☐
	4.Parata?	1 piece	☐	☐☐☐☐	☐☐☐☐
	Fish				
	5. small fish(with bones)?	60 gram	☐	☐☐☐☐	☐☐☐☐
	6. big fish (boneless)?	30 gram	☐	☐☐☐☐	☐☐☐☐
	7. Egg?	One	☐	☐☐☐☐	☐☐☐☐
	8. Dal?	½ cup	☐	☐☐☐☐	☐☐☐☐
	Green Leafy Vegetables (Shak)				
	9. pui shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
	10. Palong shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
	11.Lal skak	½ cup	☐	☐☐☐☐	☐☐☐☐
	12. Kalmi shak	½ cup	☐	☐☐☐☐	☐☐☐☐
	13.Paat shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
	14.Kochu shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
	15.Shorisha shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
	16.Moola shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
	17.Others (specify.....)	½ cup	☐	☐☐☐☐	☐☐☐☐
	Yellow/orange vegetables/fruit				
	18.Carrots	½ cup	☐	☐☐☐☐	☐☐☐☐
	Record, the amount.....				
	19.Ripe mango	½ cup	☐	☐☐☐☐	☐☐☐☐
	Record, the amount.....				
	20.Sweet Pumpkin	½ cup	☐	☐☐☐☐	☐☐☐☐
	Record, the amount.....				
	21.Ripe jackfruit	½ cup	☐	☐☐☐☐	☐☐☐☐
	Record, the amount.....				
	22.Ripe papaya	½ cup	☐	☐☐☐☐	☐☐☐☐
	Record, the amount.....				
	23.Tomato	½ cup	☐	☐☐☐☐	☐☐☐☐
	Record, the amount.....				
	24.Sweet potato	½ cup	☐	☐☐☐☐	☐☐☐☐
	Record, the amount.....				
	25.Orange	½ cup	☐	☐☐☐☐	☐☐☐☐
	Record, the amount.....				
	26.Water melon	½ cup	☐	☐☐☐☐	☐☐☐☐
	Record, the amount.....				
	27.Banana	½ cup	☐	☐☐☐☐	☐☐☐☐
	Record, the amount				
	28.Others(Specify.....)		☐	☐☐☐☐	☐☐☐☐
	Meats				
	29.Chicken	60 gram	☐	☐☐☐☐	☐☐☐☐
	30.Beef	60 gram	☐	☐☐☐☐	☐☐☐☐
	31.Mutton	60 gram	☐	☐☐☐☐	☐☐☐☐
	32.Liver	60 gram	☐	☐☐☐☐	☐☐☐☐
	Milk and milk products				
	33.Milk	1 cup	☐	☐☐☐☐	☐☐☐☐
	34.Yogurt	½ cup	☐	☐☐☐☐	☐☐☐☐
	35.Cheese	Measure of a thumb	☐	☐☐☐☐	☐☐☐☐
	36.Sugar, honey, molasses	1 tbsf	☐	☐☐☐☐	☐☐☐☐
	37. Beans, nuts	½ cup	☐	☐☐☐☐	☐☐☐☐

11.	Biological Sample (Give tick mark in the middle and right columns against each of the parameters)		
	Name	Stipulated for collection	Actual collection
	S. Retinol	☐	☐
		Sample ID ☐☐☐☐☐☐☐☐☐	
	Hemoglobin	☐	☐
		Sample ID ☐☐☐☐☐☐☐☐☐	

	Hemoglobin%: ☐☐.☐	
	S. Ferritin	☐ ☐ Sample ID ☐☐☐☐☐☐☐☐☐
	Urinary Iodine	☐ ☐ Sample ID ☐☐☐☐☐☐☐☐☐

ANNEX 7.7.4: WOMEN (NPNL) FORM

(This form is for the Non Pregnant and Non Lactating women, who will provide the biological samples. Use separate form for each of the women)

Household # (50-HH listing): ☐☐ Household# (Sl. In 20-HH list): ☐☐

Household Identification	
Stratum: 1=Rural; 2=Cities+Municipalities; 3= Urban (Slums).	☐
Division: 1=Dhaka, 2=Chittagong, 3= Rajshahi, 4=Khulna 5=Sylhet, 6=Barishal	Division: ☐ District: ☐☐
Upazilla/Municipality	Union: ☐☐ Ward: ☐☐ (.....)
Mauza	Cluster No: ☐☐☐
Household identification	
Name of the Household Head	Date: DD/MM/YY ☐☐/☐☐/☐☐
Household Land Telephone/Cell Phone No.:	
Name of the Interviewer	Signature:
Name of the Supervisor	Signature:
Name of the Quality control Officer	Signature:
Written informed consent: 1=Yes, 2=No ☐	
Result Code: ☐ Completed=1 Incomplete=2	
Reason, in case the data collection was not completed.....	

General Information of the Woman			
1.	Sl. No of women:	Sl. No.....☐☐	
2.	Women ID:	☐☐☐☐☐☐☐☐ (W/Strata/Division/Cluster/HH no/Sl. No.)	
3.	Name of the women:	Name.....	
4.	Age (Years) Consider the age in completed years	Years.....☐☐	
5.	How much formal education did you attain?	No education.....1 Primary incomplete.....2 Primary complete.....3 Secondary incomplete.....4 Secondary complete or higher.....5	
6.	What is your occupation?	Professional/technical.....01 Small Business.....02 Large Business .....03 Factory worker.....04 Service.....05 Skilled labour/service.....06 Unskilled labour.....07 Farmer/agricultural worker.....08 Poultry/cattle raising .....09 Home based manufacturing.....10	

		Domestic help.....11 House wife.....12 Other.....77 (Specify)	
7.	Are you married?	Yes.....1 No.....2	→12
8.	How old were you, at the time of marriage?	Years..... ☐☐	
9.	How many children have you given birth?(Live and dead)	Live..... ☐☐ Dead..... ☐☐	
10.	Did you suffer from malaria? (last 3 months)	Yes.....1 No.....2 Don't Know.....99	
11.	Have you attained menopause? (Ask, if she is above 40)	Yes.....1 No.....2 Don't Know.....99	

Food consumption data

Now I would like to ask you some questions about the foodn eaten by you. I know this is sometimes hard to remember, but please give me the best answer you can.

25. During the past 7 days, on how many days did you eat the following foods?

Foods	Serving size	# of days in last 7 days	# of servings in last 7 days	gm/ml
1. Rice?	1 cup	☐	☐☐☐☐	☐☐☐☐☐
Breads				
2.Chapatti?	2 pieces	☐	☐☐☐☐	☐☐☐☐
3.Bread?	2 slices	☐	☐☐☐☐	☐☐☐☐
4.Parata?	1 piece	☐	☐☐☐☐	☐☐☐☐
Fish				
5. small fish(with bones)?	60 gram	☐	☐☐☐☐	☐☐☐☐
6. big fish (boneless)?	30 gram	☐	☐☐☐☐	☐☐☐☐
7. Egg?	One	☐	☐☐☐☐	☐☐☐☐
8. Dal?	½ cup	☐	☐☐☐☐	☐☐☐☐
Green Leafy Vegetables (Shak)				
9. pui shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
10. Palong shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
11. pui shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
12. Palong shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
13.Paat shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
14.Kochu shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
15.Shorisha shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
16.Moola shak?	½ cup	☐	☐☐☐☐	☐☐☐☐
17.Others (specify.....)	½ cup	☐	☐☐☐☐	☐☐☐☐
Yellow/orange vegetables/fruit				
18.Carrots	½ cup	☐	☐☐☐☐	☐☐☐☐
Record, the amount.....				
19.Ripe mango	½ cup	☐	☐☐☐☐	☐☐☐☐
Record, the amount.....				
20.Sweet Pumpkin	½ cup	☐	☐☐☐☐	☐☐☐☐
Record, the amount.....				
21.Ripe jackfruit	½ cup	☐	☐☐☐☐	☐☐☐☐
Record, the amount.....				
22.Ripe papaya	½ cup	☐	☐☐☐☐	☐☐☐☐
Record, the amount.....				
23.Tomato	½ cup	☐	☐☐☐☐	☐☐☐☐
Record, the amount.....				
24.Sweet potato	½ cup	☐	☐☐☐☐	☐☐☐☐
Record, the amount.....				
25.Orange	½ cup	☐	☐☐☐☐	☐☐☐☐
Record, the amount.....				
26.Water melon	½ cup	☐	☐☐☐☐	☐☐☐☐
Record, the amount.....				

	27.Banana	½ cup	☐	☐☐☐☐	☐☐☐☐
	Record, the amount				
	28.Others(Specify.....)		☐	☐☐☐☐	☐☐☐☐
	Meats				
	29.Chicken	60 gram	☐	☐☐☐☐	☐☐☐☐
	30.Beef	60 gram	☐	☐☐☐☐	☐☐☐☐
	31.Mutton	60 gram	☐	☐☐☐☐	☐☐☐☐
	32.Liver	60 gram	☐	☐☐☐☐	☐☐☐☐
	Milk and milk products				
	33.Milk	1 cup	☐	☐☐☐☐	☐☐☐☐
	34.Yogurt	½ cup	☐	☐☐☐☐	☐☐☐☐
	35.Cheese	Measure of a thumb	☐	☐☐☐☐	☐☐☐☐
	36.Sugar, honey, molasses	1 tbsf	☐	☐☐☐☐	☐☐☐☐
	37. Beans, nuts	½ cup	☐	☐☐☐☐	☐☐☐☐

Now I would like to collect 3-5 ml of your blood sample to assess level of vitamin A, A/ Hemoglobin/ Iron /Zinc/Folate and B_{12} in your body. I would like to request to provide 30 ml of your urine sample for assessing level of iodine in your body.

Biological Sample (Give tick mark in the middle and right columns against each of the parameters)		
Name	Stipulated for collection	Actual collection
S. Retinol	☐	☐
	Sample ID ☐☐☐☐☐☐☐☐☐	
Hemoglobin	☐	☐
	Sample ID ☐☐☐☐☐☐☐☐☐	
Hemoglobin%: ☐☐.☐		
S. Ferritin	☐	☐
	Sample ID ☐☐☐☐☐☐☐☐☐	
S. Zinc	☐	☐
	Sample ID ☐☐☐☐☐☐☐☐☐	
Urinary Iodine	☐	☐
	Sample ID ☐☐☐☐☐☐☐☐☐	
S. Folate/B_{12}	☐	☐
	Sample ID ☐☐☐☐☐☐☐☐☐	

ANNEX 7.7.5: RETAILER'S QUESTIONNAIRE

(This form will be used to collect information from retailer shopkeepers.Use one form for each of the shop)
Section A: Retailer identification

Stratum: 1=Rural; 2=Cities+Municipalities; 3= Urban (Slums).	☐
Division: 1=Dhaka, 2=Chittagong, 3= Rajshahi, 4=Khulna 5=Sylhet, 6=Barishal	Division: ☐ District: ☐☐
Upazilla/Municipality	Union: ☐☐ Ward: ☐☐ (.....)
Mauza	Cluster No: ☐☐☐
Name of shop: _____	Shop number: ☐☐☐
Name of shop owner:	Date: DD/MM/YY ☐☐☐☐☐☐
Land Telephone/Cell Phone No. of the Shop:	
Name of the interviewer:	Signature:
Name of the Supervisor	Signature:
Name of the Quality control Officer	Signature:
Written informed consent: 1=Yes, 2=No ☐	

Result Code: ☐ Completed=1 Incomplete=2
Reason, the data collection was not completed..... .....

Section B: Data collection from shop keeper			
Q. No.	QUESTION	CODING CATEGORIES	SKIP
1.	Relationship of the respondent with the shop.	Owner……. ……1 Staff……2 Others……77	
2.	What is your Name?	Name……	
3.	How much education did you receive? (Highest class passed?)	No education……. ……..1 Primary incomplete……2 Primary complete……3 Secondary incomplete……4 Secondary complete and higher……..5	
4.	Do you sell crude salt?	Yes……..1 No…… …2	→ Q6
5.	Where do you usually buy crude salt from?	Factory……..1 Retailer……2 Wholesaler……3 Market……4 Crude salt producer……5 Other _____ 77 (Specify)	
6.	Do you sell open salt?	Yes……1 No…… ……2	→ Q10
7.	Where do you usually buy open salt from?	Factory……..1 Retailer……2 Wholesaler……3 Market……4 Other _____ 77 (Specify)	
8.	Do you seal the small packets made from the big sack?	Yes……..1 No…… …2	
9.	How do you store the open salt?	Open sunlight ……1 Damp place……2 Places where air passes……3 Cool, dry, dark place……4 Other _____ 77 (Specify)	
10.	Do you sell packet salt?	Yes……..1 No…… …2	→ Q16
11.	Where do you buy packet salt from?	Factory……..1 Retailer……2 Wholesaler……3 Market……4 Other _____ 77 (Specify)	
12.	Do you make smaller packets from ½ or 1 kg salt packets and sell them to customers?	Yes……..1 No…… …2 (Put skip instruction)	→ Q16
13.	Is the mouth of the 1 or ½ kg packet kept closed?	Yes……..1 No…… …2	
14.	Do you seal the small packets made from the ½ or 1 kg packet?	Yes……..1 No…… …2	
Q. No.	QUESTION	CODING CATEGORIES	SKIP
15.	How do you store the ½ or 1 kg packet used to make the small packets?	Open sunlight ……1 Damp place……2 Places where air passes……3 Cool, dry, dark place……4	

		Other _____ 77 (Specify)	
16.	Have you heard of iodized salt?	Yes.....1 No..... ...2	→Q32
17.	How do you know about iodized salt? (Do not prompt)		
	a. TV	Mentioned.....1 Did not mention.....2	
	b. Radio	Mentioned.....1 Did not mention.....2	
	c. Newspaper	Mentioned.....1 Did not mention.....2	
	d. Poster/Leaflet	Mentioned.....1 Did not mention.....2	
	e. Health worker	Mentioned.....1 Did not mention.....2	
	f. Friend/relative	Mentioned.....1 Did not mention.....2	
	g. School child	Mentioned.....1 Did not mention.....2	
	h. Teacher/school	Mentioned.....1 Did not mention.....2	
	i. Other (specify)	Mentioned.....1 Did not mention.....2	
18.	Does the crude salt contain iodine?	Yes, all.....1 Yes, some.....2 No.....3 Don't know.....99	
19.	Does the open salt contain iodine?	Yes, all.....1 Yes, some.....2 No.....3 Don't know.....99	
20.	Does the packet salt contain iodine?	Yes,all.....1 Yes, some.....2 No.....3 Don't know.....99	
21.	Do you know the benefits of Iodized salt?	Yes.....1 No..... 2	→Q23

Q. No.	QUESTION	CODING CATEGORIES	SKIP
22.	Please tell what are the benefits? *(Do not prompt)*		
	a. Prevent goiter	Mentioned.....1 Did not mention.....2	
	b. Prevent cretinism	Mentioned.....1 Did not mention.....2	
	c. Promote Mental development/intelligence	Mentioned.....1 Did not mention.....2	
	d. Promote Normal growth	Mentioned.....1 Did not mention.....2	
	e. Prevent abortion and still births	Mentioned.....1 Did not mention.....2	
	f. Good for health/beneficial	Mentioned.....1 Did not mention.....2	
	g. Other (Specify .....)	Mentioned.....1 Did not mention.....2	
23.	Do you know how to test salt for iodine?	Know.....1 Don't Know.....2	→Q32
23a.	Please tell the way to test salt for iodine?	Test kit.....1 Home based.....2	

		Both……3	
24.	Do you test your salt for iodine using testing kit or home based method?	Yes……1 No……3	→Q25
24a.	How do you test your salt for iodine?	Test kit……1 Home based……2 Both……3	
25.	Do you know the ingredients to test salt for iodine? *(Do not prompt)*		
	1. Salt?	Mentioned ……1 Did not mention ……2	
	2. Cooked rice?	Mentioned ……1 Did not mention ……2	
	3. Lemon juice?	Mentioned ……1 Did not mention ……2	
	Interviewers: In **Q.25** if the respondent mentions salt then ask **Q.26**, if mentions cooked rice then ask **Q.27** and if the respondent mentions lemon juice then **askQ.28.**		
26.	How much salt? *(Do not prompt)*	Pinch amount……1 Level teaspoon……2 Other……3 (Specify) Don't know……99 N/A……4	
Q. No.	QUESTION	CODING CATEGORIES	SKIP
27.	How much cooked rice? *(Do not prompt)*	Small amount……1 5 grains……2 Other……3 (Specify) Don't know ……99 N/A……4	
28.	How much lemon juice? *(Do not prompt)*	Few drops……1 Other……2 (Specify) Don't know ……99 N/A……4	
29.	What colour if salt contains iodine? *(Do not prompt)*	White……1 Violet/bluish……2 Other……3 (Specify) Don't know……99	
30.	What colour if salt has no iodine? *(Do not prompt)*	White……1 Violet/bluish……2 Other……3 (Specify) Don't know……99	
31.	How often do you test the salt you sell for iodine using the home based method?	Never……1 Sometimes……2 Always ……3	
32.	Do you know that there is salt law?	Yes……1 No…… …2	→Q 35
33.	Is there any punishment for violating this salt law?	Yes……1 No…… ……2 Don't know ……99	→Q 35 →Q 35
34.	If yes, what is the punishment?	Imprisonment……1 Fine……2 Both ……4	

35.	How many salt samples were collected (This question is not for the respondent, but for the record of the interviewer)?	Number……☐☐	

36.	Sample identification:		
	Brand 1	Cluster no: ☐☐ Shop no: ☐☐	Sample ID: ☐☐☐☐☐☐☐☐
	Open salt or Brand 2	Cluster no ☐☐ Shop no: ☐☐	Sample ID: ☐☐☐☐☐☐☐☐

Q. No.	QUESTION	CODING CATEGORIES	SKIP
37.	Do you sell cooking oil?	Yes……1 No…… ……2	Q37b
37a.	What kind of cooking oil do you sell?	Brand oil (Soya bin oil)……1 Brand oil (Palm oil)……2 Brand oil (Musterd oil)……3 Open oil……4 Other 77 (Specify)	
37b.	Have you heard of vitamin A fortified cooking oil?	Yes……1 No…… ……2	END
38c.	If yes, do you sell vitamin A fortified cooking oil? (Check the brands labels available in the shop for vitamin A fortified oil)	Yes……1 No…… ……2	

ANNEX 7.6: BIOLOGICAL SAMPLE COLLECTION FORMS

ANNEX 7.6.1: BLOOD SAMPLE COLLECTION FORM

TABLE 111: BLOOD SAMPLE COLLECTION FORM

TYPE of AREA: CLUSTER No.: DIVISION: DISTRICT:

50 HH No	20 HH No	Participants' Name	P	S	W	Lab. ID (For laboratory use only)	Participant ID	Sample ID				Remarks
								R	**F**	**B**	**Z**	
TOTAL												

Collected by: Collection date: Time:

Assisted by: Carried by:

Date:

Received by:

Date: Time:

ANNEX 7.6.2: HOUSEHOLD SALT SAMPLE COLLECTION FORM

TEAM: TYPE of AREA: CLUSTER No.: DIVISION:
DISTRICT:

TABLE 112: HOUSEHOLD SALT SAMPLE COLLECTION FORM

50-HH no.	20-HH no.	Name of the Household Head	Lab. ID (For laboratory use only)	Sample ID	Remarks

Collected by: Collection date: Time:

Assisted by: Carried by:

Date:

Received by:
Date: Time:

ANNEX 7.6.3: RETAILER'S SALT SAMPLE COLLECTION FORM

TABLE 113: RETAILER'S SALT SAMPLE COLLECTION FORM

TEAM: TYPE of AREA: CLUSTER No.: DIVISION:
DISTRICT:

Shop no.	Name of Shop	Name of Shop Owner	Lab. ID (For laboratory use only)	Sample ID	Remarks
Total Retailer's salt sample					

Collected by: Collection date: Time:

Assisted by: Carried by:

Date:

Received by:

Date: Time:

ANNEX 7.6.4: URINE SAMPLE COLLECTION FORM

TABLE 114: URINE SAMPLE COLLECTION FORM

TEAM: TYPE of AREA: CLUSTER No.: DIVISION: DISTRICT:

50 HH No	20 HH No	Participants' Name	School age	Women	Lab. ID (For laboratory use only)	Sample ID	Remarks
Total urine sample							

Collected by: Collection date: Time:

Assisted by: Carried by:

Date:

Received by:

Date: Time:

ANNEX: 7.7.1. CLUSTER MONITORING FORM

TABLE 115: CLUSTER MONITORING FORM

Cluster: Rural/ Urban/ Urban slums (Tick as appropriate)			
Cluster#.....		Date:…….. to ……	
Division.....	District……	Sub district……	Union……..
Ward	Mouza…… ……..		Mouza no……..
	Question	**Response** (Tick as appropriate)	
1	Was the sampling of the households done **appropriately**?	Well Fair Unsatisfactory	
2	Was the sampling of the biological specimen done **appropriately**?	Well Fair Unsatisfactory	
3	Was the introduction, consent taking conducted **appropriately**?	Well Fair Unsatisfactory	
4	Was the patient properly explained of the procedure before drawing blood?	Well Fair Unsatisfactory	
5	Was aseptic precaution taken?	Well Fair Unsatisfactory	
6	Was the blood collection done **appropriately**?	Well Fair Unsatisfactory	
7	Was the serum separation (Centrifuge) conducted **appropriately**?	Well Fair Unsatisfactory	
8	Was the aliquot preparation conducted **appropriately**	Well Fair Unsatisfactory	
9	Was labeling done **appropriate**ly, including checking the sample ID in the forms?	Well Fair Unsatisfactory	
10	Was cold chain maintained a**ppropriately** at every stage from blood collection to sending back to the Laboratory?	Well Fair Unsatisfactory	
11	Were the used syringes, microcuvettes, cotton etc disposed **appropriately**?	Well Fair Unsatisfactory	
12	Was weight of the young children taken **appropriately**?	Well Fair Unsatisfactory	
13	Was length/height of the young children **appropriately**?	Well Fair Unsatisfactory	
14	Was MUAC of the young children taken **appropriately**?	Well Fair Unsatisfactory	
15	Were the questions on young child feeding asked **appropriately**?	Well Fair Unsatisfactory	
16	Were the questions on food consumption asked a**ppropriately**?	Well Fair Unsatisfactory	
17	Were the questions on household food insecurity asked appropriately?	Well Fair	

		Unsatisfactory
18	Was the question on household monthly expenses asked **appropriately**?	Well Fair Unsatisfactory
19	Was the coding done appropriately?	Well Fair Unsatisfactory
20	Did you conduct re-interviews[2] in the cluster?	Yes No
21	If yes, what is degree of agreement between re interview[2] and regular interview?	Well Fair Unsatisfactory

"Appropriately" means as per the training and/or operational guidelines

[2]Do not ask the questions on infant feeding and food consumption questions in the re-interviews. Try to take the re-interview after 24 hrs and not later than 48 hours.

Score: The following score is accounted for the responses: Well=2, Fair=1, Unsatisfactory=0

Score obtained: Possible score: Result (%):

[Share the result and discuss with the field team in a supportive supervisory manner]

Name, Signature of the officer: Date:

Signature of the supervisor/PI: Date:

ANNEX: 7.7.2. BI-WEEKLY MONITORING REPORT FORM

TABLE 116: BI-WEEKLY MONITORING REPORT FORM

Monitoring report #.....		Date:
Period covering: From……. to ……		
Name of the Officer:		
Division:	Districts:	Subdistrict/subdistricts:
	Questions	Results
1	How many clusters did you visit over the fortnight?	Rural……(no.) Cluster Nos……. Urban……(no.) Cluster Nos…….. Slums……(no.) Cluster Nos…… Total……(no.)
2	How many re-interviews did you conduct over the fortnight?	
3	How many field interviews did you observe over the fortnight?	
4	How many field interviews did you observe conducted satisfactorily[1] over the fortnight?	
5	What was the proportion of the number of the field interviews you observed conducted satisfactorily[1] over the fortnight? Q5 (%) =Q4/ Q3 × 100	
6	How many episodes of length/height taking of young children did you observe over the fortnight?	
7	How many episodes of length/height taking of young children did you observe conducted correctly[2] over the fortnight?	
8	What was the proportion of the number of episodes of length/height taking of young children you observed conducted correctly[2] over the fortnight? Q8 (%) =Q7/Q6×100	
9	How many participants did you observe, with whom biological samples (blood, urine) were managed [3]over the fortnight?	

10	How many participants did you observe, with whom biological samples (blood, urine) were correctly[2] managed[3] over the fortnight?	
11	What was the proportion of participants you observed, with whom biological samples (blood, urine) were correctly[2] managed[3] over the fortnight: Q11(%) = Q10/ Q9 × 100	
12	How many feedback episodes did you take with the field data teams over the fortnight, in the cases of any inconsistencies observed?	
13	What was the average score (%) of the cluster performance over the fortnight?	
14	General comments:	
15	Specific comments:	

[1] "Satisfactorily": When the following questions, e.g. food consumption questions, household food insecurity questions, household monthly expense questions along with appropriate administration of other questions are satisfactorily administered, the interview will be termed "satisfactorily" conducted.
[2]"Correctly : As per training and operational guidelines
[3]"Manage": Blood collection, serum separation (ultra centrifuse), aliquot preparation, labeling, and maintenance of cold chain.

Signature of the officer: Date

Signature of the supervisor/PI: Date:

ANNEX 7.8: THE PEOPLE INVOLVED WITH THE NATIONAL MICRONUTRIENTS SURVEY 2011-12

7.8.1 THE INVESTIGATORS:

Dr. Sabuktgain Rahman (Principal Investigator/Survey Director, icddr,b)
Dr.Tahmeed Ahmed (Co-Principal Investigator, icddrb)
Line Director of the National Nutrition Services (NNS)/Director of the IPHN (Co-Principal Investigator, Institute of Public Health Nutrition)
Dr. Nurul Alam (Co-investigator/statistician/demographer, icddr,b)
Dr. Ahmed Shafiqur Rahman (Co-investigator, icddr,b)
Dr. A. M. Shamsir Ahmed (Co-investigator, icddr,b)
Dr. Ireen Akter Chowdhury (Co-investigator, UNICEF)
Ms.Lilian Selenje (Co-investigator, UNICEF)
Dr. Indrani Chakma (Co-investigator, UNICEF)

7.8.2 THE TECHNICAL COMMITTEE FOR THE NATIONAL MICRONUTRIENTS SURVEY

Director, Institute of Public Health Nutrition/ Line Director, National Nutrition Service (NNS), Directorate General of Health Services, (Chairman)
Professor Dr. Md. Sohrab Ali, Member, Board of Trustees (BOT), icddr,b
Abu Taher Khan, General Manager, BSCIC and Project Director, CIDD project, BSCIC
Dr. Zeba Mahmud, Country Director, Micronutrient Inititative, Bangladesh
Dr. SM Mustafizur Rahman, Member of PPC, MOHFW
Dr. Ahmed Shafiqur Rahman, Associate Scientist, Centre for Nutrition and Food Security (CNFS), icddr,b
Dr. Tahmeed Ahmed, Senior Scientist and Director, Centre for Nutrition and Food Security (CNFS), icddr,b
Ms. Krishna Chowdhury, PSO & Section Chief, Oilseed and Lipid Technology Section, IFST, BCSIR
Dr. Mainuddin Ahmed, Associate Professor of Pediatrics
Dr. Md. Nazrul Islam Khan, Professor, Institute of Nutrition and Food Science, University of Dhaka
Dr. Sheikh Nazrul Islam, Professor, Institute of Nutrition and Food Science, University of Dhaka
Dr. Md. Mohsin Ali, Nutrition Specialist, UNICEF, Bangladesh
Dr. Ireen Akhter Chowdhury, Nutrition Specialist, UNICEF, Bangladesh
Dr. Md. Mumta Henah Siddique, Ministry of Industry, GoB
Dr. Sabuktagin Rahman, Assistant Scientist, Centre for Nutrition and Food Security, icddr,b
Khandakar Nuruzzaman, Joint Chief and PD, Oil Fortification Project, Ministry of Industry, GoB
Dr. M. Mushtuq Hussain, Principal Scientific Officer, IEDCR
Dr. Ashraf Hossain Sarkar, Applied Nutritionist, IPHN
Dr. Ferdousi Begum, Associate Professor, Obstritics and Gynecology, Shaheed Ziaur Rahman Medical College, Dhaka
Dr. Sarah Khanam, IPHN
Dr. Md. Abdul Karim, IPHN
Ms. Momena Shirin, IPHN

7.8.3 MONITORING AND SUPERVISION TEAMS

Icddr,b
Mr.Morad Hossain, Field Reseach Officer
Mr. Akul Chandra Halder, Field Reseach Officer

Mr. Kamruzzaman, Field Reseach Officer
Mr. Mostofa Mohsin, Field Reseach Officer
Mr. Khairul Islam Akanda, Field Reseach Officer
Mr. Kazi Alom, Field Reseach Officer
Dr. Sabuktagin Rahman, Assistant Scientist & Principal Investigator, National Micronutrients Survey
Dr. Tahmeed Ahmed; Director, CNFS, icddr,b

7.8.4 UNICEF

Dr. Ireen Akhter Chowdhury, Nutrition Specialist
Dr. Mohsin Ali, Nutrition Specialist

7.8.5 INSTITUTE OF PUBLIC HEALTH AND NUTRITION

Mr. A.K.M. Abdur Rob Khan; Field visitor
Md. Shafiqul Islam; Home visitor
Md. Sarwar Alam; Home visitor
Md. Jafrul Islam; Field assistant
Md. Abdus Salam; Home visitor

7.8.5. STAFF MEMBERS FROM MITRA AND ASSOCIATES

Mr. S N Mitra	Executive Director
Mr. Siddique Mazumder	Director, Training
Mr. Fuad Pasha	Director, Administration
Mr. Jahangir Hossain Sharif	Assistant Director
Ms. Sittul Muna	Senior Research Officer
Mr. Sayed Abdullah Al Ahsan	Senior Research Officer
Mr. Mominul Haque	Quality. Control. Officer
Mr. Bodruddoza	H. Technician
Mr. Bidyut Barai	H. Technician
Ms. Mitu Ballabhnth	Interviewer
Ms. Nurun Nahar	Interviewer
Mr. Shamim Sardar	Quality. Control. Officer
Mr. Faruk Hossain	Quality. Control. Officer
Mr. Shahidur Rahman(Sohel)	Quality. Control. Officer
Mr. Nazmul Islam	Quality. Control. Officer
Ms. Israt Jahan(Anth)	Quality. Control. Officer
Ms. Mitu Ballabhnth(Anth)	Quality. Control. Officer
Mr. Abdul Halim Khaddam	Supervisor
Mr. Soheb Hossen	Supervisor
Mr. Abdul Ahad	Supervisor
Mr. Biplab Kumar Roy	Supervisor
Mr. Aminul Islam (Khulna)	Supervisor
Mr. Tajul Islam	Supervisor
Mr. Meherul Islam	Supervisor
Mr. Abedul Haque	Supervisor

Mr. Amirul Islam Kabil	Supervisor
Mr. Shahidal Islam	Supervisor
Mr. Rayhanul Islam	H. Technician
Mr. Jugal Majumder	H. Technician
Mr. Zeaur Rahman	H. Technician
Mr. Tauhid Hossain	H. Technician
Ms. Anwara Begum Soma	H. Technician
Mr. Kamrul Islam	H. Technician
Mr. Bodruddoza	H. Technician
Mr. Younus Ali	H. Technician
Mr. Mominul Islam	H. Technician
Ms. Ayesha Khatun	H. Technician
Mr. Bidyt Barai	H. Technician
Ms. Thamina Akther	H. Technician
Mr. Aminul Islam(Patua)	Attendance
Mr. Hassan Selim	Attendance
Mr. Arifuzzman	Attendance
Mr. Anishur Rahman	Office
Mr. Debashis Bachar	Office
Mr. Eakub Ali Khan	Office
Mr. Jahirul Islam	Office
Mr. Mominuzzaman	Office
Mr. Zahidul Islam	Office
Ms. Anjuman Ara Begam(Anth-2)	Interviewir
Ms. Ashma Hossain	Interviewir
Ms. Asma Akhter(Anth)	Interviewir
Ms. Bulbuli Begum	Interviewir
Ms. Farzana Jakaria	Office
Ms. Ferdausi Akhter	Interviewir
Ms. Jahidha Khatun(Anth)	Interviewir
Ms. Lipi Begum	Interviewir
Ms. Lovely Rani Das	Interviewir
Ms. Mazeda Khatun	Office
Ms. Monira Pathan Lutfa	Office
Ms. Mousumi Akter(Lasmin)(Anth)	Interviewir
Ms. Nasrin Akter(Anth)	Interviewir
Ms. Nur Banu(Anth-3)	Interviewir
Ms. Nurun Nahar	Office
Ms. Parul Begum	Interviewir
Ms. Rina Aktar(Anth)	Interviewir
Ms. Rinky Khanam	Interviewir
Ms. Ripa Begum	Interviewir
Ms. Sahrima Khan(Anth-3)	Interviewir
Ms. Salma Akther(Anth)	Interviewir
Ms. Samsun Nahar	Interviewir
Ms. Sheuli Rani(Anth-2)	Interviewir

Ms. Suborna Parvin(Anth-3)	Interviewir
Ms. Suma Akhter	Interviewir
Ms. Suma Akther	Interviewir
Ms. Sumina Liva (Sumi)	Interviewir
Ms. Taslima Akhter Lipi	Interviewir
Ms. Zohura Khatun(Anth-2)	Interviewir

Mr. Shishir Paul	Data Processor
Ms. Jharna Datta\	Data Enty and Edit
Mr. Jayead	Data Enty and Edit
Ms. Rokshana	Data Enty and Edit
Mr. Sharif Hossain Talukdar	Data Enty and Edit
Mr. Arefin Hossain	Data Enty and Edit
Mr. Pronob Das	Data Enty and Edit
Mr . Ripon Barman	Data Enty and Edit
Mr. Amran Hossain	Data Enty and Edit
Ms. Songta Modok	Data Enty and Edit